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HWY-DS 2.21097

September 10, 2025

TO: JAMES KUNANE TOKIOKA, DIRECTOR
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT AND TOURISM

THROUGH: MARY ALICE EVANS, DIRECTOR
OFFICE OF PLANNING AND SUSTAINABLE DEVELOPMENT

FROM: EDWIN H. SNIFFEN
DIRECTOR OF TRANSPORTATION

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) AND ANTICIPATED FINDING OF NO SIGNIFICANT IMPACT FOR WAIPILOPILO STREAM BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-083-1(57)
HAUULA, OAHU ISLAND, STATE OF HAWAII

The Hawaii Department of Transportation has reviewed the enclosed Draft EA and anticipates a Finding of No Significant Impact determination for the proposed Waipilopilo Stream Bridge Replacement project on the island of Oahu for publication in the next available edition of The Environmental Notice. A link to the Draft EA enclosures is provided due to large file size: WaipilopiloBridge-DraftEA BR-083-1(57).pdf.

Should you have any questions, please contact our Project Manager, Mr. Andrew Hirano, at (808) 692-7546, from our Design Branch, Technical Design Services Section or by email at andrew.j.hirano@hawaii.gov.

From: dbedt.opsd.erp@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Tuesday, September 16, 2025 12:32:47 PM

Action Name

Waipilopilo Stream Bridge Replacement

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds

Judicial district

Koʻolauloa, Oʻahu

Tax Map Key(s) (TMK(s))

Kamehameha Highway ROW

Action type

Agency

Other required permits and approvals

Section 4(f) regarding the use of publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites; Section 106 of the National Historic Preservation Act; Section 10 of the Rivers and Harbors Act of 1899; Section 404 of the Clean Water Act; Section 7 of the Endangered Species Act; Essential Fish Habitat; Coastal Zone Management (CZM) Federal Consistency Review; National Pollutant Discharge Elimination System; Section 401 of the CWA; Noise Permit Application; Noise Variance Application; Stream Channel Alteration Permit; Shoreline Certification; Hawaii Revised Statutes Chapter 6E Historic Preservation; City and Couty of Honolulu Grading, Grubbing, and Stockpiling Permit; Shoreline Setback Variance

Proposing/determining agency

State of Hawaii Department of Transportation

Agency jurisdiction

State of Hawaiʻi

Agency contact name

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Map It

Is there a consultant for this action?

Yes

Consultant

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Map It

Action summary

The Hawaii Department of Transportation (HDOT) proposes the removal of the existing bridge superstructure, railings, and pedestrian walkway. The new single span bridge superstructure will consist of concrete girders and concrete surface.

The existing 12-inch and 16-inch waterlines will be relocated onto the bridge deck. The replacement bridge will have a span that is 56 feet in length and 49 feet wide. The bridge will accommodate two 11-foot travel lanes (one lane in each direction) with shoulders on both sides and a protected 6-foot walkway on the mauka side of the bridge. The bridge deck is being widened to accommodate wider shoulders and improve traffic safety, this widening will not increase capacity or add additional lanes. The new bridge abutments will consist of drilled shafts connected to a cast-in-place reinforced concrete cap beam. The concrete girders will be supported by the cap beams and the concrete surface will be placed on the girders forming the riding surface. No in-water work will be done.

Reasons supporting determination

See Chapter 5: Anticipated Finding of No Significant Impact.

Attached documents (signed agency letter & EA/EIS)

- WaipilopiloBridge-DraftEA-Rev20250903-CleanWithApp_FINAL-OCR1.pdf
- HWY-DS-2.21097-WaipilopiloBridge-BR-083-157-EAltr-signed-unlocked2.pdf

ADA Compliance certification (HRS §368-1.5):

The authorized individual listed below acknowledges that they retain the responsibility for ADA compliance and are knowingly submitting documents that are unlocked, searchable, and may not be in an ADA compliant format for publication. Audio files do not include transcripts, captions, or alternative

descriptions. The project files will be published without further ADA compliance changes from ERP, with the following statement included below the project summary in The Environmental Notice: "If you are experiencing any ADA compliance issues with the above project, please contact (authorized individual submitting the project at email)."

Action location map

- WaipilopiloProjectArea3.zip

Authorized individual

Ethan Lau

Authorized individual email

ethan.lau@wsp.com

Authorized individual phone

(808) 599-3430

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

Draft Environmental Assessment

Waipilopilo Stream Bridge Replacement

Federal-Aid Project No. BR-083-1(57)

Kamehameha Highway, Hauula
District of Koʻolauloa
Island of Oʻahu





September 2025

DRAFT ENVIRONMENTAL ASSESSMENT

WAIPILOPILO STREAM BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-083-1(57)

KAMEHAMEHA HIGHWAY, HAUULA

DISTRICT OF KOOLAULOA
ISLAND OF OAHU

SEPTEMBER 2025

DRAFT ENVIRONMENTAL ASSESSMENT
Waipilopilo Stream Bridge Replacement
Federal-Aid Project No. BR-083-1(57)
Hauula, Koolauloa, Island of Oahu

Submitted Pursuant to the Hawaii Environmental Policy Act, Chapter 343, Hawaii Revised Statutes, and Title 11, Chapter 200.1, Hawaii Department of Health Administrative Rules by the:

Department of Transportation, Highways Division
State of Hawaii

The following person may be contacted for additional information concerning this document:

Andrew J. Hirano, Project Manager
Department of Transportation, Highways Division
601 Kamokila Boulevard, #688
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(808) 692-7546

This Draft Environmental Assessment (EA) discloses the foreseeable primary, secondary, and cumulative environmental impacts that could result from the proposed project's implementation and commits to specific measures to avoid, minimize, or mitigate adverse impacts to the environment. This EA also contains a record of consultation activities conducted to date as part of project planning. The Hawaii Department of Transportation (HDOT) proposes the removal of the existing bridge superstructure, railings, and pedestrian walkway. The new single span bridge superstructure will consist of concrete girders and concrete surface.

The existing 12-inch and 16-inch waterlines will be relocated onto the bridge deck. The replacement bridge will have a span that is 56 feet in length and 49 feet wide. The bridge will accommodate two 11-foot travel lanes (one lane in each direction) with shoulders on both sides and a protected 6-foot walkway on the mauka side of the bridge. The bridge deck is being widened to accommodate wider shoulders and improve traffic safety, this widening will not increase capacity or add additional lanes. The new bridge abutments will consist of drilled shafts connected to a cast-in-place reinforced concrete cap beam. The concrete girders will be supported by the cap beams and the concrete surface will be placed on the girders forming the riding surface. No in-water work will be done.

HDOT anticipates that the project is not likely to have a "significant" effect in accordance with Hawaii Revised Statutes Chapter 343 and Hawaii Administrative Rules 11-200.1-13. Therefore, an EA process was selected for the environmental review. If, during the consideration of comments received on this Draft EA, HDOT determines that a "significant" impact would occur, HDOT will either revise the project to avoid or mitigate the impact's severity or start preparing an Environmental Impact Statement.

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ABBREVIATIONS AND ACRONYMS

AAQS	Ambient Air Quality Standards
AIS	Archaeological Inventory Survey
AMP	Archaeological Monitoring Plan
APE	Area of Potential Effects
BMP	Best Management Practices
CatEx	Categorical Exclusion
CFR	Code of Federal Regulations
CIA	Cultural Impact Assessment
CWA	Clean Water Act
CWRM	Commission on Water Resource Management
CZM	Coastal Zone Management
DAR	Division of Aquatic Resources
dBA	A-weighted decibels
DLNR	Department of Land and Natural Resources
DOFAW	Division of Forestry and Wildlife
EA	Environmental Assessment
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1973
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
General Plan	Oahu General Plan
HAR	Hawaii Administrative Rules
HDOH	Hawaii Department of Health
HDOT	Hawaii Department of Transportation
HRHP	Hawaii Register of Historic Places
HRS	Hawaii Revised Statutes
IPaC	Information for Planning and Consultation

MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	mean sea level
NAC	Noise Abatement Criteria
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
OCCL	Office of Conservation and Coastal Lands
OPSD	Office of Planning and Sustainable Development
PIRO	Pacific Islands Regional Office (National Marine Fisheries Service)
The project	Waipilopilo Stream Bridge Replacement Project
Section 106	Section 106 of the National Historic Preservation Act
Section 7	Section 7 of the Endangered Species Act
SHPD	State Historic Preservation Division
SHPO	State Historic Preservation Officer
SIHP	State Inventory of Historic Places
SMA	Special Management Area
TMK	Tax Map Key
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

EXECUTIVE SUMMARY

Project Name	Waipilopilo Stream Bridge Replacement
Proposing Agency	State of Hawaii Department of Transportation (HDOT)
Determining Agency	HDOT
Landowner	State of Hawaii
General Location	The Waipilopilo Stream Bridge is located at mile marker 20.81 along Kamehameha Highway (Route 83) between Imua Place and Waikulama Street in Hauula, Oahu. It is oriented from south (Kaneohe) to north (Laie). Waipilopilo Stream Bridge is located at roughly 21°36'53.0"N 157°54'47.4"W. The HDOT, Highways Division (HDOT-HWY) proposes to replace the existing Waipilopilo Stream Bridge on Kamehameha Highway (Route 83) in the community of Hauula District of Koolauloa, Island of Oahu. The bridge is bordered by: Tax Map Key (TMK) (1) 5-4-2:022, Hauula Beach Park to the east and southeast (makai side) and TMK (1) 5-4-17:21, a 3,337 square foot (sf), privately owned, undeveloped lot to the west (mauka side).
Tax Map Keys	Kamehameha Highway Right-of-Way (ROW)
Project Area	The proposed project is in Koolauloa District on the island of Oahu. The project area is bordered by Hauula Beach Park to the east and southeast and a 3,337 sf, privately owned, undeveloped lot to the west. The project area is approximately 0.62 acre. The length of the project area is approximately 485 feet, with a width of around 50 feet.
Existing Uses of the Project Area	The existing uses in the project area consists of the Waipilopilo Stream Bridge, Waipilopilo Stream, HDOT right-of-way, and is adjacent to Hauula Beach Park on the makai side, and residential uses on the mauka side.
Proposed Project Cost	Based on conceptual engineering, the total cost of the Proposed Action is estimated at approximately $12 Million. This cost will be refined as engineering details are developed.
State Land Use Designation	Urban
County Zoning	R-5 (Residential (5 units/acre))
Special Management Area	The Waipilopilo Stream Bridge is within the Special Management Area (SMA) (tsunami). The project received an

	SMA Determination from the Department of Planning and Permitting on June 27, 2025 and an SMA Use Permit is not required, pursuant to Revised Ordinances of Honolulu, Section 25 1.3(2)(C) 'Repair or maintenance of roads and highways within existing rights-of-way'.
Anticipated Determination	Anticipated Finding of No Significant Impact (AFNSI) pursuant to Chapter 343, Hawaii Revised Statutes (HRS)
Anticipated Impacts	• Land Use No changes to existing land use are anticipated. The proposed project is consistent with future land use proposals listed in the Hamakua Community Development Plan. Implementation of the identified mitigation measures and compliance with regulations will ensure that impacts will be less than significant. • Historic, Archaeological, and Cultural Resources The Section 106 process was initiated with the State of Hawaii Department of Land and Natural Resources (DLNR) State Historic Preservation Division (SHPD) and completed on January 29, 2018. The SHPD Effect Determination letter and other related correspondence is attached to Appendix A. FHWA determined that the project will result in an *adverse effect* to both Site 4795 and the Waipilopilo Stream Bridge. The State Historic Preservation Officer (SHPO) concurs. On March 16 and 17, 2015, Pacific Consulting Services, Inc. (PCSI) conducted an Archaeological Inventory Survey (AIS). A copy of the Final AIS report is included as Appendix E in this Draft Environmental Assessment (EA). The area of potential effects (APE) is a 0.75-hectare (1.85 acres) area along Kamehameha Highway between Imua Place and Waikulama Street. See Figure 2-6. Subsurface testing consisted of the excavation of five (5) backhoe trenches. No evidence of the previously documented cultural deposit designated State Inventory of Historic Places (SIHP) Site No. 50-80-05-4795 (Site 4795) or any additional traditional Hawaiian subsurface archaeological materials or features were encountered during excavations. Site 4795 was identified through a previous AIS (Masterson et al. 1997) and deemed significant under Criteria D and E, and therefore eligible for listing on the Hawaii Register of Historic Places (HRHP). Two late historic artifacts and one vertebra from a medium mammal, probably Canis familiaris, were recovered. These artifacts lack contextual integrity for designation as a

	site, but nonetheless contribute information about the land history of the area and about the types of cultural remains associated with earlier residences in the area. The Hawaii Revised Statutes (HRS) HRS § 6E process the SHPD is expected to conduct its HRS § 6E review responsibilities in conjunction with their Section 106 responsibilities. • Hazardous Materials and Solid Waste Management Lead was detected in the samples collected from the structural components of the Waipilopilo Bridge Stream. Demolition and removal activities may expose construction workers to lead dust and fugitive lead paint. Any debris generated from the bridge and adjacent wooden walkway shall be properly characterized and disposed of to the appropriate landfill. See Section 2.15. • Biological Resources The USFWS concurred with HDOT's determination that the project *may affect, but is not likely to affect* Hawaiian waterbirds. The USFWS concurred with HDOT's determination that with the appropriate mitigation measures the project *may affect, but is not likely to affect Hawaiian seabirds.* The USFWS concurred with HDOT's determination that the project *may affect, but is not likely to affect* Hawaiian hoary bats. Because of the required night work during turtle nesting season, ongoing consultation is occurring between the USFWS and HDOT and FHWA. • Visual and Aesthetic Resources During construction, ocean views normally seen from southern and eastern directions from Kamehameha Highway will be disrupted. These impacts will be temporary and no long-term, significant visual changes are anticipated. • Traffic Mitigation measures relating to the maintenance of traffic during construction will be implemented as appropriate.

	• Noise Construction activities in the project area may cause noise that exceeds maximum levels allowed by community noise control regulations. Contractors will comply with HAR 11 Chapter 46 "Community Noise Control". The contractors will obtain a Community Noise Permit. If construction is needed to be completed during the night, weekend, or holiday, a Community Noise Variance will be obtained. If construction adheres to Community Noise Permits and Community Noise Variance, no significant impacts are anticipated. • Air Quality Air quality impacts associated with construction would consist of fugitive dust (airborne particulate matter) and mobile source emissions from construction. This dust would be controlled by the contractor at the construction site in accordance with the provisions of HAR Chapter 11-60.1-33, Fugitive Dust. The proposed project is not anticipated to increase emissions compared to existing traffic emissions. Thus, no significant air quality impacts are anticipated.
	1) Identification of the applicant or proposing agency. See Section 1.1, Introduction. 2) For applicant actions, identification of the approving agency. This project is an agency action. See "Determining Agency" in this Executive Summary and Section 1.1, Introduction. 3) List of all required permit sand approvals (state, federal, and county) and, for applicants, identification of which approval necessitates chapter 343, HRS, environmental review. See Section 1.8, Permits and Approvals, and Chapter 4, Comments and Coordination. 4) Identification of agencies, citizen groups, and individuals consulted in preparing the draft EA. See Chapter 4, Comments and Coordination, and Appendix A.

	5) General description of the action's technical, economic, social, cultural, historical, and environmental characteristics. See Chapter 2, Affected Environment, Potential Impacts, and Proposed Mitigation. 6) Summary description of the affected environment, including suitable and adequate regional, location, and site maps such as Flood Insurance Rate Maps, Floodway Boundary Maps, U.S. Geological Survey topographic maps, or state sea level rise exposure area maps. See Chapter 2, Affected Environment, Potential Impacts, and Proposed Mitigation. 7) Identification and analysis of impacts and alternatives considered. See Chapter 2, Affected Environment, Potential Impacts, and Proposed Mitigation. 8) Proposed mitigation measures. See Chapter 2, Affected Environment, Potential Impacts, and Proposed Mitigation. 9) Proposing agency or approving agency anticipated determination, including findings and reasons supporting the anticipated FONSI, if applicable. See Chapter 5, Anticipated Finding of No Significant Impact. 10) Written comments and responses to comments received, if any. See Chapter 4, Comments and Coordination, and Appendix A.

CHAPTER 1. DESCRIPTION OF THE PROPOSED ACTION

1.1 Introduction

The State of Hawaii Department of Transportation (HDOT), Highways Division (Highways) proposes to replace the existing Waipilopilo Stream Bridge on Kamehameha Highway (Route 83) in the community of Hauula, District of Koolauloa, Island of Oahu. The bridge is bordered by Tax Map Key (TMK) 5-4-2:022, Hauula Beach Park to the east and southeast (makai side) and TMK 5-4-17:21, a 3,337-square foot (sf), privately owned, undeveloped lot to the west (mauka side). Refer to Figure 1-1 and Figure 1-2.

HDOT Highways is the lead local agency for this project, which is officially named "Replacement of Waipilopilo Stream Bridge". The project is included in the Statewide Transportation Improvement Program, which is the capital improvement program for near-term transportation projects in the state.

This Draft Environmental Assessment (EA) was prepared for the Proposed Action pursuant to Chapter 343, Hawaii Revised Statutes (HRS) and State Department of Health Title 11, Chapter 200.1, Hawaii Administrative Rules (HAR). The use of state land or funds for replacing the bridge "triggers" HRS Chapter 343.

Use of federal funds is subject to environmental documentation requirements set forth under the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) 4332(2)(c). To comply with NEPA, the Federal Highway Administration (FHWA) is preparing environmental documentation to be consistent with the findings of this EA.

1.1.1 Project Area of Potential Effects and Project Area as Presented in this Draft EA

The previous SHPD determination established the APE as shown in Appendix A agency coordination for Section 106. As stated in the Executive Summary, FHWA made the determination of adverse effect on January 29, 2018. SHPO concurred. Please see Section 2.3 for further discussion regarding the SHPD-approved APE and project coordination with the SHPD.

The project area, or design solution, used in this Draft EA occurs entirely within the SHPD-approved APE. The design solution was amended, but the APE has not changed. The design solution is to proceed entirely within the SHPD-approved APE.

The Waipilopilo Stream Bridge Replacement Structural Plans are included in this Draft EA as Appendix B.

1.2 Purpose of this Document

The proposed project requires an environmental review in accordance with HRS Chapter 343 because it would use state or county lands and use state funds. HDOT is responsible for preparing this document which must comply with HAR Title 11, Chapter 200.1.

This Draft EA discloses the foreseeable primary, secondary, and cumulative environmental impacts that could result from the proposed project's implementation and commits to specific

measures to avoid, minimize, or mitigate adverse impacts to the environment. Additionally, this Draft EA contains a record of consultation activities that have been conducted to date as part of project planning.

HDOT has determined that the proposed project is not likely to have a "significant" effect in accordance with HRS Chapter 343 and HAR 11-200.1-13. Therefore, an EA process was selected for the environmental review. If, during the consideration of comments received on this Draft EA, HDOT determines that a "significant" impact would occur, HDOT will either revise the proposed project to avoid or mitigate the impact's severity and/or start preparing an Environmental Impact Statement.

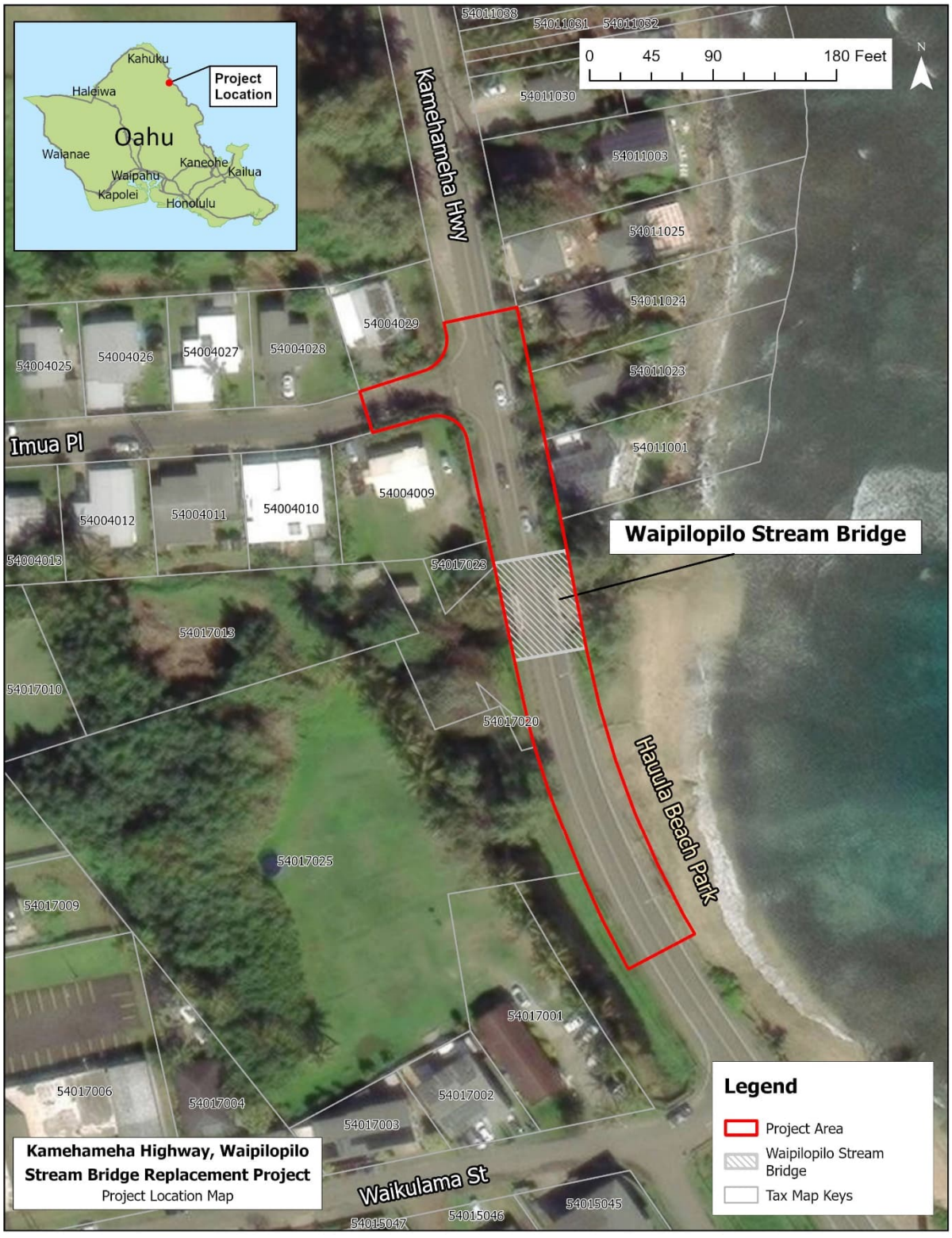
Because federal funds administered by the FHWA will be used to construct this project, the project is considered a federal action and must also comply with NEPA, a federally mandated environmental review process. To comply with NEPA, a Categorical Exclusion (CatEx) is anticipated for this project and will be documented separately. In addition to NEPA, other federal laws that apply to the proposed project include but are not limited to Section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. § et seq.) (Section 7), Magnuson-Stevens Fishery Conservation and Management Act (MSA), Section 106 of the National Historic Preservation Act (NHPA) (Section 106), and Section 4(f) of the 1966 U.S. Department of Transportation Act. These regulations have the potential to affect decision-making, including requiring avoidance and mitigation measures, as they are applied to specific resources. For this reason, they are identified and addressed when relevant throughout the document. This Draft EA provides supporting documentation for compliance with NEPA and other federal environmental regulations, the coordination for which is ongoing.

1.3 Organization of this Document

This Draft EA is organized as follows:

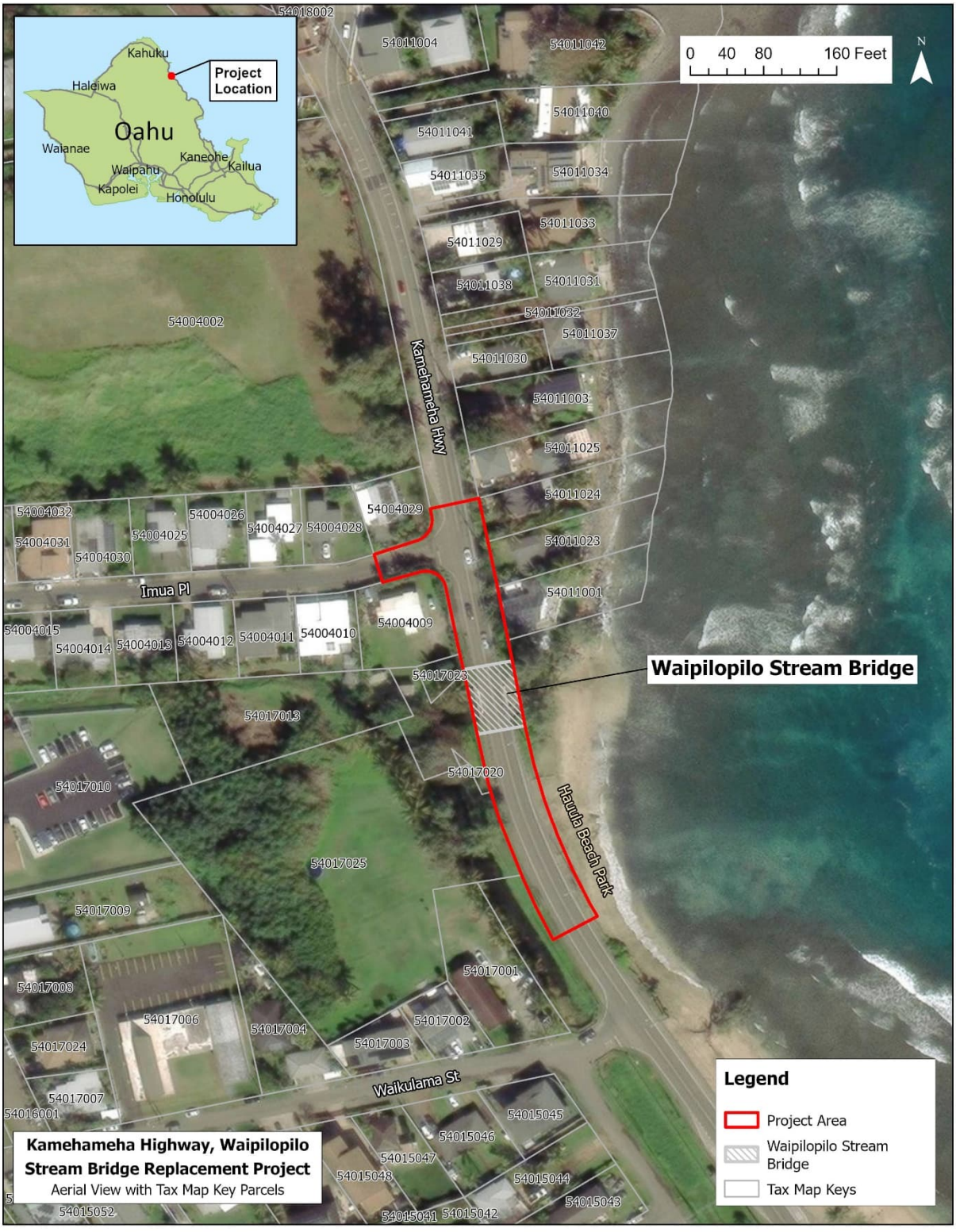
- Chapter 1 provides an introduction and discusses the purpose and need for the proposed project.
- Chapter 2 presents the alternatives that were considered and the proposed project's anticipated schedule and cost. It also lists permits and approvals that may be required.
- Chapter 3 describes existing environmental conditions, potential environmental impacts, and the mitigation measures that are proposed to reduce the level of potential effect.
- Chapter 4 documents agency and public coordination conducted to date related to the proposed project.
- Chapter 5 provides the Anticipated Finding of No Significant Impact (FONSI) statement in accordance with HAR 11-200.1-18 (d)(9).
- Chapter 6 consists of a list of references used in the preparation of this Draft EA.
- Appendices contain records of comments and coordination conducted for the project, as well as various technical reports prepared by specialists.

Figure 1-1: Project Location Map



Source: Environmental Systems Research Institute (ESRI).; Honolulu Land Information System (HoLIS), Hawaii Statewide GIS Program 2023, Accessed 2024.

Figure 1-2: Aerial View with Tax Map Parcels



Source: Esri 2024; HOLIS, Hawaii Statewide GIS Program 2023

1.4 Project Purpose and Need

HDOT is responsible for maintaining the functional and structural integrity of its bridges on all state highways. There are four (4) distinct purpose and need statements for the Replacement of the Waipilopilo Stream Bridge Project (the Build Alternative).

1.4.1 Improve Traffic Safety for Motorists and Pedestrians

Storm water runoff generated in the vicinity of the bridge sheet flows towards the roadway shoulder on each side, where it discharges into the unlined Waipilopilo Stream below. The stream continues for a short distance, where it reaches the ocean at Hauula Beach Park. A drainage ditch that runs parallel to Kamehameha Highway on the mauka side confluences with the stream at approximately 75 feet upstream of the bridge. Multiple outlets discharge into the drainage ditch from the storm drainage system within the Hauula Homesteads Subdivision.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the area shows the bridge located in Floodway Zone AEF with a base flood elevation of 8 (FEMA 2016; Esri 2024; HOLIS, Hawaii Statewide GIS Program. Downloaded 2023) (Figure 2 9). The tributary area (185.6 acres) is composed of Waipilopilo Gulch and a section of the Hauula Homesteads Subdivision. The 50- and 100-year stream flow was computed as 1,140 and 1,386 cubic feet per second (cfs), respectively.

Waipilopilo Stream, located in the Kaipapau watershed (DLNR-Division of Aquatic Resources (DAR) watershed code no. 31010), flows from the Hauula Forest Reserve on the slopes of Koolau Mountain and crosses under Kamehameha Highway (Route 83) in Hauula before entering the Pacific Ocean.

Waipilopilo Stream is a first order stream that arises at the 340-meter (1,120 foot) elevation above mean sea level (MSL) and is approximately 2.9 kilometers (1.8 miles) long. The total area of the larger Kaipapau watershed is estimated at 7.3 square meters (2.8 miles) (DLNR-DAR 2008). The elevation at the project site is less than 3 meters (10 feet) above MSL.

The design peak discharge was determined by the U.S. Soil Conservation Service method and computed by WinTR-55 version 1.00.08. The results were compared to Plate 6 of the City and County of Honolulu Rules Relating to Storm Drainage Standards and the U.S. Geological Survey StreamStats web-based application. Both yielded similar results of 1,400 cfs and 1,320 cfs, respectively. The computed stream flows were routed through the bridge using HEC-RAS version 4.1 to determine the water surface profile and scour depth. The Mean Higher High-Water level of 1.1 feet (MSL) was used as the starting water surface elevation in the analysis.

Due to the proximity of the bridge to the tidal influence, a Level 1 analysis was performed in accordance with FHWA Hydraulic Engineering Circular No 18. The evaluation determined that the hydraulic analysis depended on river and not tidal conditions.

Since the bridge is located within a floodway, the stream channel and the adjoining floodplain are needed to convey the base flood (100-year flood) discharge. The stream channel itself does not have the capacity to convey the base flood below and within the bridge opening as shown in the following HEC-RAS water surface elevation profile. The capacity of the stream channel is also restricted by the raised streambed downstream of the bridge where it discharges into the ocean. The aggradation is due to tidal actions which causes deposition of beach sand.

Contraction scour and local scour at the bridge abutments for the 100-year storm were also computed with the HEC-RAS program. Contraction scour yielded depths between 0.5 foot and 2.5 feet. Abutment scour yielded greater depths ranging between 11.5 feet and 13 feet. Although the computed results indicate that scouring may occur to the extent calculated, field conditions do not corroborate these results. Historical records do not indicate obvious signs of streambed or bank material removal at the bridge foundations.

A hydraulic analysis of the design peak discharge revealed that the stream channel does not have the capacity to convey the base flood below and within the bridge opening. Additionally, the capacity of the stream channel is restricted by stream bed aggradation due to tidal action depositing beach sand downstream of the bridge where it discharges into the ocean. Although computed results indicate that the storm water flow exceeds the capacity of the stream channel and bridge waterway, HDOT Oahu District Maintenance Section (HWY-OM) has no records of overtopping at the bridge deck. Inquiries with local nearby residents corroborate HWY-OM records.

1.4.2 Meet Current State and Federal Design Guidelines

The existing Waipilopilo Bridge, originally built in 1932 by the Territorial Highway Department of the Territory of Hawaii, was constructed with four cast-in-place reinforced concrete girders, cast-in-place reinforced concrete deck slab with asphalt overlay, concrete curb, and bridge railing. There are no concrete approach slabs to the bridge deck. The bridge abutment is composed of a reinforced concrete cap beam (with an integrally cast back wall) supported by 14-inch square precast concrete piles. The bridge structure measures approximately 27 feet wide and 25 feet long.

In 1964, a 3-foot-wide suspended wooden pedestrian walkway was added along the mauka side of the structure. In 1990, the existing guardrails were replaced and asphalt concrete pavement added to transition the paved road shoulder to the wooden pedestrian walkway. In 1995, the bridge was resurfaced as a part of a 4-mile resurfacing project.

This project was initiated in 2005, and at that time the bridge had a sufficiency rating of 56.3 based on FHWA National Bridge Inventory Standards. A sufficiency rating below 50 warrants bridge replacement. A sufficiency rating greater than or equal to 50 and below 80 warrants bridge rehabilitation. Because the bridge sufficiency rating was 56.3, this project started as a bridge rehabilitation project. Bridge rehabilitation would have widened the bridge deck to provide wider shoulders, upgraded bridge railings, and strengthened the bridge girders and deck.

During the conceptual design phase, engineering analyses indicated that the deteriorated condition of the bridge girders and deck was such that bridge replacement was a more cost-effective design solution. In addition, the gradual deterioration of the bridge between 2005 and 2016 decreased its sufficiency rating to 47.8, further warranting replacement rather than rehabilitation. In effect, the bridge was structurally deficient.

1.4.3 Address Bridge Maintenance Concerns

During the conceptual design phase, engineering analyses indicated that the deteriorated condition of the bridge girders and deck was such that bridge replacement was a more cost-effective design solution. In addition, the gradual deterioration of the bridge between 2005 and 2016 decreased its sufficiency rating to 47.8, further warranting replacement rather than rehabilitation. In effect, the bridge was structurally deficient. The project scope of work was then changed from bridge

rehabilitation to bridge replacement. Kamehameha Highway is on the National Highway System, which means it is a critical route within the regional transportation system. As part of the regional transportation system, the long-term safety and functionality of bridges are an important component of the system. In the Koolauloa District, there are no other roadways and bridges capable of providing emergency access across streams. Kamehameha Highway is also classified as a rural principal arterial. For the local community, the bridge is also used by people traveling on foot and by bicycle. The existing wooden bikeway/walkway hanging on the mauka edge of the bridge is substandard for pedestrians and bicyclists and does not meet accessibility standards under Americans with Disabilities Act.

The bridge has two 11-foot-wide travel lanes (one in each direction) with 1-foot shoulders on either side. Pedestrians walking along the makai side of the highway cannot cross the bridge without walking in the travel lane. The existing guardrails, posts, and end treatments that are connected to all ends of the bridge concrete barriers do not meet National Cooperative Highway Research Program 350 highway design standards.

1.4.4 Meet Projected Traffic Demands on Kamehameha Highway, Route 83, in the Community of Hauula, District of Koolauloa, Island of Oahu.

HDOT is responsible for maintaining the functional and structural integrity of its bridges on all State highways. The project will address bridge maintenance concerns, improve traffic safety for motorists and pedestrians, and meet projected demands on Kamehameha Highway, Route 83, on the north shore of Oahu.

Traffic volumes in the area, however, are expected to increase due to increases in the number of households and employment on the windward side of Oahu. The Oahu Regional Long Range Transportation Plan 2035 project identified a 27% growth in trips in the Hauula area from year 2007 to year 2035, or an average annual growth of 0.85% over the 28-year study period. This growth rate was applied to the 2013 Average Daily Traffic (ADT) to produce the following traffic projections:

ADT (2024) = 18,000 vehicles per day

ADT (2044) = 21,200 vehicles per day

Further details are provided in Appendix D: Waipilopilo Bridge Traffic Report.

1.5 Site Conditions

The existing bridge is located at milepost 20.81 on Kamehameha Highway between Waikulama Street and Imua Place in the Koolauloa District on the island of Oahu. It crosses the Waipilopilo Stream near its discharge into the ocean and state-owned Hauula Beach Park. Currently, Waipilopilo Stream Bridge contains two 11-foot-wide lanes (Figure 1-3). On the mauka side of the bridge exists a suspended pedestrian crossing. The upstream side of the bridge is bordered by an undeveloped lot owned by a private individual. Other lots on the mauka side surrounding the privately owned lot include the State of Hawaii, City and County of Honolulu, and private owners further mauka. The downstream side of the bridge is within Hauula Beach Park. On the Kahuku side, residential houses are located mauka and makai of the highway.

Storm water runoff generated in the vicinity of the bridge sheet flows towards the roadway shoulder on each side, where it discharges into the unlined Waipilopilo Stream below. The stream continues for a short distance, where it reaches the ocean at Hauula Beach Park. A drainage ditch that runs parallel to Kamehameha Highway on the mauka side confluences with the stream at approximately 75 feet upstream of the bridge. Multiple outlets discharge into the drainage ditch from the storm drainage system within the Hauula Homesteads Subdivision.

Utilities at the bridge include a 2.5-inch Joint Trunking System (JTS) conduit cable running along the outside face of the mauka girder. The conduit is corroded exposing the cables within. The pipe hanger supports for the conduit have separated from the bridge. A makeshift strap supports the suspended conduit at midspan to the pedestrian walkway bracket.

A 12-inch cast iron water line along the mauka side of the bridge is concrete encased as it siphons below the stream crossing. A 16-inch ductile iron water line along the makai side of the bridge is also concrete encased and is supported by caissons as it siphons below the stream crossing. There is no sewer line crossing the bridge since the lots in the area are serviced by individual wastewater disposal systems. There are overhead utility lines along both sides of the roadway. These overhead lines are electric, telephone, and cable television.

1.5.1 Drainage Basin

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the area shows the bridge located in Floodway Zone AEF with a base flood elevation of 8 (FEMA 2016; Esri 2024; HOLIS, Hawaii Statewide GIS Program. Downloaded 2023) (Figure 2-10).

The tributary area (185.6 acres) is composed of Waipilopilo Gulch and a section of the Hauula Homesteads Subdivision. The 50- and 100-year stream flow was computed as 1,140 and 1,386 cubic feet per second (cfs), respectively.

Waipilopilo Stream, located in the Kaipapau watershed (DLNR-DAR watershed code no. 31010), flows from the Hauula Forest Reserve on the slopes of Koolau Mountain and crosses under Kamehameha Highway (Route 83) in Hauula before entering the Pacific Ocean.

Waipilopilo Stream is a first order stream that arises at the 340-meter (1,120 foot) elevation above mean sea level (MSL) and is approximately 2.9 kilometers (1.8 miles) long. The total area of the larger Kaipapau watershed is estimated at 7.3 square meters (2.8 miles) (DLNR-DAR 2008). The elevation at the project site is less than 3 meters (10 feet) above MSL.

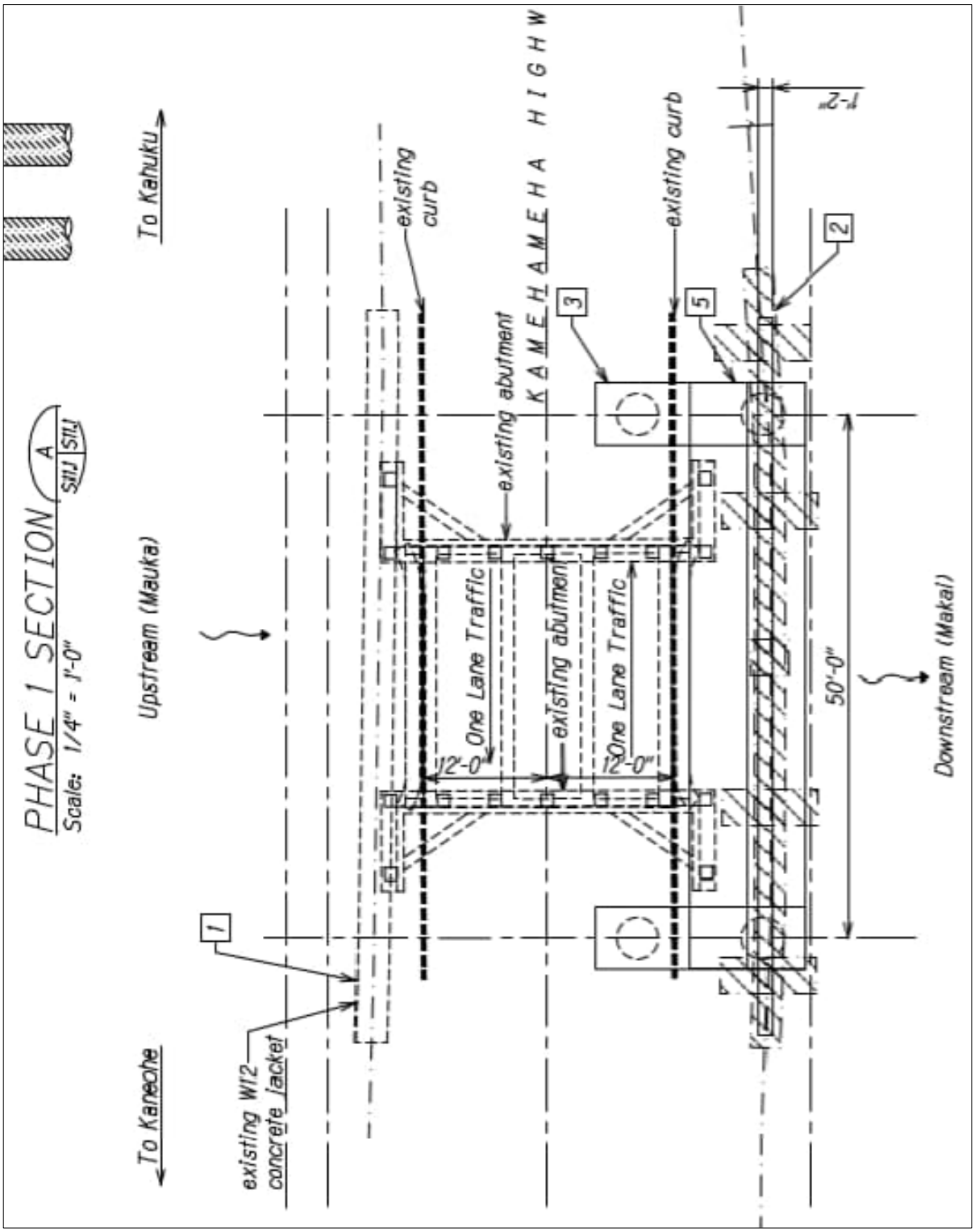
1.5.2 Hydrology and Hydraulics

The Scour report was completed on July 15, 2021. Bridge number 003000830302112 is a single-span structure located in Hauula. It is 0.03 miles south of Imua Place on Kamehameha Highway and carries the highway over Waipilopilo Stream. Waipilopilo Stream meets the Pacific Ocean approximately 120 feet downstream of the bridge crossing. According to the effective FEMA study, the bridge is located in Zone AE +8 feet. As such, the bridge is subject to storm surge during the design event. In this report, directions follow the hydraulic convention where right and left are defined looking downstream.

River control devices and embankment have widespread damage. Minor stream bed movement is evident, and debris is restricting the channel slightly. These observations were confirmed during

the site visit. While none of the inspection reports provided soundings (tape downs) for comparison, comparison of photos from the 2014 inspection report and from this report shows erosion/scour has occurred in the past. This comparison along with the estimated 100-year velocity calculations provides evidence that, at that location, Waipilopilo Stream is an aggressive stream. The recommendation is to reclassify the bridge as scour susceptible (medium priority).

Figure 1-3: Existing Lane Configurations for Kamehameha Highway at Waipilopilo Stream Bridge



1.6 Alternatives Addressed in this Environmental Assessment

Two alternatives are evaluated in this Draft EA: the No Build Alternative and the Build Alternative, also known as the Proposed Action. Other alternatives that were considered but eliminated are described in Section 1.6.3.

The proposed project had a previously prepared Draft EA, "Waipilopilo Stream Bridge Replacement, Kamehameha Highway Draft Environmental Assessment," prepared by Sato and Associates, Inc., dated February 2018. The discussion below presents again the information found in that document, as the project alternatives remain the same.

1.6.1 No Build Alternative

The No Build Alternative would retain the existing condition at the Waipilopilo Bridge stream crossing. Environmental impacts would be avoided, construction costs spared, and the need for permits precluded. This alternative would continue to pose a hazard to adjacent property owners, residents, the Hauula community, and highway traffic.

1.6.2 Build Alternative

The Build Alternative consists of the replacement of the existing Waipilopilo Stream Bridge.

The existing bridge superstructure, railings and pedestrian walkway will be completely removed. The new single span bridge superstructure will consist of concrete girders and concrete surface. The existing 12-inch and 16-inch waterlines will be relocated onto the bridge deck. The replacement bridge will have a span that is 56 feet in length and 49 feet wide. The bridge will accommodate two 11-foot travel lanes (one lane in each direction), with shoulders on both sides and a protected 6-foot walkway on the mauka side of the bridge. The bridge deck is being widened to accommodate wider shoulders and improve traffic safety; this widening will not increase capacity or add additional lanes. The new bridge abutments will consist of drilled shafts connected to a cast-in-place reinforced concrete cap beam. The concrete girders will be supported by the cap beams, and the concrete surface will be placed on the girders forming the riding surface. No in-water work will be done. See Figure 1-4 through Figure 1-7 for project plans.

Utility Relocation

Two waterlines—one 12-inch line and one 16-inch line—are attached to the existing bridge. During construction, water will be diverted between waterlines to allow water flow, even when one line is shut down. Both water lines will be permanently moved to the deck of replacement bridge. An existing 2.5-inch trunk JTS conduit cable will be removed during construction and relocated within the new bridge deck.

Staging Area

The staging area will be the responsibility of the contractor.

Figure 1-4: Build Alternative (Replacement Bridge)

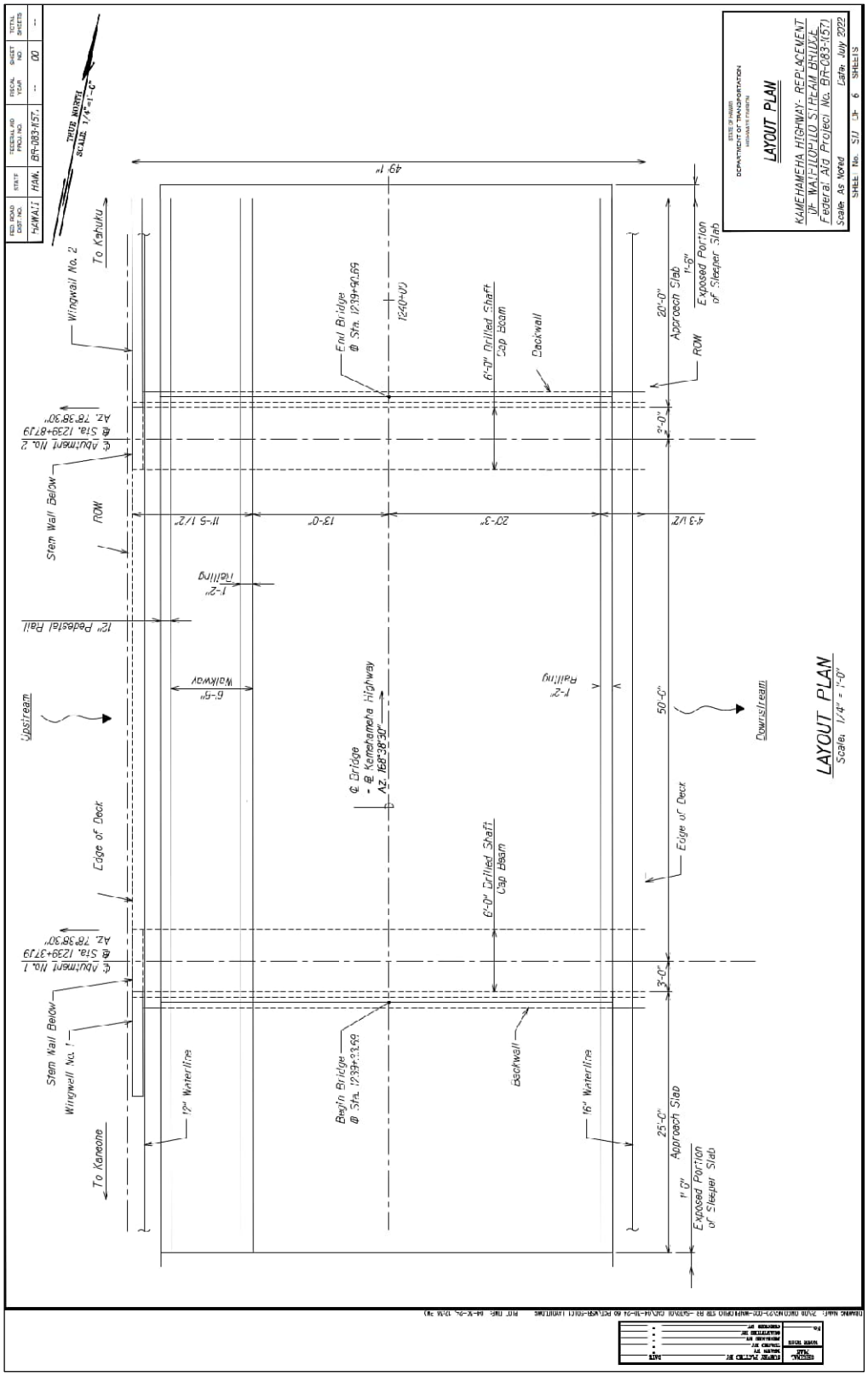


Figure 1-5: Foundation Plan

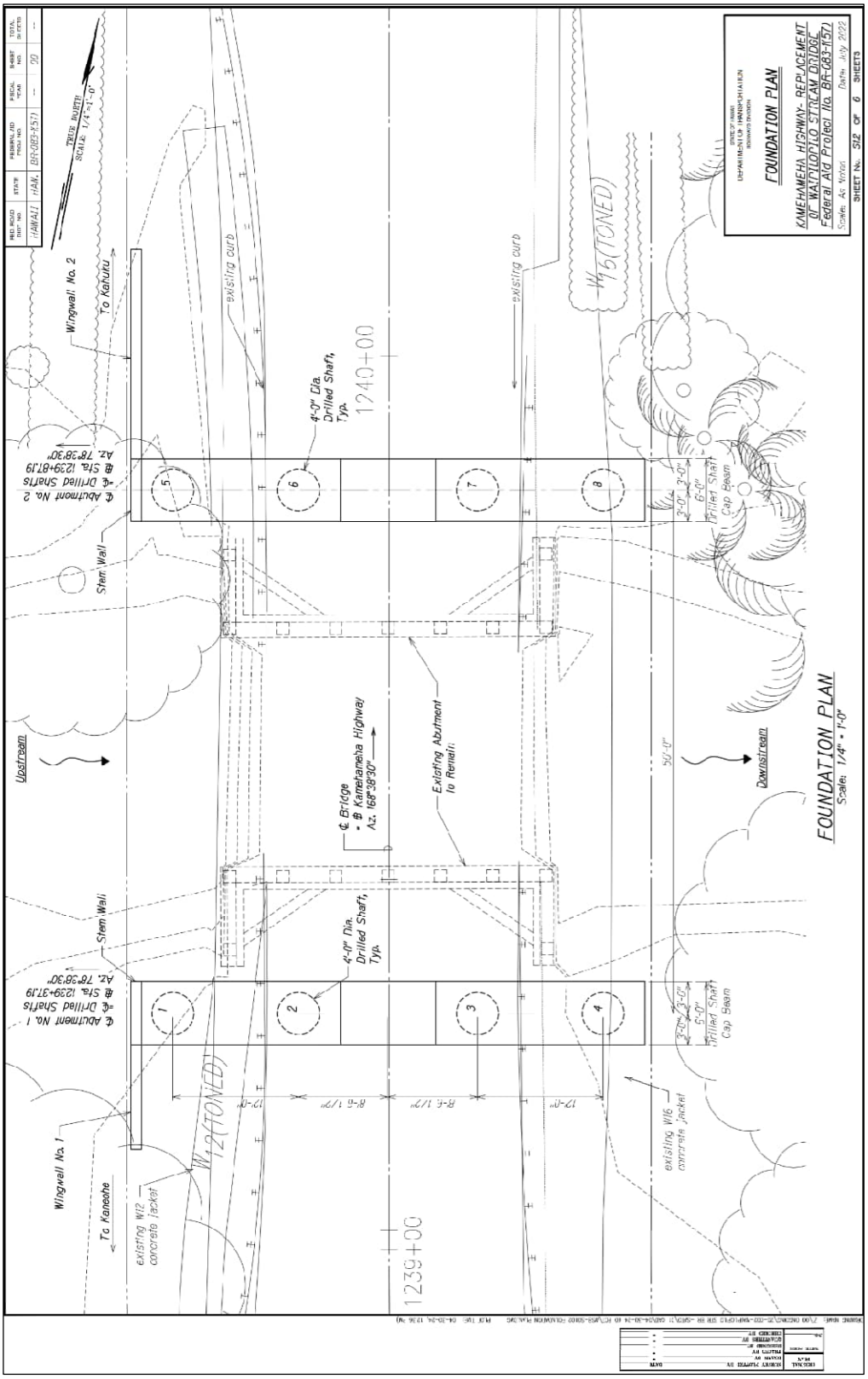


Figure 1-6: Deck Section

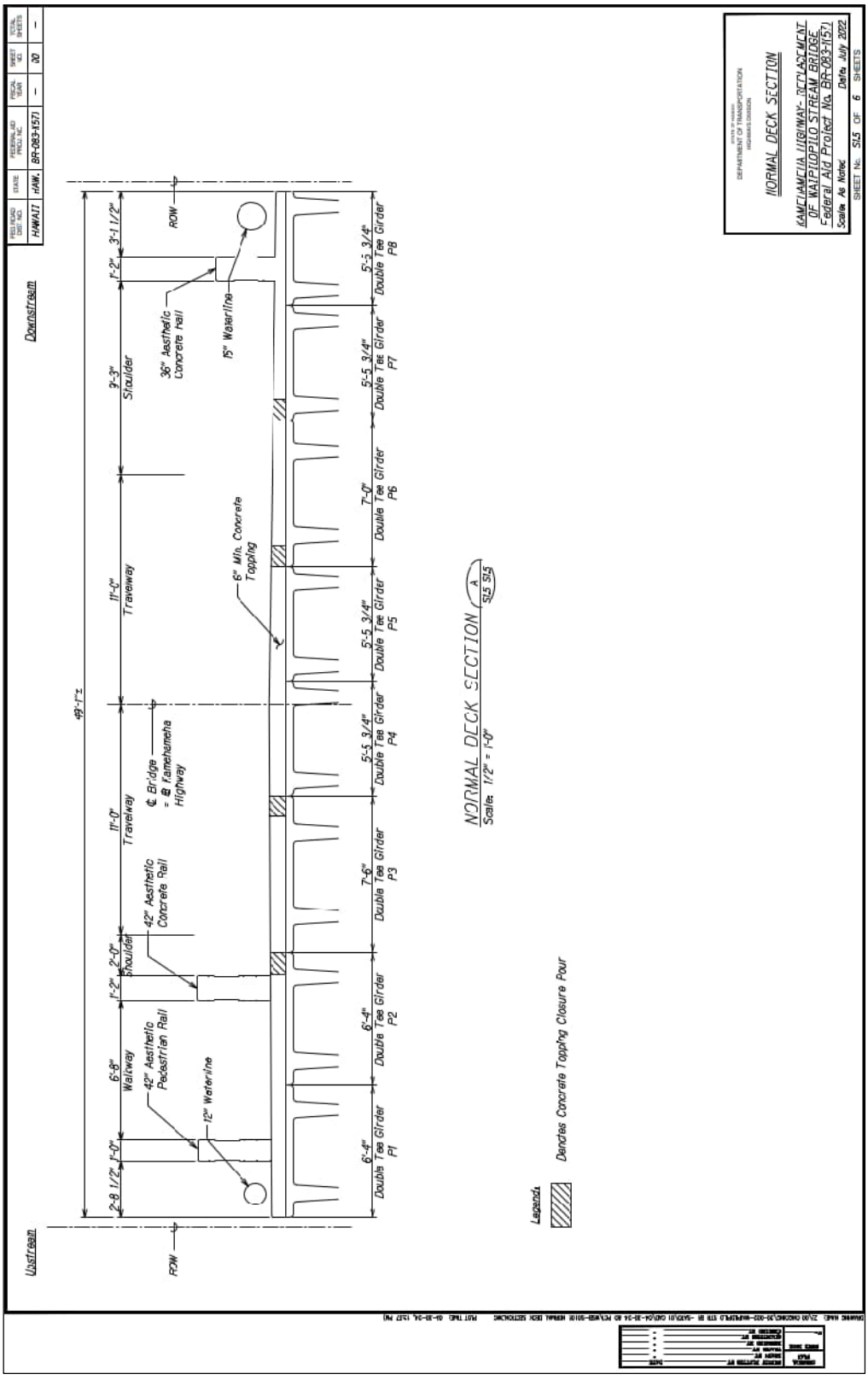
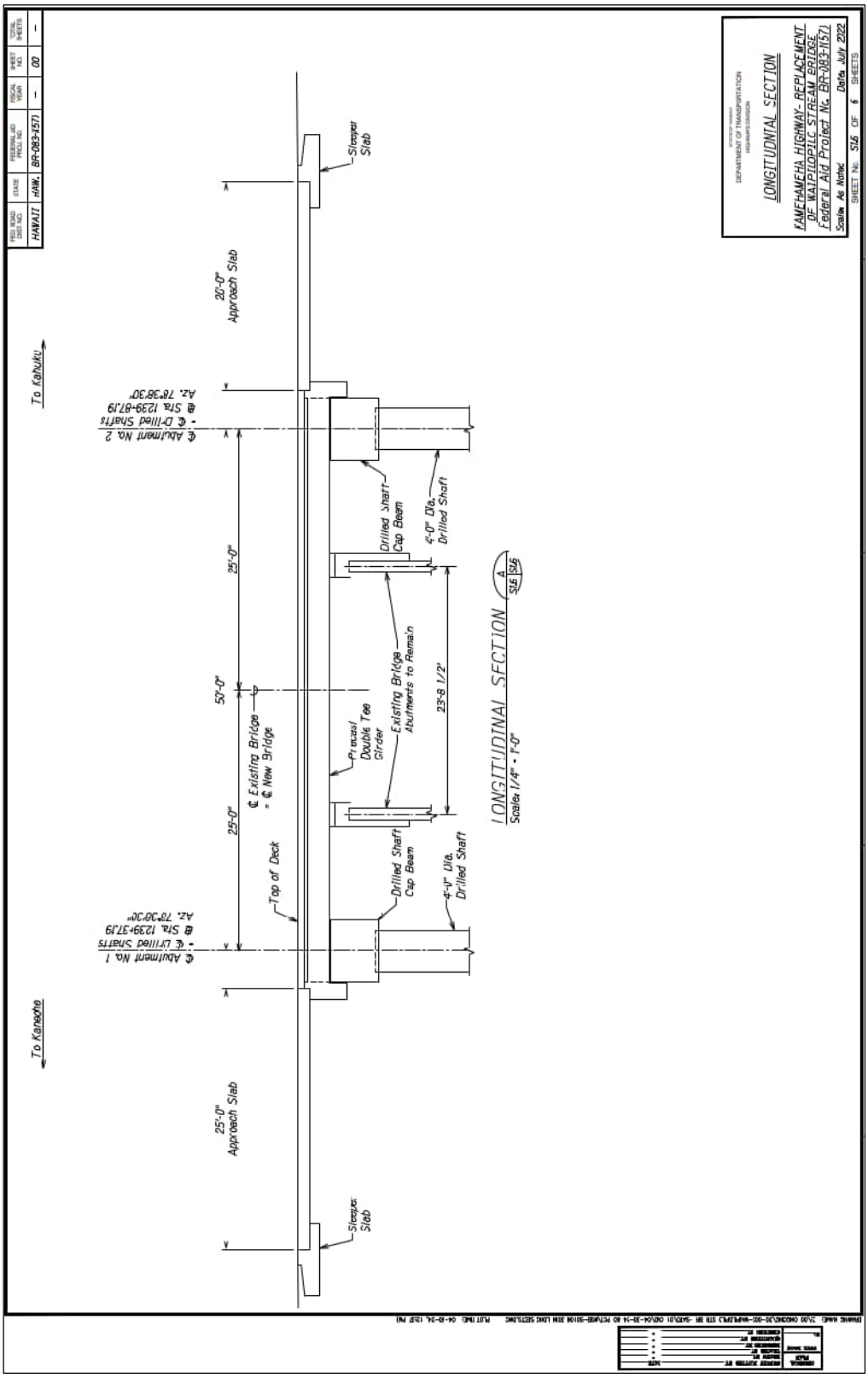


Figure 1-7: Longitudinal Section



Construction Phasing

Construction phasing would be implemented to allow traffic to continue along the bridge while construction is being completed. During construction, one lane of contraflow traffic would be allowed at all times. During peak traffic hours, construction would not occur, and plates and beams would be installed to allow two lanes of traffic flow.

Water would be diverted from the 16-inch makai waterline to the existing 12-inch mauka waterline. Once this is done, work will begin on the makai side of the bridge. The existing waterline would be demolished, and four drilled shafts drill shaft beams and two makai exterior girders would be installed.

- Phase 1:
    - Step 1: Divert water from existing makai 16-inch waterline to the existing mauka 12-inch waterline
    - Step 2: The 16-inch waterline and the platform and drilled caissons that it exists on will be abandoned in place
    - Step 3: Install the four makai drilled shafts and drill shaft cap beams
    - Step 4: Demolish the existing curb
    - Step 5: Install two makai girders and pour tapping; install permanent makai railings
- Phase 2:

    The permanent makai 16-inch waterline would be installed, allowing water to be diverted from the 12-inch mauka waterline. Once the existing pedestrian walkway barrier would be demolished, traffic would shift over to the makai side of the bridge and work could begin on the mauka side. The same work that would be completed in Phase 1 on the makai side of the bridge would occur on the mauka side.

    - Step 6: Install permanent 16-inch waterline and divert water from the 12-inch waterline to this new line
    - Step 7: Demolish existing makai barrier
    - Step 8: Fill existing deck as required to provide smooth riding surface
    - Step 9: Install road plates at interface between new and existing bridge
    - Step 10: Install temporary barriers
    - Step 11: Shift traffic to makai side of the bridge
    - Step 13: Install four mauka drilled shafts and drill shaft cap beams
    - Step 14: Demo existing curb
    - Step 15: Demo existing mauka barrier
    - Step 16: Install two mauka exterior girders and pour topping

- Phase 3:

  The pedestrian walkway would be relocated, and temporary barriers would be installed around it. The mauka exterior deck and existing abutments would be demolished and one mauka interior girder would be installed.

  - Step 17: Install temporary barriers to relocate pedestrian walkway
  - Step 18: Demolish portions of exiting mauka exterior deck and potions of existing abutments
  - Step 19: Install one interior mauka girder and pour topping:
    Pour diaphragm, backwall, and end beam closures
    Pour deck closure

- Phase 4:

  The mauka side deck would be filled and road plates installed to allow two-way traffic along the mauka side of the bridge. The same work that occurred in Phase 3 for the mauka side of the bridge would occur on the makai side of the bridge.

  - Step 20: Fill existing deck as required to provide a smooth riding surface
  - Step 21: Install road plates at interface between new and existing bridge
  - Step 22: Relocate temporary barrier and fill existing deck
  - Step 23: Shift traffic to mauka side
  - Step 24: Demolish parts of existing makai exterior deck and portions of existing abutments
  - Step 25: Install one makai interior girder and pour topping starting:
    Pour diaphragm, backwall and end beam closures
    Pour deck closures

- Phase 5:

  Traffic would be shifted to one lane on the makai side and one lane on the mauka side of the bridge, allowing work on the center of the superstructure. Drill shaft cap beams would be installed, and the remaining deck and existing abutments would be demolished. Two middle girders would be installed.

  - Step 26: Relocate temporary barriers
  - Step 27: Shift traffic to one lane on the mauka side of the bridge and one lane on the makai side of the bridge
  - Step 28: Install drill shaft cap beams
  - Step 29: Demolish remainder of existing deck and portions of existing abutment
  - Step 30: Install middle girders and pour topping:
    Pour diaphragm, backwall, and end beam
    Pour deck closure

- Phase 6:

  Two-way traffic would be shifted to the makai side of the bridge allowing for the installation of the permanent mauka bridge railing, pedestrian barrier, and 12-inch waterline.

  - Step 31: Relocate temporary barrier
  - Step 32: Shift traffic to makai side of bridge
  - Step 33: Install permanent mauka bridge railing and pedestrian barrier
  - Step 34: Install permanent 12-inch water main on bridge deck
  - Step 35: Remove temporary barrier

Project Schedule and Cost Estimate

This project is currently programmed for construction to begin in 2026. Construction is expected to take 18 to 24 months, and the cost is estimated at approximately $12 million.

1.6.3 Alternatives to the Proposed Action

Temporary Detour Facilities To Remove Need for Construction Phasing

As presented in the 2018 Draft EA, a detour road and temporary vehicular bridge will be constructed to enable more efficient construction scheduling. The two-lane detour road will be aligned immediately mauka of the existing bridge. A temporary pedestrian bridge will be constructed makai of the existing bridge.

Bridge Retrofit and Widening without Channel Widening (Rehabilitation) Alternative

The Rehabilitation Alternative proposes a widened bridge that would span approximately 30 feet center-to-center to new supporting abutments constructed behind the existing bridge abutments. A widened bridge would accommodate two 12-foot-wide lanes of traffic, two 8-foot-wide shoulders and new bridge rails for a total width of 42 feet, 4 inches. The existing bridge railings and the pedestrian walkway attached to the upstream edge of the existing bridge will be demolished. The remaining 24-foot-wide superstructure will be repaired and structurally upgraded to meet current design standards. Existing reinforced concrete girders, badly damaged due to corrosion of the embedded rebars and stirrups, will be repaired. New girders will be sized and reinforced to meet current load support standards.

The Rehabilitation Alternative was not viable due to the following reasons:

- During the conceptual design phase, engineering analyses indicated that the deteriorated condition of the bridge girders and deck was such that bridge replacement was a more cost-effective design solution.
- In addition, the gradual deterioration of the bridge between 2005 and 2016 decreased its sufficiency rating to 47.8, further warranting replacement rather than rehabilitation. In effect, the bridge was structurally deficient.

Utility Lines

Existing 12- and 16-inch water lines will remain in place, below grade. The 2.5-inch JTS conduit cable will be removed during construction and relocated within the bridge deck. A fire hydrant, a service water meter, and utility poles in the pathway of the detour road will be relocated and remain in service during construction. Temporary lighting will be provided for the detour roads and bridges.

Stream Channel Modifications

No stream channel modifications are proposed for the Rehabilitation Alternative. Therefore, the hydraulic capacity of the bridge waterway remains the same as under the existing bridge.

Staging Areas

The staging area will be the responsibility of the contractor.

Bridge Relocation More Inland

The existing bridge superstructure, railings, and pedestrian walkway will be completely removed and relocated 600 feet (0.1 mile) inland from its existing location to a new location along Keala Road. This alternative is not considered feasible as it would require an abundance of condemnation of private properties.

1.7 Project Cost

Based on conceptual engineering, costs for the Build Alternative are estimated at $12 million (2024 US Dollars). These costs will be refined as engineering details are developed.

1.8 Project Schedule

The proposed project's milestones are as follows:

- Finish Planning and Design Concepts: Early Spring 2026
- Begin Final Design: Late Spring / Early Summer 2026
- HDOT to Advertise for the Project: Late Fall 2026
- Initiate Construction: Winter 2026
- Construction Completion: End of 2028

1.9 Permits and Approvals

Table 1-1 lists approvals and permits that would be required prior to construction of the proposed project.

Table 1-1: List of Permits and Approvals by Agency

Agency	Permit or Approval
Federal	-
Federal Highway Administration	Section 4(f) regarding the use of publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites
State DLNR –SHPD	Section 106 of the National Historic Preservation Act (NHPA)
U.S. Army Corps of Engineers (USACE)	Section 10 of the Rivers and Harbors Act of 1899
USACE	Section 404 of the Clean Water Act (CWA)
U.S. Fish and Wildlife Service (USFWS)	Section 7 of the Endangered Species Act (ESA)
U.S. National Marine Fisheries Service (NMFS)	Section 7 ESA – Essential Fish Habitat (EFH) (MSA)
State	-
Department of Business, Economic Development & Tourism, Office of Planning and Sustainable Development (OPSD)	Coastal Zone Management (CZM) Federal Consistency Review: Federal Permit Required and Federal funding
Department of Health (DOH) Clean Water Branch (CWB)	National Pollutant Discharge Elimination System (NPDES) Permit for storm water discharges related to construction activities *NPDES for project discharges related to dewatering activities
DOH-CWB	Section 401 of the CWA
DOH Indoor and Radiological Health Branch (IRHB)	Noise Permit Application: Permit to exceed the maximum permissible sound levels for construction
DOH-IRHB	Noise Variance Application: Variance to exceed the maximum permissible sound levels for construction activities outside of normal permitted hours (if nighttime, weekend, or holiday work is needed)
DLNR Commission on Water Resource Management (CWRM)	Stream Channel Alteration Permit (SCAP)
DLNR Land Division	Shoreline Certification
DLNR –SHPD	Hawaii Revised Statutes (HRS) Chapter 6E Historic Preservation
County	-
City and County of Honolulu (CCH), Department of Planning and Permitting (DPP)	Grading, Grubbing, and Stockpiling Permit
CCH-DPP	Shoreline Setback Variance

CHAPTER 2. AFFECTED ENVIRONMENT POTENTIAL IMPACTS, AND PROPOSED MITIGATION

This chapter describes the existing environmental conditions of the project site, potential long-term impacts of the project, and the proposed mitigation measures to avoid, minimize, or mitigate those potential effects. The relative impact that will likely remain after mitigation is also described. Each section within this chapter is dedicated to analyzing a specific environmental or social discipline.

Existing conditions, potential impacts, and proposed mitigation measures presented in this chapter have been developed through (a) review of existing information related to the project areas (see references chapter); (b) studies conducted specifically for the project; (c) coordination with regulatory agencies; and (d) consultation with the general public.

2.1 Physical Geography and Soils

2.1.1 Existing Conditions

Topography and Geology

The regional topography of the project area varies considerably, with the terrain rising inland from the shoreline to the Koolau Mountain Range. The valley floor consists of a flat coastal plain that transitions into gentle, rising lands with less than 12 percent slope in the inland regions. At the foot of the Koolau Mountain Range, slope ranges from 12 to 20 percent, and in the steeper mountain regions, slopes increase from 20 percent to nearly vertical at the Koolau crest. The mauka portion of the project site sits at approximately 10 feet above sea level, with a relatively flat terrain and a gentle slope from mauka to makai.

Oahu is formed by the erosional remnants of two shield volcanoes, the Waianae Range to the west and the Koolau Range to the east. The Waianae Range, estimated to have formed 2.4 to 3.6 million years ago, consists of tholeiitic lava with a thick cap of transitional to alkalic rock. The Koolau Range, estimated to have formed 1.8 to 2.6 million years ago, primarily consists of tholeiitic lava with a thin cap of alkalic rock and a well-defined major dike complex (Macdonald, et al. 1983).

After a dormant period, renewed volcanic activity occurred mostly on the eastern side of Oahu, producing smaller lava flows and cinder cones that formed prominent landmarks such as Diamond Head and Punchbowl Crater (Macdonald, et al. 1983). Heavy erosion removed much of the original shield surface on the northeastern side of the Koolau Range, shaping the current landscape.

Hauula lies between the northeast side of the Koolau Range and the Windward coastal plain and consists of interbedded layers of alluvium and coralline deposits, underlain by a coral rock formation (Geolabs 2024). Alluvium generally lies at the foot of the Koolau Range and primarily consists of highly weathered basaltic sand, gravel, cobbles, and boulders in a matrix of non-calcareous clays and silts. Coralline deposits are expected to occur seaward of the alluvium and generally consist of recent beach and dune sand and other marine deposits, including older lithified dunes.

Hydrogeology

The Hawaiian Islands rely primarily on basal groundwater for drinking water. Basal groundwater forms as rainwater percolates down through the residual soils and porous volcanic rock, creating a freshwater lens known as the "Ghyben-Herzberg" lens, which floats on denser underlying saltwater. A transition zone exists between the fresh groundwater and the ocean saltwater due to tidal fluctuations, seasonal changes in recharge, and aquifer development (Macdonald, et al. 1983). Groundwater may also exist in higher elevations when downward rainwater percolation is interrupted by impermeable layers, such as dense lava flows, alluvial clay layers, and volcanic ash. This type of groundwater is referred to as perched aquifers or dike-impounded aquifers.

The project site is located below the underground injection control line, indicating that the underlying aquifers are not drinking water sources. Beneath the site lies a sedimentary caprock aquifer that rests on a primary basalt aquifer. The sedimentary caprock aquifer has a low salinity level (250 to 1000 milligrams/liter Cl-), is irreplaceable, and has a high vulnerability to contamination. The underlying basalt aquifer is a confined, basal, flank type aquifer with a low salinity level (250 to 1000 milligrams/liter Cl-), and, while it is irreplaceable, its depth and confinement protect it from contamination. Both aquifers are part of the Koolauloa Aquifer System within the Windward Aquifer Sector and are classified as ecologically important (Mink and Lau 1990).

Groundwater at the project site was encountered at depths ranging from 5.3 feet to 8 feet below ground surface (Geolabs 2024). However, due to the site's proximity to the stream and ocean, groundwater levels may vary with stream flow conditions and tidal fluctuations.

Storm water runoff in the project area generally sheet flows toward the roadway shoulder on both sides of the bridge. From there, it discharges into Waipilopilo Stream, which flows a short distance before reaching the ocean at Hauula Beach Park. A drainage ditch running parallel to Kamehameha Highway on the mauka side converges with Waipilopilo Stream approximately 75 feet upstream of the bridge.

Soils

Soils in the vicinity of the project site include Kawaihapai clay loam (KlA) (0 to 2 percent slopes) and Jaucas sand (JaC) (0 to 15 percent slopes) (Figure 2-1).

The Kawaihapai Series consists of well-drained soils that formed in alluvium derived from basic igneous rock. These soils are typically found in drainageways of alluvium fans and mountain slopes. Historically the soils were used for irrigated sugarcane. The natural vegetation for this soil type includes kiawe (*Prosopis pallida*), feather fingergrass (*Chloris virgata*), bristly foxtail (*Setaria verticillata*), lantana (*Lantana camara*), koa-haole (*Leucaena glauca*), Bermuda grass (*Cynodon dactylon*), and guava (*Psidium guajava*) (United States Department of Agriculture [USDA] 2017).

The Jaucas Series consists of very deep, permeable, and excessively drained soils typically found on coastal beaches above high tide. These soils formed in calcareous sand deposits. Areas containing these soils are typically used for recreation and as marine wildlife refuges. Vegetation consists of sea grape (*Coccoloba uvifera*), coconut (*Cocos nucifera*), and other xerophytic and salt-tolerant plants. The workability of Jaucus sand can be difficult, as it lacks stability for heavy equipment (USDA 2017).

The proposed project does fall within Agricultural Lands of Importance to the State of Hawaii (Figure 2-2).

The Geotechnical Report prepared for the project can be found in Appendix C.

2.1.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, there would be no changes to existing physical geography and soils.

Build Alternative

Topography and Geology

The proposed project would involve several construction activities that could alter the topography of the project area, such as the removal of the existing bridge and installation of new drilled shaft abutments. Minor regrading of roadway approaches will be necessary to accommodate the widened bridge deck, but the overall elevation changes would be minimal.

The proposed activities may temporarily alter the subsurface geology of the project area due to the deep foundation elements needed to support the replacement bridge. Given that the ground consists of medium-dense to dense sand and stiff clay/silt with cobbles and boulders, excavation for the drilled shafts may require removing loose material, implementing dewatering measures, and ensuring proper adhesion between the shafts and surrounding soil.

Hydrogeology

The new bridge abutments will be supported by 4-foot diameter drilled shafts that may extend up to approximately 110 feet deep below the existing grade to reach the alluvium, composed of medium-dense to dense sand and stiff clay silt material, which the shafts will adhere to as support.

Due to the proximity to the stream and ocean and the loose soil conditions, contractors may encounter groundwater inflows where dewatering or temporary water exclusions may be necessary. As such, the proposed activities may temporarily alter the underlying subsurface water movement.

Soil

The proposed activities may temporarily disturb the existing soil conditions, particularly where the use of heavy equipment, material storage, and any excavation activities would occur. Although no in-water work is anticipated, soil disturbance near Waipilopilo Stream could lead to minimal sediment runoff due to the presence of sandy material in saturated conditions. Once construction is complete, disturbed areas will be regraded and stabilized to restore soil integrity and prevent long-term erosion. The project will incorporate best management practices (BMPs) to control sediment transport and protect water quality during and after construction.

Approximately 240 cubic yards of existing roadway material will be removed to the pavement subgrade and reconstructed with asphalt concrete and base coarse. Clearing, grading, excavating,

and recontouring would remove vegetation and leave exposed areas susceptible to erosion. However, site work activities would be of limited duration, and potential impacts would be mitigated through implementation of site-specific BMPs. The area used for the temporary detour road would be restored to its pre-construction condition. Therefore, no significant impacts to soils or geology are anticipated.

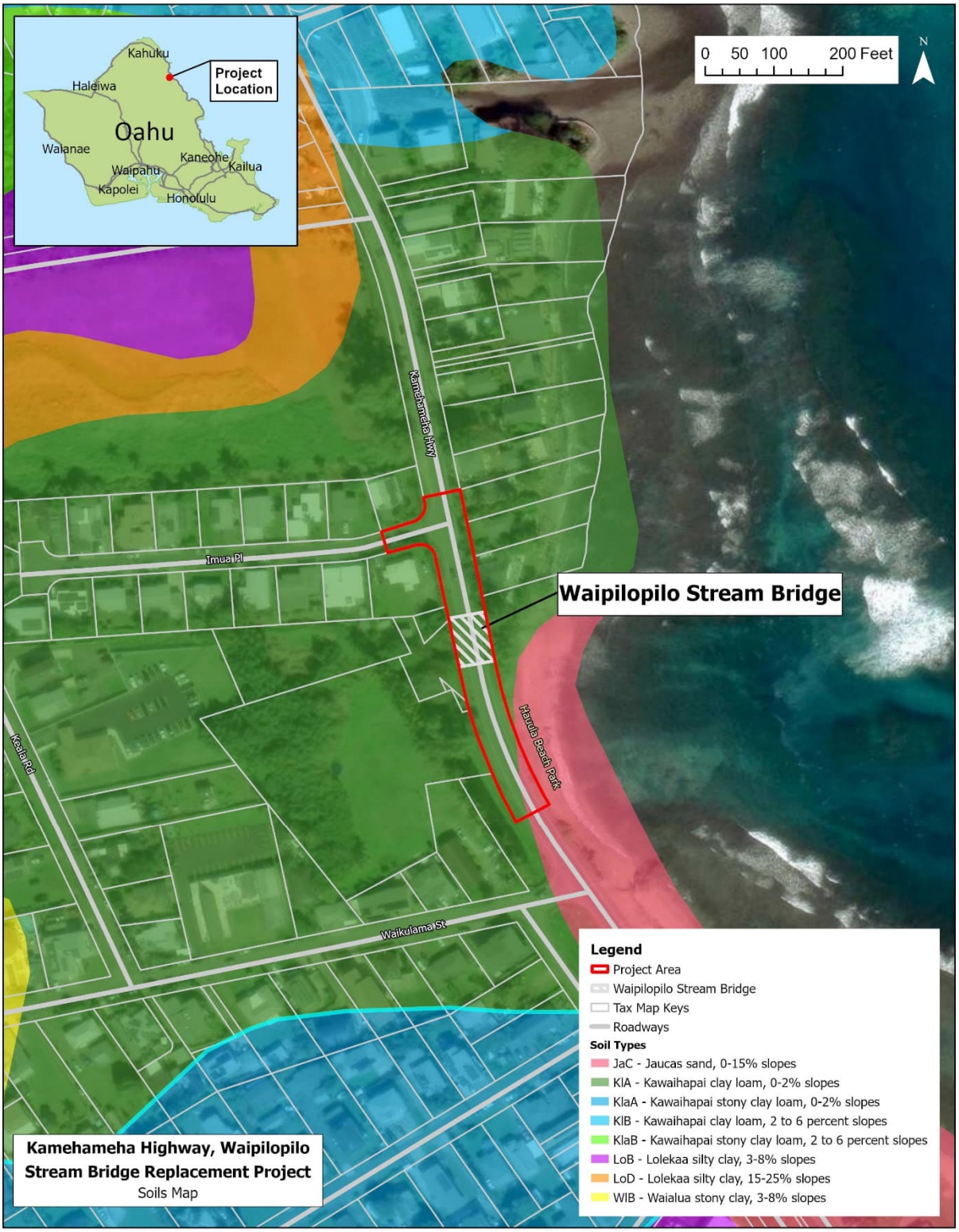
2.1.3 Avoidance, Minimization, and Mitigation Measures

The Proposed Action includes installing new abutments, which will be reinforced with cast-in-place concrete on both ends of the bridge. The existing bridge abutments will remain in place, serving as scour protection for the new abutments. The Proposed Action will also not involve any in-water work, as the new bridge will be constructed above Waipilopilo Stream, and ground-disturbing activities will occur outside of the stream boundaries. In addition, the existing 12-inch and 16-inch waterlines will be relocated onto the new bridge deck, avoiding direct impacts to the streambed.

HDOT would implement standard temporary and permanent erosion and sediment control measures during construction both on the banks of Waipilopilo Stream that would be disturbed by ground disturbance activities associated with the drilled shafts and along the areas where staging may occur. Furthermore, structural controls such as erosion control matting, geotextile fabric under riprap, and turbidity curtains may be deployed to protect water quality and soil stability. Specific mitigation measures will be determined by the contractor selected for project construction; applicable temporary mitigation and / or control measures as specified as part of the NPDES Permit for Storm Water Associated with Construction Activities (Form C) that will be obtained by the Contractor from the DOH prior to the start of any construction will be implemented for the duration of construction activities.

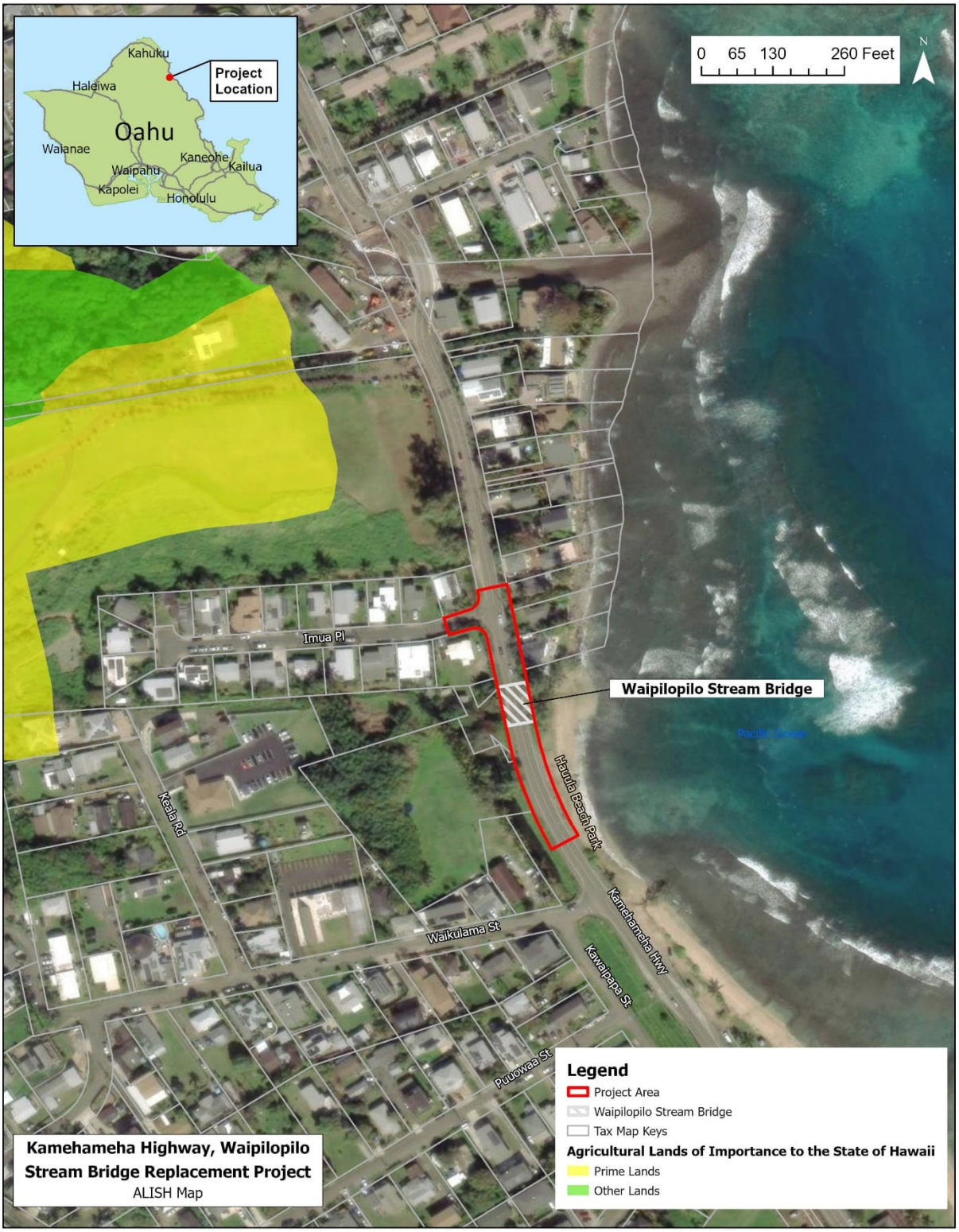
The proposed project will implement approved site-specific BMPs following each phase of the construction process, including but not limited to backfilling excess excavated material and paving or revegetation of soil exposed by grading. The project team will also prepare a Sediment and Erosion Control Plan that will outline pre-construction measures and installation, implementation of HDOT's Post-Construction BMP Manual, and submittal of the plan to the City and County of Honolulu Department of Planning and Permitting for review and approval.

Figure 2-1: Soils in the Project Area



Source: ESRI 2023; HoLIS, Hawaii Statewide GIS Program 2022; HoLIS, Hawaii Statewide GIS Program 2023; USDA, NRCS, Hawaii Statewide GIS Program 2023.

Figure 2-2: Agricultural Lands of Importance to the State of Hawaii



Source: Esri 2024; HDOA, Hawaii Statewide GIS Program 2021; HOLIS, Hawaii Statewide GIS Program 2023.

2.2 Land Use

2.2.1 Existing Conditions

The project area is designated as Urban under the State Land Use Districts (Figure 2-3). Land uses in the surrounding area are primarily residential (R-5) zoning mauka of Kamehameha Highway. Makai of Kamehameha Highway is Hauula Beach Park, with a preservation (P-2) zoning designation. The project area is within the SMA (Figure 2-4).

2.2.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, there would be no changes to existing land use, nor would easements or property acquisition be needed for the shared use path right-of-way.

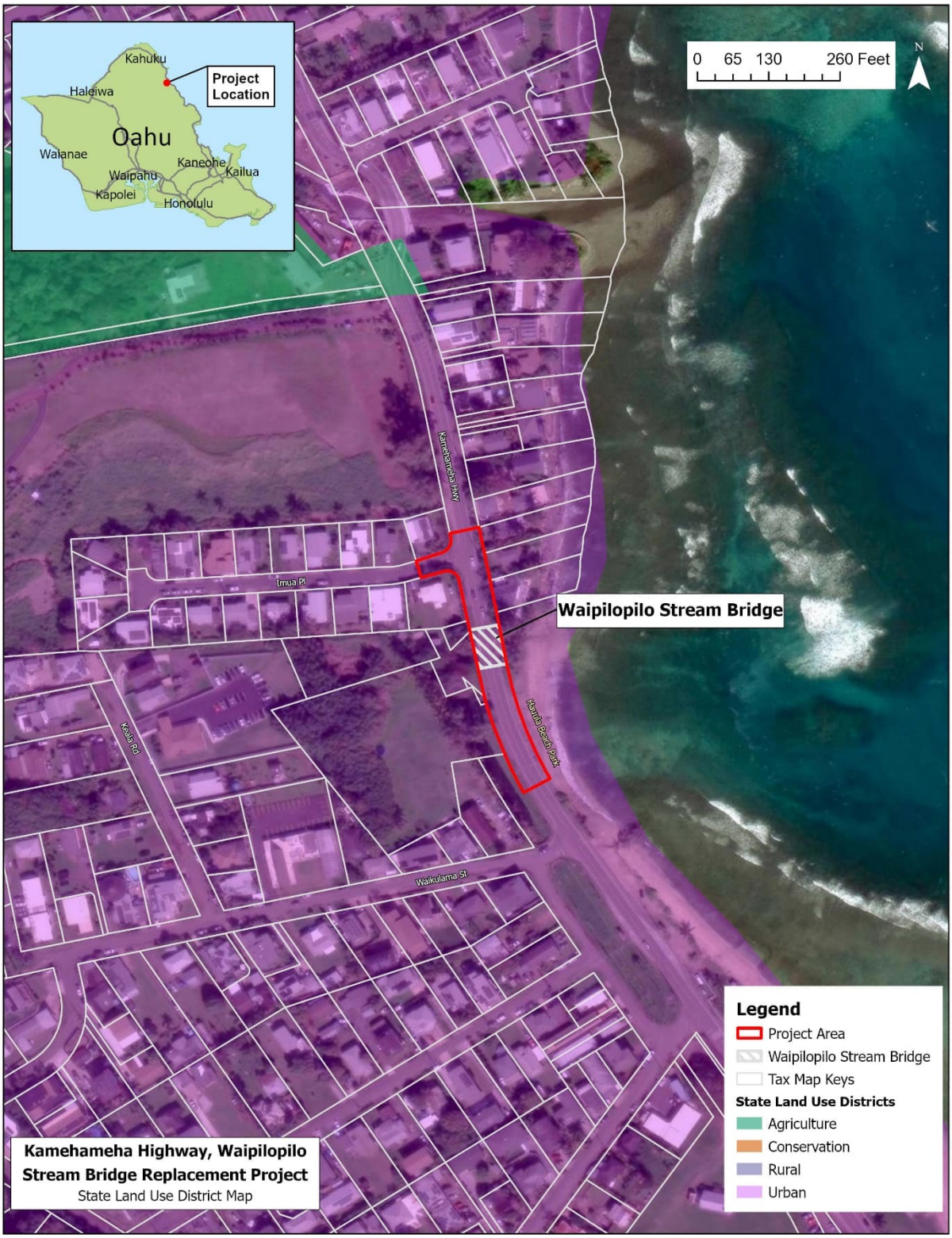
Build Alternative

Under the Build Alternative, there would be no changes to existing land use. All work would occur within the existing HDOT right-of-way. The project area is within the SMA, however, the City and County of Honolulu, Department of Planning and Permitting determined that no SMA is required pursuant to Section 25-1.3(2)(C), Revised Ordinances of Honolulu (ROH): “Repair or maintenances of roads and highways within existing rights-of-way.”

2.2.3 Avoidance, Minimization, and Mitigation Measures

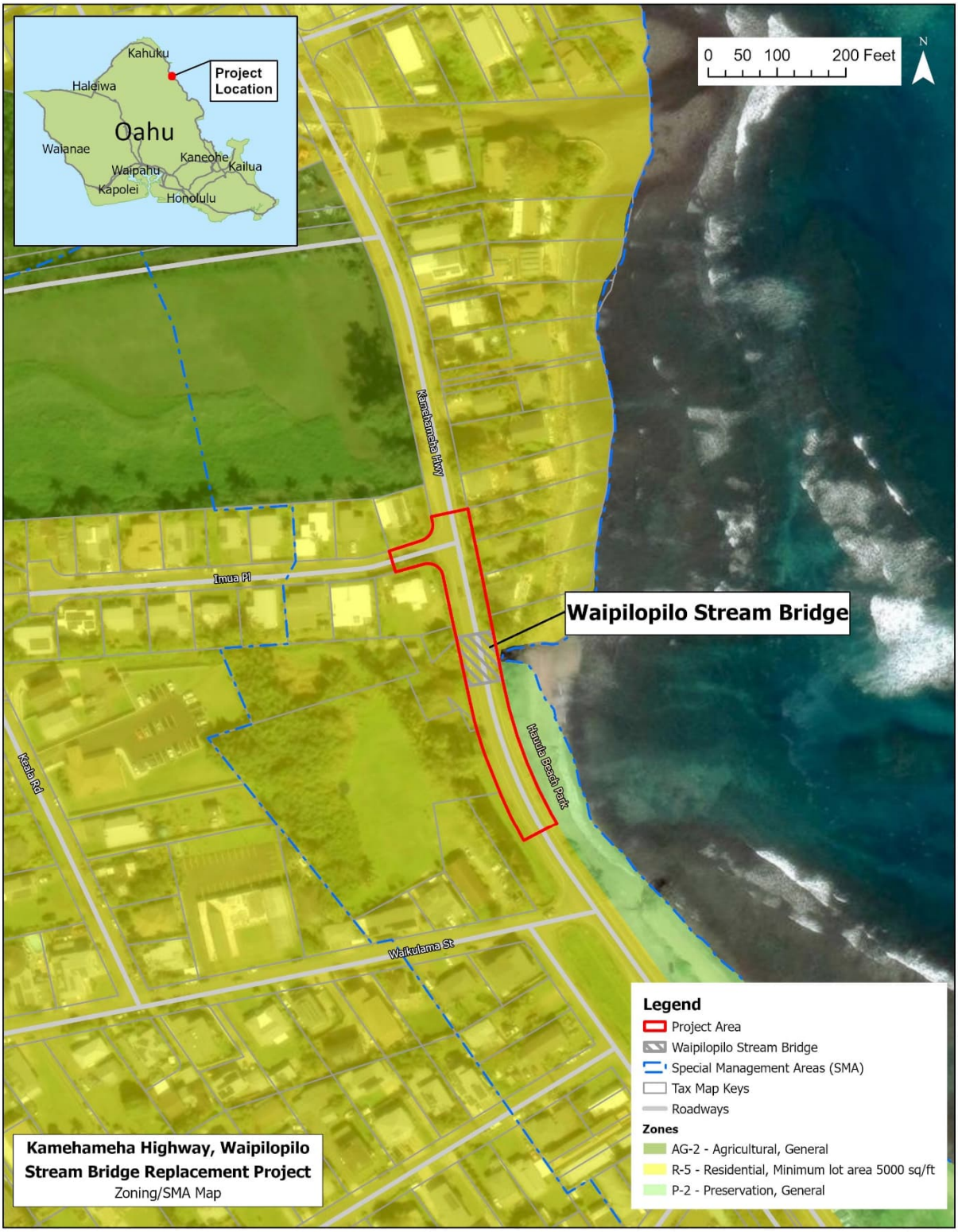
There will be no real property acquisitions or easements. The staging area will be the responsibility of the contractor during the construction phase of the project.

Figure 2-3: State Land Use Districts



Source: Esri 2023; Hawaii State Land Use Commission; Hawaii Statewide GIS Program 2024; HOLIS, Hawaii Statewide GIS Program 2022; HOLIS, Hawaii Statewide GIS Program 2023.

Figure 2-4: County Zoning and SMA Map



Source: County of Hawaii, City and County of Honolulu, County of Kauai, County of Maui, Hawaii Statewide GIS Program 2023; Esri 2023; HOLIS, Hawaii Statewide GIS Program 2022; HOLIS 2024; HOLIS, Hawaii Statewide GIS Program 2023.

2.3 Historic and Archaeological Resources

2.3.1 Regulatory Context

Section 106 of the NHPA requires actions that are federally funded, authorized, or implemented, consider the effect of such actions on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places (NRHP). Such resources are called historic properties.

The Section 106 process involves coordination and consultation with the SHPO, and other agencies and organizations that have an interest in or is mandated to protect historic properties. In addition, the Advisory Council on Historic Preservation (ACHP) is afforded the opportunity to comment on actions that may potentially affect historic properties. At the State level, Section 6E-8 of the Hawai‘i Revised Statutes (HRS) places similar responsibilities on State agencies to evaluate their projects.

Since the project involves both Federal and State agencies and funding, both regulations apply to the project. Completion of the Section 106 process normally satisfies the requirements of HRS Section 6E-8.

For a district, site, building, structure or object to be considered eligible (or be considered “historic” or a “historic property”) for the NRHP, it must meet any one of the following criteria:

- The site reflects major trends or events in the history of the State or nation;
- The site is associated with the lives of persons significant in our past;
- The site is an excellent example of a site type/work of a master; or
- The site has yielded or may likely yield information important in prehistory or history.
- The Hawai‘i Register of Historic Places (Hawai‘i Register) provides an additional criterion:
- The site has traditional cultural significance to an ethnic group.

In accordance with regulations provided in 36 Code of Federal Regulations (CFR) 800, the Federal Sponsoring or Regulating Agency has the responsibility of conducting a good faith effort to identify whether there are any historic properties in the project’s APE, after initiating the Section 106 process. If an historic property(ies) were identified within the APE, the Federal Agency would then assess whether it would be adversely affected by the proposed project. If the effect were “adverse”, such an effect is resolved through a Memorandum of Agreement (MOA) with the SHPO, which may include the ACHP. The HRS Section 6E-8 process, as described in regulations provided in Title 13, Chapter 275 of the HAR, is similar to the Section 106 process.

2.3.2 Existing Conditions

The project action area is located in the Hauula Ahupuaa, Koolauloa District on the Island of Oahu. When European explorers arrived on Oahu, Hauula supported a large population of Native Hawaiians due to arable land, freshwater, and fishing grounds. After European contact, Hauula continued to be used for agriculture. This agriculture included rice cultivation by Chinese

immigrant contract workers after the 1850s and homestead lots for Native Hawaiians after the Homestead Act was passed in 1884. Agriculture began to convert into residential and commercial development at the end of the 19th century. The Koolau Railroad was built in the early 1900s to transport agricultural products along the Koolau Coast. Maps show that the railroad tracks existed in the vicinity of the project area; however, no tracks have been encountered. In 1932, Kamehameha Highway and Waipilopilo Bridge were built.

The APE is an approximately 0.84-acre portion of mostly private property and a portion of public roadway (partially within an area with no designated TMK and partially within TMK (1) 5-4-017:017 [previously TMK (1) 5-4-004:001]) and situated on a portion of TMKs (1) 5-4-017:001 and (1) 5-4-017:025 [previously TMK (1) 5-4-017:016]. . See Figure 2-5.

As presented in Section 1.1.1, the APE was previously concurred by the SHPD on August 31, 2015. Please see Figure 2-6 for the Project APE with a recent aerial background.

The current project will continue to use the SHPD-concurred APE for all coordination with the SHPD. Because of this, the 2015 AIS is still applicable and appropriate for the current project.

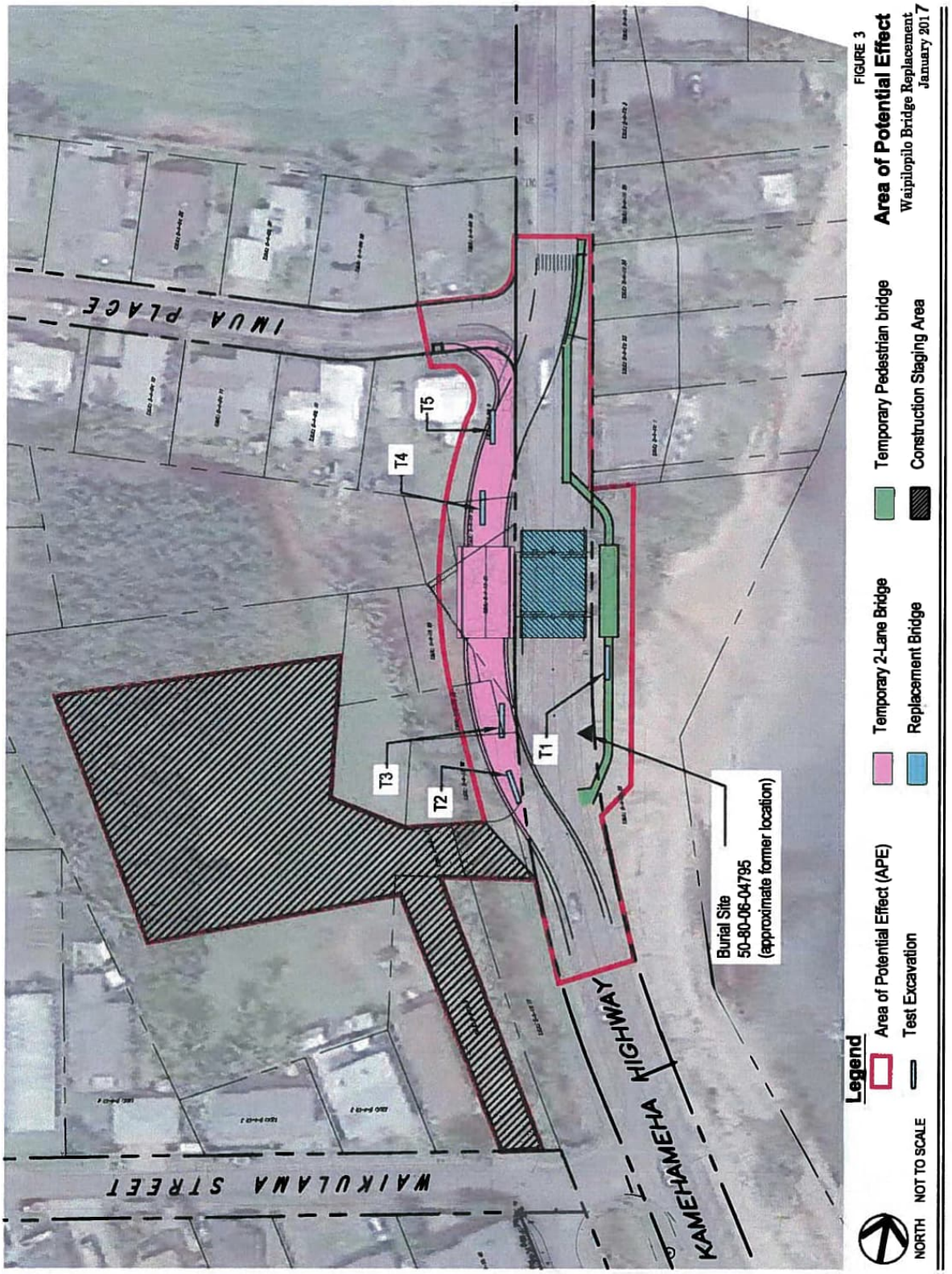
The actual current project area shown throughout this Draft EA has been minimized since the completion of the 2015 AIS and occurs entirely within the SHPD-concurred APE.

The Project Location on USGS 7.5-minute Hauula and Kahana topographic quadrangles is shown on Figure 2-7.

On March 16 and 17, 2015, Pacific Consulting Services, Inc. conducted an Archaeological Inventory Survey (AIS). A copy of the Final AIS report is included as Appendix E in this Draft EA.

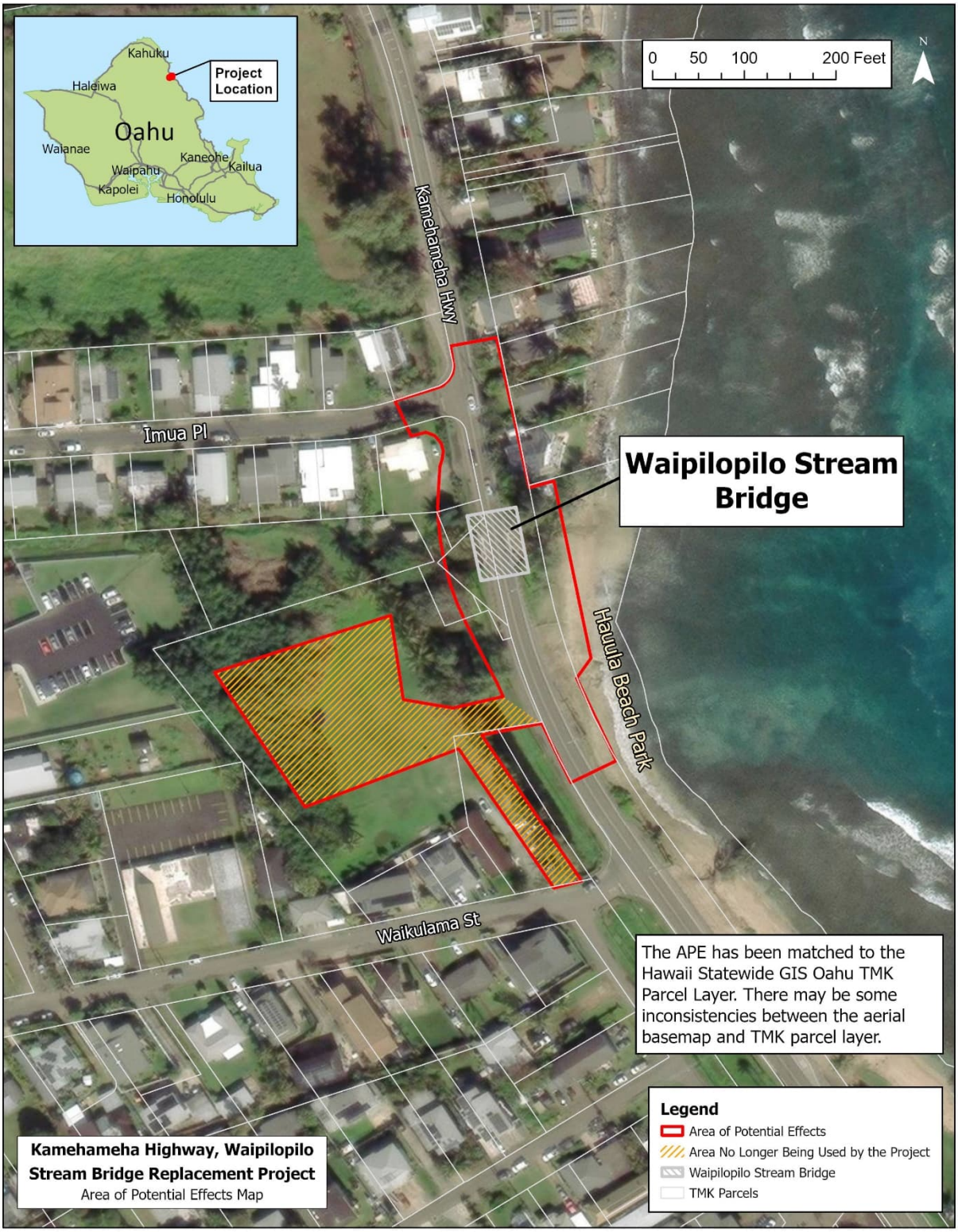
As part of the AIS, subsurface testing was conducted and consisted of the excavation of five backhoe trenches. Two late historic artifacts and one vertebra from a medium mammal, probably a dog (*Canis familiaris)*, were recovered. These artifacts lack contextual integrity for designation as a site, but nonetheless contribute information about the land history of the area and about the types of cultural remains associated with earlier residences in the area. During the literature review portion of the AIS, two “significant historic properties” were discovered. The following sections are a summary of the information contained in the AIS.

Figure 2-5: Area of Potential Effects – As Previously Concurred by SHPD (August 31, 2015)



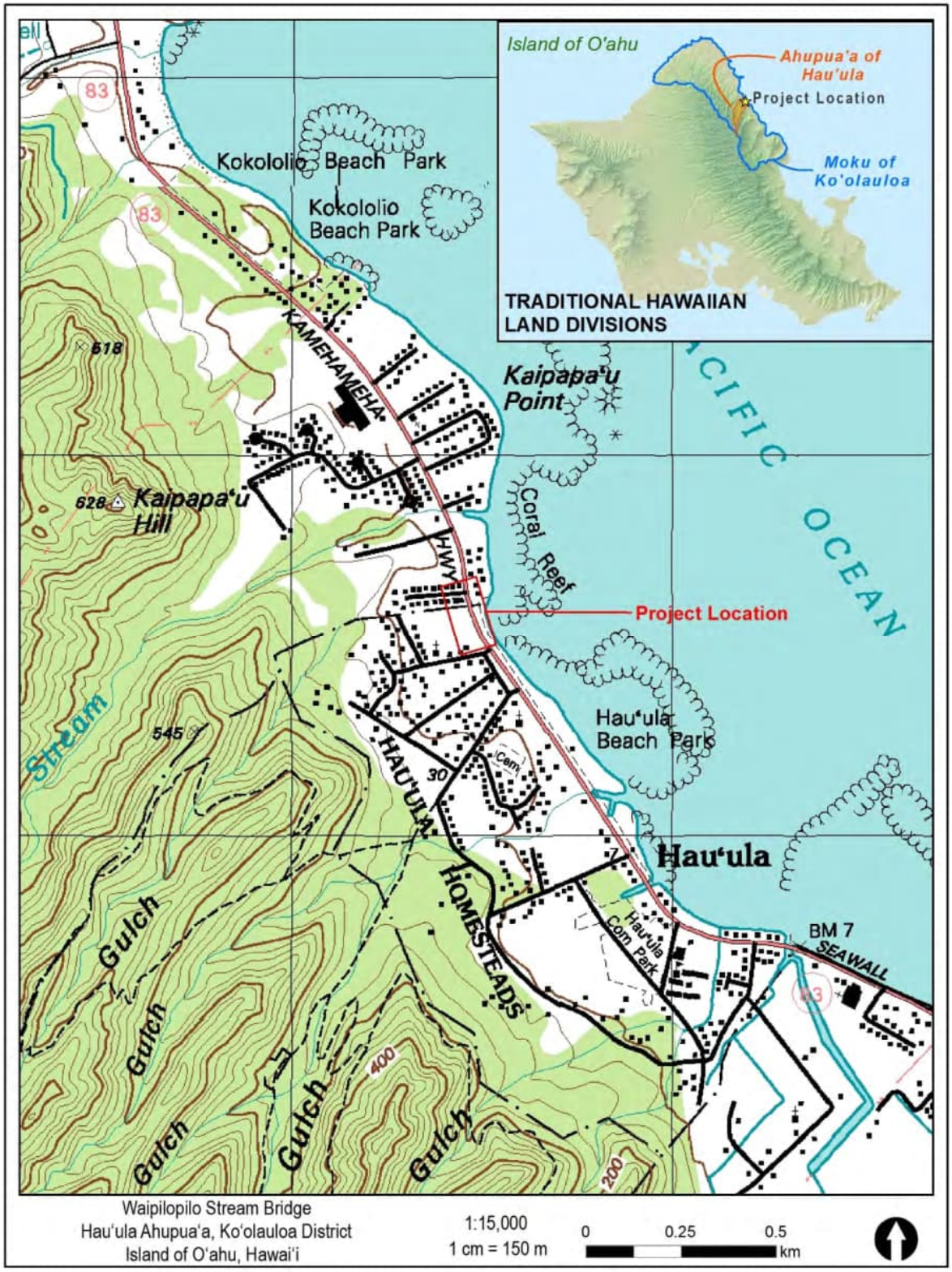
Source: SHPO concurrence with delineation of APE, letter dated August 31, 2015 (Log No. 2015.02671, Doc. No. 1508JLP02)

Figure 2-6. Area of Potential Effects – 2024 Aerial Imagery



Source: PCSI 2015; Esri 2024; HOLIS, Hawaii Statewide GIS Program 2023

Figure 2-7: Project Location Shown on USGS 7.5-minute Hauula and Kahana Topographic Quadrangles



Source: PCSI 2016

Subsurface Cultural Deposits (Site 50-80-05-4795)

Site 4795, a subsurface cultural deposit and human burial, extends through the project area (Masterson et al. 1997). The site was recommended eligible for the Hawai‘i Register under Criterion d and Criterion e. This site was therefore eligible for listing on the HRHP. The presence of the subsurface archaeological deposits and the burial associated with Site 4795 have since been disinterred and reinterred elsewhere. However, it is of concern with respect to the Waipilopilo Bridge Replacement project, as it is anticipated that the cultural deposit of Site 4795 (or a portion of the site), which remains in place, could be encountered as shallow as 30 centimeters below surface (12 inches) on the makai side of the highway during construction excavations associated with the pedestrian pathway and bridge replacement. There will be no disturbance to ground not already previously disturbed.

Waipilopilo Stream Bridge

The Waipilopilo Stream Bridge (State Historic Bridge Inventory and Evaluation Bridge No. 003000830302112), constructed in 1932 by L.L. McCandless, was one of seven bridges built under Federal-Aid Project No. 1D, and is a one-span reinforced concrete deck girder structure (Ruzicka 2015, as cited in PCSI 2016). It is a good example of early 20th century workmanship (O'Hare et al. 2014, as cited in PCSI 2016). In 2011, the Hawaii SHPO determined that Waipilopilo Stream Bridge is significant under Criteria A and C and therefore eligible for listing to both the HRHP and NRHP (6 October 2011, Log No. 2011.02252, Doc. No. 1109MA08). Consequently, the proposed demolition of the bridge was deemed to have an "adverse effect" which could be mitigated through the preparation and submittal of a Historic American Engineering Record (HAER) study. More recently, the statewide historic bridge inventory survey completed by MKE Associates LLC and Fung Associates, Inc. in 2013 recommended Waipilopilo Stream Bridge as eligible under Criterion C only; regardless, the proposed project would still have an "adverse effect" mitigated through a HAER study.

Subsequent to the 2011 determination of effect by the Hawaii SHPO, a HAER study was conducted by Mason Architects, Inc. for the bridge, and was recently submitted separately from the AIS report. The National Park Service reviewed the HAER study, assigned a HAER number (HI-124), and approved this study in July 2015; see Appendix F for the full HAER. FHWA's determination is *adverse effect* and SHPO concurs.

2.3.3 Potential Impacts

No Build Alternative

The status quo of the bridge would be maintained, HDOT would not replace Waipilopilo Stream Bridge, and there would be no impact to existing historic and archaeological resources.

Build Alternative

The replacement of the Waipilopilo Stream Bridge would impact historic and archaeological resources.

Subsurface Cultural Deposit and Human Burial (Site 50-80-05-4795)

The pedestrian pathway and other bridge construction activities are anticipated to occur at Site 4795. Due to the excavations needed for these activities, Site 4795 may be encountered at a depth as shallow as 12 inches. Additionally, based on other archaeological investigations in the area recording additional human burials on the makai side of the highway, there is the probability that unknown human burials may be discovered or disturbed during the ground moving activities.

Waipilopilo Bridge

Replacing the Waipilopilo Bridge will result in an *adverse effect* on historic properties pursuant to Section 106 and an "effect, with proposed mitigation commitments" for HRS 6E-8. The Proposed Action will replace-in-kind the entire superstructure of the bridge to address deterioration in the deck.

Please see Table 2-1 for a summary of significance information and determination of effect for the Waipilopilo Bridge and Site 4795.

Table 2-1: Summary of Significance Information and Determination of Effect for the Waipilopilo Bridge and Site 4795

Name (Year)	Location	Study Type	Findings State Inventory of Historic Places (SIHP)
Waipilopilo Stream Bridge Replacement Project			
Thurman, M.A. December 2014	Koolauloa Moku TMK Nos. Various	Archaeological Report	Hauula Beach Park Cultural Layer, SIHP No. 50-80-05-4794
O'Hare, B.A., Shideler, M.A., Hammatt, Ph.D. January 2014	TMK Nos. (1) 5-4-002, 004, 011, 017 por.	Final AIS	Waipilopilo Stream Bridge; Kamehameha Hwy; Subsurface Cultural Deposits, SIHP No. 50-80-06-4795
O'Day, M.A. August 2014	TMK No. (1) 5-4-017:016 por.	Final Archaeological Assessment	No Findings
Materson, Shideler, M.A.; Devereux, B. A.; Hammatt, Ph.D. July 1999	TMK No. (1) 5-4-002:22 por.	Archaeological Monitoring Plan (AMP)	N/A
Materson, Devereux, B.A.; Hammatt, Ph.D. May 1998	TMK No. (1) 5-4-002:22 por.	Draft AIS	SIHP No. 50-80-06-4794, 4795
Bush, B.Ed.; Hammatt, Ph.D. February 2002	TMK No. (1) 5-4-002:22 por.	Archaeological Monitoring Report	Human Remains, SIHP No. 50-80-06-5801

2.3.4 Avoidance, Minimization, and Mitigation Measures

Completion of project design, consultation, and concurrence by the SHPD will confirm appropriate mitigation commitments; please see Table 2-2 for current treatment recommendations.

Table 2-2: Site Significance and Treatment Recommendations

Site #	Site Type	Temporal Affiliation	Integrity	Significance	Recommended Treatment
Site 50-80-06-4795	Subsurface Cultural Deposit and Human Burial	Cultural	In the August 21, 2017 letter from FHWA to SHPD for the Waipilopilo Stream Bridge Replacement, it was noted: "FHWA has also determined that Site 4795 is important chiefly because of what can be learned by data recovery and has minimal value for preservation in place."	Section 106: Currently, this site is not listed on the HRHP or NRHP Site 4795 was evaluated eligible for listing on the NRHP under Criterion D. Recommended eligible under for the HRHP under Criterion d and e	Full time, on site archaeological monitoring is recommended during future ground disturbing activities that extend 30 centimeters (12 inches) or more below ground surface on the east side of Kamehameha Highway and in the vicinity of the existing Waipilopilo Stream Bridge in the project's APE. FHWA has determined that Site 4795 has minimal value for preservation in place and has asked whether the SHPO objects to this finding. The SHPO declined to comment at the time of FHWA's question, as Site 4795 should be included in the MOA discussion.
Bridge No. 00300 08303 02112	Bridge	Historic	From the SHBIE: "This concrete tee beam bridge is in its original location and in fair condition, and its materials remain intact. The bridge has concrete solid panel parapets with flat caps and curved wide end posts. The single span concrete deck is supported by concrete abutments. The parapet cap and end posts panels have been painted white. A wood pedestrian walkway with wood horizontal railings was added to one side of the bridge in 1964. Thrie beams were bolted to the end posts. The simple design of the parapet retains its historic feeling."	Section 106: C HRS 6E-8: c, d	Architectural Recordation

HDOT will continue to consult to resolve the adverse effect pursuant to 36 CFR 800.6 and HAR 13-275-8. FHWA and HDOT will prepare a Section 106 MOA to stipulate mitigation measures

that would adequately mitigate the adverse impact of the Proposed Action on Waipilopilo Stream Bridge. The following mitigation measures are anticipated to be documented in the Section 106 MOA, as well as the HRS Chapter 6E-8 review for Waipilopilo Stream Bridge:

- HDOT has prepared a HAER document with photography for recordation of Waipilopilo Stream Bridge as a mitigation to address the adverse effect caused by alterations to the bridge. The HAER was sent to the U.S. Department of the Interior, which confirmed that the documentation is now in the public domain and accessible through the Library of Congress.
- HDOT will prepare an AMP in accordance with HAR 13-279-4 and submit to SHPO for review and approval before construction and on-site archaeological monitoring. The AMP will be implemented when conducting ground-disturbing activities on the east side of the highway.
- If cultural materials are discovered during construction, all earth-moving activity within and around the immediate discovery area will be diverted until a qualified archaeologist can assess the nature and significance of the find.
- If previously unidentified non-burial historic properties or unanticipated effects are discovered, HDOT shall follow HAR § 13280 "Rules Governing General Procedures for Inadvertent Discoveries of Historic Properties During a Project Covered by the Historic Preservation Review Process."
- If human remains are discovered, HAR § 13-300 states that further disturbances and activities shall cease in any area or nearby area suspected to overlie remains, and SHPD and police department will be contacted. The appropriate process would then proceed in conformance with HAR § 13-300-31 to 43 "Procedures for Proper Treatment of Burial Sites and Human Skeletal Remains."

With these mitigation measures, HDOT has determined that the Proposed Action would result in no significant adverse impacts on historic properties under HRS Chapter 343.

2.4 Cultural Resources

2.4.1 Existing Conditions

Cultural Surveys Hawaii conducted a Cultural Impact Assessment (CIA) for the project in 2011, and a copy of this report is included in Appendix G of this Draft EA. Historical accounts in the report are summarized below.

The Hauula Ahupuaa extends from the ocean towards the crest of the Koolau Mountains and is bounded by Kaipapau Ahupuaa to the north and Makao Ahupuaa to the south in the moku (district) of Koolauloa. The ahupuaa was named after the hau, a native hibiscus that blooms during the summer months (Clark 2001:95). The flowers bloom in yellow, and by the time they fall to the ground they turn red, the ahupuaa literally meaning "red hau."

The moolelo of Hauula describes the physical phenomena such as Helumoa ("chicken scratch") and Makaluhi ("tired eyes"), suggesting a connection to the epic of Kamapuaa, the chicken stealing swine who escaped from Olopaha's tired warriors (Pukui et al. 1974:141; Thrum 1904:77).

Hauula is in the middle of the Koolau Ridge Trail Complex, also known as Castle Trail, a 20-mile summit trail with numerous junctions to the surrounding valleys and ridges, including the Laie

Trail. The trail is lined with cabins on the summit such as the Kaipapu Cabin and Malaekahana Cabin. Other trails within the ahupuaa (land division generally running from the mountain to the sea) includes the Hauula Loop Trail, Maakua Ridge Trail, and the Maakua Gulch Trail.

Hauula is composed of two main beach parks: Hauula Beach Park and Aukai Beach Park. There is one main channel, the Kilia Channel, and one archaeological site offshore, Wahi o Pua ("small fry place"). The beach fronting Hauula Beach Park is narrow and straight, measuring 1,000 feet long. North of the beach park lies the Kilia Channel, a sand-bottom channel named after a type of wave. At the bottom of the beach park, Maakua Stream flows down to the ocean, the only stream to flow to the shore. A bar of sand separates Maakua from the sea creating a muliwai ("a pond of brackish standing water").

Aukai Beach Park is south of Hauula Beach Park. The 0.2-acre parcel of land is in front of the muliwai once known as Kaluakauwa. The small beach park was named in honor of Alfred Aukai Aluli, the last private owner of the land the park sits on and of the homestead land directly across Kamehameha Highway.

The Hauula Ahupuaa contains a number of streams that irrigated the terraces in the valleys, including Hanaimoa, Kawaipapa, Makua, Papale, and Punaiki (Sterling and Summers 1978:160). The Hauula Ahupuaa does not contain any puu ("peaks") because it does not extend to the mountains. From south to north, the gulches that extend from the uplands to the sea are: Punaiki Gulch ("small cliff or slope, as along a ravine"), Maakua Gulch, Hanaimoa Gulch, and Waipilopilo Gulch.

2.4.2 Potential Impacts

No Build Alternative

The status quo of the bridge would be maintained, HDOT would not replace Waipilopilo Stream Bridge, and there would be no demolition or earth-moving activities that could impact historic structures, cultural properties, or practices.

Build Alternative

Based on the findings at SHIP #50-80-06-4795 and community knowledge of burials and cultural finds within the immediate project area, archaeological monitoring during construction is recommended. HDOT should consult with community members to develop a reinterment plan and cultural preservation plan for any human remains or cultural sites or artifacts that could be uncovered during construction or long-term maintenance of the project. Should these measures be taken by HDOT, potential effect on cultural resources in the APE would be minimized.

2.4.3 Avoidance, Minimization, and Mitigation Measures

HDOT will consult with community members to develop a reinternment plan and cultural preservation plan for any human remains or cultural sites or artifacts that could be uncovered during the construction phase of the project.

2.5 Biological Resources

Section 7 of the ESA requires federal agencies to consider impacts on endangered or threatened species and critical habitat of such species. It requires that federal agencies consult with the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) NMFS on the effects of any major construction on a federally listed endangered or threatened species or if projects could result in the destruction or adverse modification of designated critical habitat (40 CFR 402). HDOT is coordinating with both USFWS and NMFS in fulfillment of the Section 7 requirements. The Federal Migratory Bird Treaty Act (MBTA) also protects migratory bird species by making it unlawful to pursue, hunt, take, capture, possess, sell, purchase, barter, import, export, or transport any migratory bird or any part, nest, or egg of any migratory bird without authorization from the U.S. Secretary of the Interior. As part of the USFWS consultation, HDOT is confirming that the project follows the MBTA.

Specific to the marine environment, the federal MSA requires federal agencies to consider project impacts to Essential Fish Habitats (EFH), which are defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, and/or growth to maturity," including open water, wetlands, coral reeds, and submerged structures associated with federal managed fish species. The water column and bottom of the Pacific Ocean around the island of Hawaii are designated as EFH and support various life stages for management unit species identified under the Western Pacific Fishery Management Council's Pelagic and Hawaii Archipelago Fishery Ecosystem Plans. FHWA coordinated with NMFS to seek concurrence that the proposed project would have no more than minimal adverse effects on EFH.

The State of Hawaii's counterpart law to the ESA is HRS Chapter 195D, as amended, under which species are similarly protected. Chapter 195D identifies the protection of endangered species as a state responsibility. Projects conducted with the State of Hawaii must coordinate with the DLNR to avoid adverse impacts to species protected by HRS Chapter 195D. The remainder of this section discusses the potential impact to biological resources in compliance with requirements for HRS Chapter 343. See Appendix A for more details on the ongoing agency consultation.

2.5.1 Existing Conditions

SWCA Environmental Consultants (SWCA), on behalf of HDOT, prepared a Biological Assessment (BA) to identify terrestrial vegetation, birds, mammals, reptiles and amphibians, and invertebrates and obtain a broader understanding of the biological resources that could potentially be found within the approximately 0.62-acre project area. See Appendix H: Draft Biological Assessment. SWCA completed a review of scientific and technical literature on natural resources that could be found in the project area. In addition to the literature review, SWCA sent a biologist to conduct a field survey of the project area on December 5, 2024. This survey aimed to identify potential habitat for flora and fauna and document flora and fauna that they found within the project area. The following discussion is based on the results of this BA.

Flora

Surveying the project area identified three vegetation types: coastal strand, landscaped, and roadside ruderal. Coastal stand species were recorded between the shorelines and road. These species were categorized by their adaptations to withstand salt spray, winds, high light intensity, temperatures, and sand movement. The majority of coastal strand species identified were non-

native, like ironwood (*Casuraina equistifolia)* and beach heliotrope (*Tournefortia argentea*); however, some native strands species such as naupaka kahakai and pohuehue were identified in the area. Landscaped vegetation was found around residences and businesses and was the most common type of vegetation in the area. Common landscaped vegetation included areca palm (*Dypsis lutescens*), plumeria (*Plumeria rubra*), and common blue vitex (*Vitex trifoli*). Roadside ruderal vegetation was commonly found along the roads, in pastures, and at the bases of fences and houses and consisted of non-native grasses and weedy, herbaceous species. Roadside ruderal species found during the survey included Bermuda grass (*Cyodon dactylon*), pitted beardgrass (*Bothriochloa pertusa*), Guinea grass (*Urochloa maxima*), wedelia (*Sphagneticola trilobata*), creeping indigo (*Indigofera spicata*), scarlet spiderling (*Boerhavia coccinea*), narrow-leaved plantain (*Plantago lanceolaata*), and ivy gourd (*Coccinia grandis*).

A total of 56 plant species were recorded during the survey. None of the plants identified were state or federally listed species or rare native Hawaiian vascular plant species. Of the 56 plant species, only 6 species were native to the Hawaiian Island: kipukai (*Heliotropium curssavicum*), pohuehue (*Ipomoea pes-caprae ssp. Brasiliensis*), naupaka kahakai (*Scaevola taccada*), hau (*Hibiscus tiliaceus*), aeae (*Bacopa monnieri*), and pohinahina (*Vitex rotundifolia*). See Appendix H for more details.

As part of ESA Section 7 consultation, HDOT obtained a list of threatened and endangered species that may occur in the project area or may be affected by the project from the USFWS Information for Planning and Consultation (IPaC) online system. See Appendix A for more details. Eight species of endangered plants were identified as having the potential to be found in the project area (Table 2-3). However, none of the plant species identified on the IPaC report were found during SWCA's survey.

Table 2-3: Threatened and Endangered Plant Species that May Occur in the Project Area

Common Name	Scientific Name	Federal Status	State Status
Akoko	*Euphorbia celastroides var. kaenana*	Endangered	Endangered
Enaena	*Pseudognaphalium sandwicensium var. molokaiense*	Endangered	Endangered
Awiwi	*Schenkia sebaeoides*	Endangered	Endangered
Carter's Panicgrass	*Panicum fauriei var. carteri*	Endangered	Endangered
Hilo Ischaemum	*Ischaemum byrone*	Endangered	Endangered
Ihi	*Portulaca villosa*	Endangered	Endangered
Kamanomano	*Cenchrus agrimonioides*	Endangered	Endangered
No common name	*Microlepia strigosa var. mauiensis*	Endangered	Endangered

Fauna

The USFWS IPaC report identified one terrestrial mammal, eight birds, and two reptiles that are listed as threatened or endangered species that may occur in the project area or may be affected by the project. The IPaC report also identified six birds of conservation concern protected under the MBTA. Additionally, the NMFS Pacific Island Regional Office (PIRO) identified one additional marine animal that is endangered (Table 2-4). The IPaC report identified no critical habitats within the project area; however, Hauula Beach is a proposed critical habitat for green sea turtles. NMFS

PIRO identified the ocean in the vicinity of Waipilopilo Stream Bridge as marine Hawaiian monk seal (*Neomonachus schauinsladi*) critical habitat.

Table 2-4: Threatened and Endangered Species and Migratory Birds of Conservation Concern that May Occur in the Project Area

Common Name	Scientific Name	Federal Status	State Status
Terrestrial Mammals			
Hawaiian Hoary Bat	*Lasiurus cinereus semotus*	Endangered	Endangered
Birds			
Band-rumped Storm-petrel	*Hydrobates castro*	Endangered	Endangered
Hawaiian Common Gallinule	*Gallinula galeata sandvicensis*	Endangered	Endangered
Hawaiian Coot (alae Keokeo)	*Fulica Alai*	Endangered	Endangered
Hawaiian Duck	*Anas wyvilliana*	Endangered	Endangered
Hawaiian Petrel	*Pterodroma sandwhichensis*	Endangered	Endangered
Hawaiian Stilt	*Himantopus mexicanus knudseni*	Endangered	Endangered
Newell's Shearwater	*Puffinus newelli*	Threatened	Threatened
Short-tailed Albatross	*Phoebastria (=Diomedea) albatrus)*	Endangered	Endangered
Reptiles			
Green Sea Turtle	*Chelonia mydas*	Threatened	Threatened
Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered	Endangered
Aquatic Mammals			
Hawaiian Monk Seal	*Neomonachus schauinslandi*	Endangered	Endangered
Terrestrial Invertebrates			
Yellow-faced Bees (Nali meli maoli)	*Hylaeus anthracinus*	Endangered	Endangered
Migratory Bird			
Black Noddy	*Anous minutus melanogenys*	BCC	N/A
Black-footed Albatross	*Phoebastria nigripes*	BCC	N/A
Bristle-thighed Curlew	*Numenius tahitiensis*	BCC	N/A
Christmas Shearwater	*Puffinus nativitatis*	BCC	N/A
Laysan Albatross	*Phoebastria immutabilis*	BCC	N/A
Wandering Tattler	*Tringa incana*	BCC	N/A

Key: BCC = bird of conservation concern

During fieldwork for the BA, SWCA did not observe any rare native or indigenous animals or bird species that are state or federally listed as threatened, endangered, or birds of conservation concern. SWCA did not complete an acoustic survey to identify if Hawaiian hoary bats (*Lasiurus cinereus semotus*) were found in the project action area, but they examined the project action area for the presence of suitable habitat and areas for foraging because the Hawaiian hoary bat has previously been documented near Hauula. They found suitable foraging habitat and nesting habitat; however, the frequency of these habitats was limited as there are few trees greater than 15 feet in height within the project area. SWCA also confirmed that there are higher-quality habitats located nearby.

2.5.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, there would be no ground-disturbing activities and no disruption to the existing environment. Existing biological resources would not be affected.

Build Alternative

Although temporary construction duration impacts to the natural environment would be unavoidable with proposed earthwork, no significant permanent adverse impacts to biological resources are anticipated. HDOT has been consulting with or will consult with multiple resource agencies including USFWS, NOAA-NMFS, the U.S. Army Corps of Engineers (USACE), DLNR-DAR and Division of Forestry and Wildlife (DOFAW), Office of Planning and Sustainable Development (OPSD) Coastal Zone Management (CZM) Program, Commission on Water Resource Management (CWRM), and the City and County Planning Department to help identify and mitigate any potential impacts to water quality, coastal resources, and flora and faunal species. The following discussion of potential impacts is based on regulatory coordination to date and the BA. See Appendix A for additional information.

Flora

The Proposed Action may include some limited vegetation clearing within the project area to replace the superstructure of the bridge. No botanical resources of concern were identified in the project area. Given the high level of disturbance in the project area, it is unlikely that the proposed project would result in an adverse impact on state or federally protected plant species.

Fauna

Hawaiian Waterbirds

Even though endangered Hawaiian waterbirds (Hawaiian stilt (*Himantopus mexicanus knudseni)*, Hawaiian coot (*Fulica Alai)*, Hawaiian duck (*Anas wyvilliana)*, and Hawaiian common gallinule (*Gallinula galeata sandvicensis*) were not seen during the SWCA survey, these taxa occur on Oahu Island. The project area contains limited optimal foraging and nesting habitats suitable waterbird habitats, such as Waipilopilo Stream, open fields in the area, and the coastal strand vegetation along Hauula Beach. More optimal foraging habitat was found upstream of the project area. HDOT consulted with USFWS pursuant to ESA Section 7. As part of the consultation, USFWS provided mitigation measures that would be incorporated into the project to avoid and minimize impacts on waterbirds. With these measures implemented, USFWS concurred with HDOT's determination that the project *may affect, but is not likely to affect* Hawaiian waterbirds.

Seabirds

The project area does not contain suitable habitat for nesting or foraging for the Hawaiian seabirds (band-rumped storm petrel (*Hydrobates castro)*, Hawaiian petrel (*Pterodroma sandwhichensis)*, and Newell's shearwater (*Puffinus newelli)*). However, during breeding, nesting, and fledgling seasons, seabirds may pass through the area. If seabirds are passing through the area, they may become disoriented with outdoor, construction-related lighting, leading to fallout. HDOT consulted with USFWS pursuant to ESA Section 7 to develop mitigation measures to prevent impacts to Hawaiian seabirds. Ongoing coordination with the USFWS has resulted in a determination that even with the appropriate mitigation measures the project *may affect, and is likely to adversely affect* Hawaiian seabirds.

The project will continue to coordinate with the USFWS.

Hawaiian Hoary Bat

Surveys for Hawaiian hoary bats were not conducted during the SWCA survey. However, suitable habitat for roosting and foraging was found in the vicinity of the project area. Construction-related noise and disturbance could displace bats from roosting habitats. However, the limited amount of roosting habitats, preexisting busy roadway, and higher-quality roosting habitats nearby indicate that the project has a low potential for displacing Hawaiian hoary bats. As part of the consultation, USFWS provided mitigation measures that would be incorporated into the project to avoid and minimize impacts on Hawaiian hoary bats. With these measures implemented, USFWS concurred with HDOT's determination that the project may affect, but is not likely to affect Hawaiian hoary bats.

Reptiles

Hauula Beach can provide suitable habitat for sea turtle basking, nesting, foraging, and predator avoidance. Construction-related noise and lighting have the potential to displace sea turtles and discourage them from using Hauula Beach as a nesting area. Additionally, artificial lighting has the potential to disorient turtle hatchlings. However, Hauula Beach is highly disturbed, making the likelihood of turtle nesting sites low. Because of the required night work during turtle nesting season, ongoing consultation is occurring between the USFWS and HDOT and FHWA.

HDOT also consulted with NOAA-NMFS to determine project impacts on aquatic turtle habitats. At the time of consultation, the project scope included in-water work; however, current project plans do not include in-water work. NMFS determined that the project could lead to increased turbidity, due to in-water work, and that construction activities could expose turtle habitat to waste and vehicle discharge. However, NMFS confirmed that with agreed-upon mitigation measures the project would result in insignificant effects to reptiles. See Appendix A for more details.

Hawaiian Monk Seal

The waters fronting Hauula Beach are considered critical habitat for the Hawaiian monk seal. Consultation with NOAA PIRO provided mitigation measures to reduce impacts of the project on Hawaiian monk seals. No in-water work will be done and stormwater BMPs will be implemented to reduce any water quality impacts associated with construction.

Yellow-faced Bee

Yellow-faced bees (*Hylaeus anthracinus*) are found in coastal habitats. The coastal strand vegetation, such as naupaka, that is found along Hauula Beach can provide habitat for yellow-faced bees. Clearing of this coastal strand vegetation could have the potential to impact yellow-faced bees; however, the area is sparsely vegetated; therefore, it is not anticipated that the project would cause much impact to yellow-faced bees.

Other Species

The SWCA survey identified additional non-native species, including five bird species, two mammal species, one terrestrial reptile species, and four species of terrestrial invertebrates. All these species are common on Oahu as well as on other Hawaiian Islands. It is unlikely that the Replacement Alternative would adversely impact these populations.

Invasive Species

Invasive species are a potential concern particularly during construction because they may be readily transported on construction equipment. Soil and plant material may contain detrimental fungal pathogens (e.g., Rapid Ohia Death [*Ceratocystis*]), vertebrate and invertebrate pests (e.g., little fire ants [W*asmannia auropunctata*], coqui frogs [*Eleutherodactylus coqui*]) or invasive plant parts (e.g., African Tulip [*Spathodea*], octopus tree [H*eptapleurum actinophyllum*], trumpet tree [*Tabebuia*], etc.) that could harm Hawaiian native species and ecosystems. There are several invasive species that occur on Hawaii Island but do not occur on other islands. Precautions would need to be taken during construction to avoid the introduction and spread of invasive species in new locations where they do not yet occur.

2.5.3 Avoidance, Minimization, and Mitigation Measures

The following avoidance, minimization, or mitigation measures are being proposed for the project to minimize construction-related impacts on biological resources as a result of the proposed project. See Appendix A for a complete record of minimization measures agreed upon between FHWA, HDOT, and agencies. If endangered or threatened species of waterbirds are encountered during construction, measures to minimize disturbance to these birds would be implemented. These could include the education of personnel on the presence of the species or reducing speed limits. Night work will be avoided during seabird fledgling season (September 15 through December 15). If night work occurs outside of this window, construction lighting would be fully shielded, turned downward, and turned off when not in use to reduce seabird disorientation. Lighting for the Project would not occur on the beach. Woody plants greater than 15 feet tall will not be trimmed during bat birthing and pup rearing season (June 1 through September 15) to protect possible Hawaiian hoary bat roosting areas.

Additionally, for the potential impacts to seabirds, the project will continue to coordinate with the USFWS to determine appropriate mitigation measures. One potential mitigation measure the project may pursue is making a payment into the National Fish and Wildlife Foundation (NFWF) Program.

The DOFAW provided comments to the project, including the following BMPs that will be implemented:

- If nighttime construction is required during the seabird fledgling season (September 15 through December 15), we recommend a qualified biologist be present at the project site to monitor and assess the risk of seabird attraction and or grounding due to lighting. If seabirds are seen circling the area, lights should be turned off. If a downed seabird is detected, please follow DOFAW's recommended response protocol by visiting https://dlnr.hawaii.gov/wildlife/seabird-fallout-season/.
- Permanent lighting also poses a risk of seabird attraction, and as such should be minimized or eliminated to protect seabird flyways and preserve the night sky. For illustrations and guidance related to seabird-friendly light styles that also protect seabirds and the dark starry skies of Hawaii please visit https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.
- It is against State law to harm or harass State-listed waterbirds such as koloa maoli or Hawaiian duck (Anas wyvilliana), aeo or Hawaiian stilt (Himantopus mexicanus knudseni), alae keokeo or Hawaiian coot (Fulica alai), and alae ula or Hawaiian gallinule

(Gallinula chloropus sandvicensis). If any of these species are present during construction, all activities within 100 feet (30 meters) should cease and the bird or birds should not be approached. Work may continue after the bird or birds leave the area of their own accord. If a nest is discovered at any point, please contact the Oahu Branch DOFAW Office at (808) 973-9778 and establish a buffer zone around the nest.

- Barbed wire should be avoided in any construction as opeapea can become ensnared and killed by such fencing material during flight.
- The State endangered ilio holo i ka uaua or Hawaiian monk seal (Monachus schauinslandi) and threatened honu or green sea turtle (Chelonia mydas) could potentially occur or haul out onshore within the vicinity of the proposed project site. Nesting season for honu is April through December and ilio holo i ka uaua can give birth to pups all year round. If either species is detected within 100 feet (30 meters) of the project area, all nearby construction operations should cease and not continue until the focal animal has departed the area on its own accord.
- DOFAW is concerned about the impacts of nonnative predators such as cats, rodents, and mongoose, on endangered waterbirds, seabirds, and forest birds. Take action to minimize predator presence; remove cats, place bait stations for rodents and mongoose, and provide covered trash receptacles. As predation is instinctive and even well-fed cats will hunt and kill wildlife, DOFAW also recommends no feeding of feral cats should occur on the premises.
- DOFAW recommends using native plant species for landscaping that are appropriate for the area; i.e., plants for which climate conditions are suitable for them to thrive, plants that historically occurred there, etc. Do not plant invasive species. DOFAW also recommends referring to www.plantpono.org for guidance on the selection and evaluation of landscaping plants and to determine the potential invasiveness of plants proposed for use in the project.
- Avoid importing soil or other plant material from off-island. Soil and plant material may contain fungi (e.g., rapid ohia death) and other pathogens which could harm our native species and ecosystems. We recommend consulting the Hawaii Interagency Biosecurity Plan at http://dlnr.hawaii.gov/hisc/plans/hibp/ in the planning, design, and construction of the project.
- We recommend consulting the Oahu Invasive Species Committee (OISC) at (808) 266-7994 to help plan, design, and construct the project, learn of any high-risk invasive species in the area, and ways to mitigate their spread. Soil and plant material may contain detrimental fungal pathogens (like rapid ohia death), vertebrate and invertebrate pests (e.g. little fire ants, and coconut rhinoceros beetle), or invasive plant propagules (e.g. albizia, pampas grass, fireweed, etc.) that will harm our native ecosystems, and the unique native found within them. Therefore, DOFAW advances the guidance that all equipment and personal items-to include clothing and foot ware should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Additionally, DOFAW recommends minimizing the movement of plant or soil material between worksites. Suspect pests should be reported through the statewide pest hotline. Photos, videos, and locations can be shared

at www.643pest.org or call: 743-PEST. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species.

- To prevent the spread of rapid ohia death (ROD), DOFAW requests that removal, pruning/trimming, and potentially injury to ohia trees be avoided as much as possible. Wounds serve as entry points for ROD fungus and increase the odds that the tree will be infected and die. Also, clean gear/tools, clothes, footwear, and vehicles before and after use. Make sure to removal all loose soil from the aforementioned items, spray gear/tools with 70% rubbing alcohol, and wash clothes with hot water and soap. Wash tires and undercarriages of all vehicles/machinery with a high-pressure water source. If ohia trees must be removed or pruned/trimmed, please conduct these activities on a still day to minimize blown sawdust and use a sharp saw to create chips rather than dust. Seal all wounds to these trees with a stump seal product (e.g. Spectricide, etc.). For more information, please consult https://cms.ctahr.hawaii.edu/rod.
- The invasive coconut rhinoceros beetle (Oryctes rhinoceros) or CRB is widespread on the island of Oahu. CRB have been detected on other islands with moderate infestation on Kauai, one incipient site on Hawaii Island, and only one positive site on Maui in 2023. Hawaii Department of Agriculture interim rule 24-1 restricts the movement of CRB-host material from the island of Oahu, which is defined as the Quarantine Area. Regulated material (host material or host plants) is considered a risk for potential CRB infestation. Host material for the beetle specifically includes 1) entire dead trees; 2) mulch, compost, trimmings, fruit and vegetative scraps, and 3) decaying stumps. CRB host plants include the live palm plants in the following genera: Washingtonia, Livistona, and Pritchardia (all commonly known as fan palms), Cocos (coconut palms), Phoenix (date palms), and Roystonea (royal palms). When such material or these specific plants are moved there is a risk of spreading CRB because they may contain CRB in any life stage. Inspection and/or treatment approved by HDOA is mandatory before inter-island transport. For more information regarding CRB, please visit https://dlnr.hawaii.gov/hisc/info/invasive-species-profiles/coconut-rhinoceros-beetle/.
- We recommend that BMPs are employed during and after construction to contain any soils and sediment with the purpose of preventing damage to near-shore waters and marine ecosystems.
- Due to the arid climate, high fine fuel load (grasses) surrounding the worksite, and risks of wildfire to listed species and native habitats, we recommend coordinating with the Hawaii Wildfire Management Organization at (808)-850-0900 or admin@hawaiiwildfire.org, on how wildfire prevention can be addressed in the project area. When engaging in activities that have a high risk of starting a wildfire-like wielding in/near tall grass, it is recommended that you: 1) wet down the area before starting your task, 2) continuously wet down the area as needed, 3) have a fire extinguisher on hand, and 4) in the event that your vision is impaired, (i.e. welding goggles) have a spotter to watch for fire ignitions. Additionally, do not park any vehicles in or near tall grass as heat from the engine/exhaust may ignite dry vegetation.

No in-water work is proposed, but potential impacts to marine or aquatic species would be mitigated by incorporating stormwater BMPs and USFWS BMPs for work in and around aquatic environments. These BMPs could include erosion and sediment control measures, fueling vehicles

at least 50 feet away from water sources, and keeping materials needed to clean potential spills on site and accessible. The contractor will incorporate BMPs from the following sources:

The DAR provided comments to the project, including the following BMPs that will be implemented:

- Utilize construction BMPs to prevent or mitigate the release of sediment, silt, debris, chemicals or any other byproduct of the proposed project into the aquatic environment or surrounding areas.
- Given the potential presence of endemic vertebrates and invertebrates within the stream, caution should be taken to minimize direct impacts to the wetted area.
- At no time should the channel be completely obstructed, fully-dewatered, or completely diverted outside of the existing channel.
- DAR also notes that there are several known Hawaiian monk seal haul-out areas within the vicinity of the proposed project. Though the beach at the mouth of Waipilopilo Stream is not commonly used by Hawaiian monk seals for resting, caution should be taken to check the immediate area for their presence before beginning activity each day.

Construction Best Management Practices Field Manual (HDOT 2021)

- Additionally, to avoid and minimize the introduction and spread of invasive species during the construction phase, the contractor would implement BMPs to minimize the introduction and spread of invasive species at the project site. These BMPs may include the following:
- All construction equipment and vehicles would arrive at the work site for the first time in clean condition and free of any soil; plants or plant parts, including seeds; insects, including eggs; and reptiles and amphibians, including their eggs. Similarly, all construction equipment and vehicles would also be cleaned after use on the project action area and before leaving the site. This is particularly important for equipment movement between the project action area and the other islands.
- All materials imported to the project site, including gravel, soil, rock, and sand, would be certified weed free. Invasive species found on stockpiled materials would be removed either chemically or mechanically.
- Only weed-free seed mixtures would be used for hydroseeding and hydromulching on the project site. A qualified botanist would inspect the seeded areas a minimum of 60 days after the hydroseed/hydromulch is applied. Any species of plant other than those intended to be in the hydroseed/hydromulch should be removed.
- To the extent feasible the project should use native plants for revegetation or landscaping purposes. If native plants do not meet landscaping objectives, plants with a minimal risk of becoming invasive may be substituted. Additional information on selecting appropriate plants for landscaping can be obtained from the Plant Pono website (Plant Pono 2024).
- Invasive species found on stockpiled materials would be removed either chemically or mechanically.

Section 2.16 addresses temporary construction impacts and BMPs that minimize impacts to biological resources through the focus on construction stormwater and runoff management controls. General construction BMPs would be implemented to minimize the potential for temporary impacts to biological resources, including good housekeeping and measures to minimize impacts to water resources.

2.6 Wetland and Surface Water Resources

2.6.1 Existing Conditions

Waipilopilo Stream, located in the Kaipapau watershed (DLNR-DAR Watershed Code No. 31010), flows from the Hauula Forest Reserve on the slopes of the Koolau Mountain and crosses under Kamehameha Highway (Route 83) in Hauula before entering the Pacific Ocean. Waipilopilo Stream is a first order stream that arises at the 340-meter (1,120-foot) elevation above sea level and is approximately 2.9 kilometers (1.8 miles) long. The total area of the larger Kaipapau watershed is estimated at 7.3 square kilometers (2.8 square miles) (DLNR-DAR 2008). The elevation of the Project site is less than 3 meters (10 feet) above sea level (AECOS Inc. 2017). See Figure 2-8 for more details.

In the valleys of windward Oahu, natural wetlands become more extensive near the coast where the flowing water of streams tends to spread out on the coastal plain. Low-sloping ground, combined with a relatively high-water table promote flooding and saturation of the soil. Such coastal wetlands, once extremely common, have been extensively modified and destroyed by human development in the region. Palustrine and estuarine wetlands are present in the lower Kaipapau watershed and include grassy marsh, and mangrove swamp. These wetlands are areas that regularly flood, and this saturation of the soil has a deterministic effect on the type of vegetation that grows there (AECOS Inc. 2017). See Figure 2-9 for more details.

2.6.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, there would be no ground-disturbing activities and no disruption to the existing environment.

The status quo of the bridge would be maintained, HDOT would not replace Waipilopilo Stream Bridge, and there would be no effect on wetland resources.

Build Alternative

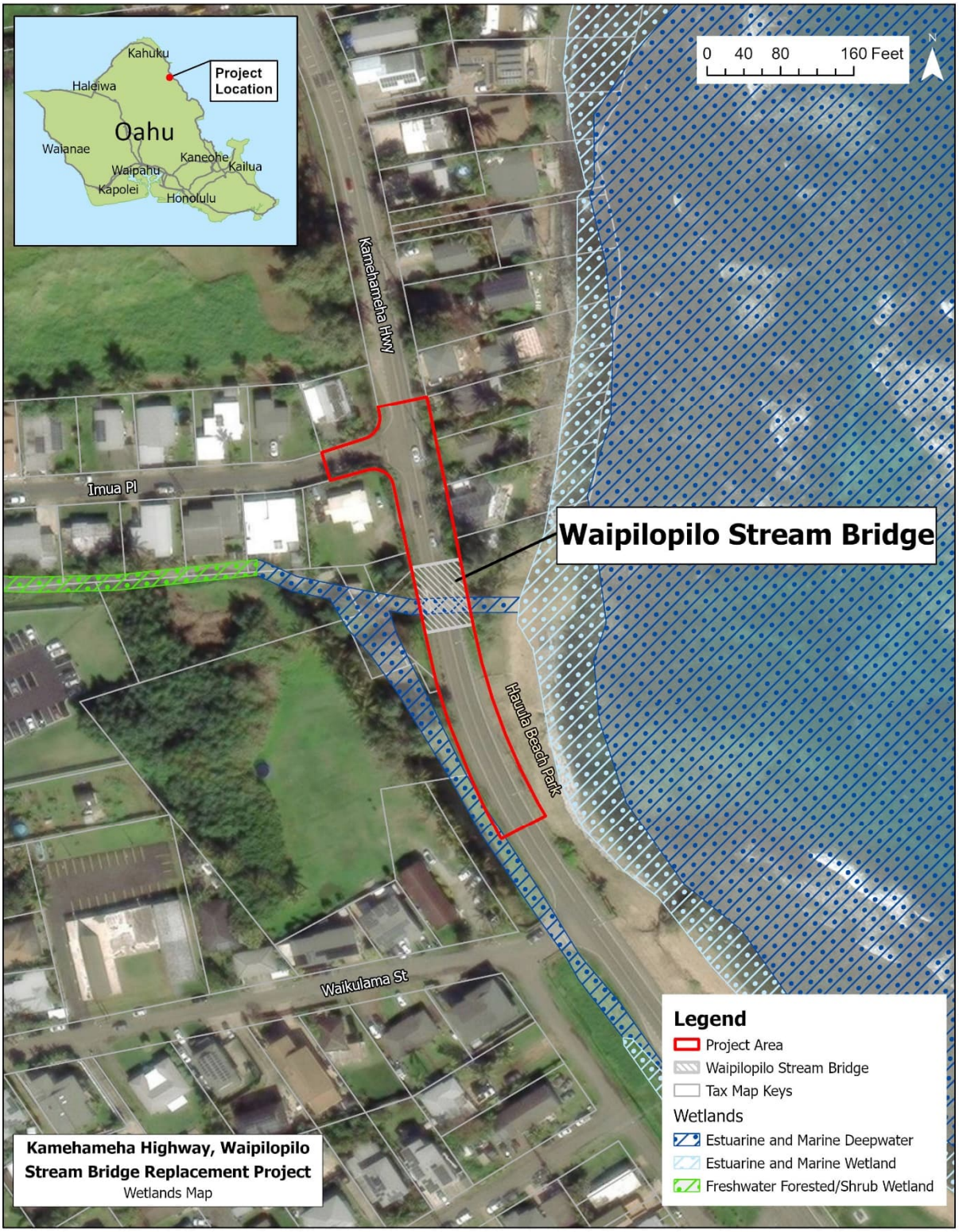
The Replacement Alternative is not anticipated to result in long-term, adverse impacts to Waipilopilo Stream water quality. Construction activities may result in temporary water quality impacts; however, implementation of stormwater BMPs outlined below will minimize or eliminate any temporary impacts.

Figure 2-8: Overview of Streams in the Kaipapau Watershed



Source: GDSI 1995, 1999; DLNR-CWRM 2008; USGS Digital Line Graphs, 1983 version; DLNR-CWRM Hawaii Stream Assessment database, 1993; DLNR-DAR, 2004, 2008. Esri 2024; HOLIS, Hawaii Statewide GIS Program

Figure 2-9: Wetlands in the Project Area



Source: USFWS 2006, Esri 2024; HOLIS, Hawaii Statewide GIS Program 2023

2.6.3 Avoidance, Minimization, and Mitigation Measures

BMPs will be implemented in accordance with the following:

- An Integrated Storm Water Management Approach and a Summary of Clear Water Diversion and Isolation Best Management Practices for Use in the State of Hawaii (FHWA 2016)
- HDOT Practitioners Guide (HDOT 2016)
- HDOT Construction Best Management Practices Field Manual (HDOT 2021)

In addition, HDOT Standard Specifications for Road and Bridge Construction Section 209, Temporary Water Pollution, Dust, and Erosion Control, would be followed. The proposed project will not require a Department of the Army permit because no in-water work is contemplated. Section 2.16 describes the short-term impacts to water quality from construction activities and mitigation measures that will be implemented to minimize these impacts.

2.7 Parks and Recreational Resources

2.7.1 Existing Conditions

Major recreational resources in the Hauula area include Hauula Bay State Recreational Area, Hauula District Park, Hauula Beach Park, Olomana Golf Course, and the Honolulu and Hauula Polo Clubs.

2.7.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, the status quo of the bridge would be maintained, HDOT would not replace Waipilopilo Stream Bridge, and there would be no impact to recreational resources.

Build Alternative

The proposed project is not anticipated to adversely impact the existing recreational resources in the area as they are located outside of the project area. Construction plans will incorporate BMPs to prevent degradation of Waipilopilo Stream and adjacent marine Class A open coastal waters.

2.7.3 Avoidance, Minimization, and Mitigation Measures

It is imperative for the contractor to confine or collect construction debris that could escape the project area and be deposited at Hauula Beach Park and/or nearshore ocean waters.

2.8 Visual and Aesthetic Resources

2.8.1 Existing Conditions

Kamehameha Highway offers scenic views of the beach, ocean, and Koolau Mountain Range from many locations along its route and near the project area. Hauula Beach Park, a linear shoreline park offers panoramic views of the beach and ocean to the south and southeast of Waipilopilo

Bridge. Immediately mauka of the bridge, views of the Koolau Mountains are partially obscured by vegetation on partially developed residential lots.

Shoreline areas are highlighted as an important component of the City and County of Honolulu's Koolauloa Sustainable Communities Plan (CCH-DPP 1999). The plan discusses the need to maintain and improve mauka-makai and lateral public access to the shoreline, to retain and expand visual access to the shoreline from the coastal highway, and to maintain the physical integrity of shoreline resources. As such, one guideline asserts the need to maintain existing makai view openings along the coastal highway. In support of this guideline, the Open Space Map of the Plan identifies Hauula Beach Park as a place providing panoramic views of the ocean.

The Coastal View Study (Chu and Jones 1987) identified a continuous coastal view along Kamehameha Highway where it passes Hauula Beach Park and significant stationary views of the ocean from the park. This study also recognized the Koolau Mountain Range as an important coastal landform of Koolauloa.

Waipilopilo Stream is not a designated wild, scenic, or recreational river (National Wild and Scenic Rivers System n.d.).

2.8.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, the status quo of the bridge would be maintained, and the visual quality of the project area would remain intact.

Build Alternative

From the project area, ocean and open beach views are available in the southern and eastern direction but are obscured by vegetation and a vacation rental house in the northeastern direction. Mountain views are partially obscured by street side vegetation and residential subdivisions.

The Replacement Alternative is not expected to adversely affect the existing scenic quality of the area after construction activities are completed.

Temporary obstructions to the existing views are anticipated during the 18-to-24-month construction period. However, the scenic quality of the area will not be adversely affected by the new bridge in the long term.

Visual renderings of what the finished bridge will look like are not provided in the Draft EA as the design is not yet finalized. The design of the bridge will be informed by input received by agencies and individuals during the Draft and Final EA processes, as well as through federal, state, and county design guidelines, as applicable.

2.8.3 Avoidance, Minimization, and Mitigation Measures

No avoidance, minimization, and mitigation measures are proposed because the Build Alternative is not anticipated to have a negative impact on visual and aesthetic resources.

2.9 Transportation Infrastructure

2.9.1 Existing Conditions

Waipilopilo Bridge was constructed in 1932 and is located at milepost 20.956 in Hauula. Hauula is approximately 14 miles from downtown Honolulu via the Pali Highway (State Route 61). Kamehameha Highway (State Route 72) is the other route to Honolulu and extends around Makapuu Point and is approximately 20 miles from downtown Honolulu.

Kamehameha Highway is a two-lane roadway (one lane in each direction) and the major thoroughfare in Hauula (Figure 1-2). Residential and commercial developments have been established along both sides of the highway. The posted speed limit in Hauula is 25 and 35 miles per hour. The posted speed limit at the bridge is 35 miles per hour. Two eleven-foot-wide lanes are provided with no shoulder and pedestrian crossing is provided via a wooden bridge attached to the mauka side of the Waipilopilo Bridge.

2.9.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, the status quo of the bridge would be maintained, HDOT would not replace Waipilopilo Stream Bridge, and disruptions to highway traffic and circulation patterns would not occur.

Build Alternative

Adverse impacts are not anticipated to the existing roadway system as a result of the proposed project. The reconstructed bridge will be widened to the edge of the right of way, providing a sidewalk on the mauka side to replace the existing pedestrian bridge, and a paved shoulder on the makai side.

Traffic at Waipilopilo Stream Bridge will be disrupted for short periods of time during the realignment of the roadway lanes to accommodate the phased demolition and construction process, as well as movement of construction equipment and materials. During construction, one lane of Waipilopilo Stream Bridge will remain open for contraflow operations. When construction is not occurring and during peak traffic hours, road plates will be installed to allow two-way traffic. Reduced speed limits will be implemented in the project area while construction occurs.

All alternatives being considered for the project would be designed in compliance with all county, state, and federal design requirements, including the National Fire Protection Association. As part of the regional transportation system, the long-term safety and functionality of bridges are an important component of the system. In the Koolauloa District, there are no other roadways and bridges capable of providing emergency access across streams. Kamehameha Highway is also classified as a rural principal arterial. For the local community, the bridge is also used by people traveling on foot and by bicycle.

2.9.3 Avoidance, Minimization, and Mitigation Measures

The contractor will be required to make provisions for emergency access and will be required to provide full access during non-working hours and peak traffic hours. It may be necessary for the

contractor to use the public right-of-way and adjacent property for parking and temporary storage of vehicles and construction materials and equipment. This temporary storage and staging area will be coordinated by the contractor. The contractor will also be required to mitigate vehicle and pedestrian traffic problems and hazards through the use of appropriate traffic control and safety devices. Measures that may be employed include the following:

- Publication of newspaper notices to alert the public of the construction project.
- Advance temporary signage and other warnings to alert approaching motorists and pedestrians of the construction project.
- Barriers, cones, signage, lighting, and other devices to promote safe passage of vehicles and pedestrians through the construction zone.
- Flaggers and/or police officers, when necessary, to control the vehicular traffic and pedestrian flow.
- Temporary fencing or other appropriate barriers, as necessary, to deter the public from unauthorized entry into restricted or hazardous construction zones during working and non-working hours.
- Secure equipment and supplies to discourage and deter theft, vandalism, and unauthorized entry into the construction areas.

Lane closures may be required for construction; however, lane closures will not be allowed between the hours of 4:30 a.m. to 8:30 a.m. and from 3:00 p.m. to 7:00 p.m. This time will provide the best opportunity to minimize traffic delay if any lane closure is necessary for construction. To reduce traffic impacts, night work would be allowed, and may last the full duration of construction.

2.10 Natural Hazards

2.10.1 Existing Conditions

Flood Hazards

The FIRM for Hauula published by FEMA places the majority of the project area in Flood Zone AE (Figure 2-10). This zone is designated as a high flood. The portion of the project area containing Waipilopilo Bridge and Kamehameha Highway in the immediate vicinity of the bridge is within Flood Zone AEF. The “F” designates the area as a flood way, or an area that should be free of encroachment so that flooding can be carried without blockage. The base flood elevation is 8 feet at the bridge and increases incrementally in the higher elevated areas above Kamehameha Highway.

Since the bridge is located within a floodway, the stream channel and the adjoining floodplain are needed to convey the base flood (100-year flood). The stream channel itself does not have the capacity to convey the base flood below and within the bridge opening (Sato & Associates 2012). The capacity of the stream channel is also restricted by the lack of connection to the ocean. The aggradation is due to tidal action, which causes deposition of beach sand.

Although the computed results indicate that the storm water flow exceeds the capacity of the stream channel and bridge waterway, HDOT HWY-OM have no records of the bridge deck being

overtopped during flood events. Inquiries with local residents report the same. Contraction scour and local scour at the bridge abutments for the 100-year storm were computed within HEC-RAS. Contraction scour yielded depths between 0.5 and 2.5 feet. Abutment scour yielded greater depths ranging from 11.5 to 13 feet. Although the computed results indicate that scouring may exist to the extents calculated, field conditions do not corroborate. Historical records do not indicate obvious signs of streambed or bank material removal at the bridge foundations.

Earthquakes

The Uniform Building provides minimum design criteria to address potential for damage due to seismic disturbances. The range of seismic risk varies from Zone 0, indicating no damage, to Zone 4, indicating major damage. The island of Oahu is in Seismic Zone 2A, as established by the Uniform Building Code.

Hurricanes

The Hawaiian Islands may be affected by Pacific hurricanes from summer to early winter months. These storms generally travel toward the islands from a southerly or southeasterly direction and can bring large amounts of rain with high winds. The storms generally contribute to localized flooding and coastal storm surges. The project area is located on the windward side of Oahu, which is less vulnerable to hurricanes than the leeward and southern shores. However, the area can experience heavy rains, with winds and storm surges along the coast from hurricanes.

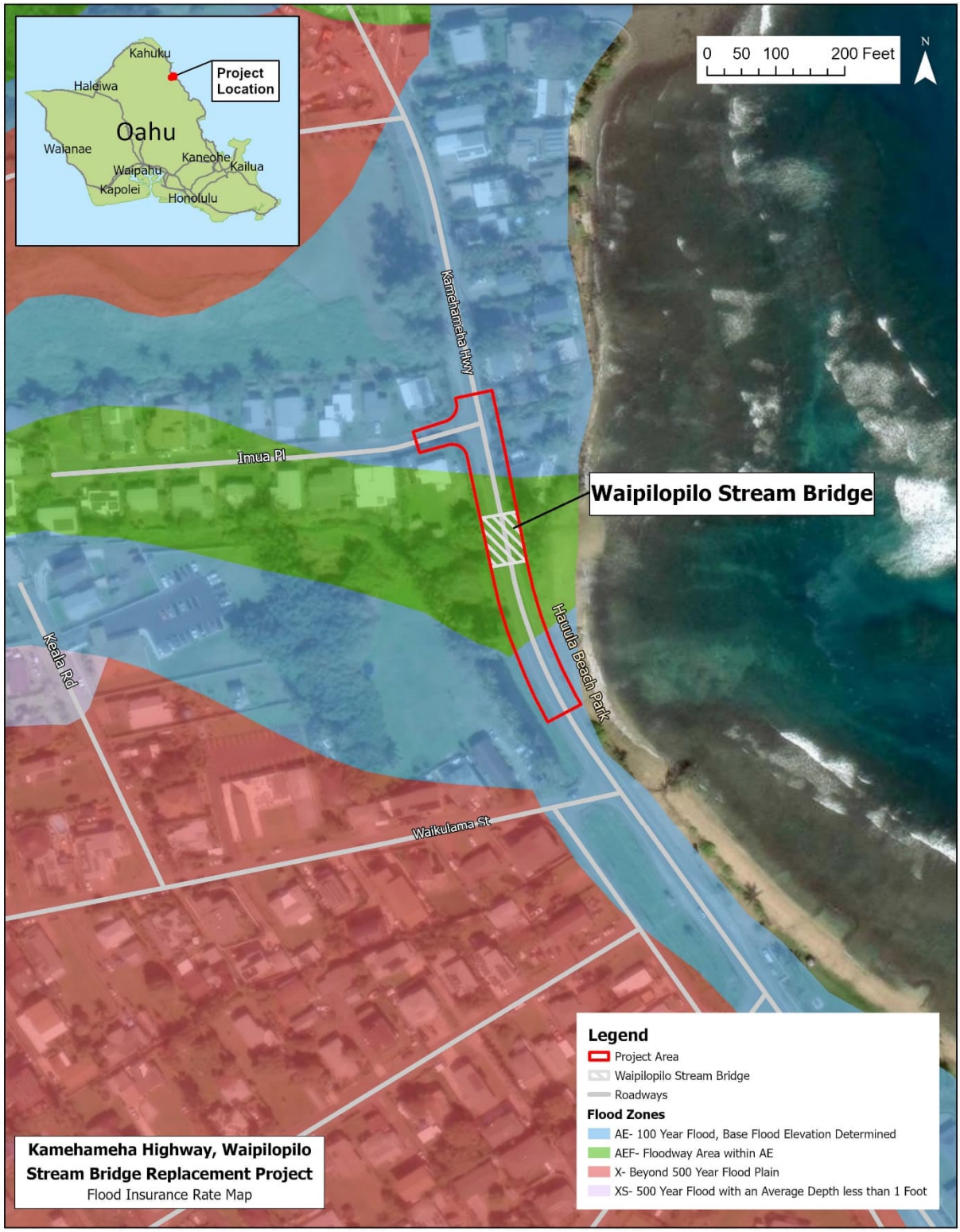
Tsunami

Waipilopilo Stream Bridge is within the Tsunami Evacuation Zone based on updated tsunami evacuation maps developed by the City and County Department of Emergency Management (Figure 2-11).

Sea Level Rise

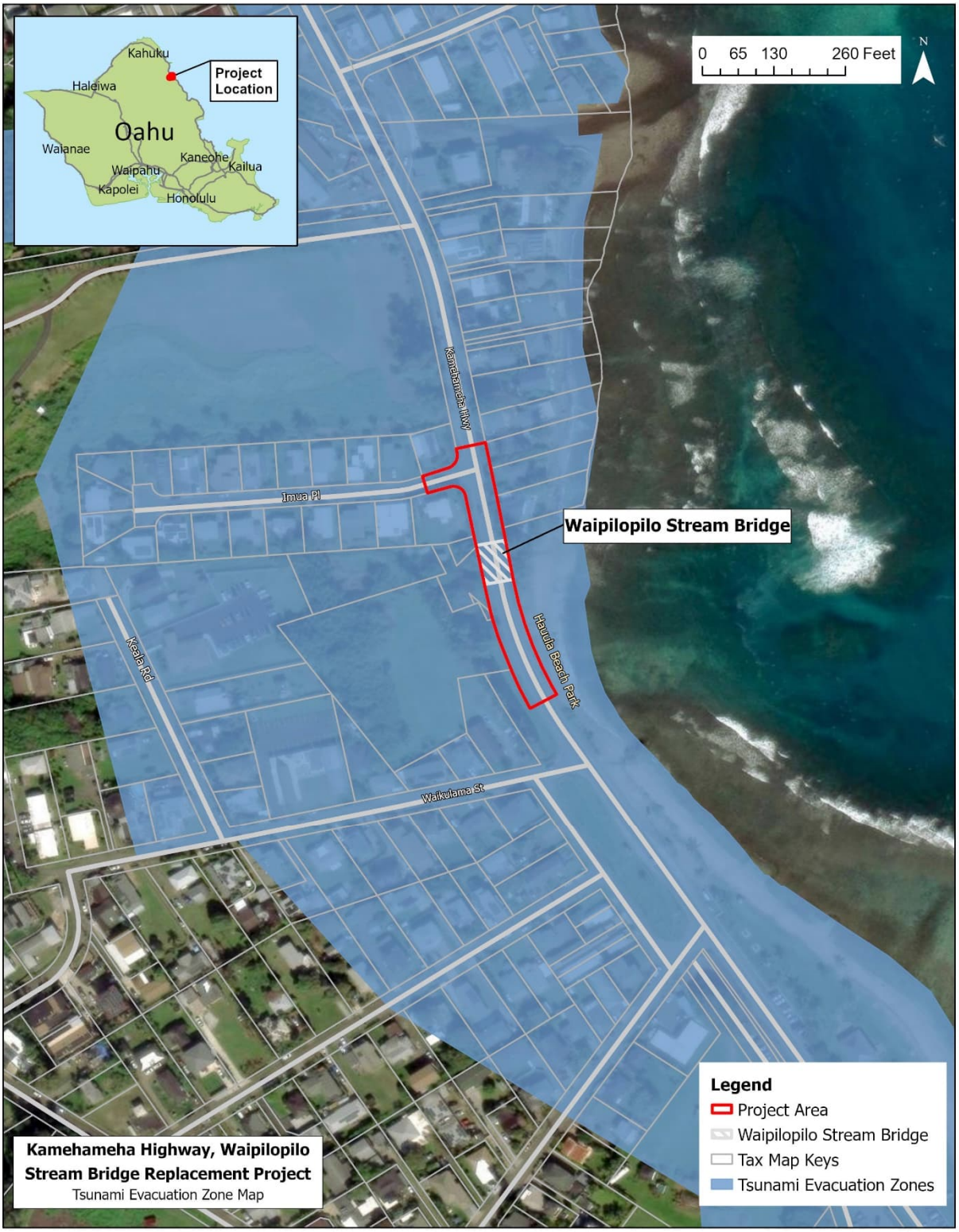
Effective July 2019, the State of Hawaii requires all new projects undergoing environmental review under HRS 343 to consider whether the project is likely to have an adverse effect or be vulnerable to sea level rise. In Hawaii, guidance encourages the use of 3.2 feet of global MSL rise as a planning target for 2100. The southern portion of the project area and the area under Waipilopilo Stream Bridge is located within a 3.2-foot sea level rise exposure area (Figure 2-12).

Figure 2-10: Flood Insurance Rate Map



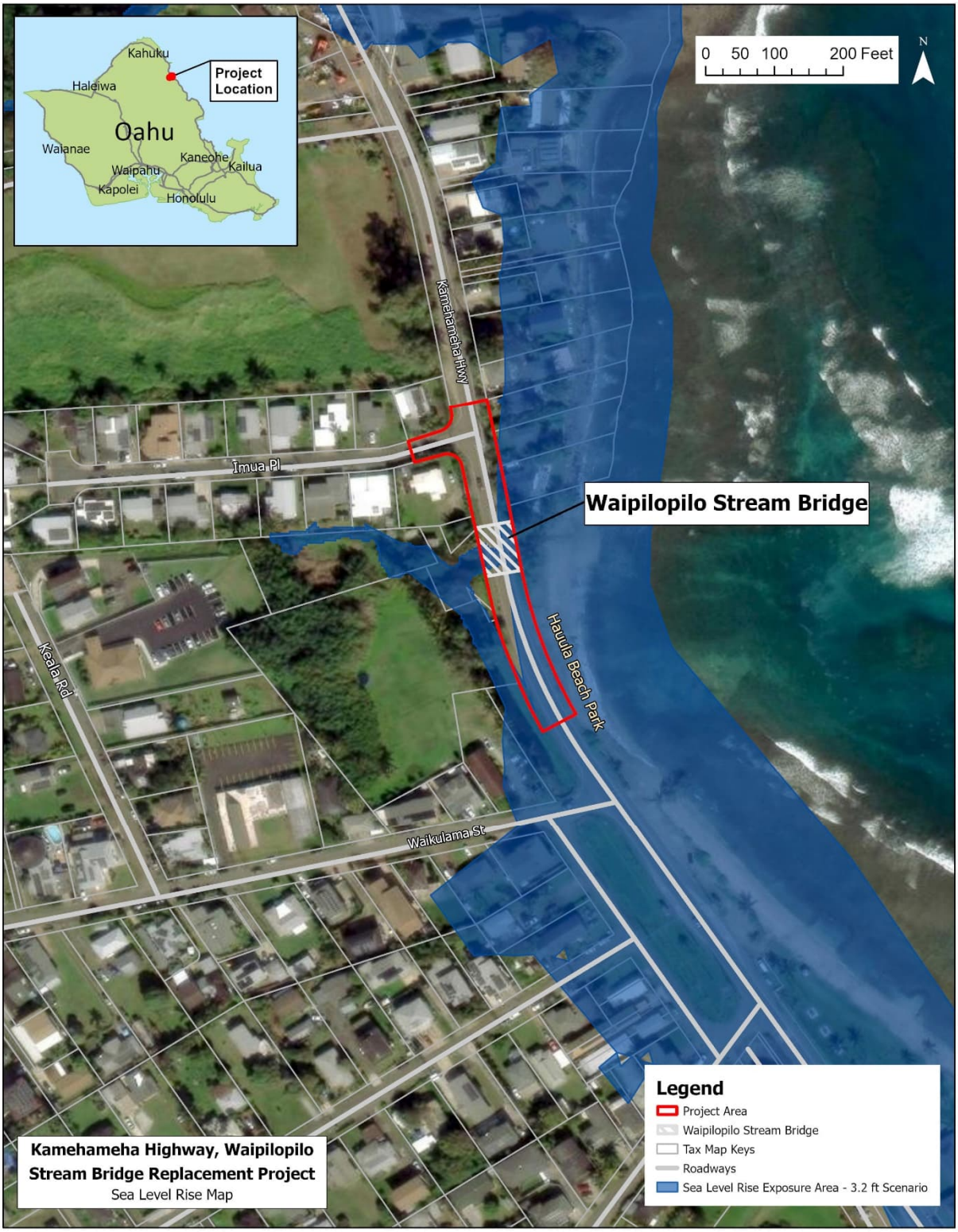
Source: FEMA 2025; Esri 2024; HOLIS, Hawaii Statewide GIS Program 2023.

Figure 2-11: Tsunami Evacuation Zone Map



Source: UH and Honolulu First Responders and the Emergency Management Community 2015, Esri 2024; HOLIS, Hawaii Statewide GIS Program 2023.

Figure 2-12: Sea Level Rise Map



Source: PacIOOS 2022, UH and Honolulu First Responders and the Emergency Management Community 2015, Esri 2024; HOLIS, Hawaii Statewide GIS Program 2023

2.10.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, the existing bridge structure will continue being exposed to flood hazards, and the stream channel would not convey the 100-year flood. While the existing bridge will not exacerbate or increase the incidence of earthquakes, hurricanes, or tsunamis, because the bridge is structurally deficient, these hazards could create unsafe conditions.

Build Alternative

The Replacement Alternative would not exacerbate or increase the frequency of any earthquakes, hurricanes, or tsunami. The new bridge would improve the structural integrity of the bridge and allow for better disaster preparedness and safe transportation infrastructure for the community in the event of evacuation orders. The replacement bridge is located in the 3.2-foot sea level rise exposure area. However, the project is replacing an existing bridge that is part of a larger transportation network. The project is not building a new bridge in the area and will not increase the risk of sea level rise or exacerbate its effects.

The replacement bridge would not increase the base flood elevation because all work on the superstructure would be above the base flood elevation. Additionally, no in-water work is proposed, and the stream channel would not be altered. The bridge would not increase the frequency or exacerbate the effects of a flood.

2.10.3 Avoidance, Minimization, and Mitigation Measures

No Build Alternative

Under the No Build Alternative, the status quo of the bridge would be maintained, HDOT would not replace Waipilopilo Stream Bridge, the existing bridge structure will continue being exposed to flood hazards, and the stream channel would not convey the 100-year flood.

Build Alternative

The replacement bridge will include mitigation design for base flood elevation change/no change and scour mitigation in the event of 100-year base flood. The replacement bridge will be designed in accordance with the latest building codes and American Association of State Highway Transportation Officials' standards to mitigate the effects of natural hazards such as earthquakes, hurricanes, and tsunamis on the new bridge. The proposed project will consider the effects of sea level rise in its design and construction. Because the Replacement Alternative is not anticipated to increase natural hazard frequency or intensity, no avoidance, minimization, or mitigation measures are proposed.

2.11 Public Services, Utilities and Infrastructure

2.11.1 Existing Conditions

Wastewater Service

There is no sewer line crossing the bridge. Lots in the area are served by on-site, individual wastewater systems such as septic tanks or cesspools.

Water Service

There is a concrete-encased, 12-inch cast iron water line along the mauka side of the bridge below the stream crossing. A concrete-encased, 16-inch ductile iron water line runs along the makai side of the bridge and is supported by caissons as it siphons below the stream crossing. Potable water in Hauula is provided by the City and County of Honolulu Board of Water Supply.

Electric, Telephone, and Cable Utilities

Overhead power lines, cables, transformers, and streetlights are supported on wooden utility poles along both sides of the roadway leading up to and beyond the bridge.

Power, telephone, and cable television services are provided to the area via overhead utility lines. These services are provided by Hawaiian Electric Company, Hawaiian Telcom, and Spectrum (formerly Oceanic Time Warner Cable), respectively.

Schools

The State of Hawaii, Department of Education, operates Hauula Elementary School, which is located at 54-046 Kamehameha Highway, approximately 0.68 miles south-southeast of the project site. Na Kamalei Koolauloa Early Education Program, a private pre-kindergarten program located at 53-270 Kamehameha Highway, is also located in Hauula.

2.11.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, no impact would be expected to any public services, utilities, or infrastructure because no work would be done on Waipilopilo Stream Bridge.

Build Alternative

The existing 12-inch and 16-inch waterlines will be permanently relocated to the deck of the replacement bridge. Water will be diverted between the waterlines while construction is occurring to allow a continuous flow of water. No significant impacts to water access are anticipated to occur during construction. Overhead utility lines may need to be temporarily relocated during construction on either side of the bridge while work is occurring. This may lead to temporary disruptions in service. The temporary electric pole relocation will be within the SHPD-approved APE. No other public services, utilities, or infrastructure will be impacted by the bridge replacement.

2.11.3 Avoidance, Minimization, and Mitigation Measures

No Build Alternative

Because there would be no impact to public services, utilities, and infrastructure, no mitigation measures would be required under the No Build Alternative.

Build Alternative

Because there will be no permanent adverse impacts to public services, utilities, and infrastructure under the Replacement Alternative, no avoidance, minimization, and mitigation measures will be required.

2.12 Noise

2.12.1 Existing Conditions

Noise is defined as any sound that is undesirable or interferes with normal human activities. Energy level equivalent (Leq) is the constant noise level over a specified period of time that is equivalent in energy to a fluctuating (or brief) noise "averaged" over that period of time. Leq is also a function of time and is expressed as Leq (time period). A noise impact occurs when the predicted traffic noise levels approach or exceed the Noise Abatement Criteria (NAC), or when the predicted traffic noise levels substantially exceed the existing noise levels.

Based on the roadway's posted speed limit in the project area and the off-peak free-flow traffic conditions, it is reasonable to assume that the existing worst-hour traffic noise levels for noise-sensitive areas near the project are below HDOT NAC.

Existing and future noise-sensitive land uses and activities located in the vicinity of the project area include residences and Hauula Beach Park. No other noise-sensitive land uses are located within the project area. All residences along the project area are Category B (residential) and the outdoor uses at the park are Category C (parks). Category B and Category C activities have an exterior NAC of Leq(h) 67 decibels A-weighted (dBA). The existing and future posted speed limit along Kamehameha Highway within the project area is 25 miles per hour.

Noise levels in the vicinity of the project site are predominantly attributable to vehicular traffic traveling along Kamehameha Highway. The noise level is generally low as a result of the posted speed limit of 25 miles per hour and the rural character of the area. Residential subdivisions and churches are located immediately to the west, and a beachfront vacation rental is located to the north of the bridge site.

2.12.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, the status quo of the bridge would be maintained, HDOT would not replace Waipilopilo Stream Bridge, and future ambient noise levels would not substantially increase or decrease.

Build Alternative

Construction activities will raise ambient noise levels in the vicinity of the project. The bridge will require drilling shafts and installation of sheet piles. These activities may utilize impact hammers, which produce intense, sharp spikes of sound, or vibratory hammers, which produce sounds of lower intensity, with a rapid repetition rate. It is expected that impacts from sheet pile installation would create sound levels of approximately 177 to 178 dBA (AECOS 2012). Demolition of the existing bridge may require saw cutting. Saw cutting is anticipated to result in a lower sound pressure level than drilling activities but will produce a continuous noise. Noise impacts cannot be avoided but will be temporary as they are expected to occur strictly during the demolition and construction period. The completed project is not anticipated to increase ambient noise levels. The bridge will still carry two lanes and the traffic capacity of the bridge will remain the same.

2.12.3 Avoidance, Minimization, and Mitigation Measures

Unavoidable construction noise impact will be mitigated to some degree by the contractor's compliance with provisions of the State of Hawaii Department of Health (HDOH) Administrative Rules, Title 11, Chapter 46, Community Noise Control. The contractor will be required to adhere to standard construction practices for noise suppression and public health requirements during normal working hours of 7:00 a.m. to 3:30 p.m., Monday through Friday, excluding holidays. The allowable noise level is 55 dBA at the property line during the day (7:00 a.m. to 10:00 p.m.) and 45 dBA at night (10:00 p.m. to 7:00 a.m.). The contractor will be required to obtain a Community Noise Permit for construction activities from the HDOH in accordance with HAR, Title 11, Chapter 46, Community Noise Control, should the anticipated noise levels exceed the allowable levels. The contractor will be responsible for ensuring that all construction equipment and on-site vehicles are equipped with muffling devices to mitigate noise impacts. If work is conducted during non-working hours (nighttime, weekends, or holidays), a Community Noise Variance will be obtained. If construction adheres to the Community Noise Permit and Community Noise Variance, no significant impacts to noise are anticipated.

2.13 Air Quality

2.13.1 Existing Conditions

As required by the 1977 Clean Air Act, National Ambient Air Quality Standards (AAQS) were established by the U.S. Environmental Protection Agency (EPA) for seven major air pollutants: carbon monoxide, nitrogen oxides, ozone, particulate matter smaller than 10 microns, particulate matter smaller than 2.5 microns, sulfur oxides, and lead. The State of Hawaii has also established its own standards for these pollutants and the additional pollutant of hydrogen sulfide. The National and State AAQS are periodically reviewed and revised. Both National AAQS and State AAQS are listed in Table 2-5.

The air in Hawaii is relatively clean and low in pollutants. The lack of sizeable heavy industry and the nearly constant winds and breezes contribute to the clean air quality of rural communities. Occasionally, natural pollution from volcanic activity on the island of Hawaii reaches Oahu. This natural pollution is known as "vog" and consists primarily of sulfur dioxide.

The sparsity of development and exposure to the prevailing trade-winds promotes good air quality in the project area. The only identifiable source of emissions at the project site is from vehicular traffic along Kamehameha Highway. However, vehicular traffic at the project site does not impair air quality with exhaust emissions and particulate matter.

Based on the latest year of available ambient air monitoring data (2023), the State of Hawaii is in attainment of all National AAQS and State AAQS. The HDOH Clean Air Branch has four air monitoring stations on the Island of Oahu, though it does not operate any stationary air monitoring sites near the project location. The closest stations to the project area are in Honolulu, approximately 21 miles away from the project area. The pollutants monitored by these stations are particulate matter smaller than 10 microns, particulate matter smaller than 2.5 microns, sulfur dioxide, carbon monoxide, and ozone. The only exceedances of the national or state AAQS on Oahu within the past 3 years occurred on January 1, 2023, with levels of particulate matter smaller than 2.5 microns exceeding the 24-hour average acceptable levels due to volcanic emissions at Sand Island, and on February 13, 2024, with sulfur dioxide emissions exceeding the 1-hour average acceptable due level to source emissions in Kahe (HDOH 2022, 2023, 2024). However, these air quality monitors are far away from the project area and likely do not represent the ambient air quality in the vicinity of the project area.

2.13.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, the existing condition of the bridge would be maintained, HDOT would not replace Waipilopilo Stream Bridge, and ambient air quality would remain unchanged.

Build Alternative

The proposed project will not change the alignment of Kamehameha Highway or Waipilopilo Stream Bridge, add traffic capacity, or result in any meaningful changes in traffic volumes, vehicle mix, vehicle speeds, or any other factor that would cause an increase in emissions. As such, the Proposed Action is not anticipated to generate any notable air quality impacts or contribute to any air quality concerns during its use and will not cause or exacerbate a violation of the state or national AAQS.

As stated in Chapter 1, the anticipated construction duration is roughly 18 to 24 months. Air quality impacts during construction generally consist of fugitive dust. Fugitive dust is airborne particulate matter of usually large particle size generated by construction vehicles operating around construction sites and from material blown from uncovered haul trucks, stockpiles, and exposed areas. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately because its generation varies greatly depending upon the type of soil, the amount and type of dirt-disturbing activity, the moisture content of exposed soil, and wind speed. Additionally, operation of construction vehicles in the area could increase mobile source emissions. Fugitive dust and mobile source emissions will occur only during construction activities and will not be significant enough to cause the ambient air quality in the area to exceed the National AAQS or State AAQS.

Table 2-5: National and State Ambient Air Quality Standards

Pollutant	Standards		
	Hawaii State	Federal Primary[a] (Health)	Federal Secondary[b] (Welfare)
Carbon Monoxide (CO)			
1 Hour[1]	9 ppm	35 ppm	----
8 Hour[1]	4.4 ppm	9 ppm	----
Nitrogen Dioxide (NO_2)			
1 Hour	----	0.1 ppm	----
Annual Mean	0.04 ppm	0.053 ppm	0.053 ppm
PM10[c]			
24 Hour[3]	150 µg /m^3	150 µg /m^3	----
Annual (Arithmetic)[2]	50 µg /m^3	----	----
PM2.5[d]			
24 Hour[5]	----	35 µg /m^3	35 µg /m^3
Annual (Arithmetic)[4]	----	12 µg /m^3	15 µg /m^3
Ozone (O_3)			
8 Hour Rolling Average	157 µg /m^3 (0.08 ppm)	0.07 ppm	0.07 ppm
Sulfur Dioxide (SO_2)			
1 Hour	----	0.075 ppm	----
3 Hour[1]	0.5 ppm	----	1,300 µg /m^3 (0.5 ppm)
24 Hour Block Average	0.14 ppm	----	----
Annual Average	80 µg /m^3 (0.03 ppm)	----	----
Lead (Pb)			
3 Months (Arithmetic)	1.5 µg /m^3	0.15 µg /m^3	0.15 µg /m^3
Hydrogen Sulfide			
1 Hour	25 ppb	----	----

Source: State of Hawaii, Department of Health, Clean Air Branch – Hawaii Administrative Rules, Chapter 59; Code of Federal Regulations, Title 40, Part 50; EPA, http://epa.gov/air/criteria.html

Notes:
[a] Designated to prevent against adverse effects on public health
[b] Designated to prevent against adverse effects on public welfare, including effects on comfort, visibility, vegetation, animals, aesthetic values, and soiling and deterioration of materials.
[c] Particulate matter 10 microns or less in diameter
[d] Particulate matter 2.5 microns or less in diameter.
(1) Not to be exceeded more than once per year.
(2) Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual PM_{10} standard in 2006 (effective December 17, 2006).
(3) Not to be exceeded more than once per year on average over 3 years.
(4) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m^3.
(5) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3 (effective December 17, 2006).

Key:
µg/m^3 = micrograms per cubic meter
ppm = parts per million
ppb = parts per billion
PM2.5 = particulate matter smaller than 2.5 microns
PM10 = particulate matter smaller than 10 microns

2.13.3 Avoidance, Minimization, and Mitigation Measures

No avoidance, minimization, and mitigation measures are proposed for any of the alternatives, because no violation of the National AAQS or State AAQS is anticipated.

Airborne, visible fugitive dust generated during construction of the Proposed Action will be controlled at the project site by the contractor in accordance with the provisions of HAR Chapter 11-60.1-33, Fugitive Dust. For example, frequent watering will control fugitive dust at construction sites. In addition, wind screens could be used in areas near residences and commercial districts. The contractor should limit the areas of disturbance at any given time to not leave exposed dirt. Landscaping will be reestablished as early as possible to limit fugitive dust. To prevent haul trucks from tracking dirt onto paved streets tire washing or road cleaning may be appropriate. State regulations further stipulate that open-bodied trucks be always covered when in motion if they are transporting wind-erodible materials.

2.14 Social and Economic Conditions

2.14.1 Existing Conditions

General Socio-Economic Conditions

HDOT's Title VI Plan (2019) is designed to fulfill its responsibilities under Title VI of the Civil Rights Act of 1964, as amended. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," was signed by the President of the United States on February 11, 1994. It is intended to address issues regarding Environmental Justice and other related non-discrimination regulations and directives. It directs federal agencies to take appropriate and necessary steps to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority or low-income populations.

If minority or low-income populations are found in the project vicinity, good faith effort must be made to ensure that disproportionate and adverse impacts on low-income and minority populations are prevented, minimized, or mitigated. An example of good faith effort is additional public notification or outreach to these groups.

The federal definition of "minority" includes the following groups:

- Black: a person having origins in any of the black racial groups of Africa.
- Hispanic: a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.
- Asian: a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent or the Pacific Islands.
- American Indian or Alaskan Native: a person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition.
- Native Hawaiian or Other Pacific Islander: a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

Pursuant to Executive Order 12898, "low-income" is defined as households with incomes at or below the U.S. Department of Health and Human Services poverty guidelines. The 2019 poverty guidelines for the State of Hawaii is at or below $29,620 for a family/household of four.

The following discussion is based on selected census data, summarized in Table 2-6 and Table 2-7.

Population and Ethnicity

The State of Hawaii is an unusual, but increasingly common case, where traditionally defined "minority" populations make up the majority of the population.

The areas of Laie and Hauula have higher percentages of the population that are White than the rest of the state, and almost double the percentage than that for the City and County of Honolulu. There are also almost triple the percentage of those who are of Native Hawaii/Other Pacific Islander descent than the rest of the state or the City and County of Honolulu.

Table 2-6: Demographic Conditions

	Hawaii State	City and County of Honolulu	2020 Census Tract 102.02 - Laie	2020 Census Tract 102.04 - Hauula
Population	1,455,271	1,015,167	8,370	2,476
Ethnicity				
White	333,261 (23%)	108,156 (10.7%)	2,204 (26%)	602 (24%)
Black or African American	23,417 (1.6%)	23,638 (2.3%)	28 (0.3%)	24 (1.0%)
American Indian/Alaska Native	4,370 (0.3%)	1,632 (0.2%)	40 (0.5%)	0 (0%)
Asian	541,902 (37%)	421,867 (41.6%)	1,022 (12.2%)	97 (3.9%)
Hispanic or Latino		130,798 (12.9%)	672 (8.0%)	243 (9.8%)
Native Hawaiian/Other Pacific Islander	157,445 (10.8%)	96,600 (9.5%)	2,130 (25.4%)	855 (34.5%)
Other	26,747 (1.8%)	2,000 (0.2%)	0 (0%)	0 (0%)
Two or More Races	368,129 (25.3%)	184,576 (18.2%)	2,274 (27.2%)	646 (26.1%)

Source: U.S. Census Bureau 2020

Table 2-7: Income in the Past 12-Months (In 2019 Inflation-Adjusted Dollars)

	Hawaii State	City and County of Honolulu	2020 Census Tract 102.02 - Laie	2020 Census Tract 102.04 - Hauula
Number of Households	478,413	338,093	1,396	637
Earn Less than $34,999	19.9%	17.5%	12.4%	16%
$35,000 to $74,999	25.5%	23.9%	29%	26%
$75,000 to $99,999	13.5%	13.3%	8%	11%
$100,000 to $200,000	30.2%	44.4%	38%	40%
$200,000 or more	10.9%	14.1%	13%	7%
Median Income (dollars)	$83,102	$90,704	$100,638	$96,141
Mean Income (dollars)	$113,310	$115,877	$117,191	$100,907

Source: U.S. Census Bureau 2020

Income and Employment

The areas of Laie and Hauula have a slightly higher percentage of households with general average incomes that are above the percentage found throughout the state or the City and County of Honolulu.

2.14.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, there would be no changes or impacts experienced by the surrounding community.

Build Alternative

In accordance with the federal definition of "minority" as presented earlier, which includes those of Asian and Native Hawaiian/Pacific Island ancestry, the proposed project improvements will affect minority populations. Additionally, socio-economic trends illustrate that there are populations where the household income is lower than the U.S. Department of Health and Human Services poverty guidelines for Hawaii.

However, the project will not disproportionately affect the community in an adverse manner. Impacts, such as those to noise and air, will not worsen as a result of the Build Alternative, and will be temporary in relation to construction activities. Benefits include a more efficient (less delay) and safer transportation system.

2.14.3 Avoidance, Minimization, and Mitigation Measures

Because the proposed project will not disproportionately affect a "minority" community and will provide a pedestrian/bicycle facility that would be accessible to all for non-motorized users, there are no proposed avoidance, minimization, or mitigation measures for the Build Alternative.

2.15 Hazardous Materials and Solid Waste Management

2.15.1 Existing Conditions

The Waipilopilo Stream Bridge was constructed in 1932 and historically was coated with lead-based paint. On September 8, 2011, a hazardous materials survey was conducted on the Waipilopilo Stream Bridge in response to the proposed bridge replacement (Kimura 2011). Samples of paint and suspect asbestos containing materials were collected from the bridge's structural components and the adjacent wooden walkway. Asbestos was not detected in any of the samples; however, lead-containing and lead-based paint was detected in the samples collected from the concrete railings, bridge supports, and wooden walkway railings (Figure 2-13) (Kimura 2011).

Based on these results, hazardous materials exist and may expose construction workers to lead. As such, any demolition debris generated from the bridge and walkway shall be characterized and disposed of by the contractor to the appropriate landfill due to the presence of lead-based paint.

2.15.2 Potential Impacts

No Build Alternative

Under the No Build Alternative, there would be no disturbance to the area or the bridge and no potential for exposure to lead-containing or lead-based paint.

Build Alternative

Bridge demolition and removal activities may generate lead dust and expose workers to lead-based paint hazards. Lead paint can also be present on crumbling plaster or rotted wood. Lead exposure can cause damage to the brain, kidneys, nerves, and blood.

2.15.3 Avoidance, Minimization, and Mitigation Measures

To minimize exposure to lead, work practices should include containment of lead paint and lead dust within the work area using dust-control measures such as routine wetting of the demolition area or silt, and handling and management of the generated debris waste stream using proper personal protective equipment. The debris waste stream shall be properly characterized for disposal to the appropriate landfill.

Figure 2-13: Hazardous Materials Map



Source: Kimura 2011, Esri 2024; HOLIS, Hawaii Statewide GIS Program 2023

2.16 Construction-Related Impacts

The construction-related impacts specific to individual resources are discussed in more detail in the following sections.

Generally, the HDOT will work with the contractor selected for the construction of the proposed project to minimize construction-related impacts. Alternative routes will be open throughout the duration of all construction work to ensure that accessibility is maintained for residents of the area, those traveling through the area, and emergency responders.

HDOT will also ensure that road closures will be advertised to the public and agencies through appropriate notices, including, but not limited to, newspaper ad placement, signage along the roadway work area, and mail-out notifications.

2.16.1 Wetland and Surface Water Resources

The wetland and surface water resources present in the project area were summarized in Section 2.6. The most recent wetland survey was completed by AECOS in 2017. This survey found that a subtidal estuary with an unconsolidated bottom exists in the east margins of the project area ditch.

The scour analysis being performed for the project will determine if in-water work is needed during the replacement of the bridge.

2.16.2 Land-Based Stormwater Impacts

As soil disturbance of the project area may exceed 1 acre, a National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Associated with Construction Activities will be required from HDOH. During construction, BMPs would be implemented to prevent debris and polluted runoff from reaching Keanuiomano Stream or other natural waters. Storm water runoff and erosion will be mitigated through the use of construction BMPs that will be established before work begins through a project-specific Erosion and Sediment Control Plan and Stormwater Pollution Prevention Plan. The project will comply with the HDOT Stormwater Permanent Best Management Practices Manual (PC-BMP Manual).

Generally accepted BMPs that will be used include the following:

- Installation of perimeter controls and sediment barriers, such as silt fences
- Minimizing disturbed areas
- Excavated/stockpiled material protection, including the covering of stockpiles
- Storm drain inlet and catch basin protection devices
- Proper waste management, including separation of recyclable materials

2.16.3 Transportation Infrastructure

Up to one travel lane will be closed at a time during construction, during which one-lane, two-way contraflow operations would be utilized. A mixture of day and night work is anticipated, as some tasks are more suitable for night work. Night work may be subject to seasonal restrictions. Full

closure is not anticipated to be necessary. There are no local detour roads around the Waipilopilo Bridge.

While delays during worst-case workday conditions are projected to be at LOS F levels, traffic operations through the work zone are projected to approach but not exceed capacity. It should be noted that the analysis results are conservative because flaggers would be able to adjust how much vehicular queue to discharge every cycle in real time. While motorists would experience more delay, overall efficiency would increase due to less clearance time while vehicles in one direction wait for the other direction to clear the work zone before proceeding.

Based on the analysis results, lane closures are recommended to occur between 8:30 AM and approximately 3:00 PM. Traffic conditions should be monitored to avoid excessive delays. See Appendix D Traffic Evaluation Technical Memorandum for more information.

2.16.4 Noise

Construction activities will involve heavy machinery and vehicles that at times may exceed the maximum levels allowed by Community Noise Control regulations for daytime within Class C Zoning Districts (agriculturally zoned areas or similar). A Community Noise Permit will be required, and the contractor would be required to comply with Community Noise regulations.

Construction of the Build Alternative will involve the use of heavy machinery that may cause temporary noise impacts to adjacent noise-sensitive land uses. Table 2-8 presents a range of noise levels for various construction equipment anticipated to be used during construction of the proposed project. Equipment noise levels vary depending on the make and model of the equipment, the operation being performed, the condition of the equipment, and other variables. The noise levels listed are based on published measurement taken at 50 feet from the equipment.

Table 2-8: Construction Equipment Noise Levels

Equipment	Decibels	Equipment	Decibels (dBA)
Standard Construction Equipment		Light Impact Equipment	
Truck	75 - 90	Jack Hammer	81 - 98
Saw	72 - 81	Jumping Jack	81 - 97
Light Tower	62 - 72		
Cold Planer	79 - 88	Heavy Impact Equipment	
Paving Machine	86 - 88	Hoe rams	95 - 106
Roller	63 - 70	Vibratory Sheetpile driver	90 - 100
Striping machine	75 - 86		
Concrete Truck	75 - 88		
Backhoe/Loader	72 - 83		
Compressor	74 - 87		
Generator	71 - 82		
Crane	75 - 87		

Since HDOH maintains community noise control standards (HAR Section 11-46) that apply to construction noise, these specifications will be followed. A Community Noise Permit will be obtained for construction activities performed during standard work hours (Monday through Friday 7:00 a.m. through 6:00 p.m. and Saturday 9:00 a.m. through 6:00 p.m., and holidays).

If nighttime, weekend, or holiday work is determined to be necessary, a Community Noise Variance will also be obtained by the contractor.

2.16.5 Air Quality

Air quality impacts during construction generally consist of fugitive dust and mobile source emissions from construction equipment. Fugitive dust is airborne particulate matter, of usually large particle size, generated by construction vehicles operating around construction sites and from material blown from uncovered haul trucks, stockpiles, and exposed areas.

Mitigation measures to address short-term impacts include the use of appropriate BMPs to address the following:

- Exhaust emissions from construction vehicles and machinery. The construction contractor will be responsible for complying with State Department of Health Administrative Rules, Title 11, Air Pollution Control requirements. For example, to minimize air pollution, the contractor will be required to keep all construction vehicles and machinery properly maintained.
- Construction activities will expose soil, which may facilitate erosion and fugitive dust emissions. The contractor will manage short-term fugitive dust with standard control measures such as sprinkling the ground with water and covering stockpiled soil and open-bodied trucks transporting wind-erodible materials. Erosion control measures will include silt screens and planting landscaping as early as possible to limit exposed soils. Tire washing and road cleaning should be implemented to prevent trucks from tracking dirt onto paved streets. Asphaltic concrete pavement cutting tools or equipment will employ wet cutting or dry cutting equipment with dust-control methods.

2.16.6 Solid and Hazardous Waste Management

According to the State of Hawaii, “Hazardous Substances” include materials and wastes that are considered severely harmful to human health and the environment, as defined by the EPA Comprehensive Environmental Response, Compensation, and Liability Act (also commonly known as “Superfund”) (State of Hawaii 2018).

Due to the presence of lead in the structural components of Waipilopilo Stream Bridge, any construction and demolition debris generated from the proposed work will be considered hazardous. As such, all waste streams from the bridge will need to be characterized for disposal to the appropriate landfill upon testing results.

In addition, areas near Waipilopilo Stream Bridge have historically been used for agricultural activities. Therefore, it is likely that pesticides, fuel, and abandoned vehicles may be encountered in the soils during ground disturbance activities.

During demolition and removal activities, the contractor will observe any visual and olfactory signs of contamination (e.g., sheen, petroleum odors, etc.). Good housekeeping and BMPs will be required of the contractor, and will include ensuring the following:

- All waste streams are to be containerized for sampling and disposal to the appropriate landfill.
- Materials and equipment are to be stored on site in appropriate containers in a neat and orderly manner (i.e., manufacturer recommendations).

- All on-site vehicles and equipment are to be monitored for leaks to prevent any spillage. A spill kit is to be placed near these areas.
- All sanitary waste generated during the construction phase is to be collected from portable units as required and directed to a HDOH-permitted treatment facility.

HDOT and its contractor will also be responsible for preparing and implementing a Construction Environmental Hazard Management Plan (C-EHMP) in conformance with the guidelines established by the HDOH-HEER office. The purpose of a C-EHMP is for management of identified environmental hazards posed by known or suspected environmental contaminants at a site and to provide clear procedures for how to manage these environmental hazards safely. With the C-EHMP in place and followed, risk to construction workers would be minimal.

CHAPTER 3. CONSISTENCY WITH GOVERNMENT PLANS AND POLICIES

3.1 State of Hawaii Plans and Controls

3.1.1 Hawaii State Plan

The Hawaii State Plan, HRS § 226, Hawaii State Planning Act, is a long-range comprehensive plan that includes an overall theme, goals, objectives, policies, priority guidelines, and implementation mechanisms. The Hawaii State Plan acts as a roadmap for long-term state development, setting goals, policies, and priorities. The plan also aids in resource allocation, enhances coordination among federal, state, and county plans and programs, and establishes a systematic approach to integrate major state and county activities.

Relevant Hawaii State Plan goals, objectives, and policy are listed below with discussion and analysis:

HRS § 226-9 Objective and policies for the economy – federal expenditures

- Policy 3 – Promote the development of federally supported activities in Hawaii that respect statewide economic concerns, are sensitive to community needs, and minimize adverse impacts on Hawaii's environment.
- Policy 6 – Strengthen federal-state-county communication and coordination in all federal activities that affect Hawaii.

Discussion: The proposed project is a state-lead initiative, in cooperation with the FHWA. HDOT is also seeking federal agency input via the required consultations, including Section 106 of the NHPA, Section 7 of the ESA, and compliance with NEPA. See Appendix A for federal coordination efforts.

HRS § 226-14 Objective and policies for facility systems--in general

- Policy 1 – Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.
- Policy 5 – Identify existing and planned state facilities that are vulnerable to sea level rise, flooding impacts, and natural hazards.
- Policy 6 – Assess a range of options to mitigate the impacts of sea level rise to existing and planned state facilities.

Discussion: Rehabilitating Waipilopilo Stream Bridge would ensure that its structural integrity can withstand the increasing threat of natural disasters. Should the Waipilopilo Stream Bridge fail, the transit system would be affected for anyone who travels through Koolauloa because Waipilopilo Stream Bridge is the only bridge crossing over the stream.

HRS § 226-17 Objectives and policies for facility systems—transportation

- Policy 6 – Encourage transportation systems that serve to accommodate present and future development needs of communities.

- Policy 9 – Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification.
- Policy 12 – Coordinate intergovernmental land use and transportation planning activities to ensure the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives.

Discussion: As stated above, the proposed project will ensure that Waipilopilo Stream Bridge's structural integrity can withstand the increasing threat of natural disasters, which is a part of Kamehameha Highway, a vital transportation corridor for the Koolauloa Region of Oahu. Should the Waipilopilo Stream Bridge fail, impacts to bridge operations would disrupt the efficient, economical, safe, and convenient movement of people and goods.

HRS § 226-109 Climate change adaptation priority guidelines

- Guideline 5 – Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change.
- Guideline 7 – Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options.
- Guideline 8 – Foster cross-jurisdictional collaboration between county, state, and federal agencies and partnerships between government and private entities and other nongovernmental entities, including nonprofit entities.
- Guideline 10 – Encourage planning and management of the natural and built environments that effectively integrate climate change policy.

Discussion: Rehabilitating the Waipilopilo Stream Bridge would ensure that its structural integrity can withstand the increasing threat of natural disasters due to climate change.

3.1.2 Hawaii 2025 Sustainability Plan

The Hawaii 2050 Sustainability Plan, revised June 2021 (Hawaii State Plan), serves as a guide for the future long-range development of the state. The Hawaii State Plan promotes the growth and diversification of the state's economy, the protection of the physical environment, the provision of public facilities, and the promotion of and assistance to socio-cultural advancement. The project is consistent with Sustainable Development Goal 9 to "Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation."

Discussion: The project will rehabilitate Waipilopilo Stream Bridge, ensuring that the infrastructure can be sustained into the future.

3.1.3 Hawaii Statewide Federal-Aid Highways 2035 Transportation Plan

The Statewide Federal-Aid Highways 2035 Transportation Plan (July 2014) provides a basis for transportation decision-making through the year 2035. The plan embraces the people of Hawaii's values and identifies needs for the movement of people and goods for all modes of land-based transportation. The project is consistent with the following goals:

- *Goal 3.2 – Maintain safe, efficient, complete transportation system for the long-term.*
- *Goal 7.1 – Provide appropriate and reliable transportation access options statewide to all users.*
- *Goal 8.1 – Maintain a safe transportation system for all land transportation modes.*
- *Goal 8.2 – Improve safety of the community through connectivity of the transportation infrastructure.*

Discussion: The proposed project will rehabilitate the structurally deficient bridge, ensuring a safe and reliable transportation system.

3.1.4 Hawaii Coastal Zone Management Program

Pursuant of the Coastal Zone Management Act (CZMA) of 1972, the Hawaii CZM Program of 1977 (HRS § 205A) intends to manage, develop, and protect resources of the coastal zone, and to provide a common focus for state and county actions. Hawaii's coastal zone includes water from the shorelines to the limits of the state's police power and management authority. This includes all land excluding those designated as forest reserves. As a result, the proposed project is within the CZM area and is subject to consistency with the objectives and policies of the Hawaii CZM Program. The Hawaii OPSD is the lead agency responsible for administering HRS Chapter 205A. This following section will examine how the proposed project is relevant to the 10 objectives outlined in the Hawaii CZM Program.

1. Recreational Resources

Objective: Provide coastal recreational opportunities accessible to the public

Policies:

a. Improve coordination and funding of coastal recreational planning and management.
b. Provide adequate, accessible, and diverse recreational opportunities in the CZM area by:
   i. Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas.
   ii. Requiring restoration of coastal resources that have significant recreational and ecosystem value, including but not limited to coral reefs, surfing sites, fishponds, sand beaches, and coastal dunes, when these resources will be unavoidably damaged by development; or requiring monetary compensation to the state for recreation when restoration is not feasible or desirable.
   iii. Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value.
   iv. Providing and adequate supply of shoreline parks and other recreational facilities suitable for public recreation.
   v. Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources.
   vi. Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters.

vii. Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing.
viii. Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by land use commissions, board of land and natural resources, and county authorities, and crediting that dedication against the requirements of Section 46-6.

Discussion: The proposed project is not anticipated to adversely impact these recreational activities.

2. Historic Resources

Objective: Protect, preserve, and where desirable, restore those natural and manmade historic and prehistoric resources in the CZM area that are significant in Hawaiian and American history and culture

Policies:

a. Identify and analyze significant archaeological resources.
b. Maximize information retention through preservation of remains and artifacts or salvage operations.
c. Support state goals for protection, restoration, interpretation, and display of historic resources.

Discussion: Archaeological and cultural analysis have been completed as part of project planning and is included in Section 2.3 and Section 2.4. FHWA has determined the Waipilopilo Stream Bridge project would result in an adverse effect to two sites of historical value. HDOT will continue to consult and resolve the adverse effects pursuant to 36 CFR 800.6 and HAR 13-275-8. HDOT will also confirm appropriate mitigation commitments with SHPD. With proper mitigation measures this project is consistent with this objective.

3. Scenic and Open Space Resources

Objective: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

a. Identify valued scenic resources in the CZM area.
b. Ensure that new developments are compatible with their visual environment by designing and locating those developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.
c. Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources.
d. Encourage those developments that are not coastal dependent to locate in inland areas.

Discussion: The proposed project is not anticipated to adversely impact scenic and open space resources.

4. Coastal Ecosystems

***Objective**:* Protect valuable coastal ecosystems, including reefs, beaches, and coastal dunes, from disruption and minimize adverse impacts on all coastal impacts.

Policies:

a. Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources.
b. Improve the technical basis for natural resource management.
c. Preserve valuable coastal ecosystems of significant biological or economic importance, including reefs, beaches, and dunes.
d. Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs.
e. Promote water quantity and quality planning and management practices that reflect tolerance of freshwater and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: This project is near the coastline, however it is not anticipated to have significant impacts on coastal ecosystems. BMPs will be followed during construction, mitigating against impacts to shorelines, reefs, and nearshore waters.

5. Economic Uses

Objective: Provide public or private facilities and improvements importation to the state's economy in suitable locations

Policies:

a. Concentrate coastal dependent development in appropriate areas.
b. Ensure that coastal dependent development and coastal related development are located, designed, and constructed to minimize exposure to coastal hazards and adverse social, visual, and environmental impacts in the CZM area.
c. Direct the location and expansion of coastal development to areas designated and used for that development and permit reasonable long-term growth at those areas, and permit coastal development outside of designated areas when:
    i. Use of designated locations is not feasible.
    ii. Adverse environmental effects and risks from coastal hazards are minimized.
    iii. The development is important to the state's economy.

Discussion: The proposed project supports the objective above by providing improved public facilities in a bridge replacement. The project area is coastal dependent but within an existing right-of-way and thus will not have adverse impacts to social, visual, and environmental impacts to the coastal zone.

6. Coastal Hazards

Objective: Reduce hazard to life and property from coastal hazards.

Policies:

a. Develop and communicate adequate information about the risks of coastal hazards.
b. Control development, including planning and zoning control, in areas subject to coastal hazards.
c. Ensure that developments comply with requirements of National Flood Insurance Program.
d. Prevent coastal flooding from inland projects.

Discussion: The project will not have immediate impacts on shorelines, reefs, and nearshore waters. It will have no adverse impacts to coastal hazards. The bridge is currently structurally deficient and replacing the bridge will increase the safety of communities within the coastal area by complying with the most up-to-date policies regarding coastal hazards.

7. Managing Development

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

a. Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development.
b. Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements.
c. Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms of understandable to the public to facilitate public participation in the planning and review process.

Discussion: The proposed project will be reviewed and processed pursuant to Chapter 343, HRS and the Title 11, HAR, Environmental Impact Statement Rules. As such, the proposed project will undergo public review during the EA process.

8. Public Participation

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

a. Promote public involvement in CZM process.
b. Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities.
c. Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion: Public review of the proposed project will be coordinated through the EA process.

9. Beach and Coastal Dune Protection

Objective: Protect beaches and coastal dunes for: (1) public use and recreation; (2) the benefit of coastal ecosystems; and (3) use as natural buffers against coastal hazards. Also to coordinate and fund beach management and protection.

Policies:

a. Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion.
b. Prohibit construction of private shoreline hardening structures, including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities.
c. Minimize construction of public shoreline hardening structures, including seawalls and revetements, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities.
d. Minimize grading of and damage to coastal dunes.
e. Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor.
f. Prohibit private property owners from creating a public nuisance by allowing private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor.

Discussion: The proposed project will not adversely impact beach processes or recreational activities. BMPs will be implemented to prevent impacts on shorelines, reefs, and nearshore waters.

10. Marine and Coastal Resources

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

a. Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial.
b. Coordinate the management of marine and coastal resources and activities to improve effectiveness of efficiency.
c. Assert and articulate the interests of the state as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone.
d. Promote research, study, and understanding of ocean and coastal processes, impacts of climate change and sea level rise, marine life, and other ocean resources to acquire and inventory information necessary to understand how coastal development activities relate to and impact ocean and coastal resources.
e. Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: Implementation of appropriate BMPs will occur during the project implementation to minimize stormwater runoff and protect marine resources.

In addition to the foregoing objectives and policies, HRS 205A § 71 states that permits will not be granted for projects that have artificial lights from floodlights, uplights, or spotlights used for decorative or aesthetic purposes when the light:

Article I. Directly illuminates the shorelines and ocean waters, or

> Article II. Is directed to travel across property boundaries toward the shoreline and ocean waters.

Further, this prohibition shall not apply to authorized users for government operations, security, public safety, or navigational needs, provided that the government agency or its authorized users shall make reasonable efforts to properly position or shield lights to minimize adverse impacts.

Discussion: No light fixtures for decorative or aesthetic purposes will be installed during the proposed project. The project area contains existing highway lighting, and no extra lighting is proposed as part of the project plans.

3.2 City and County of Honolulu Plans

3.2.1 Oahu General Plan

The General Plan for the City and County of Honolulu outlines policies for the long-range development of Oahu. The plan was originally adopted in 1977 and was most recently amended in 2021. It contains 11 sections:

1. Population
2. Balanced Economy
3. Natural Environment and Resource Stewardship
4. Housing and Communities
5. Transportation and Utilities
6. Energy Systems
7. Physical Development and Urban Design
8. Public Safety and Community Resilience
9. Health and Education
10. Culture and Recreation
11. Government Operations and Fiscal Management

The sections relevant to the Waipilopilo Bridge Replacement are:

- Section 5: Transportation and Utilities (Objective A, Policy to create a multi-modal transportation system that is safe and effective)
- Section 7: Physical development and Urban Design (Objective A, to ensure development is timely and well-designed and Objective B, to plan for the long-term physical impacts of climate change)
- Section 8: Public Safety and Health (Objective B, Policy to protect residents and visitors against natural disasters, emergencies, and unsafe conditions)

Section 5, Objective A, is further split into ten policies, of which Policy 2 and Policy 4 are relevant to the proposed project. Policy 2 aims to provide multimodal transportation services to people living outside of the ʻEwa, Central Oahu, and Pearl City-Hawaii Kai corridors through the existing highway system. Policy 4 aims to provide safe and adequate access for communities served by the coastal highway system, and, if needed, relocate highways inland to account for sea level rise and coastal erosion. Both of these policies will be supported by the proposed project as it will improve transportation by widening the bridge and replacing the railing. Under the No Build Alternative,

the bridge will continue to deteriorate, reducing travel access along this coastal highway corridor. All alternatives will increase the bridges lifespan and resilience against sea level rise.

Section 7, Objective A, is split into 13 policies, of which, Policy 1 is relevant. This policy aims to provide infrastructure improvements for areas with deteriorating infrastructure. Objective B is split into three categories, of which, Policy 1 and Policy 3 are relevant. Policy 1 calls for the integration of climate change adaptation into the planning and construction of infrastructure. Policy 3 calls for preparation for the impacts of sea level rise on communities. The replacement of the bridge will provide improvements for the deteriorating infrastructure in the area and allow a longer lifespan of the bridge against sea level rise and flood risk.

Section 8, Objective B, is further split into 11 policies, of which Policies 2, 6, and 7 are relevant. Policy 2 calls for areas subject to flood and tsunamis to be constructed in a manner that will not create any health or safety hazards. Policy 6 calls for reducing hazardous traffic conditions. Policy 7 requires the island to prepare for and respond to natural and manmade threats to public safety. As the bridge has a sufficiency rating below 50, it is structurally deficient and under the No Build Alternative it could become unsafe overtime. The Action Alternatives will allow safe travel, and in the event of emergencies, the change alternatives will allow safe travel across the bridge.

3.2.2 Koolau Loa Sustainable Communities Plan

The most recent Koolau Loa Sustainable Communities Plan was published in November 2020. This plan is a policy guide to direct efforts to supporting existing populations, specifically by maintaining and enhancing the region's ability to sustain its unique character, population, families, lifestyles, and economic livelihood. This plan builds upon the more general City and County of Honolulu General Plan by detailing plans to ensure projects help sustain economic health, social equity, and environmental protection.

Section 5.7 provides a table summarizing improvements that would be required to be made in order to implement the plan. Below is a list of policies that this project would support:

Policy 180. Provide safety improvements along Kamehameha Highway.

Discussion: The proposed project is consistent with Policy 180 as it will replace a structurally deficient bridge along Kamehameha Highway.

Policy 182. Work with responsible State and City agencies and private landowners to develop a regional pedestrian/bikeway system linking parks, schools, and commercial areas with residential communities.

Discussion: The proposed project is consistent with Policy 180 as it will replace a structurally deficient bridge along Kamehameha Highway. While there are currently no bike routes along Waipilopilo Bridge, there are plans to develop bike routes along this corridor according to the 2019 Oahu bike plan. The replacement bridge also includes the installation of a pedestrian walkway; therefore, the proposed project is consistent with policies expressed in the Koolau Loa Sustainable Communities Plan and Policy 182.

Policy 187. Provide safe pedestrian walkways on bridges.

Discussion: The bridge replacement includes a pedestrian walkway along the mauka side of the bridge. It will be separated from the road by a shoulder and concrete railing. This will allow an area for safe pedestrian crossings.

3.2.3 Land Use Ordinance

Chapter 21 of the Revised Ordinances of Honolulu was created to regulate the use of land in an orderly way in accordance with land use policies, the City and County of Honolulu's General Plan, Oahu's development and sustainable communities plans, and adopted neighborhood plans. It was also established to protect public safety and welfare by 1) reducing adverse effects resulting from inappropriate location, use, or design of sites and structures; 2) conserving the cities natural, historic, and scenic resources and encouraging design that enhances the physical for of the city; and 3) helping the public identify and understand land use regulations. These design standards can consist of location, height, bulk, and size of structures, yard areas, of-street parking facilities, and open spaces. It also sets standards for the use of structures and land for agriculture, industry, businesses, residences, or other purposes.

According to the City and County of Honolulu Land Use Zoning Designations from September 2023, the project area is in a residential district (R-5) zone. Revised Ordinances of Honolulu § 21-3.70 defines the purpose of a residential district as to allow for a range of residential densities, with a primary use being detached residences. A designation of R-5 indicates that an area is zoned for urban residential development and is often applied throughout the city.

Discussion: The replacement of Waipilopilo Bridge will not alter the essential characteristics of the area. The area will remain an R-5 Residential District and be able to accommodate urban residential development.

CHAPTER 4. COMMENTS AND COORDINATION

This chapter summarizes public and agency consultation and coordination activities associated with the proposed project that have been conducted to date. Project pre-assessment consultation and coordination activities included meetings and correspondence with government agencies, and the affected communities.

4.1 Pre-Assessment and Early Consultation

Prior to initiation of the Draft EA in December 2023, pre-consultation letters were sent to community stakeholders to request input on environmental concerns, solicit input on designs and alternatives, engage in community outreach, and identify studies or issues for further study. A list of recipients is provided below and an asterisk appears next to those entities that responded to the letter.

Elected Officials:

- State House of Representatives, Speaker of the House
- State House of Representatives, District 47
- State House of Representatives, Transportation Committee
- State Senate, President
- State Senate, State Senator District 23
- State Senate Committee on Transportation

Federal Agencies:

- Department of Agriculture, Natural Resources Conservation Service
- Department of Commerce, NMFS
- Department of Commerce, National Oceanic and Atmospheric Administration
- Department of the Interior, Office of the Environmental Policy and Compliance
- Department of the Interior, USFWS, Pacific Islands Office
- Department of the Interior, U.S. Geological Survey, Water Resources Division
- Department of the Interior, U.S. Geological Survey, Northwest/Pacific Islands
- Department of the Interior, U.S. Geological Survey, Pacific Islands Water Science Center
- EPA, Office of Federal Activities
- EPA, Pacific Islands Contact Office
- FEMA Region XI
- USACE*

State Agencies:

- Department of Agriculture*
- Department of Budget and Finance
- Department of Business, Economic Development, & Tourism
- Department of Defense
- Department of Education
- Department of Hawaiian Homelands*
- Department of Health
- Department of Health, Clean Water Branch*
- DLNR, Division of State Parks
- DLNR, Engineering Division
- DLNR, OCCL*
- DLNR, SHPD
- Department of Transportation
- Office of Hawaiian Affairs

City and County of Honolulu Agencies:

- Mayor Rick Blangiardi, City and County of Honolulu
- City and County of Honolulu, City Councilmember, Council District 2
- City and County of Honolulu, City Council Transportation Committee
- City and County of Honolulu Department of Budget and Fiscal Services
- City and County of Honolulu Department of Community Services*
- City and County of Honolulu Department of Customer Services
- City and County of Honolulu Department of Corporation Counsel
- City and County of Honolulu Department of Design and Construction*
- City and County of Honolulu Department of Emergency Management
- City and County of Honolulu Department of Emergency Services
- City and County of Honolulu Department of Enterprise Services
- City and County of Honolulu Department of Environmental Services*
- City and County of Honolulu Department of Facility Maintenance*
- City and County of Honolulu Department of Land Management
- City and County of Honolulu Department of Parks and Recreation*
- City and County of Honolulu Department of Planning and Permitting*
- City and County of Honolulu Department of Transportation Services*
- City and County of Honolulu Fire Department*
- City and County of Honolulu Police Department*
- City and County of Honolulu Managing Director’s Office
- City and County of Honolulu Neighborhood Board #28 – Koolauloa
- City and County of Honolulu Office of Climate Change, Sustainability, and Resiliency

Twenty-one responses to the request for pre-assessment consultation were received. A copy of the responses is provided in Appendix A.

4.2 Regulatory Coordination

Because the proposed project must comply with certain federal and state environmental laws and regulations, the following coordination and consultation activities are being conducted. See Appendix A for copies of written correspondence referenced in the discussions below.

4.2.1 Federal Coordination

National Environmental Policy Act Categorical Exclusion

The NEPA process is required when a federal agency proposes to take a major federal action. These federal actions, which are defined at 40 CFR 1508.1, may be "categorically excluded" from a detailed environmental analysis when the federal action normally does not have a significant effect on the human environment. FHWA has determined that a NEPA CatEx is appropriate for this Proposed Action under 23 CFR 771.117. The CatEx documentation for this project will be completed separately from this HRS Chapter 343 EA and will cite to the additional federal permits and approvals in progress for this Proposed Action.

Section 106 of the National Historic Preservation Act

The NHPA requires that actions that are federally funded, authorized, or implemented consider the effect of such actions on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP. Such resources are called historic properties. The Section 106 process involves coordination and consultation with the SHPO, and other agencies and organizations that have an interest in or is mandated to protect historic properties. In addition, the Advisory Council on Historic Preservation is afforded the opportunity to comment on actions that may adversely affect historic properties.

The following consultation and coordination activities were conducted in fulfillment of Section 106 (Appendix A):

- Letter on August 31, 2015, from HDOT to SHPD to initiate Section 106 consultation, consult on the APE, and request information on properties eligible for the NRHP from SHPO. SHPO concurred with HDOT's APE, stating that the APE extends between mile markers 20.9 and 21.0 along Kamehameha Highway (Route 83).
- SHPD's letter dated June 6, 2016, in which SHPD reviewed and accepted the AIS conducted for the subject project, stating that the APE is within the area along Kamehameha Highway from Imua Place to Waikulama Street, and that project related work will involve construction of a detour road and bridge, construction of the new Waipilopilo Bridge and a highway width transition for the widened bridge, relocation of utilities, and installation of new road pavement, striping, and markings (Log No. 2015.03867, Doc. No. 1602KM22). The current project description does not include a detour road and bridge.
    - The FHWA submittal indicates two previously identified historic properties occur within the APE: Site 50-80-06-4795 and Waipilopilo Bridge. Site 4795 was identified

during archaeological monitoring for the Laie waterline project and is a pre- to post-contact buried cultural deposit with associated pit features and a human burial (Masterson et al. 1997). The burial was disinterred and reinterred at Hauula Congregational Church Cemetery. During a 1998 AIS for the Hauula Beach Park expansion project, Site 4795 was assessed as significant under Criteria D and E (Masterson et al. 1998). The AIS conducted for the subject undertaking (Vernon et al. 2015) agreed with the Masterson et al. (1998) significant assessment for Site 4795.

- According to the FHWA, Site 4795 is expected to be encountered as shallow as 30 centimeters below surface on the east side of the highway during excavations associated with the pedestrian pathway and bridge replacement. Additionally, during the course of the AIS subsurface testing for the project, no historic properties were encountered within the APE. Excavations on the west side of Kamehameha Highway revealed this area consists of at least 70 centimeters of modern fill over natural, non-cultural soil layers (Vernon et al. 2015).
- The second historic property within the APE is the Waipilopilo Stream Bridge, which was constructed in 1932 by L.L. McCandles. Pursuant to HAR §13-275-6, the Vernon et al. (2015) report assessed the Waipilopilo Stream Bridge as significant under Criterion C.
- According to the SHPD letter dated June 6, 2016, neither Site 4795 nor the Waipilopilo Stream Bridge are currently listed on the HRHP or the NRHP. Site 4795, a subsurface cultural deposit and human burial, extends through the project area (Masterson et al. 1997). The site was recommended eligible for the Hawaii Register under Criterion d and Criterion e. SHPD previously determined the Waipilopilo Stream Bridge was eligible for listing on the HRHP and the NRHP under Criteria A and C. The Hawaii SHPO determined that Waipilopilo Stream Bridge is significant under Criteria A and C and therefore eligible for listing to both the HRHP and NRHP. However, the statewide historic bridge inventory survey recommended Waipilopilo Stream Bridge as eligible under Criterion C only (MKE Associates LLC and Fung Associates, Inc. 2013). Therefore, the AIS report prepared for the subject project (Vernon et al. 2015) recommends the Waipilopilo Stream Bridge as eligible for listing on the NRHP under Criterion C. FHWA's determination is *adverse effect* and SHPO concurs.

Section 7 of the Endangered Species Act

The ESA establishes a process for identifying and listing threatened and endangered species. It also requires that federally funded actions not jeopardize any species listed as threatened or endangered, or adversely modify designated critical habitat. Section 7 of the ESA requires consultations with federal wildlife management agencies, notably the USFWS and the NMFS), on actions that may affect listed species or designated critical habitats.

The following consultation and coordination activities were conducted with NMFS pursuant to Section 7.

- On October 7, 2024, FHWA requested concurrence under the Standard local Operating Procedures for Endangered Species in Hawaii (HI-waySLOPES) that the project is not likely to adversely affect endangered aquatic species or their critical habitat if they follow mitigation measures outlined within HI-waySLOPES

- On October 8, 2024, NMFS concurred that the project was not likely to adversely affect endangered aquatic species.

FHWA received comments from USFWS on a list of endangered species that may be found in the project area and a list of BMPs to minimize project effects on these species. These BMPs included avoiding nighttime work during sea turtle nesting and hatching season (May through December). Due to the length of night work restrictions, FHWA decided to pursue formal consultation with USFWS to determine mitigation measures that would allow night work to occur during this timeframe. This consultation is still ongoing.

Magnuson-Stevens Fishery Conservation and Management Act

The MSA, as amended (16 U.S.C. 1801-1891(d)), requires agencies which fund, permit, or undertake activities that may adversely affect EFH to consult with NOAA/PIRO regarding the potential effects of their actions on EFH and respond to NMFS recommendations. EFH are defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, and/or growth to maturity," including open water, wetlands, coral reefs, and submerged structures, associated with federally managed fish species. Actions outside of EFH, such as upstream/upslope activities, must also be reviewed.

Relationship of the Proposed Action and Alternatives to the Magnus-Stevens Act

The coastal waters, including the water column and the bottom of the Pacific Ocean, around all Hawaiian Islands are designated as EFH that support various life stages for management unit species identified under the Western Pacific Fishery Management Council's Pelagic and Hawaii Archipelago Fishery Ecosystem Plans.

Although Waipilopilo Stream is generally not tidal in its reach, project activities could result in increased turbidity, chemical contamination from construction vehicles, nutrient loading, and introduction of invasive species into the stream below the bridge. In some cases, the stream could reach the ocean and allow these impacts to adversely affect EFH. The following coordination activities were conducted with NMFS/PIRO regarding EFH consultations:

- In a letter dated October 7, 2024, FHWA requested NMFS concurrence that the proposed project will have no more than minimal adverse effect on EFH and managed species.
- On December 12, 2025, NMFS agreed with FHWA's determination and provided the additional conservation recommendation that a plan for managing the construction site in the event of approaching foul weather is developed.
- On January 8, 2025, FHWA agreed with the conservation recommendation, concluding EFH consultation for the project.

Migratory Bird Treaty Act

The MBTA, as amended (16 U.S.C. § 703 et seq.), establishes protections for migratory birds and prohibitions for activities involving migratory birds that "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for

transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export" unless permitted by regulations

Relationship of Proposed Action and Alternatives to MBTA

BMPs that apply to endangered species will minimize the impacts of the proposed project on migratory birds. None of the MBTA's list of activities are expected to apply towards any of the proposed action alternatives.

Section 4(f)

Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 U.S.C. § 303, referred to as Section 4(f)) requires that federal transportation projects avoid the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites unless the following conditions apply:

- There is no feasible and prudent avoidance alternative to the use of land; and the action includes all possible planning to minimize harm to the property resulting from such use; or
- FHWA determines that the use of the property will have a *de minimis* impact.

Relationship of the Proposed Action Alternatives to Section 4(f)

The proposed project is expected to result in an adverse effect to the historic Waipilopilo Stream Bridge. A Section 4(f) historic bridge programmatic evaluation form is required when there is a Section 106 adverse effect finding involving a historic bridge. This programmatic evaluation form is intended to document that there are no other feasible and prudent avoidance project alternatives which could minimize the anticipated impacts on the historic property. The Section 106 consultation has commenced and will continue in the preparation of a Section 106 MOA. The Section 106 MOA will be provided to FHWA during the 4(f) process to show that the project is taking measures to minimize harm to Waipilopilo Bridge.

The proposed project will not use or affect Hauula Beach Park.

Coastal Zone Management Act

The purpose of the Coastal Zone Management Act (CZMA) (16 U.S.C. § 1451 et seq.) is to encourage coastal states to manage and conserve coastal areas as a unique, irreplaceable resource. The CZMA works to protect and preserve the coastal zone, improve coastal scenic and open space resources, ensure minimal social, visual, and environmental impacts from coastal developments, and encourage research and development of new technologies for exploring, using, or protecting marine and coastal resources.

The CZMA requires a consistency determination from the State of Hawaii Department of Business, Economic Development and Tourism for actions subject to federal permits within the coastal zone, as defined by HRS § 205A-1. CZMA consistency determinations are not required for actions on federal properties that would not have reasonably foreseeable direct or indirect effects on resources in the coastal zone.

Relationship of the Proposed Action and Alternatives to the Coastal Zone Management (CZM) Area

The CZM area encompasses the entire state of Hawaii; however, the following types of activities are exempt from federal consistency when funded by FHWA:

- Non-construction activities related to highway planning and construction
- Acquisition of real property and rights-of-way
- Feasibility, alternative analysis, technical studies and data collection
- Road maintenance and repairs including removal of existing pavement, resurfacing, pavement preventative maintenance, striping and markings, replacing signage, and repairs to sidewalks and curbs
- Reconstruction, rehabilitation, and widening of roadways within established rights-of-way
- Installation of sidewalks with established rights-of-way, e.g., Safe Routes to School
- Installation of Americans with Disabilities Act-compliant curbs and ramps
- Roadway improvements including installation of lighting traffic signals, signage, pedestrian signals and crosswalks, and traffic management devices
- Installation of drainage improvements for existing roadways within established rights-of-way
- Repairs and improvements to existing bridges, including seismic retrofitting

HDOT is consulting with OPSD to determine if a federal consistency review is required for the proposed project. If one is required, HDOT will submit the necessary documentation to OPSD.

HDOT standards for road construction follow applicable laws, regulations, and BMPs, and are generally in conformity with CZMA.

U.S. Army Corps of Engineers, Department of the Army Permits

The USACE Regulatory Program regulates discharges of dredged or fill materials into waters of the United States and structures or work in navigable waters of the United States, under section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act of 1899. Such in-water activities require a Department of the Army permit from the USACE.

Section 401 of the CWA separately directs states to establish water quality certification (WQC) programs. In Hawaii, the Section 401 WQC program is administered by the HDOH Clean Water Branch.

Relationship of Proposed Action and Alternatives to the Department of Army Permit

No in-water work is proposed for the bridge replacement.

U.S. Coast Guard Bridge Permit Exception

The U.S. Coast Guard (USCG) regulates the construction, reconstruction, rehabilitation, or replacement of bridges over navigable waterways in the United States. The USCG regulates work

on bridges to ensure waterways remain navigable within reason. Any project that intents to modify or construct a bridge over a navigable waterway must apply for a USCG bridge permit.

Relationship of Proposed Action and Alternatives to the Department of Army Permit

FHWA consulted with the USCG on February 21, 2013, to confirm that a USCG bridge permit will not be required. In a letter received on March 8, 2013, the USCG confirmed that a bridge permit will not be required.

Land and Water Conservation Fund Act, Section 6(f)

Section 6(f) of the Land and Water Conservation Fund Act prevents property that was developed using Land and Water Conservation Funds from being converted to other uses without consulting with the National Parks Services Regional director. At the Hawaii state level, the DLNR Division of State Parks coordinates the Land and Water Conservation Fund program on behalf of the National Parks Service.

Relationship of the Proposed Action and Alternatives to Section 6(f)

HDOT consulted with the Division of State Parks because a Section 6(f) property, Hauula Community Park, exists in the vicinity of the proposed project. In a letter dated January 10, 2024, the Division of State Parks confirmed that the 6(f) property is outside of the proposed project area and that Section 6(f) does not apply to this project.

4.2.2 State and Local Coordination

Hawaii Revised Statutes Chapter 6E-8

Similar to Section 106, At the state level, HRS Chapter 6E-8 places similar responsibilities on State agencies to evaluate their projects.

The HRS Chapter 6E-8 review process is currently ongoing. Therefore, the significance evaluations, potential impacts, and treatment recommendations presented in this EA should be considered as preliminary findings only. SHPD is expected to conduct its HRS Chapter 6E-8 review responsibilities in conjunction with their Section 106 responsibilities, separate from the requirements of HRS Chapter 343.

Hawaii Revised Statutes Chapter 195D

The HRS Chapter 195D is the state counterpart law to the ESA, provides for the protection of aquatic life, wildlife, or land plant species that are indigenous to Hawaii. Under Chapter 195D, state agencies are required to consult with the DOFAW and DAR. As discussion in Section 2.5.3, the DAR and the DOFAW provided comments on the project.

The DAR provided the following BMPs that will be implemented:

- Utilize construction BMPs to prevent or mitigate the release of sediment, silt, debris, chemicals or any other byproduct of the proposed project into the aquatic environment or surrounding areas.

- Given the potential presence of endemic vertebrates and invertebrates within the stream, caution should be taken to minimize direct impacts to the wetted area.
- At no time should the channel be completely obstructed, fully-dewatered, or completely diverted outside of the existing channel.

The DAR also notes that there are several known Hawaiian monk seal haul-out areas within the vicinity of the proposed project. Though the beach at the mouth of Waipilopilo Stream is not commonly used by Hawaiian monk seals for resting, caution should be taken to check the immediate area for their presence before beginning activity each day.

The DOFAW provided the following BMPs that will be implemented:

- If nighttime construction is required during the seabird fledgling season (September 15 through December 15), we recommend a qualified biologist be present at the project site to monitor and assess the risk of seabird attraction and or grounding due to lighting. If seabirds are seen circling the area, lights should be turned off. If a downed seabird is detected, please follow DOFAW's recommended response protocol by visiting https://dlnr.hawaii.gov/wildlife/seabird-fallout-season/.
- Permanent lighting also poses a risk of seabird attraction, and as such should be minimized or eliminated to protect seabird flyways and preserve the night sky. For illustrations and guidance related to seabird-friendly light styles that also protect seabirds and the dark starry skies of Hawaii please visit https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.
- It is against State law to harm or harass State-listed waterbirds such as koloa maoli or Hawaiian duck (Anas wyvilliana), aeo or Hawaiian stilt (Himantopus mexicanus knudseni), alae keokeo or Hawaiian coot (Fulica alai), and alae ula or Hawaiian gallinule (Gallinula chloropus sandvicensis). If any of these species are present during construction, all activities within 100 feet (30 meters) should cease and the bird or birds should not be approached. Work may continue after the bird or birds leave the area of their own accord. If a nest is discovered at any point, please contact the Oahu Branch DOFAW Office at (808) 973-9778 and establish a buffer zone around the nest.
- Barbed wire should be avoided in any construction as opeapea can become ensnared and killed by such fencing material during flight.
- The State endangered ilio holo i ka uaua or Hawaiian monk seal (*Monachus schauinslandi*) and threatened honu or green sea turtle (*Chelonia mydas*) could potentially occur or haul out onshore within the vicinity of the proposed project site. Nesting season for honu is April through December and ilio holo i ka uaua can give birth to pups all year round. If either species is detected within 100 feet (30 meters) of the project area, all nearby construction operations should cease and not continue until the focal animal has departed the area on its own accord.
- DOFAW is concerned about the impacts of nonnative predators such as cats, rodents, and mongoose, on endangered waterbirds, seabirds, and forest birds. Take action to minimize predator presence; remove cats, place bait stations for rodents and mongoose, and provide covered trash receptacles. As predation is instinctive and even well-fed cats will hunt and kill wildlife, DOFAW also recommends no feeding of feral cats should occur on the premises.

- DOFAW recommends using native plant species for landscaping that are appropriate for the area; i.e., plants for which climate conditions are suitable for them to thrive, plants that historically occurred there, etc. Do not plant invasive species. DOFAW also recommends referring to www.plantpono.org for guidance on the selection and evaluation of landscaping plants and to determine the potential invasiveness of plants proposed for use in the project.
- Avoid importing soil or other plant material from off-island. Soil and plant material may contain fungi (e.g., rapid ohia death) and other pathogens which could harm our native species and ecosystems. We recommend consulting the Hawaii Interagency Biosecurity Plan at http://dlnr.hawaii.gov/hisc/plans/hibp/ in the planning, design, and construction of the project.
- We recommend consulting the Oahu Invasive Species Committee (OISC) at (808) 266-7994 to help plan, design, and construct the project, learn of any high-risk invasive species in the area, and ways to mitigate their spread. Soil and plant material may contain detrimental fungal pathogens (like rapid ohia death), vertebrate and invertebrate pests (e.g. little fire ants, and coconut rhinoceros beetle), or invasive plant propagules (e.g. albizia, pampas grass, fireweed, etc.) that will harm our native ecosystems, and the unique native found within them. Therefore, DOFAW advances the guidance that all equipment and personal items—to include clothing and foot ware should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Additionally, DOFAW recommends minimizing the movement of plant or soil material between worksites. Suspect pests should be reported through the statewide pest hotline. Photos, videos, and locations can be shared at www.643pest.org or call: 743-PEST. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species.
- To prevent the spread of rapid ohia death (ROD), DOFAW requests that removal, pruning/trimming, and potentially injury to ohia trees be avoided as much as possible. Wounds serve as entry points for ROD fungus and increase the odds that the tree will be infected and die. Also, clean gear/tools, clothes, footwear, and vehicles before and after use. Make sure to removal all loose soil from the aforementioned items, spray gear/tools with 70% rubbing alcohol, and wash clothes with hot water and soap. Wash tires and undercarriages of all vehicles/machinery with a high-pressure water source. If ohia trees must be removed or pruned/trimmed, please conduct these activities on a still day to minimize blown sawdust and use a sharp saw to create chips rather than dust. Seal all wounds to these trees with a stump seal product (e.g. Spectricide, etc.). For more information, please consult https://cms.ctahr.hawaii.edu/rod.
- The invasive coconut rhinoceros beetle (*Oryctes rhinoceros*) or CRB is widespread on the island of Oahu. CRB have been detected on other islands with moderate infestation on Kauai, one incipient site on Hawaii Island, and only one positive site on Maui in 2023. Hawaii Department of Agriculture interim rule 24-1 restricts the movement of CRB-host material from the island of Oahu, which is defined as the Quarantine Area. Regulated material (host material or host plants) is considered a risk for potential CRB infestation. Host material for the beetle specifically includes 1) entire dead trees; 2) mulch, compost, trimmings, fruit and vegetative scraps, and 3) decaying stumps. CRB host plants include

the live palm plants in the following genera: *Washingtonia*, *Livistona*, and *Pritchardia* (all commonly known as fan palms), *Cocos* (coconut palms), *Phoenix* (date palms), and *Roystonea* (royal palms). When such material or these specific plants are moved there is a risk of spreading CRB because they may contain CRB in any life stage. Inspection and/or treatment approved by HDOA is mandatory before inter-island transport. For more information regarding CRB, please visit https://dlnr.hawaii.gov/hisc/info/invasive-species-profiles/coconut-rhinoceros-beetle/.

- We recommend that BMPs are employed during and after construction to contain any soils and sediment with the purpose of preventing damage to near-shore waters and marine ecosystems.
- Due to the arid climate, high fine fuel load (grasses) surrounding the worksite, and risks of wildfire to listed species and native habitats, we recommend coordinating with the Hawaii Wildfire Management Organization at (808)-850-0900 or admin@hawaiiwildfire.org, on how wildfire prevention can be addressed in the project area. When engaging in activities that have a high risk of starting a wildfire—like wielding in/near tall grass, it is recommended that you: 1) wet down the area before starting your task, 2) continuously wet down the area as needed, 3) have a fire extinguisher on hand, and 4) in the event that your vision is impaired, (i.e. welding goggles) have a spotter to watch for fire ignitions. Additionally, do not park any vehicles in or near tall grass as heat from the engine/exhaust may ignite dry vegetation.

The DOFAW concurred with the avoidance and minimization measures outlined for this project to avoid construction and operational impacts to State-listed species including uau or Hawaiian petrel (*Pterodroma sandwichensis*), akeake or band-rumped storm petrel (*Oceanodroma castro*), ao or Newell's shearwater (*Puffinus newelli*), koloa maoli or Hawaiian duck (*Anas wyvilliana*), aeo or Hawaiian stilt (*Himantopus mexicanus knudseni*), alae keokeo or Hawaiian coot (*Fulica alai*), alae ula or Hawaiian gallinule (*Gallinula chloropus sandvicensis*), nalo meli maoli or yellow-faced bee (*Hylaeus spp*.), and opeapea or Hawaiian hoary bat (*Lasiurus cinereus semotus*). DOFAW provides the following additional comments regarding the potential for the proposed work to affect listed species in the vicinity of the project area.

Special Management Area and Shoreline Setback

HRS Chapter 205A, Coastal Zone Management Law, creates Special Management Areas to regulate land uses allowed on land close to the shore. No development is allowed within the SMA until a permit is acquired by the appropriate county authority, in this case City and County of Honolulu Department of Planning and Permitting. The proposed project is located within the SMA.

The project received an SMA Determination from the Department of Planning and Permitting on June 27, 2025 and an SMA Use Permit is not required, pursuant to Revised Ordinances of Honolulu, Section 25-1.3(2)(C) 'Repair or maintenance of roads and highways within existing rights-of-way'.

A shoreline certification by the state DLNR will not be required.

Hawaii Act 50, Cultural Practices

Hawaii Act 50 (Approved in 2000) sought to "promote and protect cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups" and requires the proposing agency/applicant under Chapter 343 HRS to consider cultural practices in a CIA. HDOT completed a CIA in compliance with this Act. See Appendix G.

National Pollution Discharge Elimination System Permit

Section 402 of the CWA requires an NPDES permit for point source discharges, including storm water discharges associated with construction activities. The permit is mandatory for construction activities that disturb one or more acres and discharge storm water from the project site to waters of the United States. Although this is a federal requirement, it is administered by HDOH. The proposed project is expected to require an NPDES permit from HDOH.

Solid Waste Management Plan

The Honolulu County Department of Environmental Services (DES) requires a solid waste management plan to be completed for any project that requires the preparation of an EA. A solid waste management plan should describe any waste that may be generated by a project, how waste will be organized on site, means and location of disposal, and any impacts on county-operated waste management facilities. HDOT will prepare and submit a solid waste management plan for the proposed project to the Honolulu County DES prior to disposal of any soil or vegetation.

Hazardous Waste Management Plan

Due to the presence of lead material found in the soils at the project area, the project will prepare a C-EHMP.

CHAPTER 5. ANTICIPATED FINDING OF NO SIGNIFICANT IMPACT

In accordance with HRS Chapter 343 and HAR Section 11-200.1-19, HDOT anticipates issuing a Finding of No Significant Impact (AFNSI) for the proposed project. This assessment is based on an evaluation of project impacts in relation to the "Significance Criteria" specified in HAR 11200.1-13.

The discussion below is the preliminary significance evaluation, subject to changes that may be made upon receipt of public and agency review comments that may be filed during the public comment period of this Draft EA. The Significance Criteria appear below in italics, followed by a discussion of the proposed project in relation to the specific criterion. The nature of the proposed project's potential impacts is discussed in detail in Chapter 2.

1. *Irrevocably commit a natural, cultural, or historic resource* – The proposed project will impact natural, cultural, and historic resources; see Section 2.5 for Biological Resources, Section 2.4 for Cultural Resources, and Section 2.3 for Historic and Archaeological Resources discussions. Replacing the Waipilopilo Bridge will result in an "adverse affect" on historic properties pursuant to Section 106 and an "effect, with proposed mitigation commitments" for HRS 6E-8. The Proposed Action will replace-in-kind the entire superstructure of the bridge to address deterioration in the deck. The proposed project will perform data recovery and architectural recordation as recommended treatments for these impacts. Biological surveys conducted for the proposed project indicate that areas directly affected by the proposed project do not contain species of concern or related critical habitat. HDOT has consulted with the USFWS to identify avoidance, minimization, and mitigation measures to protect species of concern.
2. *Curtails the range of beneficial uses of the environment* – The proposed project will not curtail beneficial uses of the environment. On the contrary, the proposed project will enhance the existing transportation environment for all users in the area. The replacement bridge and the realigned roadway approaches will provide a safer experience for all users.
3. *Conflicts with the State's environmental policies or long-term environmental goals established by law* – The proposed project is consistent with the environmental goals and objectives of the State of Hawaii, as demonstrated in this section and in Section 2.2 Land Use.
4. *Have a substantial adverse effect on the economic welfare, social welfare, and cultural practices of the community or State* – The proposed project will not have an adverse effect on the economic, social welfare, or the cultural practices of the community or state. Rather, the proposed project will support the social welfare of the community by providing a safer commute.
5. *Have a substantial adverse effect on public health* – The proposed project will not adversely affect public health.
6. *Involve adverse secondary impacts, such as population changes or effects on public facilities* – The proposed project is not expected to cause secondary impacts as it does not increase

any roadway capacity. The proposed project is not anticipated to induce development of the area or lead to population growth as a direct result of its construction.

7. *Involve a substantial degradation of environmental quality* – The proposed project will not result in a substantial degradation of environmental quality. The proposed project will not result in adverse environmental conditions, as demonstrated in Chapter 2.
8. *Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions* – The proposed project is a complete, independent project and will not result in commitments to other projects, nor will it result in cumulative, considerable impacts on the environment.
9. *Have a substantial adverse effect on a rare, threatened, or endangered species or its habitat* – The proposed project will not adversely affect any species of concern or associated habitat. See Section 2.5. General mitigation measures will be implemented during construction so as to not cause any adverse impacts to the area. HDOT has consulted with the USFWS, NMFS, and DLNR to identify avoidance, minimization, and mitigation measures to protect species of concern. A Biological Assessment was prepared for this project (Appendix H).
10. *Have a substantial adverse effect on air or water quality or ambient noise levels* – The proposed project will not lead to any violations of State or National AAQS. The project will comply with State of Hawaii environmental regulations and standards. BMPs will be implemented to minimize the potential for impacts to water quality during construction. While there will be short-term construction noise impacts, overall no long-term adverse noise impacts are anticipated due to the proposed project.
11. *Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a floodplain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters* – The proposed project is not located in an environmentally sensitive area. The proposed project will be designed considering the impacts to Waipilopilo Stream due to the reconstruction of Waipilopilo Stream Bridge.
12. *Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies* – The proposed project is the reconstruction of an existing bridge and the realignment of approaching roadways to the bridge that will not affect any identified views or vistas. Input from the community will continue to inform the project's final design to ensure that the bridge fits within the geographical context.
13. *Require substantial energy consumption or emit substantial greenhouse gases* – The proposed project will not result in substantial energy consumption. There may be a short-term increase in energy consumption during the project's construction; however, it could be offset by the project's long-term benefits as the realigned roadways and increased line-of-sight benefits are anticipated to help traffic flow more efficiently at this intersection.

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APPENDIX A CONSULTATION AND REGULATORY CORRESPONDENCE

Appendix A-1

Pre-Draft Environmental Assessment Coordination and Consultation

JOSH GREEN, M.D.
GOVERNOR
KE KIAʻĀINA

DESIGN BRANCH, ROOM 688A
BRIDGE DESIGN SECTION, ROOM 611
CADASTRAL DESIGN SECTION, ROOM 600
ENVIRONMENTAL DESIGN SECTION, ROOM 688A
HIGHWAY DESIGN SECTION, ROOM 609
HYDRAULIC DESIGN SECTION, ROOM 636
TECHNICAL DESIGN SECTION, ROOM 688

EDWIN H. SNIFFEN
DIRECTOR
KA LUNA HOʻOKELE

Deputy Directors
Nā Hope Luna Hoʻokele
DREANALEE K. KALILI
TAMMY L. LEE
ROBIN K. SHISHIDO

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF TRANSPORTATION | KA ʻOIHANA ALAKAU
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

IN REPLY REFER TO:

HWY-DS 2.20252

March 18, 2024

Dear Colleagues:

Subject: Pre-Consultation for Draft Environmental Assessment (EA)
Hawaii Revised Statutes (HRS) §343
Waipilopilo Bridge Replacement Project
District of Hauula, Island of Oahu
Federal-Aid Project No. BR-083-1(57)
Tax Map Key(s): (1) 5-4-002: 022 portion (por); (1) 5-4-004: 001 por & 009;
(1) 5-4-017, por 015-018 & 021-023

The State of Hawaii Department of Transportation (HDOT) is conducting an environmental review to examine the impacts of the Waipilopilo Stream Bridge Replacement project on the island of Oahu. The project area is located on Kamehameha Highway, Route 83, in the vicinity of Hauula Beach Park. HDOT is preparing an EA in compliance with the HRS § 343, Hawaii's environmental impact statement law, to evaluate and disclose the project's potential environmental impacts and identify any potential permitting requirements. At this time, HDOT is seeking input on the project information provided below, as well as information related to any environmental, social, or economic concerns related to the project or project area. In addition, because the proposed project will receive federal funding, a separate Categorical Exclusion pursuant to the National Environmental Policy Act of 1969 will also be prepared.

Previous Consultation:
A Draft EA was previously completed for this project in February 2018 and received public and agency comments. The Final EA, however, was not completed for the project. A revised Draft EA is now warranted because the City and County of Honolulu revised the General Plan and the City Council adopted the Koolau Loa Sustainable Communities Plan in the five years since the Draft EA was first published. The bypass road was removed from the project due to HDOT's desire to not spend additional funds for this temporary expense.

Existing Condition Information:
Waipilopilo Stream Bridge was constructed in 1932 and is a two-lane bridge carrying one vehicle lane in each direction as a part of the Kamehameha Highway right-of-way. The bridge is bordered by Tax Map Key (TMK) 5-4-2:022, Hauula Beach Park to the east and southeast (makai side) and TMK 5-4-017:021, a 3,337 square foot, privately owned, undeveloped lot to the west (mauka side), see enclosed Project Location Map. Kamehameha Highway is classified as a rural principal arterial. For the local community, the bridge is also used by people traveling on foot and bicycles. The new bridge will have a shielded pedestrian walkway which will comply with the American with Disability Act standards.

Overview:
The purpose of the project is to replace the Waipilopilo Stream Bridge to meet current State and Federal design guidelines. The proposed project will also address bridge maintenance concerns, improve traffic safety for motorists and pedestrians and meet projected demands on Kamehameha Highway, Route 83, on the north shore of Oahu.

Construction is expected to begin in Summer 2025 and is set to run tentatively through Summer 2027. Construction is anticipated to occur mostly during off-peak daytime hours, however nighttime work may be required to mitigate traffic impacts during construction. We are seeking your input in terms of issues that would identify potential environmental impacts associated with the proposed development.

Request for Input:
HDOT is reaching out to you as well as other City, State, Federal agencies, and the surrounding community to gather project input. We request comments and input regarding environmental concerns in all resources areas as well as design concerns that might help us to evaluate the project. Also, if relevant, we would like to know if you have any recent or upcoming projects planned in the area, or if there are any specific permitting issues or considerations that you would like to bring to our attention.

If you have any questions or concerns, or want to provide our contact information to additional parties that may be interested in participating in the environmental review for this project, please contact the following by March 25, 2024:

Mr. Andrew Hirano, HDOT Project Manager
andrew.j.hirano@hawaii.gov
State of Hawaii, Department of Transportation
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Please send your written comments to Mr. Andrew Hirano within 30 days of receipt of this letter to the email or mailing address listed above.

Sincerely,

Henry Kennedy

HENRY KENNEDY
Engineering Program Manager
Design Branch

Enclosure

From:	Chris Sasseen
To:	Hirano, Andrew J
Cc:	CAPITOL2023-repquinlan; CAPITOL2023-senawa
Subject:	[EXTERNAL] Bridge Replacement Projects in Hau"ula
Date:	Friday, March 22, 2024 1:02:43 PM

Aloha Andrew - Thank you for your letter dated March 18, 2024, advising of the upcoming Waipilopilo Bridge Replacement Project. We've noted how long it is taking to complete the nearby bridge located between the Asia Pacific School and Pipilani Place in Hau'ula.

Two requests:
- Please publish and distribute images of what the finished bridges will look like. These would be inspirational and help our communities better tolerate the disruptions.
- Please institute more efficient construction and project management methods to speed up project completion. This would reduce disruption and improve community morale.

We who regularly use Kam Hwy through Hau'ula and live in the area are concerned about the length of time it takes to complete these bridge construction projects once started. It appears that small crews work slowly and incrementally with minimal resources. By comparison, the entire Golden Gate Bridge in San Francisco took only 4 years to build, and that was with 1930s technology building across more than a mile of ocean at depths up to 500 feet.

There doesn't seem to be anything about these local bridge projects that inherently or necessarily takes so long. For example, there is nothing about the landscape that would prevent faster construction of our bridges, even with the small streams taken into consideration. The "this is Hawaii" excuse doesn't resonate. BYU-Hawaii in Laie builds entire buildings in less time than it takes DoT to replace a small bridge.

Surely DoT can institute more efficient construction and project management methods to replace these relatively short and narrow bridges. Looking at the daunting number of old bridges between Kahalu'u and Hau'ula that will need to be replaced, it would serve the communities and the State better by becoming much more efficient.

Welcome your thoughts on how to remove impediments to enable faster project completion.

Mahalo for your consideration.

Regards,

Chris

Christopher J. Sasseen
Hau'ula resident

From: Summer Kester
To: Hirano, Andrew J
Cc: DOT ADMIN DOTPAO
Subject: [EXTERNAL] Input for Waipilopilo Bridge Replacement
Date: Monday, April 1, 2024 2:37:08 PM

Dear Mr. Hirano,

I am writing to express my input and profound concerns regarding the proposed replacement project of the Waipilopilo Bridge, which overlaps with the existing bridge replacement project of Kaipapa'u Bridge, as a resident of Hau'ula. Having thoroughly reviewed the pertinent documents, including the Waipilopilo Bridge Public Information Meeting presentation dated March 13, 2018, and the details available on the Kaipapa'u Bridge project website, I find it imperative to address several significant issues that directly impact the community.

First and foremost, the timeline of these projects presents a formidable challenge to the residents of Hau'ula. With the commencement of the new proposed Waipilopilo Bridge replacement slated for the summer of 2025, coinciding with the estimated completion date of the Kaipapa'u Bridge project in November of the same year, it is evident that such simultaneous endeavors will result in substantial traffic congestion and disruption to the daily lives of residents. This congestion not only inconveniences locals but also poses a serious impediment to the timely arrival of emergency vehicles, potentially jeopardizing public safety.

Furthermore, the existing traffic issues compounded by the influx of tourist traffic and the inadequately designed temporary solutions, such as those found on the Kaipapa'u Bridge project website, only exacerbate the situation. The sporadic placement of speed humps within the community has further exacerbated congestion issues, aggravating an already challenging traffic scenario.

I must emphasize my disappointment and frustration with the Department of Transportation's apparent inability to execute projects of this nature in a timely and efficient manner. It is disheartening to observe that projects of similar (or larger) magnitude are completed within days or weeks in other states, as evidenced by the referenced article on the expeditious completion of the overpass replacement project on the heavily traveled 405 Freeway in Los Angeles, California. (https://www.accessmagazine.org/spring-2014/carmageddon-los-angeles-sizzle-fizzle/)

As a resident of Hau'ula, specifically Kaipapa'u Ahupua'a, I implore you to take immediate action to address these concerns and prioritize the efficient completion of the Kaipapa'u Bridge replacement project before commencing the Waipilopilo Bridge Replacement Project. Additionally, I request the removal of unnecessary speed humps that contest traffic flow, impede safe passing and Emergency response vehicles, and that this letter be officially recorded as my input and concerns regarding these projects.

Moreover, I would like to draw your attention to the conflicting information provided in the correspondence received from the Hawai'i Department of Transportation. The letter, dated March 18, was received in the mail on March 21, with a stated deadline for contacting you by March 25, while also indicating a 30-day response window from the date of receipt. Such inconsistencies only serve to compound the frustrations of residents and further erode confidence in the department's management of these projects.

In conclusion, I urge you to address the aforementioned concerns promptly and transparently, and to take decisive action to ensure the timely completion of these critical infrastructure projects. The residents of Hau'ula deserve nothing less than a commitment to excellence and efficiency in the execution of such endeavors.

Thank you for your attention to this matter. I eagerly await your response and swift action on these pressing issues.

Sincerely,

Summer Kester

Summer Kester
VP SHOOTZ Productions Inc.

From: Hirano, Andrew J <>
Sent: Sunday, April 14, 2024 2:47 PM
To: Silva Jr, Dennis <>
Cc: Lau, Ethan <>
Subject: FW: [EXTERNAL] Waipilopilo Stream Bridge

From: Julia Silva <>
Sent: Saturday, April 13, 2024 7:17 AM
To: Hirano, Andrew J <>
Subject: [EXTERNAL] Waipilopilo Stream Bridge

Mr. Andrew Hirano, HDOT Project Manager
State of Hawaii, Department of Transportation
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Julia Silva

Dear Mr. Hirano,

Thank you for reaching out to our community for feedback on theWaipilopilo Stream Bridge Replacement project.

We are very concerned with the flow of water. It is a current problem and would be interested to know if the bridge replacement will solve the problem or make it worse. Following are the details of the concern as shown on the black and white copy of the Project Location Map. Starting with location:

1. Open land area that belongs to Asia Pacific International School. During heavy rains water flows into a storm drain in back of TMK : 1-5-4-004-028-0000-000 Address: 54-103 Imua Place . Water empties out into Waipilopilo stream behind TMK : 1-5-4-004-011-0000-000,Address: 54-108 Imua Place. And TMK: 1-5-4-004-010-0000-000 Address: 54-104 Imua Place . The water should flow under the Waipilopilo Stream Bridge however, City and County, even after numerous requests have not opened the stream up under the bridge so as toallow free flow of the stream.

2. Along Kamehameha Hwy there is a canal that collects water from storm drains along Puuowaa St. and Hauula Homestead Rd. This water bottle necks mauka side of Waipilopilo bridge and adds to the depth of the stream and collection of debris, natural and manmade trash. It stinks and causes home owners to pump cesspools monthly when tides are high and it rains. The over growth of grass and Hau trees hampers water flow as well. Severe erosion is occurring that will soon encroach on our TMK.

Unfortunately, our residence has experienced flooding, once due to the storm drain being clogged, and another due to water breaching Kaipapau Stream Bridge which is now being replaced. Third, was failure of City and County to open up the ocean side of Waipilopilo Stream mouth. Attached or on another email will be pictures of the most current flooding. When the storm drain clogged the flooding was similar. We do not have pictures to show that flood. But it was the forty days of rain, I believe 2005 or 2006.

I am sending this letter to councel man Brenton Awa and Mayor Blangiardi. The last person in government to take our concerns seriously and keep the flow of water open for the safety of our tiny community on Imua Place was Frank Fasi. Within 2 weeks of receiving our letter he had a crew out here cleaning the stream and opened up the stream mouth. He had that done as needed or a minimum of twice a year for the duration of his mayorship.

Allow me to thank you in advance for your careful consideration and attention to this concern.

From: Makana Lewis
To: Hirano, Andrew J
Subject: Waipilopilo Stream Bridge project (OFFICE OF SENATOR AWA)
Date: Monday, April 15, 2024 12:48:05 PM

Aloha Andrew,

My name is Makana Lewis from Senator Brenton Awas office. We are forwarding you some concerns below via a constituent to do with the Waipilopilo Stream Bridge project. We understand that your office is seeking community input until April 19th. Any updates that can be shared with our office after gathering proper information will be greatly appreciated. As we want to communicate and reassure our concerned residents with any information possible. Mahalo for your time and attention on this matter.

Via constituent:

We are very concerned with the flow of water. It is a current problem and would be interested to know if the bridge replacement will solve the problem or make it worse.

1. Open land area that belongs to Asia Pacific International School. During heavy rains water flows into a storm drain in back of TMK : 1-5-4-004-028-0000-000 Address: 54-103 Imua Place . Water empties out into Waipilopilo stream behind TMK : 1-5-4-004-011-0000-000,Address: 54-108 Imua Place. And TMK: 1-5-4-004-010-0000-000 Address: 54-104 Imua Place . The water should flow under the Waipilopilo Stream Bridge however, City and County, even after numerous requests have not opened the stream up under the bridge so as toallow free flow of the stream.

2. Along Kamehameha Hwy there is a canal that collects water from storm drains along Puuowaa St. and Hauula Homestead Rd. This water bottle necks mauka side of Waipilopilo bridge and adds to the depth of the stream and collection of debris, natural and manmade trash. It stinks and causes home owners to pump cesspools monthly when tides are high and it rains. The over growth of grass and Hau trees hampers water flow as well. Severe erosion is occurring that will soon encroach on our TMK.

Me ka ha'aha'a,

Makana Lewis,
Legislative aide

Office of Senator Brenton Awa, Senate District 23
Hawai'i State Capitol, Room 203
415 S. Beretania Street
Honolulu, HI 96813
Phone: (808) 586-7330

Appendix A-2

Regulatory Coordination and Consultation

National Historic Preservation Act (NHPA) Section 106

U.S. Department of Transportation
Federal Highway Administration

Hawaii Federal-Aid Division

300 Ala Moana Blvd, Rm 3-306
Box 50206
Honolulu, Hawaii 96850
Phone: (808) 541-2700
Fax: (808) 541-2704

August 21, 2017

In Reply Refer To:
HDA-HI

Ms. Suzanne Case
Chairperson and State Historic Preservation Officer
Department of Land and Natural Resources
601 Kamokila Boulevard, Suite 555
Kapolei, HI 96707

Subject: National Historic Preservation Act Section 106 Effect Determination
Kamehameha Hihgway, Waipilopilo Stream Bridge Replacement
Hauula, Ahupuaa, Koolauloa District, Island of Oahu
Federal-aid Project No. BR-083-1(57)
Tax Map Key(s): (1) 5-4-002:022 por; (1) 5-4-004:001 por & 009; (1) 5-4-17; por 015-018 & 021-023

Dear Ms. Case:

In accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (2006), the Federal Highway Administration (FHWA) requests the State Historic Preservation Officer's (SHPO) concurrence on the effect determination for the proposed improvements. The FHWA is rendering an adverse effect determination for the subject project.

The FHWA will provide funds for the proposed improvements. Therefore, the FHWA has required the State of Hawaii Department of Transportation (HDOT) to comply with the National Environmental Policy Act, NHPA, and other federal requirements. The FHWA has authorized the HDOT to conduct NHPA Section 106 notification and consultation activities.

Overview of the Undertaking

HDOT proposes to replace the existing Waipilopilo Stream Bridge on Kamehameha Highway (Route 83) in the community of Hauula, District of Koolauloa, Island of Oahu. The bridge is bordered by: Tax Map Key (TMK) 5-4-2:022, Hauula Beach Park to the east and southeast (makai side) and TMK 5-4-17:21, a 3,337 sf, privately owned, undeveloped lot to the west (mauka side). Refer to enclosed Figures 1 and 2.

The existing Waipilopilo Bridge, originally built in 1932 by the Territorial Highway Department of the Territory of Hawaii, was constructed with 4 cast-in-place reinforced concrete girders, cast-in-place reinforced concrete deck slab with asphalt overlay, concrete curb and bridge railing. There are no concrete approach slabs to the bridge deck. The bridge abutment is comprised of a

reinforced concrete cap beam (with an integrally cast back wall) supported by 14-inch square precast concrete piles. The bridge structure measures approximately 27 feet wide by 25 feet long.

In 1964, a 3-foot-wide suspended wooden pedestrian walkway was added along the mauka side of the structure. In 1990, the existing guardrails were replaced and asphalt concrete pavement added to transition the paved road shoulder to the wooden pedestrian walkway. In 1995, the bridge was resurfaced as a part of a four (4) mile resurfacing project.

HDOT is responsible for maintaining the functional and structural integrity of its bridges on all State highways. The purpose of the project is to replace the Waipilopilo Stream Bridge to meet current State and Federal design guidelines. The proposed project would also address bridge maintenance concerns, improve traffic safety for motorists and pedestrians and meet projected demands on Kamehameha Highway, Route 83, on the north shore of Oahu.

This project was initiated in 2005 and at that time the bridge had a sufficiency rating of 56.3 based on FHWA National Bridge Inventory Standards. A sufficiency rating below 50 warrants bridge replacement. A sufficiency rating greater than or equal to 50 and below 80 warrants bridge rehabilitation. Because the bridge sufficiency rating was 56.3, this project was initiated as a bridge rehabilitation project. Bridge rehabilitation would have widened the bridge deck to provide wider shoulders, upgraded bridge railings, and strengthened the bridge girders and deck.

However, during the conceptual design phase, engineering analyses indicated that the deteriorated condition of the bridge girders and deck was such that bridge replacement was a more cost effective solution. In addition, the gradual deterioration of the bridge between 2005 and 2016 decreased its sufficiency rating to 47.8 further warranting replacement rather than rehabilitation. In effect, the bridge had become structurally deficient. The project scope of work was then changed from bridge rehabilitation to bridge replacement.

Kamehameha Highway is on the National Highway System, which means it is a critical route within the regional transportation system. As part of the regional transportation system, the long term safety and functionality of bridges are an important component of the system. In the Koolauloa District, there are no other roadways and bridges capable of providing emergency access across streams. Kamehameha Highway is also classified as a rural principal arterial. For the local community, the bridge is also used by people traveling on foot and by bicycles. The existing wooden bikeway/walkway hanging on the mauka edge of the bridge, is substandard for pedestrians and bicyclists and does not meet the accessibility standards under Americans with Disabilities Act (ADA).

The bridge has two (2) 11-foot-wide travel lanes with 1.0 foot shoulders on either side. Pedestrians walking along the makai side of the highway cannot cross the bridge without walking in the travel lane. The existing guardrails, posts and end treatments that are connected to all ends of the bridge concrete barriers do not meet the highway design standards of the National Cooperative Highway Research Program (NCHRP) 350. The most current highway design standards would be utilized for this project.

Area of Potential Effect

The Area of Potential Effect (APE) for the undertaking is shown as Figure 3 and SHPO concurred with the delineation of the APE in a letter dated August 31, 2015 (Log No. 2015.02671, Doc. No. 1508JLP02). In a June 6, 2016 letter, the Deputy SHPO accepted the AIS report (Log No. 2015 03867, Doc. No. 1602KM22). A copy of this letter is enclosed in Attachment 1. A 0.84-acre portion of mostly private property and an unmaintained portion of public roadway (TMK (1) 5-4-004:001) situated on a portion of TMK (1) 5-4-017:016 will be needed for access to the temporary construction staging area. In total the APE which measures approximately 1.85 acres, includes two (2) historic properties (Site 50-80-06-4795) and Waipilopilo Stream Bridge, and the staging area. Details of the historic properties follow the proposed project details.

Consultation Overview

The HDOT consulted with the Department of Land and Natural Resources (DLNR) State Historic Preservation Division (SHPD) and the Hauula community beginning in 2011.

The Section 106 Consultation per NHPA with Native Hawaiian Organizations (NHO) included correspondence beginning in March 2016. The following organizations were informed about the archaeological survey that was conducted and its findings and recommendations:

- Office of Hawaiian Affairs
- Hui Malama
- Oahu Island Burial Council
- Hawaiian Civic Club
- Hawaii Historic Foundation

Consulted parties were asked for input on other historic or cultural resources that they were aware of, and the names of other organizations or individuals who should be consulted as part of the Section 106 process. Legal Notice reflecting the initiation of this Section 106 consultation was posted in the *Honolulu Star-Advertiser* on February 22, 2016.

Native Hawaiian organizations and Native Hawaiian descendants with ancestral, lineal or cultural ties to, cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area were requested to contact HDOT Project Manager, James Fu, by March 22, 2016. No comments were received by the Project Manager by the end of the comment period.

A public information meeting for the HRS 343 Draft EA and Section 106 consultation per NHPA would be conducted by the HDOT during the Draft EA public review period in late 2017.

Historical, Cultural, and Archaeological Background

Cultural Surveys Hawaii (CSH) conducted a Cultural Impact Assessment (CIA) for the project in 2011. Historical accounts in the report are summarized below.

Hauula Ahupuaa extends from the ocean towards the crest of the Koolau Mountains and is bounded by Kaipapau Ahupuaa to the north and Makao Ahupuaa to the south in the *moku* (district) of Koolauloa. The *ahupuaa* was named after the *hau*, a native hibiscus that blooms during the summer months (Clark 2001:95). The flowers bloom in yellow and by the time they fall to the ground they turn red, the *ahupuaa* literally meaning "red *hau*."

The *moolelo* of Hauula describes the physical phenomena such as Helumoa ("chicken scratch") and Makaluhi ("tired eyes"), suggesting a connection to the epic of Kamapuaa, the chicken stealing swine who escaped from Olopaha's tired warriors (Pukui et. Al 1974:141; Thrum 1904:77).

Hauula is in the middle of the Koolau Ridge Trail Complex, also known as Castle Trail, a 20-mile summit trail with numerous junctions to the surrounding valleys and ridges including the Laie Trail. The trail is lined with cabins on the summit such as the Kaipapu Cabin and Malaekahana Cabin. Other trails within the *ahupuaa* (land division generally running from the mountain to the sea) includes the Hauula Loop Trail, Maakua Ridge Trail, and the Maakua Gulch Trail.

Hauula is composed of two main beach parks: Hauula Beach Park and Aukai Beach Park. There is one main channel, the Kilia Channel, and one archaeological site off-shore, Wahi o Pua ("small fry place"). The beach fronting Hauula Beach Park is fairly narrow and straight, measuring 1,000 feet long. North of the beach park lies the Kilia Channel, a sand-bottom channel named after a type of wave. At the bottom of the beach park, Maakua Stream flows down to the ocean, the only stream to flow to the shore. A bar of sand separates Maakua from the sea creating a *muliwai* ("a pond of brackish standing water").

Aukai Beach Park is south of Hauula Beach Park. The 0.2-acre parcel of land is located in front of the *muliwai* once known as Kaluakauwa. The small beach park was named in honor of Alfred Aukai Aluli, the last private owner of the land the park sits on and of the homestead land directly across Kamehameha Highway.

Hauula Ahupuaa contains a number of streams that irrigated the terraces in the valleys such as Hanaimoa, Kawaipapa, Makua, Papale, and Punaiki (Sterling and Summers 1978:160). Hauula Ahupuaa does not contain any *puu* ("peaks") because it does not extend to the mountains. From south to north, the gulches that extend from the uplands to the sea are: Punaiki Gulch ("small cliff or slope, as along a ravine"), Maakua Gulch, Hanaimoa Gulch, and Waipilopilo Gulch.

Summary of Historic Sites within the APE

Two known historic properties are within the APE for the proposed replacement of Waipilopilo Stream Bridge: a buried cultural deposit with an associated human burial (Site 4795); and the Waipilopilo Stream Bridge.

Site 4795 was previously identified during an earlier AIS (Masterson et al. 1997) as a cultural deposit and associated human burial; the burial was removed and reinterred at Hauula Congregational Church Cemetery. The presence of the subsurface archaeological deposits

associated with Site 4795 and a native Hawaiian burial that has since been disinterred and re-interred elsewhere, both of which were identified by Masterson et al. (1997), indicate potential exists for buried historic properties to be encountered during the Waipilopilo Bridge Replacement project. It is anticipated that Site 4795 will be encountered as shallow as 30 cm (12 inches) on the east side (makai side) of the highway during construction excavations associated with the pedestrian pathway and bridge replacement. Site 4795 was assessed as significant under Criteria D and E in Masterson et al. (1998).

During the course of archaeological subsurface testing for the project in 2016, no historic properties were encountered in the APE. Excavations on the west side of Kamehameha Highway (Trenches 2–5) indicate that this area consists of at least 70 cm (28 in) of modern fill over natural, non-cultural soil layers. Therefore, no additional work is recommended in this portion of the APE. However, archaeological monitoring is recommended for ground disturbing work in the portion of the APE that is situated on the east side of Kamehameha Highway

The second historic property within the APE is the Waipilopilo Stream Bridge itself which was constructed in 1932 by L.L. McCandles. Pursuant to NRHP and HAR §13-275-6, the report assessed the Waipilopilo Stream Bridge as significant under Criterion C (NRHP). According to SHPD, although a bridge railing that resembles the existing one would be preferred, SHPD acknowledges that the HDOT Custom design (no cut outs, rectangular imprints) has not been crash tested. SHPD indicated in consultation meetings (November 2016 and February 2017) that the Texas Type C412 (rectangular cut outs) is compatible based on SHPD's site visit in December 2016.

Per the NHPA Section 106, the AIS report (*Archaeological Inventory Survey Report In Support of the Waipilopilo Stream Bridge Replacement Project, Hauula Ahupuaa, Koolauloa District, Island of Oahu, Hawaii*, PCSI, June 2016) provides register eligibility evaluations for Site 4795 and the Waipilopilo Stream Bridge, project effect determination recommendations, and mitigation recommendations. Site 4795 was evaluated eligible for listing on the HRHP and the NRHP under Criterion D. Previously, SHPD determined the Waipilopilo Stream Bridge was evaluated eligible for listing on the HRHP and the NRHP under Criteria A and C. However, the *Hawaii State Historic Bridge Inventory and Evaluation* survey recommended Waipilopilo Stream Bridge as eligible under Criterion C only (MKE Associates LLC and Fung Associates, Inc. 2013). Therefore, the report recommends the Waipilopilo Stream Bridge as eligible for listing on the NRHP under Criterion C.

Effect Determination

Based on our analysis, site observations, and consultation with the SHPD, the FHWA has determined the Waipilopilo Stream Bridge project would result in an adverse effect on the Waipilopilo Stream Bridge and Site 4795.

FHWA has also determined that Site 4795 is important chiefly because of what can be learned by data recovery and has minimal value for preservation in place.

Final Site Significance Assessments, NRHP Eligibility Evaluation, and Effect Determinations and Mitigation Recommendations for the Waipilopilo Stream Bridge and Site 50-80-06-4795

SIHP Site No. or Resource Name	NRHP Eligibility	Section 106 Effect Determination Recommendations	Section 106 Mitigation Recommendations
Waipilopilo Stream Bridge	C	Adverse Effect	Completion of a Historic American Engineering Record (HAER) Study
50-80-06-4795	D	Adverse Effect	Archaeological monitoring Preparation of a MOA

Mitigation Policies

Mitigation measures during the construction of the proposed improvements will be implemented to avoid and minimize potential impacts to archaeological, cultural, and historic resources. The following mitigation measures will be implemented, at a minimum:

- Preparation of a Memorandum of Agreement (MOA) which would include the recommended forms of mitigation: Historic American Engineering Record (HAER) documentation of the bridge; and implementation of on-site archaeological monitoring of the portion of the APE on the east side of Kamehameha Highway.
- If cultural materials are discovered during construction, all earth-moving activity within and around the immediate discovery area will be diverted until a qualified archaeologist can assess the nature and significance of the find.
- If human remains are discovered, Hawaii Administrative Rules Title 13. Subtitle 13, Chapter 300 states that further disturbances and activities shall cease in any area or nearby area suspected to overlie remains, and SHPD and Police Department will be contacted. The appropriate process would then proceed in conformance with Hawaii Administrative Rules §13-300 Subchapter 4 "Procedures for Property Treatment of Burial Sites and Human Skeletal Remains."

The HDOT will prevent the disturbance or taking of any historic property or resource to the extent possible by instituting these mitigation measures and enforcing their implementation by contractors. Also, HDOT will continue to consult with the public regarding the bridge railing type.

The FHWA requests the State Historic Preservation Officer's concurrence with the adverse effect determination. The FHWA is also consulting with the State Historic Preservation Officer on the finding that Site 4795 has minimal value for preservation in place, and if the SHPO has any objection to this finding.

If you have any questions, please feel free to contact me at (808) 541-2316 or by email at meesa.otani@dot.gov. Thank you for your assistance.

Sincerely yours,

Meesa Otani
Environmental Engineer

Enclosures

cc: Sharen Cho-Ibanez, HDOT, HWY-DS
Misako Mimura, HDOT, HWY-DE
Liana Choy, Sato & Associates, Inc.

110304/020 021113 r2



0 100 200 300
FEET

FIGURE 1
Location Map
Waipilopilo Bridge
Replacement January 2017

110304/018 021113 r3



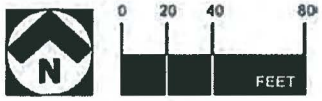


FIGURE 2

Aerial View with Tax Map Parcels

Waipilopilo Bridge Replacement
January 2017

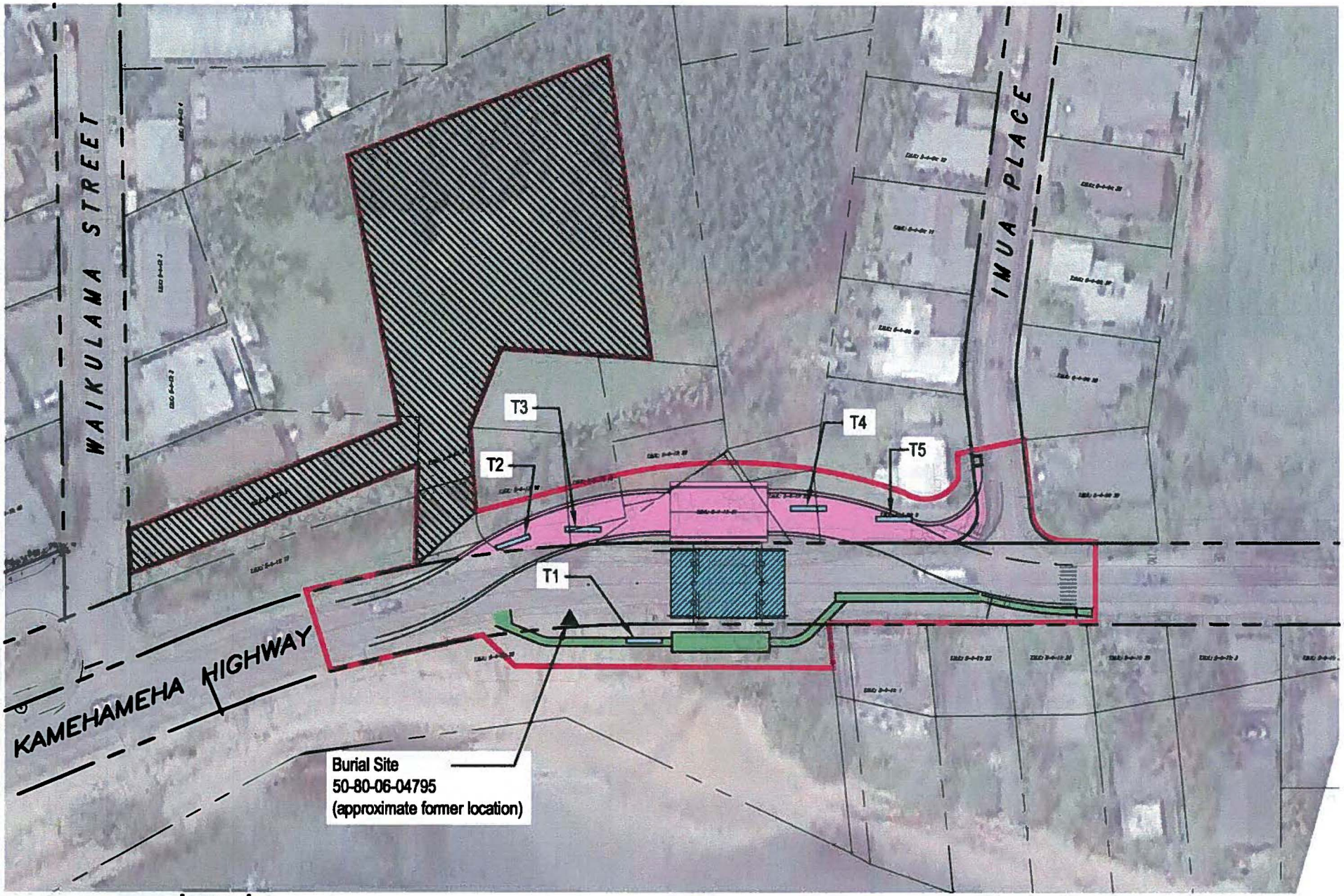


FIGURE 3

Area of Potential Effect

Waipilopilo Bridge Replacement
January 2017

ATTACHMENT 1

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

KEKOA KALUHIWA
FIRST DEPUTY

JEFFREY T. PEARSON
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

June 6, 2016

Ford N. Fuchigami, Director
State of Hawaii, Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813

Log No. 2015.03867
Doc. No. 1602KM22
Archaeology, Architecture

Dear Mr. Fuchigami,

SUBJECT: **Chapter 6E-8 and National Historic Preservation Act (NHPA) Section 106 Review–**
Archaeological Inventory Survey for the Waipilopilo Stream Bridge Replacement Project
Federal Aid Project No. BR-083-1(57), Ref. HWY-DB-2.9293
Hauʻula Ahupuaʻa, Koʻolauloa District, Island of Oʻahu
TMK: (1) 5-4-002: 022 por.; 5-4-004: 001 por., 009 por.; 5-4-017: por. of 015-018 and 021-023

Thank you for the opportunity to review the revised draft report titled *Archaeological Inventory Survey in Support of the Waipilopilo Stream Bridge Replacement Project, Hauʻula Ahupuaʻa, Koʻolauloa District, Island of Oʻahu, TMK: (1) 5-4-002: 022 por.; 5-4-004: 001 por., 009 por.; 5-4-017: por. of 015-018 and 021-023, Federal Aid Project No. BR-083-1(57)* (Vernon et al., September 2015). The proposed project to replace the existing Waipilopilo Bridge will receive federal funds from the Federal Highway Administration (FHWA) and pursuant to the Code of Federal Regulations (CFR) Title 36 Section 800.16(y), the project has been determined to be a federal undertaking subject to National Historic Preservation Act (NHPA) Section 106 process. Project related work will involve the construction of a detour road and bridge; construction of the new Waipilopilo Bridge and a highway width transition for the widened bridge; relocation of utilities; and installation of new road pavement, striping, and markings. The APE totals 1.85 acres of the area along Kamehameha Highway from Imua Place to Waikulama Street and SHPD concurred with the APE on August 31, 2015 (Log No. 2015.02671, Doc. No. 1508JLP02). A brief overview the project history is presented below.

On October 6, 2011, SHPD determined the Waipilopilo Stream Bridge eligible for listing on both the Hawaii State Register of Historic Places (HRHP) and the National Register of Historic Places (NRHP) under Criteria A and C and that the proposed replacement project would result in an adverse effect (October 6, 2011; Log No. 2011.02252, Doc. No. 1109MA08). The SHPD Architecture Branch requested either Historic American Buildings Survey (HABS) II or HABS I as mitigation. Additionally, an archaeological literature review and field inspection (Runyon et al. 2013) identified two historic properties (Site 50-80-06-4795 and the Waipilopilo Stream Bridge) within the proposed project's area of potential effect (APE) and recommended an archaeological inventory survey (AIS) be conducted (August 14, 2013; Log No. 2013.2014, Doc. No. 1308NN01). The archaeological inventory survey plan (AISP) was accepted on January 16, 2014 (Log No. 2013.06297, Doc. No. 1312NN05). The draft AIS report was received on July 15, 2015 (Log No. 2015.02739) for which SHPD held a consultation with Pacific Consulting Services, Inc. (PCSI) and provided written comments for revision (July 28, 2015; Dr. Susan Lebo [SHPD] and Steve Clark [PCSI] meeting). SHPD received the revised submittal on October 28, 2015 (Log No. 2015.03867). The State of Hawaii Department of Transportation (HDOT) provided corrected TMK information in a letter dated January 29, 2016 (Ref. HWY-DB 2.1017; Log No. 2016.00322). Our office received a pre-assessment consultation for the draft environmental assessment (DEA) for the project on March 17, 2016 (Log No. 2016.00657). Finally, we received a revised draft of the AIS report on May 6, 2015 and final minor revisions on June 6, 2015.

The archaeological inventory survey (AIS) was completed at the request of Environmental Planning Solutions, LLC in support of the Waipilopilo Stream Bridge Replacement project. The AIS fieldwork involved the excavation of five backhoe trenches (Trenches 1-5). Auger testing was also completed in Trenches 1-4 at the base of the excavation to determine water table depth. Excavation on the eastern side of Waipilopilo Stream Bridge (Trench 1) documented modern fill overlying natural loamy sand, clay, and sandy loams while excavations on the western side (Trenches 2-5) documented modern fill to 1 m below surface or deeper overlying sandy loam, or clay loam and silty clay. Excavations documented a few historic artifacts including one glass bottle and a ceramic shard, and faunal remains of a medium mammal vertebra.

The AIS identified two historic properties within the proposed undertaking's APE (Site 50-80-06-4795 and the Waipilopilo Bridge) and the report provides significance assessments for each. Site 4795 was previously identified by Masterson et al. (1997) during archaeological monitoring for the Laie waterline project and consists of a pre- to post-Contact buried cultural layer with associated pit features and human burials. During a subsequent AIS for Hau'ula Beach Park expansion project (Masterson et al. 1998), Site 4795 was evaluated significant under Criteria "d" (information potential) and "e" (significance to ethnic group for religious or cultural practices). Pursuant to Hawaii Administrative Rules (HAR) §13-275-6, the current AIS agreed with the previous significance evaluations of Site 4795 being significant under Criteria "d" and "e". The second historic property within the APE is the Waipilopilo Stream Bridge itself which was constructed in 1932 by L.L. McCandles. Pursuant to HAR §13-275-6, the report assessed the Waipilopilo Stream Bridge as significant under Criterion "c" (style or method of construction). Currently, neither Site 4795 nor the Waipilopilo Stream Bridge are listed on the HRHP or the NRHP.

Per the NHPA Section 106, the report provides register eligibility evaluations for Site 4795 and the Waipilopilo Stream Bridge, project effect determination recommendations, and mitigation recommendations. Site 4795 was evaluated eligible for listing on the HRHP and the NRHP under Criterion D. Previously, SHPD determined the Waipilopilo Stream Bridge was evaluated eligible for listing on the HRHP and the NRHP under Criteria A and C. However, the statewide historic bridge inventory survey recommended Waipilopilo Stream Bridge as eligible under Criterion C only (MKE Associates LLC and Fung Associates, Inc. 2013). Therefore, the report recommends the Waipilopilo Stream Bridge as eligible for listing on the NRHP under Criterion C.

The project effect determination recommendations are **"adverse effect"** under NHPA Section 106, and **"effect with proposed mitigation commitments"** under Hawaii Revised Statutes (HRS) §6E-8. The report indicates that if the FHWA project effect determination is **"adverse effect"** then a Memorandum of Agreement (MOA) will be necessary to resolve the adverse effect. The MOA may include stipulations that address the specific mitigation recommendations listed in the AIS report for Site 4795 and the Waipilopilo Stream Bridge.

The report provides several mitigation recommendations to address the effects to the Waipilopilo Stream Bridge and Site 4795. Pursuant to HAR §13-275-8(a)(1)C), the agreed-upon mitigation measures for Site 4795 is data recovery in the form of archaeological monitoring for all ground disturbing project related work; and architectural documentation of the Waipilopilo Stream Bridge. Mitigation recommendations for under Section 106 include HAER documentation of the Waipilopilo Stream Bridge and archaeological monitoring for Site 4795. The MOA may include the identified mitigation recommendations as well as additional stipulations, if appropriate. A HAER study was completed for the Waipilopilo Stream Bridge (Ruzicka 2015; HAER no. HI-124) and accepted by the National Park Service as mitigation for the proposed undertaking; our office received a copy of the HAER study July 13, 2015.

SHPD has reviewed the AIS report and the **State Historic Preservation Officer (SHPO) concurs** with the project effect determination recommendations of **"adverse effect"** per 36 CFR 800.5 and **"effect with proposed mitigation commitments"** per HAR §13-275-7(a)(2). The SHPO also concurs with the aforementioned mitigation recommendations and SHPD looks forward to receiving the following items:

- For the purposes of HRS §6E-8 and as stipulated in HAR §13-275-7(e), **an archaeological monitoring plan** that meets the requirements of HAR §13-279-4 shall be submitted for review and acceptance prior to any project related work commencing;
- A formal letter from the FHWA detailing the final historic property eligibility determinations and project effect determinations for SHPO concurrence; and

- A formal letter from the FHWA agreeing to an MOA that identifies appropriate mitigation measures should the agency provide a project effect determination of "adverse effect."

The report provides sufficient discussion of the project, physical environment, cultural and historical background, previous archaeological studies, methods and field findings, and meets the requirements specified in HAR §13-276-5 and the Secretary of the Interior's Standards for Archaeological Documentation. **It is accepted by SHPD**. Please send one hardcopy of the document, clearly marked FINAL, along with a copy of this review letter and a text-searchable PDF version on CD to the Kapolei SHPD office, attention SHPD Library.

The FHWA is the office of record for this undertaking. Please maintain a copy of this letter with your environmental review record for this undertaking.

Please contact Jessica Puff at (808) 692-8023 or at Jessica.L.Puff@hawaii.gov for any questions regarding architectural resources. Please contact Susan Lebo at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov if you have any questions regarding this letter or if the APE or scope of work changes in any way.

Aloha,



Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc: Meesa Otani, FHWA (Messa.Otani@dot.gov)
Wayne Kaneshiro, FHWA (Wayne.Kaneshiro@dot.gov)
James Fu, HDOT (James.Fu@hawaii.gov)
Steve Clark, PCSI (Steve.Clark@pcsihawaii.com)

Section 4(f)

Pending Completion of Section 106
Memorandum of Agreement

U.S Fish and Wildlife Service Endangered Species Action Section 7

Hawaii Revised Statutes Chapter 6E-8

JOSH GREEN, M.D.
GOVERNOR
KE KIA'ĀINA

EDWIN H. SNIFFEN
DIRECTOR
KA LUNA HO'OKELE

Deputy Directors
Nā Hope Luna Ho'okele
DREANALEE K. KALILI
TAMMY L. LEE
CURT T. OTAGURO
ROBIN K. SHISHIDO

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF TRANSPORTATION | KA 'OIHANA ALAKAU
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

HWY-DS 2.20765

July 31, 2024

TO: DAWN N. S. CHANG, CHAIRPERSON AND STATE HISTORIC PRESERVATION OFFICER
DEPARTMENT OF LAND AND NATURAL RESOURCES

ATTENTION: LESLEY K. IAUKEA, Ph.D., ACTING ADMINISTRATOR
STATE HISTORIC PRESERVATION DIVISION

FROM: EDWIN H. SNIFFEN
DIRECTOR OF TRANSPORTATION

SUBJECT: HAWAII REVISED STATUTES (HRS) § 6E-8 AND HAWAII ADMINISTRATIVE RULES (HAR) § 13-275
REQUEST FOR CONCURRENCE ON EFFECT DETERMINATION
KAMEHAMEHA HIGHWAY, WAIPILOPILO STREAM BRIDGE REPLACEMENT
AHUPUAA OF HAUULA AND KAIPAPAU, HAUULA, ISLAND OF OAHU
FEDERAL-AID PROJECT NO. BR-083-1(57)
TAX MAP KEY (TMK) NOS. (1) 5-4-002: 022 PORTION (por.); (1) 5-4-004: 001 por. & 009; (1) 5-4-017; por. 015-018 & 021-023

The State of Hawaii Department of Transportation (HDOT) is planning to replace the Waipilopilo Stream Bridge located on Kamehameha Highway in Hauula. In accordance with HRS § 6E-8 and HAR § 13-275-5(b)(2), HDOT requests the State Historic Preservation Division's (SHPD) review of the proposed project and concurrence to HDOT's determination of "effect with proposed mitigation."

The Federal Highway Administration (FHWA) intends to fund the bridge project and therefore is considered a federal action triggering federal requirements including the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act of 1966 (NHPA).

To comply with NEPA, preparation for environmental documentation to be consistent with the findings of this Environmental Assessment is being done.

Project Action Area
The Project Action Area, defined by HAR § 13-275-2, is "the area the proposed project may potentially affect, either directly or indirectly. It includes not only the area where the project will take place, but also the project's area of potential effects." For this project, the project action area consists of a 100-foot-wide corridor, measured from the edge of pavement and paralleling the mauka side of existing Kamehameha Highway, which encompasses all ground-disturbing activities and considerations potential visual effects.

The Waipilopilo Stream Bridge is oriented from south to north and carries Kamehameha Highway (Route 83) over Waipilopilo Stream. It crosses the Waipilopilo Stream near its discharge into the ocean and State-owned Hauula Beach Park. The bridge is bordered by TMK No. 5-4-002:022 por., Hauula Beach Park to the east and southeast (makai side) and TMK No. 5-4-017; por. 021, a 3,337 square foot, privately owned, undeveloped lot to the west (mauka side). The proposed action is a bridge replacement project. The bridge was built in 1932 and is 27 feet wide and 25 feet long. Please see the enclosed Project Action Area Map.

Proposed Activity
The project consists of replacing the Waipilopilo Stream Bridge, addressing its deteriorated condition. The purpose of the project is to replace the Waipilopilo Stream Bridge to meet current State and Federal design guidelines. The proposed project will also address bridge maintenance concerns, improve traffic safety for motorists and pedestrians, and meet projected demands on Kamehameha Highway, (Route 83), on the north shore of Oahu. There will be no graded areas, parking areas and related facilities.

The estimated start of construction is Summer 2025 for two years. There will be no bypass road planned for this project as the bridge construction will be completed in phases to maintain traffic flow. Construction is anticipated to occur during off-peak daytime hours and nightwork is also anticipated for this project.

The proposed project is located in Hauula on the island of Oahu. The Waipilopilo Stream Bridge carries Kamehameha Highway over Waipilopilo Stream at Milepost 20.81. The proposed action area spans approximately 1.47 acres and consists of the bridge footprint, construction staging areas, as well as the highway right of way. The bridge structure measures approximately 25 feet long and 27 feet wide.

Historic Properties Within the Project Action Area – December 2023 SHPD Library Visit
Pursuant to HAR § 13-275-2, a historic property is "any building, structure, object, district, area or site, including heiau and underwater site, which is over fifty years old." A significant historic property is "any historic property that meets the criteria of the Hawaii register of historic places." The SHPD Library was visited on December 8, 2023, to review available documents related to the Project Action Area. There were 11 documents that covered areas that were within or adjacent to the Project Action Area; of these, there were six that, upon closer review, contained information potentially relevant to the proposed Project.

Name (Year)	**Location**	**Study Type**	**Findings** State Inventory of Historic Properties (SIHP)
Waipilopilo Stream Bridge Replacement Project			
Thurman, M.A. December 2014	Koolauloa Moku TMK Nos. Various	Archaeological Report	Hauula Beach Park Cultural Layer, SIHP No. 50-80-05-4794
O'Hare, B.A., Shideler, M.A., Hammatt, Ph.D. January 2014	TMK Nos. (1) 5-4-002, 004, 011, 017 por.	Final Archaeological Inventory Survey	Waipilopilo Stream Bridge; Kamehameha Highway; Subsurface Cultural Deposits, SIHP No. 50-80-06-4795
O'Day, M.A. August 2014	TMK No. (1) 5-4-017:016 por.	Final Archaeological Assessment	No Findings
Materson, Shideler, M.A.; Devereux, B. A.; Hammatt, Ph.D. July 1999	TMK No. (1) 5-4-002:22 por.	Archaeological Monitoring Plan	N/A
Materson, Devereux, B.A.; Hammatt, Ph.D. May 1998	TMK No. (1) 5-4-002:22 por.	Draft Archaeological Inventory Survey	SIHP No. 50-80-06-4794, 4795

Name (Year)	Location	Study Type	Findings State Inventory of Historic Properties (SIHP)
Bush, B.Ed.; Hammatt, Ph.D. February 2002	TMK No. (1) 5-4-002:22 por.	Archaeological Monitoring Report	Human Remains, SIHP No. 50-80-06-5801

The documents were reviewed in relation to the TMK Nos. covered by them and whether there was overlap with the TMK Nos. associated with the proposed Project. These documents and relevant portions of their contents are presented below.

Evaluation of Significance, HAR § 13-275-6
According to the SHPD letter dated June 6, 2016, neither Site 4795 nor the Waipilopilo Stream Bridge are currently listed on the Hawaii Register of Historic Places (HRHP) or the National Register of Historic Places (NRHP). (Vernon et al. 2015) evaluated Site 4795 as eligible for listing on the HRHP and the NRHP under Criterion d. SHPD previously determined the Waipilopilo Stream Bridge was eligible for listing on the HRHP and the NRHP under Criterion a and c; however, the Statewide historic bridge inventory survey, surveyed by MKE Associates LLC. and Fung Associates, Inc., 2013, recommended Waipilopilo Stream Bridge as eligible under Criterion c only. Therefore, the Archaeological Inventory Survey (AIS) report prepared for the subject project (Vernon et al. 2015) recommends the Waipilopilo Stream Bridge as eligible for listing on the NRHP under Criterion c. The project effect determination recommendations provided in the (Vernon et al. 2015) AIS report are "adverse effect" under NHPA Section 106, and "effect with proposed mitigation commitments" under HRS § 6E-8. FHWA has determined the Waipilopilo Stream Bridge project will result in an adverse effect to both Site 4795 and the Waipilopilo Stream Bridge. The State Historic Preservation Office (SHPO) concurs.

Additionally, FHWA has determined that Site 4795 has minimal value for preservation in place and asks whether the SHPO objects to this finding. The SHPO declines to comment at this time as Site 4795 should be included in the Memorandum of Agreement (MOA) discussion.

Archaeological Monitoring
Due to the sensitive nature of previous archaeological findings indicating the possible presence of burials in the area, archaeological monitoring is advised for identification purposes for project activities that exceed below the depth of existing base course.

Pursuant to HRS § 6E, in the event of any artifacts or human remains are uncovered during construction operations, the contractor shall immediately suspend work and notify the Honolulu

Police Department, the State Department of Land and Natural Resources, and the Historic Preservation Division. In addition, for non-City projects, the contractor shall inform the Civil Engineering Branch, Department of Planning and Permitting; and for City projects, notify the responsible City agency.

Effects to Significant Historic Properties, HAR § 13-275-7
An AIS Plan was completed in 2017. Three significant cultural resources have been identified within the project action area. The sites include:

1) Waipilopilo Bridge built in 1932 by Lincoln Loy McCandless.
2) Kamehameha Highway (Route 83).
3) SIHP No. 50-80-06-4795, a subsurface cultural deposit and human burial that extends through the project action area.

Given that the project is replacing the historic Waipilopilo Stream Bridge, HDOT is anticipating the determination of "effect with proposed mitigation commitments."

Avoidance, Minimization, and Mitigation Policies, HAR § 13-275-8
In accordance with HAR § 13-275-8(a)(1)(A), the proposed mitigation for the Waipilopilo Stream Bridge is preservation in the form of avoidance and protection (conservation). The HDOT is also proposing data recovery in the form of Historic American Engineering Record (HAER) documentation as mitigation to the impact to the Waipilopilo Stream Bridge wingwalls.

Also, HDOT commits to implementing the following mitigation measures during construction to further avoid and minimize potential impacts to archaeological, cultural, and historic resources:

- If cultural materials are discovered during construction, all earth-moving activity within and around the immediate discovery area will be diverted until a qualified archaeologist can assess the nature and significance of the find.
- If previously unidentified non-burial historic properties, or unanticipated effects are discovered, HDOT shall follow HAR § 13-280 "Rules Governing General Procedures for Inadvertent Discoveries of Historic Properties During a Project Covered by the Historic Preservation Review Process."
- If human remains are discovered, HAR § 13-300 states that further disturbances and activities shall cease in any area or nearby area suspected to overlie remains, and SHPD and the Police Department will be contacted. The appropriate process would then proceed in conformance with HAR § 13-300-31 to 43 "Procedures for Proper Treatment of Burial Sites and Human Skeletal Remains."

HDOT will prevent the disturbance or taking of any historic property or resource to the extent possible by instituting these mitigation measures identified.

Supporting Evidence
The FHWA previously coordinated with the SHPD regarding this Project on August 21, 2017, in a letter to Ms. Suzanne Case from Ms. Meesa Otani (enclosed). The SHPD responded to the letter on January 29, 2018 (Log No. 2017.01846, Doc. No. 1801SH08; enclosed). This letter, in part, read:

> According to the SHPD letter dated June 6, 2016, neither Site 4795 nor the Waipilopilo Stream Bridge are currently listed on the HRHP or the NRHP. (Vernon et al. 2015) evaluated Site 4795 as eligible for listing on the HRHP and the NRHP under Criterion d. SHPD previously determined the Waipilopilo Stream Bridge was eligible for listing on the HRHP and the NRHP under Criterion a and c. However, the Statewide historic bridge inventory survey recommended Waipilopilo Stream Bridge as eligible under Criterion c only (MKE Associates LLC and Fung Associates, Inc. 2013). Therefore, the AIS report prepared for the subject project (Vernon et al. 2015) recommends the Waipilopilo Stream Bridge as eligible for listing on the NRHP under Criterion c. The project effect determination recommendations provided in the (Vernon et al. 2015) AIS report are "adverse effect" under NHPA Section 106, and "effect with proposed mitigation commitments" under HRS § 6E-8. FHWA has determined the Waipilopilo Stream Bridge project will result in an adverse effect to both Site 4795 and the Waipilopilo Stream Bridge. The SHPO concurs.
>
> Additionally, FHWA has determined that Site 4795 has minimal value for preservation in place and asks whether the SHPO objects to this finding. The SHPO declines to comment at this time as Site 4795 should be included in the MOA discussion.
>
> Federal agencies are required to avoid, minimize, or mitigate adverse effects. Please note that if the federal agency and the SHPO concur that the adverse effect cannot be avoided, the Section 106 process will not conclude until the consultation process is complete; a MOA is developed, executed, and implemented; and, if applicable, the formal comments of the Advisory Council have been received per 36 Code of Federal Regulations § 800.6. The SHPO will consult with the FHWA on the development of a MOA to resolve adverse effects.
>
> As stipulated in HAR § 13-275-7, when an agency finds that a project will affect one or more significant historic properties and makes the determination of, "effect, with proposed mitigation commitments," then detailed mitigation plans shall be developed for SHPD review and acceptance prior to project work commencing.
>
> The FHWA's proposed mitigation commitments for this project are on-site archaeological monitoring of the portion of the area of potential effect (APE) on the east

side of Kamehameha Highway and HAER documentation of the bridge. The SHPO will consult with the FHWA on the development of a MOA to resolve adverse effects.

SHPD No. 50-80-06-4795
Site 4795 was identified during archaeological monitoring for the Laie waterline project is a pre- to post-contact buried cultural deposit with associated pit features and a human burial (Masterson et al. 1997); the burial was disinterred and reinterred at Hauula Congregational Church Cemetery. During a 1998 AIS for the Hauula Beach Park expansion project, Site 4795 was assessed as significant under Criterion d and e (Masterson et al. 1998). The AIS conducted for the subject undertaking (Vernon et al. 2015) agreed with the (Masterson et al. 1998) significant assessment for Site 4795.

According to the FHWA, Site 4795 is expected to be encountered as shallow as 30 centimeters below surface on the east side of the highway during excavations associated with the pedestrian pathway and bridge replacement. Additionally, during the course of the AIS subsurface testing for the project, no historic properties were encountered within the APE. Excavations on the west side of Kamehameha Highway revealed this area consists of at least 70 centimeters of modern fill over natural, non-cultural soil layers (Vernon et al. 2015).

Waipilopilo Stream Bridge
The second historic property within the APE is the Waipilopilo Stream Bridge which was constructed in 1932 by L.L. McCandles. Pursuant to HAR § 13-275-6, the Vernon et al. (2015) report assessed the Waipilopilo Stream Bridge as significant under Criterion c.

Waipilopilo Stream Bridge – State Historic Bridge Inventory Evaluation (SHBIE)
The SHBIE discusses the Waipilopilo Stream Bridge (Pages 4-17, 4-280) as follows:

Character Defining Features:

- Associated with early developments in concrete bridge construction in Hawaii
- Good example of a 1930's reinforced concrete bridge

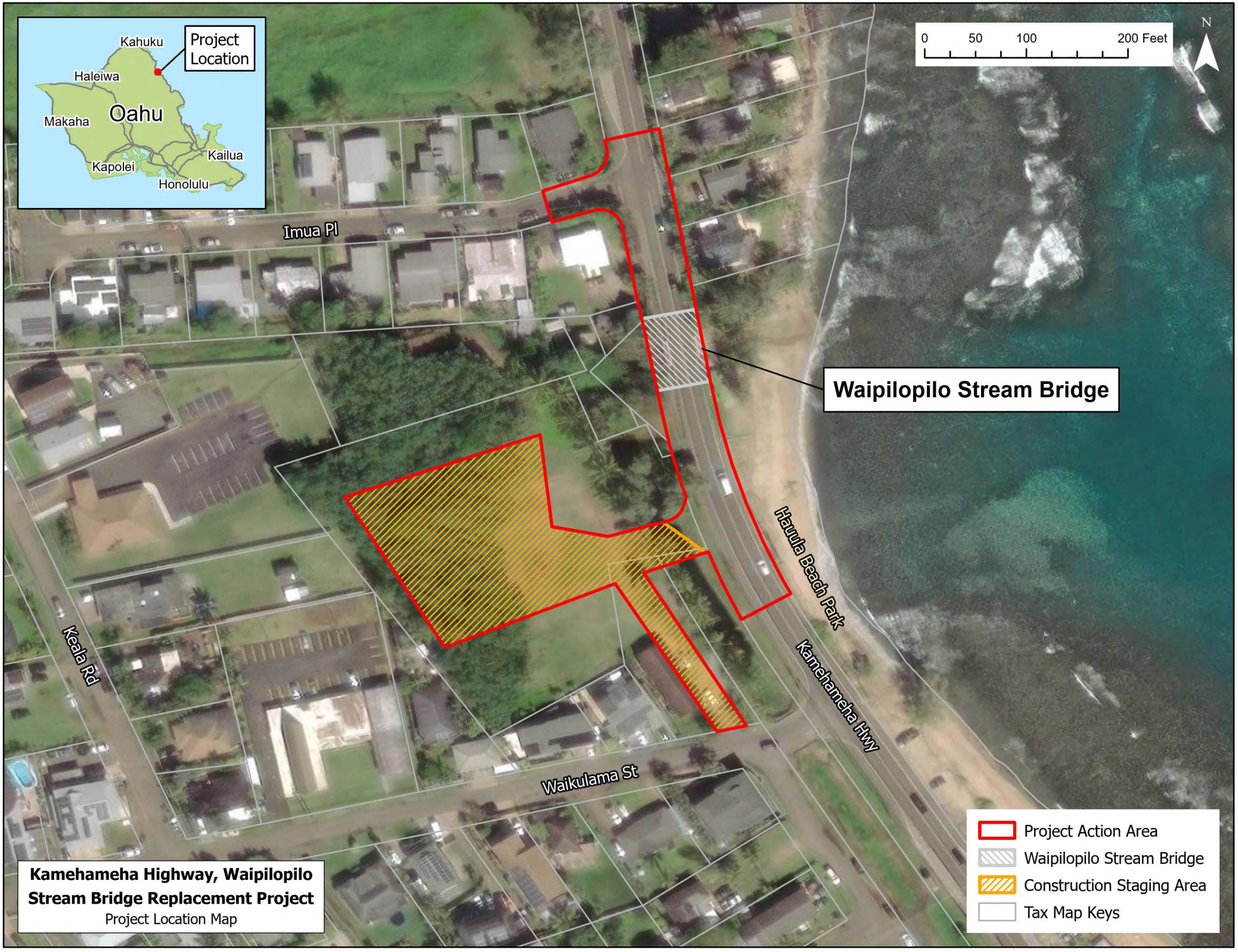
Narrative Description:
The Waipilopilo Stream Bridge carries Kamehameha Highway across the Waipilopilo Stream. This concrete tee beam bridge is in its original location and in fair condition, and its materials remain intact. The bridge has concrete solid panel parapets with flat caps and curved wide end posts. The single span concrete deck is supported by concrete abutments. The parapet cap and end posts panels have been painted white. A wood pedestrian walkway with wood horizontal railings was added to one side of the bridge in 1964. Three beams were bolted to the end posts. The simple design of the parapet retains its historic feeling.

Significance Statement:
This bridge is eligible under Criterion c for its association with early developments in concrete bridge construction in Hawaii. It is a good example of a 1930's reinforced concrete bridge that is typical of its period in its use of materials, method of construction, craftsmanship, and design.

Conclusion
Pursuant to HAR § 13-275-5(b)(2), we request your written concurrence with HDOT's determination of "effect, with proposed mitigation commitments" within 45 days from receipt of this letter.

Should you have any questions, please contact our Project Manager, Mr. Andrew Hirano, at (808) 692-7546, from our Design Branch, Technical Design Services Section or by email at andrew.j.hirano@hawaii.gov.

Enclosures



Kamehameha Highway, Waipilopilo Stream Bridge Replacement Project

Project Location Map

U.S. Department of Transportation
Federal Highway Administration

Hawaii Federal-Aid Division

300 Ala Moana Blvd, Rm 3-306
Box 50206
Honolulu, Hawaii 96850
Phone: (808) 541-2700
Fax: (808) 541-2704

August 21, 2017

In Reply Refer To:
HDA-HI

Ms. Suzanne Case
Chairperson and State Historic Preservation Officer
Department of Land and Natural Resources
601 Kamokila Boulevard, Suite 555
Kapolei, HI 96707

Subject: National Historic Preservation Act Section 106 Effect Determination
Kamehameha Hihgway, Waipilopilo Stream Bridge Replacement
Hauula, Ahupuaa, Koolauloa District, Island of Oahu
Federal-aid Project No. BR-083-1(57)
Tax Map Key(s): (1) 5-4-002:022 por; (1) 5-4-004:001 por & 009; (1) 5-4-17; por 015-018 & 021-023

Dear Ms. Case:

In accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (2006), the Federal Highway Administration (FHWA) requests the State Historic Preservation Officer's (SHPO) concurrence on the effect determination for the proposed improvements. The FHWA is rendering an adverse effect determination for the subject project.

The FHWA will provide funds for the proposed improvements. Therefore, the FHWA has required the State of Hawaii Department of Transportation (HDOT) to comply with the National Environmental Policy Act, NHPA, and other federal requirements. The FHWA has authorized the HDOT to conduct NHPA Section 106 notification and consultation activities.

Overview of the Undertaking

HDOT proposes to replace the existing Waipilopilo Stream Bridge on Kamehameha Highway (Route 83) in the community of Hauula, District of Koolauloa, Island of Oahu. The bridge is bordered by: Tax Map Key (TMK) 5-4-2:022, Hauula Beach Park to the east and southeast (makai side) and TMK 5-4-17:21, a 3,337 sf, privately owned, undeveloped lot to the west (mauka side). Refer to enclosed Figures 1 and 2.

The existing Waipilopilo Bridge, originally built in 1932 by the Territorial Highway Department of the Territory of Hawaii, was constructed with 4 cast-in-place reinforced concrete girders, cast-in-place reinforced concrete deck slab with asphalt overlay, concrete curb and bridge railing. There are no concrete approach slabs to the bridge deck. The bridge abutment is comprised of a

reinforced concrete cap beam (with an integrally cast back wall) supported by 14-inch square precast concrete piles. The bridge structure measures approximately 27 feet wide by 25 feet long.

In 1964, a 3-foot-wide suspended wooden pedestrian walkway was added along the mauka side of the structure. In 1990, the existing guardrails were replaced and asphalt concrete pavement added to transition the paved road shoulder to the wooden pedestrian walkway. In 1995, the bridge was resurfaced as a part of a four (4) mile resurfacing project.

HDOT is responsible for maintaining the functional and structural integrity of its bridges on all State highways. The purpose of the project is to replace the Waipilopilo Stream Bridge to meet current State and Federal design guidelines. The proposed project would also address bridge maintenance concerns, improve traffic safety for motorists and pedestrians and meet projected demands on Kamehameha Highway, Route 83, on the north shore of Oahu.

This project was initiated in 2005 and at that time the bridge had a sufficiency rating of 56.3 based on FHWA National Bridge Inventory Standards. A sufficiency rating below 50 warrants bridge replacement. A sufficiency rating greater than or equal to 50 and below 80 warrants bridge rehabilitation. Because the bridge sufficiency rating was 56.3, this project was initiated as a bridge rehabilitation project. Bridge rehabilitation would have widened the bridge deck to provide wider shoulders, upgraded bridge railings, and strengthened the bridge girders and deck.

However, during the conceptual design phase, engineering analyses indicated that the deteriorated condition of the bridge girders and deck was such that bridge replacement was a more cost effective solution. In addition, the gradual deterioration of the bridge between 2005 and 2016 decreased its sufficiency rating to 47.8 further warranting replacement rather than rehabilitation. In effect, the bridge had become structurally deficient. The project scope of work was then changed from bridge rehabilitation to bridge replacement.

Kamehameha Highway is on the National Highway System, which means it is a critical route within the regional transportation system. As part of the regional transportation system, the long term safety and functionality of bridges are an important component of the system. In the Koolauloa District, there are no other roadways and bridges capable of providing emergency access across streams. Kamehameha Highway is also classified as a rural principal arterial. For the local community, the bridge is also used by people traveling on foot and by bicycles. The existing wooden bikeway/walkway hanging on the mauka edge of the bridge, is substandard for pedestrians and bicyclists and does not meet the accessibility standards under Americans with Disabilities Act (ADA).

The bridge has two (2) 11-foot-wide travel lanes with 1.0 foot shoulders on either side. Pedestrians walking along the makai side of the highway cannot cross the bridge without walking in the travel lane. The existing guardrails, posts and end treatments that are connected to all ends of the bridge concrete barriers do not meet the highway design standards of the National Cooperative Highway Research Program (NCHRP) 350. The most current highway design standards would be utilized for this project.

Area of Potential Effect

The Area of Potential Effect (APE) for the undertaking is shown as Figure 3 and SHPO concurred with the delineation of the APE in a letter dated August 31, 2015 (Log No. 2015.02671, Doc. No. 1508JLP02). In a June 6, 2016 letter, the Deputy SHPO accepted the AIS report (Log No. 2015 03867, Doc. No. 1602KM22). A copy of this letter is enclosed in Attachment 1. A 0.84-acre portion of mostly private property and an unmaintained portion of public roadway (TMK (1) 5-4-004:001) situated on a portion of TMK (1) 5-4-017:016 will be needed for access to the temporary construction staging area. In total the APE which measures approximately 1.85 acres, includes two (2) historic properties (Site 50-80-06-4795) and Waipilopilo Stream Bridge, and the staging area. Details of the historic properties follow the proposed project details.

Consultation Overview

The HDOT consulted with the Department of Land and Natural Resources (DLNR) State Historic Preservation Division (SHPD) and the Hauula community beginning in 2011.

The Section 106 Consultation per NHPA with Native Hawaiian Organizations (NHO) included correspondence beginning in March 2016. The following organizations were informed about the archaeological survey that was conducted and its findings and recommendations:

- Office of Hawaiian Affairs
- Hui Malama
- Oahu Island Burial Council
- Hawaiian Civic Club
- Hawaii Historic Foundation

Consulted parties were asked for input on other historic or cultural resources that they were aware of, and the names of other organizations or individuals who should be consulted as part of the Section 106 process. Legal Notice reflecting the initiation of this Section 106 consultation was posted in the *Honolulu Star-Advertiser* on February 22, 2016.

Native Hawaiian organizations and Native Hawaiian descendants with ancestral, lineal or cultural ties to, cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area were requested to contact HDOT Project Manager, James Fu, by March 22, 2016. No comments were received by the Project Manager by the end of the comment period.

A public information meeting for the HRS 343 Draft EA and Section 106 consultation per NHPA would be conducted by the HDOT during the Draft EA public review period in late 2017.

Historical, Cultural, and Archaeological Background

Cultural Surveys Hawaii (CSH) conducted a Cultural Impact Assessment (CIA) for the project in 2011. Historical accounts in the report are summarized below.

Hauula Ahupuaa extends from the ocean towards the crest of the Koolau Mountains and is bounded by Kaipapau Ahupuaa to the north and Makao Ahupuaa to the south in the *moku* (district) of Koolauloa. The *ahupuaa* was named after the *hau*, a native hibiscus that blooms during the summer months (Clark 2001:95). The flowers bloom in yellow and by the time they fall to the ground they turn red, the *ahupuaa* literally meaning "red *hau*."

The *moolelo* of Hauula describes the physical phenomena such as Helumoa ("chicken scratch") and Makaluhi ("tired eyes"), suggesting a connection to the epic of Kamapuaa, the chicken stealing swine who escaped from Olopaha's tired warriors (Pukui et. Al 1974:141; Thrum 1904:77).

Hauula is in the middle of the Koolau Ridge Trail Complex, also known as Castle Trail, a 20-mile summit trail with numerous junctions to the surrounding valleys and ridges including the Laie Trail. The trail is lined with cabins on the summit such as the Kaipapu Cabin and Malaekahana Cabin. Other trails within the *ahupuaa* (land division generally running from the mountain to the sea) includes the Hauula Loop Trail, Maakua Ridge Trail, and the Maakua Gulch Trail.

Hauula is composed of two main beach parks: Hauula Beach Park and Aukai Beach Park. There is one main channel, the Kilia Channel, and one archaeological site off-shore, Wahi o Pua ("small fry place"). The beach fronting Hauula Beach Park is fairly narrow and straight, measuring 1,000 feet long. North of the beach park lies the Kilia Channel, a sand-bottom channel named after a type of wave. At the bottom of the beach park, Maakua Stream flows down to the ocean, the only stream to flow to the shore. A bar of sand separates Maakua from the sea creating a *muliwai* ("a pond of brackish standing water").

Aukai Beach Park is south of Hauula Beach Park. The 0.2-acre parcel of land is located in front of the *muliwai* once known as Kaluakauwa. The small beach park was named in honor of Alfred Aukai Aluli, the last private owner of the land the park sits on and of the homestead land directly across Kamehameha Highway.

Hauula Ahupuaa contains a number of streams that irrigated the terraces in the valleys such as Hanaimoa, Kawaipapa, Makua, Papale, and Punaiki (Sterling and Summers 1978:160). Hauula Ahupuaa does not contain any *puu* ("peaks") because it does not extend to the mountains. From south to north, the gulches that extend from the uplands to the sea are: Punaiki Gulch ("small cliff or slope, as along a ravine"), Maakua Gulch, Hanaimoa Gulch, and Waipilopilo Gulch.

Summary of Historic Sites within the APE

Two known historic properties are within the APE for the proposed replacement of Waipilopilo Stream Bridge: a buried cultural deposit with an associated human burial (Site 4795); and the Waipilopilo Stream Bridge.

Site 4795 was previously identified during an earlier AIS (Masterson et al. 1997) as a cultural deposit and associated human burial; the burial was removed and reinterred at Hauula Congregational Church Cemetery. The presence of the subsurface archaeological deposits

associated with Site 4795 and a native Hawaiian burial that has since been disinterred and re-interred elsewhere, both of which were identified by Masterson et al. (1997), indicate potential exists for buried historic properties to be encountered during the Waipilopilo Bridge Replacement project. It is anticipated that Site 4795 will be encountered as shallow as 30 cm (12 inches) on the east side (makai side) of the highway during construction excavations associated with the pedestrian pathway and bridge replacement. Site 4795 was assessed as significant under Criteria D and E in Masterson et al. (1998).

During the course of archaeological subsurface testing for the project in 2016, no historic properties were encountered in the APE. Excavations on the west side of Kamehameha Highway (Trenches 2–5) indicate that this area consists of at least 70 cm (28 in) of modern fill over natural, non-cultural soil layers. Therefore, no additional work is recommended in this portion of the APE. However, archaeological monitoring is recommended for ground disturbing work in the portion of the APE that is situated on the east side of Kamehameha Highway

The second historic property within the APE is the Waipilopilo Stream Bridge itself which was constructed in 1932 by L.L. McCandles. Pursuant to NRHP and HAR §13-275-6, the report assessed the Waipilopilo Stream Bridge as significant under Criterion C (NRHP). According to SHPD, although a bridge railing that resembles the existing one would be preferred, SHPD acknowledges that the HDOT Custom design (no cut outs, rectangular imprints) has not been crash tested. SHPD indicated in consultation meetings (November 2016 and February 2017) that the Texas Type C412 (rectangular cut outs) is compatible based on SHPD's site visit in December 2016.

Per the NHPA Section 106, the AIS report (*Archaeological Inventory Survey Report In Support of the Waipilopilo Stream Bridge Replacement Project, Hauula Ahupuaa, Koolauloa District, Island of Oahu, Hawaii*, PCSI, June 2016) provides register eligibility evaluations for Site 4795 and the Waipilopilo Stream Bridge, project effect determination recommendations, and mitigation recommendations. Site 4795 was evaluated eligible for listing on the HRHP and the NRHP under Criterion D. Previously, SHPD determined the Waipilopilo Stream Bridge was evaluated eligible for listing on the HRHP and the NRHP under Criteria A and C. However, the *Hawaii State Historic Bridge Inventory and Evaluation* survey recommended Waipilopilo Stream Bridge as eligible under Criterion C only (MKE Associates LLC and Fung Associates, Inc. 2013). Therefore, the report recommends the Waipilopilo Stream Bridge as eligible for listing on the NRHP under Criterion C.

Effect Determination

Based on our analysis, site observations, and consultation with the SHPD, the FHWA has determined the Waipilopilo Stream Bridge project would result in an adverse effect on the Waipilopilo Stream Bridge and Site 4795.

FHWA has also determined that Site 4795 is important chiefly because of what can be learned by data recovery and has minimal value for preservation in place.

Final Site Significance Assessments, NRHP Eligibility Evaluation, and Effect Determinations and Mitigation Recommendations for the Waipilopilo Stream Bridge and Site 50-80-06-4795

SIHP Site No. or Resource Name	NRHP Eligibility	Section 106 Effect Determination Recommendations	Section 106 Mitigation Recommendations
Waipilopilo Stream Bridge	C	Adverse Effect	Completion of a Historic American Engineering Record (HAER) Study
50-80-06-4795	D	Adverse Effect	Archaeological monitoring Preparation of a MOA

Mitigation Policies

Mitigation measures during the construction of the proposed improvements will be implemented to avoid and minimize potential impacts to archaeological, cultural, and historic resources. The following mitigation measures will be implemented, at a minimum:

- Preparation of a Memorandum of Agreement (MOA) which would include the recommended forms of mitigation: Historic American Engineering Record (HAER) documentation of the bridge; and implementation of on-site archaeological monitoring of the portion of the APE on the east side of Kamehameha Highway.
- If cultural materials are discovered during construction, all earth-moving activity within and around the immediate discovery area will be diverted until a qualified archaeologist can assess the nature and significance of the find.
- If human remains are discovered, Hawaii Administrative Rules Title 13. Subtitle 13, Chapter 300 states that further disturbances and activities shall cease in any area or nearby area suspected to overlie remains, and SHPD and Police Department will be contacted. The appropriate process would then proceed in conformance with Hawaii Administrative Rules §13-300 Subchapter 4 "Procedures for Property Treatment of Burial Sites and Human Skeletal Remains."

The HDOT will prevent the disturbance or taking of any historic property or resource to the extent possible by instituting these mitigation measures and enforcing their implementation by contractors. Also, HDOT will continue to consult with the public regarding the bridge railing type.

The FHWA requests the State Historic Preservation Officer's concurrence with the adverse effect determination. The FHWA is also consulting with the State Historic Preservation Officer on the finding that Site 4795 has minimal value for preservation in place, and if the SHPO has any objection to this finding.

If you have any questions, please feel free to contact me at (808) 541-2316 or by email at meesa.otani@dot.gov. Thank you for your assistance.

Sincerely yours,

Meesa Otani
Environmental Engineer

Enclosures

cc: Sharen Cho-Ibanez, HDOT, HWY-DS
Misako Mimura, HDOT, HWY-DE
Liana Choy, Sato & Associates, Inc.

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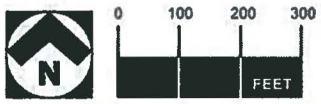


FIGURE 1

Location Map

Waipilopilo Bridge
Replacement January 2017

110304/018 021113 r3



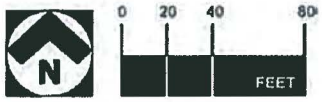


FIGURE 2

Aerial View with Tax Map Parcels

Waipilopilo Bridge Replacement
January 2017

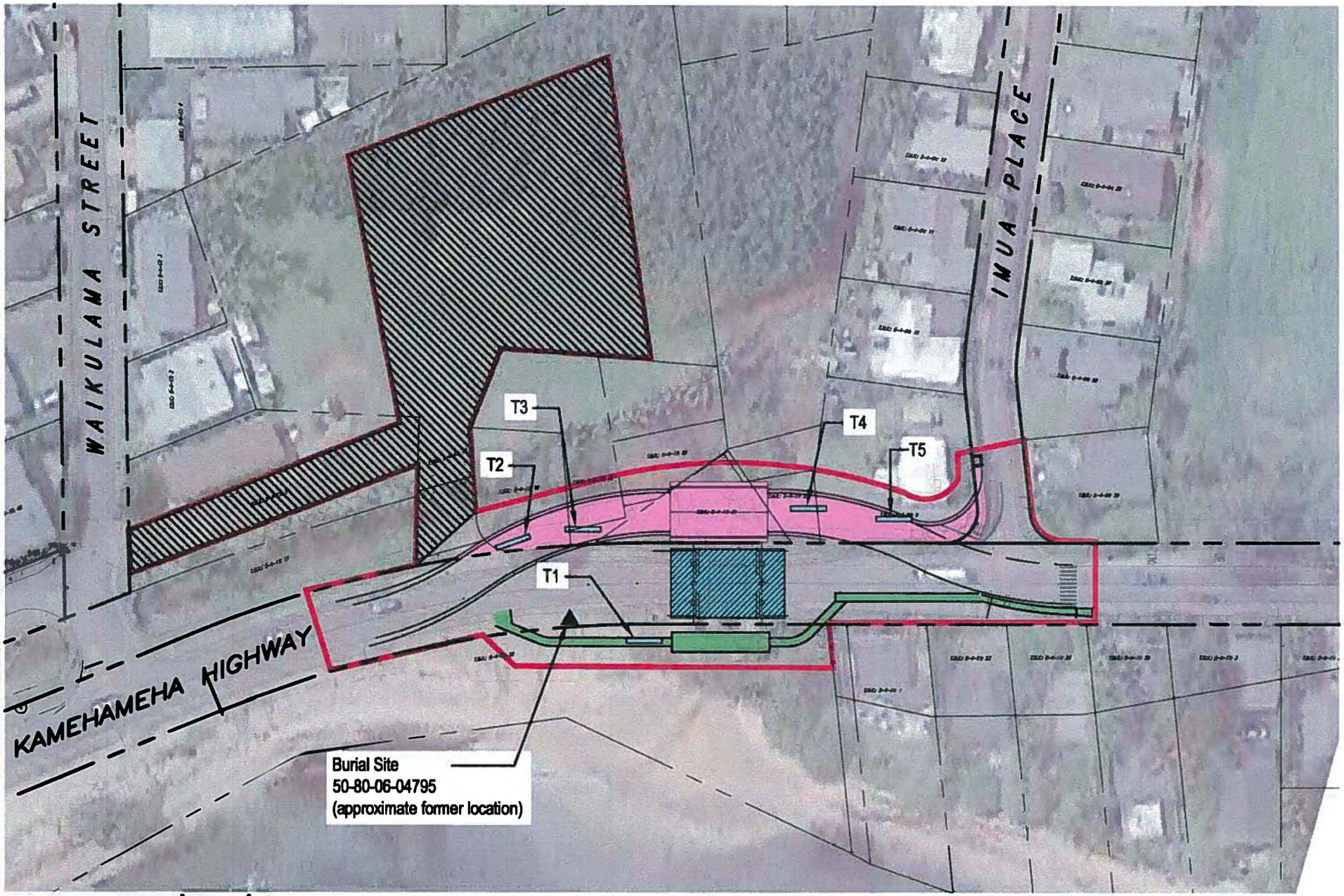


FIGURE 3

Area of Potential Effect

Waipilopilo Bridge Replacement
January 2017

ATTACHMENT 1

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

KEKOA KALUHIWA
FIRST DEPUTY

JEFFREY T. PEARSON
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

June 6, 2016

Ford N. Fuchigami, Director
State of Hawaii, Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813

Log No. 2015.03867
Doc. No. 1602KM22
Archaeology, Architecture

Dear Mr. Fuchigami,

SUBJECT: **Chapter 6E-8 and National Historic Preservation Act (NHPA) Section 106 Review–**
Archaeological Inventory Survey for the Waipilopilo Stream Bridge Replacement Project
Federal Aid Project No. BR-083-1(57), Ref. HWY-DB-2.9293
Hauʻula Ahupuaʻa, Koʻolauloa District, Island of Oʻahu
TMK: (1) 5-4-002: 022 por.; 5-4-004: 001 por., 009 por.; 5-4-017: por. of 015-018 and 021-023

Thank you for the opportunity to review the revised draft report titled *Archaeological Inventory Survey in Support of the Waipilopilo Stream Bridge Replacement Project, Hauʻula Ahupuaʻa, Koʻolauloa District, Island of Oʻahu, TMK: (1) 5-4-002: 022 por.; 5-4-004: 001 por., 009 por.; 5-4-017: por. of 015-018 and 021-023, Federal Aid Project No. BR-083-1(57)* (Vernon et al., September 2015). The proposed project to replace the existing Waipilopilo Bridge will receive federal funds from the Federal Highway Administration (FHWA) and pursuant to the Code of Federal Regulations (CFR) Title 36 Section 800.16(y), the project has been determined to be a federal undertaking subject to National Historic Preservation Act (NHPA) Section 106 process. Project related work will involve the construction of a detour road and bridge; construction of the new Waipilopilo Bridge and a highway width transition for the widened bridge; relocation of utilities; and installation of new road pavement, striping, and markings. The APE totals 1.85 acres of the area along Kamehameha Highway from Imua Place to Waikulama Street and SHPD concurred with the APE on August 31, 2015 (Log No. 2015.02671, Doc. No. 1508JLP02). A brief overview the project history is presented below.

On October 6, 2011, SHPD determined the Waipilopilo Stream Bridge eligible for listing on both the Hawaii State Register of Historic Places (HRHP) and the National Register of Historic Places (NRHP) under Criteria A and C and that the proposed replacement project would result in an adverse effect (October 6, 2011; Log No. 2011.02252, Doc. No. 1109MA08). The SHPD Architecture Branch requested either Historic American Buildings Survey (HABS) II or HABS I as mitigation. Additionally, an archaeological literature review and field inspection (Runyon et al. 2013) identified two historic properties (Site 50-80-06-4795 and the Waipilopilo Stream Bridge) within the proposed project's area of potential effect (APE) and recommended an archaeological inventory survey (AIS) be conducted (August 14, 2013; Log No. 2013.2014, Doc. No. 1308NN01). The archaeological inventory survey plan (AISP) was accepted on January 16, 2014 (Log No. 2013.06297, Doc. No. 1312NN05). The draft AIS report was received on July 15, 2015 (Log No. 2015.02739) for which SHPD held a consultation with Pacific Consulting Services, Inc. (PCSI) and provided written comments for revision (July 28, 2015; Dr. Susan Lebo [SHPD] and Steve Clark [PCSI] meeting). SHPD received the revised submittal on October 28, 2015 (Log No. 2015.03867). The State of Hawaii Department of Transportation (HDOT) provided corrected TMK information in a letter dated January 29, 2016 (Ref. HWY-DB 2.1017; Log No. 2016.00322). Our office received a pre-assessment consultation for the draft environmental assessment (DEA) for the project on March 17, 2016 (Log No. 2016.00657). Finally, we received a revised draft of the AIS report on May 6, 2015 and final minor revisions on June 6, 2015.

The archaeological inventory survey (AIS) was completed at the request of Environmental Planning Solutions, LLC in support of the Waipilopilo Stream Bridge Replacement project. The AIS fieldwork involved the excavation of five backhoe trenches (Trenches 1-5). Auger testing was also completed in Trenches 1-4 at the base of the excavation to determine water table depth. Excavation on the eastern side of Waipilopilo Stream Bridge (Trench 1) documented modern fill overlying natural loamy sand, clay, and sandy loams while excavations on the western side (Trenches 2-5) documented modern fill to 1 m below surface or deeper overlying sandy loam, or clay loam and silty clay. Excavations documented a few historic artifacts including one glass bottle and a ceramic shard, and faunal remains of a medium mammal vertebra.

The AIS identified two historic properties within the proposed undertaking's APE (Site 50-80-06-4795 and the Waipilopilo Bridge) and the report provides significance assessments for each. Site 4795 was previously identified by Masterson et al. (1997) during archaeological monitoring for the Laie waterline project and consists of a pre- to post-Contact buried cultural layer with associated pit features and human burials. During a subsequent AIS for Hau'ula Beach Park expansion project (Masterson et al. 1998), Site 4795 was evaluated significant under Criteria "d" (information potential) and "e" (significance to ethnic group for religious or cultural practices). Pursuant to Hawaii Administrative Rules (HAR) §13-275-6, the current AIS agreed with the previous significance evaluations of Site 4795 being significant under Criteria "d" and "e". The second historic property within the APE is the Waipilopilo Stream Bridge itself which was constructed in 1932 by L.L. McCandles. Pursuant to HAR §13-275-6, the report assessed the Waipilopilo Stream Bridge as significant under Criterion "c" (style or method of construction). Currently, neither Site 4795 nor the Waipilopilo Stream Bridge are listed on the HRHP or the NRHP.

Per the NHPA Section 106, the report provides register eligibility evaluations for Site 4795 and the Waipilopilo Stream Bridge, project effect determination recommendations, and mitigation recommendations. Site 4795 was evaluated eligible for listing on the HRHP and the NRHP under Criterion D. Previously, SHPD determined the Waipilopilo Stream Bridge was evaluated eligible for listing on the HRHP and the NRHP under Criteria A and C. However, the statewide historic bridge inventory survey recommended Waipilopilo Stream Bridge as eligible under Criterion C only (MKE Associates LLC and Fung Associates, Inc. 2013). Therefore, the report recommends the Waipilopilo Stream Bridge as eligible for listing on the NRHP under Criterion C.

The project effect determination recommendations are **"adverse effect"** under NHPA Section 106, and **"effect with proposed mitigation commitments"** under Hawaii Revised Statutes (HRS) §6E-8. The report indicates that if the FHWA project effect determination is **"adverse effect"** then a Memorandum of Agreement (MOA) will be necessary to resolve the adverse effect. The MOA may include stipulations that address the specific mitigation recommendations listed in the AIS report for Site 4795 and the Waipilopilo Stream Bridge.

The report provides several mitigation recommendations to address the effects to the Waipilopilo Stream Bridge and Site 4795. Pursuant to HAR §13-275-8(a)(1)C), the agreed-upon mitigation measures for Site 4795 is data recovery in the form of archaeological monitoring for all ground disturbing project related work; and architectural documentation of the Waipilopilo Stream Bridge. Mitigation recommendations for under Section 106 include HAER documentation of the Waipilopilo Stream Bridge and archaeological monitoring for Site 4795. The MOA may include the identified mitigation recommendations as well as additional stipulations, if appropriate. A HAER study was completed for the Waipilopilo Stream Bridge (Ruzicka 2015; HAER no. HI-124) and accepted by the National Park Service as mitigation for the proposed undertaking; our office received a copy of the HAER study July 13, 2015.

SHPD has reviewed the AIS report and the **State Historic Preservation Officer (SHPO) concurs** with the project effect determination recommendations of **"adverse effect"** per 36 CFR 800.5 and **"effect with proposed mitigation commitments"** per HAR §13-275-7(a)(2). The SHPO also concurs with the aforementioned mitigation recommendations and SHPD looks forward to receiving the following items:

- For the purposes of HRS §6E-8 and as stipulated in HAR §13-275-7(e), **an archaeological monitoring plan** that meets the requirements of HAR §13-279-4 shall be submitted for review and acceptance prior to any project related work commencing;
- A formal letter from the FHWA detailing the final historic property eligibility determinations and project effect determinations for SHPO concurrence; and

- A formal letter from the FHWA agreeing to an MOA that identifies appropriate mitigation measures should the agency provide a project effect determination of "adverse effect."

The report provides sufficient discussion of the project, physical environment, cultural and historical background, previous archaeological studies, methods and field findings, and meets the requirements specified in HAR §13-276-5 and the Secretary of the Interior's Standards for Archaeological Documentation. **It is accepted by SHPD**. Please send one hardcopy of the document, clearly marked FINAL, along with a copy of this review letter and a text-searchable PDF version on CD to the Kapolei SHPD office, attention SHPD Library.

The FHWA is the office of record for this undertaking. Please maintain a copy of this letter with your environmental review record for this undertaking.

Please contact Jessica Puff at (808) 692-8023 or at Jessica.L.Puff@hawaii.gov for any questions regarding architectural resources. Please contact Susan Lebo at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov if you have any questions regarding this letter or if the APE or scope of work changes in any way.

Aloha,



Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc: Meesa Otani, FHWA (Messa.Otani@dot.gov)
Wayne Kaneshiro, FHWA (Wayne.Kaneshiro@dot.gov)
James Fu, HDOT (James.Fu@hawaii.gov)
Steve Clark, PCSI (Steve.Clark@pcsihawaii.com)

Hawaii Revised Statute Chapter 195D

JOSH GREEN, M.D.
GOVERNOR | KE KIAʻĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIAʻĀINA

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA

DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

DAWN N.S. CHANG
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AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
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CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

MEMORANDUM

TO: HENRY KENNEDY, Engineering Program Manager
Design Branch, Department of Transportation

FROM: JASON D. OMICK, Wildlife Program Manager
Division of Forestry and Wildlife

SUBJECT: HRS Chapter 195D and HRS Chapter 343 Consultation for Waipilopilo Stream Bridge Replacement, Kamehameha Highway Right-of-Way, Milepost 20.81, Hauʻula, Oʻahu, Hawaiʻi; Federal Aid Project No BR-083-1(57)

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your consultation request regarding the proposed project. The proposed project consists of replacing the Waipilopilo Stream Bridge on Kamehameha Highway, in Hauʻula, Koʻolauloa, O'ahu. The bridge is bordered by Tax Map Key (TMK) 5-4-002:022, Hauʻula Beach Park to the east and southeast (makai side), and TMK 5-4-017:025, a 74,487-square-foot, privately owned, undeveloped lot to the west (mauka side). The proposed action is a bridge replacement to address deterioration in the bridge girders and deck. Additionally, the project will include widening the bridge deck to improve traffic safety and meet current state and federal design guidelines. The existing bridge superstructure, railings, and pedestrian walkway will be completely removed. The new single span bridge superstructure will consist of concrete girders and a concrete surface. The existing 12-inch and 16-inch waterlines will be relocated onto the bridge deck. The replacement bridge will have a span that is approximately 56 feet long and 49 feet wide. The estimated start of construction is August 2027 for two years. No in-water work will be done. Night work is anticipated but it will be restricted during seabird fledgling season (September 15 to December 15). One utility pole will be removed for construction, and lighting will be returned to original condition upon completion of the project.

Waipilopilo Bridge crosses the Waipilopilo Stream near its discharge into the ocean and the State-owned Hauʻula Beach Park. It is designated as a Riverine and Freshwater Forest/Shrub. The downstream portion of Waipilopilo Stream at the coastline is designated Estuarine and Marine Wetland and the ocean is designated at Estuarine and

Marine Deepwater. The upstream side of the bridge is bordered by an undeveloped open space, and residential. The downstream side of the bridge is within Hauʻula Beach Park. The proposed project site is located with State Land Use District Urban and surrounding land uses include agricultural lands, open space, and residential.

A Biological Assessment was prepared for the proposed action, consisting of a review of available scientific and technical literature regarding natural resources in the project area and action area. SWCA Environmental Consultants reviewed available geospatial data, aerial photographs, and topographic maps of the project area and action area. On December 5, 2024, a SWCA Environmental Consultants' biologist also conducted a field survey of the project area. The survey consisted of pedestrian botanical and faunal surveys. The biologist walked through sections of the site that could serve as potential habitat for wildlife and plants, documenting vegetation types, fauna, wetlands or streams, and any known or suspected special-status species and their habitats. It was determined that with the implementation of planned avoidance and minimization measures, the proposed project may affect, but is not likely to adversely affect, individuals or populations of State-listed seabirds, waterbirds, yellow-faced bee, and Hawaiian hoary bat.

DOFAW concurs with the avoidance and minimization measures outlined for this project to avoid construction and operational impacts to State-listed species including ʻuaʻu or Hawaiian petrel (*Pterodroma sandwichensis*), ʻakeʻake or band-rumped storm petrel (*Oceanodroma castro*), ʻaʻo or Newell's shearwater (*Puffinus newelli*), koloa maoli or Hawaiian duck (*Anas wyvilliana*), aeʻo or Hawaiian stilt (*Himantopus mexicanus knudseni*), ʻalae keʻokeʻo or Hawaiian coot (*Fulica alai*), ʻalae ʻula or Hawaiian gallinule (*Gallinula chloropus sandvicensis*), nalo meli maoli or yellow-faced bee (*Hylaeus* spp.), and ʻōpeʻapeʻa or Hawaiian hoary bat (*Lasiurus cinereus semotus*). DOFAW provides the following additional comments regarding the potential for the proposed work to affect listed species in the vicinity of the project area.

If nighttime construction is required during the seabird fledgling season (September 15 through December 15), we recommend a qualified biologist be present at the project site to monitor and assess the risk of seabird attraction and or grounding due to lighting. If seabirds are seen circling the area, lights should be turned off. If a downed seabird is detected, please follow DOFAW's recommended response protocol by visiting https://dlnr.hawaii.gov/wildlife/seabird-fallout-season/.

Permanent lighting also poses a risk of seabird attraction, and as such should be minimized or eliminated to protect seabird flyways and preserve the night sky. For illustrations and guidance related to seabird-friendly light styles that also protect seabirds and the dark starry skies of Hawaiʻi please visit https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.

It is against State law to harm or harass State-listed waterbirds such as koloa maoli or Hawaiian duck (*Anas wyvilliana*), aeʻo or Hawaiian stilt (*Himantopus mexicanus knudseni*), ʻalae keʻokeʻo or Hawaiian coot (*Fulica alai*), and ʻalae ʻula or Hawaiian gallinule (*Gallinula chloropus sandvicensis*). If any of these species are present during

construction, all activities within 100 feet (30 meters) should cease and the bird or birds should not be approached. Work may continue after the bird or birds leave the area of their own accord. If a nest is discovered at any point, please contact the **Oʻahu Branch DOFAW Office at (808) 973-9778** and establish a buffer zone around the nest.

Barbed wire should be avoided in any construction as ʻōpeʻapeʻa can become ensnared and killed by such fencing material during flight.

The State endangered ʻīlio holo i ka uaua or Hawaiian monk seal (*Monachus schauinslandi*) and threatened honu or green sea turtle (*Chelonia mydas*) could potentially occur or haul out onshore within the vicinity of the proposed project site. Nesting season for honu is April through December and ʻīlio holo i ka uaua can give birth to pups all year round. If either species is detected within 100 feet (30 meters) of the project area, all nearby construction operations should cease and not continue until the focal animal has departed the area on its own accord.

DOFAW is concerned about the impacts of nonnative predators such as cats, rodents, and mongoose, on endangered waterbirds, seabirds, and forest birds. Take action to minimize predator presence; remove cats, place bait stations for rodents and mongoose, and provide covered trash receptacles. As predation is instinctive and even well-fed cats will hunt and kill wildlife, DOFAW also recommends no feeding of feral cats should occur on the premises.

DOFAW recommends using native plant species for landscaping that are appropriate for the area; i.e., plants for which climate conditions are suitable for them to thrive, plants that historically occurred there, etc. Do not plant invasive species. DOFAW also recommends referring to www.plantpono.org for guidance on the selection and evaluation of landscaping plants and to determine the potential invasiveness of plants proposed for use in the project.

Avoid importing soil or other plant material from off-island. Soil and plant material may contain fungi (e.g., rapid ʻōhiʻa death) and other pathogens which could harm our native species and ecosystems. We recommend consulting the Hawaiʻi Interagency Biosecurity Plan at http://dlnr.hawaii.gov/hisc/plans/hibp/ in the planning, design, and construction of the project.

We recommend consulting the **Oʻahu Invasive Species Committee (OISC) at (808) 266-7994** to help plan, design, and construct the project, learn of any high-risk invasive species in the area, and ways to mitigate their spread. Soil and plant material may contain detrimental fungal pathogens (like rapid ʻōhiʻa death), vertebrate and invertebrate pests (e.g. little fire ants, and coconut rhinoceros beetle), or invasive plant propagules (e.g. albizia, pampas grass, fireweed, etc.) that will harm our native ecosystems, and the unique native found within them. Therefore, DOFAW advances the guidance that all equipment and personal items—to include clothing and foot ware should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Additionally, DOFAW recommends minimizing the movement of plant or soil material between

worksites. Suspect pests should be reported through the statewide pest hotline. Photos, videos, and locations can be shared at www.643pest.org or call: 743-PEST. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species.

To prevent the spread of rapid ʻōhiʻa death (ROD), DOFAW requests that removal, pruning/trimming, and potentially injury to ʻōhiʻa trees be avoided as much as possible. Wounds serve as entry points for ROD fungus and increase the odds that the tree will be infected and die. Also, clean gear/tools, clothes, footwear, and vehicles before and after use. Make sure to removal all loose soil from the aforementioned items, spray gear/tools with 70% rubbing alcohol, and wash clothes with hot water and soap. Wash tires and undercarriages of all vehicles/machinery with a high-pressure water source. If ʻōhiʻa trees must be removed or pruned/trimmed, please conduct these activities on a still day to minimize blown sawdust and use a sharp saw to create chips rather than dust. Seal all wounds to these trees with a stump seal product (e.g. Spectricide, etc.). For more information, please consult https://cms.ctahr.hawaii.edu/rod.

The invasive coconut rhinoceros beetle (*Oryctes rhinoceros*) or CRB is widespread on the island of Oʻahu. CRB have been detected on other islands with moderate infestation on Kauaʻi, one incipient site on Hawaiʻi Island, and only one positive site on Maui in 2023. Hawaiʻi Department of Agriculture interim rule 24-1 restricts the movement of CRB-host material from the island of Oʻahu, which is defined as the Quarantine Area. Regulated material (host material or host plants) is considered a risk for potential CRB infestation. Host material for the beetle specifically includes 1) entire dead trees; 2) mulch, compost, trimmings, fruit and vegetative scraps, and 3) decaying stumps. CRB host plants include the live palm plants in the following genera: *Washingtonia*, *Livistona*, and *Pritchardia* (all commonly known as fan palms), *Cocos* (coconut palms), *Phoenix* (date palms), and *Roystonea* (royal palms). When such material or these specific plants are moved there is a risk of spreading CRB because they may contain CRB in any life stage. Inspection and/or treatment approved by HDOA is mandatory before inter-island transport. For more information regarding CRB, please visit https://dlnr.hawaii.gov/hisc/info/invasive-species-profiles/coconut-rhinoceros-beetle/.

We recommend that Best Management Practices are employed during and after construction to contain any soils and sediment with the purpose of preventing damage to near-shore waters and marine ecosystems.

Due to the arid climate, high fine fuel load (grasses) surrounding the worksite, and risks of wildfire to listed species and native habitats, we recommend coordinating with the Hawaiʻi Wildfire Management Organization at (808)-850-0900 or admin@hawaiiwildfire.org, on how wildfire prevention can be addressed in the project area. When engaging in activities that have a high risk of starting a wildfire—like wielding in/near tall grass, it is recommended that you: 1) wet down the area before starting your task, 2) continuously wet down the area as needed, 3) have a fire extinguisher on hand, and 4) in the event that your vision is impaired, (i.e. welding goggles) have a spotter to watch for fire ignitions. Additionally, do not park any vehicles in or near tall grass as heat from the engine/exhaust may ignite dry vegetation.

We appreciate your efforts to work with our office for the conservation of our native species. These comments are general guidelines and should not be considered comprehensive for this site or project. It is the responsibility of the applicant to do their own due diligence to avoid any negative environmental impacts. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Kelli Yamaguchi, Protected Species Habitat Conservation Planning Associate via email at kelli.yamaguchi.researcher@hawaii.gov.

Sincerely,

JASON D. OMICK
Wildlife Program Manager

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL
RESOURCES DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

Date: 7/17/2025

DAR # AR6912

DAWN N.S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

RYAN K.P. KANAKA"OLE
FIRST DEPUTY

CIARA W.K. KAHAHANE
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION BUREAU
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MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES
ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

MEMORANDUM

TO: Brian J. Neilson
DAR Administrator

FROM: Bryan Ishida, Aquatic Biologist

SUBJECT: WAIPILOPILO STREAM BRIDGE REPLACEMENT

Request Submitted by: DOT-HENRY KENNEDY, ENGINEERING PROGRAM MANAGER

Location of Project: KAMEHAMEHA HIGHWAY RIGHT-OF-WAY MILEPOST 20.81
HAUULA, OAHU ISLAND, STATE OF HAWAII

Brief Description of Project:

The project consists of replacing the Waipilopilo Stream Bridge on Kamehameha Highway, Route 83, in the community of Hauula, District of Koolauloa, Island of Oahu. The bridge is bordered by: Tax Map Key (TMK) 5-4-002:022, Hauula Beach Park to the east and southeast, makai side, and TMK 5-4-017:025, a 74,487-square-foot, privately owned, undeveloped lot to the west (mauka side). See Attachment 1: Project Area Map

The proposed action is a bridge replacement to address the deterioration in the bridge girders and

Comments:

☐ No Comments ☒ Comments Attached

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: _____ Date: Jul 31, 2025

Brian J. Neilson
DAR Administrator

DAR# AR6912

Brief Description of Project

deck. Additionally, the project will include widening the bridge deck to improve traffic safety and meet current state and federal design guidelines.

The existing bridge superstructure, railings, and pedestrian walkway will be completely removed. The new single span bridge superstructure will consist of concrete girders and concrete surface. The existing 12-inch and 16-inch waterlines will be relocated onto the bridge deck. The replacement bridge will have a span that is approximately 56 feet long and 49 feet wide. The bridge will accommodate two 11-foot travel lanes (one in each direction) with shoulders on both sides and a protected 6-foot walkway. The bridge deck is being widened to accommodate wider shoulders and improve traffic safety, this widening will not increase capacity or add additional lanes. The new bridge abutments will consist of drilled shafts connected to a cast-in-place reinforced concrete cap beam. The concrete girders will be supported by the cap beams and the concrete surface will be placed on the girders forming a riding surface. No in-water work will be done.

The estimated start of construction is August 2027 for two years. Night work is anticipated but it
will be restricted during seabird fledgling season (September 15 to December 15). The Waipilopilo Bridge will remain open during construction, consisting of contra-flow operation. There will be no temporary bridge or detour. One utility pole will be removed for construction,
lighting will be returned to original condition upon completion of the project. Night work is anticipated to reduce traffic impacts during the daytime. Construction staging will be the responsibility of the contractor.

DAR# AR6912

Comments

Waipilopilo Stream is located within the Kaipapaʻu watershed within the Oʻahu moku of Koʻolauloa. Given the location of this project, potential impacts to both the stream and the adjacent marine environment to the East are of concern. Accordingly, The Division of Aquatic Resources (DAR) recommends that heightened caution be exercised during all proposed actions to prevent negative impacts to aquatic habitats and resources. In particular, DAR stresses the importance of utilizing construction best management practices (BMPs) to prevent or mitigate the release of sediment, silt, debris, chemicals or any other byproduct of the proposed project into the aquatic environment or surrounding areas. Given the potential presence of endemic vertebrates and invertebrates within the stream, caution should be taken to minimize direct impacts to the wetted area. At no time should the channel be completely obstructed, fully-dewatered, or completely diverted outside of the existing channel. DAR also notes that there are several known Hawaiian monk seal haul-out areas within the vicinity of the proposed project. Though the beach at the mouth of Waipilopilo Stream is not commonly used by Hawaiian monk seals for resting, caution should be taken to check the immediate area for their presence before beginning activity each day.

Mahalo for the opportunity to provide comment

National Marine Fisheries Service (NMFS) Essential Fish Habitat

Re: Request for Initiation of Tiered Project-Specific Conference for the Federal Highway Administration's HiWaySLOPES program (I-PI-19-1767-AG, PIRO-2019-01855),

NMFS File No.: I-PI-19-1767-AG, PIRO-2019-01855
Tiered Consultation?: Yes; Implementation Record
NMFS File No.: PIRO-2024-02518
PIRO Reference No.: I-PI-24-2387-DG
Action Agency Award Number: BR-083-1(057)
NMFS Analyst: Benjamin Stablow

Proposed Action: The proposed action consists of replacing the Waipilopilo Stream Bridge. Construction will involve the use of heavy equipment and power tools, and potential in-water work in the Waipilopilo Stream. Construction is estimated to begin in August 2025 and take approximately two years. The bridge will remain open during construction and a contra-flow operation will be employed to separate traffic from the area under construction. The underside of the bridge will be accessed via scaffolding that will be hung from the sides of the bridge, or built adjacent to the stream. One utility pole will be removed for construction, and lighting will be returned to original condition upon completion of the project. Additionally, a grassy clearing will be graded to establish a staging area for equipment. All necessary BMPs established in the HiWaySLOPES programmatic (I-PI-19-1767-AG, PIRO-2019-01855) will be implemented.

Action Area: The proposed bridge replacement will take place about 100 ft. from the Hauʻula beach shoreline along Kamehameha Hwy. Approximately 2,000 m^2 of a grassy clearing 625 ft. North of the Waipilopilo Stream Bridge on the mauka side of the highway, about 244 ft. from the shore will be graded as a staging area for heavy equipment.

Species Considered: The parent consultation record (I-PI-19-1767-AG) considered all designated species and critical habitat within the proposed action area. Here we consider the proposed critical habitat for the Central North Pacific green sea turtle.

NLAA Rationale: All activities proposed by the FHWA align with those previous activities considered in the biological evaluation (i.e., road and bridge repairs, irrigation repairs, vegetation removal and replacement; I-PI-19-1767-AG, PIRO-2019-01855). All stressors to designated species and critical habitat were analyzed in the prior consultation. Here we discuss the potential impacts to proposed green sea turtle critical habitat from the proposed action.

- *Increased Turbidity:* In-water work conducted on the Waipilopilo Stream Bridge may disturb sediment in the stream bed that could subsequently enter the marine environment, exposing essential features of proposed Central Pacific North green sea turtle critical habitat to elevated turbidity. Sedimentation and turbidity can negatively impact green sea turtle food resources like seagrass and algae (USFWS and NMFS 1998). The FHWA will employ BMPs to minimize and contain turbidity and sediment from project-related work through the appropriate use of effective sediment containment devices. The installation of turbidity curtains around the work area will contain sediments and limit turbidity plumes, with some level of elevated turbidity possibly detectable periodically beyond the turbidity curtains. Any appreciable increases in turbidity in the action area are expected to be small in volume and dissipate quickly from the water column. Given the implemented BMPs, we are reasonably certain the effects from exposure to increased turbidity for Central North Pacific green sea turtle critical habitat will not reach the scale where harm or harassment occur and are therefore insignificant.

- *Exposure to Waste and Discharge:* The proposed action involves activities that may expose essential features of proposed green sea turtle critical habitat to wastes and discharges. Land-based vehicles and equipment can cause accidental spills of petroleum-based products (lubricants, oil, and fuel) that may be harmful to green sea turtle foraging resources. BMPs establish that the project will maintain an oil spill contingency plan to control and clean spilled petroleum products, and equipment and vehicles are checked daily before commencing work to reduce the risk of leaks and discharge. Activities will cease if leaks are detected from equipment operations and will not proceed until repaired. If any accidental spill occurs, it is anticipated to be small in size, contained, and quickly cleaned up before entering the aquatic environment. Based on the unlikely event of a spill and the adherence to the BMPs that will prevent or minimize potential exposure from spills, we are reasonably certain the probability of exposure to essential features of proposed green sea turtle critical habitat is extremely unlikely and, therefore discountable.

Conclusions: I agree the FWHA used the best scientific and commercial data available and incorporates the programmatic biological opinion (I-PI-19-1767-AG, PIRO-2019-01855). I also agree that all effects on the identified ESA-listed species are insignificant.

_____ NMFS Representative Signature

October 8, 2024 Date

References:

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Endangered Species Consultation Handbook. Procedures for Conducting Consultation and Conference 4 Activities under Section 7 of the Endangered Species Act. https://www.fisheries.noaa.gov/webdam/download/64572719

U.S. Department of Transportation
Federal Highway Administration

Federal Highway Administration
Hawaii Division
&
National Oceanic and Atmospheric Administration
Pacific Islands Regional Office Protected Resources Division

ENDANGERED SPECIES ACT SECTION 7 PROGRAMMATIC CONSULTATION
HI-WAYSLOPES NOTIFICATION AND VERIFICATION FORM

This form constitutes informal consultation and a request for concurrence under the Standard Local Operating Procedures for Endangered Species in Hawaii (HI-waySLOPES). The Federal Highway Administration (FHWA) is requesting verification from the National Oceanic and Atmospheric Administration (NOAA) that the above referenced project meets all requirements of the Standard Local Operating Procedures for Endangered Species in Hawaii Programmatic Consultation (HI-waySLOPES). The FHWA determined the proposed action is not likely to adversely affect species listed under the Endangered Species Act or their designated critical habitat administered by the National Marine Fisheries Service (NMFS). The project sponsor will be required to comply with the HI-waySLOPES conservation measures and activity-specific best management practices (BMPs) to avoid effects to threatened and endangered marine species.

Date of Request: 10/7/2024
Date of Requested NMFS Response: 11/7/24
Federal-aid Project No.: BR-083-2(057)
NOAA PIRO Reference No.: TBD
Project Sponsor (HDOT or LPA): HDOT
Project Manager Name, Phone, & Email: Andrew Hirano, (808) 692-7546, andrew.j.hirano@hawaii.gov
Project Title: Waipilopilo Stream Bridge Replacement
Project Location (attach a map): Kamehameha Highway, Hauula, Milepost 20.81
Project Latitude and Longitude (approximate): 21°36'53.9"N, 157° 54'47.6"W
Water Body Adjacent or Above: Waipilopilo Stream
Project Description (Scope of Work, if more space is needed, please attach description to form.):

The project consists of replacing the Waipilopilo Stream Bridge on Kamehameha Highway (Route 83) in the community of Hauula, District of Koolauloa, Island of Oahu. The bridge is bordered by: Tax Map Key (TMK) 5-4-2:022, Hauula Beach Park to the east and southeast (makai side) and TMK 5-4-17:25, a 74,487-square-foot, privately owned, undeveloped lot to the west (mauka side).

HDOT is responsible for maintaining the functional and structural integrity of its bridges on all State highways. The purpose of the Waipilopilo Stream Bridge replacement is intended to:

- Improve traffic safety for motorists and pedestrians;
- Meet current State and Federal design guidelines;
- Address bridge maintenance concerns; and
- Meet projected demands on Kamehameha Highway, Route 83, on the north shore of Oahu.

Construction staging will take place on the corner of Ikea Loop and Kamehameha Highway, within the privately owned mauka parcel TMK 5-4-004: 002. The estimated start of construction is August 2025 for 2-years. Night work is anticipated and may last the full duration of the construction period. The Waipilopilo Bridge will remain open during construction, consisting of contra-flow operation. There will be no temporary bridge or detour. One utility pole will be removed for construction, lighting will be returned to original condition upon completion of the project. Please refer to the enclosed project location map that delineates the proposed action area.

COVERED ACTIVITIES:
Please select the activities included in the scope of work for the project. More detailed information about the activities is included in the Biological Evaluation.

- ☐ Road repair, resurfacing, and/or reconstruction
- ☑ Bridge repair, rehabilitation, and/or replacement
- ☑ Grading and establishment of staging and storage areas
- ☐ Geotechnical Drilling
- ☐ Grading of access roads and traffic detours

NOAA SPECIES/CRITICAL HABITAT IN ACTION AREA:
Please select the species and/or designated critical habitat that occurs in the action area.

- ☑ Green sea turtle (*Chelonia mydas*), Central North Pacific DPS – threatened
- ☑ Hawksbill sea turtle (*Eretmochelys imbricate*) – endangered
- ☑ Hawaiian monk seal (*Monachus schauinslandi*) – endangered
- ☑ Hawaiian monk seal (*Monachus schauinslandi*) – critical habitat

Please provide justification, description of marine environment to be impacted, additional BMPs, special conditions and/or additional avoidance and minimization measures the applicant has proposed in order to comply with the HI-waySLOPES programmatic consultation and to ensure the proposed project is not likely to adversely affect endangered or threatened species under NMFS jurisdiction or to destroy or adversely modify critical habitat. Attach map and drawings.

The Waipilopilo Stream Bridge is approximately 100-feet from the shoreline. There may be in-water work for this project. HDOT is coordinating with the U.S. Army Corps of Engineers (USACE) and anticipates obtaining a Nationwide Permit (NWP) from USACE. Appropriate stormwater best management practices (BMPs) will be implemented and maintained throughout construction to minimize potential effects, if any, to NMFS protected species.

The Contractor will be required to prevent any debris from falling into the water. Access to the bridge under-deck would be from scaffolding hung from the sides of the bridge or built adjacent to the stream.

The project is not likely to adversely affect threatened or endangered species under NMFS jurisdiction, such as green sea turtles, as they are unlikely to travel up stream to the project site. There are no critical habitat for listed species in the action area.

CONSERVATION MEASURES:
All applicable conservation measures shall be included in the Plans or Specifications.

All projects covered under HI-waySLOPES shall implement the following conservation measures:

1. Constant vigilance shall be kept for the presence of ESA-listed marine species (sea turtles) at all times.
2. A responsible party (i.e., permittee/site manager/project supervisor) shall designate a competent observer to search/monitor work sites and the areas adjacent to the authorized work area for ESA-listed marine species.
3. Work shall be postponed or halted when ESA-listed marine species are within 50 yards.
4. A pollution and erosion control plan for the project site and adjacent areas must be prepared and carried out. As a minimum, this plan all include:
    a. Proper installation and maintenance of silt fences/curtains, sausages, equipment diapers, or drip pans.
    b. A contingency plan to control and clean spilled petroleum products and other toxic materials.
    c. Appropriate materials to contain and clean potential spills will be stored at the work site, and be readily available.
    d. All project-related materials and equipment placed in the water will be free of pollutants.
    e. Daily pre-work inspections of heavy equipment for cleanliness and leaks, with all heavy equipment operations postponed or halted until leaks are repaired and equipment is cleaned.
    f. Fueling of project-related vehicles and equipment will take place at least 50 feet away from the water and within a containment area, preferably over an impervious surface.
5. BMPs shall be implemented in accordance with An Integrated Storm Water Management Approach and a Summary of Clear Water Diversion and Isolation Best Management Practices for Use in the State of Hawaii, by the Federal Highway Administration and Hawaii Department of Transportation Practitioners Guide (2016) or the Construction Best Management Practices Field Manual by the State of Hawaii Department of Transportation (2008).

Does the project have in-water work?

☑ Yes
☐ No

If yes, then the following conservation measures shall be implemented:

1. All objects will be lowered to the bottom in a controlled manner. This can include the use of buoyancy controls such as lift bags, or the use of cranes, winches, or other equipment that affect positive control over the rate of descent.
2. Special attention shall be given to ensure that no ESA-listed marine species are within 50 yards of maintenance dredging, in-water excavation and movement of large armor stones, and benthic core sampling, and that those operations will immediately shut-down should any ESA-listed species enter within that range.
3. Full-depth silt curtains (or alternative as described in justification) shall be installed around all work sites with the potential to disturb and mobilize sediments. This will contain mobilized sediments in the marine environment and reduce the potential for elevated turbidity.

RECOMMENDATION BY PROJECT SPONSOR:

The Project Sponsor recommends to FHWA that the proposed project be considered consistent with HI-waySLOPES **programmatic consultation.** Additionally, the Project Sponsor agrees to implement the applicable conservation measures and agrees to re-consult if there is any change in the description of the project or new information reveals that the effects of the proposed action may affect ESA-listed species in a manner or extent not previously considered, or a new species or critical habitat is designated that may be affected by the proposed action.

Recommended by HDOT and/or LPA Project Manager:

Signature:	Date:
Henry Kennedy	Jun 28, 2024

FHWA DETERMINATION:

FHWA has determined that the proposed project meets all requirements of the HI-waySLOPES and that the proposed action is not likely to adversely affect species listed under the Endangered Species Act or their designated critical habitat administered by the NMFS. The FHWA requests concurrence from NMFS with this determination.

FHWA Signature:	Date:
Mera J. Ota	October 7, 2024

NMFS CONCURRENCE:

☑ NMFS concurs with the FHWA determination that the proposed project is consistent with HI-waySLOPES, as described and checked above.

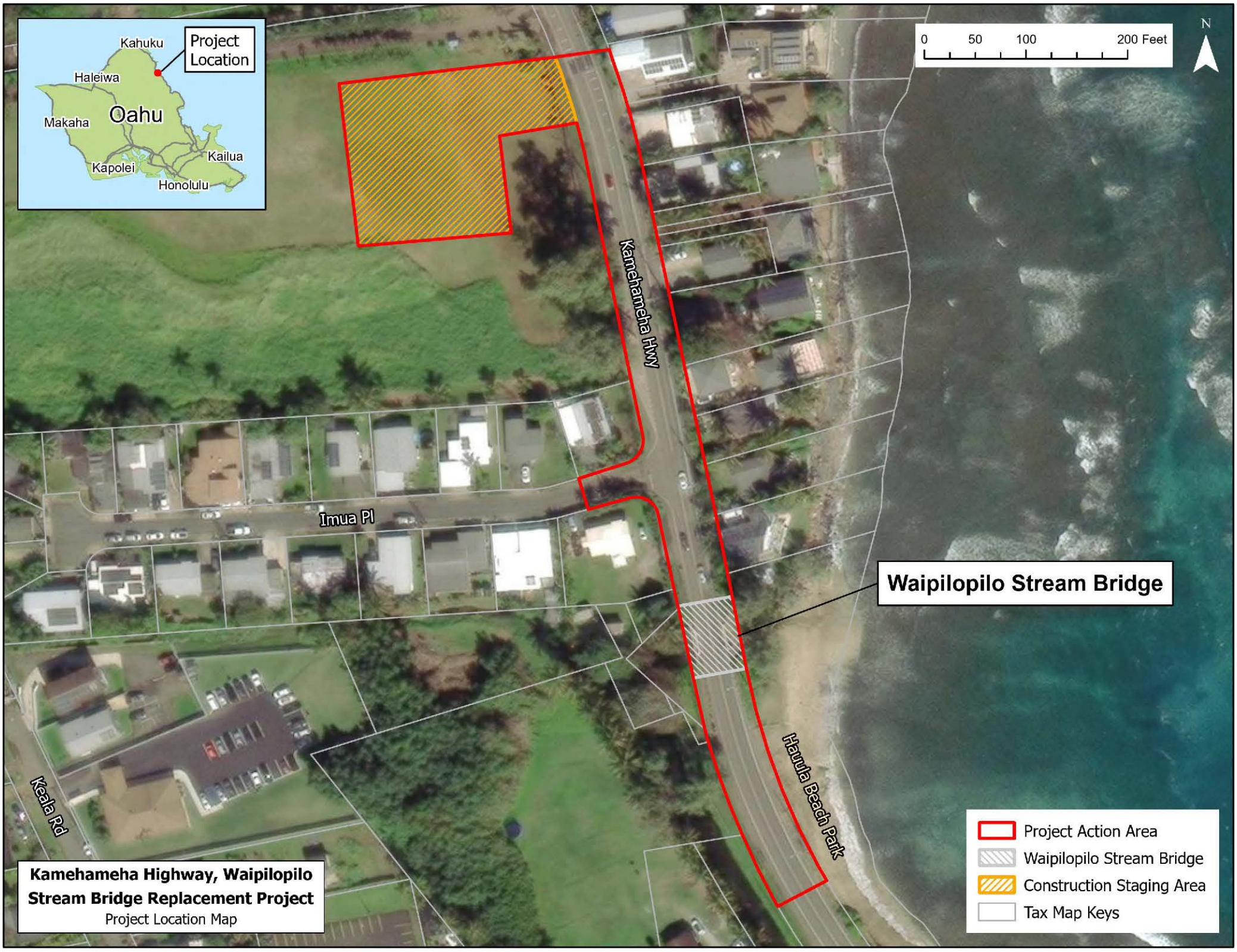
☐ NMFS does not concur with the FHWA determination that the project is consistent with HI-waySLOPES, as described and checked above, and requests an individual Section 7 consultation.

NMFS Signature:	Date:
	October 8, 2024

ATTACHMENTS:

Please select documents attached to form.

- ☑ Project Location Map
- ☐ Project Description
- ☐ Drawings
- ☑ Photos
- ☐ Other



Kamehameha Highway, Waipilopilo Stream Bridge Replacement Project

Project Location Map


Kahuku
Project Location
Haleiwa
Oahu
Makaha
Kailua
Kapolei
Honolulu
0
50
100
200 Feet
N
Kamehameha Hwy
Imua Pl
Waipilopilo Stream Bridge
Haauia Beach Park
Keala Rd
Project Action Area
Waipilopilo Stream Bridge
Construction Staging Area
Tax Map Keys
Wetlands
Estuarine and Marine Deepwater
Estuarine and Marine Wetland
Freshwater Forested/Shrub Wetland
Kamehameha Highway, Waipilopilo Stream Bridge Replacement Project
Wetlands Map











Waipilopilo Stream Bridge roadway view. (Looking towards Kahuku)

From: Otani, Meesa (FHWA)
To: Kimoto, Evan; Hirano, Andrew J; Laus, Lawrence M; Mimura, Misako K
Subject: [EXTERNAL] FW: BR-083-1(057) Waipilopilo Stream Bridge Replacement EFH Consultation
Date: Wednesday, January 8, 2025 5:02:56 PM

FYI

From: Alexandria Barkman - NOAA Federal <alexandria.barkman@noaa.gov>
Sent: Wednesday, January 8, 2025 5:01 PM
To: Otani, Meesa (FHWA) <meesa.otani@dot.gov>
Subject: Re: BR-083-1(057) Waipilopilo Stream Bridge Replacement EFH Consultation

CAUTION: This email originated from outside of the Department of Transportation (DOT). Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Aloha Meesa,
Thank you for agreeing to implement the CR. The EFH consultation for the Waipilopilo Stream Bridge Project is complete.

Alex

On Wed, Jan 8, 2025 at 4:55 PM Otani, Meesa (FHWA) <meesa.otani@dot.gov> wrote:

> Hi Alex,
>
> Thank you for your response.
>
> HDOT will implement the additional conservation recommendation"
>
> *Conservation Recommendation 1:* Develop a plan for managing equipment, materials, and job site conditions in the event of approaching foul weather (e.g., tropical storms and hurricanes). Equipment and materials may need to be removed from the project site or adequately secured. Stormwater runoff and erosion may require heightened management during storm events.
>
> Please let me know if you have any questions.
>
> Thank you!
> Meesa
>
> ---
>
> **From:** Alexandria Barkman - NOAA Federal <alexandria.barkman@noaa.gov>
> **Sent:** Thursday, December 12, 2024 2:00 PM
> **To:** Otani, Meesa (FHWA) <meesa.otani@dot.gov>
> **Cc:** evan.kimoto@hawaii.gov; Laus, Lawrence M <lawrence.m.laus@hawaii.gov>; misako.k.mimura@hawaii.gov; Hirano, Andrew J <andrew.j.hirano@hawaii.gov>; Gerry Davis -

NOAA Federal <gerry.davis@noaa.gov>; Malia Chow - NOAA Federal <malia.chow@noaa.gov>; David Delaney - NOAA Federal <david.delaney@noaa.gov>; Sean Hanser - NOAA Federal <sean.hanser@noaa.gov>
Subject: Re: BR-083-1(057) Waipilopilo Stream Bridge Replacement EFH Consultation

CAUTION: This email originated from outside of the Department of Transportation (DOT). Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Aloha Meesa,

The National Marine Fisheries Service, Pacific Islands Regional Office (NMFS), received the Federal Highway Administration's (hereafter, FHWA) essential fish habitat (EFH) consultation request and EFH Assessment (EFHA) for the Waipilopilo Stream Bridge Repair project on October 7, 2024. Additional information was received on November 19 and December 6, 2024. After reviewing the consultation enclosures, we have determined that there may be adverse effects to EFH. In the EFHA, you have outlined best management practices (BMPs) that, when adhered to and implemented, will avoid and minimize most adverse effects to EFH. We are providing a conservation recommendation pursuant to the EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA; Section 305(b)(4)(A) as described by 50 CFR 600.920). Implementing the recommendation will help you further avoid and minimize potential adverse effects to EFH.

Project Description

The purpose of the proposed project is to replace the Waipilopilo Stream Bridge on Kamehameha Highway in Hau'ula, Oahu, Hawai'i. The existing bridge will be demolished and removed, and a new bridge will be constructed. The new bridge will be approximately 46 feet wide by 60 feet long and made of concrete. Four drilled shafts (likely 4 foot (ft) diameter) will be installed on either side of the bridge. All drilled shafts will be behind the existing bridge abutment, which will remain. No in-water work will take place for this project. The heavy equipment used for the project will include a concrete truck, pump truck, concrete paving machine/screed, crane, forklift, backhoe, excavator, loader, trucks, drill rig, concrete saw, hoe ram, and jack hammer. Construction staging would take place in a grassy flat clearing in front of the Asia Pacific International School on the corner of Ikea Loop and Kamehameha Highway. There would be no cleared vegetation to access the staging area.

Night work is anticipated and may last the full duration of the construction period. The Waipilopilo Bridge would remain open during construction, consisting of contra-flow operation. There would be no temporary bridge or tour. One utility pole would be removed for construction, lighting would be returned to original condition upon completion of the project. The work is estimated to take two years, starting in August 2025.

Essential Fish Habitat

The marine water column from the surface to a depth of 3,281 ft from the shoreline to the outer boundary of the EEZ (200 nautical miles), and the seafloor from the shoreline out to

a depth of 2,296 ft around each of the Hawaiian Islands, have been designated as EFH. As such, the water column and bottom of the Pacific Ocean around O'ahu are designated as EFH, and support various life stages for the management unit species (MUS) identified under the Western Pacific Fishery Management Council's Pelagic and Hawai'i Archipelago Fishery Ecosystem Plans. The MUS and life stages found in these waters include eggs, larvae, juveniles, and adults of Bottomfish, Crustacean, and Pelagic MUS. Specific types of habitat considered as EFH include coral reef, patch reefs, hard substrate, artificial substrate, seagrass beds, soft substrate, lagoon, estuarine, surge zone, deep-slope terraces and pelagic/open ocean.

Baseline Condition

Waipilopilo stream is located on Oahu's northeast coastline. The stream empties in the Hau'ula Beach. The benthic cover directly offshore from the action area is coralline algae and macroalgae (Battista et al. 2007).

Adverse Effects

Construction that occurs in coastal areas or streams can end up affecting aspects of EFH downstream from where a project occurs. Stressors that affect water quality through either increased turbidity or contamination can, in turn, affect flora and fauna over time and space (Minton 2017).

> Sedimentation (pollution stressor): Land-based work could result in disturbed sediments entering the stream that leads to the ocean, especially during heavy rains. Increased turbidity can elicit short- and long-term responses from aquatic organisms depending on the quantity, quality, and duration of suspended sediment exposure (Kjelland et al. 2015). Coral reef organisms are easily smothered by sediment and can experience both physiological and lethal responses to concentrations below 10 milligrams (mg)/cm^2/day and 10 mg/Liter (L) (Tuttle and Donahue 2022). Adverse effects from deposited sediment can occur as low as 1 mg/cm^2/day for larvae and 4.9 mg/cm^2/day for adult tissue (Tuttle and Donahue 2022). Suspended sediment levels of 10 mg/L can lead to reduced growth rates and levels of 3.2 mg/L can cause bleaching and tissue mortality (Tuttle and Donahue 2022), although corals show considerable interspecific variability. Increased turbidity can cause changes in fish behavior, including altered predator-prey relationships (Higham et al. 2015). There will not be any in-water work for this project, reducing the risk of increased turbidity impacting EFH.
>
> Chemical Contamination (pollution stressor): Use of machinery on land can lead to accidental spills or leaks of petroleum products. The chemical spills could introduce toxicants to the steam through runoff and eventually the marine environment. Contaminants can have a variety of lethal and sublethal effects on habitat-forming marine organisms, including alteration of growth, interference with reproduction, disruption of metabolic processes, and changes in behavior. These adverse effects can cascade through ecosystems, altering species composition and ecosystem functions and services. Some pollutants are environmentally persistent and can take years or even decades to biodegrade, and others can bioaccumulate or biomagnify through the food chain, eventually posing a direct threat to human health. Contaminant concentrations in fishes are linked to

locations with increased urbanization and military history (Nalley et al. 2021; 2023a).

Nutrient Loading (pollution stressor): Construction along coasts can result in nutrient loading to occur both during and after construction. The decline of coral reefs close to urbanized areas, agriculturally, or industrially exploited regions has been considered to be promoted by anthropogenic nutrient enrichment of reef waters (D'Angelo and Wiedenmann 2014). Coral reef ecosystems thrive in oligotrophic, or nutrient-poor, waters, and nutrient enrichment has been shown to negatively affect coral reef ecosystems directly and indirectly (Nalley et al. 2023b). Exposure to elevated nutrients can cause a shift to an assemblage dominated by algae (Lapointe 1997; Dudgeon et al. 2010). Nutrient enrichment can also lead to increased abundances of invasive algae that outcompete native algae in areas with nutrient pollution (Dulai et al. 2023).

Invasive Species (biological stressor): Introduced species are organisms that have been moved, intentionally or unintentionally, into areas where they do not naturally occur. Invasive species rapidly increase in abundance to the point that they come to dominate their new environment, creating adverse ecological effects to other species of the ecosystem and the functions and services it may provide (Goldberg and Wilkinson, 2004). Nearly 500 Introduced species have been identified in Hawaii (Coles and Eldredge 2002; Carlton and Eldredge 2009). Invasive species can decrease species diversity, change trophic structure, and diminish physical structure, but adverse effects are highly variable and species-specific. Invasive algae may be introduced to the site on equipment, though the risk will be minimal since no in-water work is expected for this project.

FHWA-proposed BMPs

To minimize any potential effects to EFH managed species, the following additional BMPs and minimization measures will be implemented:

- Waste Management – Concrete wastes solid wastes, and any sanitary/septic wastes will be located away from and managed to assure no contamination.
- Vehicle and Equipment Management – All vehicles and equipment cleaning, maintenance, and refueling will be located away from and managed to assure no contamination to the marine environment.
- Storm Water Management and Erosion Control – Site-specific storm water BMPs will be implemented and/or installed at the road staging and work areas to prevent water quality degradation associated with storm water runoff. The Contractor will be required to install and maintain BMPs as part of the proposed project. The Contractor will be required to prevent any debris from falling into the water.
- The HDOT Standard Specification for Road and Bridge Construction Section 209 Temporary Water Pollution, Dust, and Erosion Control will be followed.
- Reduce the generation and runoff of pollutants during bridge reconstruction operations by decreasing the use of hazardous materials and incorporating practices to prevent spillage into sensitive areas.
- The project will require temporary construction laydown areas near the bridge. Stockpiling, storage, and equipment staging will utilize appropriate BMPs to prevent potential surface

runoff from entering the stream. No stockpiling, storage, or equipment staging will occur in the stream.

- Invasive species controls shall be maintained to ensure that all materials transported from off-site are free of such species

FHWA Conclusion

With the implementation of FHWA provided BMPs and minimization measures, the FHWA determined that the project will have no more than minimal adverse effects on EFH and MUS.

NMFS Conclusion

NMFS agrees with the FHWA's determination that the proposed action will adversely affect EFH, but the adverse effects are expected to be no more than minimal.

Conservation Recommendation

Pursuant to Section 305(b)(4)(A) (as described by 50 CFR 600.920 and 600.925(b)) of the MSA, we provide the following conservation recommendation that when implemented, will ensure that potential adverse effects to EFH at the proposed action areas are avoided, minimized, and offset.

Conservation Recommendation 1: Develop a plan for managing equipment, materials, and job site conditions in the event of approaching foul weather (e.g., tropical storms and hurricanes). Equipment and materials may need to be removed from the project site or adequately secured. Stormwater runoff and erosion may require heightened management during storm events.

Conclusion

Your EFH consultation submission provided a sufficient description of the action needed for the BMPs for a project that will occur on land. NMFS has concluded that this project may have adverse effects on EFH, and have found necessary to provide only one conservation recommendation in consideration of extreme weather during the activity period. When implemented and adhered to, this recommendation will help to further ensure that potential adverse effects to EFH are avoided and minimized. Please be advised that regulations (Section 305(b)(4)(B)) to implement the EFH provisions of the Magnuson-Stevens Act requires that federal agencies provide a written response to this letter within 30 days of its receipt, but a preliminary response is acceptable if more time is needed. The final response must include a description of measures to be required or actions to be taken to address the conservation recommendation. If the conservation recommendation cannot be adopted, an explanation of the reason for not implementing them must be provided at least 10 days prior to final approval of the activities.

Thank you for coordinating on this proposed project. Feel free to contact me 808-725-5018 or at alexandria.barkman@noaa.gov with any questions or comments.

Regards,

Alex

Literature cited

Battista, T., B. Costa, and S. Anderson. 2007. Shallow-water benthic habitats of the main eight Hawaiian Islands. NOAA Technical Memorandum NOS NCCOS 61, Biogeography Branch. Silver Spring, MD.

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Kjelland, M., C. Woodley, T. Swannack, and D. Smith. 2015. A review of the potential effects of suspended sediment on fishes: Potential dredging-related physiological, behavioral, and transgenerational implications. *Environ. Syst. and Decis.*, 35:334-350.

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M.D. Sudnovsky, J.L. Whitney, M.J. Donahue. 2023a. Trophic and spatial patterns of contaminants in fishes from the Republic of the Marshall Islands in the equatorial Pacific. *Chemosphere*, 314:137593.

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Tuttle, L.J. and M.J. Donahue. 2022. Effects of sediment exposure on corals: A systematic review of experimental studies. *Environ. Evid.*, *11*(1):1-33.

On Mon, Oct 7, 2024 at 4:45 PM 'Otani, Meesa (FHWA)' via _NMFS PIR ESHESA <efhesaconsult@noaa.gov> wrote:

> Good afternoon,
>
> Attached is the Essential Fish Habitat consultation for the Kamehameha Highway, Waipilopilo Stream Bridge Replacement project.
>
> Please let me know if you have any questions.
>
> Thank you!
>
> Meesa Otani
> Environmental Engineer
> Federal Highway Administration, Hawaii Division Office
> 300 Ala Moana Blvd. Rm. 3-229, Box 50206
> Honolulu, Hawaii 96850
> (808) 541-2316 | meesa.otani@dot.gov
> Call me on Teams
> Chat with me on Teams

--

Alexandria Barkman, PhD.
EFH Consulting Biologist, PIRO Habitat Conservation Division
National Marine Fisheries Service | U.S. Department of Commerce
Office: (808) 725-5150
www.fisheries.noaa.gov

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Alexandria Barkman, PhD.

EFH Consulting Biologist, PIRO Habitat Conservation Division
National Marine Fisheries Service | U.S. Department of Commerce
Office: (808) 725-5150
www.fisheries.noaa.gov



U.S. Coast Guard

U.S. Department of Homeland Security

United States Coast Guard

Commander
Fourteenth Coast Guard District

300 Ala Moana Blvd.
Honolulu, HI 96850-4982
Staff Symbol:dpw
Phone: (808)535-3412
Fax: (808)535-3414
Email: Douglas.J.Milelr@uscg.mil

RECEIVED
MAR 0 8 2013
HAWAII DIVISION

16211

MAR 8 2013

Mrs. Meesa Otani.
FHWA – Hawaii Federal – Aid Division
300 Ala Moana BLVD, Rm 3-306
Box 50206
Honolulu, HI 96850

Re: Waipilopilo Stream Bridge Replacement, Project No. BR-083-1(57)

Dear Mrs. Otani:

This is in response to your letter dated February 21, 2013 invoking 23 U.S.C. Section 144 (h) for the referenced bridge project. Based upon information you have provided, we concur with your determination.

Although this project will not require a bridge permit, other areas of Coast Guard jurisdiction apply. The following stipulations must be met:

a. Any changes or modification to the proposed plan must be reviewed by this office.

b. Any spillage of oil or oil based products during construction must be promptly reported to the Coast Guard by calling 1-800-424-8802.

Additionally, we have determined that the Waipilopilo Bridge does not have significant nighttime navigation and, as such, is exempt from any lighting and or signal requirements as per Title 33 Code of Federal Regulations Part 118.40.

If you have any further questions feel free to contact LT Douglas Miller at the number above.

Sincerely,

B. HOFFERBER
Commander, U. S. Coast Guard
Chief, Waterways Management Branch
By direction

Copy: USCG Sector Honolulu

Special Management Area

City & County Honolulu
Department of
Planning & Permitting
650 S. King Street
Honolulu, Hawaii 96813
Phone (808) 768-8000
dpp@honolulu.gov

Special Management Area Permit Determination

DPP TRACKING NUMBER

The purpose of this form is to determine whether the permitting requirements of Chapter 25, Special Management Area, Revised Ordinances of Honolulu applies to your permit. There is a standard fee of $150 per tax map key. A final determination will be made prior to issuing permits. All checks shall be payable to the City and County of Honolulu.

Applicant Information

Name: Edwin H. Sniffen, Director, and Andrew Hirano, Project Manager, Design Branch, Highway Design Section, State of Hawaii Department of Transportation

Mailing Address: State of Hawaii Department of Transportation, Highways Division, 869 Punchbowl Street, Honolulu, HI 96813

Phone Number: (808) 587-2150; (808) 692-7546

Email address: edwin.h.sniffen@hawaii.gov; andrew.j.hirano@hawaii.gov

Signature: _____ **Date:** Jun 9, 2025

2025 JUN 12 AM 10
CITY & COUNTY OF HONOLULU
DEPT. OF PLANNING AND PERMITTING

Property Information

Street Address/ Location of Property: Waipilopilo Stream Bridge Replacement / Hauula, District of Koolauloa, Oahu

Tax Map Key(s): 5-4-002:022, 5-4-017:021

Describe Existing Site and Use:

Attach if available:
- Existing site plans
- Drawings
- Photographs
- Other documents that will help to describe the existing condition

The Hawaii Department of Transportation, Highways, (HDOT-HWY) proposes to replace the existing Waipilopilo Stream Bridge on Kamehameha Highway (Route 83) in the community of Hauula, District of Koolauloa, Island of Oahu. The bridge is bordered by Tax Map Key (TMK) 5-4-2 022, Hauula Beach Park to the east and southeast (makai side) and TMK 5-4-17 21, a 3 337 sf, privately owned, undeveloped lot to the west (mauka side). The purpose of the project is to replace the Waipilopilo Stream Bridge to meet current State and Federal design guidelines. The proposed project will also address bridge maintenance concerns, improve traffic safety for motorists and pedestrians and meet projected demands on Kamehameha Highway, Route 83, on the north shore of Oahu. The use of State land or funds for replacing the bridge triggers Chapter 343, HRS.

The project also uses federal fund provided by the Federal Highway Administration (FHWA) and is thus, subject to environmental documentation requirements set forth under the National Environmental Policy Act (NEPA), 42 U.S.C. 4332(2)(c).

The existing bridge is located at milepost 20.81 on Kamehameha Highway between Waikulama Street and Imua Place in the Koolauloa District on the island of Oahu. It crosses the Waipilopilo Stream near its discharge into the ocean and State-owned Hauula Beach Park. The upstream side of the bridge is bordered by an undeveloped lot owned by a private individual. Other lots on the mauka side surrounding the privately owned lot include the State of Hawaii, City & County of Honolulu and private owners further mauka. The downstream side of the bridge is within Hauula Beach Park. On the Kahuku side residential houses are located mauka and makai of the highway.

Describe Proposed Activity or Development:

- Describe the proposed use (i.e., Single Family Dwelling, retail, accessory, etc.)
- Type of structure (residential, commercial, industrial)
- Include floor area calculations, estimated cost or detailed cost valuation
- If available, attach proposed site plans, and other proposed drawings

The proposed action is a bridge replacement to address the deterioration in the bridge girders and deck. Additionally, the project will include widening the bridge deck to improve traffic safety and meet current State and Federal design guidelines.

The existing bridge superstructure, railings and pedestrian walkway will be completely removed. The new single span bridge superstructure will consist of concrete girders and concrete surface. The existing 12" and 16" waterlines will be relocated onto the bridge deck. The replacement bridge will have a span that is 56 feet in length and 49 feet wide. The bridge will accommodate two 11-foot travel lanes (one lane in each direction) with shoulders on both sides and a protected 6-foot walkway. The bridge deck is being widened to accommodate wider shoulders and improve traffic safety. The widening will not increase capacity or add additional lanes. The new bridge abutments will consist of drilled shafts connected to a cast-in-place reinforced concrete cap beam. The concrete girders will be supported by the cap beams and the concrete surface will be placed on the girders forming the riding surface. No in-water work will be done.

During construction, Waipilopilo Bridge will remain open, consisting of contra-flow operation. There will be no temporary bridge or detour. To reduce traffic impact during the daytime, nightwork is anticipated and may last the full duration of the 18–24-month construction period.

Construction staging areas and potential construction parcels will be determined by the Project Contractor.

There will be electrical relocation work outside of the HDOT right-of-way (ROW).

Special Management Area Permit Determination – Page 2

2025/ELOG-1092(MM)

THIS PAGE TO BE COMPLETED BY THE DEPARTMENT OF PLANNING AND PERMITTING

Is an SMA permit required? ☐ **Yes** ☒ **No, pursuant to Section 25-1.3(2) (C), ROH (see below)**

☐ **Yes, permit required per Section 25-1.3(3) or (4), ROH**

Proposal involves:

☐ **(A)** Construction or reconstruction of a dwelling unit that is less than 7,500 square feet of floor area, is not situated on a shoreline lot or a lot that is impacted by waves, storm surges, high tide, or shoreline erosion, and is not part of a larger development of three or more dwelling units;

☐ **(B)** Structural and nonstructural improvements:

- ☐ **(i)** To existing dwelling units, including the addition of minor accessory structures and floor area additions; provided that such additions are limited to 300 square feet if the dwelling unit is considered development, or
- ☐ **(ii)** Directly related to relocating a dwelling unit farther mauka or to an area less susceptible to coastal hazards, on the same zoning lot, and activities related to the relocation of the dwelling unit;

☒ **(C)** Repair or maintenance of roads and highways within existing rights-of-way;

☐ **(D)** Routine maintenance dredging of existing streams, channels, or drainageways;

☐ **(E)** The repair and maintenance of underground utility lines, including but not limited to water, sewer, power, or telephone lines, or minor appurtenant structures, such as pad mounted transformers and sewer pump stations;

☐ **(F)** Zoning variances, except with respect to height, density, or parking, or shoreline setback variances;

☐ **(G)** Repair, maintenance, or interior alterations to existing structures;

☐ **(H)** Demolition or removal of structures, except for structures located on any historic site as designated in national or State registers;

☐ **(I)** The use of any land for the purpose of cultivating, planting, growing, and harvesting of plants, crops, trees, and other agricultural, horticultural, or forestry products; animal husbandry; aquaculture or mariculture of plants or animals; or other agricultural purposes, subject to review by the agency in accordance with subdivision (3); provided that this exclusion does not apply to uses associated with agricultural activity dedicated to manufacturing, processing, or packaging;

☐ **(J)** The transfer of title to land;

☐ **(K)** The creation or termination of easements, covenants, or other rights in structures or land;

☐ **(L)** The subdivision of a parcel of land into four or fewer parcels if no associated construction activities are proposed; provided that after the initial subdivision, any subsequent subdivision of the resulting parcels will be considered development for purposes of this chapter;

☐ **(M)** Installation of underground utility lines and appurtenant aboveground fixtures less than 4 feet in height along existing corridors;

☐ **(N)** Nonstructural improvements to existing commercial structures; or

☐ **(O)** Construction, installation, maintenance, repair, or replacement of emergency management warning or signal devices and sirens.

Preliminary SMA Permit Determination

☐ **Minor** ☐ **Major**

Note: Final determination will be based on review of actual SMA Application submission

Minor Permits: See Sections 25-2.3 and 25-5.2, ROH

Major Permits: See Sections 25-2.3 and 25-5.3, ROH

Notes:

Proposal to replace the existing Waipilopilo Stream Bridge to comply with current State and Federal design guidelines and for maintenance repairs does not meet ROH Chapter 25 definition of "development." An SMA Permit is not required, provided that all work is done within the right of way. Receipt No. 25-00796 and Check No. 1687314 attached.

SIGNATURE	for Dawn Takeuchi Apuna Director TITLE	June 27, 2025 DATE

Chapter 25 of the Revised Ordinance of Honolulu (ROH) and the Application Instructions for the SMA permits can be found on our website: https://www.honolulu.gov/dpp/permitting/coastal-area-permits.html

Section 6(f)

JOSH GREEN, M.D.
GOVERNOR | KE KIAʻĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIAʻĀINA

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA

DIVISION OF STATE PARKS
P.O. BOX 621
HONOLULU, HAWAII 96809

DAWN N.S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

LAURA H.E. KAAKUA
FIRST DEPUTY

DEAN D. UYENO
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

January 10, 2024

Mr. Henry Kennedy
Engineering Program Manager, Design Branch
State Department of Transportation
Highway Division
601 Kamokila Boulevard, Room 688A
Kapolei, HI 96707

Dear Mr. Kennedy:

SUBJECT: Waipilopilo Stream Bridge Replacement Project
Kamehameha Highway, Hauʻula, Koʻolauloa, Oʻahu
TMK: (1) 5-4-017:001 por., 5-4-017:016 por.

This letter confirms that the project proposed by State Department of Transportation, Highways Division to replace the Waipilopilo Stream Bridge in Hauʻula will not affect any property where federal grant funds were used through the Land and Water Conservation Fund (LWCF) program. The LWCF program provides stateside funding assistance for public outdoor recreation and on behalf of the National Park Service, the State Department of Land and Natural Resources, Division of State Parks administers the program on the state level.

When these federal funds are used to acquire, develop, or renovate a recreation property, it is designated a LWCF protected property and subject to Section 6(f)(3) of the LWCF Act. No LWCF funds have been used at Hauʻula Beach Park which adjoins the project area. The nearest property receiving LWCF funding assistance is Hauʻula Community Park, also known as Hauʻula District Park, which is about 0.5 mile south of the project area. Based on the maps and information provided, the project will not affect the LWCF protected property and Section 6(f) does not apply for this bridge replacement project.

If you have any questions, please contact Martha Yent, Hawaiʻi LWCF Coordinator, at Martha.E.Yent@hawaii.gov or 808-587-0287.

Sincerely,

Curt Cottrell

CURT COTTRELL
State Parks Administrator

Conservation District Use Permit Coordination

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA

P.O. BOX 621
HONOLULU, HAWAII 96809

DAWN N.S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RYAN K.P. KANAKA'OLE
FIRST DEPUTY

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AQUATIC RESOURCES
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ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

REF:OCCL:AW

Corr. OA 24-147

Apr 2, 2024

Andrew Hirono, HDOT Project Manager
State of Hwaii, Department of Transportation
601 Kamokila Boulevard, Room 688
Kapolei, HI 96707

SUBJECT: Pre-consultation for Draft Environmental Assessment (EA) for Waipilopilo Bridge Replacement Project, Haula, HI Tax Map Key (TMK) (1) 5-4-002:022

Dear Mr. Hirono,

The Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands (OCCL) is responding to your letter dated 18 March 2024 regarding proposed Waipilopilo Bridge Replacement Project along Kamehameha Highway in Hauula. According to the information you provided, the location of the proposed construction is outside of the Conservation District boundaries and is not regulated by this office. However, the construction may impact the adjacent beach park and state land makai of the shoreline. We encourage you to incorporate construction best practices to reduce any negative impacts on the beach and nearshore waters. OCCL also encourages you to review the State of Hawai`i Sea Level Rise Viewer (https://www.pacioos.hawaii.edu/shoreline/slr-hawaii/) to assess the potential impacts of sea level rise on the bridge replacement project, and to review and incorporate the recommendations of the 2017 Hawaii Sea Level Rise Vulnerability and Adaptation Report and 2022 Update to that Report to improve infrastructure resilience. Those reports can be found at: https://climate.hawaii.gov/hi-adaptation/climate-change-reports/.

Please contact Amy Wirts, University of Hawaii Sea Grant Extension Agent and OCCL Coastal Lands Program Coordinator at (808) 587-0376 or by email at Amy.E.Wirts@hawaii.gov, should you have any questions regarding this matter.

Sincerely,

S Michael Cain

S. Michael Cain, Administrator
Office of Conservation and Coastal Lands

APPENDIX B STRUCTURAL PLANS

INDEX TO DRAWINGS	
SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	STANDARD PLANS SUMMARY
3-12	GENERAL NOTES AND ABBREVIATIONS
13-17	WATER POLLUTION & EROSION CONTROL PLAN, NOTES AND DETAILS
18	ALIGNMENT PLAN
19-23	ROADWAY PLAN
24-27	UTILITY PLAN
28-29	PAVEMENT MARKINGS PLAN, NOTES AND LEGEND
30-35	TRAFFIC CONTROL PLAN, NOTES, LEGEND AND DETAILS
36-71	STRUCTURAL PLANS

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION
HONOLULU, HAWAII

PLANS FOR

KAMEHAMEHA HIGHWAY

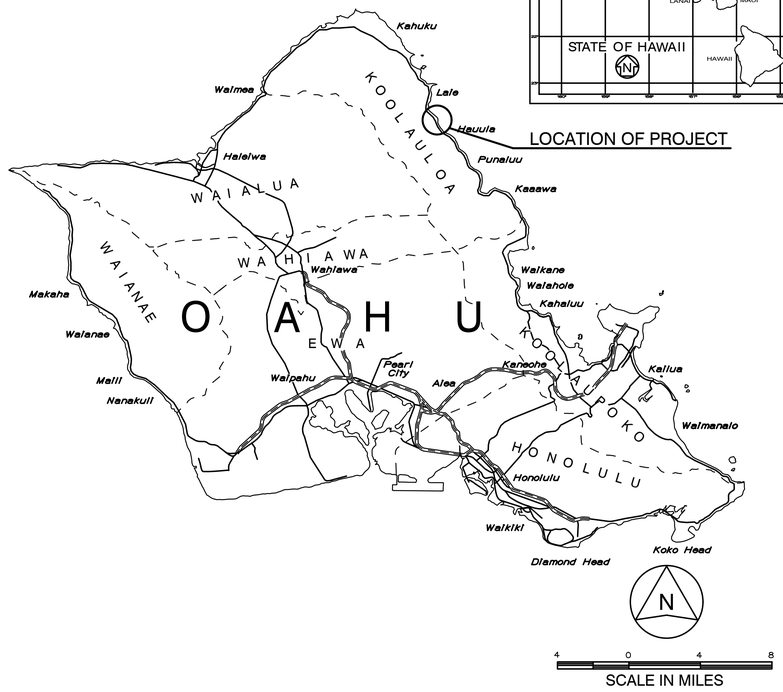
WAIPILOPILO STREAM BRIDGE REHABILITATION

FEDERAL AID PROJECT NO. BR-083-1(57)

DISTRICT OF KOOLAULAU
ISLAND OF OAHU

Preliminary Submittal - 3/14/25

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	1	71

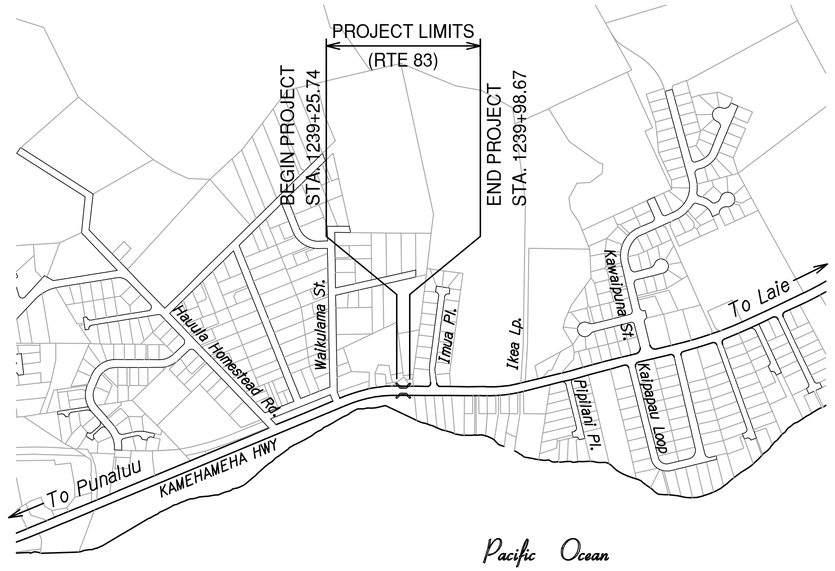


FEDERAL AID INTERSTATE PROJECTS PREVIOUSLY CONSTRUCTED OR UNDER CONSTRUCTION

MILE POST __X__ TO MILE POST __X__

DESIGN DESIGNATION

ADT (2034)	19,600
ADT (2044)	21,200
DHV (2034)	1,570
DHV (2044)	1,700
K	8.0
D	55/45
T	4.5
T24	5.5



LAYOUT PLAN

NOT TO SCALE

N

WSP USA INC.	HWY-DD	692-7548	MAR 2025
DESIGNED BY	MANAGED BY	PHONE	DATE

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
NOTE BOOK	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

APPROVED:

HIGHWAYS ADMINISTRATOR DATE

STANDARD PLANS SUMMARY

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	2	71

STANDARD PLAN NO.	TITLE	DATE
B-01	NOTES & MISCELLANEOUS DETAILS	05/31/07
B-03	BACKFILL DETAILS AT EARTH RETAINING STRUCTURES	05/31/07
B-12	PRESTRESSED CONCRETE PILES & COMPRESSION SPLICE	05/31/07
	CAN DETAILS	
B-12A	PRESTRESSED CONCRETE PILES, PILE & COMPRESSION	05/31/07
	SPLICE CAN DETAILS & NOTES	
B-12B	PILE INTERACTION DIAGRAM	05/31/07
B-13	PRESTRESSED CONCRETE PILE BUILD-UP DETAILS	05/31/07

D-01	CATTLE GATE	05/31/07
D-02	CHAIN LINK FENCE WITH TOPRAIL	05/31/07
D-03	CHAIN LINK FENCE WITHOUT TOPRAIL	05/31/07
D-04	WIRE FENCE WITH METAL POSTS	05/31/07
D-05	TYPICAL DETAILS OF CURBS AND/OR GUTTERS	05/31/07
D-06	TYPICAL DETAIL OF REINFORCED CONCRETE DROP DRIVEWAY	05/31/07
D-07	CENTERLINE AND REFERENCE SURVEY MONUMENTS	05/31/07
D-08	STREET SURVEY MONUMENT	05/31/07
D-15	CONCRETE SIDEWALK	05/31/07
D-16	P.C.C. BUS PAD	05/31/07
D-17	P.C.C. BUS PAD	05/31/07
D-18	P.C.C. PAVEMENT LAYOUT	05/31/07
D-19	P.C.C. PAVEMENT W/ PERMEABLE BASE JOINT DETAILS	05/31/07
D-20	P.C.C. PAVEMENT W/ PERMEABLE BASE JOINT DETAILS	05/31/07
D-21	P.C.C. LONGITUDINAL JOINT DETAILS	05/31/07
D-22	P.C.C. CONNECTION TO CURBS AND GUTTERS	05/31/07
D-23	JOINTS	05/31/07

L-01	TREE PLANTING	08/16/06
L-02	TREE PLANTING	08/16/06
L-03	TREE TRANSPLANTING	08/16/06
L-04	PALM PLANTING	08/16/06
L-05	SHRUB PLANTING	08/16/06
L-06	LANDSCAPE DETAILS	08/16/06
L-07	LANDSCAPE DETAILS	08/16/06
L-08	LANDSCAPE DETAILS	08/16/06
L-09	LANDSCAPE DETAILS	08/16/06
L-10	LANDSCAPE DETAILS	08/16/06
L-11	PLANTING NOTES	08/16/06
L-12	IRRIGATION DETAILS	08/16/06
L-13	IRRIGATION DETAILS	08/16/06
L-14	IRRIGATION DETAILS	08/16/06
L-15	IRRIGATION DETAILS	08/16/06
L-16	IRRIGATION DETAILS	08/16/06
L-17	IRRIGATION DETAILS	08/16/06
L-18	IRRIGATION DETAILS	08/16/06
L-19	IRRIGATION DETAILS	08/16/06
L-20	IRRIGATION DETAILS	08/16/06
L-21	IRRIGATION DETAILS	08/16/06
L-22	IRRIGATION DETAILS	08/16/06
L-23	IRRIGATION DETAILS	08/16/06
L-24	IRRIGATION NOTES	08/16/06

STANDARD PLAN NO.	TITLE	DATE
H-01A	TYPE A CATCH BASIN	05/31/07
H-01B	TYPE B CATCH BASIN	05/31/07
H-01C	TYPE C CATCH BASIN	05/31/07
H-01D	TYPE D CATCH BASIN	05/31/07
H-01E	CATCH BASIN SECTIONS	05/31/07
H-02A	TYPE A1 CATCH BASIN	05/31/07
H-02B	TYPE B2 CATCH BASIN	05/31/07
H-02C	TYPE C1 CATCH BASIN	05/31/07
H-02D	TYPE D1 CATCH BASIN	05/31/07
H-02E	CATCH BASIN SECTION	05/31/07
H-03	TYPE A,B, AND C STORM DRAIN MANHOLE	05/31/07
H-04	TYPE D STORM DRAIN MANHOLE	05/31/07
H-05	TYPICAL REINFORCING DETAILS FOR DRAINAGE STRUCTURES	05/31/07
H-06	TYPICAL REINFORCING DETAILS FOR DRAINAGE STRUCTURES	05/31/07
H-07	CATCH BASIN AND MANHOLE CASTINGS	05/31/07
H-08	TYPE 1A-9 AND 1A-9P GRATED DROP INLET	05/31/07
H-09	TYPE 2A-9 AND 2A-9P GRATED DROP INLET	05/31/07
H-10	TYPE A-9 OR A-9P STEEL FRAMES	05/31/07
H-11	TYPE A-9 AND A-9P STEEL GRATES	05/31/07
H-12	TYPE 61614P AND 1211214P GRATED DROP INLET	05/31/07
H-13	TYPE 61616P AND 1211216P GRATED DROP INLET	05/31/07
H-14	TYPE 61214P GRATED DROP INLET	05/31/07
H-15	TYPE 1211214, 1211214P, 1211216, 1211216P STEEL	05/31/07
	FRAME AND GRATES	
H-16	TYPE 61614, 61614P, 61616, 61616P STEEL FRAME	05/31/07
	AND GRATES	
H-17	TYPE 61214 STEEL FRAMES AND GRATES	05/31/07
H-18	TYPE 61214P STEEL GRATES	05/31/07
H-19	TYPE 61614B STEEL FRAME AND GRATES	05/31/07
H-20	CEMENT RUBBLE MASONRY STRUCTURES	05/31/07
H-21	CONCRETE AND CEMENT RUBBLE MASONRY STRUCTURES	05/31/07
H-22	INLET/OUTLET STRUCTURE	05/31/07
H-23	INLET/OUTLET STRUCTURE	05/31/07
H-24	FLARED END SECTION FOR CULVERTS	05/31/07
H-25	FLARED END SECTION FOR CULVERTS	05/31/07
H-26	CONCRETE SPILLWAY INLET	05/31/07
H-27	CAP COUPLING DETAILS STANDARD JOINT	05/31/07
H-28	REINFORCED CONCRETE COLLAR & JACKET	05/31/07
H-29	UNDERDRAIN CLEANOUT STEEL FRAME AND COVER	05/31/07
H-30	UNDERDRAIN CONNECTION TO DRAINAGE STRUCTURE	05/31/07

TE-01	SIGN HEIGHT AND LOCATION	07/11/08
TE-1A	SIGN INSTALLATION	07/11/08
TE-02A	GALVANIZED FLANGED CHANNEL SIGN POST MOUNTING	05/31/07
TE-02B	GALVANIZED FLANGED CHANNEL SIGN POST MOUNTING	05/31/07
TE-02C	GALVANIZED FLANGED CHANNEL SIGN POST MOUNTING	05/31/07
TE-03A	GALVANIZED SQUARE TUBE SIGN POST MOUNTING	05/31/07
TE-03B	GALVANIZED SQUARE TUBE SIGN POST MOUNTING	05/31/07
TE-04 ●	REGULATORY SIGNS	07/11/08
TE-05 ●	WARNING SIGNS	07/11/08
TE-06 ●	MISCELLANEOUS SIGNS	07/11/08
TE-07 ●	CONSTRUCTION SIGNS	07/11/08
TE-08	MISCELLANEOUS INTERSECTION SIGNS	07/11/08

STANDARD PLAN NO.	TITLE	DATE
TE-09	BIKE ROUTE SIGN & SUPPLEMENTARY PLATES	07/11/08
TE-10	INTERSTATE ROUTE MARKER	07/11/08
TE-11	STATE ROUTE MARKER AND AUXILIARY MARKERS	07/11/08
TE-12	STATE ROUTE MARKER AND BORDER DETAIL FOR	07/11/08
	GUIDE SIGNS	
TE-12A	ROUTE SIGN ASSEMBLIES	07/11/08
TE-13	STREET NAME SIGN ON MAST ARM	07/11/08
TE-14	MISCELLANEOUS REFLECTOR MARKERS	07/11/08
TE-15	OBJECT MARKERS	07/11/08
TE-16	MILE POSTS	07/11/08
TE-17A	CANTILEVER OVERHEAD SIGN ELEVATION & DETAILS	05/31/07
TE-17B	CANTILEVER SIGN FRAME DETAIL AND SECTION	05/31/07
TE-17C	CANTILEVER SIGN FRAME DETAIL	05/31/07
TE-17D	CANTILEVER SIGN FRAME SECTION	05/31/07
TE-17E	CANTILEVER SIGN FRAME DETAILS	05/31/07
TE-18A	TWO POST OVERHEAD SIGN FRAME ELEVATIONS	05/31/07
TE-18B	TWO POST SIGN FRAMING PLAN SECTION	05/31/07
TE-18C	TWO POST SIGN FRAMING SECTIONS AND DETAILS	05/31/07
TE-18D	TWO POST SIGN FRAME DETAILS	05/31/07
TE-18E	TWO POST SIGN FRAME DETAILS	05/31/07
TE-19A	OVERHEAD SIGN FRAMING SCHEDULE	05/31/07
TE-19B	SIGN POST DRILLED SHAFT FOUNDATION	05/31/07
TE-19C	SPREAD FOOTING	05/31/07
TE-19D	SIGN FRAME FOUNDATION SCHEDULE	05/31/07
TE-19D.1	SIGN FRAME FOUNDATION SCHEDULE	05/31/07
TE-19D.2	SIGN FRAME FOUNDATION SCHEDULE	05/31/07
TE-19D.3	SIGN FRAME FOUNDATION SCHEDULE	05/31/07
TE-19D.4	SIGN FRAME FOUNDATION SCHEDULE	05/31/07
TE-19D.5	SIGN FRAME FOUNDATION SCHEDULE	05/31/07
TE-19E	ANCHORAGE DETAILS	05/31/07
TE-19F	ANCHORAGE DETAILS	05/31/07
TE-19G	MISCELLANEOUS SIGN FRAME DETAILS	05/31/07
TE-19H	LUMINAIRE WALKWAY SUPPORT	05/31/07
TE-19J	FIXED MESSAGE LUMINAIRE SUPPORT	05/31/07
TE-19K	MISCELLANEOUS SIGN DETAILS	05/31/07
TE-19L	MISCELLANEOUS SIGN DETAILS	05/31/07
TE-19M	MISCELLANEOUS SIGN FRAME DETAILS	05/31/07
TE-20	SUPPORTS FOR GROUND MOUNTED GUIDE SIGN	05/31/07
TE-20A	SUPPORTS FOR GROUND MOUNTED GUIDE SIGN	05/31/07
TE-20B	SUPPORTS FOR GROUND MOUNTED GUIDE SIGN	05/31/07
TE-20C	SUPPORTS FOR GROUND MOUNTED GUIDE SIGN	05/31/07
TE-21A	SIGN BREAKAWAY MOUNTS	05/31/07
TE-21B	SIGN BREAKAWAY MOUNTS	05/31/07
TE-22	LAMINATED ALUMINUM SIGN PANELS (OVERHEAD)	05/31/07
TE-23	LAMINATED ALUMINUM SIGN PANELS (GROUND MOUNTED)	07/11/08
TE-24	SOLID ALUMINUM EXTRUDED SIGN PANEL AND	05/31/07
	ACCESSORY DETAILS	
TE-25	GUIDE SIGNS LUMINAIRE MOUNTINGS	05/31/07
TE-26 ●	RAISED PAVEMENT MARKERS AND STRIPING	07/11/08
TE-27 ●	RAISED PAVEMENT MARKERS AND STRIPING	07/11/08
TE-28	ENTRANCE AND EXIT PAVEMENT MARKINGS	07/11/08
TE-28A	MISCELLANEOUS PAVEMENT MARKINGS	07/11/08
TE-29	PAVEMENT ARROWS AND SYMBOLS	07/11/08
TE-30	PAVEMENT ALPHABETS, NUMBERS & SYMBOLS	07/11/08
TE-31	PAVEMENT ALPHABETS, NUMBERS & SYMBOLS	07/11/08

STANDARD PLAN NO.	TITLE	DATE
TE-32	TYPE I & II TRAFFIC SIGNAL SYSTEM MISC. DETAILS	05/31/07
TE-33	TYPE II TRAFFIC SIGNAL SYSTEM	08/16/06
TE-33A.1	TYPE II TRAFFIC SIGNAL STANDARD	05/31/07
TE-33A.2	TYPE II TRAFFIC SIGNAL STANDARD	05/31/07
TE-34	LOOP DETECTOR DETAILS	07/11/08
TE-35	LOOP DETECTORS & DUCT DETAILS	07/11/08
TE-36	TRAFFIC SIGNAL DETAILS	07/11/08
TE-37	PULLBOX & COVER DETAILS	07/11/08
TE-37A	TYPE "A" TRAFFIC PULLBOX	05/31/07
TE-37B	TYPE "A" TRAFFIC PULLBOX REINFORCING	05/31/07
TE-37C	TYPE "B" TRAFFIC PULLBOX	05/31/07
TE-37D	TYPE "B" TRAFFIC PULLBOX REINFORCING	05/31/07
TE-37E	TYPE "B" TRAFFIC PULLBOX FOUNDATION	05/31/07
TE-37F	TYPE "C" TRAFFIC PULLBOX	05/31/07
TE-37G	TYPE "C" TRAFFIC PULLBOX REINFORCING	05/31/07
TE-37H	TYPE "C" TRAFFIC PULLBOX FOUNDATION	05/31/07
TE-37J	TRAFFIC PULLBOX COVER AND DETAILS	05/31/07
TE-38	TYPE III TRAFFIC SIGNAL STANDARD	05/31/07
TE-38A.1	TYPE III TRAFFIC SIGNAL STANDARD	05/31/07
TE-38A.2	TYPE III TRAFFIC SIGNAL STANDARD	05/31/07
TE-39	METAL GUARDRAIL CONNECTION TO CONCRETE BARRIER	07/11/08
TE-40	CONCRETE BARRIER TRANSITION	05/31/07
TE-40A	CONCRETE BARRIER TRANSITION SECTIONS	05/31/07
TE-41	GUARDRAIL TYPE 4 (RIGID BARRIER)	05/31/07
TE-42	PORTABLE CONCRETE BARRIER	05/31/07
TE-43	PORTABLE CONCRETE BARRIER	05/31/07
TE-44	GUARDRAIL TYPE 4 MISCELLANEOUS DETAILS	07/11/08
TE-45 ●	BARRICADES	07/11/08
TE-46	DELINEATION & PAVEMENT MARKINGS AT NARROW BRIDGES	07/11/08
TE-47	HIGHWAY LIGHT STANDARD	05/31/07

NOTE:

STANDARD PLANS APPLICABLE TO THIS PROJECT ARE INDICATED BY A " ● " NEXT TO THE STANDARD PLAN NO. (FOR EXAMPLE: D-07 ●)

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD PLAN SUMMARY

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None *Date: Mar. 2025*

SHEET No. *G-1* OF *1* SHEETS

SURVEY PLOTTED BY _____ DATE
DRAWN BY _____
TRACED BY _____
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ORIGINAL PLAN
NOTE BOOK _____
No. _____

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	3	71

GENERAL NOTES:

1. The project is the replacement of the existing Waipilopilo Stream Bridge. The project includes removing the existing bridge superstructure, and the construction of AC pavement, cold planing, one span bridge, temporary and permanent waterline relocations, concrete approach slab, guardrails, installation and relocation of fencing, street lighting, relocation of temporary and permanent overhead utility lines, installing pavement markings, adjusting and relocating utilities, erosion control and traffic control.

2. The Contractor is reminded of the requirements of Subsection 105.16 - Subcontracts, which requires the Contractor to perform work amounting to not less than 30 percent of the total contract cost less deductible items. Non-compliance with this Subsection may be grounds for rejection of bid.

3. The Contractor's attention is directed to the following Sections of the Special Provisions: Subsection 104.09 - Maintenance of Traffic; Subsection 104.11 - Utilities and Services; Subsection 107.06 - Contractor Duty Regarding Public Convenience; and Section 645 - Work Zone Traffic Control.

4. The existence and location of underground utilities, manholes, monuments and structures as shown on the plans are from the latest available data, but the accuracy is not guaranteed. The encountering of other obstacles during the course of work is possible. The Contractor shall tone for the exact locations and depths of all underground utilities, either shown on or omitted from the plans, in areas where work, such as the placement of sign posts, installation of guardrail, traffic signal, widening, etc. may affect these properties. Toning shall be considered incidental to the various contract items and will not be paid for seperately. The Contractor shall be held liable for any damages incurred to the existing facilities and/or improvements as a result of his operations. All damaged portions shall be replaced in accordance with the standards and specifications of the affected utility company at no cost to the State.

5. All existing utilities, whether or not shown on the plans, shall be protected at all times by the Contractor during construction unless specified on the plans to be abandoned. The Contractor shall be held liable for any damages incurred to the existing utilities as a result of his operations. All damaged portions shall be replaced in accordance with the Standards and Specifications of the affected utility company at no cost to the State.

6. The Contractor shall verify the presence of existing aerial and underground utilities which may conflict with construction activities and shall coordinate with the utility company for temporary relocations, as necessary. All costs associated with temporary relocations shall be borne by the Contractor.

7. The Contractor shall indemnify and be solely responsible for the protection of adjacent properties, utilities and existing structures from damages due to construction. Repairing any damage shall be at the Contractor's own expense, to the satisfaction of the Engineer.

8. Prior to resurfacing operations, the Contractor shall be responsible for locating, preserving and marking all utility and highway facilities that will require adjustments to the new finished pavement grade. Additionally, the Contractor shall submit to the Engineer a list of all items, including water, drainage, sewer, electrical, telephone, and cable utilities to be adjusted to the new finished grade.

9. The Contractor shall submit maintenance plans and schedules, including road or lane closures, lane switches, and the placement of temporary traffic control devices to the Engineer for acceptance prior to Construction.

10. The Contractor shall notify the Engineer in writing, two (2) weeks prior to starting construction operations.

11. The exact locations and limits of areas to be reconstructed and cold planed shall be determined in the field by the Engineer.

12. The Contractor shall notify the following for any work affecting bus operations, routes, or stops no less than 30 days prior to the start date. Point of contact information (Notification is required to all phone numbers and emails):

    DTS-TMD
    (808) 768-8396
    thebusstop@honolulu.gov & handivan@honolulu.gov

    Oahu Transit Services-Bus Operations
    (808) 768-9520 & (808) 768-9534
    John.donovan@thebus.org, Sean-bennett.paio@thebus.org & Field-ops-mgr@thebus.org

    Oahu Transit Services - Paratransit Operations
    (808) 456-5021
    Tracie.coelho@thebus.org

13. The Contractor shall obtain all necessary permits prior to start of work at his own cost.

14. At the end of each day's work, the Contractor shall remove all equipment and other obstructions to permit free and safe passage of public traffic.

15. The Contractor shall remove and dispose of all existing raised pavement markers and traffic tapes prior to the overlaying of Asphalt Concrete. This work shall be considered incidental to the various pay items and will not be paid for separately.

16. The existing drainage system shall be kept functional at all times during construction. The Contractor shall furnish materials, equipment, labor, tools and incidentals necessary to maintain flow. This work shall be considered incidental to various contract items.

17. Smooth riding connections shall be constructed at all limits of resurfacing including the beginning and end of project, connecting approaches, side streets, walkways and driveways as shown on the plans and/or as directed by the Engineer. This work shall be considered incidental to various contract items.

18. The Contractor shall clean and remove any accumulation of aggregates along the roadside within 10 feet of the edge of pavement. This work shall be considered incidental to various contract items.

19. Tack coat shall be incidental to various Asphalt Concrete Pavement items.

20. Dressing of shoulder shall consist of clearing, grubbing, grading, reshaping and compacting the unpaved shoulders with suitable material as shown on the plans and/or as directed by the Engineer. This work shall be considered incidental to the various contract items.

21. Removal and disposal of existing guardrail, end terminals, asphalt concrete pavement, and any debris shall be considered incidental to their respective bid items.

22. All saw cutting work including vacuuming of slurry shall be considered incidental to various contract items and will not be paid for separately.

23. The Contractor shall provide for vehicular and pedestrian access to and from all existing side streets and driveways at all times.

24. Existing facilities and/or pavement to remain which has been damaged by the Contractor shall be restored to its original condition at no cost to the State.

25. The Contractor shall be held liable for any damages incurred to the existing landscaping as a result of his operations.

26. Contractor shall dispose or deliver any removed material at no cost to the State.

27. The Contractor shall provide and maintain for access to and from all existing driveways, sidewalks, ADA access routes complying with 2010 ADAAG Section 206.1, side streets, and cross streets at all times. This work shall be considered incidental to various contract items and will not be paid for separately.

28. The Contractor is to take special measures to reduce dust from cold planing operations including but not limited to use of water misters on cold planing equipment and vacuum sweepers. Use of power brooms to sweep road is not allowed if a dust nuisance is created.

29. The vertical riding surface drop-off between adjacent surfaces shall not exceed 3-inches. This shall include differences in height between adjacent pavement surfaces, cold planed surfaces, bridge decks and new concrete slabs. If a vertical riding surface drop-off exists at the end of each day's work, the Contractor shall provide temporary transition tapers with maximum slopes of 48:1 for travel in the longitudinal direction and 6:1 for transverse movements.

30. The Contractor shall not perform any construction work during periods of heavy rainfall.

31. The Contractor shall use the Traffic Control setup included in the 2005 Hawaii Standard Specifications for Road and Bridge Construction Section 645, and/or develop a site specific Traffic Control Plan where warranted.

32. If, during construction, any previously unidentified archeological sites or remains (such as artifacts, shell , bone, or charcoal deposits, human burials, rock or coral alignments, pavings or walls) are encountered, the Contractor shall stop work and contact SHPD immediately. Work in the immediate area must stop until SHPD asses the impact and makes further recommendations for mitigative activity.

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STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GENERAL NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. N-1 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	4	71

NOTES FOR PROTECTION OF ENDANGERED SPECIES:

1. HAWAIIAN SEABIRDS
   No night time construction will be permitted during the seabird fledging period (September 15th through December 15th). The Contractor's attention is directed to Special Provision Section 107.18 - Avoidance and Minimization Measures for Endangered Species.

   All outdoor lights shall be fully shielded and only visible from below the bulb height. Outdoor lights shall only be used when necessary and shall be turned off when activity is not occurring in the lighted area.

2. HAWAIIAN HOARY BAT ('Ope'ape'a)
   No disturbing, clearing, grubbing, or trimming of woody plants greater than 15' tall shall be allowed during the Hawaiian Hoary Bat birthing and pup-rearing season (June 1st through September 15th).

   The Contractor shall not use barbed wire fencing.

3. HAWAIIAN WATERBIRDS
   In areas where waterbirds are known to be present, post and implement reduced speed limits and inform project personnel about the presence of endangered species on-site.

   In areas where vegetated streambanks would be disturbed, waterbird nest searches shall be conducted by a qualified biologist before any work is conducted, within 3 days of project initiation and after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest).

   If a nest or active brood is found:
   - Contact the Service (808) 861-8525 within 48 hours for further guidance.
   - Establish and maintain a 100-foot buffer around all active nests and/or broods until the chicks/ducklings have fledged. Do not conduct potentially disruptive activities or habitat alteration within this buffer.

4. SEA TURTLES
   When possible, night work near the beach, night work near the beach will be avoided between May 1 and November 1, the sea turtle nesting and hatching season

5. Shielded lighting to reduce direct and ambient lighting of beach habitats within and adjacent to the project site will be used.

   When possible, night work near the beach will be avoided between May 1 and November 1, the sea turtle nesting and hatching season.

6. HAWAIIAN SHORT-EARED OWL OR PUEO
   Before clearing any vegetation, daily pre-construction surveys shall be conducted by a qualified biologists

   If pueo nests are present, DOFAW staff should be notified and a 100 foot buffer zone should be established in which no clearing occurs until nesting is completed.

7. A biological monitor that is familiar with the species' biology shall be present on the project site during all construction or earth moving activities until the chicks/ducklings fledge to ensure that Hawaiian waterbirds and nests are not adversely impacted.

NOTES FOR PROTECTION OF ENDANGERED SPECIES (CON'T):

8. Turbidity and siltation from project-related work should be minimized and contained within the project area by silt containment devices and curtailing work during flooding or adverse tidal and weather conditions. BMPs should be maintained for the life of the construction period until turbidity and siltation within the project area is stabilized. All project construction-related debris and sediment containment devices should be removed and disposed of at an approved site.

9. No project construction-related materials or equipment (dredges, vessels, backhoes, silt curtains, etc.) shall be placed in an aquatic environment. Project related activities should not result in any debris disposal, non-native species introductions, or attraction of non-native pests to the affected or adjacent aquatic or terrestrial habitats.

10. Project construction-related materials (fill, revetment rock, pipe, etc.) should not be stockpiled in, or in close proximity to, aquatic habitats and should be protected from erosion (e.g., with filter fabric, etc.), to prevent materials from being carried into waters by wind, rain, or high surf.

11. Fueling of project-related vehicles and equipment should take place away from the aquatic environment and a contingency plan to control petroleum products accidentally spilled during the project should be developed. The plan should be retained on site with the person responsible for compliance with the plan. Absorbent pads and containment booms should be stored on-site to facilitate the clean-up of accidental petroleum releases.

12. All deliberately exposed soil or under-layer materials used in the project near water should be protected from erosion and stabilized as soon as possible with geotextile, filter fabric or native or non-invasive vegetation matting, hydro-seeding, etc.

13. Artificial light from exterior fixtures on the zoning lot, including but not limited to floodlights, uplights, or spot lights used for decorative or aesthetic purposes, is prohibited if the light directly illuminates or is directed to project across property boundaries toward the shoreline and ocean waters, except as otherwise permitted pursuant to HRS Section 205A-71(b). All outdoor lighting shall be fully shielded during and after construction to avoid artificial light impacts on seabirds, hoary bats, and sea turtles, particularly during the seabird fledgling season from September 15 through December 15.

14. All project activities must cease if a Hawaiian monk seal or green sea turtle is present within 150 ft of the work area, or as recommended by State of Federal regulations. Project activities may only recommence after the animal voluntarily leaves the area. If a monk seal and/or pup pair is present, a 300 ft buffer must be observed. Any Project-related debris that may impose an entaglement threat to monk seals and turtles must be removed from the work area at the end of wach day and at the conclusion of the Project.-related activites.

PUBLIC HEALTH, SAFETY, AND CONVENIENCE NOTES:

1. The Contractor shall observe and comply with all Federal, State, and Local laws required for the protection of public health and safety and environmental quality.

2. The Contractor, at his own expense, shall keep the project and its surrounding areas free from dust nuisance. The work shall be in conformance with the air pollution standards and regulations of the State Department of Health. The City may require supplementary measures as necessary.

PUBLIC HEALTH, SAFETY, AND CONVENIENCE NOTES (CON'T):

3. The Contractor's attention is directed to Chapter 448, Public Health Regulations, Department of Health, State of Hawaii, "Community Noise Control for Oahu" in which maximum allowable noise levels have been set. If the construction activities for this project will exceed the allowable noise levels, the Contractor will be required to obtain a permit from the Director of the Department of Health. The Contractor shall obtain a copy of Chapter 448 and become familiar with the noise level restrictions and the procedures for obtaining a Permit for construction activities.

4. The Contractor is to comply with the directions of the State of Hawaii Occupation Safety and Health Law (DOSH).

MONUMENT GENERAL NOTES

1. All existing right-of-way, centerline, as-built, construction, and NGS (horizontal and vertical in the NGS database) monuments located within the State of Hawaii right of way, must be preserved and displayed on the plans. All monuments shall be preserved during all design and construction phases. If monuments are disturbed or destroyed, the Cadastral Engineering Section (HWY-DC) shall be notified prior to groundbreaking. Reconciliation to the Right-of-Way Baseline and/or a boundary study and determination may be required prior to re-installation of the disturbed or destroyed monuments. HWY-DC shall be contacted for guidelines and procedures. As to construction, a State of Hawaii Licensed Surveyor shall perform the location and staking of the reset monument. The DOT Standard Plans & Specifications, with the exception of NGS monuments which shall have a NGS approved "brass disk" marker, shall be referenced for the monument type and materials.

2. Any NGS vertical monuments that are deemed necessary for relocation due to construction shall follow the NGS benchmark reset procedures written by Curtis Smith dated September 2010 or newer. All work must be done by an electronic digital level that is acceptable by NGS for second-order class one or higher work. The surveyor must use two one-piece invar barcode rods with current certifications with struts with 15 lbs turning plate or turtles; and/or turning pin with driving cap and temperature readings. Contact NGS prior to any work to ensure all equipment meets reset specifications. A State of Hawaii Licensed Surveyor shall perform the relocation. All work must be submitted both in electronic and hard copy formats to NGS and HWY-DC.

3. All monument work shall be considered incidental to this project.

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STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GENERAL NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. N-2 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	5	71

LEGEND:

EXISTING

BFP	SMH
CATV BOX	SEWER VALVE
C.O.	8" SEWER LINE (S 8)
DI	SIGNAL CORPS LINE (SC)
D.S.	S.L.
DSP	SLB
24" DRAIN LINE (D 24)	SPR
ELECTRIC/TV LINE (E/TV)	STREET MONUMENT
ELEC. BOX (ELEC.)	TEL BOX
ELEC MH	TEL. MH
ELEC. BOX	TELEPHONE LINE (TEL.)
ELEC TRANSFORMER	TREE
E.O.	TSL
F.A. BOX	TSLB
FH	U.P./S.L.
2" GAS LINE (GAS 2)	U.P./CONDUIT
G.P.	UTILITY BOX
G.W.	U.S. POSTAL M.B.
H.B.	6" WATERLINE (W 6)
ICV	WM
ICV BOX	WMH
L.P.	WV
MB	
MH	
OVERHEAD LINE (O/H)	
PBX	
PSL	
RISER	
SCMH	
SDMH	

ABBREVIATIONS:

AC	Asphalt Concrete
APPROX.	Approximate
℄	Baseline
BC	Bottom Curb
BFP	Back Flow Preventer
BOT.	Bottom
BW	Bottom Wall
℄	Centerline
C	Chord
CATV	Cable Television
C.B.	Catch Basin
C.L.	Chain Link
CMU	Concrete Masonry Unit
C.O.	Clean Out
COL.	Column
COMM.	Communication
CONC.	Concrete
CRM	Concrete Rubble Masonry
D	Diameter or Drain
DI	Drain Inlet
D.S.	Down Spout
DSP	Dry Stand Pipe
DWY	Driveway
E/D42	Existing 42" Drain Pipe
E/ELEC.	Electric
ELEV/EL.	Elevation
EMH	Electric Manhole
E.O.	Electric Outlet
EP	Edge of Pavement
F.A.	Fire Alarm
FH	Fire Hydrant
G	Gas
GND.	Ground
G.P.	Guard Post/Guy Pole/Gate Post
GV	Gas Valve
G.W.	Guy Wire
H	Height
H.B.	Hose Bib
HMA	Hot Mix Asphalt
ICV	Irrigation Control Valve
INV.	Invert
JPCP	Jointed Pre-cast Concrete Pavement
L.P.	Lamp Pole / Light Pole
MB	Mail Box
MH	Manhole
NTS	Not to Scale
O/H	Overhead
PBX	Penal Box
PCC	Portland Cement Concrete
P/L	Property Line
PMA	Polymer Modified Asphalt
PSL	Pedestrian Signal Light
REF	Reflector
RPM	Raised Pavement Marker
R/W	Right of Way
S	Sewer or Spread
SC	Signal Corps
SCMH	Signal Corps Manhole
SDMH	Storm Drain Manhole
S.E.	Super Elevation
S.L.	Street Light
SLB	Street Light Box
SMH	Sewer Manhole
ST. NAME	Street Name
STA.	Station
TC	Top Curb
TDC	Top Drop Curb
T/TEL.	Telephone/Tangent
TMH	Telephone Manhole
TP	Top Pipe
TS	Top Stem
TSL	Traffic Signal Light
TSLB	Traffic Signal Light Box
TV	Top Valve
TW	Top Wall
U.P.	Utility Pole
U.P./S.L.	Utility Pole w/Street Light
W	Water
WM	Water Meter
WMH	Water Manhole
WV	Water Valve Box
X-WALK	Cross Walk

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STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

LEGEND AND ABBREVIATIONS

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. N-3 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	6	71

HAWAIIAN TELCOM NOTES:

1. The Contractor shall procure and pay for all licenses and permits and shall give all notices necessary and incident to the due and lawful prosecution of the work.

2. The Contractor shall obtain an excavation permit and toning request from Hawaiian Telcom's Excavation Permit Section, located at 1177 Bishop Street, two weeks prior to the start of construction. Hours of business are 8:00 a.m. to 11:00 a.m. and 12:00 noon to 3:00 p.m. Monday through Friday, except holidays.

3. Prior to the excavation of the ductline, the Contractor shall request Hawaiian Telcom to locate existing ductline wherever required. For underground cable locating and marking, five (5) working days advance notice is required. Three (3) working days advance notice is required for any inspection by a designated representative.

4. The locations of existing utilities are approximate only. The Contractor shall exercise extreme caution and shall maintain proper clearances whenever construction crosses or is in close proximity of Hawaiian Telcom facilities. The Contractor shall verify their locations and shall be liable for any damages to Hawaiian Telcom facilities. Any damages shall be reported immediately to Hawaiian Telcom's Repair Section at #611 (24 hours) or to the Excavation Permit Section at 546-7746 (normal working hours, Monday through Friday, except holidays). As a result of his operations, adjustments to the new ductline alignment, if required, shall be made to provide the required clearances.

5. The Contractor shall take necessary precaution not to damage existing cables or ducts. A Hawaiian Telcom inspector or designated representative is required to be at any job site whenever there will be a breakage into or entry into any structure that contain Hawaiian Telcom facilities. Temporary cable and duct supports shall be provided wherever necessary.

6. The Contractor shall notify Hawaiian Telcom's inspector or designated representative a minimum of 72 hours prior to excavation, bracing, or backfilling of Hawaiian Telcom's structures or facilities.

7. All applicable construction work shall be done in accordance with the "Hawaiian Telcom Standard Specifications for Placing Telephone Systems" dated January 2007. All subsequent amendments and additions, and all other pertinent standards for telephone construction. Contractor shall familiarize his personnel by obtaining applicable specifications.

8. When excavation is adjacent to or beneath Hawaiian Telcom's existing structures or facilities, the Contractor shall:

   a) Sheet and/or brace the excavation to prevent slides, cave-ins, or settlements to ensure no movement to Hawaiian Telcom's structures or facilities.

   b) Protect existing structures and/or facilities with beams, struts, or underpinning while excavating beneath them to ensure no movement to Hawaiian Telcom's structures or facilities.

9. The Contractor shall brace all poles or light standards near the new ductline, manhole, or handhole during his operations.

10. The Contractor shall saw-cut A.C. pavement and concrete gutter wherever new manholes, handholes, or ductlines are to be placed and shall restore to existing condition or better.

11. The Contractor shall repair sidewalks in accordance with these contract documents and State Standard Plan D-15.

12. The underground pipes, cables, or ductlines known to exist by the Engineer from his search of records are indicated on the plans. The Contractor shall verify the locations and depths of the facilities and exercise proper care in excavating in the area. Wherever connections of new utilities to existing utilities are shown on the plans, the Contractor shall expose the existing lines at the proposed connections to verify their locations and depths prior to excavation for the new lines.

13. Wherever connections to existing utilities are shown on the plans, the Contractor shall expose the existing lines prior to excavation of the main trenches to verify their locations and depths.

14. The Contractor, at his own expense, shall keep the project and surrounding area free from dust nuisance. The cost for supplementary measures, which will be required by the City and County, shall be borne by the Contractor.

15. The Contractor shall pump all manholes dry during final inspection.

16. The Contractor shall notify Hawaiian Telcom inspector 24 hours prior to the pouring of concrete or backfilling.

17. When connecting to manhole walls, all existing reinforcing bars shall be left intact. Ducts shall be adjusted in the field in order to clear reinforcing.

18. The Contractor shall be responsible for laying out all required lines and grades and shall preserve all benchmarks and working points necessary to lay out the work correctly. The new ductline shall be adjusted by the Contractor to suit the existing conditions and the details as described in the plans.

19. Minimum concrete strength shall be:
    For ductline 2500 psi at 28 days
    For manhole 3000 psi at 28 days or as specified in design notes

20. Bends in the duct alignment, due to changes in grade shall have a minimum radius of 25 feet. All 90 degree C-bends at a pole or at the building floor slab penetration shall have a bend radius of ten times the diameter of the duct or greater.

21. After ductline has been completed, a mandrel with a square front not less than 12" long and having a diameter of ¼" less than the inside diameter of the duct, shall be pulled through each duct after which a brush with stiff bristles shall be pulled through to make certain that no particles of earth, sand, or gravel have been left inside. Ducts shall be completely dry and clean.

22. All ducts and conduits shall have an 1800# polyester mule-tape (NEPTCO, WP1800P, Hawaiian Telcom Material Code No. 571154) installed throughout its entire length. All ducts shall be capped to prevent entry of foreign material during construction and at the completion of installation.

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

HAWAIIAN TELCOM NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. N-4 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	7	71

SPECTRUM NOTES:

1. The locations of existing utilities are approximate only. The Contractor shall verify their locations and shall be responsible for any damages to these utilities as a result of his operations. Adjustments to the new ductline alignment, if required, shall be made to provide the required clearances.
2. The underground pipes, cables, or ductlines known to exist by the Engineer from his search of records are indicated on the plans. The Contractor shall verify the locations and depths of the facilities and execise proper care in excavating in the areas. Wherever connections of new utilities to existing utilites are shown on the plans, the Contractor shall expose the existing lines at the proposed connections to verify their locations and depths prior to excavation for the new lines.
3. Prior to the excavation of the ductline, the Contractor shall request that Spectrum to locate existing ductline wherever required.
4. The Contractor shall take necessary precaution not to damage existing cables or ducts. Any work involving existing cables or ducts shall be done in the presence of the Spectrum Inspector or his representative.
5. The Contractor shall notify the Spectrum Inspector 48 hours prior to the start of work on CATV infrastructure, pouring of concrete or backfilling. Spectrum's Inspector, Moki Place, can be reached at 808 625-8378.
6. Wherever connections to existing utilities are shown on the plans, the Contractor shall expose the existing lines prior to excavation of the main trenches to verify their locations and depths.
7. The location of CATV facilities shown on plans are from existing records with varying degrees or accuracy as to its actual fixed location. The Contractor shall use extreme caution when working in close proximity of CATV facilities.
8. The Contractor shall obtain excavation permit clearance from Spectrum's Engineering Section located at 200 Akamainui St., Mililani Tech Park.
9. For any field assistance or verification of CATV facilities, the Contractor shall call the Technical Operatons Center at 808 625-8378.
10. Any work required to relocate CATV facilities shall be done by Spectrum and the Contractor shall be responsible for all coordination requirements and associated costs.
11. Any damage to Spectrum's facilities shall be reported to Spectrum's repair dispatch department at 808 625-8437 or 808 625-8666.
12. All existing improvements that are disturbed during the construction phase shall be restored to its original or better condition.
13. The Contractor shall take all necessary precaution not to damage the existing cables in the pullbox. All damages to existing cables shall be repaired by Spectrum and paid for by the Contractor.
14. Coordinate all penetration of telephone pullboxes with Hawaiian Telcom Inspector.
15. Smooth finish inside wall of existing pullboxes and handholes to its original condition or better. All entrances into the pullbox shall be grouted around conduits.
16. For 3" conduits or larger, the Contractor shall install Neptco WP1800 MULETAPE or approved equal in all ductlines. Leave MULETAPE in place for future use as a pull or fish line, unless otherwise noted. Reference Verizon Material Code No. 571154. All ducts shall be capped to prevent entry of foreign material during construction and at completion of installation. Endbells are required for conduits 2" and larger.
17. For conduits less than 3", the Contractor shall place poly cord through out project, and secure in manholes, handholes, and pullboxes.
18. Penetration into pullboxes if necessary to be from factory installed opening or from bricks position. Penetration from pullbox walls is not acceptable. All conduits shall enter through the end of the pullbox at 90 degrees.
19. A minimum of (2) precast sections must be used on all 2x4 or 2x6 pullboxes.
20. Two minimum layers of bricks to be used shall always be at least one layer lower than the lowest duct entering the pullbox. At no time however, shall there be less then two layers of bricks on each installation.
21. At no time shall cement mortar, wood, or any other material be used between precast sections. Leveling or raising of boxes to grade must be done at brickwork section using cement mortar. The permanent installation of wooded wedges to accomplish this purpose will not be accepted.
22. Concrete precast base may be used as an alternative to bricks.
23. Trenching to be by hand digging near and across existing utility lines.
24. Minimum clearance between street light stand and fire hydrants shall be three feet.
25. Underground utilities shown hereon is for information only. No guarantee is made on the accuracy or completeness of said installation.
26. For underground cable location and marking, five working days advance notice is required. Three working days advance notice is required for any inspection by a designated representative. Contractor shall take necessary precaution not to damage any existing cables or ducts. Spectrum's Inspector or designated reprsentative is required to be at any job site whenever there will be a breakage into or entry into any structure that contain Spectrum's facilities.
27. Concrete strength shall be 3000 psi in 28 days.
28. Bends in the duct alignment, due to changes in grade shall have a minimum radius of 20-feet. All 90-degree C-bends at a pole or at the building floor slab penetration, shall have a bend radius of ten times the diameter of the duct or greater.
29. After ductline has been completed, a mandrel with a square front not less than 12-inch long and having a diameter of 1/4-inch less than the inside diameter of duct, shall be pulled through each duct after which a brush with stiff bristles shall be pulled through to make certain that no particles of earth, sand, or gravel have been left inside. Ducts shall be completely dry and clean.
30. All construction must be inspected and approved by Spectrum prior to the installation of any of its facilities and the energizing of its system.
31. Contractor and/or customer shall provide Spectrum with sufficient installation time in their occupancy time table.
32. Install 4-mil thick orange color warning tape 3-inch wide, entire length of trench when placing CATV conduits. Tape should read "CAUTION BURIED CABLE LINE BELOW". Manufactured by Harris Industries, Inc., catalog number UT-43 or equivalent tape. Tape to be installed 12-inches below grade.

ADJUSTMENT TO EXISTING UTILITIES NOTE:

1. Adjust all utility valve box frame & covers, water meter boxes, manhole frames & covers, street monument covers, etc., to new finish grade. Coordinate with private companies and City agencies for work on each respective utility.

SURVEY PLOTTED BY _____ DATE
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ORIGINAL PLAN
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STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

SPECTRUM NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. N-5 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	8	71

HAWAIIAN ELECTRIC COMPANY NOTES (Rev 12/04/19):

1. Location of Hawaiian Electric Facilities:

   The location of Hawaiian Electric's overhead and underground facilities shown on the plans are from existing records with varying degrees of accuracy and are not guaranteed as shown. The Contractor shall verify in the field the locations of the facilities and shall exercise proper care in excavating and working in the area. Wherever connections of new utilities to existing utilities and utility crossings are shown, the Contractor shall expose the existing lines at the proposed connections and crossings to verify the depths prior to excavation for the new lines. The Contractor shall be responsible for any damages to Hawaiian Electric's facilities whether shown or not shown on the plans.

2. Compliance with Hawaii Occupational Safety and Health Laws:

   The Contractor shall comply with the State of Hawaii's Occupational Safety and Health Laws and Regulations, including without limitation, those related to working on or near exposed or energized electrical lines and equipment.

3. Excavation Clearance:

   The Contractor shall obtain an excavation clearance from Hawaiian Electric's Planning and Design Section of the Customer Installations Division (543-5654) located at 820 Ward Avenue, 4th floor, a minimum of ten (10) working days prior to starting construction.

4. Caution!!! Electrical Hazard!!!

   Existing Hawaiian Electric overhead and underground lines are energized and will remain energized during construction unless prior special arrangements have been made with Hawaiian Electric. Only Hawaiian Electric personnel are to handle these energized lines and erect temporary guards to protect these lines from damage. The Contractor shall work cautiously at all times to avoid accidents and damage to existing Hawaiian Electric facilities, which can result in electrocution.

5. Overhead lines:

   State law (OSHA) requires that a worker and the longest object he or she may contact cannot come closer than a specified minimum radial clearance when working close to or under any overhead lines. It is the Contractor's responsibility to be informed of and comply with the law.

   At any time should the Contractor anticipate that his work will result in the need to encroach within the minimum required clearance as stated in the law, the Contractor shall notify Hawaiian Electric at least four (3) months prior to the planned encroachment so that, if feasible, the necessary protections (e.g. relocate or de-energize Hawaiian Electric lines) can be investigated. Hawaiian Electric may also be able to blanket its distribution (12kV and below) lines to provide a visual aid in preventing accidental contact. Hawaiian Electric's cost of safeguarding or identifying its lines will be charged to the Contractor.

   Contact Hawaiian Electric's Customer Installations Division at 543-7070 for assistance in identifying and safeguarding overhead power lines.

6. Pole Bracing:

   Contractor shall not excavatewithin 10 feet from Hawaiian Electric's utility poles or any anchor system supporting the utility pole. If Contractor must excavate closer than 10 feet from a utility pole or its anchor system, Contractor will be responsible for protecting, supporting, securing and taking all precautions to prevent damage to or leaning of existing poles. Before commencing such excavation, Contractor must submit its bracing calculations and drawings, prepared and stamped by a Licensed Structural Engineer, to Hawaiian Electric's Customer Installations Division (543-7070) for review. Hawaiian Electric requires a minimum of ten (10) working days to conduct the review of Contractor's submittal. Contractor shall be responsible for the design, installation, and removal of the temporary pole bracing system, as well as all costs incurred by Hawaiian Electric to review Contractor's drawings and to repair or straighten poles impacted by Contractor's activities, including response and restoration costs incurred by Hawaiian Electric arising out of or related to outages caused by Contractor's failure to meet the foregoing requirements. Hawaiian Electric's review and approval of any Contractor submittals including its work procedure shall not relieve Contractor from any liability resulting from Contractor's excavation near or around Hawaiian Electric's utility poles.

7. Underground Lines:

   The Contractor shall exercise extreme caution whenever construction crosses or is in close proximity of underground lines. Hawaiian Electric's existing electrical cables are energized and will remain energized during construction. Only Hawaiian Electric personnel are to break into existing Hawaiian Electric facilities, handle these cables, and erect temporary guards to protect these cables from damage. The cost of Hawaiian Electric's assistance in providing proper support and protection of its underground lines will be charged to the Contractor. For assistance/coordination in providing proper support and protection of these lines, the Contractor shall call Hawaiian Electric's Customer Installations Division at 543-7070 a minimum of ten (10) working days in advance.

   Special precautions are required when excavating near Hawaiian Electric's 138kV or 46kV underground lines (See Hawaiian Electric instructions to Consultants/Contractors on "Excavation near Hawaiian Electric's underground 138kV and/or 46kV lines" for detailed requirements).

   For verification of underground lines, the Contractor shall call the Hawaii One Call Center at 866-423-7287 minimum of five (5) working days in advance.

8. Underground Fuel Pipelines:

   The Contractor shall exercise extreme caution whenever construction crosses or is in close proximity of Hawaiian Electric's underground fuel oil pipelines. Special precautions are required when excavating near Hawaiian Electric's underground fuel oil pipelines (See Hawaiian Electric's specific Fuel Pipeline "Guidelines" to Consultants/Contractors on Excavation near Hawaiian Electric's Underground Fuel Pipelines for detailed requirements).

9. Excavations:

   When trench excavation is adjacent to or beneath Hawaiian Electric's existing structures or facilities, the Contractor is responsible for:

   a. Arranging for Hawaiian Electric Standby Personnel to observe work at Contractor's cost.

   b. Sheeting, bracing, or otherwise supporting the excavation and stabilizing the existing ground to render it safe and secure and to prevent possible slides, cave-ins, and settlements.

   c. Properly supporting existing structures or facilities with beams, struts, under-pinnings, or other necessary methods to fully protect it from damage.

   d. Backfilling with proper backfill material including special thermal backfill where existing (refer to Engineering Division for thermal backfill specifications).

10 Relocation of HECO Facilities:

   Any work required to relocate or modify Hawaiian Electric facilities shall be done by Hawaiian Electric, or by the Contractor under Hawaiian Electric's supervision. The Contractor shall be responsible for all coordination, and shall provide necessary support for Hawaiian Electric's work, which may include, but not be limited to, staking of pole/anchor locations, identifying right of way and property lines, excavation and backfill, permits and traffic control, barricading, and restoration of pavement, sidewalks, and other facilities.

   All costs associated with any relocation or modification (either temporary or permanent) for the convenience of the Contractor, or to enable the Contractor to perform his work in a safe and expeditious manner in fulfilling his contract obligations shall be borne by the Contractor.

11. Conflicts:

   Any redesign or relocation of Hawaiian Electric's facilities not shown on the plans may be cause for lengthy delays. The Contractor acknowledges that Hawaiian Electric is not responsible for any delay or damage that may arise as a result of any conflicts discovered or identified with respect to the location or construction of Hawaiian Electric's electrical facilities in the field, regardless of whether the Contractor has met the requested minimum advance notices. In order to minimize any delay or impact arising from such conflicts, Hawaiian Electric should be notified immediately upon discovery or identification of such conflict.

12. Damage to Hawaiian Electric Facilities:

   The Contractor shall be responsible for the protection of all Hawaiian Electric surface and subsurface utilities and shall be responsible for any damages to Hawaiian Electric's facilities as a result of his operations. The Contractor shall immediately report such damages or any hazardous conditions related to Hawaiian Electric's lines to Hawaiian Electric's Trouble Dispatcher at 548-7961. Repair work shall be done by Hawaiian Electric or by the Contractor under Hawaiian Electric's supervision. Costs for damages to Hawaiian Electric's facilities shall be borne by the Contractor.

   In case of damage or suspected damage to Hawaiian Electric's fuel pipeline, the Contractor shall immediately notify Hawaiian Electric's Security Command Center at 543-7685 (a 24-hour number) so Hawaiian Electric personnel can secure the damaged section and report any oil spills to the proper authorities. All costs associated with the damage, repair, and oil spill cleanup shall be borne by the Contractor.

13. Hawaiian Electric Stand-by Personnel:

   The Contractor may request Hawaiian Electric to provide an inspector to stand-by during construction near Hawaiian Electric's facilities. The cost of such inspection will be charged to the Contractor.

   The Contractor shall call Hawaiian Electric's Customer Installations Division at 543-7070 a minimum of three (3) months in advance to arrange for Hawaiian Electric Stand-by Personnel.

ORIGINAL PLAN
NOTE BOOK
No.
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QUANTITIES BY
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DATE

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

HAWAIIAN ELECTRIC NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. N-6 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	9	71

HAWAIIAN ELECTRIC COMPANY NOTES (Cont.):

14. Clearances:

The following clearances shall be maintained between Hawaiian Electric's ductline and all adjacent structures (charted and uncharted) in the trench:

GUIDELINES FOR MINIMUM HORIZONTAL (PARALLEL) CLEARANCES BETWEEN HAWAIIAN ELECTRIC AND OTHER UNDERGROUND UTILITIES

Underground Utility	Hawaiian Electric Direct Buried Cable	Hawaiian Electric Direct Buried in Conduit (no concrete encasement)	Hawaiian Electric 3" (Min.) Concrete Encasement	Applicable Notes:
HECO DB Conduits	12"	3"	0"	
HECO 3" Encasement	0"	0"	0"	
Telephone/CATV DB	12"	12"	6"	
Telephone/CATV DB Ducts	12"	12"	6"	
Telephone/CATV 3" Encasement	0"	0"	0"	5
Traffic Signal	12"	12"	12"	
Water DB (BWS Owned)	36"	36"	36"	1, 4
Customer Owned Water Service Laterals	12"	12"	12"	
Water (Concrete Jacketed) (BWS Owned)	36"	36"	36"	1, 4
Gas DB	12"	12"	12"	1
Gas (Concrete Jacketed)	12"	12"	12"	1
Sewer DB	36"	36"	36"	1, 2
Sewer (Concrete Jacketed)	36"	36"	36"	1, 2
Drain	12"	12"	12"	1
Fuel Pipelines				3

Notes:

1. Where space is available, parallel clearance to other utilities, or foreign structures other than communication or traffic signal shall be 36".
2. If 36" clearance cannot be met:
   - If clearance is less than 12", jacket sewer line with reinforced concrete (per Hawaiian Electric's std. 30-1030) for a distance of 5' plus pipe diameter.
   - If clearance is between 12" and 36", jacket sewer line with plain concrete.
3. All Fuel Pipeline crossings shall be reviewed and approved by the company that owns and maintains it.
4. 5 feet clear to water mains 16" and larger.
5. For situations with 0" minimum separation, a 6" separation is recommended.
6. Clearances measured from outer edges or diameters of utilities. Whenever concrete jackets are involved, clearances shall be total clear distance between the concrete jacket and utility concerned.

GUIDELINES FOR MINIMUM VERTICAL (CROSSING) CLEARANCES HAWAIIAN ELECTRIC AND OTHER UNDERGROUND DUCTLINES

Underground Utility	Hawaiian Electric Direct Buried Cable	Hawaiian Electric Direct Buried in Conduit (no concrete encasement)	Hawaiian Electric 3" (Min.) Concrete Encasement	Applicable Notes:
Hawaiian Electric DB Conduits	6"	3"	0"	
Hawaiian Electric 3" Encasement	0"	0"	0"	
Telephone/CATV DB	12"	12"	6"	
Telephone/CATV DB Ducts	12"	12"	6"	
Telephone/CATV 3" Encasement	0"	0"	0"	3
Traffic Signal	12"	12"	6"	
Water DB (BWS Owned)	12"	12"	12"	5
Customer Owned Water Service Laterals	6"	6"	6"	
Water (Concrete Jacketed) (BWS Owned)	12"	12"	12"	5
Gas DB	12"	12"	12"	
Gas (Concrete Jacketed)	12"	12"	12"	
Sewer DB	24"	24"	24"	1
Sewer (Concrete Jacketed)	24"	24"	24"	1
Drain	12"	12"	6"	
Fuel Pipelines				2

Notes:

1. If clearance cannot be met:
   - If clearance is less than 12", jacket sewer line with reinforced concrete (per Hawaiian Electric's std. 30-1030) for a distance of 5' plus pipe diameter.
   - If clearance is between 12" and 24", jacket sewer line with plain concrete.
2. All Fuel Pipeline crossings shall be reviewed and approved by the company that owns and maintains it.
3. For situations with 0" minimum separation, a 6" separation is recommended.
4. Clearances measured from outer edges or diameters of utilities. Whenever concrete jackets are involved, clearances shall be total clear distance between the concrete jacket and utility concerned.
5. 36" clearance is required for trenchless installation work.

The Contractor shall notify the construction manager & Hawaiian Electric of any heat sources (power cable duct bank, steamline, etc.) encountered that are not properly identified on the drawing.

15. Indemnity:

The Contractor shall indemnify, defend and hold harmless Hawaiian Electric from and against all losses, damages, claims, and actions, including but not limited to reasonable attorney's fees and costs based upon or arising out of damage to property or injuries to persons, or other tortious acts caused or contributed to by Contractor or anyone acting under its direction or control or on its behalf; provided Contractor's indemnity shall not be applicable to any liability based upon the sole negligence of Hawaiian Electric.

ORIGINAL PLAN
NOTE BOOK ____ No. ____
SURVEY PLOTTED BY ____ DATE
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TRACED BY ____ .
DESIGNED BY ____ .
QUANTITIES BY ____ .
CHECKED BY ____ .

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

HAWAIIAN ELECTRIC NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. N-7 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	10	71

WATER NOTES:

1. Unless otherwise specified, all materials and construction of water system facilities and appurtenances shall be in accordance with the City and County of Honolulu Board of Water Supply's "WATER SYSTEM STANDARDS", DATED 2002, THE "WATER SYSTEM EXTERNAL CORROSION CONTROL STANDARDS", VOLUME 3, DATED 2021, and all subsequent amendments and additions.

2. All plans approved by the Board of Water Supply are based solely on the adequacy of the water supply.

3. The Contractor shall notify Board of Water Supply Capital Projects Division, Construction Section in writing or call (808) 748-5730, and submit six (6) sets of 24"x36" approved construction drawings, one week prior to commencing construction activities.

4. The existence and location of underground utilities and structures as shown on the plans are from the latest available data but is not guaranteed as to the accuracy or the encountering of other obstacles during the course of the work. The Contractor shall be responsible and pay for all damages to existing utilities. The Contractor shall not assume that where no utilities are shown, that none exist.

5. Re-approval shall be required if this project is not under construction within a period of two years.

6. The Contractor shall be responsible for the protection of all water lines during construction. The Contractor shall be especially careful when excavating behind water lines, tees, and bends wherever there is a possibility of water line movement due to the removal of the supporting earth beyond the existing reaction blocks. The Contractor shall take whatever measure necessary to protect the water lines, such as constructing special reaction blocks (with BWS approval) and/or modifying his construction methods.

7. Prior to any excavating, the Contractor shall verify in the field the location of existing water mains and appurtenances.

8. The Contractor shall verify all existing service lateral locations whether shown or not shown on plans prior to commencing with any of the work and shall not assume that where no services are shown, none exist.

9. The Contractor shall adjust all manhole frames/valve boxes/meter boxes within the resurfaced area. The Contractor shall be responsible for "referencing" these manholes/valve boxes/meter boxes to facilitate the adjustments.

10. All waterline construction requiring shutdown connection shall be scheduled for normal working hours at six (6) hours maximum downtime.

11. At the electrical/cable/signal ductline water crossings, adjust all electrical/cable/signal ductline elevations to maintain 12" vertical clear separation from all waterlines at no cost to the Board of Water Supply.

12. Maintain 3'-0" minimum horizontal clear separation between all waterlines and nearest electrical/cable/signal ductlines paralleling the water system at no cost to the Board of Water Supply.

13. All fire hydrants to be adjusted and/or relcated shall be replaced with new fire hydrants, unless otherwisedirected by the Board of Water Supply.

WATER NOTES, CON'T:

14. Maintain 3'-0" minimum horizontal clear separation between electrical/cable/signal appurtenances, (including any modular units) and the nearest waterline or water appurtenance. Contractor shall field verify for any conflicts at each electrical/cable/signal appurtenance location. Where conflicts occur, the contractor shall coordinate with the project engineer to revise the electrical/cable/signal appurtenance to provide the required clearances at no cost to the BWS.

15. Pipe cushion shall be of high resistivity material. The Contractor shall submit a soil certification that high resistant cushion material has a resistivity greater than 5,000 OHM-CM. Remainder of the backfill material shall be as specified in the Water Systems Standards. Pipe cushion and backfill material shall contain no hazardous substances above regulatory action levels including but not limited to lead, asbestos, mercury, chromium, cadmium, zinc, strontium, and polychlorinated biphenyls (PCB).

16. All ductile iron pipe including sections requiring reinforced concrete jacketing, shall be Ductile Iron Class 53, and bonded dielectric coated as per the Board of Water Supply 2002 Water System Standards as amended.

17. The Contractor shall install electronic markers to all mains and test the electronic markers prior to installations to verify proper operation. BWS personnel shall verify the number and locations of placed electronic markers before final paving of the project.

18. No deviation to the Board of Water Supply 2002 Water System Standards shall be allowed without the Manager and Chief Engineer's approval.

19. Any adjustments to the existing water system required during construction, to meet the requirements of the BWS Standards, whether shown on the plans or not, shall be done by the Contractor at no cost to the Board of Water Supply.

20. When a utility (gas, sewer, electrical duct line, fiber optic, drainage, etc.) crosses below a Board of Water Supply water main, the designer of record and their construction engineer shall be responsible for determining the adequate water main structural support and submit the construction method and shop drawing, stamped by a licensed engineer and reviewed by the designer of record, to the Board of Water Supply for approval. All work shall be at no cost to the Board of Water Supply.

22. All ductile iron fittings and metallic valves shall have factory applied coating and wrapped with petroleum wax tape.

23. Soil resistivity for the site has a corrosion rating of Corrosion Category A (Moderately to Severely Corrosive) and Corrosion Category B (Negligibly to Mildly Corrosive) as reported by Geolabs. All required electrical isolation procedures and corrosion control requirements shall apply.

APPROVED:

MANAGER & CHIEF ENIGINEER, BWS — DATE
(For Work Affecting BWS Facilities in City/State Right-of-Way and BWS Easement only

WATER NOTES, CON'T:

24. Water Pipeline Chlorination and Testing Procedures

A. The following chlorination and water sample collection procedure shall apply to all water pipeline projects (all work to be coordinated through Board of Water Supply Inspector):

1. Chlorination of Water Systems

a. The Contractor shall provide a 4-week advance notice, in writing, to the Officer-In-Charge for proposed flushing, filling and bacterial testing of the new pipeline.

b. The Contractor shall hire a State of Hawaii - Department of Health certified laboratory to provide water sampling services and to deliver water samples to the Micro Lab for analysis. Water samples for bacterial testing shall be delivered no later than 2:30 p.m. on the day the samples are taken to the Board of Water Supply Microlab located at 630 S. Beretania St., Honolulu, HI 96843. The Micro Lab shall perform analysis and provide their results to the Officer-In-Charge by 4:30 p.m. on the following day (in some cases, final results notification may take up to 48 hours).

c. Water mains shall be disinfected in accordance with the Board of Water Supply System Standards (2002), as amended, Section 302.29.

Step 1 - Preliminary Flushing (Prior to Chlorination): The mains shall be flushed with maximum available pressure and velocity. Adequacy of turnovers shall be determined by the absence of particles. Turbidity shall be less than 1.0 NTU before chlorination. During all flushing operations, the Manager's authorized representative shall determine the rate of water use.

Step 2 - Chlorination: The Contractor shall submit to the Manager, for approval, a sketch showing locations of sampling points and a plan or schedule delineating the method or steps the Contractor proposes to use to accomplish the work. The following methods for chlorination shall be used:

a. The following chlorination and water sample collection procedure shall apply to all water pipeline projects:

Step 1: Chlorinate main by filling with water and introducing chlorine in sufficient quantity to obtain a minimum chlorine concentration of 50 parts per million. Leave chlorinated water in main overnight.

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STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

UTILITY NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None — Date: Mar. 2025

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
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WATER NOTES Cont.

Step 2: Flush main with fresh water until all chlorine has been flushed out as evidenced by the N, N-diethyl-p-phenylenediamine (DPD) test, then collect a water sample while continuing to flush the main.

Step 3: Repeat Steps 1 and 2. After collecting the second water sample, stop flushing and allow the water to stand in the main overnight.

Step 4: Thoroughly flush the main with fresh water until all water that had been standing in the main overnight has been flushed out. Stop flushing and let the water stand in the main for one hour. Collect a water sample.

d. *The main is deemed acceptable and certified when:*

(i) *the three consecutive water samples, collected 24 hours apart under Steps 1 and 2, show no TC (Total Coliform bacteria), no E. coli, less than CFU/ml (Colony Forming Units per ml) of HPC (Heterotrophic Plate Count bacteria) or less than 202 HPC using the MPN (Most Probable Number) method and Turbidity <1.0 NTU, and*

(ii) *the sample of water held in the main for one hour, collected under Step 4, also shows no TC, no E. coli, less than 200 CFU of HPC using the MPN method and Turbidity <1.0 NTU.*

e. *Chlorination, flushing, sampling and testing will be extended should unsatisfactory results be encountered. Any sample that shows positive TC, E. coli, HPC > 200 CFU/ml, HPC >202 MPN or Turbidity >1.0 NTU is unsatisfactory.*

f. *Steps 1 and 2 may be repeated before collecting the one-hour hold sample specified in Step 4. Repeating Steps 1 and 2 is recommended in the event samples show the presence of TC and/or E. coli and/or increasing total bacterial results from one sample to the next.*

g. *Water samples that show the presence of atypical results, debris, high turbidity or results inconsistent with existing water are subject to reconfirmation. The Mana er reserves the right to request and test additional water samples in the interest of safeguarding public health and safety at no additional cost to the Department.*

h. *Liquid chlorine, chlorine based liquid disinfectants or calcium hypochlorite that has been tested and certified as meeting the specifications of ANSI/NSF Standard 60, Drinking Water Treatment Chemicals - Health Effects, shall be used for chlorination of the water mains.*

i. *Prior to chlorination, the water mains shall be thoroughly flushed.*

j. *The interior surfaces of the water mains shall be exposed to the chlorinating solution by completely filling the mains to remove air pockets, for a minimum of 24-hours and the free chlorine residual shall not be less than 10ppm after such time.*

k. *Should the calcium hypochlorite be used, no solid and/or undissolved portion of the compound shall be introduced into any section of the water mains to be chlorinated.*

l. *At the end of the 24-hour disinfection period, representative samples shall be taken and analyzed to ensure a free chlorine residual of at least 10 ppm.*

m. *Should the free chlorine residual results indicate adequate chlorination, the water mains shall be thoroughly flushed and filled with water from the existing system and again tested for free chlorine residual. The flushing shall be considered adequate if the free chlorine residual test results indicate that the water in the water mains has a comparable chlorine residual as the water in the existing system.*

n. *The Contractor shall be responsible for the proper disposal of chlorinated water to safeguard public health and the environment in accordance with applicable State of Hawaii Department of Health requirements. A neutralizing chemical shall be applied to the water to be disposed to thoroughly neutralize the chlorine residual remaining in the water in accordance with Board of Water Supply Water System Standards (2002), as amended.*

o. *The Contractor shall be responsible for obtaining a National Pollutant Discharge Elimination System (NPDES) Permit from the Department of Health, Clean Water Branch prior to the start of construction, for the disposal of water used for hydro testing and chlorination, as required by the contract documents.*

p. *Following the acceptable flushing of the water mains, three (3) consecutive days of acceptable samples, taken at least 24-hours apart, from representative points shall be taken and subjected to microbiological tests. For water lines, at least one set of samples shall be collected from every 1,200 feet of new water main. Positive or invalid test results will not be acceptable, and the process will be repeated.*

q. *All measures for chlorine residual shall be analyzed using E.P.A. approved methods for drinking water.*

r. *All microbiological tests shall be performed by a laboratory approved by the Department of Health, State of Hawaii and the Water Quality Division of the Board of Water Supply.*

s. *The Contractor shall be responsible for all costs associated with all of the foregoing.*

t. *Cleaning and Swabbing procedures shall be in accordance with Board of Water Supply Water System Standards (2002), as amended.*

u. *All materials in direct contact with the potable water shall have National Sanitation Foundations (NSF) approvals. The Contractor shall submit these approvals to the Board of Water Supply for information only prior to its application.*

25. *All water mains and appurtenances shall be subject to hydrostatic test pressure of 150 psi and by the contractor in accordance with Division 300 - Construction, Section 302.28, PIPE PRESSURE TEST of the "WATER SYSTEM STANDARDS", DATED 2002. During the 30-minute pressure test, the pressure shall not drop more than 10 psi.*

26. *The Contractor shall chlorinate the entire inside surface of each pipe and fitting with disinfection solution of 5 ounces of sodium hypochlorite mixed with 10 gallons of water. (For connection only)*

27. *Prior to installation, the Contractor shall submit for approval by Board of Water Supply, the manufacturer's certification that all cast iron (gray or ductile) fittings for the project conform in all respects to the Water Systems Standards, dated 2002.*

28. *Polygon shape for mechanical joint glands as described in AWWA Standard C111 shall be "straight-sided" or an approved equal on a job-to-job basis.*

29. *Contractor shall cut and plug all existing unused laterals at the main whether or not shown on the plans. The damaged area shall be repaired to an equal or better condition than the immediate area. All work shall be done at the expense of the Contractor.*

30. *The Contractor/Developer shall obtain a NPDES permit prior to chlorination and/or dewatering. A copy of the permit shall be submitted to the Board of Water Supply, Capital Projects Division, Construction Section.*

31. *Install 4 mil thick, non-metallic, blue colored, 6 inches wide warning tape over centerline of the pipe and below the base course along the entire length of trench. Tape should be marked with "CAUTION WATER LINE BURIED BELOW".*

32. *Cleaning shall be by the use of pigs introduced into the pipeline and run completely through al installed pipelines and all branches line for fire hydrants. "Pigging" of service laterals is not required. Bare Foam "pigs" shall be used to swab piping clean as each length of pipeline is installed. The type, density, size, diameter and length of the pig shall be submitted for review and approval by the Manager prior to pigging work. "Pig" shall be used per manufacturer's specifications. Prior to use, the "pig" shall be submerged in a chlorine solution of 1 oz. of 5% chlorine bleach in 5 gallons of water. "Pigging" of the pipeline shall be considered incidental to the installation of the new pipeline. Manual sweeping, hand cleaning or swabbing may be allowed in lieu of "pigging" as approved by the Board of Water Manager.*

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APPROVED:

MANAGER & CHIEF ENIGINEER, BWS
(For Work Affecting BWS Facilities in City/State Right-of-Way and BWS Easement only

DATE

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

UTILITY NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. N-9 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	12	71

GRADING NOTES

1. All grading work shall be done in accordance with Chapter 14, Articles 13, 14, 15 and 16, as related to Grading, Soil Erosion and Sediment Control, of the Revised Ordinances of Honolulu, 1990, as Amended.

2. No Contractor shall perform any grading operation so as to cause falling rocks, soil or debris in any form to fall, slide or flow onto adjoining properties, streets or natural watercourses. Should such violations occur, the costs incurred for any remedial action shall be payable by the Contractor.

3. The Contractor, at his own expense, shall keep the project area and surrounding area free from dust nuisance. The work shall be in conformance with the Air Pollution Control Standards contained in The Hawaii Administrative Rules, Title 11, Chapter 60.1, "Air Pollution Control".

4. The underground pipes, cables or ductlines known to exist by the Engineer from his search of records are indicated on the plans. The Contractor shall verify the locations and depths of the facilities and exercise proper care in excavating in the area. Wherever connections of new utilities are shown on the plans, the Contractor shall expose the existing lines at the proposed connections to verify their locations and depths prior to excavation for the new lines.

5. Adequate provisions shall be made to prevent surface waters from damaging the cut face of an excavation or the sloped surfaces of a fill. Furthermore, adequate provisions shall be made to prevent sediment-laden runoff from leaving the site.

6. All slopes and exposed areas shall be sodded or planted as soon as final grades have been established. Planting shall not be delayed until all grading work has been completed. Grading to final grade shall be continuous, and any area within which work has been interrupted or delayed shall be planted.

7. Fills on slopes steeper than 5:1 shall be keyed.

8. The Engineer shall be informed of the location of the borrow/disposal site for the project when the application for a grading permit is made. The borrow/disposal site must also fulfill the requirements of the grading ordinance.

9. No grading work shall be done on Saturdays, Sundays and holidays at any time without prior notice to the District Engineer, provided such grading work is also in conformance with The Community Noise Control Standard Contained in The Hawaii Administrative Rules, Title 11 Chapter 46, "Community Noise Control".

10. The limits of the area to be graded shall be flagged before the commencement of the grading work.

11. All grading operations shall be performed in conformance with the applicable provisions of the water pollution control and water quality standards contained in Hawaii Administrative Rules, Title 11 Chapter 55, "Water Pollution Control" and Title 11 Chapter 54, "Water Quality Standards" and if applicable, the NPDES permit for the project.

12. Where applicable and feasible the measures to control erosion and other pollutants shall be in place before any earth moving phase of the grading is initiated.

13. Temporary erosion controls shall not be removed before permanent erosion controls are in-place and established.

14. Temporary erosion control procedures shall be submitted for approval prior to application for grading permit.

15. If the grading work involves contaminated soil, then all grading work shall be done in conformance with applicable State and Federal requirements.

16. Non-compliance to any of the above requirements shall mean immediate suspension of all work, and remedial work shall commence immediately. All remedial work shall be billed to the Contractor. All remedial work shall be at no cost to the State. Furthermore, violators shall be subjected to administrative, civil and/or criminal penalties.

17. Prior to placement of any fill, the existing ground shall be scarified to a depth of six inches and compacted to a minimum of 90 percent compaction as determined by AASHTO T-180.

18. After clearing and grubbing, additional roots and other vegetation found in the upper 6 to 8 inches shall be removed.

19. Construction observation and field density testing shall be performed by the State. Where test and/or observations indicate that the density of uniformity of any portion of the fill is inadequate, that portion shall be removed and reworked until the required density or uniformity has been satisfactorily obtained.

DRAINAGE NOTES

1. Existing drainage systems shall remain functional at all times during construction. The Contractor is to furnish materials, equipment, labor, tools and incidentals necessary to maintain flow. This work shall be considered incidental to the various contract items.

2. The Contractor shall verify the locations of all existing culverts and utilities in the field. Any existing culverts and utilities damaged during construction shall be repaired or replaced by the Contractor at their own expense.

3. Only non-pneumatic type of drill as approved by the Engineer will be permitted for drilling holes in concrete. Where indicated on the plans, the approximate diameter of drilled holes for installation of dowels shall be ¾" and voids after installing dowels shall be filled with epoxy grout.

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STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GRADING NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. N-10 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	13	71

WATER POLLUTION AND EROSION CONTROL NOTES:

A. GENERAL:

1. See Special Provisions Section 209 - Water Pollution and Erosion Control. Section 209 describes but is not limited to: submittal requirements; scheduling of a water pollution and erosion control conference with the Engineer; construction requirements; method of measurement; and basis of payment. In addition, Appendix A lists potential pollutant sources and corresponding BMPs used to mitigate the pollutants.

2. Follow the guidelines in the current HDOT Construction Best Management Practices Field Manual in developing, installing and maintaining the Best Management Practices (BMP) for the project. For any conflicting requirements between the Manual and applicable bid documents, the applicable bid documents will govern. Should a requirement not be clearly described within the applicable bid documents, the Contractor shall notify the Engineer immediately for interpretation. For the purposes of clarification under Note A.2, "applicable bid documents" include the construction plans, standard specifications, Special Provisions, Permits, and the Storm Water Pollution Prevention Plan (SWPPP) when applicable.

3. Follow the guidelines in the Honolulu's City & County "Rules Relating to Water Quality" along with applicable Soil Erosion Guidelines for projects on Maui, Molokai, Kauai, and Hawaii.

4. The Engineer may assess liquidated damages of up to $27,500 for non-compliance of each BMP requirement and each requirement stated in Section 209 and special provisions, for every day of non-compliance. There is no maximum limit on the amount assessed per day.

5. The Engineer will deduct the cost from the progress payment for all citations received by the Department for non-compliance, or the Contractor shall reimburse the State for the full amount of the outstanding cost incurred by the State.

6. If necessary, install a rain gage prior to any field work including the installation of any site-specific best management practices. The rain gage shall have a tolerance of at least 0.05 inches of rainfall. Install the rain gage on the project site in an area that will not defer rainfall from entering the gage opening. Do not install in a location where rain water may splash into rain gage. The rain gage installation shall be stable and plumbed. Do not begin field work until the rain gage is installed and site-specific best management practices are in-place.

7. Submit Site-Specific BMP Plan to the Engineer along with a completed Site-Specific BMP Review Checklist within 30 calendar days of contract execution. The Site-Specific BMP Review Checklist may be obtained from http://www.stormwaterhawaii.com.

B. WASTE DISPOSAL:

1. Waste Materials
Collect and store all waste materials in a securely lidded metal dumpster or roll off container with cover to keep rain out or loss of waste during windy conditions. The dumpster shall meet all local and State solid waste management regulations. Deposit all trash and construction debris from the site in the dumpster. Empty the dumpster weekly or when the container is two-thirds full, whichever is sooner. Do not bury construction waste materials onsite. The Contractor's supervisory personnel shall be instructed regarding the correct procedure for waste disposal. Post notices stating these practices in the office trailer, on a weatherproof bulletin board, or other accessible location acceptable to the Engineer. The Contractor shall be responsible for seeing that these procedures are followed. Submit the Solid Waste Disclosure Form for Construction Sites to the Engineer within 30 calendar days of contract execution. Provide a copy of all the disposal receipts from the facility permitted by the Department of Health to receive solid waste to the Engineer monthly. This should also include documentation from any intermediary facility where solid waste is handled or processed.

2. Hazardous Waste
Dispose all hazardous waste materials in the manner specified by local or State regulations and by the manufacturer. The Contractor's site personnel shall be instructed in these practices and shall be responsible for seeing that these practices are followed.

3. Sanitary Waste
Collect all sanitary waste from the portable units a minimum of once per week, or as required. Position sanitary facilities where they are secure and will not be tipped over or knocked down.

C. EROSION AND SEDIMENT CONTROL INSPECTION AND MAINTENANCE PRACTICES:

1. For projects with an NPDES Permit for Construction Activities, inspect at the following intervals. For construction areas discharging to nutrient or sediment impaired waters, inspect all control measures at least once each week and within 24 hours of any rainfall event of 0.25 inches or greater within a 24 hour period. For construction areas discharging to waters not impaired for nutrient or sediments, inspect all control measures weekly. Inspections are only required during the project's normal working hours. The discharge point water classification may be found in the SWPPP.

2. For projects without an NPDES Permit for Construction Activities, inspect all control measures weekly.

3. Maintain all erosion and sediment control measures in good working order. If repair is necessary, initiate repair immediately and complete by the close of the next work day if the problem does not require significant repair or replacement, or if the problem can be corrected through routine maintenance. When installation of a new erosion or sediment control or a significant repair is needed, install the new or modified control or complete the repair no later than 7 calendar days from the time of discovery. "Immediately" means the Contractor shall take all reasonable measures to minimize or prevent discharge of pollutants until a permanent solution is installed and made operational. If a problem is identified at a time in the day in which it is too late to initiate repair, initiation of repair shall begin on the following work day.

4. Remove built-up sediment from silt fence when it has reached one-third the height of the fence. Remove sediment from other perimeter sediment control devices when it has reached one-half the height of the device.

5. Inspect silt screen or fence for depth of sediment, tears, to verify that the fabric is securely attached to the fence posts or concrete slab and to verify that the fence posts are firmly in the ground. Inspect and verify the bottom of the silt screen is buried a minimum of 6 inches below the existing ground.

6. Inspect temporary and permanent seeding and planting for bare spots, washouts and healthy growth.

7. Complete and submit to the Engineer a maintenance inspection report within 24 hours after each inspection.

8. Provide a stabilized construction entrance at all points of exit onto paved roads to reduce vehicle tracking of sediments. Include stabilized construction entrance in the Water Pollution, Dust, and Erosion Control submittals. Minimum length should be 50 feet. Minimum width should be 30 feet. Minimum depth should be 12 inches or as recommended by the soils engineer and underlain with geo-textile fabric. If minimum dimensions cannot be met, provide other stabilization techniques that remove sediment prior to exit. Clean the paved street adjacent to the site entrance daily or as required to remove any excess mud, cold-planed materials, dirt or rock tracked from the site. Do not hose down the street without containing or vacuuming wash water. Cover dump trucks hauling material from the construction site with a tarpaulin. Remove sediment tracked onto the street, sidewalk, or other paved area by the end of the day in which the track-out occurs.

9. Include designated Concrete Washout Area(s) in the Water Pollution, Dust, and Erosion Control submittals.

10. Submit the name of a specific individual designated responsible for inspections, maintenance and repair activities and filling out the inspection and maintenance report.

11. Personnel selected for the inspection and maintenance responsibilities shall receive training from the Contractor. They shall be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order.

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STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

WATER POLLUTION AND EROSION CONTROL NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. E-1 OF 5 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
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WATER POLLUTION AND EROSION CONTROL NOTES (Cont.):

12. Contain, remove, and dispose slurry generated from saw cutting of pavement in accordance with approved BMP practices. Do not allow discharge into the drainage system or State waters.

13. For projects with an NPDES Permit for Construction Activities, immediately initiate stabilizing exposed soil areas upon completion of earth-disturbing activities for areas where earth-disturbing activities have permanently or temporarily ceased. Earth-disturbing activities have permanently ceased when clearing and excavation within any area of the construction site that will not include permanent structures has been completed. Earth-disturbing activities have temporarily ceased when clearing, grading, and excavation within any area of the site that will not include permanent structures will not resume (i.e., the land will be idle) for a period of 14 or more calendar days, but such activities will resume in the future. For construction areas discharging into waters not impaired for nutrients or sediments, complete initial stabilization within 14 calendar days after the temporary or permanent cessation of earth-disturbing activities. For construction areas discharging into nutrient or sediment impaired waters, complete initial stabilization within 7 calendar days after the temporary or permanent cessation of earth-disturbing activities. Classification of water at the discharge point may be found in the SWPPP.

14. For projects without an NPDES Permit for Construction Activities, complete initial stabilization within 14 calendar days after the temporary or permanent cessation of earth-disturbing activities.

D. GOOD HOUSEKEEPING BEST MANAGEMENT PRACTICES:

1. Materials Pollution Prevention Plan
   a. Applicable materials or substances listed below are expected to be present onsite during construction. Other materials and substances not listed below shall be added to the inventory.

Concrete	Cleaning Solvents
Detergents	Wood
Paints (enamel and latex)	Masonry Block
Metal Studs	Herbicides and Pesticides
Tar	Curing Compounds
Fertilizers	Adhesives
Petroleum Based Products	

   b. Use Material Management Practices to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff. Make an effort to store only enough product as is required to do the job.
   c. Store all materials stored onsite in a neat, orderly manner in their appropriate containers and if possible under a roof or other enclosure.
   d. Keep products in their original containers with the original manufacturer's label.
   e. Do not mix substances with one another unless recommended by the manufacturer.
   f. Whenever possible, use a product up completely before disposing of the container.
   g. Follow manufacturer's recommendations for proper use and disposal.
   h. Conduct a daily inspection to ensure proper use and disposal of materials onsite.

2. Hazardous Material Pollution Prevention Plan
   a. Keep products in original containers unless they are not resealable.
   b. Retain original labels and Safety Data Sheets (SDS), formerly Material Safety Data Sheets (MSDS).
   c. Dispose of surplus products according to manufacturers' instructions and local and State regulations.

3. Onsite and Offsite Product Specific Plan
   The following product specific practices shall be followed onsite:
   a. Petroleum Based Products:
      Monitor all onsite vehicles for leaks and perform regular preventive maintenance to reduce the chance of leakage. Store petroleum products in tightly sealed containers which are clearly labeled. Apply asphalt substances used onsite according to the manufacturer's recommendation.
   b. Fertilizers:
      Apply fertilizers used only in the minimum amounts recommended by the manufacturer and federal, state, and local requirements. Avoid applying just before a heavy rain event. Apply at the appropriate time of year for the location, and preferably timed to coincide as closely as possible to the period of maximum vegetation uptake and growth. Once applied, work fertilizer into the soil to limit exposure to storm water. Do not apply to storm conveyance channels with flowing water. Storage shall be in a covered shed or in an area where fertilizer will not come into contact with precipitation or stormwater. Transfer the contents of any partially used bags of fertilizer to a sealable plastic bin to avoid spills.
   c. Paints:
      Seal and store all containers when not required for use. Do not discharge excess paint to the drainage system, sanitary sewer system, or State waters. Dispose properly according to manufacturers' instructions and State and local regulations.
   d. Concrete Trucks:
      Washout or discharge concrete truck drum wash water only at a designated site as far as practicable from storm drain inlets or State waters. Do not discharge water in the drainage system or State waters. Disposal by percolation is prohibited. Clean disposal site as required or as requested by the Engineer.

4. Spill Control Plan
   a. Post a spill prevention plan to include measures to prevent and clean up each spill.
   b. The Contractor shall be the spill prevention and cleanup coordinator. Designate at least three site personnel who shall receive spill prevention and cleanup training. These individuals shall each become responsible for a particular phase of prevention and cleanup. Post the names of responsible spill personnel in the material storage area on a weatherproof bulletin board or other accessible location acceptable to the Engineer and in the office trailer onsite.
   c. Clearly post manufacturers' recommended methods for spill cleanup. Make site personnel aware of the procedures and the location of the information and cleanup supplies.
   d. Keep ample materials and equipment necessary for spill cleanup in the material storage area onsite.
   e. Clean up all spills immediately after discovery.
   f. Keep the spill area well ventilated. Personnel shall wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
   g. Report spills of toxic hazardous material to the appropriate State or local government agency, regardless of the size. Where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117, or 40 CFR Part 302 occurs during a 24-hour period, the Contractor shall notify the Engineer as soon as the Contractor has knowledge of the discharge. The Engineer will notify the National Response Center (NRC) at (800) 424-8802, the Clean Water Branch during regular business hours at 586-4309, and the Hawaii State Hospital Operator at 247-2191 and the Clean Water Branch (DOH-CWB) via email at cleanwaterbranch@doh.hawaii.gov during non-business hours immediately. The Contractor shall also provide to the Engineer, within 7 calendar days of knowledge of the release, a description of the release, the circumstances leading to the release, and the date of the release. The Engineer will provide this information to the DOH-CWB. The Engineer will provide information to the NRC if requested.

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STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

WATER POLLUTION AND EROSION CONTROL NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. E-2 OF 5 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	15	71

WATER POLLUTION AND EROSION CONTROL NOTES (Cont.):

E. PERMIT REQUIREMENTS:

1. The calculated land disturbance area for this project based on the construction plans is 0.30 acres not including Contractor Staging and Storage areas. If the total of the disturbed area and the Contractor Staging and Storage area is one acre or greater, the Contractor shall obtain the NPDES Construction Activities Permit using HDOT's latest SWPPP template. See Hawaii Administrative Rules Chapter 11-55, Appendix C for the definition of land disturbance. The Contractor shall be responsible for obtaining the required NPDES Construction Activities Permit and complying with the requirements of HAR 11-55 including, but not limited to:

   a. Deadlines for initiating and completing initial stabilization
   b. Increased inspection frequency and installation of rain gage if applicable
   c. Deadlines to initiate and complete repairs to BMPs
   d. Reporting requirements and corrective action reports

2. Comply with all applicable State and Federal Permit conditions. Permits may include, but not limited to the following:

   a. NPDES Permit for Construction Activities

   b. NPDES Permit for Construction Dewatering

F. SITE-SPECIFIC BMP REQUIREMENTS:
Each BMP below is referenced to the corresponding section of the current HDOT Construction Best Management Practices Field Manual and appropriate Supplemental Sheets. The Manual may be obtained from the HDOT Statewide Stormwater Management Program Website at http://www.stormwaterhawaii.com/resources/contractors-and-consultants under Construction Best Management Practices Field Manual. Supplemental BMP sheets are located at http://www.stormwaterhawaii.com/resources/contractors-and-consultants/storm-water-pollution-prevention-plan-swppp under Concrete Curing and Irrigation Water.

The requirements for Water Pollution, Dust, and Erosion Control submittals are included in Section 209 of the Hawaii Standard Specifications for Road and Bridge Construction dated 2005 and applicable Special Provisions. A list of pollutant sources and corresponding BMP used to mitigate the pollutants are included in Section 209 of the Special Provisions under Appendix A.

Follow the requirements below:

1. Protect all Drainage Inlets receiving runoff from disturbed areas (SC-1).

2. Contain on-site runoff using Perimeter Sediment Controls
   a. SC-7 Silt Fence or Filter Fabric Fence
   b. SC-2 Vegetated Filter Strips and Buffers
   c. SC-6 Compost Filter Berm/Sock
   d. SC-8 Sandbag Barrier
   e. SC-9 Brush or Rock Filter

3. Control offsite runoff from entering construction area
   a. EC-3 Run-On Diversion
   b. EC-5 Earth Dike, Swales, and Ditches

4. Incorporate applicable Site Management BMP
   a. SM-1 Employee Training
   b. SM-2 Material Delivery and Storage
   c. SM-3 Stockpile Management
   d. SM-6 Solid Waste Management
   e. SM-7 Sanitary/Septic Waste Management
   f. SM-9 Hazardous Waste Management
   g. SM-10 Spill Prevention and Control
   h. SM-11 Vehicle and Equipment Cleaning
   i. SM-12 Vehicle and Equipment Maintenance
   j. SM-13 Vehicle and Equipment Refueling
   k. SM-14 Scheduling
   l. SM-15 Location of Potential Sources of Sediment
   m. SM-16 Staging Area
   n. SM-17 Preservation of Existing Vegetation
   o. SM-19 Dust Control

5. Contain pollutants within the Construction Staging/Storage Area BMP with applicable Perimeter Sediment Controls and Site Management BMP. Include a Stabilized Construction Entrance/Exit (SC-11) for all areas which exit onto a paved street. Restrict vehicle access to these points.

6. Manage Concrete Waste including installing a Concrete Washout Area (SM-4) and properly disposing of Concrete Curing Water (California Stormwater BMP Handbook NS-12 Concrete Curing).

7. Remove saw cut slurry and hydrodemolition water from the site by vacuuming. Provide storm drain protection and/or perimeter sediment controls during saw cutting and hydrodemolition work.

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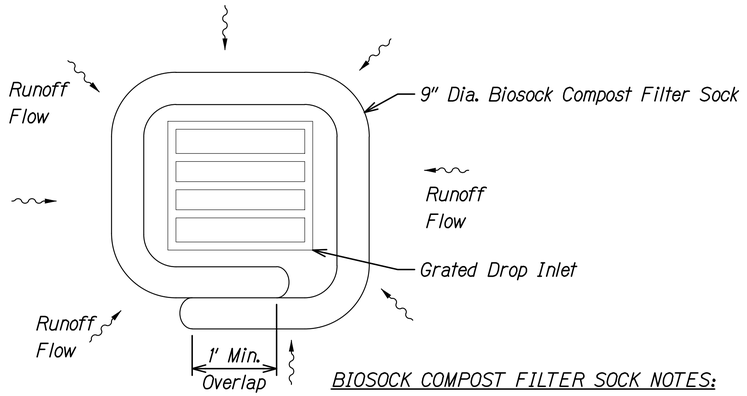
WATER POLLUTION AND EROSION CONTROL NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. E-3 OF 5 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	16	71



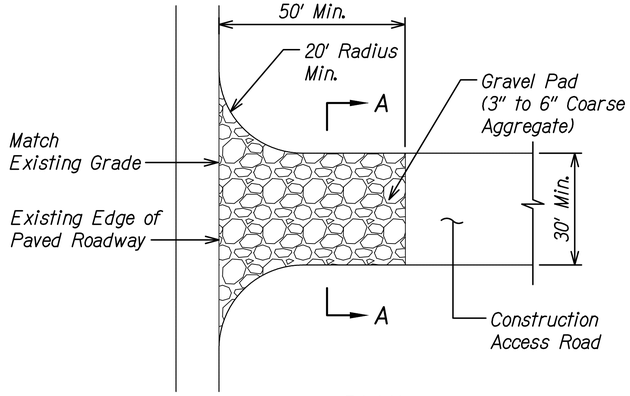
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BIOSOCK COMPOST FILTER SOCK NOTES:

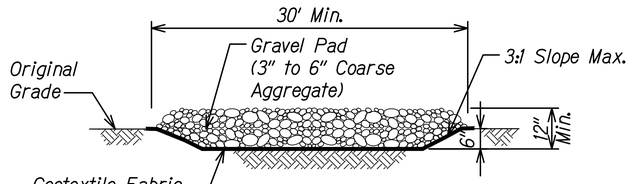
1. Remove accumulated sediment when depth reaches 1/3 the barrier height.
2. Biosock Material and compost shall be removed at the completion of construction (or a phase of construction) and shall be disposed of properly.

BIOSOCK COMPOST FILTER SOCK DRAIN INLET PROTECTION DETAIL

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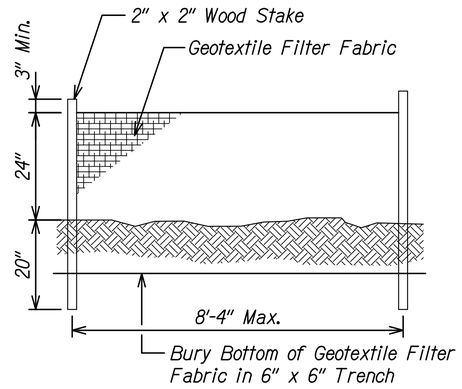
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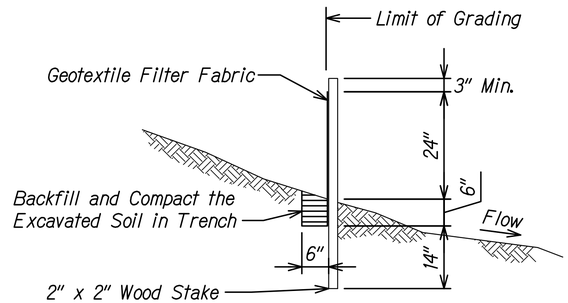


SECTION A-A

TEMPORARY STABILIZED CONSTRUCTION ENTRANCE

Not to Scale



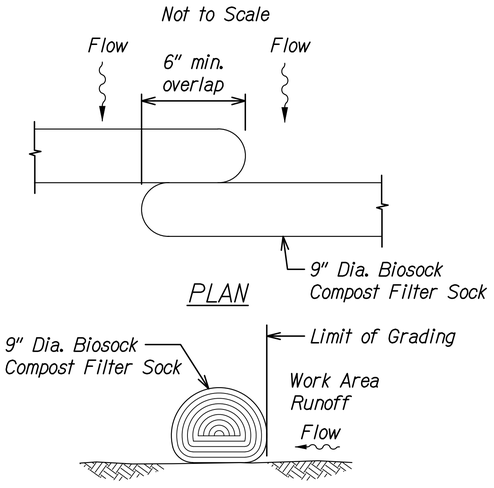


SILT FENCE DETAIL

Not to Scale

SILT FENCE NOTES:

1. The filter fabric shall be a minimum of 36 inches wide.
2. If silt fence is obtained from manufacturer as a package (i.e. fabric attached to post) the manufacturer's installation instructions shall be adhered to.



SECTION

BIOSOCK COMPOST FILTER SOCK PERIMETER CONTROL DETAIL

Not to Scale

ORIGINAL PLAN
NOTE BOOK
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE
No.

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

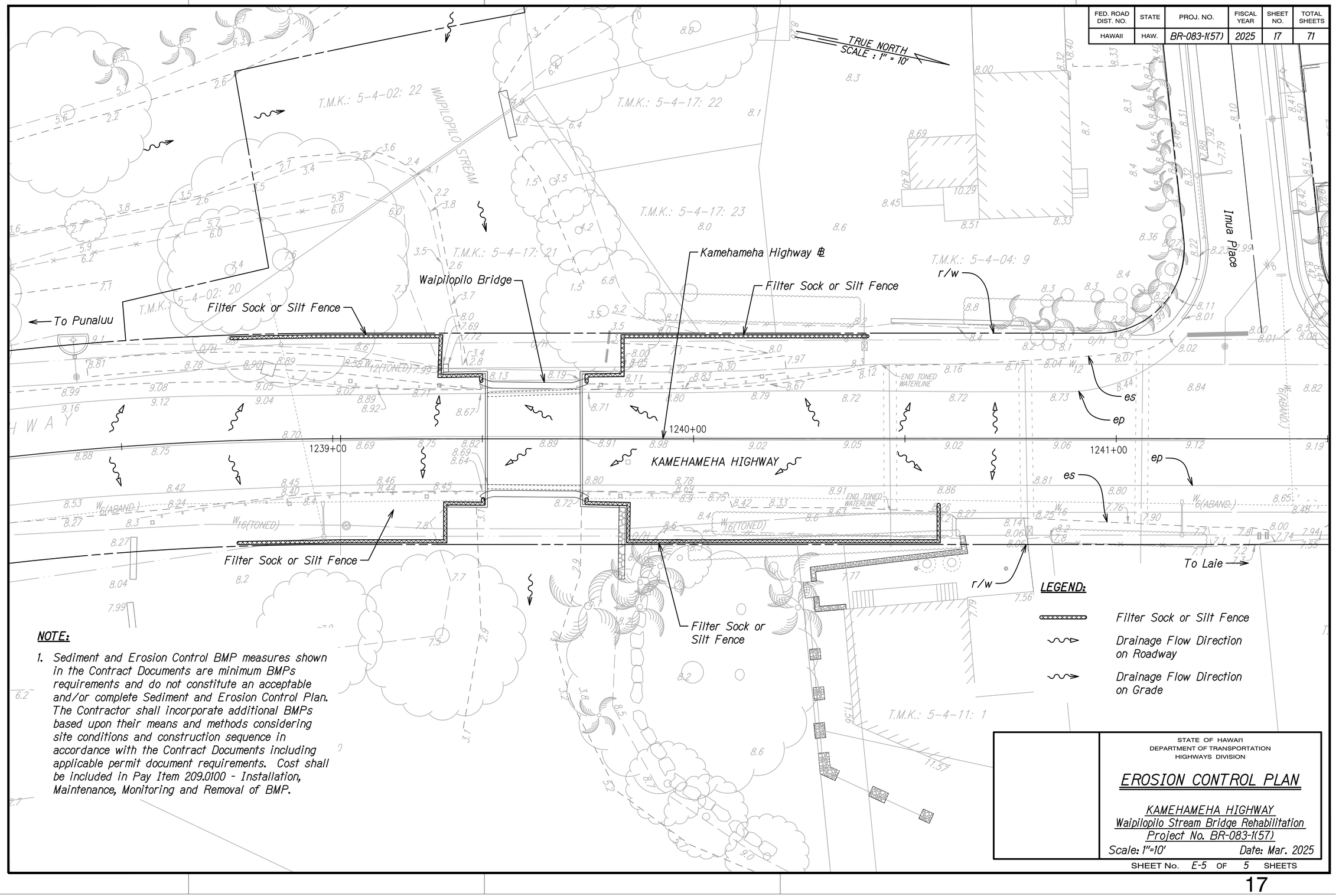
EROSION CONTROL DETAILS

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. E-4 OF 5 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	17	71



NOTE:

1. *Sediment and Erosion Control BMP measures shown in the Contract Documents are minimum BMPs requirements and do not constitute an acceptable and/or complete Sediment and Erosion Control Plan. The Contractor shall incorporate additional BMPs based upon their means and methods considering site conditions and construction sequence in accordance with the Contract Documents including applicable permit document requirements. Cost shall be included in Pay Item 209.0100 - Installation, Maintenance, Monitoring and Removal of BMP.*

LEGEND:

- Filter Sock or Silt Fence
- Drainage Flow Direction on Roadway
- Drainage Flow Direction on Grade

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
NOTE BOOK	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

EROSION CONTROL PLAN

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: 1"=10' Date: Mar. 2025

SHEET No. E-5 OF 5 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	18	71

TRUE NORTH
SCALE : 1" = 10'

T.M.K.: 5-4-02: 22
T.M.K.: 5-4-17: 22
T.M.K.: 5-4-17: 23
T.M.K.: 5-4-17: 21
T.M.K.: 5-4-02: 20
T.M.K.: 5-4-04: 9
T.M.K.: 5-4-11: 23
T.M.K.: 5-4-11: 1

℄ STA 1239+01.85 (BK.) = ℄ STA 1239+16.47 (AH)
EQ.

Kamehameha Highway ℄
Waipilopilo Bridge
Imua Place
KAMEHAMEHA HIGHWAY

STA. KAM-1
RR SPIKE
ELEV=8.23
KAMEHAMEHA HIGHWAY
℄ STA. 1240+14.50,
o/s 16.23' Lt.

r/w

To Punaluu
To Laie

O/H
W12(TONED)
W12
W16(TONED)
W16
W6(ABAND.)
END TONED WATERLINE

es
ep

339°14'32.83" ← 99.36'
359°23'17.62" ← 87.03'
356°14'4.08" ← 123.50'
168°38'30" →
156°33'16.92" → 163.72'
158°47'46.22" → 199.95'
224°16'41.25" → 41.53'

1239+00
1240+00
1241+00

℄ Sta. 1241+00
to Street Mon.
168°47'0.58", 36.92'

STREET
MONUMENT
KAMEHAMEHA HIGHWAY
℄ STA. 1241+36.92,
o/s 0.09' Rt.

STA. W-3
1/2" PIPE
ELEV=7.87
KAMEHAMEHA HIGHWAY
℄ STA. 1239+39.91,
o/s 34.28' Rt.

℄ CURVE DATA (A)

Δ = 22°36'0.00"
Δ/2 = 11°18'0.00"
R = 716.80'
T = 143.23'
Ch = 280.91'
Lc = 282.74'

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
NOTE BOOK	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ALIGNMENT PLAN

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: 1"=10' Date: Mar. 2025

SHEET No. A-1 OF 1 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	19	71

TRUE NORTH
SCALE : 1" = 10'

T.M.K.: 5-4-02: 22
T.M.K.: 5-4-17: 22
T.M.K.: 5-4-17: 17
T.M.K.: 5-4-04: 9
T.M.K.: 5-4-02: 21
T.M.K.: 5-4-11: 1

Trailing-End Anchorage System w/ RWE-03A Rounded End See Detail on Sht. R-5

Hawaii MASH Transition See Structural Plan Sht. SX.X

Quadguard Elite M10 8-Bay System Crush Cushion (MASH TL-3) (2' System Wdth, 22' System Lgth) or Approved Equal

℄ K Sta. 1238+47.43, O/S 15.63' Lt. Begin Trailing-End Anchorage System

℄ K Sta. 1238+70.19, O/S 13.71' Lt. End Trailing-End Anchorage Sys. Begin Hawaii MASH Transition

℄ K Sta. 1238+94.72, O/S 13.04' Lt. End Hawaii MASH Transition

℄ K Sta. 1240+10.77, O/S 13.58' Lt. Begin Quadguard Elite M10 8-Bay System

℄ K Sta. 1240+37.85±, O/S 13.58' Lt. End Quadguard Elite M10 8-Bay System

6" Min. Reinforced 4000 PSI (Min.) P.C. Concrete Pad (4'-0" Width, 27'-0" Length). Anchor Block to be Located at the Front of the Pad.

Bridge Parapet/Barrier Wall See Structural Plans

See Structural Plans

20'-0"

25'-0"

R/W

To Punaluu

es

ep

Exist. Guardrail To Be Removed

1238+00

1239+00

1240+00

1241+00

R-500'

Kamehameha Highway ℄

END TONED WATERLINE

KAMEHAMEHA HIGHWAY (STATE)

To Laie

Waipilopilo Bridge

Bridge Parapet/Barrier Wall See Structural Plans

6" Min. Reinforced 4000 PSI (Min.) P.C. Concrete Pad (4'-0" Width, 21'-0" Length). Anchor Block to be Located at the Front of the Pad.

℄ K Sta. 1238+ 15.06, O/S 21.27' Rt. Begin MFLEAT Terminal

℄ K Sta. 1238+55.80, O/S 20.02' Rt. End MFLEAT Terminal Begin Guardrail

℄ K Sta. 1238+68.66, O/S 20.10' Rt. End Guardrail Begin Hawaii MASH Transion

℄ K Sta. 1238+94.37, O/S 20.2' Rt. End Hawaii MASH Transition

℄ K Sta. 1240+10.77, O/S 20.83' Rt. Begin QuadGuard M10 6-Bay System

℄ K Sta. 1240+32.77±, O/S 20.83' Rt. End QuadGuard M10 6-Bay System

MFLEAT Terminal or Approved Equal

31" W-Beam Guardrail w/ Standard 8" Offset Block. 12'-6" Pay Limit. See Detail on Sheet R-2 & R-3.

Hawaii MASH Transition See Structural Plan Sheet SX.X

QuadGuard M10 6-Bay System Crush Cushion (MASH TL-3) (2' System Wdth, 22' System Lgth) or Approved Equal

LEGEND:

- 4" PMA Pavement, Mix No. IV / 8" AC Base / 12" AC Subbase
- 2" PMA Pavement, Mix No. IV
- 2" Cold Plane / 2" PMA Pavement, Mix No. IV
- AC Transition on Sleeper Slab
- See Structural Plans
- Flow Arrow

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

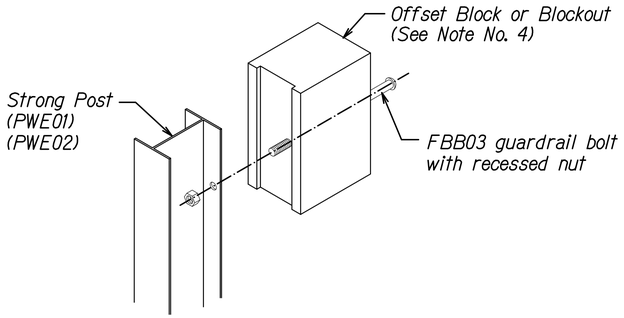
ROADWAY PLAN

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: 1"=10' Date: Mar. 2025

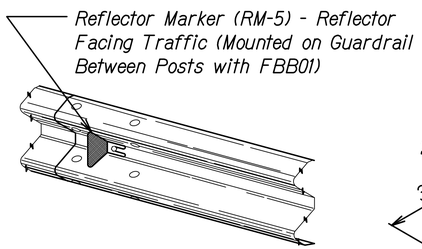
SHEET No. R-1 OF 5 SHEETS

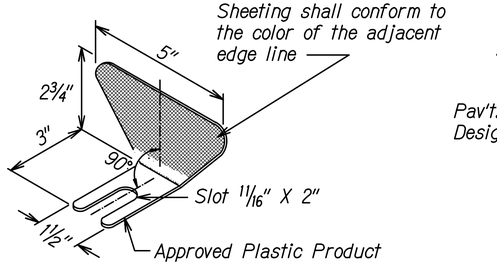
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	20	71



Exploded View
(Rail and washer not shown)

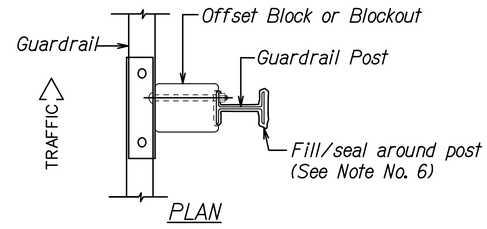
STEEL POST AND BLOCK DETAIL



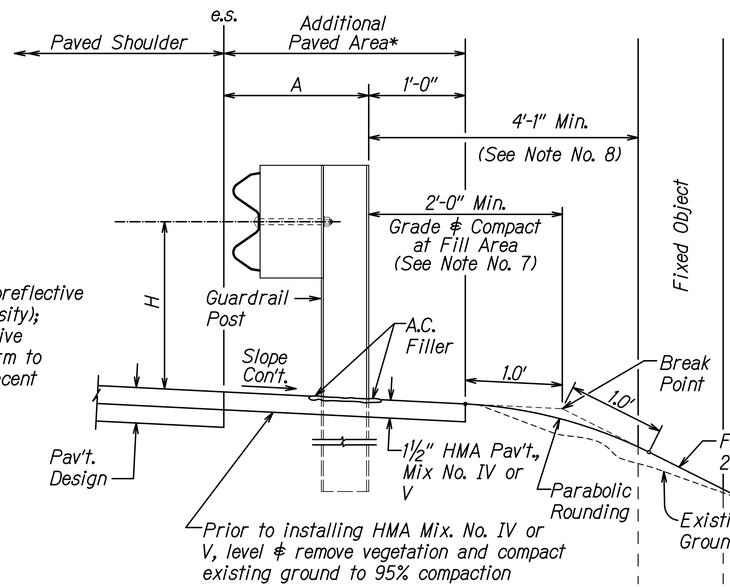


REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION

GUARDRAIL TYPE	DIMENSION	
	H	A
MGS w/ Standard 8" Offset Block	2'-1"	1'-6"
MGS w/ No Blockout	2'-7/8"	9 1/4"



PLAN



ELEVATION

TYPICAL GUARDRAIL INSTALLATION

GENERAL NOTES

1. All hardware, posts and fasteners shall be hot-dip zinc coated galvanized after fabrication. No punching, drilling or cutting will be permitted after galvanizing.
2. Where conditions require, special post lengths in increments of 6 inches may be specified by the Engineer.
3. All fasteners, posts, and rail elements (i.e. FBB03, PWE01, RWM04b, etc.) shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware", a report prepared and approved by the AASHTO-AGC-ARTBA Joint Cooperative Committee, Subcommittee On New Highway Materials, Task Force 13 Report. Dimensions of fastners, posts and rail elements have been converted from metric units into their present form.
4. The Blockout or Offset Block shall be approved by the State.
5. All new guardrail systems (system consists of total length of guardrail including both end treatments) shall include the Additional Paved Area.
6. After the guardrail posts are installed in the paved area, the Contractor shall fill/seal around each guardrail post and all cracks in the paved area caused during the guardrail post installation. If required by the inspector/engineer, the Contractor shall tamper the paved area around the guardrail post prior to filling/sealing. All costs associated with this work shall not be paid for separately, but shall be considered incidental to the various guardrail items.
7. When standards for the fill slope area cannot be met, a site specific, engineer approved design may be used.
8. Minimum working width (clear distance) between back of MGS post to any fixed object is 4'-1" (49").
9. New Hot Mix Asphalt (HMA) pavement at guardrails shall extend 6 feet longitudinally beyond terminal ends.
10. Reflector Markers (RM-5) mounted on guardrails shall be spaced every 25 feet. RM-5's shall not be installed on Terminal Sections. Furnishing and installing of each RM-5 shall be considered incidental to the guardrail system.
11. New End Treatment shall be MASH compliant. Contractor will be required to submit shop drawings for approval during construction.

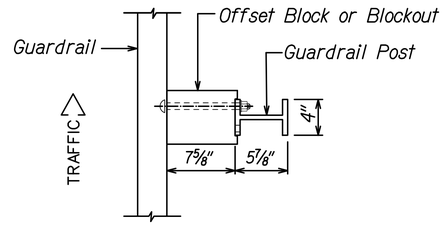
ORIGINAL PLAN | SURVEY PLOTTED BY | DATE
NOTE BOOK | DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
No. | CHECKED BY

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

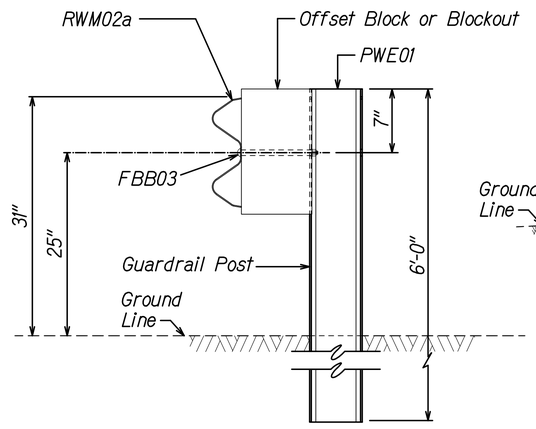
GUARDRAIL DETAIL AND NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)
Scale: Not to Scale Date: Mar. 2025

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	21	71

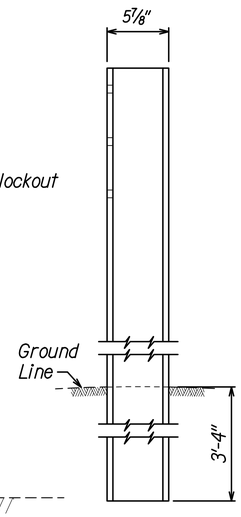


PLAN

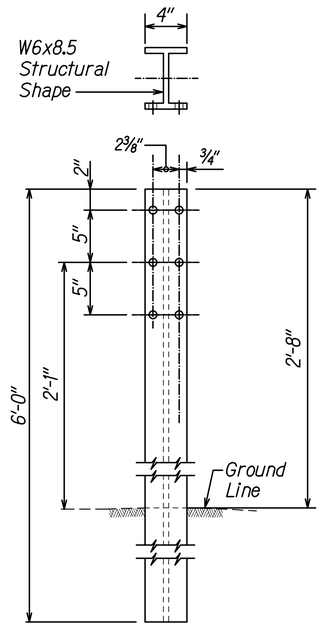


SECTION A-A

NOTE:
All Holes are ¾" Dia.

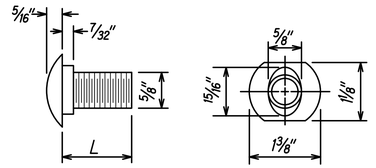


SIDE

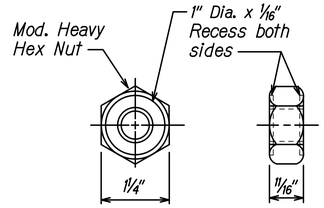


FRONT

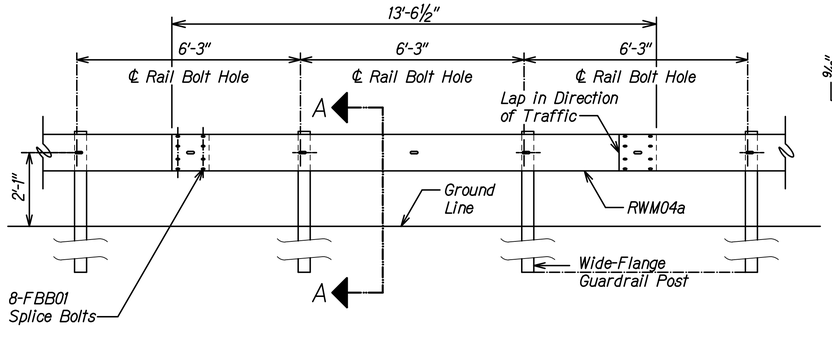
W-BEAM STRONG POST (PWE01)



DESIGNATOR	L
FBB01	1⅜"
FBB02	2"
FBB03	10"



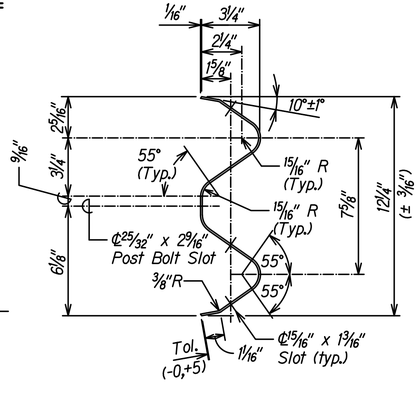
GUARDRAIL BOLTS AND RECESSED NUT

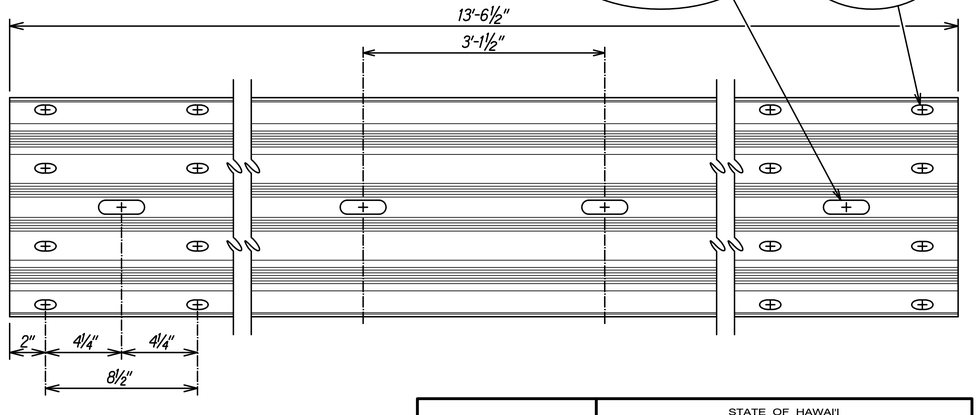


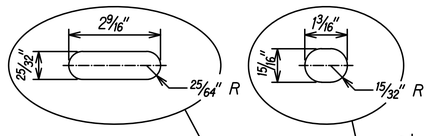
ELEVATION

MIDWEST GUARDRAIL SYSTEM WITH STANDARD 8" OFFSET BLOCK (SGR47)

DESIGNATOR	BASE METAL THICKNESS
RWM04a	12 Gauge







4 SPACE W-BEAM GUARDRAIL (RWM04a)

ORIGINAL PLAN
SURVEY PLOTTED BY DATE
DRAWN BY
TRACED BY
NOTE BOOK DESIGNED BY
QUANTITIES BY
CHECKED BY
No.

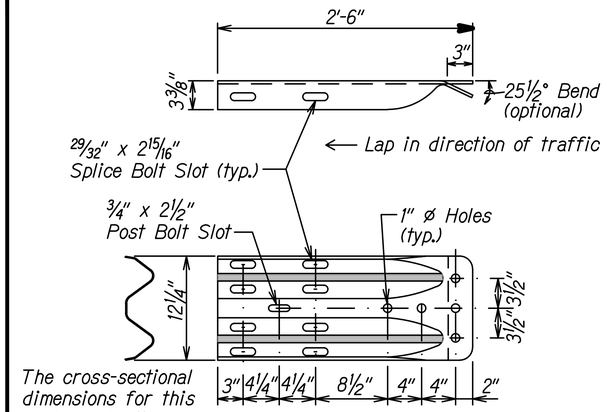
STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

31" W-BEAM GUARDRAIL WITH STANDARD 8" OFFSET BLOCK

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: Not to Scale Date: Mar. 2025

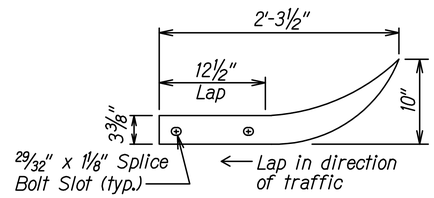
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	22	71



The cross-sectional dimensions for this part are to fit over part RWM02a on the approach end and under part RWM02a on the trailing end.

DESIGNATOR	BASE METAL THICKNESS
RWE02b	10 Gauge

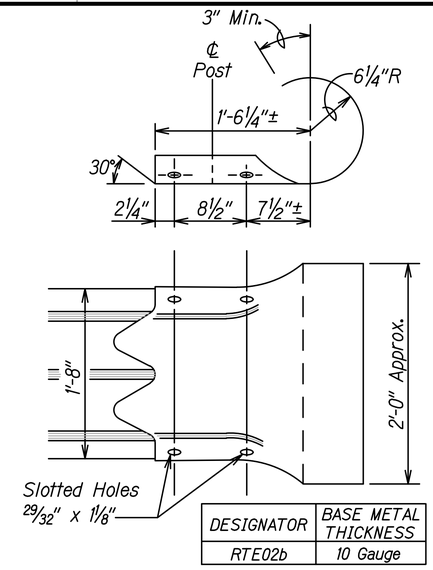
W-BEAM TERMINAL CONNECTOR (RWE02b)



The cross-sectional dimensions for this part are to fit over part RWM02a on the approach end and under part RWM02a on the trailing end.

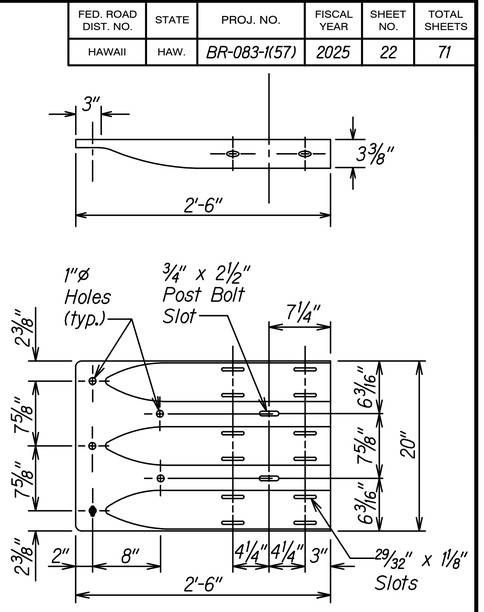
DESIGNATOR	BASE METAL THICKNESS
RWE01a	12 Gauge

W-BEAM END SECTION (FLARED RWE01a)



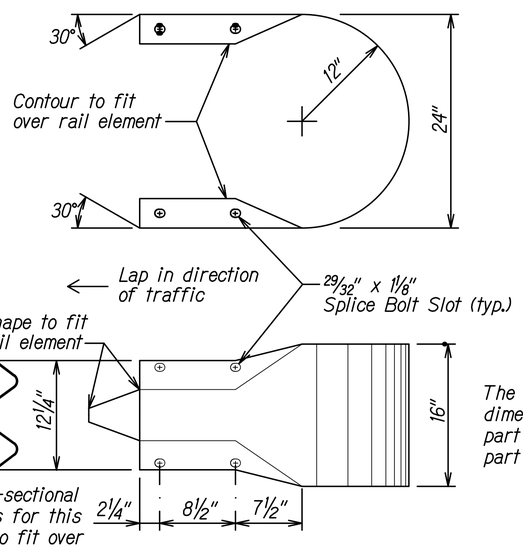
DESIGNATOR	BASE METAL THICKNESS
RTE02b	10 Gauge

THRIE-BEAM SECTION (ROUNDED) (RTE02b)



DESIGNATOR	BASE METAL THICKNESS
RTE01b	10 Gauge

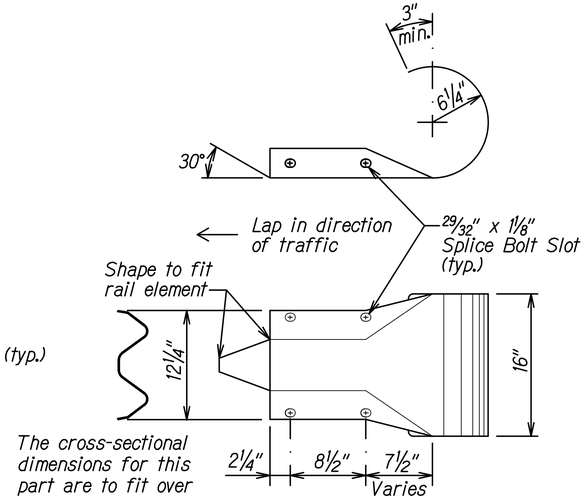
THRIE-BEAM TERMINAL CONNECTOR (RTE01b)



The cross-sectional dimensions for this part are to fit over part RWM02a

DESIGNATOR	BASE METAL THICKNESS
RWE06a	12 Gauge

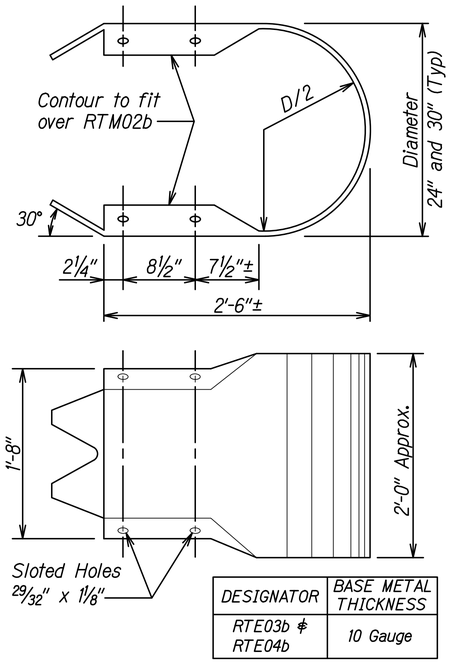
W-BEAM END SECTION (BUFFER RWE06a)



The cross-sectional dimensions for this part are to fit over part RWM02a

DESIGNATOR	BASE METAL THICKNESS
RWE03a	12 Gauge

W-BEAM END SECTION (ROUNDED RWE03a)



DESIGNATOR	BASE METAL THICKNESS
RTE03b & RTE04b	10 Gauge

THRIE-BEAM END SECTION (BUFFER RTE03b or RTE04b)

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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	TRACED BY	
NOTE BOOK	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

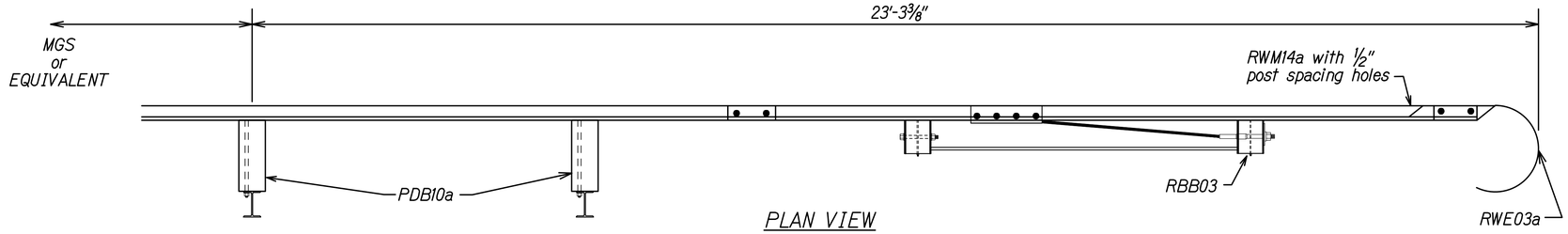
GUARDRAIL TERMINAL CONNECTORS & END SECTIONS

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

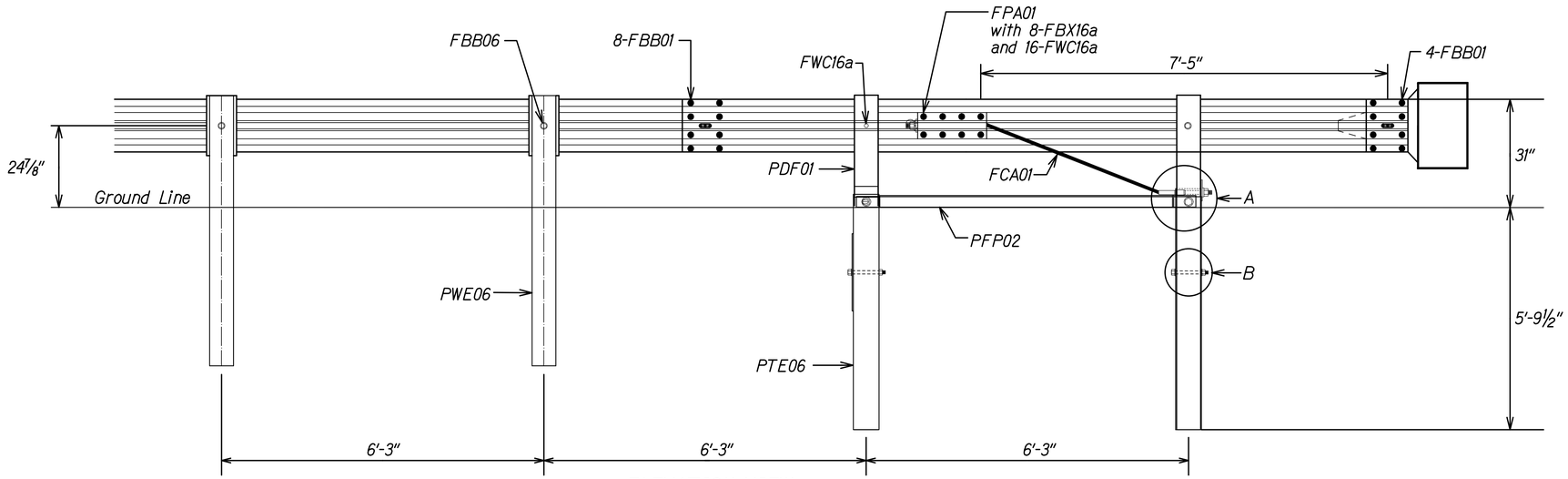
Scale: Not to Scale Date: Mar. 2025

SHEET No. R-4 OF 5 SHEETS

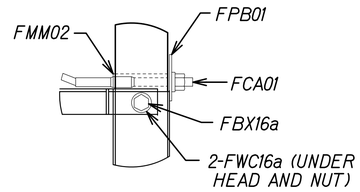
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	23	71



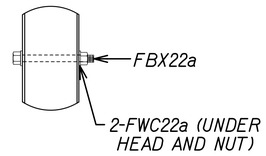
PLAN VIEW



ELEVATION VIEW
NON TRAFFIC SIDE

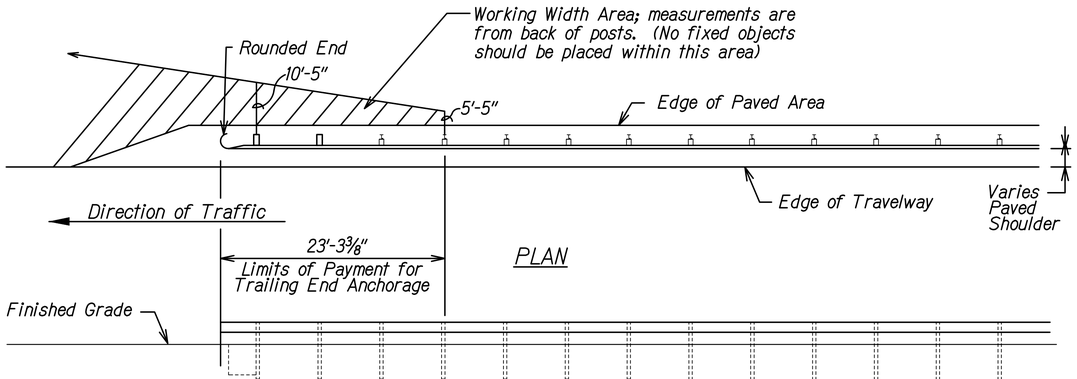


DETAIL A



DETAIL B

ITEM NO.	QTY	COMPONENTS
FBB01	12	Guardrail Bolt and Nut
FBB03	2	Guardrail Bolt and Nut
FBB06	1	Guardrail Bolt and Nut
FBX16a	2	Hex Head Bolt (10") and Nut
FBX16a	8	Hex Head Bolt (1½") and Nut
FBX22a	2	Hex Head Bolt (7½") and Nut
FCA01	1	BCT Anchor Cable Assembly
PDB10a	2	MGS Timber Blockout
PFP02	1	Strut and Yoke Assembly
PWE06	1	Wide-Flange Guardrail Post
FMM02	1	BCT Post Sleeve
FPA01	1	Anchor Bracket Assembly
FPB01	1	BCT Bearing Plate
FWC16a	22	Circular Washer
FWC22a	4	Circular Washer
PDF01	2	BCT Timber Post
PTE06	2	Foundation Tube
RWE03a	1	W-Beam Rounded End Section
RWM14a	1	W-Beam MGS End Section



PLAN

ELEVATION

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE

NOTE BOOK | No.

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TRAILING-END ANCHORAGE SYSTEM

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: Not to Scale Date: Mar. 2025

SHEET No. R-5 OF 5 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	24	71

Start Waterline "A"
℄ K Sta. 1238+10.47, 17.93' Lt.
Connect to exist. w12
Contractor to verify invert and location
MATERIALS FOR CONNECTION:
1 - 12" Tapping Tee Sleeve
1 - 12" Gasket
3 - 12" Tapping Gate Valve
1 - Concrete Block

℄ K Sta. 1238+9.54, 4.04' Lt.
1 - 12" 11-¼ degree Bend

Waterline "A"
12" Temp. Cross Connection

End Waterline "A"
℄ K Sta. 1238+10.57, 18.94' Rt.
Connect to exist. w16
Contractor to verify invert and location
MATERIALS FOR CONNECTION:
1 - 12" Tapping Tee Sleeve
1 - 12" Gasket
1 - 12" Tapping Gate Valve
2 - 16" Tapping Gate Valves
1 - Concrete Block

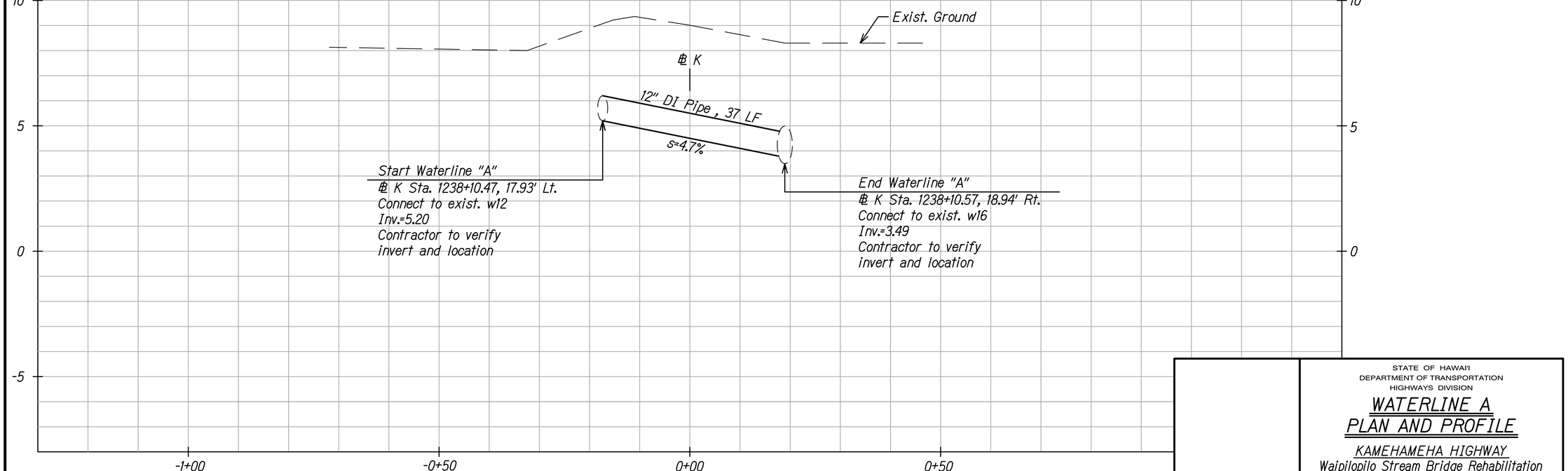
℄ P.T. Sta. 1239+1.85 Bk.=
℄ P.T. Sta. 1239+16.47 Ah.

Waterline "B"
See Sheet U-2

TRUE NORTH
SCALE : 1" = 10'

PLAN - WATERLINE "A"
Scale: 1"=10'

NOTE:
Construct Waterline "A" prior to Construction Phase 1.



PROFILE - WATERLINE "A"
Scale: Horiz. 1"=10'
Vert. 1"=5'

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
NOTE BOOK	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

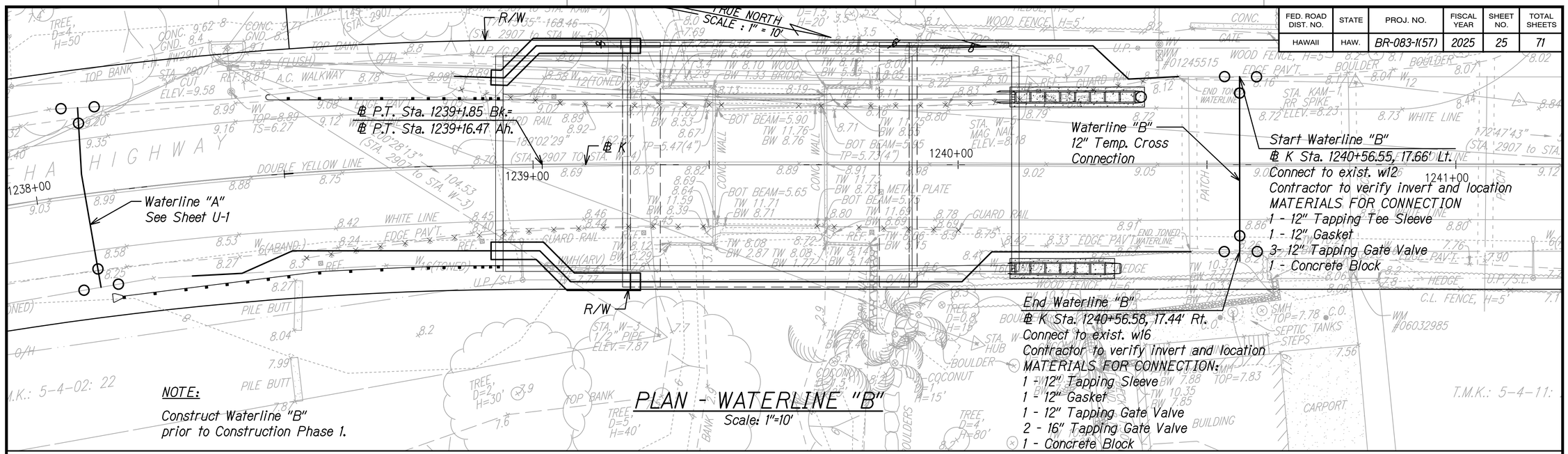
WATERLINE A PLAN AND PROFILE

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: As Shown Date: Mar. 2025

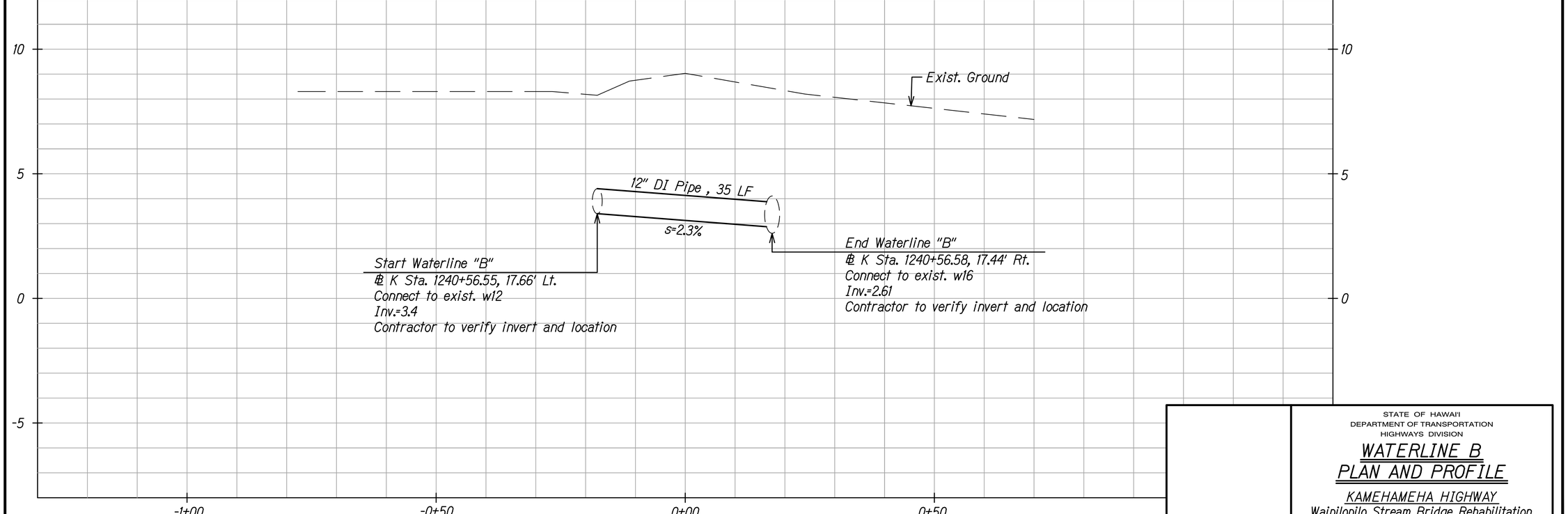
SHEET No. U-1 OF 4 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	25	71



PLAN - WATERLINE "B"

Scale: 1"=10'



PROFILE - WATERLINE "B"

Scale: Horiz. 1"=10'
Vert. 1"=5'

ORIGINAL PLAN
SURVEY PLOTTED BY ____ DATE
DRAWN BY ____
TRACED BY ____
NOTE BOOK DESIGNED BY ____
QUANTITIES BY ____
CHECKED BY ____
No. ____

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

WATERLINE B PLAN AND PROFILE

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: As Shown Date: Mar. 2025

SHEET No. U-2 OF 4 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	26	71

TRUE NORTH
SCALE : 1" = 10'

Waterline "C", Sta. 0+21.1
= ℄ K Sta. 1238+50.54, 15.49' Rt.
1-16" 1/16 Bend (H)
1-Conc. Block

℄ P.T. Sta. 1239+1.85 Bk.=
℄ P.T. Sta. 1239+16.47 Ah.

℄ K

Waterline "C", Sta. 0+10
=℄ K Sta. 1238+39.82, 19.18' Rt.
1-16" 1/16 Bend (H)
1-Conc. Block

Waterline "C", Sta. 0+70.77
=℄ K Sta. 1239+1.35, 17.28' Rt.
1-16" 1/8 Bend (H)
1-Conc. Block

Waterline "C", Sta. 1+35.71
= ℄ K Sta. 1239+78.35, 23.48' Rt.
Air Relief Valve w/ Enclosure

Waterline "C", Sta. 1+66.62
= ℄ K Sta. 1240+6.78, 17.49' Rt.
1-16" 1/8 Bend (H)
1-Conc. Block

End Waterline "C" Sta. 2+6.58
= ℄ K Sta. 1240+46.74, 17.45' Rt.
Contractor to verify invert and location
1-16" Ductile Iron Fitting

Begin Waterline "C" Sta. 0+00
= ℄ K Sta. 1238+29.55, 18.79' Rt.
Contractor to verify invert and location
1-16" Ductile Iron Fitting

Waterline "C", Sta. 0+79.54
= ℄ K Sta. 1239+22.19, 23.48' Rt.
1-16" 1/8 Bend (H)
1-Conc. Block

Waterline "C", Sta. 0+85.05
= ℄ K Sta. 1239+27.7, 23.48' Rt.
1-16" 1/8 Bend (B.V.)
1-Conc. Block

Waterline "C", Sta. 0+91.54
= ℄ K Sta. 1239+34.19, o/s 23.48' Rt.
1-16" 1/8 Bend (T.V.)
1-Conc. Block

Waterline "C", Sta. 1+47.53
= ℄ K Sta. 1239+90.18, 23.48' Rt.
1-16" 1/8 Bend (T.V.)
1-Conc. Block

Waterline "C", Sta. 1+58.14
= ℄ K Sta. 1240+0.78, 23.48' Rt.
1-16" 1/8 Bend (H)
1-Conc. Block

Waterline "C", Sta. 1+55.13
= ℄ K Sta. 1239+97.77, 23.48' Rt.
1-16" 1/8 Bend (B.V.)
1-Conc. Block

PLAN
WATERLINE "C"
Scale: 1"=10'

NOTES:
1. For Reinforced Concrete Jacket Detail, see Board of Water Supply Standard Plan B1, Dated 2002.
2. During Construction Phase 1. Shut off existing 16-inch waterline from Waterline "A" to Waterline "B". Construct Waterline "C".
3. Open valves for Waterline "C" once completed.

Waterline "C" Sta. 1+43.99
= ℄ K Sta. 1239+78.35, 23.48' Rt.
Air Relief Valve with Enclosure

Exist. w16 to Remain
Slope = 0.09%

℄ K Sta. 1238+10.57, 18.94' Rt.
12" Cross Connection
Inv.=3.49

1.0'

Bridge Deck
FG Elev.=8.8 (Approx.)

Exist. w16 to Remain
Slope = 0.23%

℄ K Sta. 1240+56.58, 17.44' Rt.
12" Cross Connection
Inv.=2.61

Begin Waterline "C" Sta. 0+00
=℄ K Sta. 1238+75.23±, 19.7' Rt.
Connect to Exist. w16
3.24± 1-16" DI Fitting

Waterline "C" Sta. 0+10
=℄ K Sta. 1238+39.82, 19.18' Rt.
3.25 1-16" 1/16 Bend (H)

Waterline "C" Sta. 0+21.1
=℄ K Sta. 1238+50.541, 15.49' Rt.
3.25 1-16" 1/16 Bend (H)

Waterline "C" Sta. 0+70.77
=℄ K Sta. 1239+1.35, 17.28' Rt.
3.30 1-16" 1/8 Bend (H)

Waterline "C" Sta. 0+79.54
=℄ K Sta. 1239+22.19, 23.48' Rt.
3.30 1-16" 1/8 Bend (H)

Waterline "C" Sta. 0+85.05
=℄ K Sta. 1239+27.7, 23.48' Rt.
3.31 1-16" 1/8 Bend (B.V.)

Waterline "C" Sta. 0+91.54
=℄ K Sta. 1239+34.19, 23.48' Rt.
9.8 1-16" 1/8 Bend (T.V.)

Waterline "C" Sta. 1+47.53
=℄ K Sta. 1239+90.18, 23.48' Rt.
9.8 1-16" 1/8 Bend (T.V.)

Waterline "C" Sta. 1+55.13
=℄ K Sta. 1239+27.7, 23.48' Rt.
2.20 1-16" 1/8 Bend (B.V.)

Waterline "C" Sta. 1+58.14
=℄ K Sta. 1240+0.78, 23.48' Rt.
2.21 1-16" 1/8 Bend (H)

Waterline "C" Sta. 1+66.62
=℄ K Sta. 1240+6.78, 17.49' Rt.
2.24 1-16" 1/8 Bend (H)

End Waterline "C" Sta. 2+6.58
=℄ K Sta. 1240+46.74, 17.45' Rt.
Connect to Exist. w16
2.32± 1-16" DI Fitting

10 5 0 -5

0+00 0+50 1+00 1+50

PROFILE - WATERLINE "C"
Scale: Horiz. 1"=10'
Vert. 1"=5'

ORIGINAL PLAN
SURVEY PLOTTED BY: DATE
DRAWN BY:
TRACED BY:
DESIGNED BY:
QUANTITIES BY:
CHECKED BY:
NOTE BOOK
No.

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

WATERLINE C
PLAN AND PROFILE

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: As Shown Date: Mar. 2025

SHEET No. U-3 OF 4 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	27	71

Waterline "D" 0+28.74
= ℄ K Sta. 1239+24.91, 23.85' Lt.
1-12" 1/8 Bend (B.V.)
1-Conc. Block

Waterline "D" 0+38
= ℄ K Sta. 1239+34.19, 23.85' Lt.
1-12" 1/8 Bend (T.V.)
1-Conc. Block

Waterline "D" Sta. 1+1.99
= ℄ K Sta. 1239+97.37, 23.85' Lt.
1-12" 1/8 Bend (B.V.)
1-Conc. Block

Waterline "D" Sta. 1+30.94
= ℄ K Sta. 1240+27.12, 23.85' Lt.
1-12" 1/8 Bend (H)
1-Conc. Block

Waterline "D" Sta. 1+41.55
=℄ K 1240+34.27, 17.18' Lt.
1-12" 1/8 Bend (H)
1-Conc. Block

Waterline "D" 0+19.07
= ℄ K Sta. 1239+0.66, 23.85' Lt.
1-12" 1/8 Bend (H)
1-Conc. Block

Waterline "D" Sta. 0+85.06
= ℄ K Sta. 1239+81.24, 23.85' Lt.
Air Relief Valve

Begin Waterline "D" Sta. 0+00
= ℄ K Sta. 1238+84.64, o/s 17.93' Rt.
Contractor to verify invert and location
1-12" Cast Iron to Ductile Iron Fitting

End Waterline "D" Sta. 1+51.55
= ℄ K Sta. 1240+44.26, 17.67' Lt.
Contractor to verify invert and location
1-12" Cast Iron to Ductile Iron Fitting

Waterline "D" Sta. 0+10
= ℄ K Sta. 1238+94.39, 17.47' Lt.
1-12" 1/8 Bend (H)
1-Conc. Block

℄ P.T. Sta. 1239+1.85 Bk.=
℄ P.T. Sta. 1239+16.47 Ah.

Waterline "D" 0+94.01
= ℄ K Sta. 1239+90.19, 23.85' Lt.
1-12" 1/8 Bend (T.V.)
1-Conc. Block

NOTES:
1. For Reinforced Concrete Jacket Detail, see Board of Water Supply Standard Plan B1, Dated 2002.
2. Prior to Construction Phase 2. Shut off existing 12-inch waterline from Waterline "A" to Waterline "B". Construct Waterline "D".
3. Construct Waterline "D" in Construction Phase 2. Open valves for Waterline "D" once completed.

PLAN - WATERLINE "D"
Scale: 1"=10'

℄ K Sta. 1238+10.47, 17.93' Lt.
12" Cross Connection
Inv.=5.20

Exist. w12 to Remain
Slope = 1.17%

Waterline "D" Sta. 0+85.06
= ℄ K Sta. 1239+86.63, 23.48' Rt.
Air Relief Valve with Enclosure

℄ K Sta. 1240+56.55, 17.66' Lt.
12" Cross Connection
Inv.=3.4

Exist. w12 to Remain
Slope = 0.0%

Begin Waterline "D" Sta. 0+00
= ℄ K Sta. 1238+84.64±, 17.93' Lt.
Connect to Exist. w12
4.38± 1-12" Cast Iron to DI Fitting

Waterline "D" Sta. 0+10
= ℄ K Sta. 1238+94.39, 17.47' Lt.
4.27 1-12" 1/8 Bend (H)

Waterline "D" Sta. 0+19.07
= ℄ K Sta. 1239+0.66, 23.85' Lt.
4.16 1-12" 1/8 Bend (H)

Waterline "D" Sta. 0+28.74
= ℄ K Sta. 1239+28.33, 23.85' Lt.
4.05 1-12" 1/8 Bend (B.V.)

Waterline "D" Sta. 0+38
= ℄ K Sta. 1239+34.19, 23.85' Lt.
9.79 1-12" 1/8 Bend (T.V.)

Waterline "D" Sta. 0+94.01
= ℄ K Sta. 1239+78.18, 23.85' Lt.
9.79 1-12" 1/8 Bend (T.V.)

Waterline "D" Sta. 1+1.99
= ℄ K Sta. 1239+98.53, 23.85' Lt.
3.40 1-12" 1/8 Bend (B.V.)

Waterline "D" Sta. 1+30.94
= ℄ K Sta. 1240+27.12, 23.85' Lt.
3.40 1-12" 1/8 Bend (H)

Waterline "D" Sta. 1+41.55
= ℄ K Sta. 1240+34.27, 17.18' Lt.
3.40 1-12" 1/8 Bend (H)

End Waterline "D" Sta. 1+51.55
= ℄ K Sta. 1240+44.26±, 17.67' Lt.
Connect to Exist. w12
3.40± 1-12" Cast Iron to DI Fitting

PROFILE - WATERLINE "D"
Scale: Horiz. 1"=10'
Vert. 1"=5'

ORIGINAL PLAN
SURVEY PLOTTED BY ____ DATE
DRAWN BY ____ . . . . .
TRACED BY ____ . . . . .
NOTE BOOK DESIGNED BY ____ . . . . .
QUANTITIES BY ____ . . . . .
No. ____ CHECKED BY ____ . . . . .

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

WATERLINE D
PLAN AND PROFILE

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)
Scale: As Shown Date: Mar. 2025

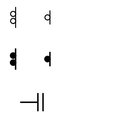
SHEET No. U-4 OF 4 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	28	71

PAVEMENT MARKING NOTES:

1. Location of pavement markers is shown schematically. For exact location of markers in relation to stripe, see Standard Plans.
2. All pavement striping, legends and symbols shall be retroreflective thermoplastic compound pavement markings.
3. Removal of existing pavement markings shall be considered incidental to the various contract items.
4. Layout of pavement markings and striping shall be done by the Contractor and approved by the Engineer prior to any installation work.
5. Existing pavement markings not incorporated in the final traffic pattern shall be removed as directed by the Engineer. The costs shall be incidental to the various pavement marking items.
6. All pavement striping shall be as noted on the legend or plans.
7. All preformed pavement marking tapes over existing pavement shall be applied with an approved primer as recommended by the tape's manufacturer and as approved by the Engineer. The primer shall be allowed to dry to the tacky stage prior to tape application.

LEGEND



Existing Sign

New Sign

Type II (OM2-2V) Object Marker

(1) 6" White Edge Stripe with Type C Raised Pavement Markers @ 40'-0" o.c. (Tape, Type I or Thermoplastic Extrusion)

(2) 4" Double Solid Yellow with Type D Raised Pavement Markers @ 20'-0" o.c. (Tape, Type I or Thermoplastic Extrusion)

ORIGINAL PLAN
NOTE BOOK
No.

SURVEY PLOTTED BY DATE
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

PAVEMENT MARKINGS NOTES & LEGEND

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	29	71

TRUE NORTH
SCALE : 1" = 20'

Kamehameha Highway ℄

℄ Sta. 1238+69.07
Meet existing pavement markers

℄ STA 1239+01.85 (BK) = ℄ STA 1239+16.47 (AH)
EQ.

℄ Sta. 1239+33.69
Begin Bridge

℄ Sta. 1239+90.18
End Bridge

℄ Sta. 1240+40.18
Meet existing pavement markers

50'-0"

50'-0"

r/w

To Punaluu

ep

es

Waipilopilo Bridge

4" Double Solid Yellow Stripe with Type D
Raised Pavement Markers @ 20'-0" o.c.
(Tape Type 1 or Thermoplastic Extrusion)

6" White Edge Stripe with Type C
Raised Pavement Markers @ 40'-0" o.c.
(Tape Type 1 or Thermoplastic Extrusion)

Imua Place (City)

KAMEHAMEHA HIGHWAY (STATE)

1237+00 1238+00 1239+00 1240+00 1241+00 1242+00

To Laie

T.M.K.: 5-4-04: 27
T.M.K.: 5-4-04: 10
T.M.K.: 5-4-04: 28
T.M.K.: 5-4-04: 29
T.M.K.: 5-4-04: 9
T.M.K.: 5-4-17: 1
T.M.K.: 5-4-17: 17
T.M.K.: 5-4-17: 22
T.M.K.: 5-4-17: 21
T.M.K.: 5-4-02: 20
T.M.K.: 5-4-02: 22
T.M.K.: 5-4-11: 1
T.M.K.: 5-4-11: 23
T.M.K.: 5-4-11: 24
T.M.K.: 5-4-11: 25

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
NOTE BOOK	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

PAVEMENT MARKINGS PLAN

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: 1"=20' Date: Mar. 2025

SHEET No. P-2 OF 2 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	30	71

GENERAL NOTES FOR TRAFFIC CONTROL PLAN

1. Only Traffic Control Plans for major construction activities are shown. The Contractor shall develop his own Traffic Control Plans in accordance with Section 645 of the Special Provisions for activities to complete work not covered by the Traffic Control Plans. The Contractor shall submit the Traffic Control Plans to the Engineer for acceptance. Payment for development and implementation of the Traffic Control Plans shall be included in pay item 645.1000 - Traffic Control.
2. All lane closures and traffic pattern changes (detours) not shown on the plan shall be submitted to the Engineer for acceptance in accordance with Specifications Section 645 - Work Zone Traffic Control. For restrictions on lane closures, detours, construction work during peak hours, and other requirements regarding maintaining vehicular and pedestrian traffic, see Subsection 107.03 - Working Hours; Night Work and Section 645 -Work Zone Traffic Control.
3. The Contractor shall make minor adjustments at intersections, driveways, bridges, structures, etc. to fit field conditions.
4. Cones or delineators shall be extended to a point where they are visible to approaching traffic.
5. Traffic control devices shall be installed such that the sign or device farthest from the work area shall be placed first. The others shall then be placed progressively toward the work area.
6. Flaggers and/or police officers shall be in sight of each other or in direct communications at all times. Flaggers and/or police officers working at night shall be illuminated as required by the MUTCD.
7. Sign spacings (L), taper lengths (T), and spacings of cones or delineators shall be as shown in Table 645-1 - For Traffic Control Plan of Section 645 in the Specifications, unless otherwise noted on HDOT's Traffic Control Plans.
8. All traffic lanes shall be a minimum of 10 feet wide.
9. All signs shall be promptly removed or covered whenever the message is not applicable or not in use.
10. The backs of all signs for traffic control shall be appropriately covered to preclude the display of inapplicable sign messages (i.e., when signs have messages on both faces).
11. Replace permanent pavement markings and traffic signs that are missing, damaged, or have been removed upon completion of each day's work. Payment for replacing permanent pavement markings and signs shall be considered incidental to the various contract items.
12. At the end of each day's work or as soon as the work is completed, the Contractor shall remove all traffic control devices no longer needed to permit free and safe passage of public traffic. Removal shall be in the reverse order of installation. Signs and temporary control devices shall not be stored within the roadway right-of-way.
13. The locations of pavement markings, signs, and delineators used in the Traffic Control shall be as shown on the plans, Contractor's accepted Traffic Control Plans, and/or as determined in the field by the Engineer.
14. Damage to signs, pavement markers, and delineators caused by the Contractor's negligence shall be repaired or replaced by the Contractor as directed by the Engineer at no cost to the State.
15. Signs for night work shall be retroreflective and shall be mounted with a Type B high intensity flasher. The sign and flasher will be paid under Pay Item No. 645.1000 - Traffic Control.
16. Work zone limits shown for each traffic control phase encompass all work items to be completed in that particular phase.
17. The Contractor shall provide all sign supports and/or posts for construction warning signs, including median barrier mounting brackets.
18. The Contractor shall furnish, install, maintain, and remove all traffic control devices shown on the traffic control plans. Payment for all work shown, including furnishing all police officers shown on the traffic control plans, shall be under Pay Item No. 645.1000 - Traffic Control.
19. Signs shall not be partially covered. If a sign needs to be covered, the entire sign shall be covered.

Legend:

- Work Area
- Traffic Cones @ 35' o.c.
- Traffic Cones @ 10' o.c.
- Sign
- Flagman
- Direction of Traffic
- Police Officer and Police Vehicle with Visible Blue Light

ORIGINAL PLAN
NOTE BOOK ____ No. ____
SURVEY PLOTTED BY ____ DATE
DRAWN BY ____
TRACED BY ____
DESIGNED BY ____
QUANTITIES BY ____
CHECKED BY ____

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TRAFFIC CONTROL NOTES AND LEGEND

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. TC-1 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	31	71

GENERAL NOTES FOR TRAFFIC CONTROL PLAN (WITHIN CITY R/W)

1. The Permittee shall make minor adjustments at intersections, driveways, bridges, structures, etc. to fit field conditions.
2. Cones or delineators shall be extended to a point where they are visible to approaching traffic.
3. Traffic control devices shall be installed such that the sign or device farthest from the work area is placed first. The others shall then be placed progressively toward the work area.
4. Regulatory and Warning Signs within the construction zone that are in conflict with the traffic control plans shall be removed or covered.
5. Flaggers and/or police officers shall be in sight of each other or in direct communication at all times.
6. When required by the issuing office, the Permittee shall install a flashing arrow signal as shown on the traffic control plans.
7. All traffic lanes shall be a minimum of 10 feet wide.
8. All construction warning signs shall be promptly removed or covered whenever the message is not applicable or not in use.
9. The backs of all signs used for traffic control shall be appropriately covered to preclude the display of inapplicable sign messages (i.e., when signs have messages on both faces).
10. Lane closure shall be limited only to the extent of accomplishing each day's work. As soon as each day's work is completed, the Permittee shall remove all traffic control devices no longer needed to permit free and safe passage of public traffic. Removal shall be in the reverse order of installation. Existing faded or obliterated pavement markings that are necessary for safe traffic flow in the construction area shall be replaced with temporary or permanent markings before opening the roadway to public traffic each day.
11. Permanent pavement markings and traffic signs shall be replaced upon completion of each phase of work.
12. Cones and delineators shall be spaced at a maximum distance of 20 feet apart. A minimum of six channelizing devices shall be used for each taper length.
13. Driveways shall be kept open unless the owners of the property using the driveway are otherwise provided for satisfactorily. Further, the Permittee shall control traffic going into and out of driveways.
14. Buffer and taper area on approach to any work area shall be kept clear of vehicles and equipment.
15. A high level warning device (flag tree) shall be installed on approach to all work areas.
16. "No Parking" signs shall be posted within any work area and for the buffer and taper areas approaching the work area.
17. Contractor shall obtain approval from DPP, Traffic Review Branch, for work or traffic control within City R/W. Payment shall be included in pay item 645.1000 Traffic Control.

ORIGINAL PLAN
NOTE BOOK ____ No. ____
SURVEY PLOTTED BY ____ DATE
DRAWN BY ____ .
TRACED BY ____ .
DESIGNED BY ____ .
QUANTITIES BY ____ .
CHECKED BY ____ .

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

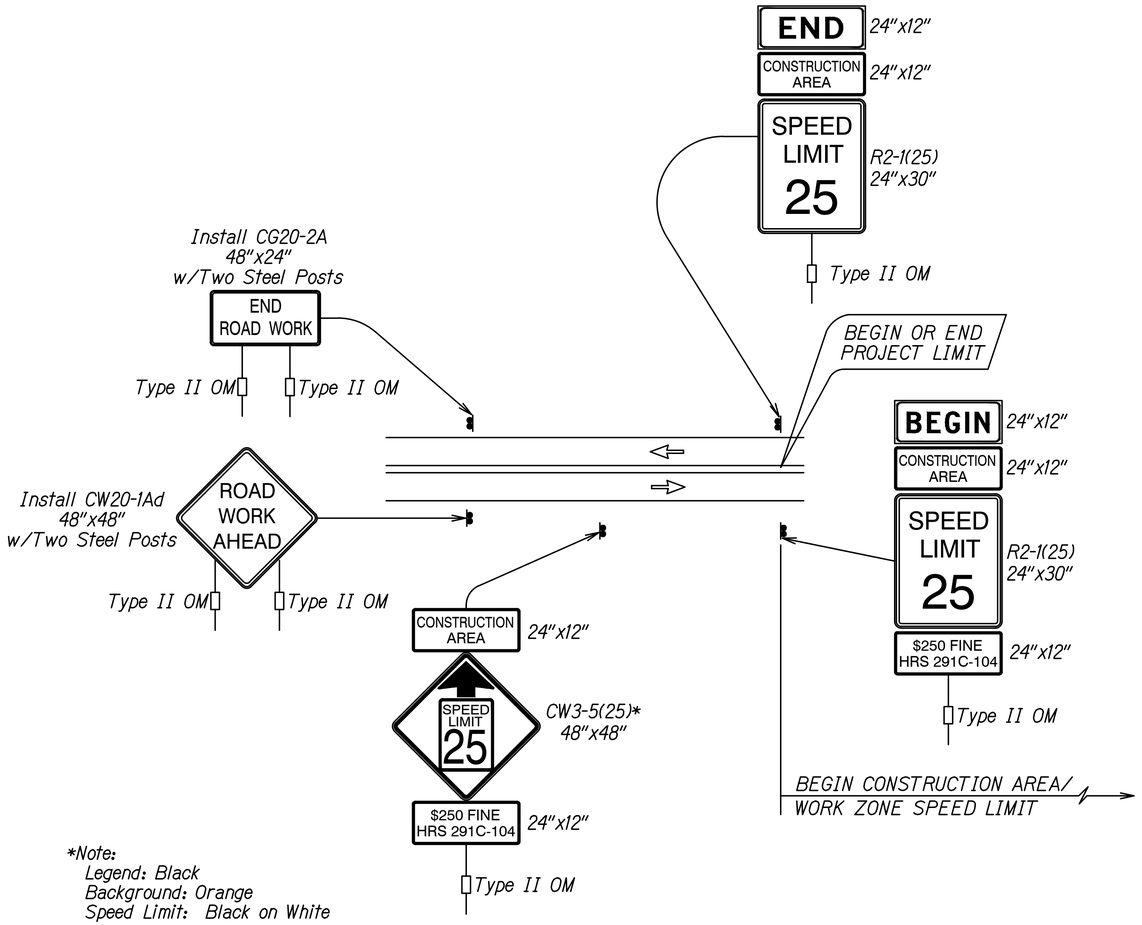
TRAFFIC CONTROL NOTES

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

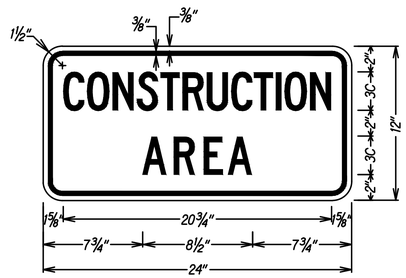
SHEET No. TC-2 OF 6 SHEETS

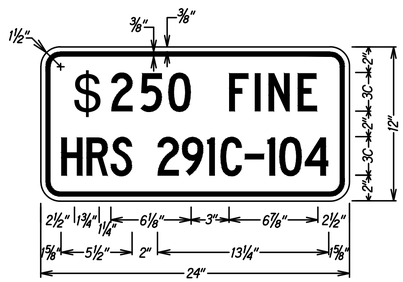
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	32	71

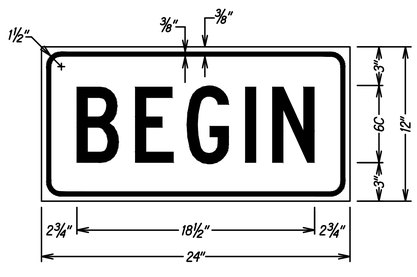


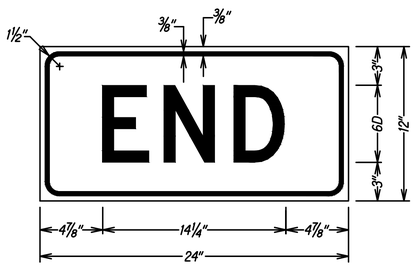
*Note:
Legend: Black
Background: Orange
Speed Limit: Black on White

TYPICAL DETAIL FOR CONSTRUCTION SIGNS ON TWO LANE OR MULTILANE UNDIVIDED LOW SPEED HIGHWAY









Work Zone Notes:

1. *This Work Zone Sign Plan is intended for use on long-term stationary work zones/construction phases (3 days or more). All work zones or construction phases less than 3 days duration will use Traffic Control Plans shown in Section 645 of the Special Provisions.*
2. *All existing regulatory speed limit signs with posts within the work zone/project limits shall be removed and replaced with work zone speed limit sign assemblies (R2-1(10) with "CONSTRUCTION AREA" and "$250 FINE HRS 291C-104" Supplemental Signs).*
3. *Construction sign assemblies shall be installed on both the approaching and trailing ends of each work zone as shown on this plan.*
4. *Each construction warning sign shall have a minimum of two (2) Type II OM. Each work zone speed limit assembly shall have a minimum of one (1) Type II OM. Installation of each Type II OM shall be considered incidental to Pay Item No. 645.1000 Traffic Control.*
5. *Upon the completion of all physical work or as directed by the Engineer, all construction signs and work zone speed limit assemblies shall be removed. All speed limit signs and posts that were existing at the start of the project within the work zone/project limits shall be restored back to their original locations and configurations.*
6. *Placement of construction signs shall not obstruct the path of pedestrians and bicyclists.*
7. *The removal and restoration of existing regulatory speed limit signs shall be considered incidental to Pay Item No. 645.1000 Traffic Control.*
8. *The installation, maintenance and removal of work zone speed limit signs shall be paid for under Pay Item No. 645.1000 Traffic Control.*
9. *The work zone speed limit signs shall be new and become the property of the Contractor.*
10. *The Contractor shall adjust the locations of work zone signs to correspond with the beginning and end of work zone limits for each phase. Relocation of work zone signs shall be considered incidental to Pay Item No. 645.1000 Traffic Control.*
11. *For sign location and speed limits, see Traffic Control Plan.*

TABLE I
GUIDELINE FOR ADVANCE PLACEMENT OF SPEED REDUCTION SIGN CW3-5(XX), CONSTRUCTION AREA SPEED LIMIT

EXISTING POSTED SPEED LIMIT (MPH)	XX-NEW CONSTRUCTION AREA SPEED LIMIT (MPH)	D-REDUCED SPEED LIMIT SIGN SPACING TO FIRST CONSTRUCTION AREA SPEED LIMIT SIGN (FEET)
≤ **25**	EXIST. SPEED LIMIT TO REMAIN	
30	25	100
35	25	175
40	30	175

ORIGINAL PLAN | SURVEY PLOTTED BY | DATE
NOTE BOOK | DRAWN BY
TYPED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
No.

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

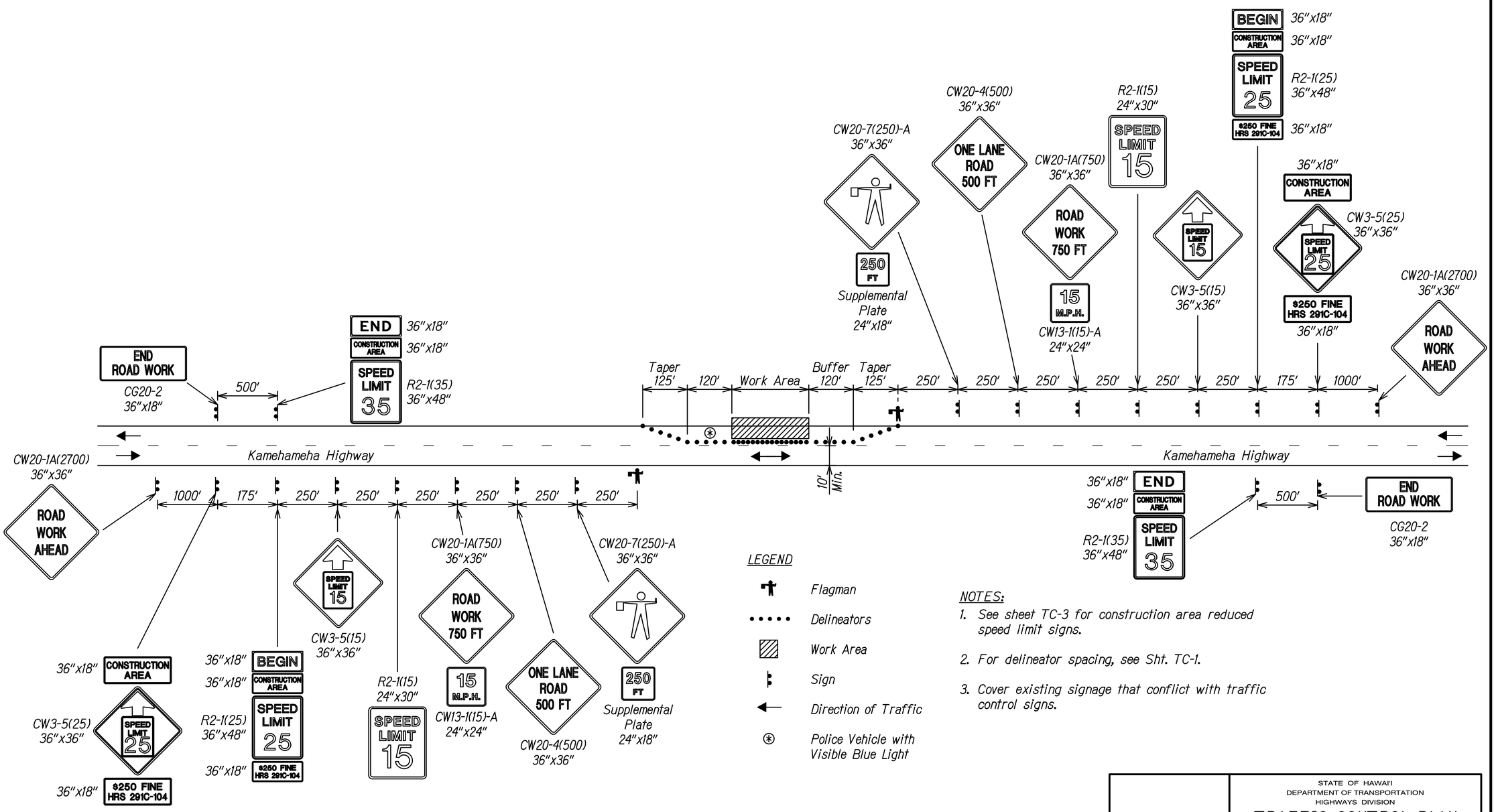
LOW SPEED UNDIVIDED HIGHWAY
WORK ZONE SIGNING PLAN, NOTES & DETAILS

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: None Date: Mar. 2025

SHEET No. TC-3 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	33	71



LEGEND

- Flagman
- Delineators
- Work Area
- Sign
- Direction of Traffic
- Police Vehicle with Visible Blue Light

NOTES:

1. See sheet TC-3 for construction area reduced speed limit signs.
2. For delineator spacing, see Sht. TC-1.
3. Cover existing signage that conflict with traffic control signs.

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TYPED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | NOTE BOOK | No.

TYPICAL TRAFFIC CONTROL PLAN FOR ONE LANE CLOSURE ALONG TWO-LANE ROADWAY

Not to Scale

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

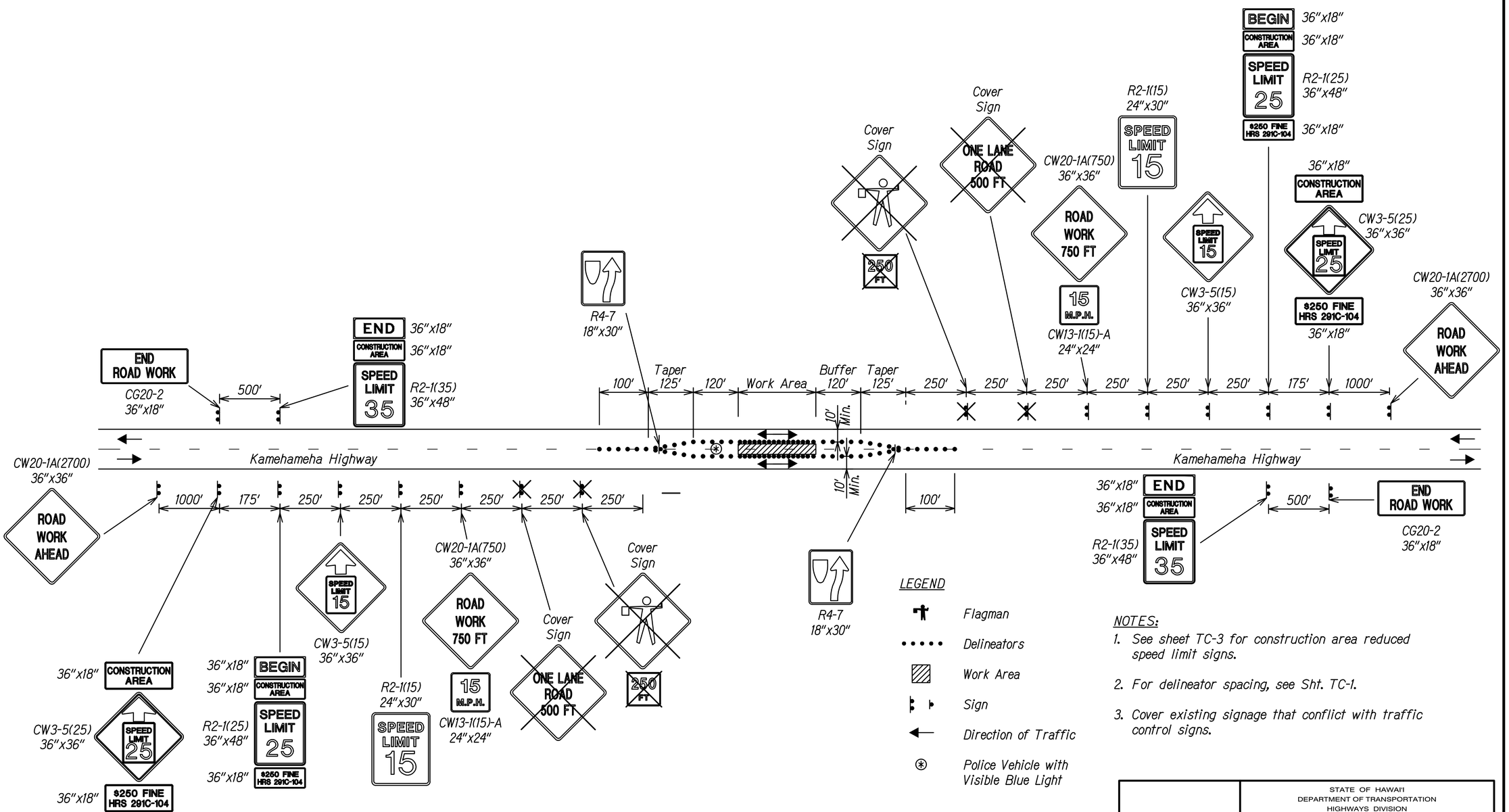
TRAFFIC CONTROL PLAN ONE LANE CLOSED

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: NTS Date: Mar. 2025

SHEET No. TC-4 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	34	71



NOTES:

1. See sheet TC-3 for construction area reduced speed limit signs.
2. For delineator spacing, see Sht. TC-1.
3. Cover existing signage that conflict with traffic control signs.

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE

NOTE BOOK | No.

TYPICAL TRAFFIC CONTROL PLAN FOR WORK AT CENTER OF ROAD ALONG TWO-LANE ROADWAY

Not to Scale

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TRAFFIC CONTROL PLAN WORK AT CENTER OF ROAD

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: NTS Date: Mar. 2025

SHEET No. TC-5 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	35	71

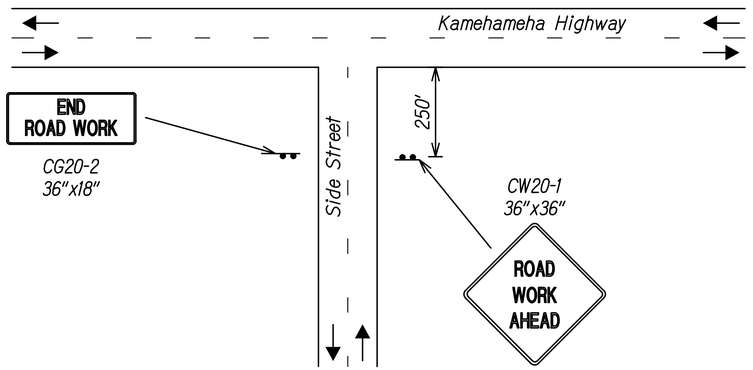
LEGEND

Sign

Direction of Traffic

NOTES:

1. See sheet TC-3 for construction area reduced speed limit signs.
2. For delineator spacing, see Sht. TC-1.
3. Cover existing signage that conflict with traffic control signs.



TYPICAL SIDE STREET SIGNING

Not to Scale

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STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TRAFFIC CONTROL PLAN
TYPICAL SIDE STREET SIGNING

KAMEHAMEHA HIGHWAY
Waipilopilo Stream Bridge Rehabilitation
Project No. BR-083-1(57)

Scale: NTS Date: Mar. 2025

SHEET No. TC-6 OF 6 SHEETS

INDEX TO STRUCTURAL DRAWINGS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	36	71

SHEET NO.	DESCRIPTION
S0.1	INDEX TO STRUCTURAL DRAWINGS
S0.2	STRUCTURAL GENERAL NOTES
S0.3	STRUCTURAL GENERAL NOTES
S0.4	STRUCTURAL GENERAL NOTES
S0.5	SYMBOLS AND ABBREVIATIONS
S1.1	LAYOUT PLAN
S1.2	FOUNDATION PLAN
S1.3	DECK FRAMING PLAN
S1.4	FINISH GRADE PLAN
S1.5	NORMAL DECK SECTION
S1.6	LONGITUDINAL SECTION
S2.1	DEMOLITION PLAN
S2.2	DEMOLITION SECTION
S3.1	NOT USED
S4.1	PRECAST DOUBLE TEE GIRDER ELEVATION AND SECTIONS
S4.2	PRECAST DOUBLE TEE GIRDER CAMBER AND DEFLECTION
S4.3	PRECAST DOUBLE TEE GIRDER NOTES
S5.1	ABUTMENT NO. 1 PLAN
S5.2	ABUTMENT NO. 2 PLAN
S5.3	ABUTMENT SECTIONS
S6.1	WINGWALL NO. 1 ELEVATION
S6.2	WINGWALL NO. 2 ELEVATION

SHEET NO.	DESCRIPTION
S7.1	DRILLED SHAFT NOTES
S7.2	DRILLED SHAFT
S7.3	LOAD TEST SHAFT
S8.1	END BEAM AND BACKWALL SECTIONS
S8.2	INTERMEDIATE DIAPHRAGMS
S9.1	DOWNSTREAM RAILING ELEVATION
S9.2	UPSTREAM RAILING ELEVATIONS
S10.1	APPROACH SLAB AND SLEEPER SLAB SECTION
S11.1	CONSTRUCTION PHASE 1
S11.2	CONSTRUCTION PHASE 2
S11.3	CONSTRUCTION PHASE 3
S11.4	CONSTRUCTION PHASE 3A
S11.5	CONSTRUCTION PHASE 4
S11.6	CONSTRUCTION PHASE 5
S11.7	CONSTRUCTION PHASE 6

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NOTE BOOK
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DRAWING NAME: Z:\OD ONGOING\20-002.2 WAIPILOPILO STR BR-00(HA)01 CAD\03-14-25\WSB-S0001 INDEX.DWG PLOT TIME: 03-13-25 3:30 PM)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

INDEX TO STRUCTURAL DRAWINGS

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S0.1 OF 5 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	37	71

STRUCTURAL GENERAL NOTES:

1. General Specifications:

   A. Hawaii Department of Transportation (HDOT) 2005 "Standard Specifications for Road and Bridge Construction", together with Special Provisions prepared for this project.

1. Design Specifications:

   A. American Association of State Highway and Transportation Officials (AASHTO) 2020 "LRFD Bridge Design Specifications", 10th Edition, and its subsequent interim supplements and as amended by the HDOT Highways Division.

   B. HDOT Document dated August 8, 2014 with subject title "Design Criteria for Bridges and Structures" and HDOT memorandum dated January 8, 2018 with subject title "Changes to Design Criteria for Bridges and Structures".

   C. AASHTO 2015 "LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals", 1st Edition including all subsequent interim revisions and editions and as amended by the HDOT document dated August 8, 2014 with subject title "Design Criteria for Bridge and Structures".

3. Design Loads:

   A. Dead Load: A weight of 25 psf for future wearing surface from curb to curb has been provided for in the design.

   B. Utility Load: An allowance of 150 plf on each side of the bridge for utility loads has been provided for in the design.

   C. Railing Test Level: TL-3

   D. Live Load: AASHTO HL-93 Vehicular Live Loading

   E. Seismic Loads:

PGA = 0.169 g	F_{PGA} = 1.95	As = 0.329 g
Ss = 0.384 g	Fa = 2.07	S_{DS} = 0.795 g
S_1 = 0.105 g	Fv = 3.49	S_{D1} = 0.366 g
Site Class = E	Seismic Zone = 3	

4. Concrete:

   A. All concrete strengths shall be as noted below:

Item No.	Structural Parts	Compressive Strength, f'c (28 Days)	Maximum Water/ Cementitious (W/C)	Maximum Cementitious Material Content (lbs./cy)	Included Admixtures (See Notes Below in This Section)
(1)	Drilled Shafts	5,000 psi	0.45	720	C
(2)	Drilled Shaft Cap Beam	6,000 psi*	0.40	670	C, D, E
(3)	Wingwalls	6,000 psi*	0.40	670	C, D, E
(4)	Precast Double Tees	xxxx psi	xxx	xxx	C, E
(5)	Concrete Topping, Edge Beams, End Beams, Backwalls, Diaphragms, Approach Slabs and Sleeper Slabs	(SBD, See Section 601)			
(6)	Closure Pour - Concrete Topping, End Beams, Backwalls, Diaphragms, Approach Slabs, and Sleeper Slabs	(VESLMC, See Section 677)			
(7)	Bridge Railings and End Posts	6,000 psi*	0.40	670	C, D, F
(8)	Except as noted otherwise, all others	5,000 psi	0.45	670	C

   * 56-day compressive strengths shall be a minimum of 6,000 psi. No extra cylinders need to be tested if 28-day compressive strengths are greater than 6,000 psi.

   B. The use of calcium chloride in any concrete is prohibited.

   C. Amine carboxylate corrosion inhibiting water-based admixture such as Cortec MCI 2005 NS or approved equal shall be added at a dosage of 24 ounces per cubic yard of concrete.

   D. Shrinkage reducing admixture such as Masterlife SRA 35 or approved equal shall be added at a dosage of 128 ounces per cubic yard of concrete or as recommended by the Manufacturer.

   E. Alkali resistant structural glass fiber such as CEMFIL, ANTI-CRAK HP67/36 or approved equal shall be added to the concrete mix. The dosage rate shall be 15 lbs. per cubic yard of concrete for CEMFIL or the equivalent amount of approved equal to achieve similar properties as the glass dosage. The fiber shall be added to the concrete as recommended by the Manufacturer during the mixing process.

4. Concrete (Cont.):

   F. A 1 1/2" long macro synthetic fiber such as Forta Ferro, Strux 90/40, Masterfiber Mac Matrix or approved equal shall be added to the concrete mix. The dosage shall be 7.5 lbs. per cubic yard of concrete or the equivalent amount of approved equal to achieve similar properties.

   G. Contractor is not limited to only adding admixtures listed on these notes. Other admixtures may be added upon approval of the Engineer.

   H. The Contractor has the option to design the concrete for all items to be pumpable and flowable. All concrete shall be designed for minimum segregation and separation.

ORIGINAL PLAN
NOTE BOOK No.
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QUANTITIES BY
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DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRUCTURAL GENERAL NOTES

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S0.2 OF 5 SHEETS

DRAWING NAME: Z:\JOB ONGOING\20-002.2 WAIPILOPILO STR BR-DOT\A01 CAD\03-14-25\WSB-S002 STRGNOTES.DWG PLOT TIME: 03-13-25, 3:31 PM

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	38	71

STRUCTURAL GENERAL NOTES:

5. Materials:

A. Non-shrink grout shall be a pre-mix product consisting of non-staining, non-metallic aggregate cement, water reducing and plasticizing agents capable of developing a minimum compressive strength of 4,000 psi in 3 days and 7,000 psi in 28 days. The non-shrink grout shall contain at least 10 grams of migrating amine carboxylate corrosion inhibiting admixture per 0.4 to 0.5 cubic feet of non-shrink grout.

B. Premolded joint filler shall comply with ASTM D1751 with a minimum compressive strength of 100 psi at 50% deformation, unless otherwise specified on the contract documents.

C. Epoxy resin adhesive for drilled dowels shall conform to ASTM C881 as appropriate for application such as HILTI-RE 500-V3 or approved equal. All Manufacturer's installation instructions, including hole cleaning, shall be followed.

D. Polymer modified repair mortar shall be a factory blended cementitious patching material (containing no gypsum) combined with a polymer type admixture, water and a penetrating corrosion inhibitor. It shall conform to the following minimum material properties.

(1) 7-day compressive strength - 4,000 psi

(2) 28-day compressive strength - 5,000 psi

(3) 28-day splitting tensile strength - 750 psi

(4) 28-day flexural strength - 1,500 psi

E. Concrete sealer shall be equal to or exceed the performance of a 28-day water cured quality concrete per ASTM C39 and ASTM C1202. Concrete sealer shall not leave a film or coating on the concrete surface and shall not interfere with bonding of any future materials to the concrete surface.

F. Concrete sealer shall be applied to all exposed concrete surfaces including back faces of and wingwalls, drilled shaft caps prior to backfilling.

G. If formwork is removed/stripped exposing concrete within 7-days of placement then concrete shall be cured. All exposed concrete shall be cured using Sinak Lithium Cure 1000 or approved equal at a coverage rate of no less than 400 sq. ft. per gallon.

H. Cure concrete as specified in the Contract documents. Remove curing that may affect areas requiring future bonding unless a curing agent such as Sinak Lithium Cure or approved equal that does not affect bond is used.

6. Reinforcement:

A. All reinforcing steel shall be ASTM A1035 Type CS Grade 100 unless otherwise noted.

B. Reinforcing steel shall be ASTM A706, Type W, Grade 60 where welded connections are required.

6. Reinforcement (Cont.):

C. Epoxy-coated reinforcing steel shall be ASTM A775 where noted on the plans.

D. Reinforcing bars shall be placed and installed in accordance with the CRSI Manual of Standard Practice and CRSI Placing Reinforcing Bars, unless otherwise noted.

E. The covering measured from the surface of the concrete to the face of any reinforcing bars shall be as follows, except as otherwise shown:

(1) Top of concrete topping, top of approach slab, top of sleeper slab, top of end beams = 2 3/4"

(2) Railings, end posts, wingwalls, drilled shaft caps, = 2 1/2", unless otherwise noted.

(3) Concrete cast against and permanently exposed to earth = 3"

(4) Drilled shafts = 4"

(5) Precast Double Tee = 1 1/2", unless otherwise noted.

(6) All others unless otherwise noted = 2 1/2"

F. Minimum lap splice length for steel reinforcing shall be 40 bar diameters or 2'-0", whichever is greater, for #8 bars or smaller. Minimum lap splice length for #9 bars or larger shall be 50 bar diameters. Increase lap length by multiplying the minimum lap splice length by 1.3 for bars having more than 12" of fresh concrete below bars. Increase lap length by 1.25 for ASTM A1035 reinforcing. Lap splices for bundled bars shall consist of individual bar splices within a bundle that do not overlap. Entire bundles shall not be lap spliced.

G. Unless otherwise noted, reinforcing splices shall be staggered. Minimum distance between staggered lap splice shall be equal to the length required for the lap splice. Number of bars spliced at sections normal to axis of member shall not exceed 50 percent of the total main reinforcing in the member.

H. Minimum clear spacing between parallel bars shall be 1 1/2 times the diameter of bars (for non bundled bars). In no case shall the clear distance between the bars be less than 1 1/2 times the maximum size of the coarse aggregate or 1 1/2".

I. All dimensions relating to reinforcing bars are to centers of bars unless otherwise noted.

J. Reinforcing bars shall be securely tied at all intersections and lap splices except where the spacing of intersections is less than 1-foot in each direction, in which case alternate intersections shall be tied.

K. Strands for prestressing shall be Grade 270, seven wire low relaxation type conforming to ASTM A416.

L. Dissimilar metals shall be separated at contact points using teflon tape.

6. Reinforcement (Cont.):

M. Threaded couplers shall be made from ASTM A1035 steel and be capable of developing both 125% of the reinforcing steel yield strength and 100% of the ultimate strength, such as Barsplice 100KSI Barsplicer Flanged Coupler or approved equal. Optional flanges for threaded couplers must be made of plastic.

7. Glass Fiber Reinforced Polymer Bar (ASTM D7957):

A. Glass Fiber Reinforced Polymer (GFRP) rebar shall conform to ASTM D7957.

B. Concrete cover for the GFRP bars shall be 1 1/2" unless otherwise noted.

C. Minimum lap splice lengths for the GFRP bars shall be 42 bar diameter unless otherwise noted.

D. All GFRP bars shall be securely tied in place. Tie wire shall be alloy 302 or 304 stainless steel or non-metallic.

E. The GFRP bars may be cut in the field with a masonry or diamond blade.

F. All work including materials and bends shall follow Manufacturer's recommendations.

8. Construction Notes:

A. Structural General Notes apply to the structural plans unless otherwise noted.

B. The Contractor shall be responsible for obtaining As-Builts of the existing structures. As-Built plans are available for review from the Highways Design Branch located at the State Department of Transportation, Highways Division, Kakuhihewa Building, Room 809, 601 Kamokila Boulevard, Kapolei, HI 96707. The Contractor shall verify all dimensions and site conditions and shall report any discrepancies in writing to the Engineer before commencing work or ordering materials.

ORIGINAL PLAN
NOTE BOOK No.
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRUCTURAL GENERAL NOTES

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S0.3 OF 5 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	39	71

STRUCTURAL GENERAL NOTES:

8. Construction Notes (Cont.):

C. The contract documents are complementary. Any requirement occurring in one document is as binding as though occurring in all. A stricter requirement prevails over any less strict requirements. The stricter requirement will be the requirement that provides the greater product life, durability, strength, and function.

D. The Contractor shall verify all site conditions and not rely upon these plans for existing elevations and azimuths, stream channel location, roads, roadway gutters, curbs and sidewalks, etc. Conditions may differ from those shown.

E. The Contractor shall verify the location of all utility lines and notify the respective owners before commencing with excavation, and any temporary piling or sheeting.

F. The Contractor shall be solely responsible for the protection of adjacent properties, utilities and existing and new structures from damage due to construction. Repairing any damage shall be at the Contractor's own expense, to the satisfaction of the Engineer.

G. Except as otherwise noted, all vertical dimensions are measured plumb.

H. Construction joints may be relocated or additional ones added subject to the approval of the Engineer.

I. Unless otherwise noted, all exposed concrete edges shall be chamfered 3/4"x3/4"

J. The Contractor shall submit working drawings and calculations for the proposed bracing/shoring details needed to protect the existing structures when subjected to loading from equipment, drilled shaft rigs, cranes, vehicles and fresh concrete, etc. All drawings and calculations shall be stamped by a State of Hawaii licensed Structural Engineer and a licensed Civil Engineer specializing in geotechnical engineering. The above work, including working drawings and calculations, shall be incidental to any structure excavation. The drawings and calculations shall be found acceptable by the Engineer before any construction work is to proceed.

K. No construction work, including falsework, shall be performed in any portion of the existing channel unless otherwise permitted by the Engineer.

L. Construction joints between separate pours shall not be feather edged, unless otherwise noted. All joints shall be made square and vertical for the entire thickness of the new pour prior to pouring, except as directed by the Engineer.

M. Construction joints shall be cleaned and roughened to 1/4" amplitude.

8. Construction Notes (Cont.):

N. The Contractor shall provide a template including details showing exact location of rebar so that no interference will occur between vertical drilled shaft reinforcement and horizontal reinforcement in the drilled shaft cap beam and abutment walls.

O. All holes for post-installed adhesive anchors and reinforcing dowel bars shall be hammer drilled using a hollow bit connected to a vacuum system in accordance with current evaluation service report from ICC-ES.

P. All individuals performing anchor and dowel work shall hold a current ACI/CRSI installer certification.

Q. Drilling procedures, equipment, material and certifications shall be submitted to the Engineer for approval.

R. Drilled holes in existing concrete for anchors and dowels shall not be left unfilled for more than 8 hours. Adhesive material in drilled holes shall fully cure prior to pouring concrete around dowels.

S. Location of drilled holes shown in plans are approximate. Prior to placing holes in concrete, the Contractor shall locate all reinforcing steel and adjust the location of the holes to clear all reinforcing bars. Final hole locations are subject to the approval of the Engineer.

T. All holes drilled into concrete that go unused shall be completely filled with a polymer-modified cementitious repair mortar containing a corrosion inhibitor.

U. The Contractor is responsible for determining the limits and providing all necessary earthwork shoring to facilitate the staged construction requirements of the bridge. Shoring design shall take into account grade differences due to the excavation operations. The Contractor shall submit working drawings and calculations for the shoring design. The drawings and calculations shall be stamped by a State of Hawaii licensed Structural Engineer and a licensed Civil Engineer specializing in geotechnical engineering. The drawings and calculations shall be found acceptable by the Engineer before any construction work is to proceed.

V. Temporary lateral bracing shall be provided for all wingwalls after casting. Bracing shall remain in place until backfilling operations behind and in front of walls are completed.

9. Foundation Notes:

A. The foundation design is based upon recommendations contained in the geotechnical engineering report prepared by Geolabs, Inc. with the subject title "Geotechnical Engineering Exploration Waipilopilo Stream Bridge Replacement, Hauula, Oahu, Hawaii" dated December 6, 2024. The report shall be considered as a part of the construction documents and its recommendations shall be implemented unless otherwise directed by the Engineer. The Contractor may obtain a copy of the report at the State of Hawaii, Department of Transportation, Highways Division, upon written request to the Engineer.

9. Foundation Notes (Con.t):

B. Design Soil Parameters

(1) Static lateral earth pressure (above groundwater)

(a) Active condition, level backfill = 37 pcf
(b) At-rest condition, level backfill = 55 pcf

(2) Dynamic lateral earth pressure

(a) Active condition, level backfill = 6.1H* psf (rectangular distribution)
* Where H = Height of Wall in Feet

(3) Bearing Pressure

(a) Extreme Event Limit State = 7,500 psf
(b) Strength Limit State = 3,375 psf
(c) Service Limit State = 2,500 psf

(4) Passive Resistance

(a) Extreme Event Limit State = 330 psf
(b) Strength Limit State = 165 psf

(5) Coefficient of Friction
(a) Extreme Event Limit State = 0.36
(b) Strength Limit State = 0.30

10. Load Rating:

The governing load rating results are as follows:

		Rating Factor	Live Load Distribution Factor	Load Effect	Controlling Member
Design	HL-93 (Inv)	xx	xx	xx	xx
	HL-93 (Opr)	xx	xx	xx	xx

ORIGINAL PLAN
NOTE BOOK No.
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DRAWING NAME: 2\00 ONGOING\20-0022 WAIPILOPILO STR BR-00(A)01 CAD\03-14-25\WEB-S002 STRGNOTES.DWG PLOT TIME: 03-13-25 3:33 PM)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRUCTURAL GENERAL NOTES

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S0.4 OF 5 SHEETS

SYMBOLS AND ABBREVIATIONS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	40	71

∉	And
@	At
ø	Diameter
≥	Greater Than or Equal to
≤	Less Than or Equal to
#	Number
AB	Anchor Bolt
Abut.	Abutment
Abbr.	Abbreviation
AC	Asphaltic Concrete
Add.	Additional
Alt.	Alternate
Approx.	Approximate
Az.	Azimuth
Bal.	Balance
℄	Baseline
Bet.	Between
BF	Both Faces
BFE	Bottom of Footing Elevation
Bk.	Back
Blt.	Bolt
Bm.	Beam
BOF	Bottom of Footing
Bot., Bott., B	Bottom
Br.	Bridge
Brg., Brgs.	Bearing, Bearings
BVC	Beginning of Vertical Curve
BW	Both Ways
Cant.	Cantilever
CBW	Concrete Barrier Wall
cc	Center to Center
CF	Cubic Feet
CFCW	Continuous Flashing Compound Waterproofing
CG	Center of Gravity
CIP	Cast Iron Pipe, Cast in Place
CJ	Construction Joint
℄	Center line
Cl.	Class
Clr.	Clearance
CLSM	Controlled Low Strength Material
CMU	Concrete Masonry Unit
Cntl. Jt.	Control Joint
CO	Clean Out
Col.	Column
Conc.	Concrete
Conn.	Connection
Const.	Construction
Cont.	Continuous
CSL	Crosshole Sonic Logging
CRM	Cement Rubble Masonry
CY, Cu. Yd.	Cubic Yard
Dbl.	Double
Demol.	Demolition
Det.	Detail
DI	Drain Inlet, Ductile Iron
Dia.	Diameter
Diaph.	Diaphragm
Dim.	Dimension
Dist.	Distance
Dn.	Down
DO	Ditto
DS	Drilled Shaft
Dwg., Dwgs.	Drawing, Drawings
Dwls.	Dowels
e	Existing
E	East
EA, Ea., ea.	Each
EF	Each Face
EFH	Each Face Horizontal
EFV	Each Face Vertical
EJ	Expansion Joint
El., Elev.	Elevation
Elec.	Electrical
Emb.	Embankment
EMH	Electrical Manhole
EPE	Existing Edge of Pavement
EPS	Expanded Polystyrene
Eq.	Equal
ES	Edge of Shoulder
Est.	Estimated
EVC	End of Vertical Curve
EW	Each Way
Exc.	Excavation
Excl.	Excluding
Exist., Ex.	Existing
Exp., (E)	Expansion
Ext.	Exterior
(F)	Fixed
FA	Force account
FB	Flat Bar
FC	Compression Stresses
f'c	Specified Compressive Strength of Concrete at 28 days
f'ci	Specified Compressive Strength of Concrete at Time of Initial Prestress
FF	Far Face, Front Face
Fig.	Figure
Fin. Gr.	Finish Grade
FRP	Fiberglass Reinforced Polymer
FT	Tensile Stresses
Ft.	Feet, Foot
Ftg.	Footing
G, Gir.	Girder
Ga.	Gage, Gauge
Galv.	Galvanized
GDI	Grated Drain Inlet
GFRP	Glass Fiber Reinforced Polymer Rebar
Gr.	Grade
Grd.	Ground
GRP	Grouted Rubble Pavement
(H)	Hinge
HDPE	High Density Polyethylene
HDOT	State of Hawaii Department of Transportation
HECO	Hawaiian Electric Company
Horiz., H	Horizontal
Ht.	Height
HS	High strength
IB	Inbound
ID	Inside Diameter
IF	Inside Face
In.	Inch
Int.	Interior
Inv.	Invert
Jt.	Joint
K	Kips
KF	Kip Foot
KLF	Kips Per Linear Foot
KSF	Kips Per Square Foot
KSI, ksi	Kips Per Square Inch
L	Length
lb., lbs., LBS.	Pound, Pounds
LF, Lin. Ft.	Linear Feet/Foot
Longit.	Longitudinal
LS	Lump Sum
Ltg. Std.	Lighting Standard
M	Modified
Max.	Maximum
Mech.	Mechanical
MH	Manhole
Min.	Minimum
Misc.	Miscellaneous
MPH	Miles Per Hour
MSL	Mean Sea Level
N	North
NF	Near Face
NIC	Not in Contract
No.	Number
NTS	Not to Scale
OB	Outbound
oc, o.c.	On Center
OD	Outside Diameter
OG	Outside Girder, Outbound Girder
Opn'g	Opening
O/S	Offset
OHWM	Ordinary High Water Mark
PB	Pull Box
PL	Plate
PCCP	Portland Cement Concrete Pavement
PC	Point of Curvature
PCF	Pounds per Cubic Foot
P(e)	Effective Prestress Force After All Losses
Perf.	Perforated
PI	Point of Intersection of Tangents
PIVC	Point of Intersection of Vertical Curve
PLF, plf	Pounds per Linear Foot
PPM	Parts Per Million
PRC	Point of Reverse Curvature
PVC	Polyvinyl Chloride
Prestr.	Prestressed
P/S	Prestressed Strands
PSF, psf	Pounds per Square Foot
PSI, psi	Pounds per Square Inch
PT	Point of Tangency
Pt., Pts.	Point, Points
R, Rad.	Radius
Rebar	Reinforcing Bar
Ref.	Reference
Reinf.	Reinforced, Reinforcing, Reinforcement
Req'd.	Required
Ret.	Retaining
RF	Rear Face
ROW	Right of Way
Rdwy.	Roadway
S	South
SBD	Special Bridge Deck Mix
SE	Super Elevation
Sect.	Section
SF, sq. ft.	Square Feet
Sht.	Sheet
Sim.	Similar
Sl.	Slope
Spcs., Spg.	Spaces, Spacing
Spec.	Specification
Sprd.	Spread
SRW	Segmental Retaining Wall
SS	Stainless Steel
Std.	Standard
Sta.	Station
Stiff.	Stiffener
Stirr.	Stirrup
Stl.	Steel
Str.	Straight, Stream
Struct.	Structure
SY	Square Yard
Symm.	Symmetrical
T	Top
T℄B	Top and Bottom
Tan.	Tangent
TCE	Top of Column (and Bent Cap Soffit) Elevation
Temp.	Temporary
Term.	Terminal
TFE	Top of Footing Elevation
Thk.	Thick
TOD	Top of Deck
TOP	Top of Pier
Tot.	Total
Transv.	Transverse
TS	Structural Tubing
TSS	Tendon For Girder in Simply Supported Condition
Typ.	Typical
Undergrd.	Underground
UNO	Unless Noted Otherwise
Var.	Varies
VC	Vertical Curve
VESLMC	Very Early Strength Latex Modified Concrete
Vert., V	Vertical
W	West
w/	With
W/C	Water/Cementitious
WP	Work Point, Working Point
WS	Water Surface
WW	Wingwall
WWF	Welded Wire Fabric
Yr.	Year

ORIGINAL PLAN | NOTE BOOK No.

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

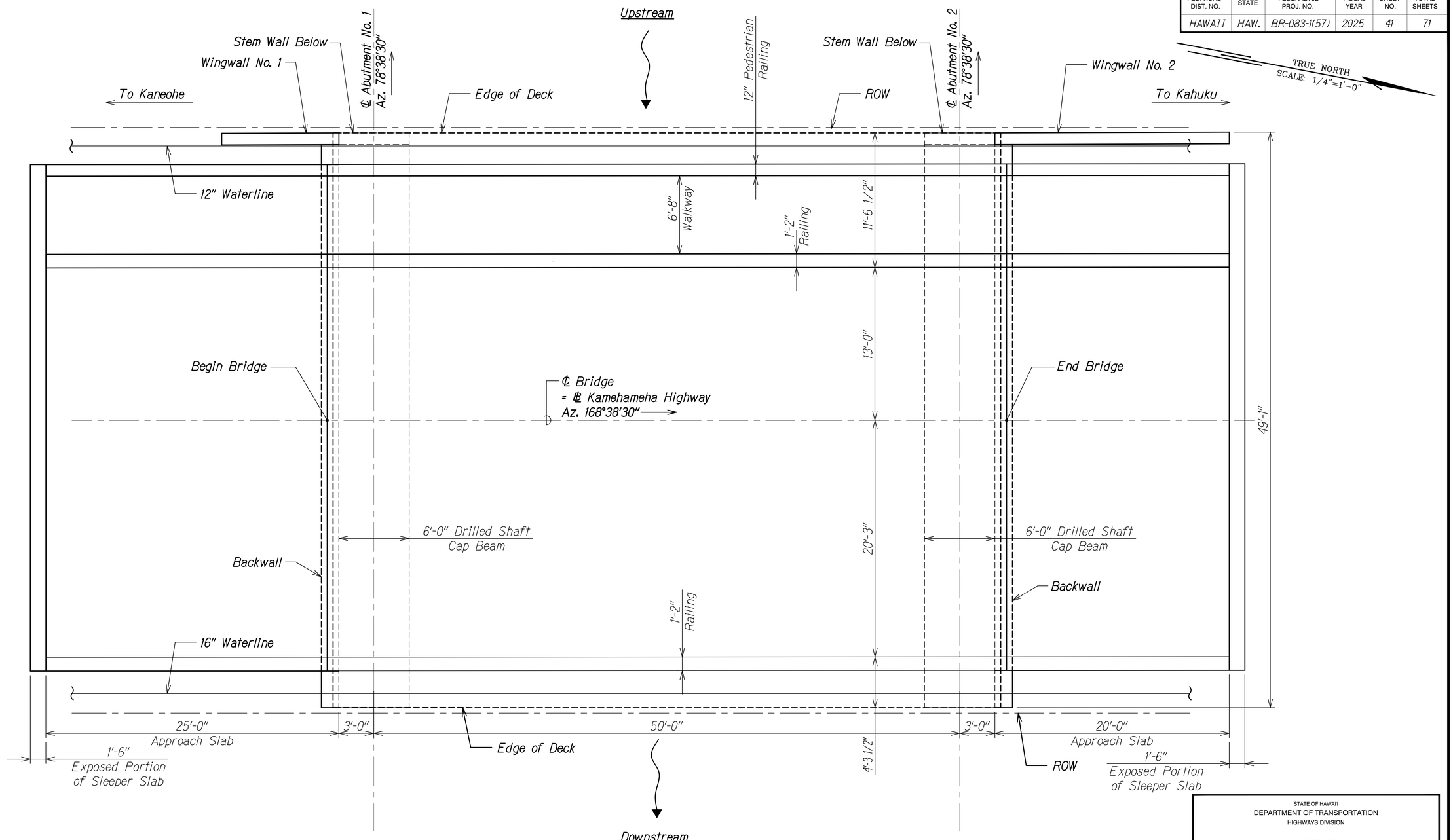
SYMBOLS AND ABBREVIATIONS

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S0.5 OF 5 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	41	71



LAYOUT PLAN
Scale: 1/4" = 1'-0"

ORIGINAL PLAN
NOTE BOOK
No.

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DRAWING NAME: Z:\OD ONGOING\20-0022 WAIPILOPILO STR BR-80\PLN\01 CAD\03-14-25\WSB-S0101 LAYOUT.DWG PLOT TIME: 03-13-25, 3:34 PM

STATE OF HAWAII
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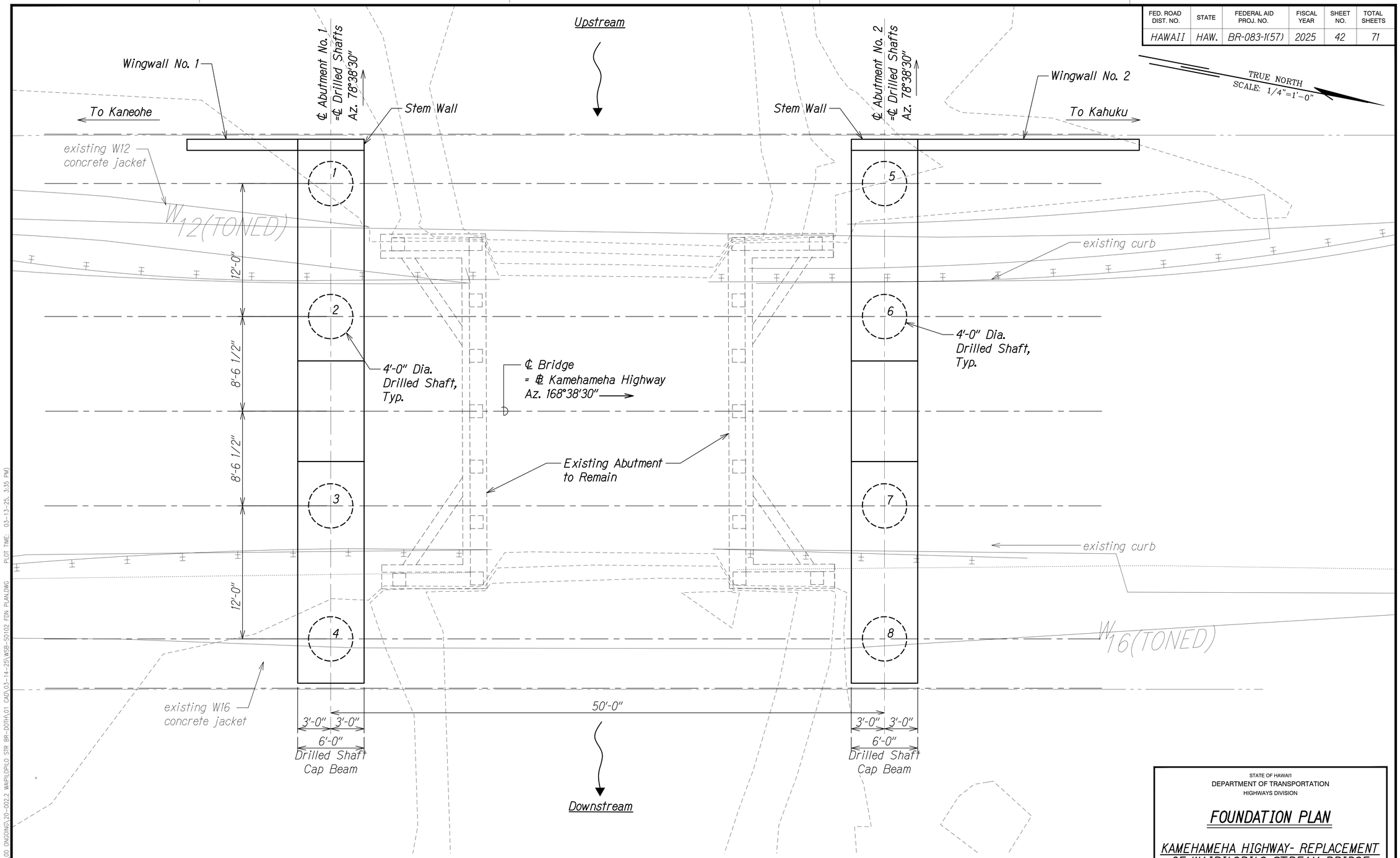
LAYOUT PLAN

KAMEHAMEHA HIGHWAY- REPLACEMENT
OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S1.1 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	42	71



FOUNDATION PLAN
Scale: 1/4" = 1'-0"

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	QUANTITIES BY
	CHECKED BY
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

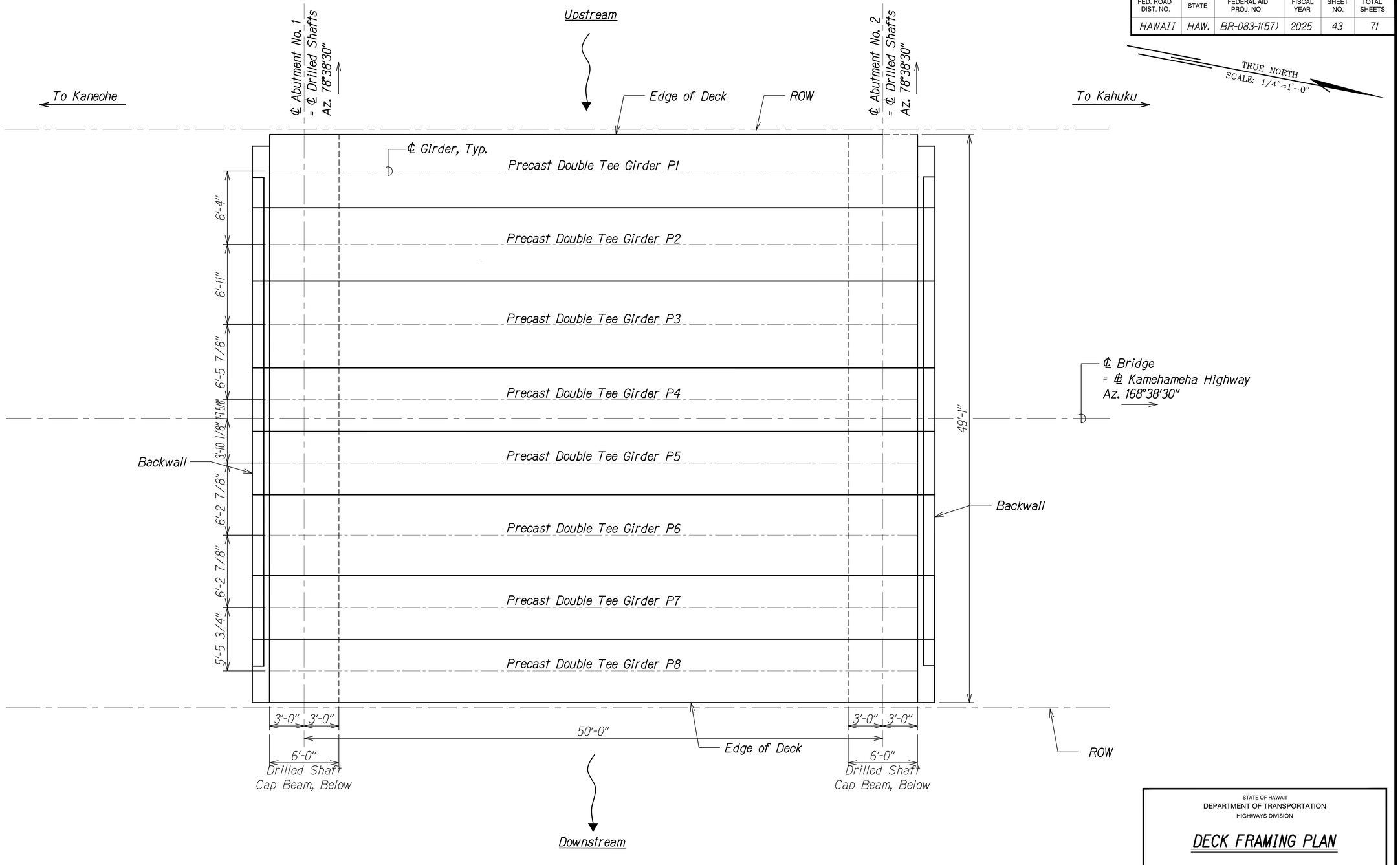
FOUNDATION PLAN

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S1.2 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	43	71



DECK FRAMING PLAN

Scale: 1/4" = 1'-0"

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

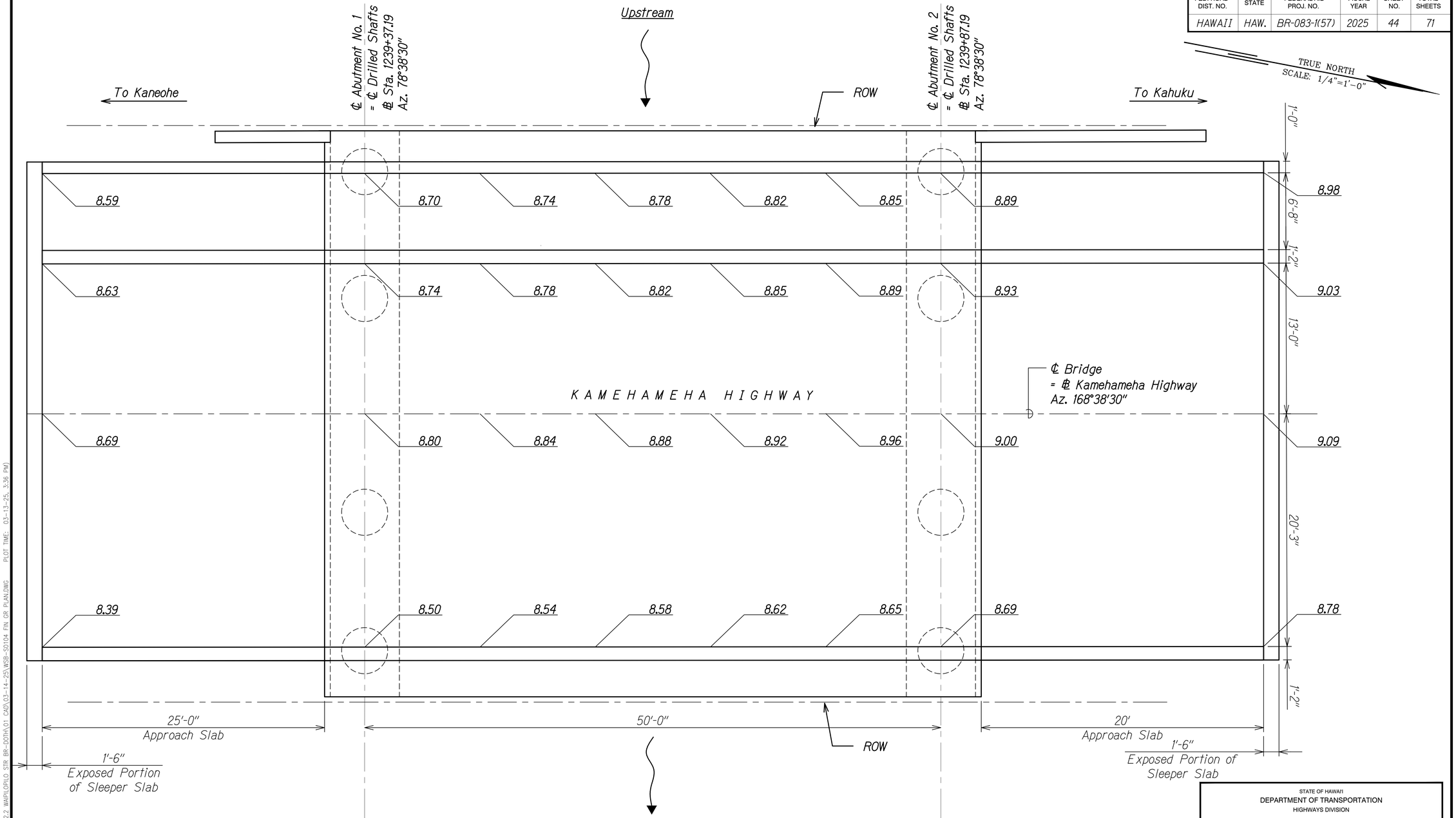
DECK FRAMING PLAN

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S1.3 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	44	71



NOTE:

Off the bridge, finish grades are given at the joint between the sleeper slab and approach slab. On the bridge, finish grades are given at each ℄ Abutment and at 10 feet intervals.

FINISH GRADE PLAN

Scale: 1/4" = 1'-0"

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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No.	TRACED BY	
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

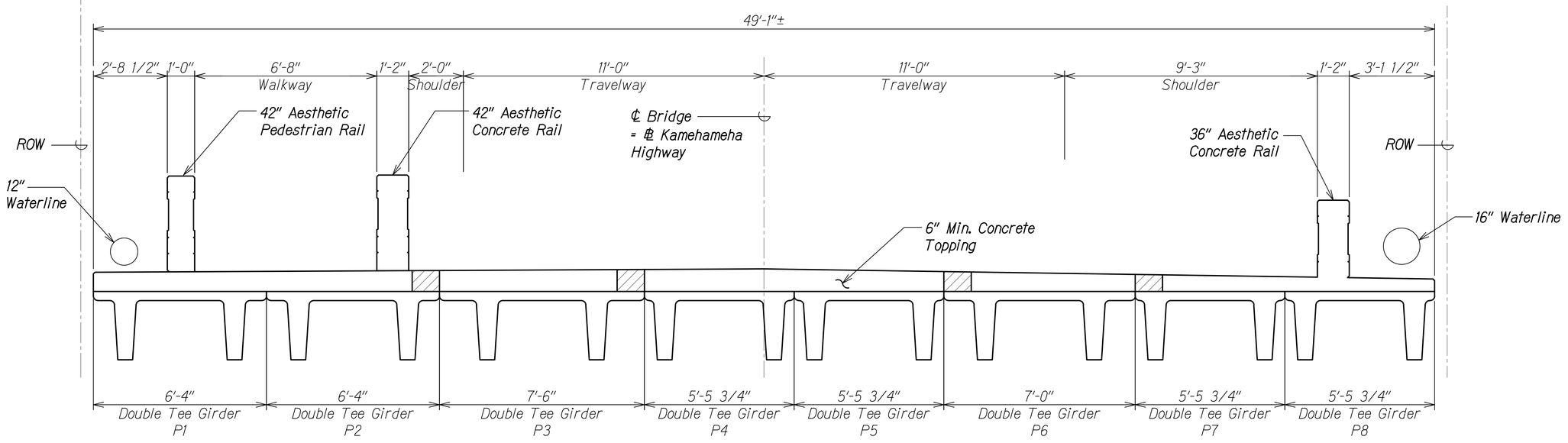
FINISH GRADE PLAN

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S1.4 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	45	71



NORMAL DECK SECTION (A S1.5 | S1.5)

Scale: 1/2" = 1'-0"

LEGEND:

Denotes Concrete Topping Closure Pour

ORIGINAL PLAN
NOTE BOOK
No.
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DRAWN BY
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DRAWING NAME: Z:\OD ONGOING\25-002.2 WAIPILOPILO STR BR-00(HA)01 CAD\03-14-25\WSB-S0105 NORM DECK SECT.DWG PLOT TIME: 03-13-25, 3:37 PM

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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

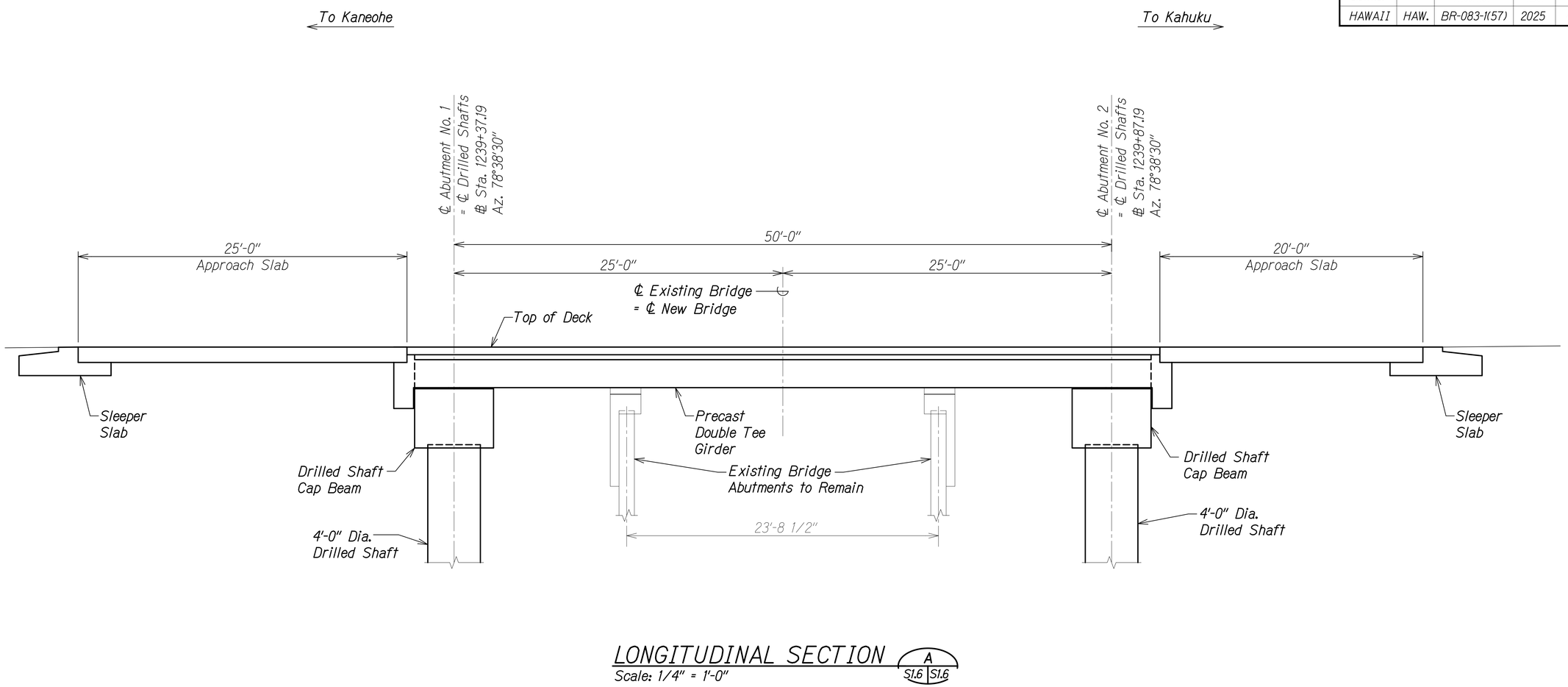
NORMAL DECK SECTION

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S1.5 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	46	71



LONGITUDINAL SECTION

Scale: 1/4" = 1'-0"

A S1.6 | S1.6

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

LONGITUDNIAL SECTION

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S1.6 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	47	71

To Kaneohe

To Kahuku

TRUE NORTH
SCALE: 1/4"=1'-0"

Existing W12 Waterline and Concrete Jacket to be Remain, See Civil Drawings

Existing W12 Waterline and Concrete Jacket to be Removed

Existing Railing to be Removed

Existing W12 Waterline and Concrete Jacket to be Removed

W12(TONED)

existing curb

Existing Beams and Deck to be Removed and Portion of Existing Abutment

Existing Abutment to Remain

K A M E H A M E H A H I G H W A Y

Existing Abutment to Remain

Existing Railing to be Removed

W16(TONED)

Existing W16 Waterline and Concrete Jacket to be Removed

Existing Pile Cap to be Removed

Existing Pile Cap to Remain

Existing W12 Waterline and Concrete Jacket to be Remain, See Civil Drawings

Existing Pile Cap to Remain

Existing Pile Cap to be Removed

Existing W16 Waterline and Concrete Jacket to be Removed

DEMOLITION PLAN

Scale: 1/4" = 1'-0"

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

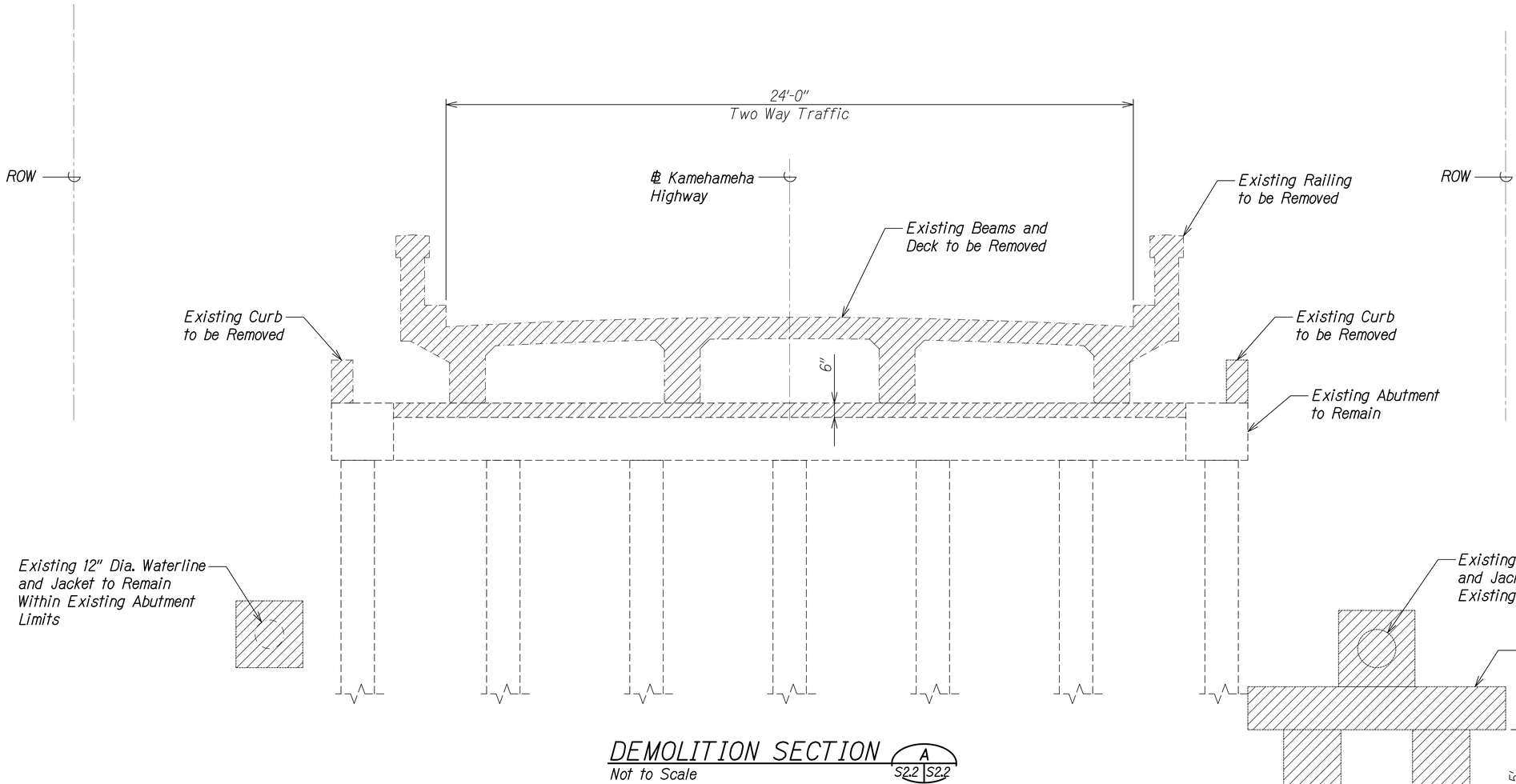
DEMOLITION PLAN

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S2.1 OF 2 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	48	71



DEMOLITION SECTION

Not to Scale

A S2.2 | S2.2

ORIGINAL PLAN
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

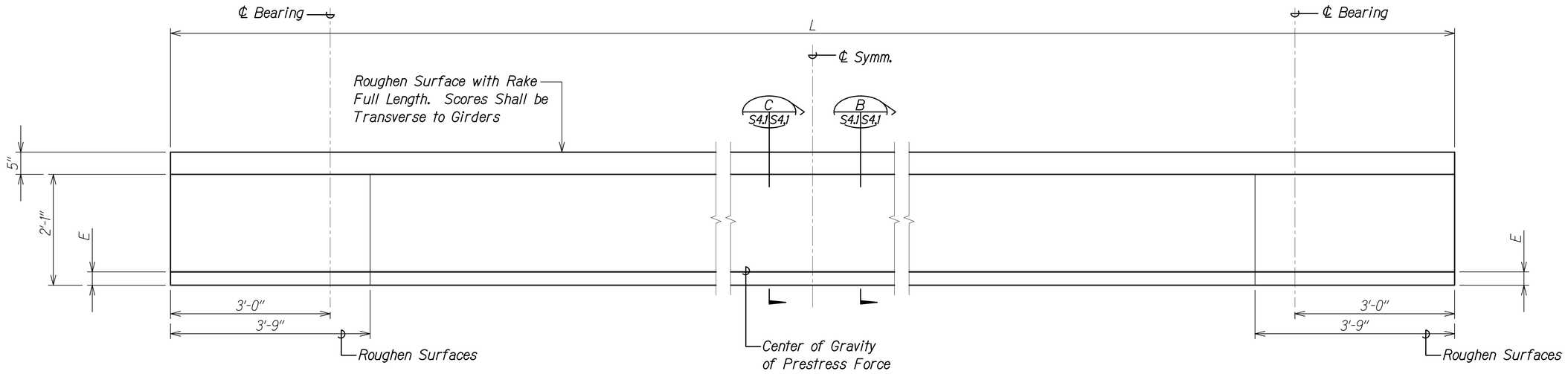
DEMOLITION SECTION

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

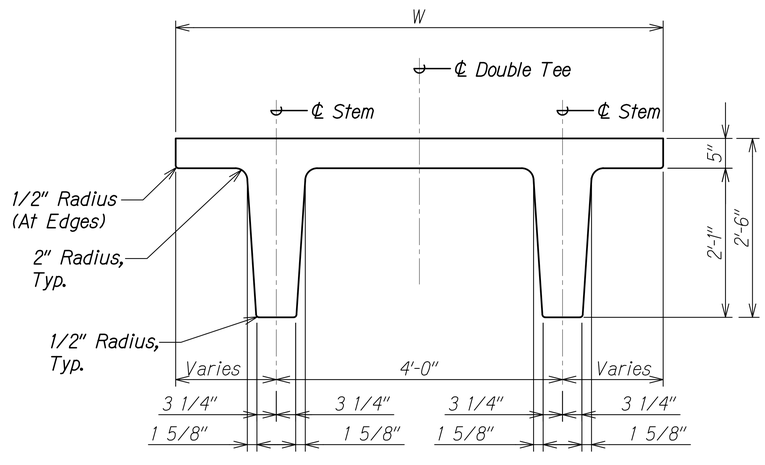
SHEET No. S2.2 OF 2 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	49	71



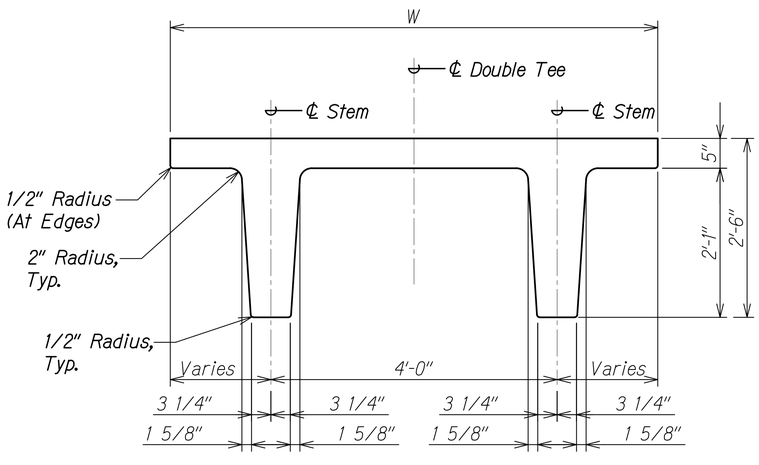
PRECAST DOUBLE TEE GIRDER ELEVATION (A S4.1 S4.1)

Scale: 1" = 1'-0"



EXTERIOR PRECAST DOUBLE TEE GIRDER NORMAL SECTION (B S4.1 S4.1)

Scale: 1" = 1'-0"



INTERIOR PRECAST DOUBLE TEE GIRDER NORMAL SECTION (C S4.1 S4.1)

Scale: 1" = 1'-0"

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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NOTE BOOK	TRACED BY	
	DESIGNED BY	
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	CHECKED BY	

DRAWING NAME: Z:\OD ONGONG\20-0022 WAIPILOPILO STR BR-DOTH\01 CAD\03-14-25\WEB-S040T DBL TEE ELEV.DWG PLOT TIME: 03-13-25, 3:42 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

PRECAST DOUBLE TEE GIRDER ELEVATION AND SECTIONS

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

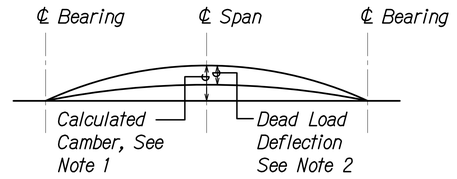
SHEET No. S4.1 OF 3 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	50	71

PRECAST DOUBLE TEE GIRDER DIMENSIONS, PRESTRESSING, CAMBER AND DEAD LOAD DEFLECTION SCHEDULE

PRECAST RIBBED GIRDER MARK	L (ft)	W1 (ft)	E (in)	WORKING FORCE (kips)	CAMBER (in)	DEAD LOAD DEFLECTION (in)
P1	56' - 0"	6'-4"				
P2	56' - 0"	6'-4"				
P3	56' - 0"	7'-6"				
P4	56' - 0"	5'-5 3/4"				
P5	56' - 0"	5'-5 3/4"				
P6	56' - 0"	7'-0"				
P7	56' - 0"	5'-5 3/4"				
P8	56' - 0"	5'-5 3/4"				

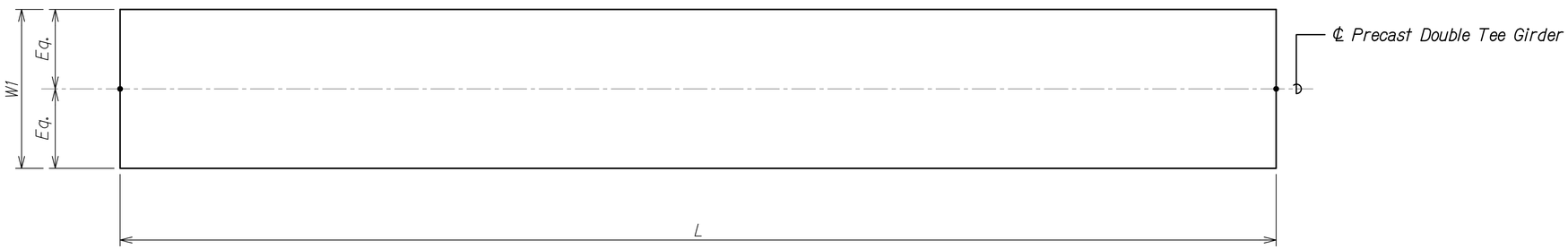
NOTE: Precast Double Tee Girder length given is the horizontal distance between ℄ Bearing in Feet.



GIRDER CAMBER DIAGRAM
Not to Scale

CAMBER AND DEFLECTION NOTES:

1. Calculated camber includes the effect of the prestress force and the weight of the Precast Double Tee Girder after removal from the bed. Positive values shown for calculated camber indicate a net upward defection. The calculated camber value has been multiplied by creep factors to approximate the effect of camber growth and concrete creep. The actual camber shall not exceed the calculated camber by more than 1/2".
2. Dead load deflection results are from the weight of the Diaphragms and Cast-In-Place Concrete topping for "P" Girders.
3. Dead Load Deflection results are from the weight of
4. All cambers and deflections are in inches.
5. See sheet SX.X through SX.X for camber and deflection values.



PRECAST DOUBLE TEE GIRDER PLAN
Not to Scale

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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DRAWING NAME: Z:\JOB ONGOING\23-002.2 WAIPILOPILO STR BR-(0)01A\01 CAD\03-14-25\WSB-S0401 GBL TEE ELEV.DWG PLOT TIME: 03-13-25, 3:43 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

PRECAST DOUBLE TEE GIRDER
CAMBER AND DEFLECTION

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S4.2 OF 3 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	51	71

NOTES:

1. Prestressed concrete 28-day strength f'c = 10,000 psi
   Prestressed concrete strength at time of release f'ci = 7,000 psi

2. Pretensioned Strands shall be 7-wire 0.6-inch diameter Low Relaxation Steel Strands (Area = 0.217 in^2.) with an ultimate tensile strength of 270 ksi. For properties, see Specifications.

3. Reinforcing steel bar shall be A1035 Type CS Grade 100.

4. Strand pattern shall be symmetrical about the longitudinal ℄ of the Precast Double Tee Girder.

5. Strand release sequence shall not induce any lateral deflection of the Precast Double Tee Girder.

6. Contractor shall submit shop drawings indicating proposed strand pattern, utility duct layout, releasing sequence, reinforcing details and hold down device details to the Engineer prior to fabrication.

7. During curing, care shall be taken to avoid any lateral deflection of the Precast Double Tee Girder due to improper orientation. Steam curing may be used to accelerate strength gain.

8. Lifting devices shall be placed as close as possible to the centerline of bearings of the Precast Double Tee Girder. Details and locations of lifting devices shall be submitted to the Engineer for approval. Such approval does not relieve the Contractor of his responsibilities if beam is damaged due to failure of the lifting device.

9. See Sheet S4.2 for Camber Diagram.

10. The concrete shall pass a charge of less than 1000 Coulombs at 90-days from casting as determined by AASHTO T277. Concrete test specimens shall be cured under the same conditions as the Precast Double Tee Girders.

11. Precast Double Tee Girder shall contain 128 oz. of Shrinkage Reducing Admixture (SRA) per cubic yard of concrete.

12. Precast Double Tee Girder shall contain 24 oz. of migrating corrosion inhibitor amine carboxylate water-based admixture per cubic yard of concrete.

13. Extend all strands and longitudinal reinforcing 2'-0" beyond ends of Precast Double Tee Girders as shown on SX.X.

14. Precast Double Tee Girder shall contain 2 pounds of Kuralon RSC15 PVA fibers or approved equal per cubic yard of concrete.

DRAWING NAME: Z:\OD ONGOING\20-0022 WAIPILOPILO STR BR-60(1)\01 CAD\03-14-25\WCB-S0401 DBL TEE ELEV.DWG PLOT TIME: 03-13-25, 3:43 PM

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

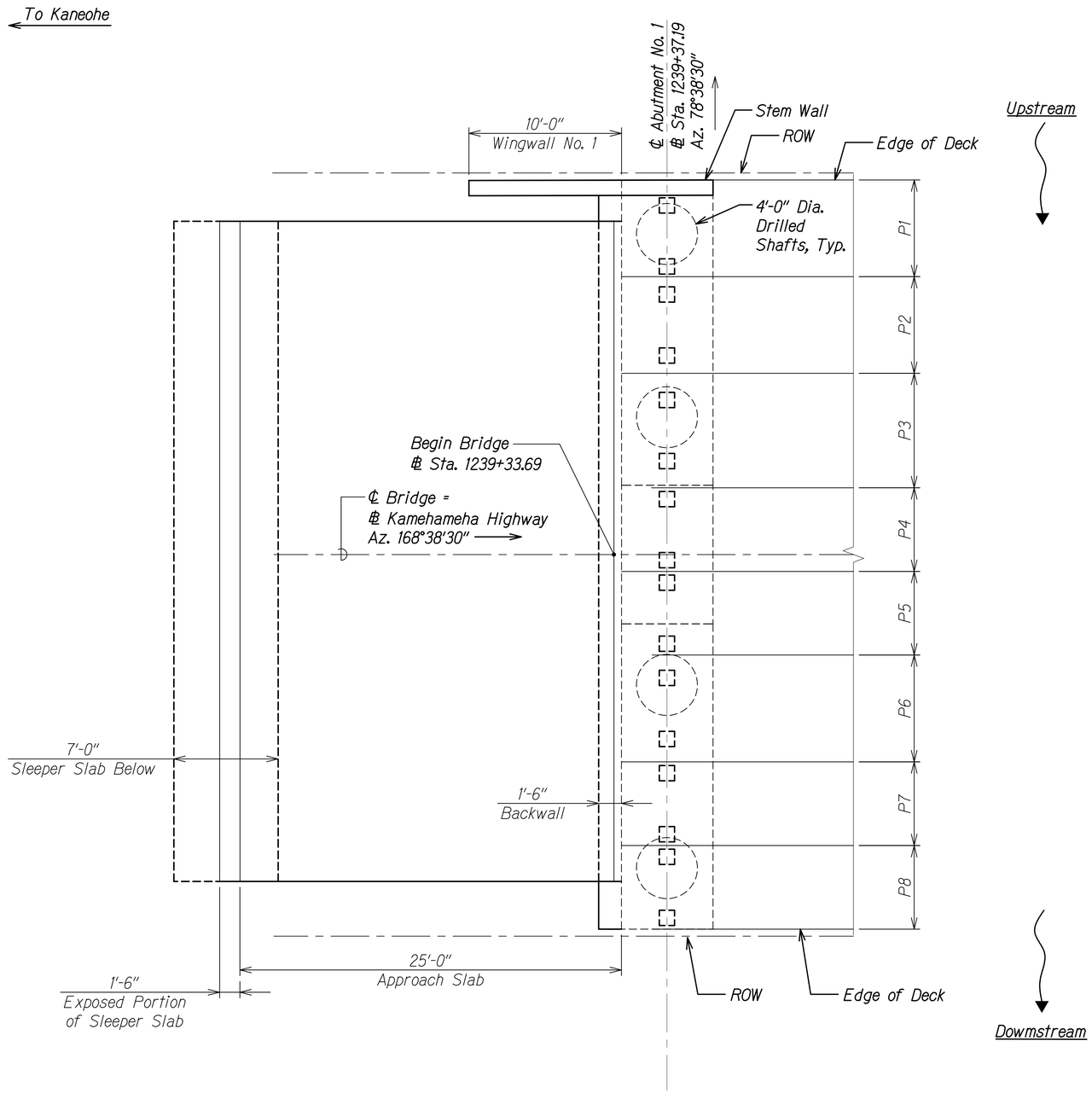
PRECAST DOUBLE TEE GIRDER NOTES

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S4.3 OF 3 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	52	71



ABUTMENT NO. 1 PLAN

Scale: 1/4" = 1'-0"

TRUE NORTH
SCALE: 1/4"=1'-0"

ORIGINAL PLAN

NOTE BOOK
No.

SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ABUTMENT NO. 1 PLAN

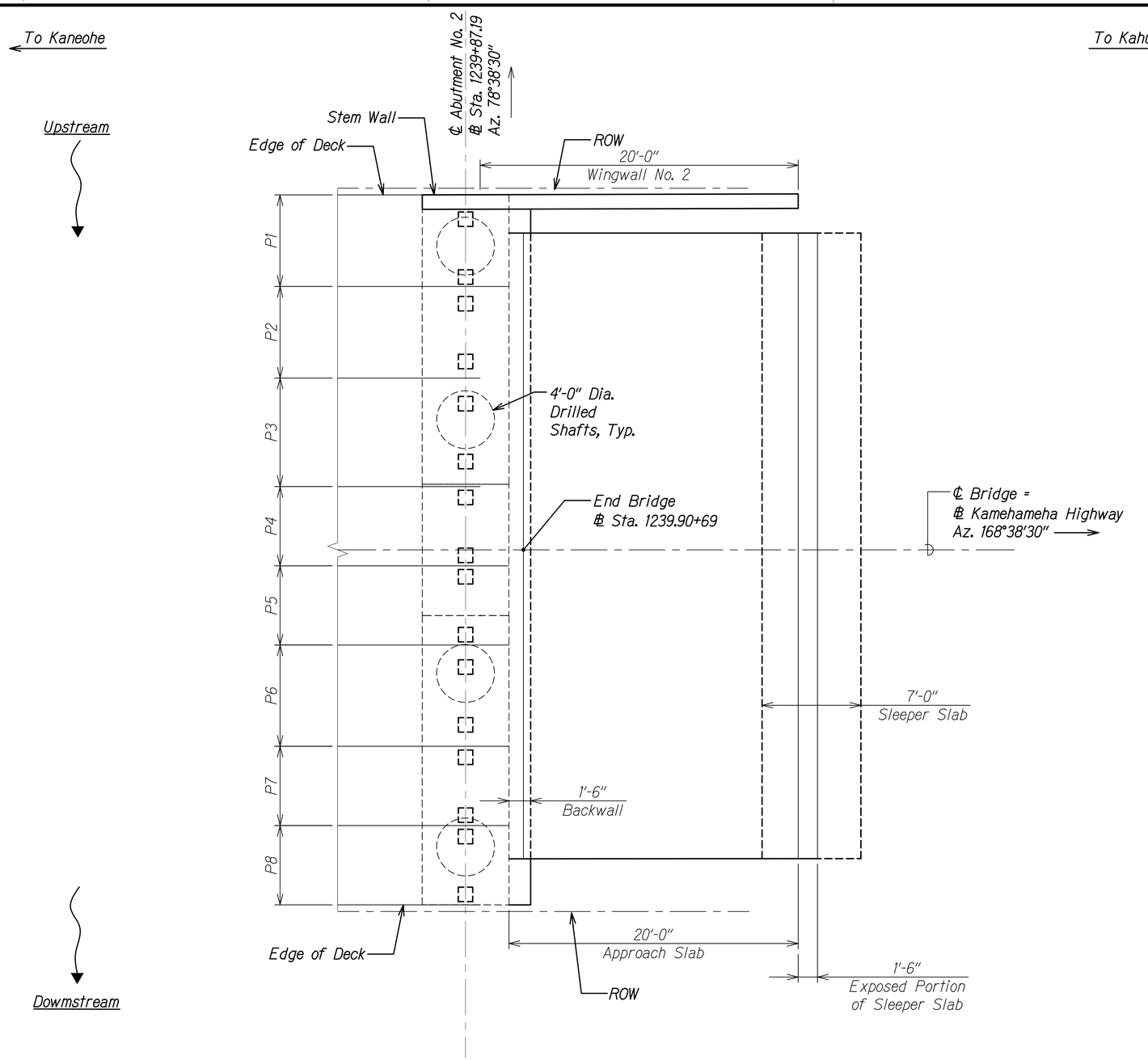
KAMEHAMEHA HIGHWAY- REPLACEMENT
OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S5.1 OF 3 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	53	71

TRUE NORTH
SCALE: 1/4"=1'-0"



ABUTMENT NO. 2 PLAN

Scale: 1/4" = 1'-0"

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
No.	TRACED BY	
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DRAWING NAME: Z:\OD ONGOING\20-022 WAIPILOPILO STR BR-EOHA\01 CAD\03-14-25\WSB-03501 ABUT PLAN.DWG PLOT TIME: 03-13-25, 3:46 PM)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

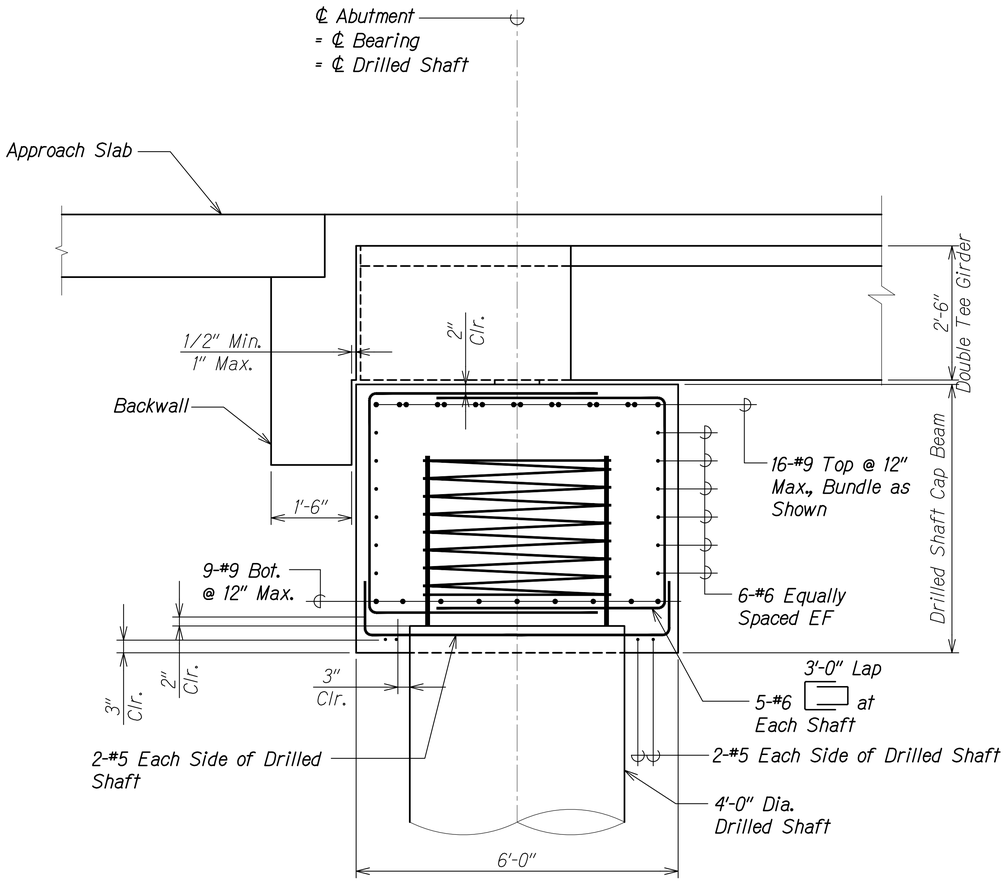
ABUTMENT NO. 2 PLAN

KAMEHAMEHA HIGHWAY- REPLACEMENT
OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

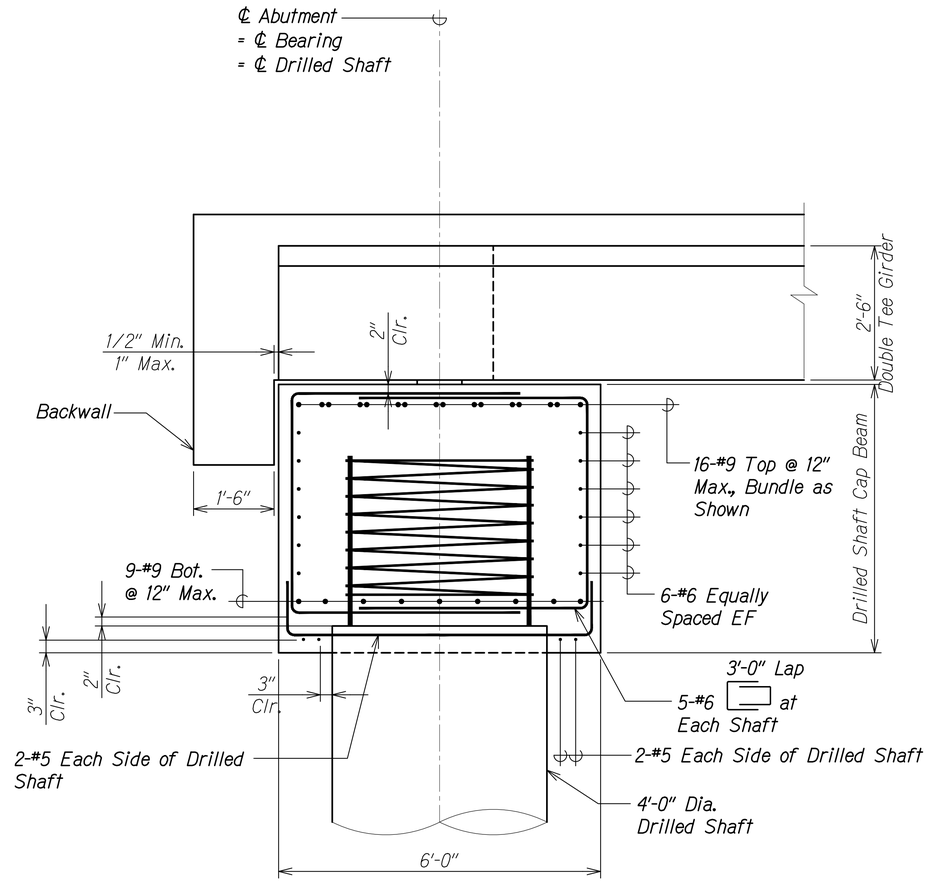
Scale: As Noted Date: Mar. 2025

SHEET No. S5.2 OF 3 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	54	71



SECTION A
Scale: 3/4" = 1'-0"
S5.3 | S5.3



SECTION B
Scale: 3/4" = 1'-0"
S5.3 | S5.3

ORIGINAL PLAN
NOTE BOOK
No.

SURVEY PLOTTED BY
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DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ABUTMENT SECTIONS

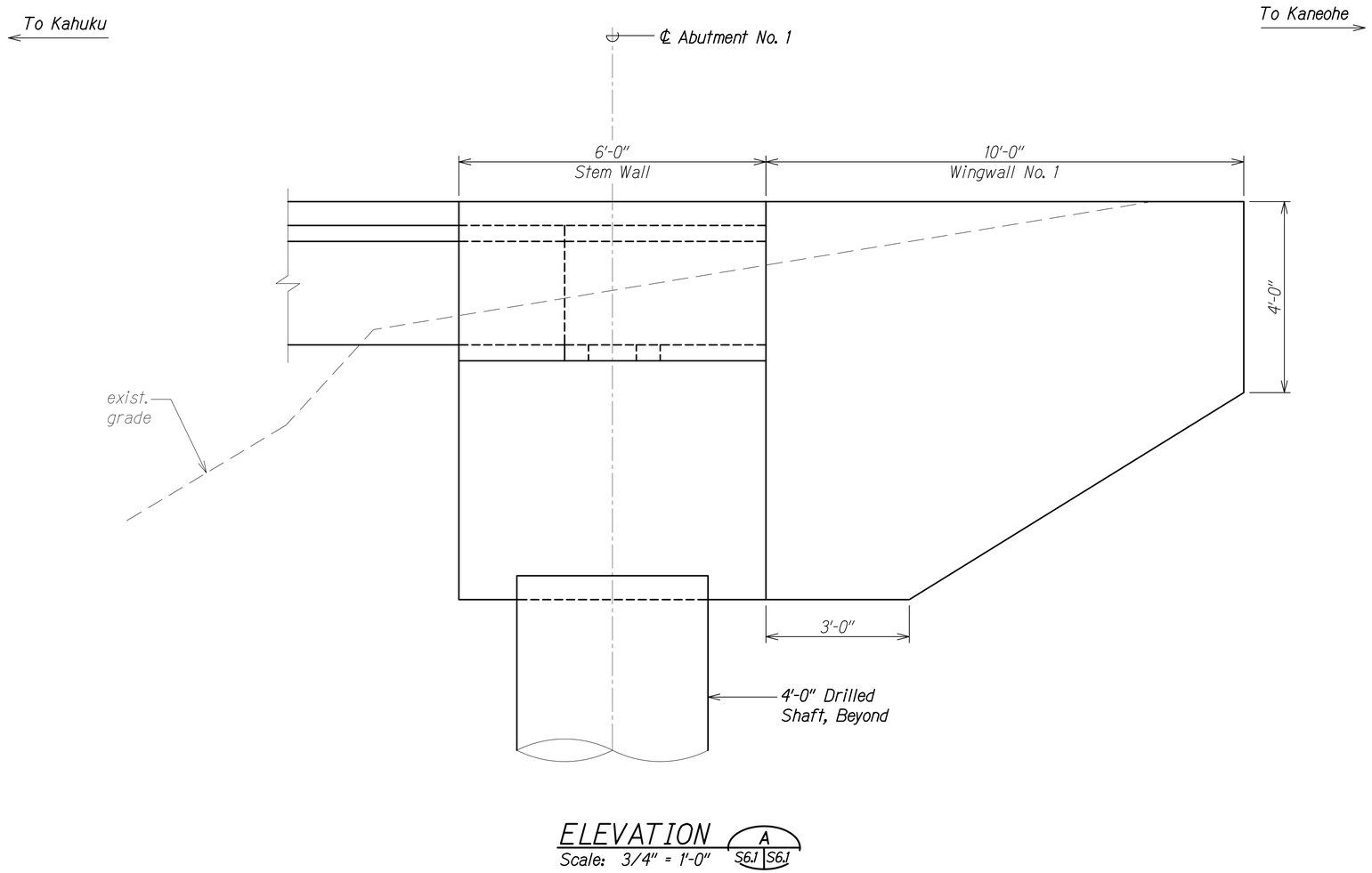
KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S5.3 OF 3 SHEETS

DRAWING NAME: Z:\OD ONGOING\20-022 WAIPILOPILO STR BR-BOTH\01 CAD\03-14-25\WSB-S5S3 ABUT SECTIONS PLOT TIME: 03-13-25, 3:47 PM

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	55	71



ELEVATION

Scale: 3/4" = 1'-0"

A S6.1 | S6.1

ORIGINAL PLAN
NOTE BOOK No.

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DESIGNED BY "
QUANTITIES BY "
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DRAWING NAME: Z:\00 ONGOING\20-022 WAIPILOPILO STR BR-EOHA\01 CAD\03-14-25\WSB-S9661 WINGWALL ELEV.DWG PLOT TIME: 03-13-25, 3:48 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

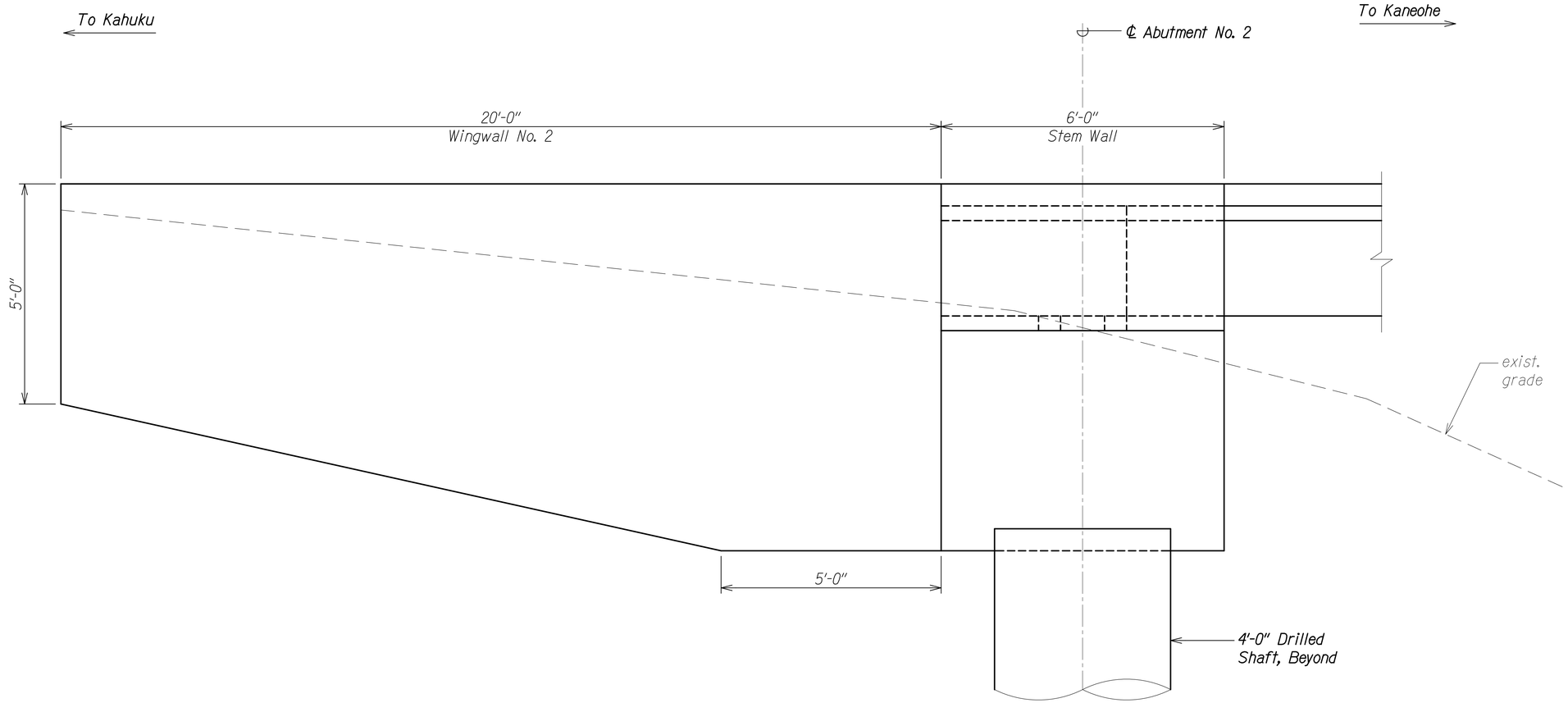
WINGWALL NO. 1 ELEVATION

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S6.1 OF 2 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	56	71



ELEVATION (A) S6.2 | S6.2
Scale: 3/4" = 1'-0"

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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STATE OF HAWAII
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HIGHWAYS DIVISION

WINGWALL NO. 2 ELEVATION

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S6.2 OF 2 SHEETS

DRAWING NAME: Z:\OD ONGOING\29-002.2 WAIPILOPILO STR BR-DOT\A01 CAD\03-14-25\WSB-S0601 WINGWALL ELEV.DWG PLOT TIME: 03-13-25, 3:53 PM)

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	57	71

DRILLED SHAFT NOTES:

1. All excavation and drilling operations for foundations shall be monitored by the Engineer.

2. Bottom of drilled shaft cap beam and drilled shaft tip elevations shall be verified by the Engineer prior to placing reinforcement and concrete.

3. Concrete shall be placed promptly after drilling (within 24 hours) and shall not be placed without approval of the Engineer.

4. Drilled shaft tip elevations shown on this sheet are the minimum depths to be constructed and shall be used to estimate quantities for bidding. The actual tip elevation shall be determined by the Engineer.

5. Construction of drilled shafts shall be done in such a manner and sequence to prevent collapse of drilled shafts due to premature loading of poured drilled shafts before its 28-day concrete strength and other mishaps that may reduce its capacity.

6. Drilling of adjacent shafts shall be staggered in such a manner that the shaft concrete shall have cured a minimum of 24 hours prior to drilling adjacent shafts.

7. Reinforcement:
   - A. Lap splice length for #10 Cont. shall be 6'-6". No lap splices are allowed in the upper half of the drilled shaft.
   - B. Lap splice length for #6 Spiral shall be 3'-8".
   - C. Stagger splice points not more than 33% of total at any section normal to axis of the member.
   - D. Lapped splices shall have a minimum of 2'-0" vertically between ends of splice points.

8. Concrete for drilled shaft shall have a compressive strength of 5000 psi at 28-days of age.

9. Unless noted otherwise, concrete for drilled shafts shall be placed by pumping through a solid tremie pipe. A water reducing and set retarding admixture may be used in all drilled shaft concrete. Proposed admixture shall be tested and certified in the mix design and approved by the Engineer.

10. Concrete placement shall continue after the shaft is full and until good quality concrete is evident at the top of the shaft and/or drilled shaft extension.

11. Vibration or agitation of drilled shaft concrete during placement is prohibited.

12. Plastic spacers or spacers made with accepted materials shall be used to maintain proper position and clearances to reinforcing bars.

13. The Contractor shall record actual volume of drilled shaft concrete placed and compare with predicted and/or theoretical volumes.

14. The center of the drilled shaft concrete and reinforcing bars shall not vary horizontally by more than 3 inches from the location shown on the plans. The vertical alignment of the drilled shaft shall not vary by more than quarter (1/4) inch per foot of depth.

15. An instrumented load test shall be conducted on the drilled shaft load test shaft. The drilled shaft load test shaft shall be located in the vicinity of Abutment No. 2, as shown on sheet S1.1 and S1.2 and shall be a minimum length of 109 feet below the ground surface. The drilled shaft load test shaft shall be reinforced as shown. A bi-directional axial load test shall be conducted using an expandable base load cell (Osterberg load cell).
    The drilled shaft load test should be performed in general accordance with the quick load test method of ASTM Test Designation D 1143. The drilled test shaft shall be loaded to failure to evaluate the ultimate side shear resistance of the shaft.

16. The drilled shaft load test shaft shall be instrumented with a minimum of forty-four (42) embedment strain gages starting from 5 feet above the load test shaft tip elevation and at 5 foot intervals toward the top of the drilled shaft. A load cell of adequate size to measure the maximum test load shall be used. The instrumented load test shall be completed before construction of any production drilled shafts. The Contractor shall allow seven (7) working days after completion of the load test before any estimated drilled shaft tip elevations will be provided for production drilled shafts.

17. Crosshole Sonic Logging (CSL) nondestructive integrity testing shall be performed on every production shaft and at the load test shaft shown on S1.1 and S1.2 and on sheets S8.2 and S8.3. Shafts indicating irregular CSL readings may be subject to additional testing.

18. Remove portion of CSL test access tubes within footing and completely fill tubes with non-metallic, non-shrink, non-gaseous cementitious grout of equal strength as the drilled shaft prior to footing reinforcing and concrete placement. See Specifications Section 511.

DRILLED SHAFT TABLE			
Location	Drilled Shaft Type (in Inches)	Length (in Feet)	Estimated Tip Elevation (in Feet MSL)
Abutment No. 1	48	--	--
Abutment No. 2	48	--	--
Trial Shaft	48	--	--

AXIAL LOADS OF DRILLED SHAFT					
Location		Strength Limit State (Kips)		Extreme Limit State (Kips)	
		Demand	Capacity	Demand	Capacity
Abutment No. 1	Axial Compression	--	--	--	--
Abutment No. 2	Axial Compression	--	--	--	--

ORIGINAL PLAN
NOTE BOOK No.
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DATE

DRAWING NAME: Z:\OD ONGOING\25-002.2 WAIPILOPILO STR BR-DOT\A01 CAD\03-14-25\WSB-S0701 DRILL SHAFT.DWG PLOT TIME: 03-13-25, 3:49 PM

STATE OF HAWAII
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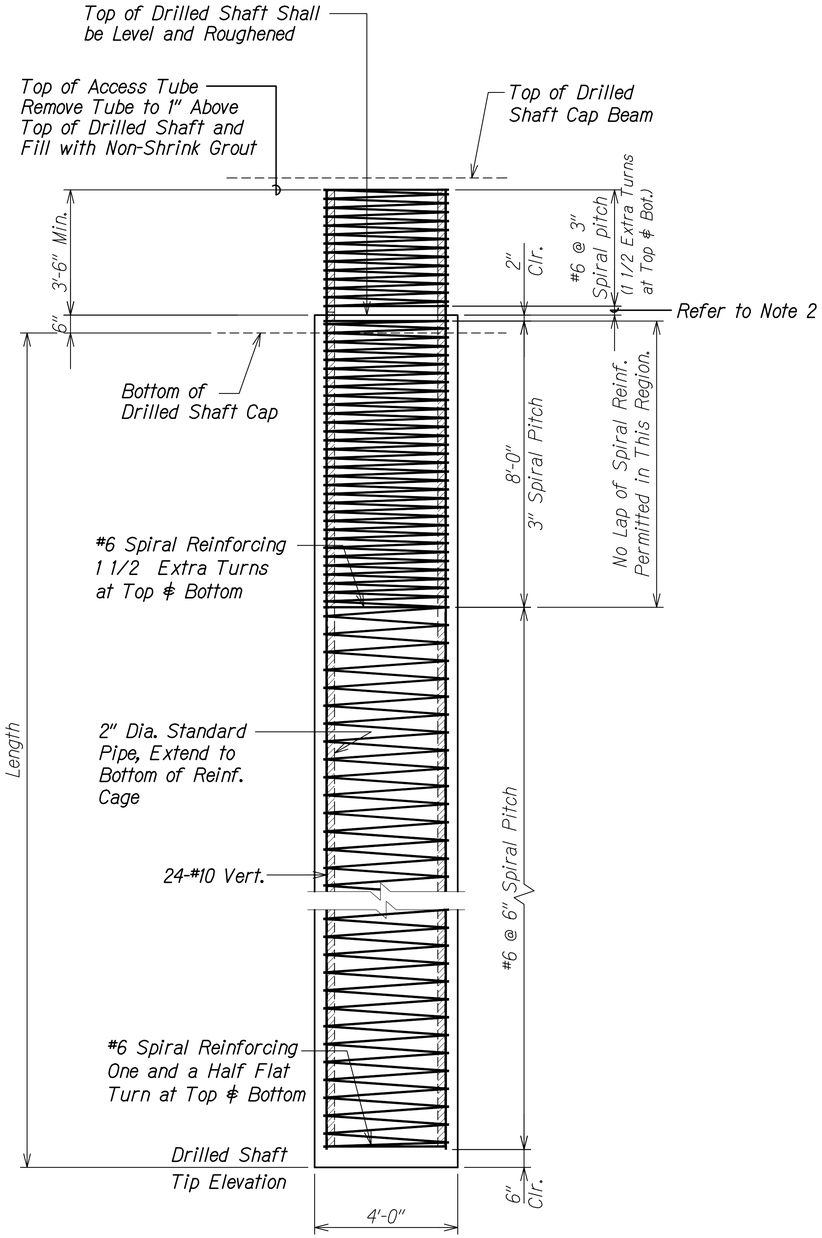
DRILLED SHAFT NOTES

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

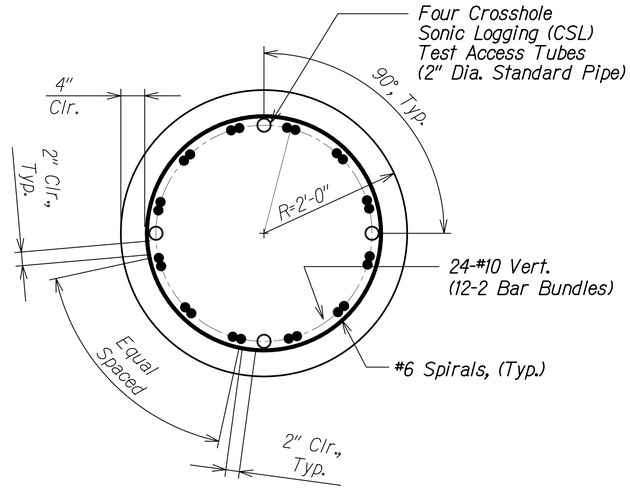
SHEET No. S7.1 OF 3 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	58	71



TYPICAL DRILLED SHAFT ELEVATION

Not to scale



SECTION AT DRILLED SHAFT FOR ABUTMENT

Scale: 1" = 1'-0"

A S7.2 S7.2

NOTES:

1. The Contractor shall refer to the Special Provisions Section 511 "DRILLED SHAFT".
2. Spirals may be discontinuous at drilled shaft cap beam reinforcement to allow for placing drilled shaft cap beam reinforcement. Each end of the spiral shall have 1 1/2 extra turns.
3. Provide template or mock-up to ensure no interference between vertical #10 bars and horizontal rebars in shaft cap beams.

ORIGINAL PLAN | NOTE BOOK No. | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE

DRAWING NAME: Z:\OD ONGOING\20-0022 (WAIPILOPILO STR BR-BOTH)\01 CAD\03-14-25\WSB-S0701 DRILL SHAFT.DWG PLOT TIME: 03-13-25, 3:49 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

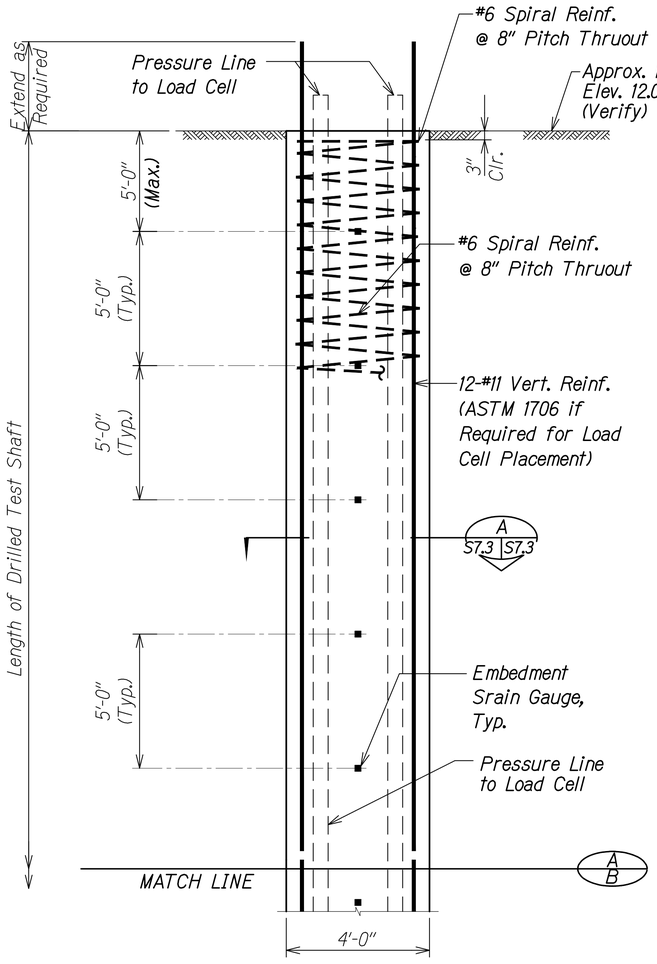
DRILLED SHAFT

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

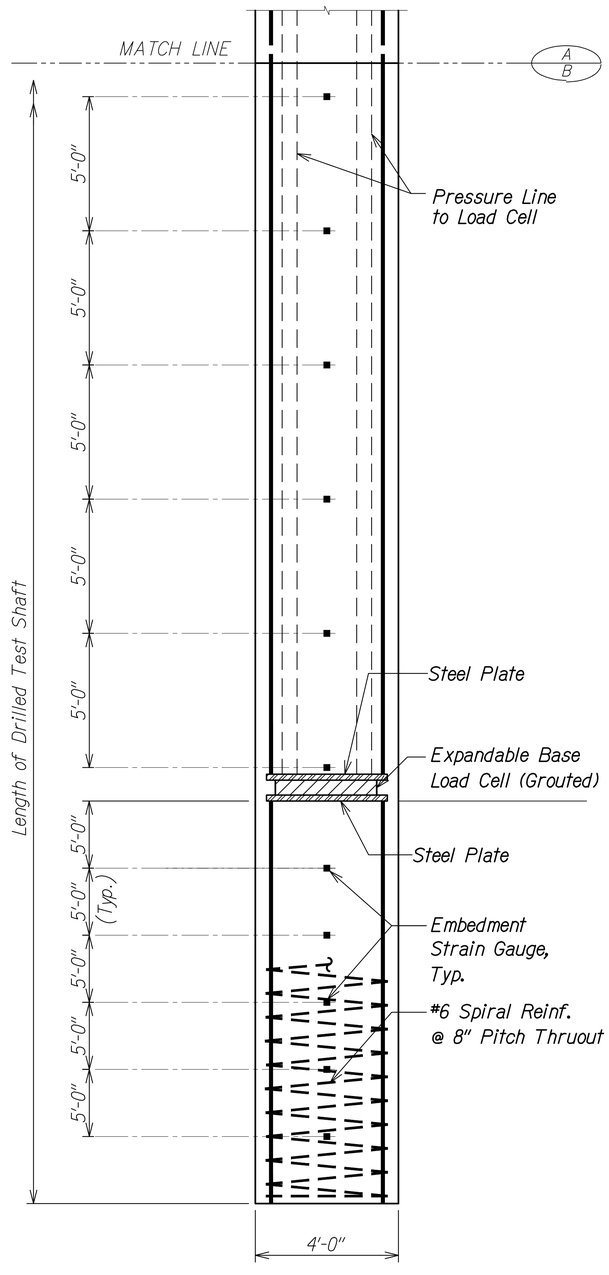
SHEET No. S7.2 OF 3 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	59	71



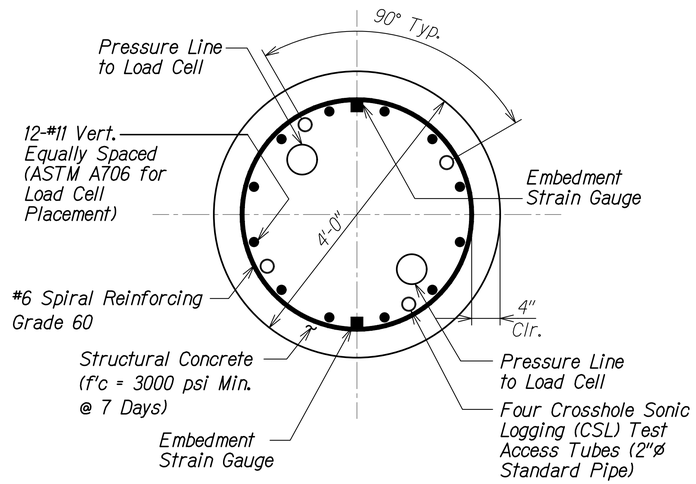
ELEVATION - UPPER PORTION "A"

Scale: Horiz. 1/2" = 1'-0"
Vert. 3/16" = 1'-0"



ELEVATION - LOWER PORTION "B"

Scale: Horiz. 1/2" = 1'-0"
Vert. 3/16" = 1'-0"



SECTION A

Scale: 1" = 1'-0"

S7.3 | S7.3

ORIGINAL PLAN	
NOTE BOOK	
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

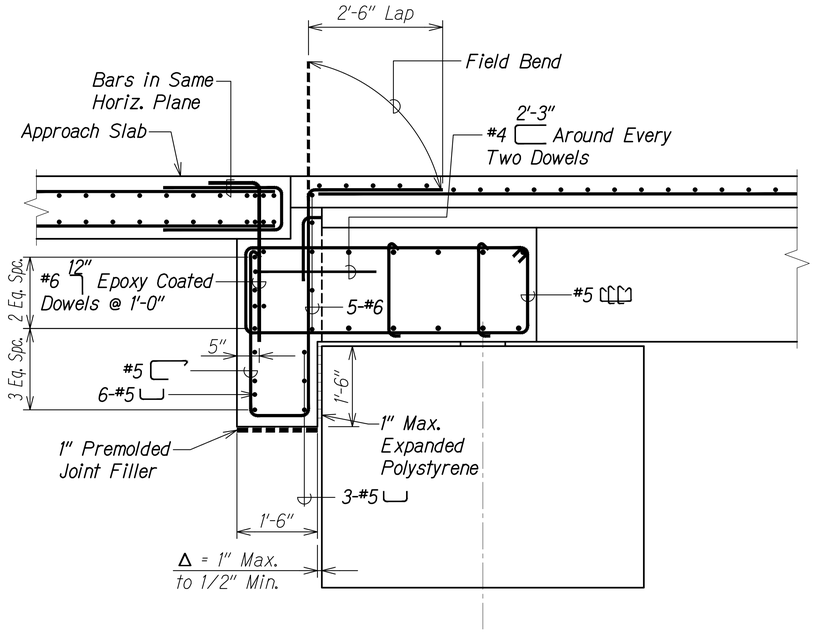
LOAD TEST SHAFT

KAMEHAMEHA HIGHWAY- REPLACEMENT
OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S7.3 OF 3 SHEETS

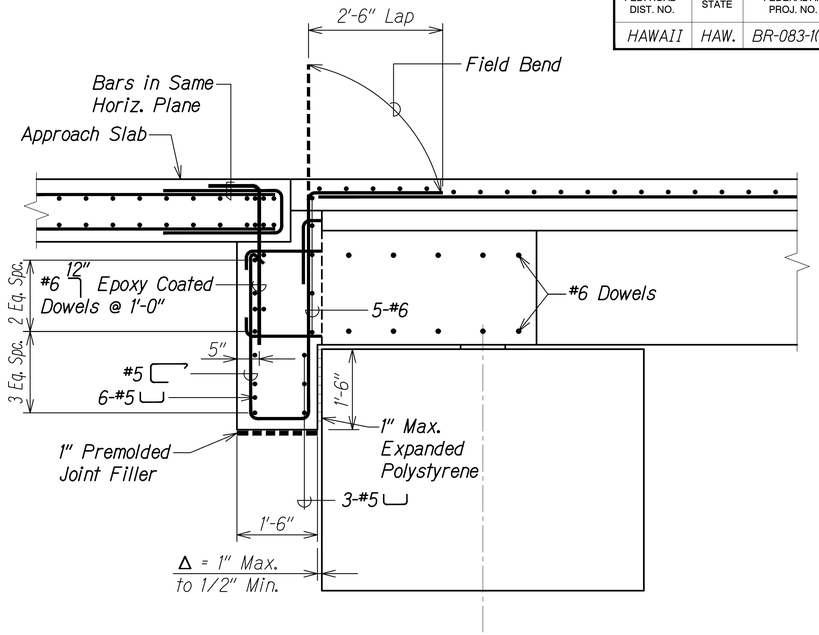
FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	60	71



END BEAM AND BACKWALL BETWEEN GIRDER STEMS

Scale: 3/4" = 1'-0"

A S8.1 | S8.1



END BEAM AND BACKWALL AT GIRDER STEMS

Scale: 3/4" = 1'-0"

B S8.1 | S8.1

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	"
NOTE BOOK	TRACED BY	"
	DESIGNED BY	"
No.	QUANTITIES BY	"
	CHECKED BY	"

DRAWING NAME: Z:\OD ONGOING\20-0022 WAIPILOPILO STR BR-80\A01 CAD\03-14-25\WEB-S0801 GIRDER SECT.DWG PLOT TIME: 03-13-25, 3:50 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

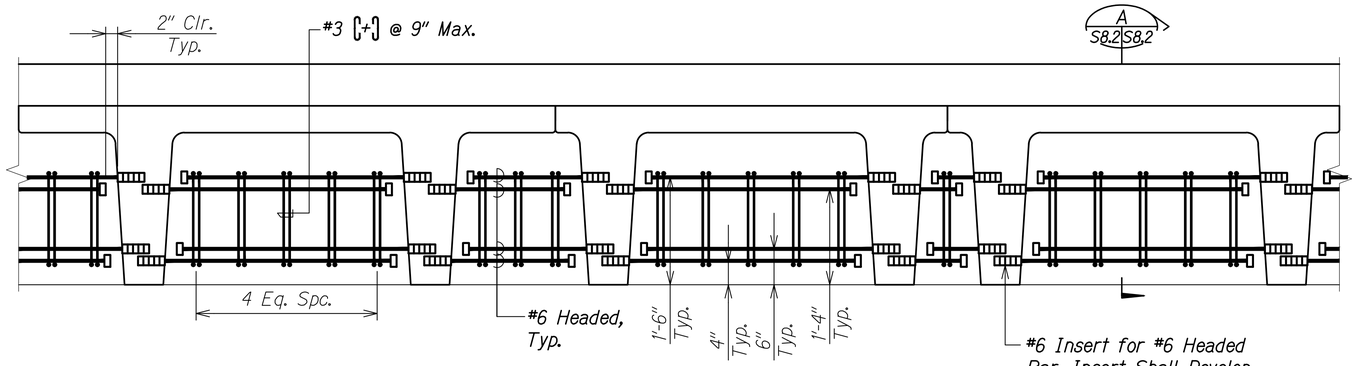
END BEAM AND BACKWALL SECTIONS

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

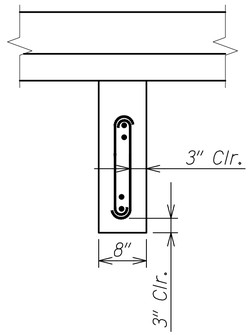
SHEET No. S8.1 OF 2 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	61	71



INTERMEDIATE DIAPHRAGMS

Scale: 1" = 1'-0"



SECTION A S8.2 S8.2

Scale: 1" = 1'-0"

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	"
No.	TRACED BY	"
	DESIGNED BY	"
	QUANTITIES BY	"
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DRAWING NAME: Z:\JOB ONGOING\29-002.2 WAIPILOPILO STR BR-200\A01 CAD\03-14-25\WSB-S0801 GIRDER SECT.DWG PLOT TIME: 03-13-25, 3:52 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

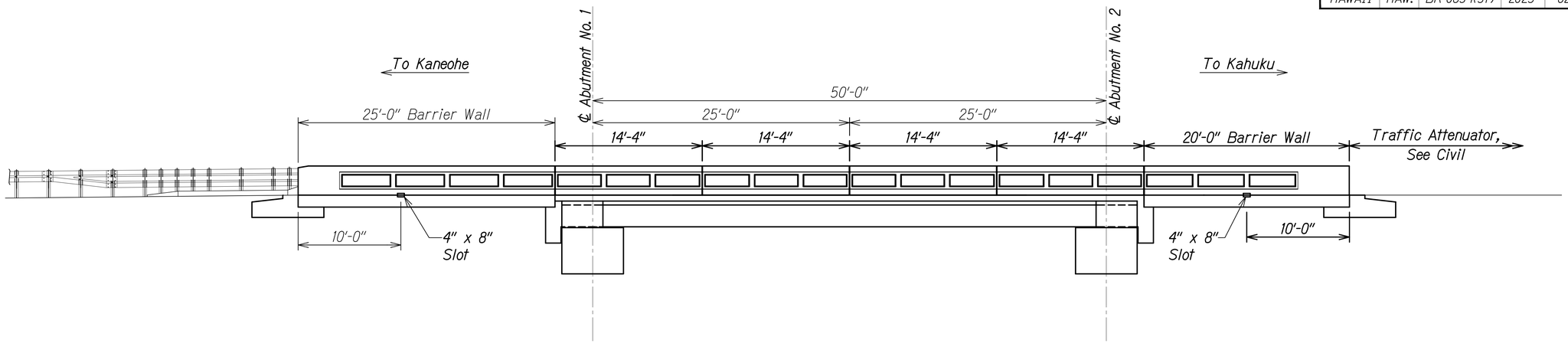
INTERMEDIATE DIAPHRAGMS

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S8.2 OF 2 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	62	71



BRIDGE RAILING ELEVATION (A)

Scale: 3/16" = 1'-0"

S9.1 | S9.1

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	"
	TRACED BY	"
	DESIGNED BY	"
	QUANTITIES BY	"
No.	CHECKED BY	"

DRAWING NAME: Z:\JOB ONGOING\29-002.2 WAIPILOPILO STR BR-20\HA\01 CAD\03-14-25\WSB-S0901 RAILG ELEV.DWG PLOT TIME: 03-13-25, 3:56 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

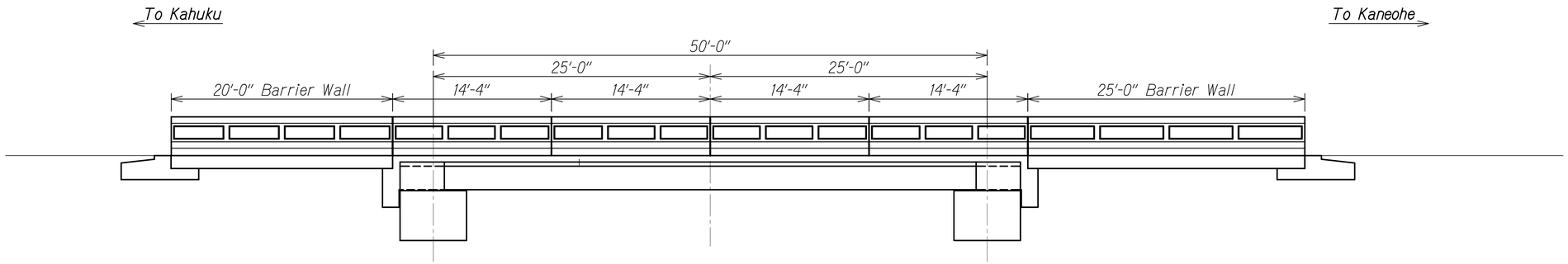
DOWNSTREAM RAILING ELEVATION

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

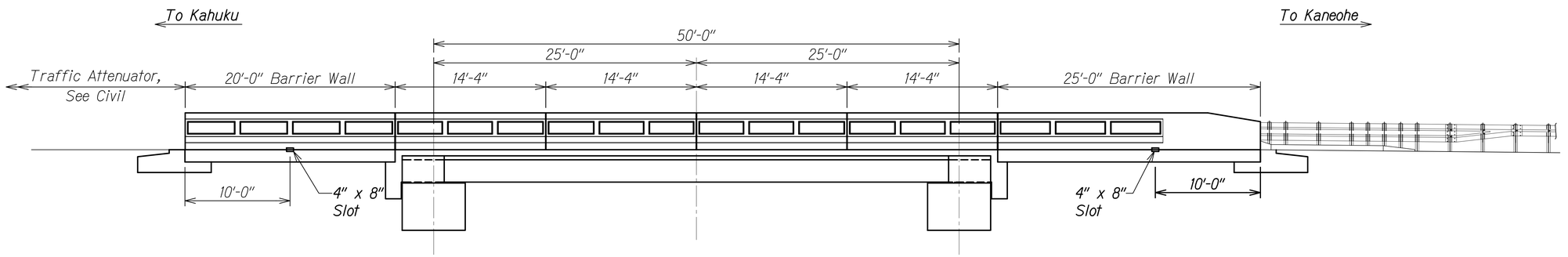
SHEET No. S9.1 OF 2 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	63	71



PEDESTRIAN RAILING ELEVATION (A)

Scale: 3/16" = 1'-0"



BRIDGE RAILING ELEVATION (B)

Scale: 3/16" = 1'-0"

SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE

ORIGINAL PLAN
NOTE BOOK
No.

DRAWING NAME: Z:\OD ONGOING\23-002.2 WAIPILOPILO STR BR-DOT\A01 CAD\03-14-25\WSB-S0901 RAILG ELEV.DWG PLOT TIME: 03-13-25, 3:56 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

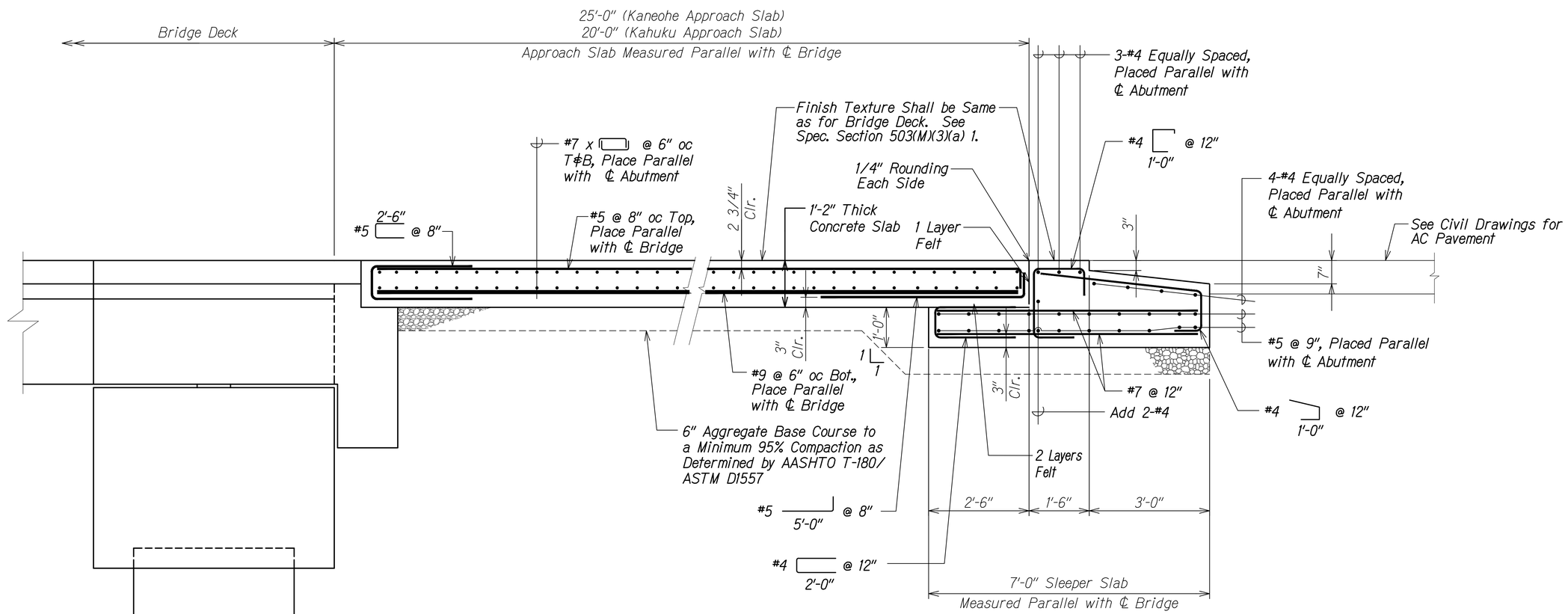
UPSTREAM RAILING ELEVATIONS

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S9.2 OF 2 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	64	71



TYPICAL APPROACH SLAB AND SLEEPER SLAB SECTION

Scale: 3/4" = 1'-0"

A SB11.1 | SB11.1

NOTES:

1. Approach slab and sleeper slab finish texture shall be the same as the bridge deck finish texture.
2. 6" Aggregate base course shall be incidental to the measurement and payment for Concrete for Kaloi Approach Slabs and Sleeper Slabs.

ORIGINAL PLAN
NOTE BOOK No.
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE

DRAWING NAME: Z:\JOB ONGOING\23-002.2 WAIPILOPILO STR BR-30TH\01 CAD\03-14-25\WSB-S1001 APPROACH SLAB.DWG PLOT TIME: 03-13-25, 3:29 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

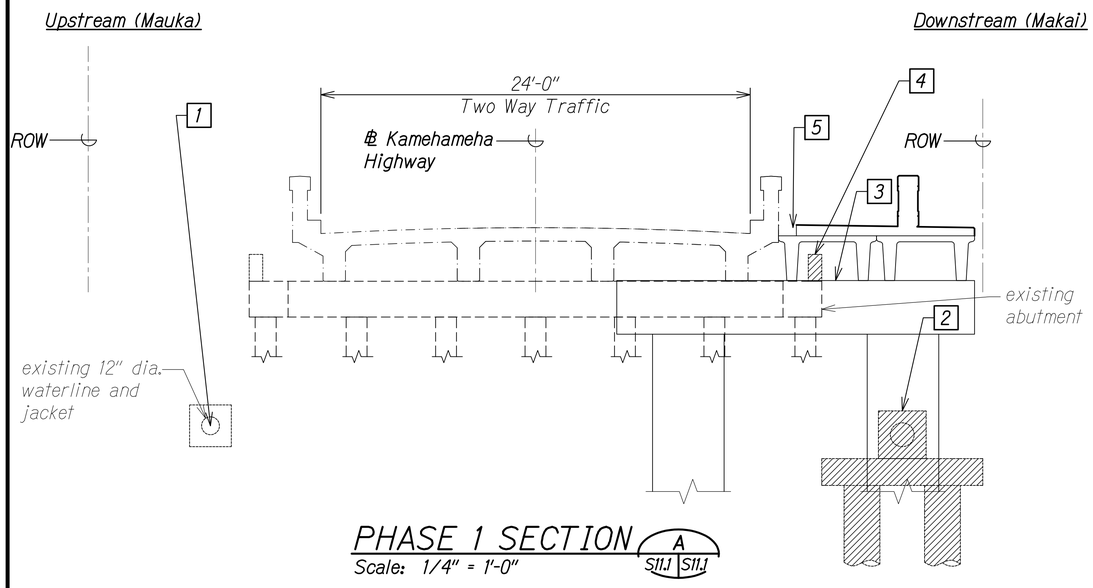
APPROACH SLAB AND SLEEPER SLAB SECTION

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

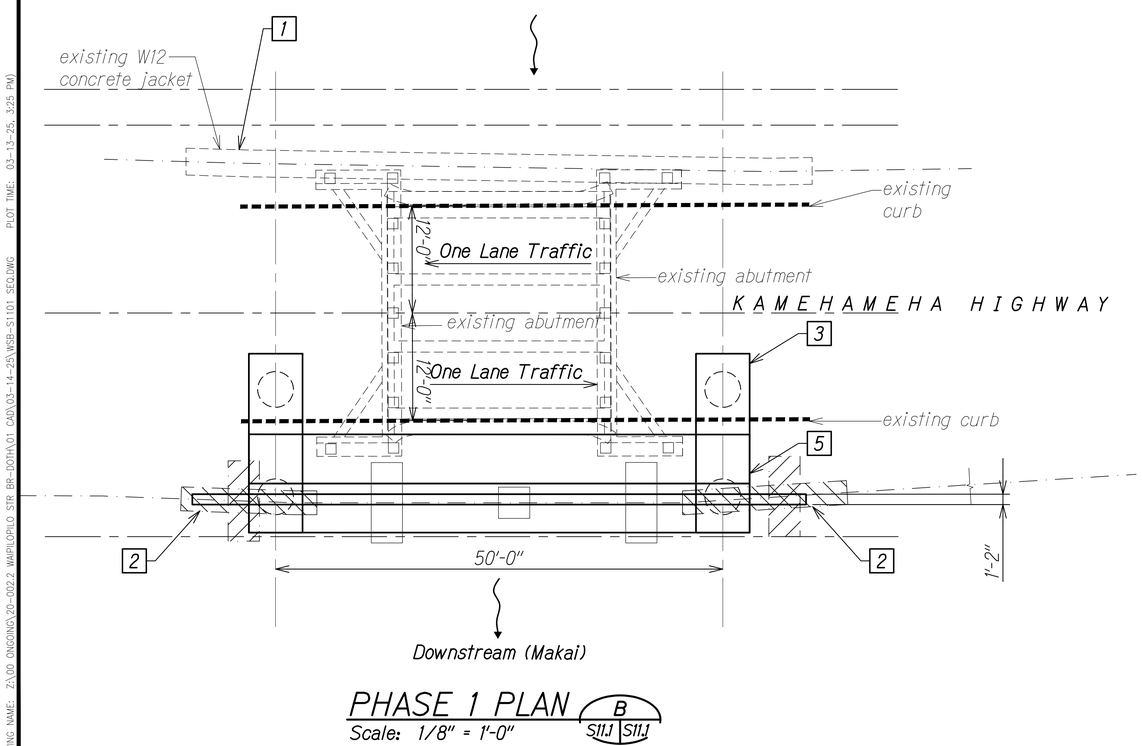
SHEET No. S10.1 OF 1 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	65	71



PHASE 1 SECTION (A) S11.1 | S11.1

Scale: 1/4" = 1'-0"



PHASE 1 PLAN (B) S11.1 | S11.1

Scale: 1/8" = 1'-0"

Construction Sequence:

1. Divert water from existing W16 (Makai) to Existing W12 (Mauka).
2. Demo existing W16, platform, and portions of drilled cassions as shown on Sht. S2.1.
3. Install four (4) Makai drilled shafts and drill shaft cap beams.
4. Demo existing curb.
5. Install two (2) Makai exterior girders, pour topping starting at midnight and ending by 6 AM, and install permanent Makai bridge railing.

NOTES:

1. During construction hours, one lane contraflow traffic at all times unless otherwise allowed by Engineer.
2. During peak traffic hours, two lanes required. Contractor shall cover trenches or holes with plates and beams to allow two lane traffic.

ORIGINAL PLAN
NOTE BOOK
No.

SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE

DRAWING NAME: Z:\OD ONGINO\20-002.2 WAIPILOPILO STR BR-DOTH\01 CAD\03-14-25\WSB-S1101 SEQ.DWG PLOT TIME: 03-13-25, 3:25 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

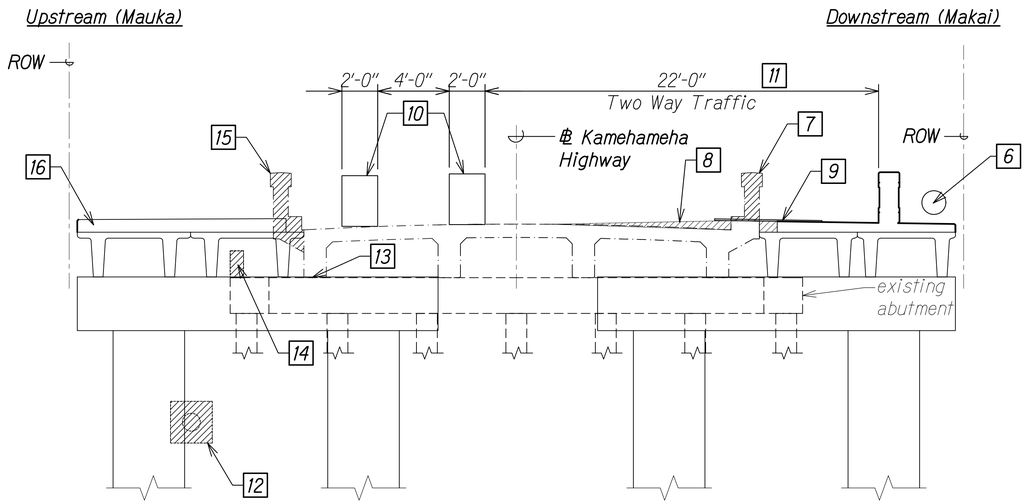
CONSTRUCTION PHASE 1

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

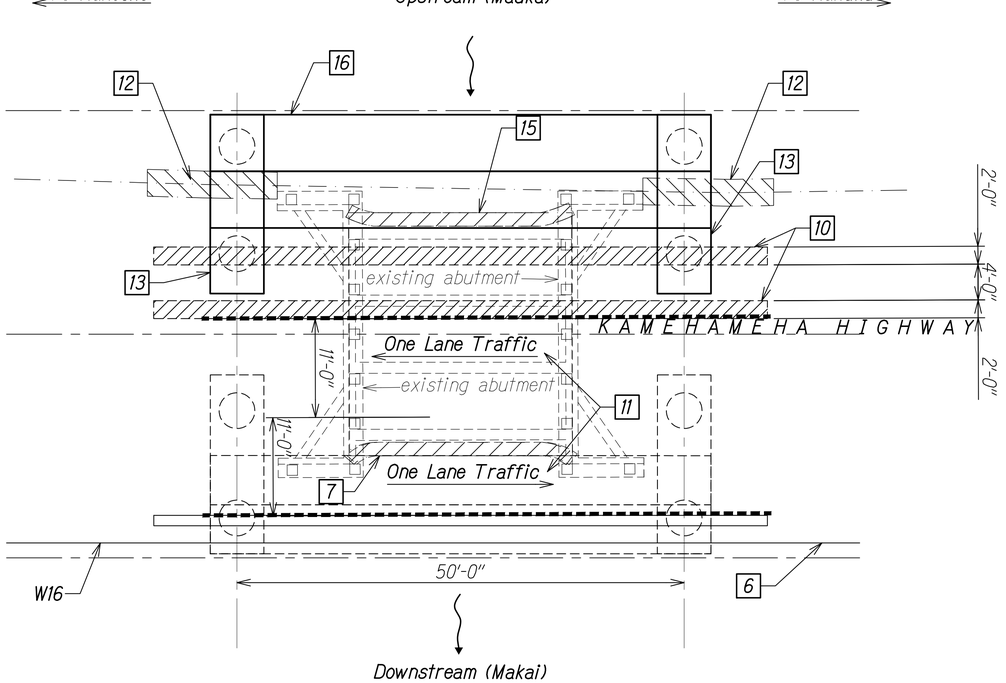
Scale: As Noted Date: Mar. 2025

SHEET No. S11.1 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	66	71



PHASE 2 SECTION A
Scale: 1/4" = 1'-0"
S11.2 S11.2



PHASE 2 PLAN B
Scale: 1/8" = 1'-0"
S11.2 S11.2

Construction Sequence:

6 *Install permanent W16 main. Divert water from existing W12 to new W16.*

7 *Demo existing Makai barrier.*

8 *Fill existing deck as required to provide smooth riding surface.*

9 *Install road plates at interface between new and existing bridge.*

10 *Install temporary barriers.*

11 *Shift traffic to Makai side of Bridge.*

12 *Demo existing W12 as shown on Sht. S2.1.*

13 *Install four (4) Mauka drilled shafts and drill shaft cap beams.*

14 *Demo existing curb.*

15 *Demo existing Mauka Barrier.*

16 *Install two (2) Mauka exterior girders. Pour topping starting at midnight and ending by 6 AM.*

NOTES:

1. *During construction hours, one lane contraflow traffic at all times unless otherwise allowed by Engineer.*
2. *During peak traffic hours, two lanes required. Contractor shall cover trenches or holes with plates and beams to allow two lane traffic.*

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
No.	TRACED BY	
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DRAWING NAME: Z:\OD ONGONG\25-002.2 WAIPILOPILO STR BR-DOT\A01 CAD\03-14-25\WSB-S1101 SEQ.DWG PLOT TIME: 03-13-25, 3:25 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

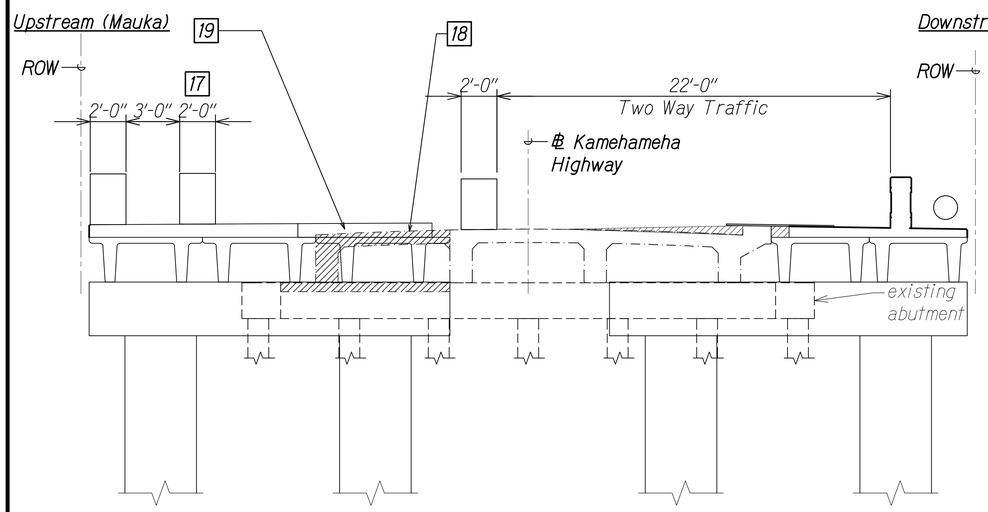
CONSTRUCTION PHASE 2

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

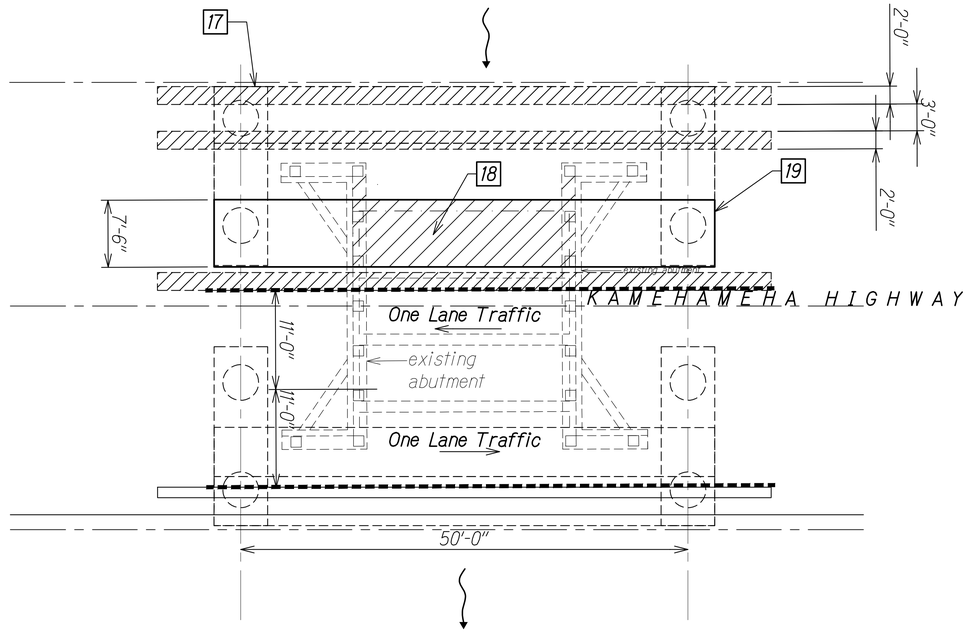
SHEET No. S11.2 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	67	71



PHASE 3 SECTION (A) S11.3 | S11.3

Scale: 1/4" = 1'-0"



PHASE 3 PLAN (B) S11.3 | S11.3

Scale: 1/8" = 1'-0"

Construction Sequence:

17 Install temporary barriers and relocate pedestrian walkway, (see S11.4 for alternate pedestrian walkway).

18 Demo portions of existing Mauka exterior deck and portions of existing abutments.

19 Install one (1) Mauka interior girder. Pour topping starting at midnight and ending by 6 AM.

19A Pour diaphragm, backwall and end beam closures starting at midnight after concrete in 19 has aged 24 hours and reaches 3,000 psi.

19B Pour deck closure after concrete in 19A has aged 3 hours and reaches 3,000 psi starting at midnight. Complete pour by 6 AM.

NOTES:

1. During construction hours, one lane contraflow traffic at all times unless otherwise allowed by Engineer.
2. During peak traffic hours, two lanes required. Contractor shall cover trenches or holes with plates and beams to allow two lane traffic.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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DRAWING NAME: 2\00 ONGOING\20-022 WAIPILOPILO STR BR-BOTH\01 CAD\03-14-25\WSB-S1101 SEQ.DWG PLOT TIME: 03-13-25, 3:25 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

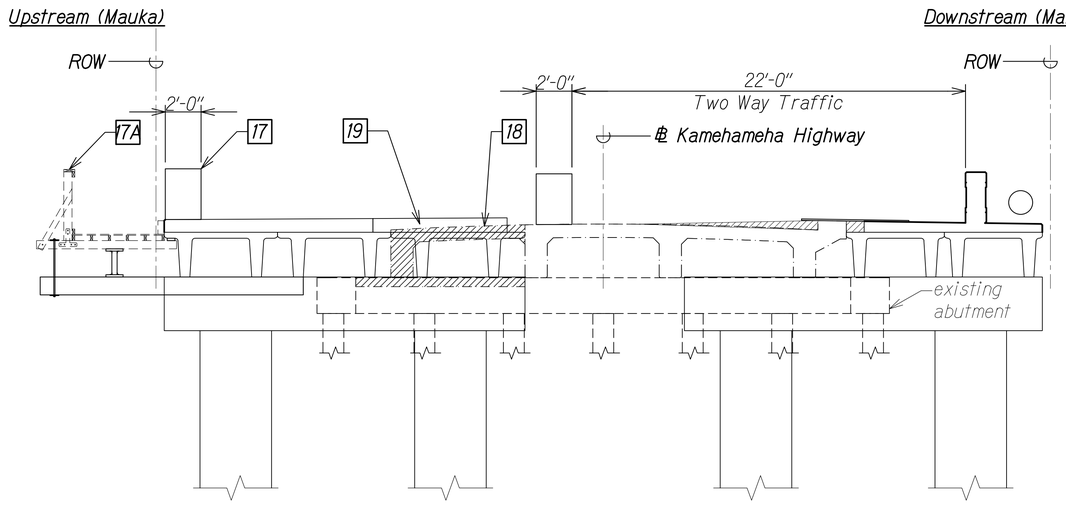
CONSTRUCTION PHASE 3

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S11.3 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	68	71



PHASE 3A SECTION (A)

Scale: 1/4" = 1'-0"

S11.4 | S11.4

Construction Sequence:

17 *Install temporary barriers.*

17A *Install temporary pedestrian walkway.*

18 *Demo portions of existing Mauka exterior deck and portions of existing abutments.*

19 *Install one (1) Mauka interior girder. Pour topping starting at midnight and ending by 6 AM.*

19A *Pour diaphragm, backwall and end beam closures starting at midnight after concrete in 19 has aged 24 hours and reaches 3,000 psi.*

19B *Pour deck closure after concrete in 19A has aged 3 hours and reaches 3,000 psi starting at midnight. Complete pour by 6 AM.*

NOTES:

1. *During construction hours, contraflow traffic.*
2. *During peak traffic hours, two lanes required. Contractor shall cover trenches or holes with plates and beams to allow two lane traffic.*

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	"
No.	TRACED BY	"
	DESIGNED BY	"
	QUANTITIES BY	"
	CHECKED BY	"

DRAWING NAME: Z:\OD ONGOING\29-002.2 WAIPILOPILO STR BR-20\HA\01 CAD\03-14-25\WSB-S1101 SEQ.DWG PLOT TIME: 03-13-25, 3:26 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

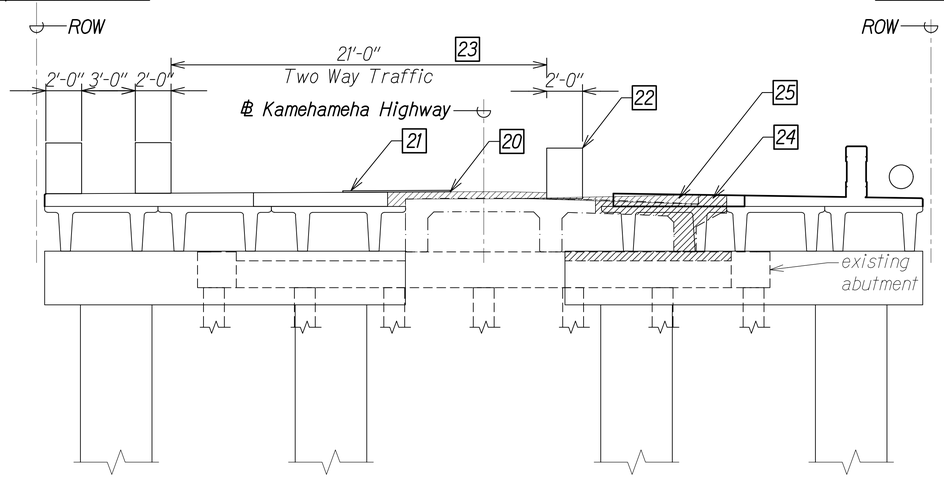
CONSTRUCTION PHASE 3A

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

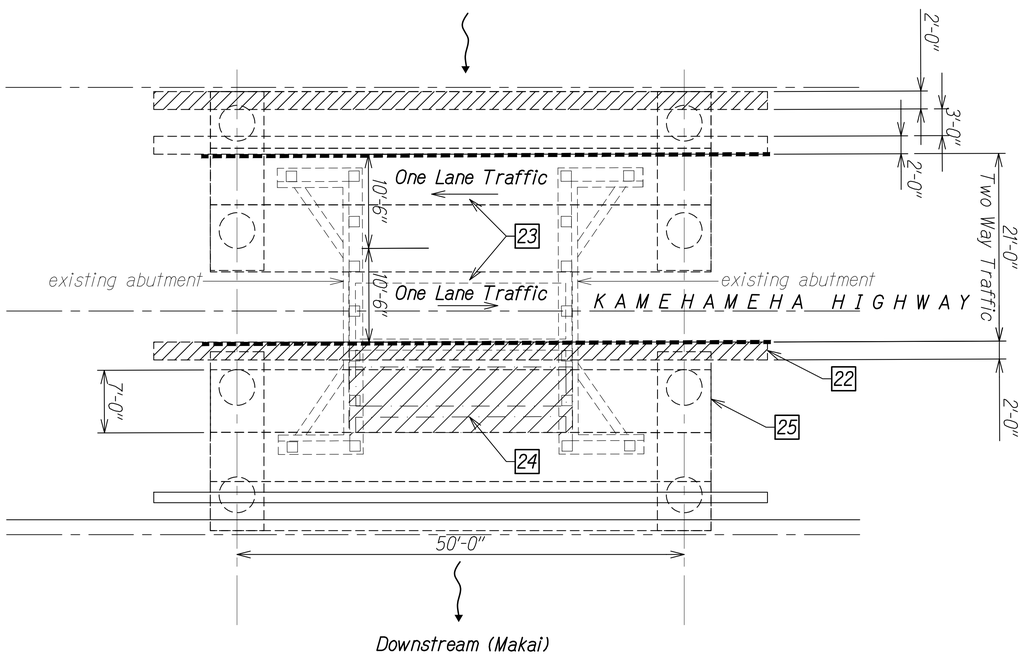
SHEET No. S11.4 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	69	71



PHASE 4 SECTION (A) S11.5 | S11.5

Scale: 1/4" = 1'-0"



PHASE 4 PLAN (B) S11.5 | S11.5

Scale: 1/8" = 1'-0"

Construction Sequence:

20 Fill existing deck as required to provide smooth riding surface.

21 Install road plates at interface between new and existing bridge.

22 Relocate temporary barrier and fill existing deck as required to provide smooth riding surface.

23 Shift traffic to Mauka side of bridge. (See Note 3).

24 Demo portions of existing Makai exterior deck and portions of existing abutments.

25 Install one (1) Makai interior girder. Pour topping starting at midnight and ending by 6 AM.

25A Pour diaphragm, backwall and end beam closures starting at midnight after concrete in 25 has aged 24 hours and reaches 3,000 psi.

25B Pour deck closure after concrete in 25A has aged 3 hours and reaches 3,000 psi starting at midnight. Complete pour by 6 AM.

NOTES:

1. During construction hours, one lane contraflow traffic at all times unless otherwise allowed by Engineer.
2. During peak traffic hours, two lanes required. Contractor shall cover trenches or holes with plates and beams to allow two lane traffic.
3. 11'-0" lane widths with alternate pedestrian walkway.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
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DRAWING NAME: Z:\OD ONGONG\25-002.2 WAIPILOPILO STR BR-DOT\A01 CAD\03-14-25\WSB-S1101 SEQ.DWG PLOT TIME: 03-13-25, 3:26 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

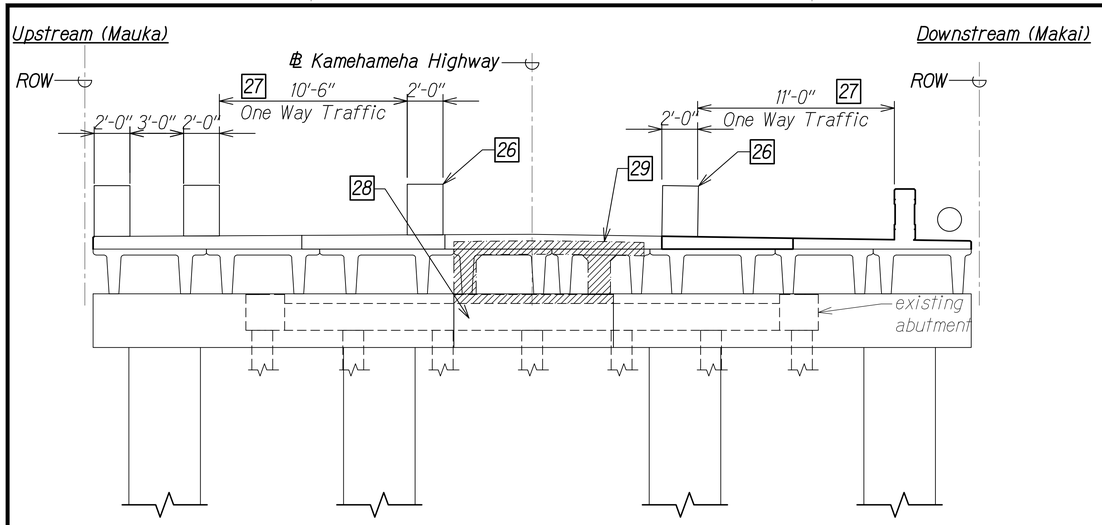
CONSTRUCTION PHASE 4

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

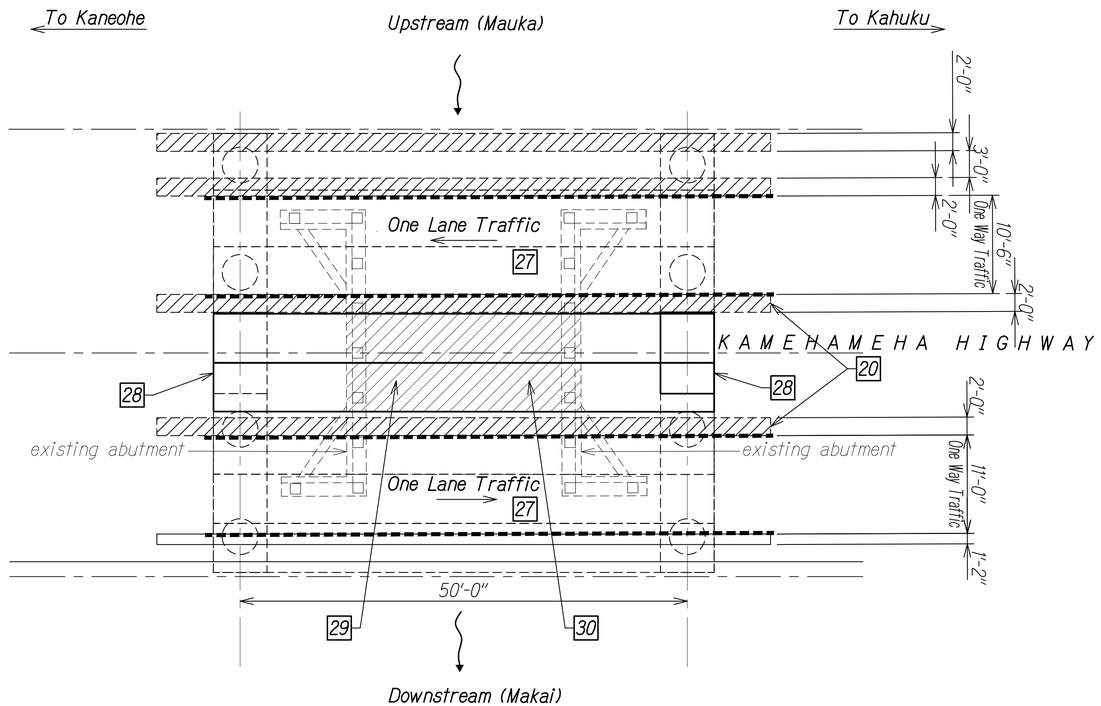
SHEET No. S11.5 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	70	71



PHASE 5 SECTION (A) S11.6 | S11.6

Scale: 1/4" = 1'-0"



PHASE 5 PLAN (B) S11.6 | S11.6

Scale: 1/8" = 1'-0"

Construction Sequence:

26 *Relocate temporary barriers.*

27 *Shift traffic. One lane Mauka side of bridge, one lane Makai side of bridge. (See Note 3).*

28 *Install drill shaft cap beams.*

29 *Demo remainder of existing deck and portions of existing abutments.*

30 *Install two (2) middle girders. Pour topping starting at midnight and ending by 6 AM.*

30A *Pour diaphragm, backwall and end beam closures starting at midnight after concrete in 30 has aged 24 hours and reaches 3,000 psi.*

30B *Pour deck closure after concrete in 30A has aged 3 hours and reaches 3,000 psi starting at midnight. Complete pour by 6 AM.*

NOTES:

1. *During construction hours, one lane contraflow traffic at all times unless otherwise allowed by Engineer.*
2. *During peak traffic hours, two lanes required. Contractor shall cover trenches or holes with plates and beams to allow two lane traffic.*
3. *11'-0" lane widths with alternate pedestrian walkway.*

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
No.	TRACED BY	
	DESIGNED BY	
	QUANTITIES BY	
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DRAWING NAME: 2\00 ONGOING\20-022 WAIPILOPILO STR BR-BOTH.01 C4D\03-14-25\WSB-S1101 SEQ.DWG PLOT TIME: 03-13-25, 3:26 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

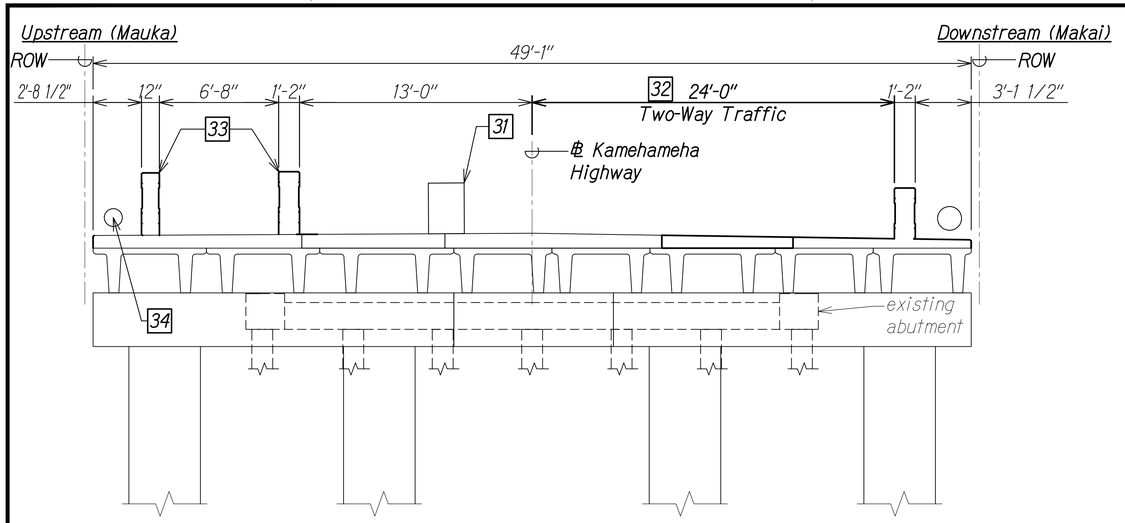
CONSTRUCTION PHASE 5

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S11.6 OF 7 SHEETS

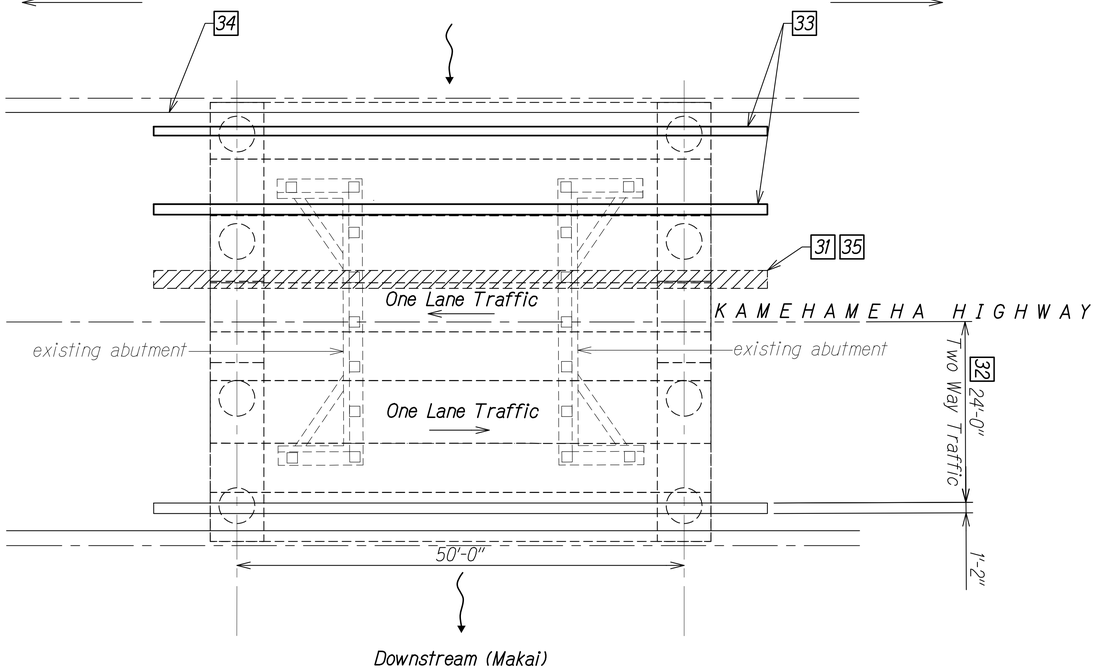
FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(57)	2025	71	71



PHASE 6 SECTION

Scale: 1/4" = 1'-0"

A S11.7 S11.7



PHASE 6 PLAN

Scale: 1/8" = 1'-0"

B S11.7 S11.7

Construction Sequence:

31 *Relocate temporary barriers.*

32 *Shift traffic to Makai side of bridge.*

33 *Install permanent Mauka bridge railing and pedestrian barrier.*

34 *Install permanent W12 main.*

35 *Remove temporary barrier.*

NOTES:

1. *During construction hours, one lane contraflow traffic at all times unless otherwise allowed by Engineer.*
2. *During peak traffic hours, two lanes required. Contractor shall cover trenches or holes with plates and beams to allow two lane traffic.*

ORIGINAL PLAN
NOTE BOOK No.
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE

DRAWING NAME: 2\00 ONGOING\20-0022 WAIPILOPILO STR BR-BOTH\01 CAD\03-14-25\WSB-S1101 SEQ.DWG PLOT TIME: 03-13-25, 3:59 PM

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CONSTRUCTION PHASE 6

KAMEHAMEHA HIGHWAY- REPLACEMENT OF WAIPILOPILO STREAM BRIDGE
Federal Aid Project No. BR-083-1(57)

Scale: As Noted Date: Mar. 2025

SHEET No. S11.7 OF 7 SHEETS

APPENDIX C GEOTECHNICAL REPORT

GEOTECHNICAL ENGINEERING EXPLORATION

WAIPILOPILO STREAM BRIDGE REPLACEMENT

HAUULA, OAHU, HAWAII

W.O. 8412-00(C) DECEMBER 6, 2024

Prepared for

WSP

GEOLABS, INC.
Geotechnical Engineering and Drilling Services

GEOTECHNICAL ENGINEERING EXPLORATION
WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

W.O. 8412-00(C) DECEMBER 6, 2024

Prepared for

WSP

GLENN G. BARUT
LICENSED PROFESSIONAL ENGINEER
No. 10296-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION.

4-30-26
SIGNATURE EXPIRATION DATE OF THE LICENSE

GEOLABS, INC.
Geotechnical Engineering and Drilling Services
94-429 Koaki Street, Suite 200 • Waipahu, HI 96797

Hawaii • California

GEOLABS, INC.
Geotechnical Engineering and Drilling Services

December 6, 2024
W.O. 8412-00(C)

Mr. Randall Urasaki
WSP
1001 Bishop Street, Suite 2400
Honolulu, HI 96813

Dear **Mr. Urasaki:**

Geolabs, Inc. is pleased to submit our report entitled "Geotechnical Engineering Exploration, Waipilopilo Stream Bridge Replacement, Hauula, Oahu, Hawaii," prepared in support of the design of the project.

Our work was performed in general accordance with the scope of services outlined in our fee proposal dated April 17, 2023.

Please note that the soil samples recovered during our field exploration (remaining after testing) will be stored for a period of two months from the date of this report. The samples will be discarded after that date unless special arrangements are made for a longer sample storage period. Please contact our office for alternative sample storage requirements, if appropriate.

Detailed discussion and recommendations are contained in the body of this report. If there is any point that is not clear, please contact our office.

Very truly yours,

GEOLABS, INC.

Gerald Y. Seki, P.E.
Vice President

GS:GB:lf

94-429 Koaki Street, Suite 200 • Waipahu, Hawaii 96797
Telephone: (808) 841-5064 • E-mail: hawaii@geolabs.net

GEOTECHNICAL ENGINEERING EXPLORATION
WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

W.O. 8412-00(C) DECEMBER 6, 2024

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APPENDIX C

Boring Logs from Report Prepared by Hirata & Associates, Inc.,
dated November 19, 2012 (Fourteen Sheets)

GEOTECHNICAL ENGINEERING EXPLORATION
WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

W.O. 8412-00(C) DECEMBER 6, 2024

SUMMARY OF FINDINGS AND RECOMMENDATIONS

The subsurface conditions at the site generally consisted of 4 to 7 inches of asphaltic concrete underlain by fills extending to depths of about 4 to 7 feet below the existing ground surface. The fills were underlain by loose to medium dense silty sand and gravel, extending to depths of about 12 to 14 feet below the existing ground surface. The borings encountered soft to very soft silt and loose to very loose silty sand below the silty sand and gravel, extending to depths of about 48 to 70 feet below the existing ground surface. The soft to very stiff silt and loose to very loose silty sands were underlain by older alluvium consisting of medium stiff to hard clayey silt and medium dense to dense silty sand interbedded with cobbles and boulders extending to the maximum depth explored of about 141 feet below the existing ground surface.

Groundwater was encountered in the drilled borings at depths ranging from 5.3 to 8 feet below the existing ground surface, corresponding to approximate elevations ranging from +0.4 to +3.4 feet Mean Sea Level (MSL). It should be noted that groundwater levels may vary with stream flow conditions, tidal fluctuations, seasonal rainfall, time of year, and other factors.

Based on the subsurface conditions and the foundation load provided, we believe that a deep foundation system consisting of 4-foot diameter drilled shafts may be used to support the replacement bridge structure. The drilled shaft foundations would derive support principally from adhesion between the drilled shaft and the alluvium (medium dense to dense sand and stiff clay/silt with cobbles/boulders). The contribution from end-bearing of the drilled shafts has been discounted in our analyses due to the difficulties of obtaining a clean bottom for end-bearing shafts in these subsurface conditions during construction. Based on an unfactored capacity of approximately 1,740 kips, we recommend a drilled shaft embedment depth of about 110 feet below the existing ground surface, which corresponds to a tip elevation of about -101 feet MSL.

A trial and load test shaft program consisting of the construction of a trial shaft and a load test shaft is recommended for the project. Due to the high capacity recommended for the drilled shafts, a conventional load test would not be practicable. Therefore, we recommend conducting a bi-directional axial load test on the reinforced load test shaft using an expandable base load cell. The text of this report should be referred to for detailed discussion and specific recommendations for the design of the replacement bridge project.

END OF SUMMARY OF FINDINGS AND RECOMMENDATIONS

SECTION 1. GENERAL

1.1 Introduction

This geotechnical engineering report presents the results of our analyses and geotechnical recommendations for the *Waipilopilo Stream Bridge Replacement* project in the Hauula area on the Island of Oahu, Hawaii. The project location and general vicinity are shown on the Project Location Map, Plate 1.

This report presents our geotechnical engineering recommendations derived from our analyses for the design of bridge foundations, retaining structures, and site grading only. The findings and recommendations presented herein are subject to the limitations noted at the end of this report.

1.2 Project Considerations

The bridge replacement project site is located at Waipilopilo Stream on Kamehameha Highway near the intersection with Imua Place in Hauula on the Island of Oahu, Hawaii. We understand that it is planned to replace the existing single-span bridge.

Based on as-built drawings, the existing single-span concrete bridge structure is supported on 14-inch by 14-inch driven concrete piles. We understand that the new bridge abutments will be constructed behind the existing abutments and supported on 4-foot diameter drilled shafts. In addition, we understand that four 4-foot diameter drilled shafts will be used to support each abutment. The existing bridge abutments will be left in place.

Additional subsurface information is provided in the report by Hirata & Associates, Inc. entitled “Foundation Investigation, Rehabilitation of Waipilopilo Stream Bridge, Kamehameha Highway, Koolauloa, Oahu, Hawaii,” dated November 19, 2012, for the project.

1.3 Purpose and Scope

The purpose of our geotechnical engineering exploration is to obtain an overview of the surface and subsurface conditions to develop a soil and/or rock data set to formulate geotechnical recommendations for the design of the bridge rep

lacement project. To accomplish this, we propose an exploration program consisting of the following tasks and work efforts:

1. Research and review of available subsurface information in the project vicinity and existing as-built drawings.
2. Performance of site reconnaissance to observe the existing bridge conditions.
3. Application for the HDOT roadway permit.
4. Application and coordination of underground utility toning.
5. Mobilization and demobilization of a truck-mounted drill rig and operators to the project site and back.
6. Drilling and sampling of two borings at selected locations extending to depths of about 57.5 and 141 feet below the existing ground surface.
7. Coordination of the field exploration and logging of the borings by our geologist.
8. Geotechnical laboratory testing of selected soil samples obtained during the field exploration as an aid in classifying the materials and evaluating their engineering properties.
9. Analyses of the field and laboratory data to formulate geotechnical recommendations for the bridge replacement design.
10. Preparation of a formal report summarizing our work on the project and presenting our findings and recommendations.
11. Coordination of our overall work on the project by our project engineer.
12. Quality assurance of our work and client/design team consultation by our principal engineer.
13. Miscellaneous work efforts such as drafting, word processing, and clerical support.

Detailed descriptions of our field exploration methodology and the Logs of Borings are presented in Appendix A. The laboratory test results of selected soil and core samples obtained from our field exploration are presented in Appendix B.

END OF GENERAL

SECTION 2. SITE CHARACTERIZATION

2.1 Regional Geology

The Island of Oahu was built by the extrusion of basaltic lavas from the Waianae and Koolau Volcanoes. The older Waianae Volcano is estimated to be middle to late Pliocene in age and forms the bulk of the western third of the island. The younger Koolau Volcano is estimated to be late Pliocene to early Pleistocene (Ice Age) in age and forms the majority of the eastern two-thirds of the island. Waianae Volcano became extinct while Koolau Volcano was still active, and its eastern flank was partially buried below Koolau Volcano lavas banking against its eastern flank. These banked or ponded lavas formed a broad plateau referred to as the Schofield Plateau.

The proposed replacement bridge project is in the Hauula area of the District of Koolauloa on the windward side of the Island of Oahu, Hawaii. The coastal area of Hauula lies within the Coastal Plain province of Oahu and is located to the northeast of the Koolau Mountain province. As a result, much of the generally flat land area in the vicinity is underlain by unconsolidated coastal sediments (coralline sands and silts) with pockets of hard, cemented sand dunes (sandstone) and coral/limestone rock formation.

Progressing from the coastal area toward the hills of the Koolau Mountains, the subsurface conditions gradually change to reflect an increase in the thickness of terrestrial sediments, such as the alluvial soils derived from the hills and valleys to the southwest of the coastline. The alluvial soils may overlie the buried coral formation and sand deposits in the subsurface. The deposition of sediments has continued from earlier geologic times through the present. Subsequently, development within the last 100 years has brought the project area to its present form.

2.2 Existing Site Conditions

Waipilopilo Stream Bridge Replacement project is located along Kamehameha Highway near the intersection with Imua Place in the Hauula area on the Island of Oahu, Hawaii. The location of the project site is shown on the Site Plan, Plate 2.

The existing Waipilopilo Stream Bridge is a single-span concrete bridge structure. Based on as-built drawings, the existing single-span concrete bridge structure

is supported on 14-inch by 14-inch driven concrete piles. The existing bridge deck is overlaid with a layer of asphaltic concrete and is approximately 22 feet long and 24 feet wide.

Within the project limits, Kamehameha Highway is a two-lane thoroughfare consisting of one traffic lane in each direction. The existing roadway is paved with asphaltic concrete.

The existing ground surface along the roadway is fairly level with ground elevations ranging from about Elevations +8.5 feet MSL at the south side of the bridge to about +9 feet MSL at the north side of the bridge.

2.3 Subsurface Conditions

We explored the subsurface conditions at the project site by drilling and sampling two borings, designated as Boring Nos. 101 and 102, extending to depths of about 141 and 57.5 feet below the existing ground surface, respectively. The approximate boring locations are shown on the Site Plan, Plate 2.

In addition, the subsurface conditions at the project site were explored by Hirata & Associates, Inc. for the original design of the bridge replacement project by drilling and sampling four borings, designated as B1 through B4, extending to depths ranging from about 29.5 to 140 feet below the existing ground surface. The boring information and the results of the laboratory testing performed are provided in the Hirata & Associates, Inc. report entitled “Foundation Investigation, Rehabilitation of Waipilopilo Stream Bridge, Kamehameha Highway, Koolauloa, Oahu, Hawaii,” dated November 19, 2012. The results of our field exploration and the field exploration performed by Hirata & Associates, Inc. were also used in the development of our geotechnical engineering recommendations.

Based on the field explorations, the subsurface conditions at the site generally consisted of a 4 to 7-inch surface layer consisting of asphaltic concrete underlain by fills extending to depths of about 4 to 7 feet below the existing ground surface. Below the fills, loose to medium dense silty sand and gravel were encountered in the borings extending to depths of about 12 to 14 feet below the existing ground surface. Soft to

very soft silt and loose to very loose silty sand were encountered below the silty sand and gravel and extended to depths of about 48 to 70 feet below the existing ground surface. The soft to very soft silt and loose to very loose silty sand was underlain by older alluvium consisting of medium stiff to hard clayey silt and silty clay, and medium dense to dense silty sand interbedded with cobbles and boulders extending to the maximum depth explored of about 141 feet below the existing ground surface.

Groundwater was encountered in the drilled borings at depths ranging from 5.3 to 8 feet below the existing ground surface, corresponding to approximate elevations of +0.4 to +3.4 feet MSL. It should be noted that groundwater levels may vary with stream flow conditions, tidal fluctuations, seasonal rainfall, time of year, and other factors.

2.4 Seismic Design Parameters

Based on the Load and Resistance Factor Design (LRFD) Bridge Design Specifications, 9th Edition (2020), the project site may be subject to seismic activity and seismic design considerations will need to be addressed. The following subsections provide discussions on the seismicity, soil profile type for seismic design, and the potential for liquefaction at the project site.

2.4.1 Earthquakes and Seismicity

In general, earthquakes that occur throughout the world are caused solely by shifts in the tectonic plates. In contrast, earthquake activity in Hawaii is linked primarily to volcanic activity. Therefore, earthquake activity in Hawaii generally occurs before or during volcanic eruptions. In addition, earthquakes may result from the underground movement of magma that comes close to the surface but does not erupt. The Island of Hawaii experiences thousands of earthquakes each year, but most of the earthquakes are so small that they can only be detected by sensitive instruments. However, some of the earthquakes are strong enough to be felt, and a few cause minor to moderate damage.

In general, earthquakes (associated with volcanic activity) are most common on the Island of Hawaii. Earthquakes that are directly associated with the movement of magma are concentrated beneath the active Kilauea and Mauna Loa Volcanoes on

the Island of Hawaii. Because the majority of the earthquakes in Hawaii (over 90 percent of earthquakes) are related to volcanic activity, the risk of high seismic activity and degree of ground shaking diminishes with increased distance from the Island of Hawaii. The Island of Hawaii has experienced numerous earthquakes greater than Magnitude 5 (M5+); however, earthquakes are not confined only to the Island of Hawaii.

To a lesser degree, the Island of Maui has experienced numerous earthquakes greater than Magnitude 5. Therefore, moderate to strong earthquakes have occurred in the County of Maui. The effects of earthquakes occurring on the Islands of Hawaii and Maui may be felt on the Island of Oahu. For example, several small landslides occurred on the Island of Oahu as a result of the Maui Earthquake of 1938 (M6.8). In addition, some houses on the Island of Oahu were reportedly damaged as a result of the Lanai Earthquake of 1871 (M7+).

In the last 150 years of recorded history, we are not aware of earthquakes greater than Magnitude 6 that have occurred on the Island of Oahu. An earthquake of Magnitude 4.8 to 5.0 occurred along the Diamond Head Fault in 1948 on the Island of Oahu. The moderate tremor resulted in broken store windows, ruptured building walls, and broken underground water mains.

2.4.2 Soil Profile Type for Seismic Design

Based on the subsurface information obtained from our borings and the geologic setting of the area, the project site may be classified from a seismic analysis standpoint as Site Class E soil type and profile based on AASHTO 2020 LRFD Bridge Design Specifications, 9th Edition.

Based on the AASHTO 2020 LRFD Bridge Design Specifications, the replacement bridge structure will need to be designed based on an earthquake return period of 1,000 years. Based on a 1,000-year return period and the anticipated Site Class, the following seismic design parameters were estimated and may be used for the seismic analysis of the replacement bridge structure planned for the project.

SEISMIC DESIGN PARAMETERS WAIPILOPILO STREAM BRIDGE AASHTO 2020 LRFD BRIDGE DESIGN SPECIFICATIONS 1,000-YEAR RETURN PERIOD (~7% PROBABILITY OF EXCEEDANCE IN 75 YEARS)	
Parameter	**Value**
Peak Bedrock Acceleration, PBA (Site Class B)	0.168g
Spectral Response Acceleration (Site Class B), S_S	0.384g
Spectral Response Acceleration (Site Class B), S_1	0.105g
Site Class	"E"
Site Coefficient, F_{pga}	1.95
Site Coefficient, F_a	2.07
Site Coefficient, F_v	3.49
MCE Peak Ground Acceleration, PGA (Site Class C) or A_s	0.329g
Design Spectral Response Acceleration, S_{DS}	0.795g
Design Spectral Response Acceleration, S_{D1}	0.366g
Seismic Design Category	"C"

2.4.3 Liquefaction Potential

Soil liquefaction is a condition where saturated cohesionless soils located near the ground surface undergo a substantial loss of strength due to the build-up of excess pore water pressures resulting from cyclic stress applications induced by earthquakes. In this process, when the loose saturated sand deposit is subjected to vibration (such as during an earthquake), the soil tends to densify and decrease in volume, causing an increase in pore water pressure. If drainage is unable to occur rapidly enough to dissipate the build-up of pore water pressure, the effective stress (internal strength) of the soil is reduced. Under sustained vibrations, the pore water pressure build-up could equal the overburden pressure, essentially reducing the soil shear strength to zero and causing it to behave as a viscous fluid. During liquefaction, the soil acquires sufficient mobility to permit both horizontal and vertical movements, and if not confined, will result in significant deformations.

Soils most susceptible to liquefaction are loose, uniformly graded, fine-grained sands and loose silts with little cohesion. The major factors affecting the liquefaction characteristics of a soil deposit are as follows:

FACTORS	LIQUEFACTION SUSCEPTIBILITY
Grain Size Distribution	Fine and uniform sands and silts are more susceptible to liquefaction than coarse or well-graded sands.
Initial Relative Density	Loose sands and silts are most susceptible to liquefaction. Liquefaction potential is inversely proportional to relative density.
Magnitude and Duration of Vibration	Liquefaction potential is directly proportional to the magnitude and duration of the earthquake.

Based on the subsurface conditions encountered, very loose to medium dense silty sand and gravel were encountered below the groundwater table between the depths of about 5 and 31 feet below the existing ground surface. Based on our analyses, the very loose to medium dense silty sand and gravel are potentially liquefiable during a seismic event of Magnitude 6 with an associated peak ground acceleration of 0.329g.

It appears that the very loose to medium dense silty sand and gravel have a factor of safety of 0.4 to 1.0 against liquefaction. Based on the analyses, the project site could be subject to appreciable ground settlements of about 10 inches in the event of liquefaction during a strong earthquake (M6+).

END OF SITE CHARACTERIZATION

SECTION 3. DISCUSSION AND RECOMMENDATIONS

The subsurface conditions at the site generally consisted of 4 to 7 inches of asphaltic concrete underlain by fills over loose to medium dense silty sand and gravel. The borings encountered soft to very stiff silt and loose to very loose silty sand below the silty sand and gravel. The soft to very stiff silt and loose to very loose silty sands were underlain by older alluvium extending to the maximum depth explored of about 141 feet below the existing ground surface.

Based on the subsurface conditions and the foundation load provided, we believe that a deep foundation system consisting of 4-foot diameter drilled shafts may be used to support the replacement bridge structure. The drilled shaft foundations would derive support principally from adhesion between the drilled shaft and the alluvium (medium dense to dense sand and stiff clay/silt with cobbles/boulders). The contribution from end-bearing of the drilled shafts has been discounted in our analyses due to the difficulties of obtaining a clean bottom for end-bearing shafts in these subsurface conditions during construction. We recommend a drilled shaft embedment depth of about 110 feet below the existing ground surface, which corresponds to a tip elevation of about -101 feet MSL.

The load-bearing capacity of drilled shafts depends, to a significant extent, on the friction between the shaft and the surrounding soils. Therefore, proper construction techniques, especially during the drilling operations, are important. The contractor should exercise care in drilling the shaft holes and in placing concrete into the drilled holes.

A trial and load test shaft program consisting of the construction of a trial shaft and a load test shaft is recommended for the project. Due to the high capacity recommended for the drilled shafts, a conventional load test would not be practicable. Therefore, we recommend conducting a bi-directional axial load test on the reinforced load test shaft using an expandable base load cell.

Detailed discussions of these items and our geotechnical recommendations for the design of the project are presented in the following sections.

3.1 Replacement Bridge Foundations

In general, we understand that the new replacement bridge structure will be about 41 feet wide and 50 feet long. Based on the information provided, the new bridge will be one-span bridge supported by reinforced cast-in-place concrete abutments at both ends. We understand that the existing bridge abutments will be left in place. The existing abutments would likely act as a scour protection structure for the new bridge abutments; therefore, foundation scour was not considered in the design of the drilled shaft foundation.

Based on the subsurface conditions encountered, we recommend using drilled shaft foundations with a nominal diameter of 4 feet to support the proposed replacement bridge structure. The drilled shaft foundations would derive support principally from adhesion between the drilled shaft and the alluvium (medium dense to dense sand and stiff clay/silt with cobbles/boulders) encountered in the borings. The contribution from end-bearing of the drilled shafts has been discounted in our analyses due to the difficulties of obtaining a clean bottom for end-bearing shafts in these subsurface conditions during construction.

Based on our engineering analyses and the above assumptions, we recommend using drilled shafts with the following compressive load capacities for the extreme event and strength limit states based on Load and Resistance Factor Design (LRFD) methods for the design of highway bridges. The following table presents the extreme event and strength limit state capacities for the drilled shafts with the corresponding drilled shaft tip elevation.

FOUNDATION LAYOUT AND DRILLED SHAFT CAPACITIES					
Drilled Shaft Diameter (feet)	**Drilled Shaft Length** (feet)	**Drilled Shaft Tip Elev.** (feet MSL)	**Compressive Load Capacity Per Drilled Shaft** (kips)		
			Unfactored Single Shaft Capacity	**Extreme Event Limit State**	**Strength Limit State**
4	110	-101	1,740	1,575	850

3.1.1 Downdrag Loads

In the event of seismically induced liquefaction, settlement of the compressible deposits will occur at the project site. When the loose to medium dense silty sand and gravel deposits consolidate or move downward relative to the drilled shafts, the consolidation or downward movement will create negative skin friction forces, generally known as downdrag forces, acting on the shafts. The magnitude of the downdrag force depends on the thickness of the liquefiable layer, the relative density of the potentially liquefiable deposits, and the drilled shaft size.

The compressive load capacity of the drilled shafts has been reduced by the expected downdrag loads in the drilled shaft foundation analyses. Based on our foundation analyses, we estimate the downdrag load imposed on the drilled shafts due to the settlement of the loose to medium dense silt sand and gravel may be on the order of about 160 kips for each 4-foot diameter drilled shaft.

3.1.2 Lateral Load Resistance

In general, lateral load resistance for the drilled shaft is a function of the stiffness of the surrounding soil, the stiffness of the shaft, allowable deflection at the top of the shaft, and induced moment in the shaft. To evaluate the lateral load resistance of the new bridge structure, stiffness modeling parameters were estimated based on the subsurface conditions encountered in the drilled borings. The stiffness modeling parameters were obtained using the program LPILE 2022 for Windows, which is a microcomputer adaptation of a finite difference, laterally loaded pile program. The analysis was carried out to generate non-linear “p-y” curves to represent soil moduli at various depths in the transverse direction. Results of the generated non-linear “p-y” curves in the transverse direction are summarized and presented on Plates 3.1 through 3.4.

3.1.3 Foundation Settlements

Settlement of the drilled shaft foundation will result from elastic compression of the drilled shaft and subgrade response of the foundation embedded in the alluvium. Total settlements of the drilled shafts are estimated to be on the order of about 0.5 inches with differential settlements between the drilled shafts not exceeding

about one-half that amount. We believe that these settlements are essentially elastic and should occur as the loads are applied.

3.1.4 Drilled Shaft Construction Considerations

In general, the performance of drilled shafts depends significantly upon the contractor's method of installation and construction procedures. The following conditions would have a significant effect on the effectiveness and cost of the drilled shaft foundations.

The load-bearing capacity of drilled shafts depends, to a significant extent, on the friction between the shaft and the surrounding soils. Therefore, proper construction techniques, especially during the drilling operations, are important. The contractor should exercise care in drilling the shaft holes and in placing concrete into the drilled holes.

Based on the anticipated subsurface conditions described above, some of the geotechnical considerations associated with drilled shaft foundations are discussed below.

3.1.4.a Loose Sand and Gravel

Drilled shaft foundations are highly effective in soil that will stay open after drilling until concrete placement. Unfortunately, materials such as the loose sand and gravel and very soft clayey silt encountered during our field exploration may collapse following the drilling if they remain unsupported. Therefore, partial-depth temporary steel casing and/or the use of drilling fluids (polymer slurry) may be necessary to maintain the integrity of the drilled hole during drilled shaft installation. This condition would increase the construction difficulty and costs of the foundations. However, this condition is common in Hawaii and has been addressed by local drilled shaft subcontractors.

Drilling by methods utilizing drilling fluids may have a significant effect on the supporting capacity of the drilled shaft; therefore, the use of drilling fluids would require prior evaluation and acceptance by Geolabs. If drilling

fluids are proposed by the drilled shaft subcontractor, the same type and quantity of drilling fluids should be used to construct the dedicated trial and load test shafts for load testing purposes to evaluate the effect of the drilling fluid on the borehole stability and capacity of the drilled shaft.

Care should be exercised during the removal of the temporary casing to reduce the potential for "necking" of the drilled shaft. Therefore, a minimum 5-foot head of concrete above the bottom of the casing or adequate concrete head to counter the hydrostatic pressures due to the shallow groundwater should be maintained during the removal of the casing. The shallow groundwater conditions at the project site may pose construction difficulties because proper observation of the sides and bottoms of the drilled shaft may not be possible.

3.1.4.b Obstructions and Boulders

Where obstructions and boulders are anticipated, some difficult drilling conditions will likely be encountered and should be expected. The drilled shaft subcontractor will need to have the appropriate equipment and tools to drill through these types of natural or man-made obstructions where encountered. The drilled shaft subcontractor will need to demonstrate that the proposed drilling equipment (and coring tools, where appropriate) will be capable of installing the drilled shafts to the recommended depths and dimensions.

It should be noted that large hole diameters may develop due to dislodging of cobbles and boulders during the drilling operations. Therefore, the actual volume of concrete required to fill the drilled shaft foundation may be appreciably more than the theoretical concrete volume.

3.1.4.c Shallow Groundwater Conditions

Groundwater is anticipated within the depths of the drilled shaft excavations; therefore, concrete placement by tremie methods will be required during drilled shaft construction. The concrete should be placed

in a suitable manner by displacing the water in an upward fashion from the bottom of the drilled hole. A low-shrink concrete mix with high slump (7 to 9 inches slump range) should be used to provide close contact between the drilled shafts and the surrounding soils. The concrete should be placed in a suitable manner to reduce the potential for segregation of the aggregates from the concrete mix.

In addition, the concrete should be placed promptly after drilling (within 24 hours after substantial completion of the holes) to reduce the potential for softening of the sides of the drilled holes.

It is imperative for a Geolabs representative to be present during construction to observe the drilling and installation of drilled shafts. Although the drilled shaft designs are primarily based on skin friction, the bottom of the drilled hole should be relatively free of loose materials prior to the placement of concrete. Therefore, Geolabs' observation of the drilled shaft installation operations is necessary to confirm the assumed subsurface conditions.

3.1.5 Test Shaft Program

A test shaft program is normally required and highly recommended for a bridge replacement project. Considering the diameter and structural load capacity of the drilled shafts, we recommend performing a test shaft program, including the performance of an instrumented load test at the bridge site, to fulfill the following objectives:

- To examine the adequacy of the methods and equipment proposed by the contractor to install the high-capacity drilled shafts into the existing subsurface soil deposits.
- To confirm or modify the estimated tip elevations of the drilled shafts.
- To assess the contractor's method of placing and extracting the temporary casing for the drilled shaft.
- To assess the contractor's method of concrete placement.

To achieve these objectives, we recommend that the trial shaft program consists of drilling one 4-foot diameter trial shaft extending to a depth of about 110 feet below the existing ground surface. The location of the trial shaft should be near, but outside of, the planned abutment foundation locations. We recommend a Geolabs Inc. representative observe the installation of the trial shaft program to evaluate the contractor's method of drilled shaft installation and to evaluate the subsurface materials encountered in the drilled holes. Observation of the drilled shaft installation operations is a vital part of the foundation design to confirm the design assumptions.

3.1.6 Bi-Directional Load Test

As part of the pre-construction activities, we recommend conducting one static load test at the project site. The load test should be conducted on a dedicated 4-foot diameter drilled shaft separate from the trial shaft, extending to a depth of about 110 feet below the existing ground surface. The results of the load test will be used to confirm or modify the estimated tip elevations of the production drilled shafts. The load test shaft should be structurally reinforced and instrumented with embedment strain gauges for load testing purposes. As a minimum, two embedment strain gauges should be placed at each level, starting near the load cell location at an elevation of about 5 feet above and below the load cell and subsequently at about 10-foot intervals.

Due to the high capacity recommended for the drilled shafts, a conventional load test would not be practical and would be costly to conduct. Therefore, we recommend conducting a bi-directional axial load test on the reinforced load test shaft using an expandable base load cell (Osterberg Load Cell). The expandable base load cell will need to be installed within the load test shaft reinforcing cage prior to lowering the cage in place. Details of the bi-direction load cell placement are shown on the Drilled Shaft Load Test Detail, Plate 4.

The Osterberg Load Cell should be capable of applying a load of at least 1,400 kips in each direction for the load test shaft. The expandable load cell will need to be attached to the reinforcing steel cage prior to lowering the cage into the drilled hole.

The expandable load cell should be placed at a depth of about 80 feet below the existing ground surface.

The drilled shaft load test should be performed in general accordance with the Quick Load Test Method of ASTM D1143. In general, the load test shaft should be loaded at increments of about 100 to 150 kips and should be held for a minimum of 12 hours at or near failure to evaluate the potential for creep effects. The load test shaft should be loaded to failure to evaluate the ultimate side shear resistance of the shaft. Installation of the expandable base load cell and embedment strain gauges, the performance of the bi-directional axial load test, and analyses of the load test data should be performed by a qualified professional experienced in these types of load testing procedures.

Considering the specialized nature of the test shaft program, we recommend that a Geolabs representative be present during the test shaft program to evaluate the contractor's method of drilled shaft installation and to evaluate the subsurface materials encountered. In addition, Geolabs should observe the instrumented load test on the reinforced load test shaft. It should be noted that the drilled shaft design was developed from our analysis using the available field exploration data provided by others. Therefore, observation of the drilled shaft installation operations by Geolabs is a vital part of the foundation design to confirm our design assumptions.

3.1.7 Non-Destructive Integrity Testing

Based on the critical nature of the drilled shaft foundations for the replacement bridge structure, we recommend conducting non-destructive integrity testing on the production drilled shafts for the project. Crosshole Sonic Logging (CSL) is one of the non-destructive integrity testing methods that has gained widespread use and acceptance for integrity testing of drilled shafts.

Crosshole Sonic Logging techniques are based on the propagation of sound waves through concrete. In general, the actual velocity of sound wave propagation in concrete is dependent on the concrete material properties, geometry of the element, and wavelength of the sound waves. When ultrasonic frequencies are

generated, Pressure (P) waves and Shear (S) waves travel through the concrete. If anomalies are contained in the concrete, the anomalies will reduce the P-wave travel velocity in the concrete. Anomalies in the drilled shaft concrete may include soil particles, gravel, water, voids, contaminated concrete, and highly segregated constituent particles.

The transit time of an ultrasonic P-wave signal may be measured between an ultrasonic transmitter and receiver in two parallel water-filled access tubes placed into the concrete during construction. The P-wave velocity can be obtained by dividing the measured transit time from the distance between the transmitter and receiver. Therefore, anomalies may be detected (if they exist).

In general, the access tubes should be securely attached to the interior of the reinforcing cage as near to parallel as possible in the drilled shaft. We recommend casting a minimum of four access tubes into the concrete of the 4-foot diameter drilled shafts.

In addition, the access tubes should extend from the bottom of the drilled shaft reinforcing cage to at least 3.5 feet above the top of the shaft. It is imperative that joints required to achieve the full length of the access tubes should be watertight. The contractor is responsible for taking extra care to prevent damage to the access tubes during the placement of the reinforcing cage into the drilled hole. The tubes should be filled with potable water as soon as possible after concrete placement, but water filling of the access tubes should not be later than 4 hours after the concrete placement. Subsequently, the top of the access tubes should be capped with watertight caps.

The Crosshole Sonic Logging (CSL) test of drilled shafts should be conducted after at least 7 days of curing time but no later than 28 days after concrete placement. In addition, the CSL test of drilled shafts should be performed in general accordance with ASTM D6760. In the event that a drilled shaft is found to have significant anomalies and/or is suspected to be defective based on the CSL testing and/or field observations, the drilled shaft should be cored to evaluate the integrity of the

concrete in the drilled shaft. The coring location within the drilled shaft should be determined by our representative, who should be present to observe the installation of the drilled shafts. After completion of the crosshole sonic logging of the drilled shafts, all the access tubes should be filled with grout of the same strength as the drilled shaft concrete.

3.2 Structural Approach Slabs

To reduce the potential for appreciable abrupt differential settlements between the drilled shaft supported bridge structure and the compacted backfills behind the drilled shaft cap beams, we recommend providing structure approach slabs at each end of the replacement bridge structure. In general, the structured approach slabs should be at least 15 feet long.

The structure approach slabs should be supported on a minimum of 8 inches of aggregate subbase course placed on a prepared subgrade. The subgrade should be scarified to a depth of about 8 inches, moisture-conditioned to above the optimum moisture content, and compacted to no less than 95 percent relative compaction. The aggregate subbase course should also be moisture-conditioned to above the optimum moisture content and compacted to at least 95 percent relative compaction. Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil established in accordance with AASHTO T-180 (or ASTM D1557). Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

3.3 Retaining Walls

In general, retaining structures, including the wing walls, should be designed to resist the lateral earth pressures due to the adjacent soils and surcharge effects. Parameters for the design of foundations for the bridge abutment walls supported on drilled shafts are provided in the “Replacement Bridge Foundations” section herein. Design of foundations for the wing walls (not structurally connected to the bridge structure) should be based on the parameters presented in the following subsections.

3.3.1 Shallow Retaining Wall Foundations

In general, we anticipate that shallow foundations bearing on fill consisting of stiff clayey silt encountered at the project site may be utilized for support of the planned retaining walls. Based on our field exploration, we believe that the following values may be used to evaluate the bearing support, sliding resistance, and passive pressure resistance of the planned retaining walls based on LRFD design methods.

RETAINING WALL FOUNDATIONS			
Description	**Extreme Event Limit State**	**Strength Limit State**	**Service Limit State**
Bearing Pressure	7,500 psf	3,375 psf	2,500 psf
Coefficient of Sliding Friction	0.36	0.30	N/A
Passive Pressures	330 pcf	165 pcf	N/A

In general, foundations should be embedded a minimum of 2 feet below the lowest adjacent finished grades. Foundations next to utility trenches or easements should be embedded below a 45-degree imaginary plane extending upward from the bottom edge of the utility trench, or they should extend to a depth as deep as the inverts of the utility lines. This requirement is necessary to avoid surcharging adjacent below-grade structures with additional structural loads and to reduce the potential for appreciable foundation settlement.

For sloping ground conditions, the footing should extend deeper to obtain a minimum 6-foot setback distance measured horizontally from the outside edge of the footing to the face of the slope. Wall footings oriented parallel to the direction of the slope should be constructed in stepped footings.

Based on a service limit state bearing pressure of 2,500 psf, we estimate that foundation settlements under the anticipated design loads for foundations bearing on the stiff soils to be less than 1 inch.

Lateral loads acting on the structure may be resisted by frictional resistance between the base of the foundation and the bearing soil and by passive earth pressure developed against the near-vertical faces of the embedded portion of the foundation. The passive pressure values, expressed in pounds per square foot per foot of embedment (pcf), and the coefficients of friction presented in the above table may be used to evaluate the lateral load resistance for footings embedded and bearing on the stiff fills. Unless covered by pavements or slabs, the passive resistance in the upper 12 inches should be neglected.

3.3.2 Static Lateral Earth Pressures

Retaining structures, including the abutment walls and wing walls, should be designed to resist the lateral earth pressures due to the adjacent soils and surcharge effects caused by loads adjacent to the retaining structures. The recommended lateral earth pressures for the design of retaining structures, expressed in equivalent fluid pressures, are presented in the following table.

LATERAL EARTH PRESSURES FOR DESIGN OF RETAINING STRUCTURES			
Backfill Condition	**Earth Pressure Component**	**Active** (pcf)	**At-Rest** (pcf)
Level Backfill	Horizontal	37	55
	Vertical	None	None

The values provided above assume that Type A Structure Backfill Material conforming to Section 703.20 of the Hawaii Standard Specifications for Road and Bridge Construction, 2005 (HSS) will be used to backfill behind the retaining structures. It is assumed that the backfill behind retaining structures will be compacted to at least 90 percent relative compaction. In general, an active condition may be used for gravity retaining walls or walls that are free to deflect by as much as 0.5 percent of the wall height. If the tops of walls are not free to deflect beyond this degree or are restrained, the walls should be designed for the at-rest

condition. These lateral earth pressures do not include hydrostatic pressures that might be caused by groundwater trapped behind the walls.

Surcharge stresses due to areal surcharges, line loads, and point loads within a horizontal distance equal to the depth of the wall should be considered in the design. For uniform surcharge stresses imposed on the loaded side of the wall, a rectangular distribution with uniform pressure equal to 33 percent of the vertical surcharge pressure acting over the entire height of the wall, which is free to deflect (cantilever), may be used in the design. For walls that are restrained, a rectangular distribution equal to 50 percent of the vertical surcharge pressure acting over the entire height of the wall may be used for design. Additional analyses during design may be needed to evaluate the surcharge effects of point loads and line loads.

3.3.3 Dynamic Lateral Earth Pressures

Dynamic lateral earth forces due to seismic loading (a_{max}= 0.329g) may be estimated by using $6.1H^2$ pounds per lineal foot of wall length for level backfill conditions, where H is the height of the wall in feet. It should be noted that the dynamic lateral earth forces provided assume that the wall will be allowed to move laterally by between about 1 to 2 inches in the event of an earthquake. The resultant force should be assumed to act through the mid-height of the wall. An appropriately reduced factor of safety may be used when dynamic lateral earth forces are accounted for in the design of the retaining structures.

3.3.4 Drainage

Retaining walls should be well-drained to reduce the potential for the build-up of hydrostatic pressures. A typical drainage system would consist of a 12-inch wide zone of permeable material, such as drain rock (AASHTO M43 Size No. 67), directly adjacent to the wall with a perforated pipe (perforations facing down) at the base of the wall discharging to an appropriate outlet or weepholes. As an alternative, a prefabricated drainage product, such as MiraDrain or EnkaDrain, may be used instead of the drainage material. The prefabricated drainage product should also be hydraulically connected to a perforated pipe at the base of the wall.

Backfill behind the permeable drainage zone should consist of Type A Structure Backfill Material conforming to Section 703.20 of the HSS (a minimum of 95 percent relative compaction). Unless covered by concrete slabs or pavements, the upper 12 inches of backfill should consist of relatively impervious material to reduce the potential for water infiltration behind the walls. In addition, the backfill below the drainage outlet (or weepholes) should consist of a relatively impervious material to reduce the potential for water infiltration into the footing subgrade. The relatively impervious material should be compacted to no less than 90 percent relative compaction.

3.4 Site Grading

We anticipate that the grading work for the project will generally consist of cuts and fills on the order of about 2 feet or less in thickness relative to the existing ground surface. In addition, we anticipate that relatively substantial excavations of about 5 feet deep, followed by subsequent backfilling, will be required to construct each abutment structure for the new replacement bridge. In general, grading work should conform to Section 200 of the Hawaii Standard Specifications for Road and Bridge Construction (2005) and the site-specific recommendations contained in this report.

A Geolabs representative should monitor site grading operations to observe whether undesirable materials are encountered during the excavation process and to confirm whether the exposed soil conditions are similar to those encountered in our field exploration.

In general, areas to receive fills should be cleared of vegetation and deleterious materials. The resulting grub/spoil materials should be disposed of properly off-site. Soft, weak, or yielding areas disclosed during clearing operations should be over-excavated to expose firm or dense ground, and the resulting excavation should be backfilled with general fill materials moisture-conditioned to above the optimum moisture content and compacted to a minimum of 90 percent relative compaction. After clearing and grubbing, the exposed subgrades should be scarified to a minimum depth of 8 inches, moisture-conditioned to above the optimum moisture content, and compacted to a minimum of 90 percent relative compaction. The compaction requirement for

finished subgrades in pavement areas should be increased to a minimum of 95 percent relative compaction. Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil established in accordance with AASHTO T-180 (or ASTM D1557). Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

In general, the excavated on-site materials may be reused as a source of general fill and backfill materials, provided that they are free of organic materials and contain no lumps or rock fragments greater than 3 inches in the largest dimension. It should be noted that the excavated loose/soft materials excavated below the groundwater level should not be used as a source of general fill and backfill. Where used as general fill and backfill materials, the on-site materials should be moisture-conditioned to above the optimum moisture content, placed in level lifts not exceeding 8 inches in loose thickness, and compacted to a minimum of 90 percent relative compaction.

Imported material should consist of select granular fill such as crushed coral or basalt. Select granular fill materials should be well-graded from coarse to fine with particles no larger than 3 inches in the largest dimension. Select granular fill should have a laboratory CBR value of 20 or more with a maximum swell value of 1 percent or less when tested in accordance with AASHTO T-193 (or ASTM D1883). In addition, select granular fill material should contain between 10 and 30 percent particles passing the No. 200 sieve. Imported materials should be brought to above the optimum moisture content and compacted to a minimum of 95 percent relative compaction. Surfaces should be finished to create smooth, unyielding subgrades and should be kept moist until covered by concrete slabs or pavements. Imported materials should be tested and approved prior to delivery to the project site for their intended use.

For backfill behind the abutment structures, the backfill material should consist of well-graded, granular fill material conforming to Type A Structure Backfill Material of Section 703.20 of the HSS. The material should be moisture-conditioned to above the optimum moisture content, placed in level loose lifts not exceeding 8 inches, and compacted to a minimum of 90 percent relative compaction. For backfill below the groundwater level, free-draining granular material, such as AASHTO M43, No. 67

gradation, wrapped on all sides with non-woven filter fabric should be used. This free-draining granular material should be used up to a level of about 12 inches above groundwater level to facilitate compaction of the backfill materials.

3.5 Utility Trenches

If new utility lines are planned for the project, we anticipate that the trench for the underground utility lines generally will be excavated in the near-surface fills consisting of stiff clays and silts and loose to medium dense beach deposits consisting of coralline sand. In general, we recommend providing granular bedding consisting of 6 inches of free-draining granular materials (AASHTO M43 Size No. 67 gradation) below the pipes. If soft and/or loose soils are exposed at or near the invert of the pipes, an additional 24 inches of free-draining gravel (No. 2 Coarse rock) wrapped in a non-woven filter fabric (Mirafi 180N or equivalent) should be provided below the bedding layer for uniform support.

Free-draining granular materials, such as AASHTO M43, No. 67 gradation, should also be used for the initial trench backfill up to about 12 inches above the pipes or about 12 inches above the groundwater level to provide adequate support around the pipes. It is critical to use free-draining materials to reduce the potential for the formation of voids below the haunches of pipes and to provide adequate support around the sides of the pipes. Improper trench backfill could result in backfill settlement and pipe damage.

The upper portion of the trench backfill from the level 12 inches above the pipes (or groundwater level) to the top of the subgrade may consist of the excavated on-site soils with a maximum particle size of 6 inches. The backfill material should be moisture-conditioned to above the optimum moisture content, placed in maximum 8-inch level loose lifts, and mechanically compacted to a minimum of 90 percent relative compaction to reduce the potential for significant future ground subsidence. Where trenches are below pavement areas, the upper 3 feet of the trench backfill below the pavement grade should be compacted to a minimum of 95 percent relative compaction.

3.6 Corrosion

Laboratory corrosivity tests, including pH (ASTM G51), Minimum Resistivity (ASTM G57), Chloride Content (EPA 300.0), and Sulfate Content (EPA 300.0) were performed by our laboratory and CERCO Analytical, Inc. to evaluate the corrosivity of the on-site soils on selected soil samples obtained from our field exploration. Results of the corrosivity tests are presented on Plate B-12 in Appendix B.

Resistivity is generally recognized as one of the most significant soil characteristics with regard to the corrosivity of the soil to buried metallic objects. In general, the lower the resistivity, the greater the potential for corrosion of the buried metallic structure. Conversely, the higher the resistivity, the less likely the soil will contribute to the corrosion of metallic objects. Results of the resistivity testing indicate that the on-site soils have minimum resistivity values of about 300 and 510 ohm-cm.

The method used to control the corrosion of underground concrete structures is dependent on the pH and the chloride and sulfate contents found in the soil. The pH values based on the test results are about 7.2 and 8.1. Based on the chloride and sulfate content tests performed on the on-site soils, the tested chloride content values are about 630 and 1,000 ppm and the tested sulfate content values are about 360 and 620 ppm.

Based on the Board of Water Supply, City and County of Honolulu, Water System External Corrosion Control Standards, Volume 3 (2021), soil corrosivity can be categorized as Corrosion Category A (Moderately to Severely Corrosive) or Corrosion Category B (Negligibly to Mildly Corrosive). The criteria for determining the soil category are presented in the following table:

CORROSION CATEGORY		
Soil Parameter	**Corrosion Category A** (Moderately to Severely Corrosive)	**Corrosion Category B** (Negligibly to Mildly Corrosive)
Resistivity (ohm-cm)	≤ 5,000	> 5,000
pH	≤ 6.5	> 6.5

CORROSION CATEGORY		
Soil Parameter	**Corrosion Category A** (Moderately to Severely Corrosive)	**Corrosion Category B** (Negligibly to Mildly Corrosive)
Chloride Content (ppm)	≥ 500	< 500
Sulfate Content (ppm)	≥ 1,000	< 1,000

These results indicate that the soils at the sites may be considered in Corrosion Category A (Moderately to Severely Corrosive). However, we believe that it may be appropriate to consult with a professional corrosion engineer to review the test results and provide detailed recommendations for corrosion protection.

3.7 Design Review

Preliminary and final drawings and specifications for the proposed project should be forwarded to Geolabs for review and written comments prior to construction pricing. This review is necessary to evaluate the general conformance of the plans and specifications with the intent of the geotechnical recommendations provided herein. If this review is not made, Geolabs cannot be responsible for misinterpretation of our recommendations.

3.8 Post-Design Services/Services During Construction

Geolabs should be retained to provide geotechnical engineering services during the construction of this project. The following are critical items of construction monitoring that require "Special Inspection":

- Review of the geotechnical aspects of the contractor submittals
- Observation of the test shaft installation and load test program
- Observation of the production drilled shaft foundation installation
- Observation of subgrade soil preparation
- Observation of fill placement and compaction

A Geolabs representative should also monitor other aspects of the earthwork construction to observe compliance with the design concepts, specifications, or recommendations and to expedite suggestions for design changes that may be required in the event that subsurface conditions differ from those anticipated at the time this

report was prepared. Geolabs should be accorded the opportunity to provide construction observation services to confirm the assumptions made in formulating the recommendations presented herein.

If the actual exposed subsurface conditions encountered during construction are different from those considered in this report, then appropriate modifications to the design should be made.

END OF DISCUSSION AND RECOMMENDATIONS

SECTION 4. LIMITATIONS

The analyses and recommendations submitted herein are based, in part, upon information obtained from our field exploration and the available field exploration by others. Variations of subsurface conditions between and beyond the field exploration points may occur, and the nature and extent of these variations may not become evident until construction is underway. If variations then appear evident, it will be necessary to re-evaluate the recommendations presented herein.

The boring locations from our field exploration indicated herein are approximate, having been located in the field using a hand-held Global Position System (GPS) device. Elevations of the borings were interpolated from spot elevations shown on the Boring Location Plan prepared by Hirata & Associates, Inc., dated November 19, 2012. The physical locations and elevations of the borings should be considered accurate only to the degree implied by the methods used.

The stratification lines shown on the graphic representations of the borings depict the approximate boundaries between the soil types and, as such, may denote a gradual transition. Water level data from the borings were measured at times shown on the graphic representations and/or presented in the text herein. These data have been reviewed, and interpretations made in the formulation of this report. We did not encounter groundwater in our borings at the time of our field exploration. However, it must be noted that fluctuation may occur due to variations in rainfall, temperature, and other factors.

This report has been prepared for the exclusive use of WSP and their client, State of Hawaii – Department of Transportation, Highways Division, for specific application to the Waipilopilo Stream Bridge Replacement project in accordance with generally accepted geotechnical engineering principles and practices. No warranty is expressed or implied.

This report has been prepared solely for the purpose of assisting the engineers in the design of the project. Therefore, this report may not contain sufficient data or the proper information to serve as a basis for construction cost estimates. A contractor

wishing to bid on this project is urged to retain a competent geotechnical engineer to assist in the interpretation of this report and/or in the performance of additional site-specific exploration for bid estimating purposes.

The owner/client should be aware that unanticipated soil conditions are commonly encountered. Unforeseen soil conditions, such as perched groundwater, soft deposits, hard layers, or cavities may occur in localized areas and may require additional probing or corrections in the field (which may result in construction delays) to attain a properly constructed project. Therefore, a sufficient contingency fund is recommended to accommodate these possible extra costs.

This geotechnical engineering exploration conducted at the project site was not intended to investigate the potential for the presence of hazardous materials existing at the site. It should be noted that the equipment, techniques, and personnel used to conduct a geo-environmental exploration differ substantially from those applied in geotechnical engineering.

END OF LIMITATIONS

CLOSURE

The following plates and appendices are attached and complete this report:

Project Location Map ..... Plate 1

Site Plan ..... Plate 2

Lateral Load Analysis ..... Plates 3.1 thru 3.4

Drilled Shaft Load Test Detail ..... Plate 4

Field Exploration ..... Appendix A

Laboratory Tests ..... Appendix B

Boring Logs from Report Prepared by Hirata & Associates, Inc., ... Appendix C
dated November 19, 2012 (Fourteen Sheets)

-ΩΩΩΩΩΩΩΩΩ-

Respectfully submitted,

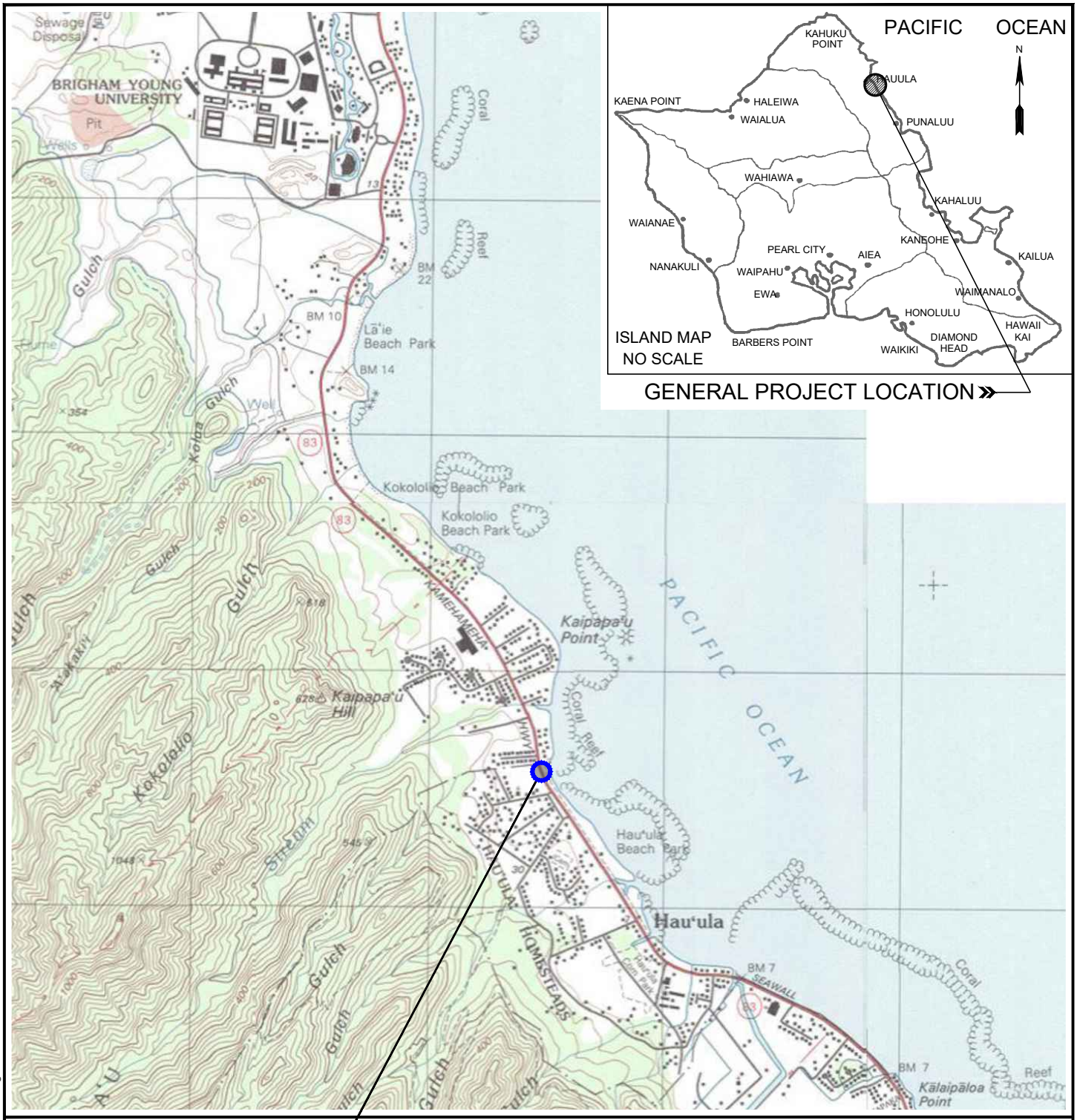
GEOLABS, INC.

By _____
Glenn Barut, P.E.
Senior Project Engineer

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PLATES



PROJECT LOCATION MAP

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

2000 1000 0 2000 FT.

GRAPHIC SCALE

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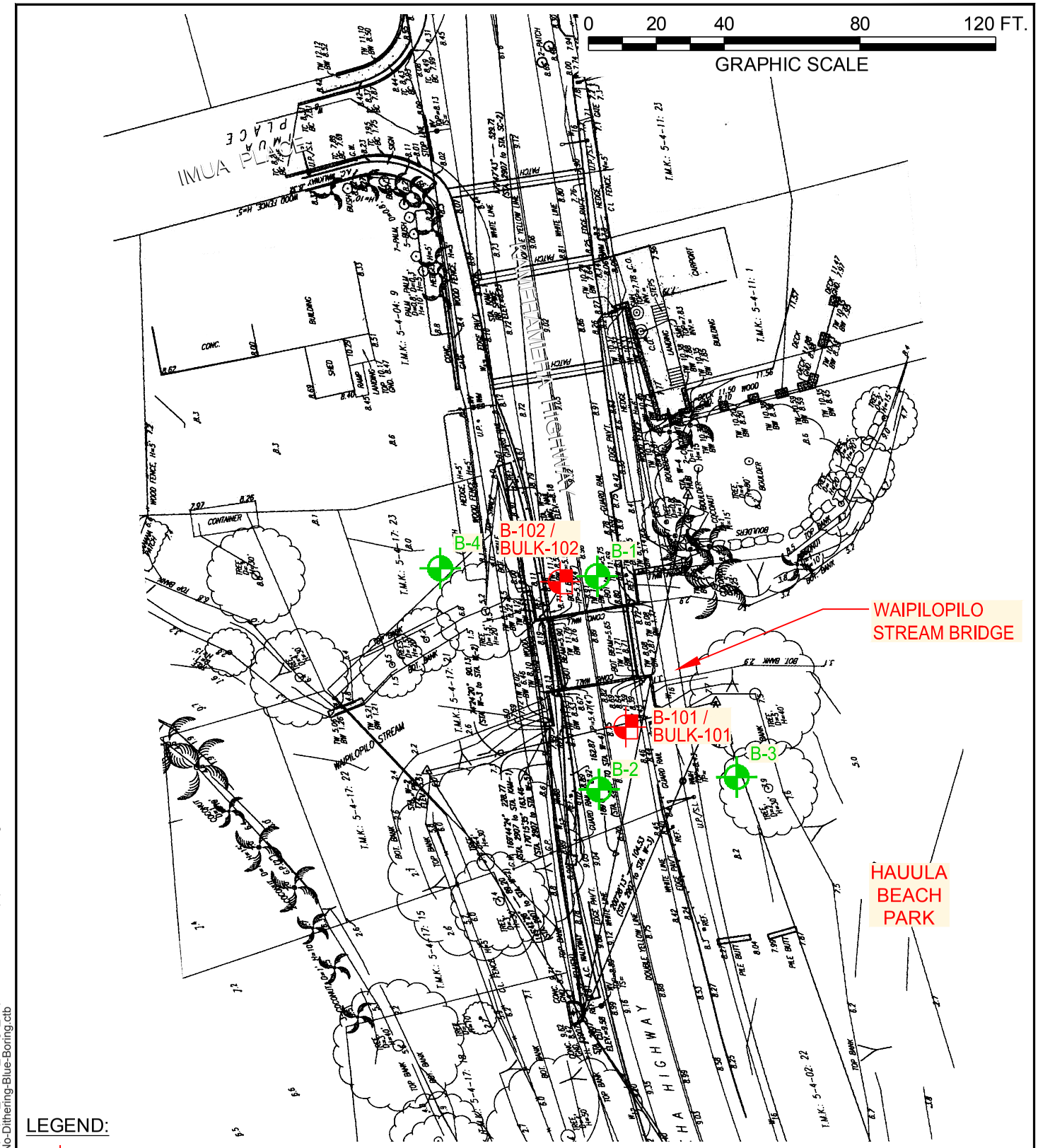
REFERENCE: MAP CREATED WITH TOPO!® ©2010 NATIONAL GEOGRAPHIC; ©2007 TELE ATLAS, REL. 1/2007.

GEOLABS, INC.

Geotechnical Engineering

DATE	DRAWN BY	PLATE
JUNE 2024	HYC	1
SCALE	W.O.	
1" = 2,000'	8412-00(C)	

CAD User: HENRY File Last Updated: June 10, 2024 5:01:34pm Plot Date: June 14, 2024 - 3:46:30pm
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Plotter: DWG To PDF-GEO.pc3 Plotstyle: GEO-No-Dithering-Blue-Boring.ctb



LEGEND:

- APPROXIMATE BORING LOCATION LOCATION
- APPROXIMATE BULK SAMPLE LOCATION
- APPROXIMATE BORING LOCATION (FROM REPORT BY HIRATA & ASSOCIATES, INC., W.O. 11-5064, DATED NOVEMBER 19, 2012)

REFERENCE: GOOGLE EARTH™ PRO. ©2024 GOOGLE, INC. IMAGERY DATED JANUARY 7, 2023. BORING LOCATION PLAN BY HIRATA & ASSOCIATES, INC. DATED NOVEMBER 19, 2012.

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SITE PLAN

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

GEOLABS, INC.
Geotechnical Engineering

DATE	DRAWN BY	PLATE
JUNE 2024	HYC	2
SCALE	W.O.	
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Plotter: DWG To PDF-GEO.pc3 Plotstyle: GEO-No-Dithering-Blue-Boring.ctb

P-Y CURVES - TRANSVERSE DIRECTION

WAIPILOPILO STREAM BRIDGE REPLACEMENT

HAUULA, OAHU, HAWAII

5.0 feet		10.0 feet		15.0 feet		20.0 feet		25.0 feet	
y	p	y	p	y	p	y	p	y	p
(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.3	960.4	0.7	1014.9	0.5	1009.7	0.5	1517.0	0.6	2182.9
1.4	986.2	0.7	1019.0	0.5	1041.4	0.6	1550.9	0.6	2213.1
1.4	999.1	0.7	1023.0	0.5	1072.2	0.6	1584.0	0.6	2242.8
1.4	1007.1	0.7	1027.1	0.6	1102.1	0.6	1616.4	0.7	2272.1
1.5	1015.1	0.7	1031.1	0.6	1131.1	0.6	1648.2	0.7	2301.1
1.5	1023.1	0.7	1035.0	0.6	1159.4	0.7	1679.2	0.7	2329.6
1.5	1031.0	0.8	1039.0	0.6	1187.1	0.7	1709.7	0.7	2357.8
1.6	1039.0	0.8	1042.9	0.7	1214.1	0.7	1739.6	0.7	2385.6
1.6	1047.0	0.8	1046.8	0.7	1240.4	0.7	1768.9	0.7	2413.0
1.7	1054.9	0.8	1050.6	0.7	1266.3	0.8	1797.8	0.8	2440.2
1.7	1062.9	0.8	1054.4	0.8	1291.6	0.8	1826.1	0.8	2467.0
1.7	1070.9	0.8	1058.2	0.8	1316.4	0.8	1853.9	0.8	2493.5
1.8	1078.8	1.3	1276.3	1.3	1722.4	1.3	2410.1	1.3	3241.5
1.8	1086.8	1.8	1494.5	1.8	2128.5	1.8	2966.3	1.8	3989.5
2.2	1086.8	2.2	1494.5	2.2	2128.5	2.2	2966.3	2.2	3989.5
2.5	1086.8	2.5	1494.5	2.5	2128.5	2.5	2966.3	2.5	3989.5

30.0 feet		35.0 feet		40.0 feet		45.0 feet		50.0 feet	
y	p	y	p	y	p	y	p	y	p
(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.7	3040.7	0.0	23.2	0.0	23.2	0.0	23.2	0.0	23.2
0.7	3058.7	0.0	46.4	0.0	46.4	0.0	46.4	0.0	46.4
0.7	3076.7	0.1	69.5	0.1	69.5	0.1	69.5	0.1	69.5
0.7	3094.5	0.2	92.7	0.2	92.7	0.2	92.7	0.2	92.7
0.7	3112.2	0.3	115.9	0.3	115.9	0.3	115.9	0.3	115.9
0.7	3129.9	0.6	139.1	0.6	139.1	0.6	139.1	0.6	139.1
0.8	3147.4	0.9	162.3	0.9	162.3	0.9	162.3	0.9	162.3
0.8	3164.8	1.3	185.4	1.3	185.4	1.3	185.4	1.3	185.4
0.8	3182.1	1.9	208.6	1.9	208.6	1.9	208.6	1.9	208.6
0.8	3199.3	2.6	231.8	2.6	231.8	2.6	231.8	2.6	231.8
0.8	3216.4	3.5	255.0	3.5	255.0	3.5	255.0	3.5	255.0
0.8	3233.4	4.5	278.1	4.5	278.1	4.5	278.1	4.5	278.1
1.3	4203.4	5.8	301.3	5.8	301.3	5.8	301.3	5.8	301.3
1.8	5173.4	7.2	324.5	7.2	324.5	7.2	324.5	7.2	324.5
2.2	5173.4	36.0	324.5	36.0	324.5	36.0	324.5	36.0	324.5
2.5	5173.4	38.4	324.5	38.4	324.5	38.4	324.5	38.4	324.5

P-Y CURVES - TRANSVERSE DIRECTION

WAIPILOPILO STREAM BRIDGE REPLACEMENT

HAUULA, OAHU, HAWAII

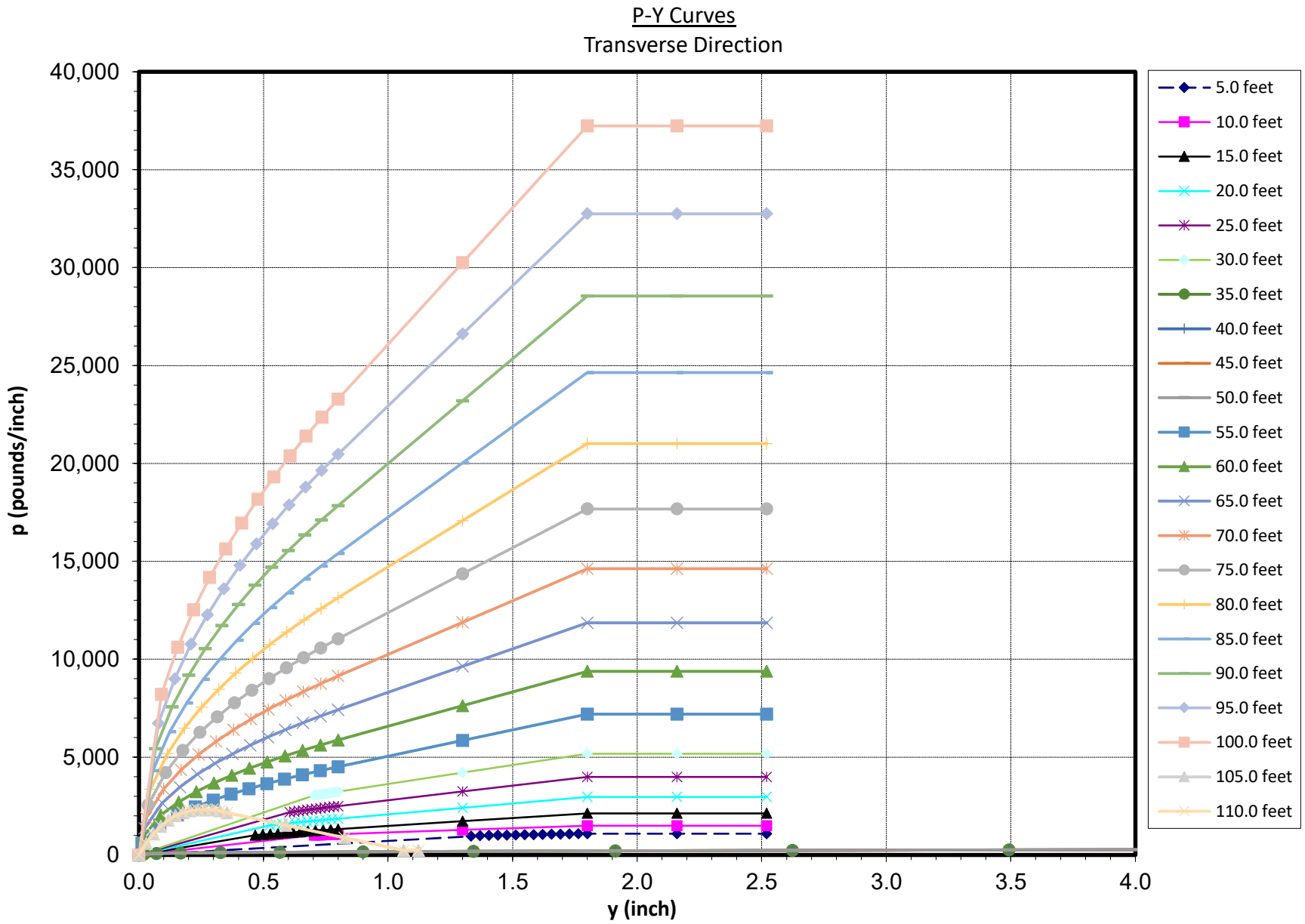
55.0 feet		60.0 feet		65.0 feet		70.0 feet		75.0 feet	
y	p	y	p	y	p	y	p	y	p
(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	603.9	0.0	928.5	0.0	1352.8	0.0	1889.9	0.0	2552.8
0.1	1523.1	0.1	2037.0	0.1	2648.6	0.1	3368.4	0.1	4207.6
0.2	2048.6	0.2	2704.9	0.2	3467.9	0.2	4345.5	0.2	5346.1
0.2	2457.3	0.2	3228.8	0.2	4117.0	0.2	5127.8	0.2	6267.6
0.3	2802.9	0.3	3673.6	0.3	4670.5	0.3	5798.0	0.3	7061.4
0.4	3107.6	0.4	4066.5	0.4	5160.6	0.4	6393.3	0.4	7768.6
0.4	3382.8	0.4	4422.1	0.4	5604.8	0.4	6933.8	0.5	8412.0
0.5	3635.7	0.5	4749.0	0.5	6013.8	0.5	7432.1	0.5	9006.1
0.6	3870.8	0.6	5053.2	0.6	6394.7	0.6	7896.5	0.6	9560.5
0.7	4091.4	0.7	5338.8	0.7	6752.4	0.7	8333.2	0.7	10082.0
0.7	4299.8	0.7	5608.7	0.7	7090.7	0.7	8746.3	0.7	10575.9
0.8	4497.8	0.8	5865.2	0.8	7412.3	0.8	9139.3	0.8	11045.9
1.3	5847.2	1.3	7624.7	1.3	9636.0	1.3	11881.1	1.3	14359.7
1.8	7196.5	1.8	9384.3	1.8	11859.7	1.8	14622.8	1.8	17673.5
2.2	7196.5	2.2	9384.3	2.2	11859.7	2.2	14622.8	2.2	17673.5
2.5	7196.5	2.5	9384.3	2.5	11859.7	2.5	14622.8	2.5	17673.5

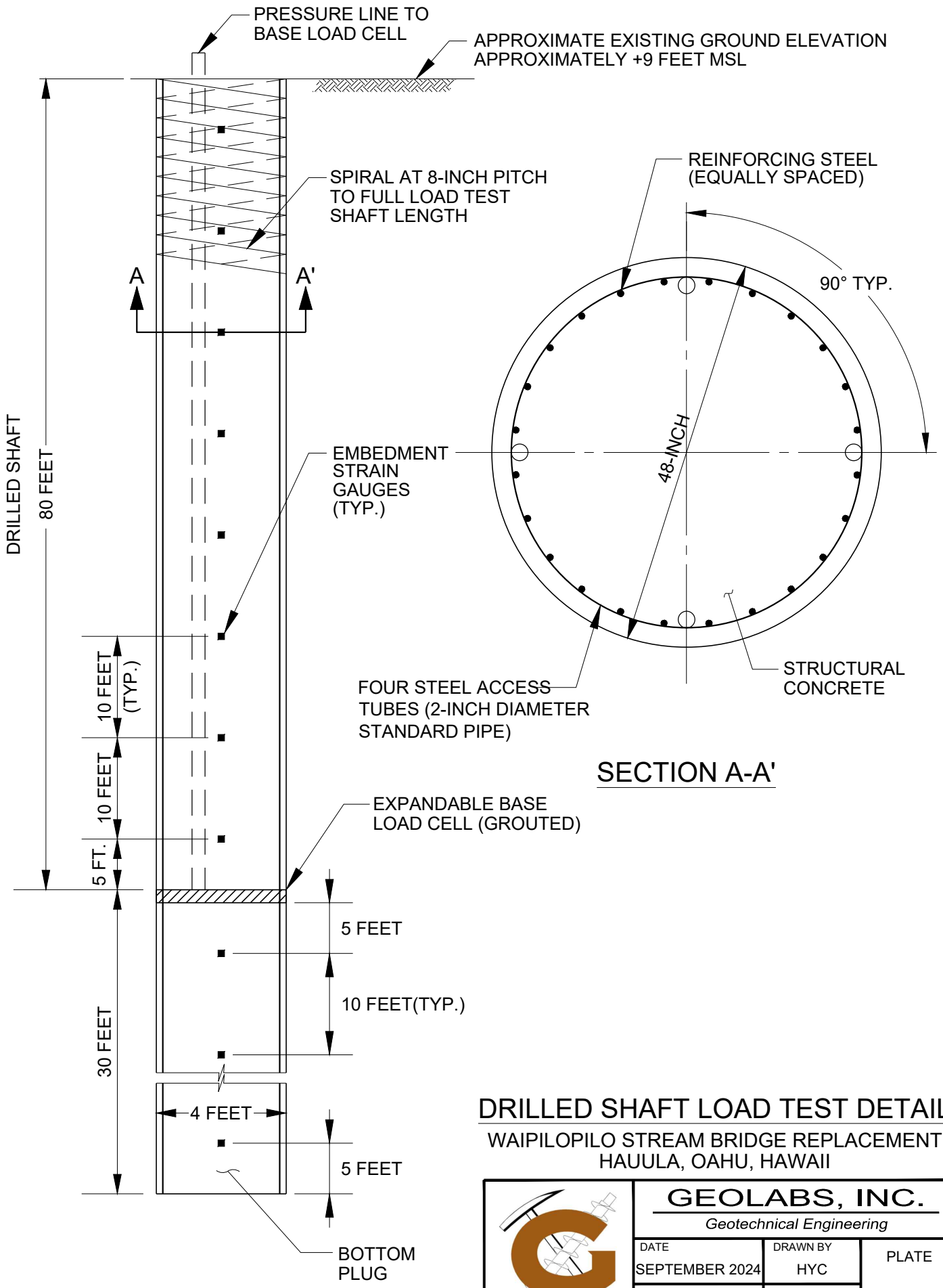
80.0 feet		85.0 feet		90.0 feet		95.0 feet		100.0 feet	
y	p	y	p	y	p	y	p	y	p
(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)	(inch)	(pounds/inch)
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	3354.7	0.1	4308.1	0.1	5426.1	0.1	6721.2	0.1	8206.1
0.1	5177.8	0.1	6290.7	0.1	7558.5	0.1	8993.1	0.2	10606.6
0.2	6478.7	0.2	7752.9	0.2	9178.6	0.2	10766.0	0.2	12525.8
0.3	7543.7	0.3	8963.6	0.3	10535.5	0.3	12267.7	0.3	14169.2
0.3	8466.3	0.3	10018.7	0.3	11725.1	0.3	13592.5	0.3	15628.0
0.4	9290.9	0.4	10965.1	0.4	12796.4	0.4	14790.2	0.4	16952.4
0.5	10043.0	0.5	11830.4	0.5	13778.3	0.5	15891.0	0.5	18173.2
0.5	10738.5	0.5	12632.0	0.5	14689.7	0.5	16914.8	0.5	19310.9
0.6	11388.3	0.6	13381.9	0.6	15543.5	0.6	17875.5	0.6	20380.3
0.7	12000.2	0.7	14088.8	0.7	16349.4	0.7	18783.3	0.7	21392.1
0.7	12580.0	0.7	14759.3	0.7	17114.3	0.7	19645.8	0.7	22354.5
0.8	13132.3	0.8	15398.3	0.8	17843.9	0.8	20469.2	0.8	23274.0
1.3	17071.9	1.3	20017.7	1.3	23197.1	1.3	26609.9	1.3	30256.3
1.8	21011.6	1.8	24637.2	1.8	28550.2	1.8	32750.7	1.8	37238.5
2.2	21011.6	2.2	24637.2	2.2	28550.2	2.2	32750.7	2.2	37238.5
2.5	21011.6	2.5	24637.2	2.5	28550.2	2.5	32750.7	2.5	37238.5

P-Y CURVES - TRANSVERSE DIRECTION
WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

105.0 feet		110.0 feet	
y	p	.	p
(inch)	(pounds/inch)	(inch)	(pounds/inch)
0.0	0.0	0.0	0.0
0.0	589.2	0.0	589.2
0.1	1077.6	0.1	1077.6
0.1	1471.7	0.1	1471.7
0.1	1778.6	0.1	1778.6
0.1	2005.8	0.1	2005.8
0.2	2161.8	0.2	2161.8
0.2	2256.2	0.2	2256.2
0.2	2300.5	0.2	2300.5
0.3	2310.0	0.3	2310.0
0.3	2300.5	0.3	2300.5
0.3	2256.2	0.3	2256.2
0.4	2161.8	0.4	2161.8
0.6	1518.1	0.6	1518.1
0.8	874.1	0.8	874.1
1.1	230.1	1.1	230.1
1.1	230.1	1.1	230.1

P-Y CURVES - TRANSVERSE DIRECTION
WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII





SECTION A-A'

DRILLED SHAFT LOAD TEST DETAIL

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

GEOLABS, INC.
Geotechnical Engineering

DATE	DRAWN BY	PLATE
SEPTEMBER 2024	HYC	4
SCALE	W.O.	
NOT TO SCALE	8412-00(C)	

CAD User: HENRY File Created: April 23, 1998 File Last Updated: December 06, 2024 11:17:21am
File: B:\Drafting\Drafting\Working\8412-00(C)_Waipilopilo_Stream_Bridge_Replacement\8412-00(C)DrilledShaftLoadTestDetail.dwg\Model

APPENDIX A

APPENDIX A

Field Exploration

We explored the subsurface conditions at the site by drilling and sampling two borings, designated as Boring Nos. 101 and 102, extending to depths of about 57.5 and 141 feet below the existing ground surface, respectively. The borings were drilled with a truck-mounted drill rig equipped with augers and rotary coring tools. The approximate boring locations are shown on the Site Plan, Plate 2.

Our geologist classified the materials encountered in the borings by visual and textural examination in the field and monitored the drilling operations on a near-continuous basis. Soils were classified in general accordance with ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), as shown on the Soil Log Legend, Plate A-0.1. Deviations made to the soil classification in accordance with ASTM D2487 are described in the Soil Classification Log Key, Plate A-0.2. Graphic representations of the materials encountered are presented on the Logs of Borings, Plates A-1.1 through A-2.2.

Core samples of the rock materials encountered at the project site were obtained by using diamond core drilling techniques in general accordance with ASTM D2113, Diamond Core Drilling for Site Investigation. Core drilling is a rotary drilling method that uses a hollow bit to cut into the rock formation. The rock material left in the hollow core of the bit is mechanically recovered for examination and description. Rock cores were described in general accordance with the Rock Description System as shown on the Rock Log Legend, Plate A-0.3.

Recovery (REC) is used as a subjective guide to the interpretation of the relative quality of rock masses. Recovery is defined as the actual length of material recovered from a coring attempt versus the length of the core attempt. For example, if 3.7 feet of material is recovered from a 5.0-foot core run, the recovery would be 74 percent and would be shown on the Logs of Borings as REC = 74%.

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Soil Log Legend

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS	GRAVELS	CLEAN GRAVELS	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		LESS THAN 5% FINES	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		MORE THAN 12% FINES	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL RETAINED ON NO. 200 SIEVE	SANDS	CLEAN SANDS	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		LESS THAN 5% FINES	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	50% OR MORE OF COARSE FRACTION PASSING THROUGH NO. 4 SIEVE	SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
		MORE THAN 12% FINES	SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE-GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
50% OR MORE OF MATERIAL PASSING THROUGH NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT 50 OR MORE	MH	INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

LEGEND

- (2-INCH) O.D. STANDARD PENETRATION TEST
- (3-INCH) O.D. MODIFIED CALIFORNIA SAMPLE
- SHELBY TUBE SAMPLE
- GRAB SAMPLE
- CORE SAMPLE
- WATER LEVEL OBSERVED IN BORING AT TIME OF DRILLING
- WATER LEVEL OBSERVED IN BORING AFTER DRILLING
- WATER LEVEL OBSERVED IN BORING OVERNIGHT

LL	LIQUID LIMIT (NP=NON-PLASTIC)
PI	PLASTICITY INDEX (NP=NON-PLASTIC)
TV	TORVANE SHEAR (tsf)
UC	UNCONFINED COMPRESSION OR UNIAXIAL COMPRESSIVE STRENGTH
TXUU	UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (ksf)

Plate

A-0.1

GEOLABS, INC.

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Soil Classification Log Key
(with deviations from ASTM D2488)

GEOLABS, INC. CLASSIFICATION*

GRANULAR SOIL (- #200 <50%)

- **PRIMARY** constituents are composed of the largest percent of the soil mass. Primary constituents are capitalized and bold (i.e., **GRAVEL, SAND**)
- **SECONDARY** constituents are composed of a percentage less than the primary constituent. If the soil mass consists of 12 percent or more fines content, a cohesive constituent is used (**SILTY** or **CLAYEY**); otherwise, a granular constituent is used (**GRAVELLY** or **SANDY**) provided that the secondary constituent consists of 20 percent or more of the soil mass. Secondary constituents are capitalized and bold (i.e., **SANDY** GRAVEL, **CLAYEY** SAND) and precede the primary constituent.
- **accessory descriptions** compose of the following:
  with some: >12%
  with a little: 5 - 12%
  with traces of: <5%
  accessory descriptions are lower cased and follow the Primary and Secondary Constituents
  (i.e., SILTY GRAVEL **with a little sand**)

COHESIVE SOIL (- #200 ≥50%)

- **PRIMARY** constituents are based on plasticity. Primary constituents are capitalized and bold (i.e., **CLAY, SILT**)
- **SECONDARY** constituents are composed of a percentage less than the primary constituent, but more than 20 percent of the soil mass. Secondary constituents are capitalized and bold (i.e., **SANDY** CLAY, **SILTY** CLAY, **CLAYEY** SILT) and precede the primary constituent.
- **accessory descriptions** compose of the following:
  with some: >12%
  with a little: 5 - 12%
  with traces of: <5%
  accessory descriptions are lower cased and follow the Primary and Secondary Constituents
  (i.e., SILTY CLAY **with some sand**)

EXAMPLE: Soil Containing 60% Gravel, 25% Sand, 15% Fines. Described as: **SILTY GRAVEL** with some sand

RELATIVE DENSITY / CONSISTENCY

Granular Soils			Cohesive Soils			
N-Value (Blows/Foot)		Relative Density	N-Value (Blows/Foot)		PP Readings (tsf)	Consistency
SPT	MCS		SPT	MCS		
0 - 4	0 - 7	Very Loose	0 - 2	0 - 4		Very Soft
4 - 10	7 - 18	Loose	2 - 4	4 - 7	< 0.5	Soft
10 - 30	18 - 55	Medium Dense	4 - 8	7 - 15	0.5 - 1.0	Medium Stiff
30 - 50	55 - 91	Dense	8 - 15	15 - 27	1.0 - 2.0	Stiff
> 50	> 91	Very Dense	15 - 30	27 - 55	2.0 - 4.0	Very Stiff
			> 30	> 55	> 4.0	Hard

MOISTURE CONTENT DEFINITIONS

Dry: Absence of moisture, dry to the touch

Moist: Damp but no visible water

Wet: Visible free water

ABBREVIATIONS

WOH: Weight of Hammer

WOR: Weight of Drill Rods

SPT: Standard Penetration Test Split-Spoon Sampler

MCS: Modified California Sampler

PP: Pocket Penetrometer

GRAIN SIZE DEFINITION

Description	Sieve Number and / or Size
Boulders	> 12 inches (305-mm)
Cobbles	3 to 12 inches (75-mm to 305-mm)
Gravel	3-inch to #4 (75-mm to 4.75-mm)
Coarse Gravel	3-inch to 3/4-inch (75-mm to 19-mm)
Fine Gravel	3/4-inch to #4 (19-mm to 4.75-mm)
Sand	#4 to #200 (4.75-mm to 0.075-mm)
Coarse Sand	#4 to #10 (4.75-mm to 2-mm)
Medium Sand	#10 to #40 (2-mm to 0.425-mm)
Fine Sand	#40 to #200 (0.425-mm to 0.075-mm)

Soil descriptions are based on ASTM D2488-09a, Visual-Manual Procedure, with the above modifications by Geolabs, Inc. to the Unified Soil Classification System (USCS).

Plate

A-0.2

GEOLABS, INC.

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Rock Log Legend

ROCK DESCRIPTIONS

	**BASALT**		**CONGLOMERATE**
	**BOULDERS**		**LIMESTONE**
	**BRECCIA**		**SANDSTONE**
	**CLINKER**		**SILTSTONE**
	**COBBLES**		**TUFF**
	**CORAL**		**VOID/CAVITY**

ROCK DESCRIPTION SYSTEM

ROCK FRACTURE CHARACTERISTICS

The following terms describe general fracture spacing of a rock:

Massive: Greater than 24 inches apart

Slightly Fractured: 12 to 24 inches apart

Moderately Fractured: 6 to 12 inches apart

Closely Fractured: 3 to 6 inches apart

Severely Fractured: Less than 3 inches apart

DEGREE OF WEATHERING

The following terms describe the chemical weathering of a rock:

Unweathered: Rock shows no sign of discoloration or loss of strength.

Slightly Weathered: Slight discoloration inwards from open fractures.

Moderately Weathered: Discoloration throughout and noticeably weakened though not able to break by hand.

Highly Weathered: Most minerals decomposed with some corestones present in residual soil mass. Can be broken by hand.

Extremely Weathered: Saprolite. Mineral residue completely decomposed to soil but fabric and structure preserved.

HARDNESS

The following terms describe the resistance of a rock to indentation or scratching:

Very Hard: Specimen breaks with difficulty after several "pinging" hammer blows.
Example: Dense, fine grain volcanic rock

Hard: Specimen breaks with some difficulty after several hammer blows.
Example: Vesicular, vugular, coarse-grained rock

Medium Hard: Specimen can be broked by one hammer blow. Cannot be scraped by knife. SPT may penetrate by ~25 blows per inch with bounce.
Example: Porous rock such as clinker, cinder, and coral reef

Soft: Can be indented by one hammer blow. Can be scraped or peeled by knife. SPT can penetrate by ~100 blows per foot.
Example: Weathered rock, chalk-like coral reef

Very Soft: Crumbles under hammer blow. Can be peeled and carved by knife. Can be indented by finger pressure.
Example: Saprolite

Plate
A-0.3

GEOLABS, INC.

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WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Log of Boring

B-101

Laboratory			Field								
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	Approximate Ground Surface Elevation (feet): 8.4 * **Description**
										GW	6-inch **ASPHALTIC CONCRETE**
	47				7					SM MH	Gray **SANDY GRAVEL (BASALTIC)**, dense, moist (fill) Brown **SILTY SAND**, medium dense, moist (fill) Orangish brown **CLAYEY SILT** with a little gravel (basaltic), medium stiff, moist (fill)
Sieve - #200 = 10.2%	28	92	19		15		5			SP-SM	Light tannish white **SAND (CORALLINE)** with some cobbles (basaltic) and a little silt, loose, moist to wet (beach deposit)
Sieve - #200 = 21.8%	54		0		4		10			SM	Dark gray **SILTY SAND** with some gravel and organics, very loose (estuarine deposit)
LL=NP PI=NP	51	77	0		7		15			SM	Light gray **SILTY SAND (CORALLINE)** with some gravel, loose (lagoonal deposit)
Sieve - #200 = 19.8%	44		0		5		20				grades with soft sandy silt pockets and wood fragments locally
	42	72	0		5		25				grades to very loose
	71		0		WOH/24"		30			MH-OH	Dark gray **CLAYEY SILT** with some organics, very soft (swamp deposit)
							35				

Date Started:	February 5, 2024	Water Level: ▽ 6.3 ft. 02/05/2024 1015 HRS ▽ 8.0 ft. 02/06/2024 1020 HRS	Plate
Date Completed:	February 7, 2024		
Logged By:	S. Latronic	Drill Rig: CME 55DG	
Total Depth:	141 feet	Drilling Method: 5" Solid-Stem Auger & PQ Coring	A - 1.1
Work Order:	8412-00(C)	Driving Energy: 140 lb. wt., 30 in. drop	

GEOLABS, INC.

Geotechnical Engineering

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Log of Boring

B-101

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	(Continued from previous plate) Description
TXUU S_u=0.4 ksf	68	60	0		4	0.1				MH-OH	grades with traces of fine sand and gravel locally
	100		0		WOH/24"		40				
	66	63	0		4	0.1	45				
	55		19		8		50				grades with gravel (basaltic), medium stiff
	51	72	40		43		55			SM	Brownish gray **SILTY SAND (BASALTIC)** with some gravel and a little cobbles, medium dense (older alluvium)
	48		92		22		60				
	27	96	71		39/6" +50/3"		65				grades with more cobbles, very dense
							70				

Date Started:	February 5, 2024	Water Level: ▽	6.3 ft. 02/05/2024 1015 HRS
Date Completed:	February 7, 2024	▽	8.0 ft. 02/06/2024 1020 HRS
Logged By:	S. Latronic	Drill Rig:	CME 55DG
Total Depth:	141 feet	Drilling Method:	5" Solid-Stem Auger & PQ Coring
Work Order:	8412-00(C)	Driving Energy:	140 lb. wt., 30 in. drop

Plate

A - 1.2

BORING_LOG 8412-00(C).GPJ GEOLABS.GDT 12/6/24

GEOLABS, INC.

Geotechnical Engineering

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Log of Boring

B-101

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	(Continued from previous plate) Description
	35		81		87					SM	
							75				Gray and brown subrounded **COBBLY BOULDERS (BASALTIC)** with some sandy gravel, very dense (river channel deposit)
			28							ML	Brown **SANDY SILT**, stiff (older alluvium)
	62	67			26	1.0	80				
UC= 11230 psi			64								grades with gravel (basaltic)
							85				Gray subrounded **COBBLY BOULDERS (BASALTIC)** with some sandy gravel, very dense (river channel deposit)
			43							SM	Brown with some gray **SILTY SAND (BASALTIC)** with some subrounded gravel, medium dense (older alluvium)
	70				17		90				
			97							MH	Grayish brown **CLAYEY SILT** with a little fine sand, very stiff (older alluvium)
	62	66			29		95				
			57							SM	Brown and gray **SILTY SAND (BASALTIC)** with a little clay, medium dense (older alluvium)
	62				17		100				grades with clayey silt, pockets locally
			83								
							105				

Date Started:	February 5, 2024	Water Level: ▽ 6.3 ft. 02/05/2024 1015 HRS ▽ 8.0 ft. 02/06/2024 1020 HRS	Plate
Date Completed:	February 7, 2024		
Logged By:	S. Latronic	Drill Rig: CME 55DG	
Total Depth:	141 feet	Drilling Method: 5" Solid-Stem Auger & PQ Coring	A - 1.3
Work Order:	8412-00(C)	Driving Energy: 140 lb. wt., 30 in. drop	

BORING_LOG 8412-00(C).GPJ GEOLABS.GDT 12/6/24

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WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Log of Boring

B-101

Laboratory			Field								
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	(Continued from previous plate) Description
	59	67			33	3.0				MH	Brown **CLAYEY SILT** with some sand (basaltic), very stiff (older alluvium)
			0							SM	Brown with some gray **SILTY SAND (BASALTIC)** with a little gravel and traces of clay, medium dense (older alluvium)
LL=64 PI=33	64				16		110			CH	Brown with some gray **SILTY CLAY** with a little sand (basaltic), very stiff (older alluvium)
			83								
TXUU S_u=2.6 ksf	71	58			32	3.5	115				grades with silty clay pockets
			60								
	80				18		120				
			25								
TXUU S_u=2.2 ksf	74	56			28		125				grades with some sands (basaltic)
			71								
	66				22		130				
UC= 4290 psi			89								
			100				135				Grayish brown subrounded **COBBLY BOULDERS (BASALTIC)** with some sandy gravel, very dense (river channel deposit)
							140				

Date Started:	February 5, 2024	Water Level: ▽ 6.3 ft. 02/05/2024 1015 HRS ▽ 8.0 ft. 02/06/2024 1020 HRS	Plate
Date Completed:	February 7, 2024		
Logged By:	S. Latronic	Drill Rig: CME 55DG	
Total Depth:	141 feet	Drilling Method: 5" Solid-Stem Auger & PQ Coring	A - 1.4
Work Order:	8412-00(C)	Driving Energy: 140 lb. wt., 30 in. drop	

BORING_LOG 8412-00(C).GPJ GEOLABS.GDT 12/6/24

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WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Log of Boring

B-101

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS

(Continued from previous plate)

Description

Boring terminated at 141 feet

* Elevations estimated from Boring Location Plan prepared by Hirata & Associates, Inc. dated November 19, 2012.

145
150
155
160
165
170
175

Date Started:	February 5, 2024	Water Level: ▽	6.3 ft. 02/05/2024 1015 HRS
Date Completed:	February 7, 2024	▽	8.0 ft. 02/06/2024 1020 HRS
Logged By:	S. Latronic	Drill Rig:	CME 55DG
Total Depth:	141 feet	Drilling Method:	5" Solid-Stem Auger & PQ Coring
Work Order:	8412-00(C)	Driving Energy:	140 lb. wt., 30 in. drop

Plate

A - 1.5

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WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Log of Boring

B-102

Approximate Ground Surface Elevation (feet): 8.9 *

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	USCS	Description
	27	90			14				GW	7-inch **ASPHALTIC CONCRETE**
										Gray **SANDY GRAVEL (BASALTIC)**, very dense, moist (fill)
									MH	White **COBBLES (CORALLINE)**, very dense, moist (fill)
										Brown **CLAYEY SILT** with a little gravel (basaltic), medium stiff, moist (fill)
Sieve - #200 = 7.1%	26		21		7		5		SP-SM	Tannish gray **SAND (CORALLINE)** with a little cobbles, gravel, and silt (basaltic), loose, moist (beach deposit)
	6		0		13		10		GM	Light gray **SILTY GRAVEL (CORALLINE)** with some sand (coralline), very loose (lagoonal deposit)
Sieve - #200 = 13.6%	39		0		3		15			
	45	80	0		3		20			
Sieve - #200 = 28.6%	48		0		1		25		SM	Light gray **SILTY SAND (CORALLINE)** with a little gravel and soft sandy silt pockets, very loose (lagoonal deposit)
									MH-OH	Dark gray **CLAYEY SILT** with a little organics, very soft (swamp deposit)
	62	65	0		2	0.1	30			
							35			

Date Started:	February 8, 2024	Water Level: ▽	5.8 ft. 02/08/2024 0935 HRS
Date Completed:	February 8, 2024	▼	5.5 ft. 02/08/2024 1140 HRS
Logged By:	S. Latronic	Drill Rig:	CME 55DG
Total Depth:	57.5 feet	Drilling Method:	5" Solid-Stem Auger & PQ Coring
Work Order:	8412-00(C)	Driving Energy:	140 lb. wt., 30 in. drop

Plate

A - 2.1

BORING_LOG 8412-00(C).GPJ GEOLABS.GDT 12/6/24

GEOLABS, INC.

Geotechnical Engineering

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Log of Boring

B-102

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	(Continued from previous plate) Description
			13							MH-OH	
LL=72 PI=36	65		17		4		40			MH	Light gray **CLAYEY SILT** with some fine sand, soft (lagoonal deposit)
			0				45				
TXUU S_u=0.5 ksf	78	52	31		9	1.0	50			MH	Brownish gray **CLAYEY SILT** with some gravel and sand (basaltic), medium stiff (older alluvium)
	65	63			19		55				grades with silty sand and gravel pockets locally, stiff
											Boring terminated at 57.5 feet
							60				
							65				
							70				

Date Started:	February 8, 2024	Water Level: ▽ 5.8 ft. 02/08/2024 0935 HRS ▼ 5.5 ft. 02/08/2024 1140 HRS	Plate
Date Completed:	February 8, 2024		
Logged By:	S. Latronic	Drill Rig: CME 55DG	A - 2.2
Total Depth:	57.5 feet	Drilling Method: 5" Solid-Stem Auger & PQ Coring	
Work Order:	8412-00(C)	Driving Energy: 140 lb. wt., 30 in. drop	

BORING_LOG 8412-00(C).GPJ GEOLABS.GDT 12/6/24

APPENDIX B

A P P E N D I X B

Laboratory Tests

Moisture Content (ASTM D2216) and Unit Weight (ASTM D2937) determinations were performed on selected samples as an aid in the classification and evaluation of soil properties. The test results are presented on the Logs of Borings at the appropriate sample depths.

Three Atterberg Limits tests (ASTM D4318) were performed on selected soil samples to evaluate the liquid and plastic limits. The test results are summarized on the Logs of Borings at the appropriate sample depths. A graphic presentation of the test results is provided on Plate B-1.

Six Sieve Analysis tests (ASTM C117 & C136) were performed on selected soil samples to evaluate the gradation characteristics of the soils and to aid in soil classification. Graphic representations of the grain size distribution are provided on Plates B-2 and B-3.

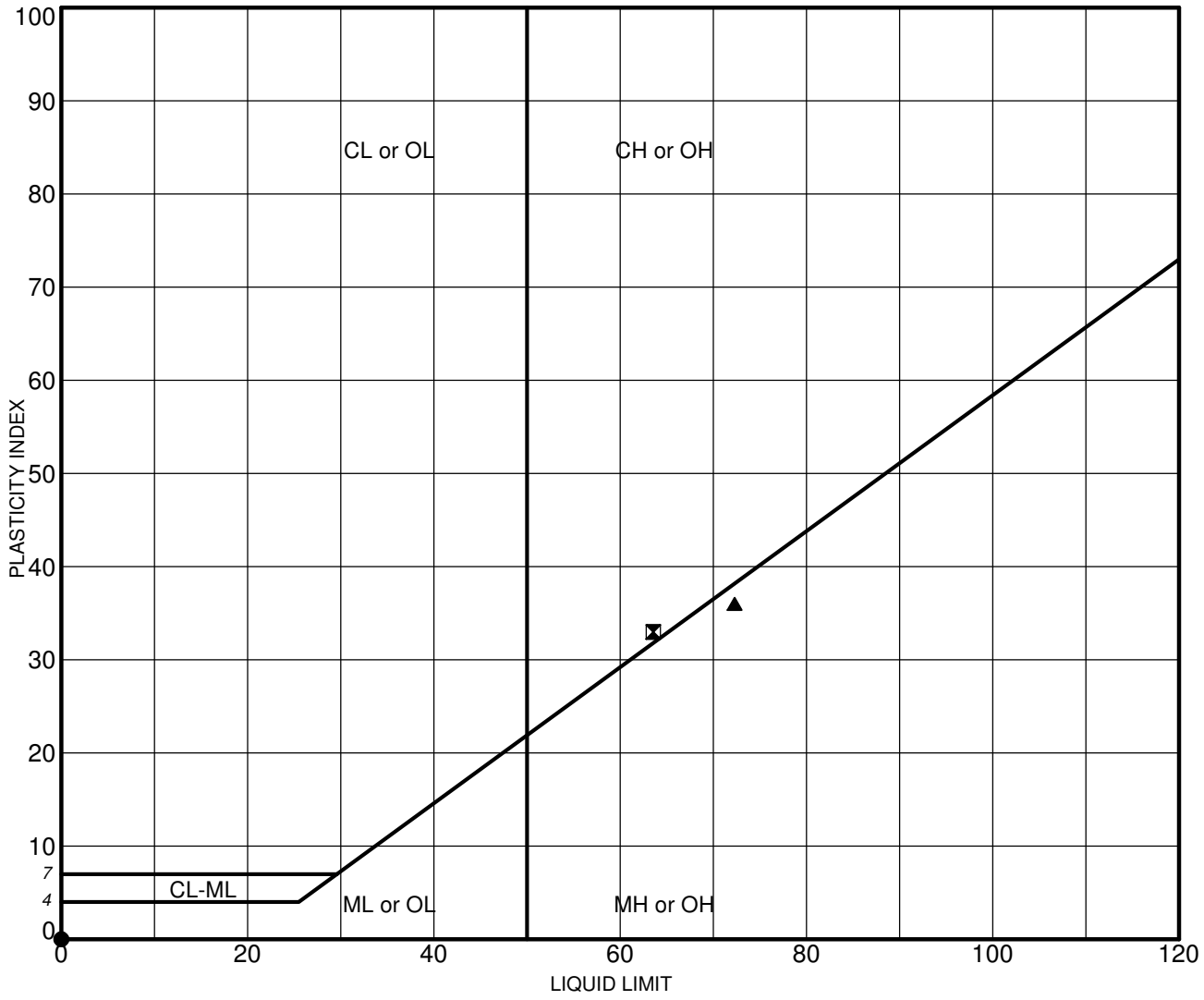
Two Uniaxial Compressive Strength tests (ASTM D7012 Method C) were performed on selected rock core samples to evaluate the uniaxial compressive strength of the rock formation encountered. The test results are presented on Plate B-4.

Four Unconsolidated Undrained Triaxial Compression tests (ASTM D2850) were performed on selected soil samples to evaluate the undrained shear strength of the in-situ soils. The approximate in-situ effective overburden pressure was used as the applied confining pressure for the relatively “undisturbed” soil sample. The test results and the stress-strain curves are presented on Plates B-5 through B-8.

Two laboratory Resistance (R) Value tests (ASTM D2844) were performed on bulk samples of the near-surface soils to evaluate the pavement support characteristics of the soils. The test results are presented on Plates B-9 and B-10.

One Modified Proctor compaction test (ASTM D1557) was performed on a bulk sample of the near-surface soils to evaluate the dry density and moisture content relationships. The test results are presented on Plate B-11.

Two sets of pH (ASTM G51) and Minimum Resistivity (ASTM G57) tests were performed by our office, and two sets of Chloride (EPA 300) and Sulfate Content (EPA 300) tests were performed by CERCO Analytical, Inc. on selected soil samples obtained from our field exploration. The test results are presented on Plate B-12.



	Sample	Depth (ft)	LL	PL	PI	Description
●	B-101	16.0-17.5	NP	NP	NP	Light gray silty sand with some gravel
⊠	B-101	111.0-113.0	64	31	33	Brown with some gray silty clay (CH) with a little sand
▲	B-102	41.0-43.0	72	36	36	Light gray clayey silt (MH) with some fine sand

NP = NON-PLASTIC

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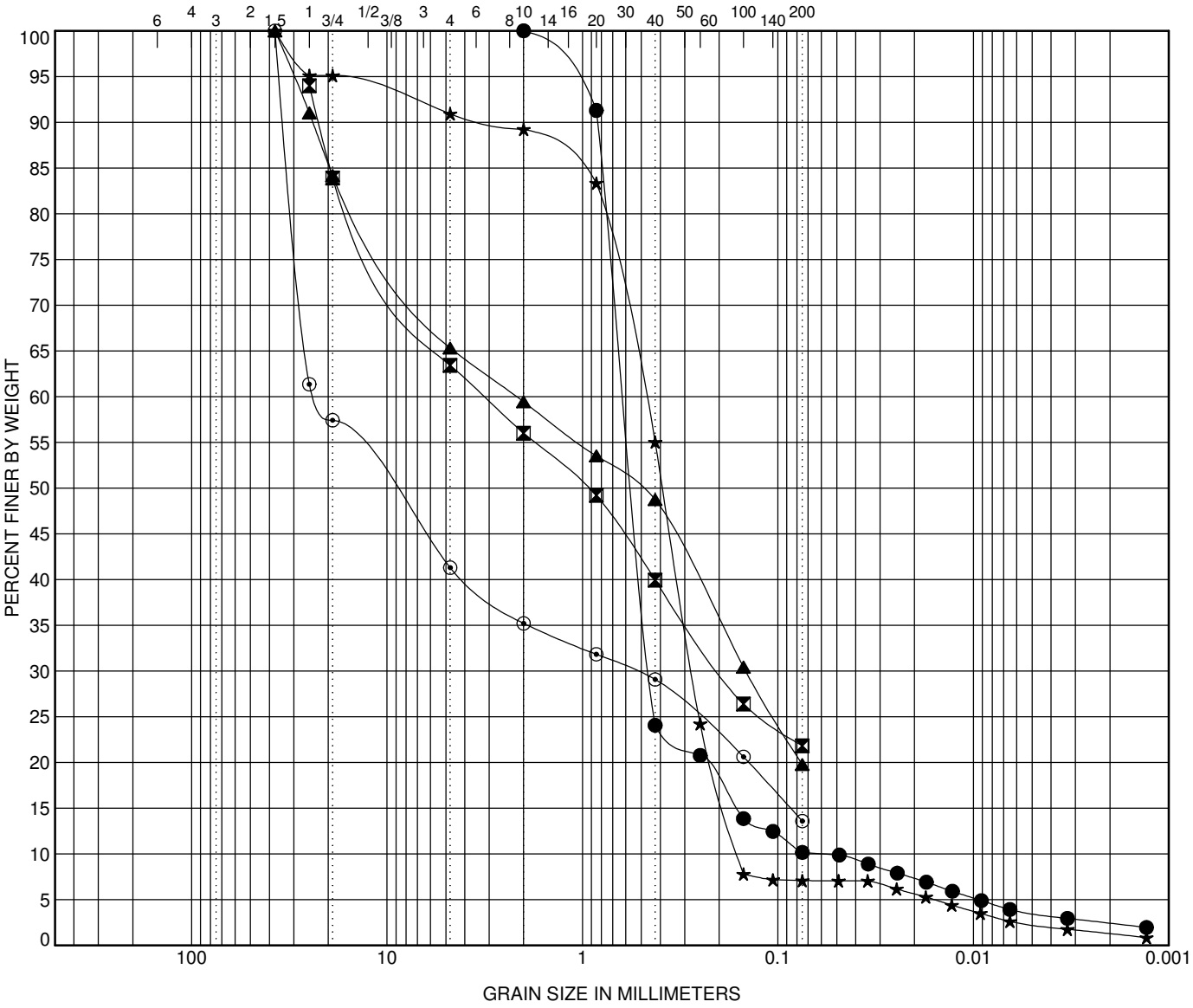
W.O. 8412-00(C)

ATTERBERG LIMITS TEST RESULTS - ASTM D4318

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 1

G ATTERBERG PI-100 LL-120 8412-00(C).GPJ GEOLABS.GDT 6/18/24



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	B-101	5.0-6.5	Light tannish white sand (SP-SM) with a little silt				5.6	10.4
⊠	B-101	11.0-13.0	Dark gray silty sand (SM) with some gravel					
▲	B-101	21.0-23.0	Light gray silty sand (SM) with some gravel					
★	B-102	5.5-7.5	Tannish gray sand (SP-SM) with a little gravel and silt				1.0	3.0
⊙	B-102	16.0-18.0	Light gray silty gravel (GM) with some sand					

	Sample	Depth (ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
●	B-101	5.0-6.5	2	0.616	0.452	0.059	0.0	89.8	10.2
⊠	B-101	11.0-13.0	25	3.187	0.198		30.6	41.6	21.8
▲	B-101	21.0-23.0	37.5	2.175	0.146		34.7	45.5	19.8
★	B-102	5.5-7.5	37.5	0.48	0.276	0.161	9.1	83.8	7.1
⊙	B-102	16.0-18.0	37.5	22.752	0.537		58.7	27.7	13.6

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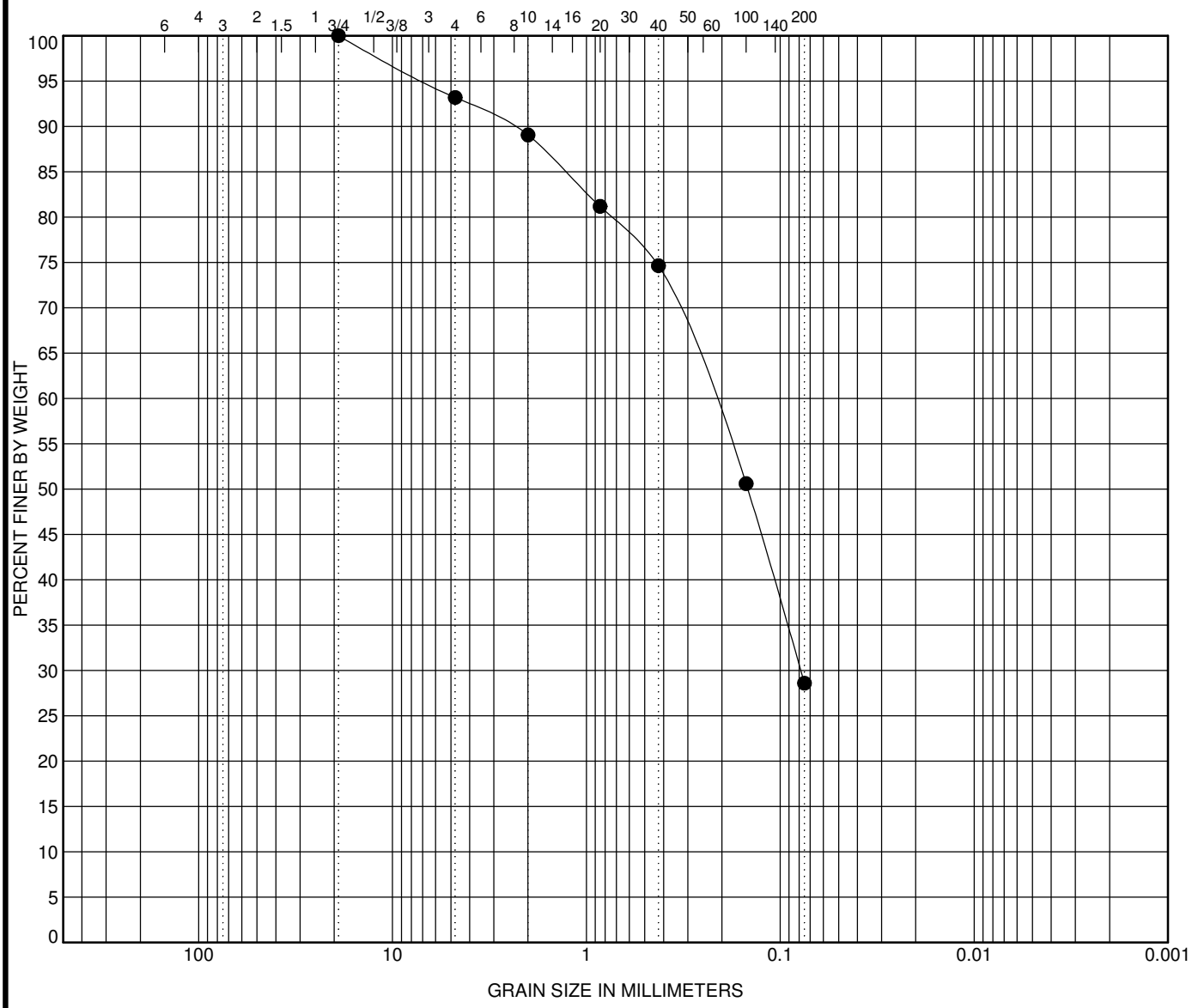
W.O. 8412-00(C)

GRAIN SIZE DISTRIBUTION - ASTM D6913

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 2

G_GRAIN_SIZE_MOD_8412-00(C).GPJ GEOLABS.GDT 12/6/24



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	B-102	26.0-28.0	Light gray silty sand (SM) with a little gravel					

	Sample	Depth (ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
●	B-102	26.0-28.0	19	0.225	0.078		6.8	64.6	28.6

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W.O. 8412-00(C)

GRAIN SIZE DISTRIBUTION - ASTM D6913

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 3

G_GRAIN_SIZE_MOD_8412-00(C).GPJ GEOLABS.GDT 12/6/24

Location	Depth	Length	Diameter	Length/ Diameter Ratio	Density	Load	Compressive Strength
	(feet)	(inches)	(inches)		(pcf)	(lbs)	(psi)
B-101	82.5 - 86	6.714	3.248	2.07	168.8	93,050	11,230
B-101	133 - 136	6.644	3.204	2.07	159.5	34,610	4,290

ASTM D7012 (METHOD C)

Note: Samples were not prepared in accordance with ASTM D4543. Therefore, results reported may differ from results obtained from a test speciment that meets the requirements of Practice D4543

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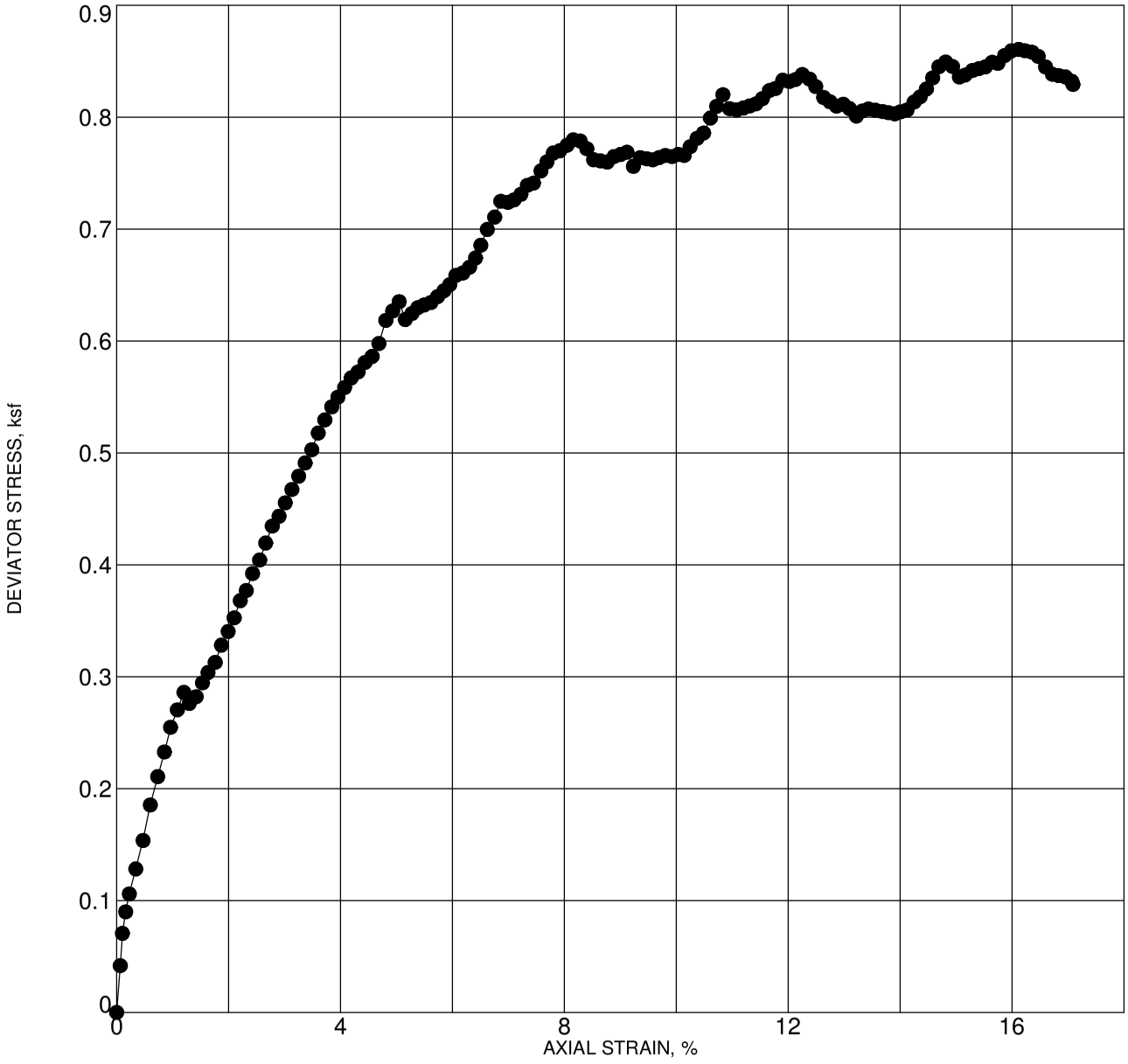
W.O. 8412-00(C)

UNIAXIAL COMPRESSIVE STRENGTH TEST

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 4

G_ROCK_UC_TEST_PORTRAIT_8412-00(C).GPJ GEOLABS.GDT 6/18/24



Max. Deviator Stress (ksf):	0.8
Confining Stress (ksf):	2.0

Location: B-101
Depth: 36.0 - 37.5 feet
Description: Dark gray clayey silt with some organics
Test Date: 3/11/2024

Dry Density (pcf)	59.9	Sample Diameter (inches)	2.413
Moisture (%)	71.4	Sample Height (inches)	5.033
Axial Strain at Failure (%)	14.9	Strain Rate (% / minute)	0.70

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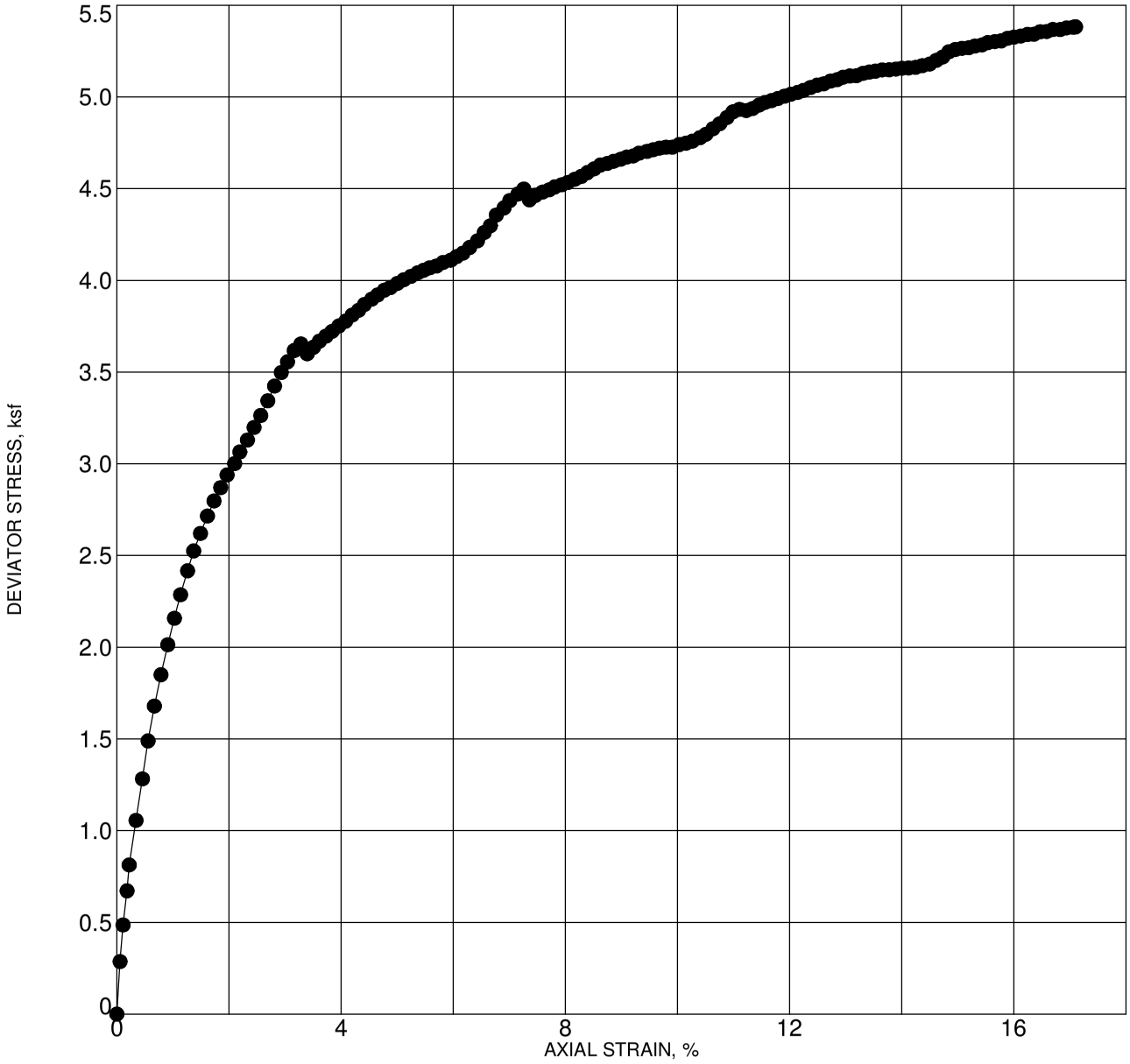
W.O. 8412-00(C)

TRIAXIAL UU COMPRESSION TEST - ASTM D2850

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 5

G_TXUU_8412-00(C).GPJ_GEOLABS.GDT_6/18/24



Max. Deviator Stress (ksf):	5.3
Confining Stress (ksf):	5.0

Location: B-101
Depth: 116.0 - 117.5 feet
Description: Brown with some gray silty clay with a little sand
Test Date: 3/11/2024

Dry Density (pcf)	57.6	Sample Diameter (inches)	2.413
Moisture (%)	74.2	Sample Height (inches)	5.033
Axial Strain at Failure (%)	15.0	Strain Rate (% / minute)	0.70

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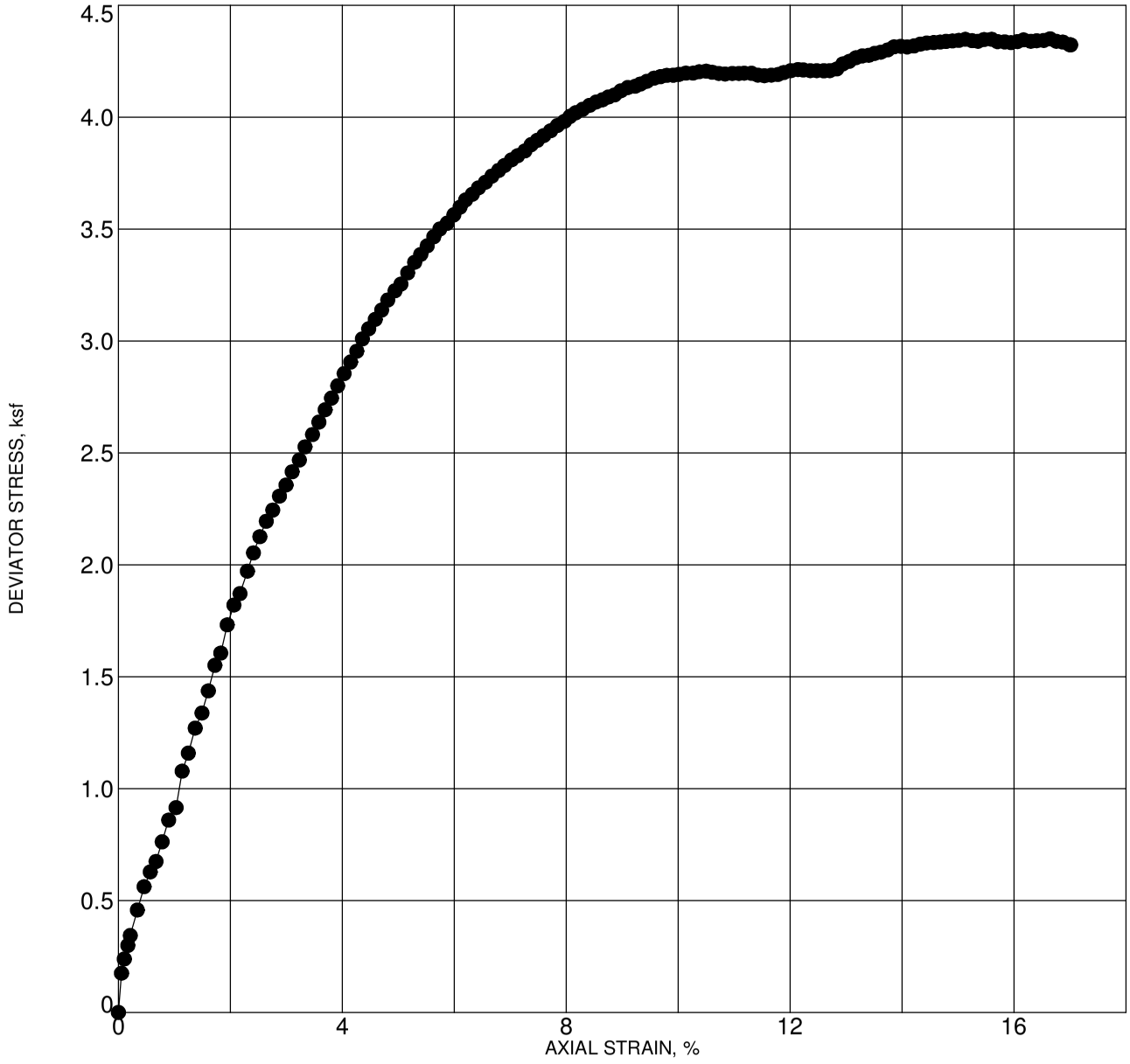
W.O. 8412-00(C)

TRIAXIAL UU COMPRESSION TEST - ASTM D2850

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 6

G_TXUU_8412-00(C).GPJ_GEOLABS.GDT_6/18/24



Max. Deviator Stress (ksf):	4.3
Confining Stress (ksf):	1.5

Location: B-101
Depth: 126.0 - 127.5 feet
Description: Brown with some gray silty clay with a little sand
Test Date: 3/9/2024

Dry Density (pcf)	60.8	Sample Diameter (inches)	2.413
Moisture (%)	63.4	Sample Height (inches)	5.033
Axial Strain at Failure (%)	14.9	Strain Rate (% / minute)	0.69

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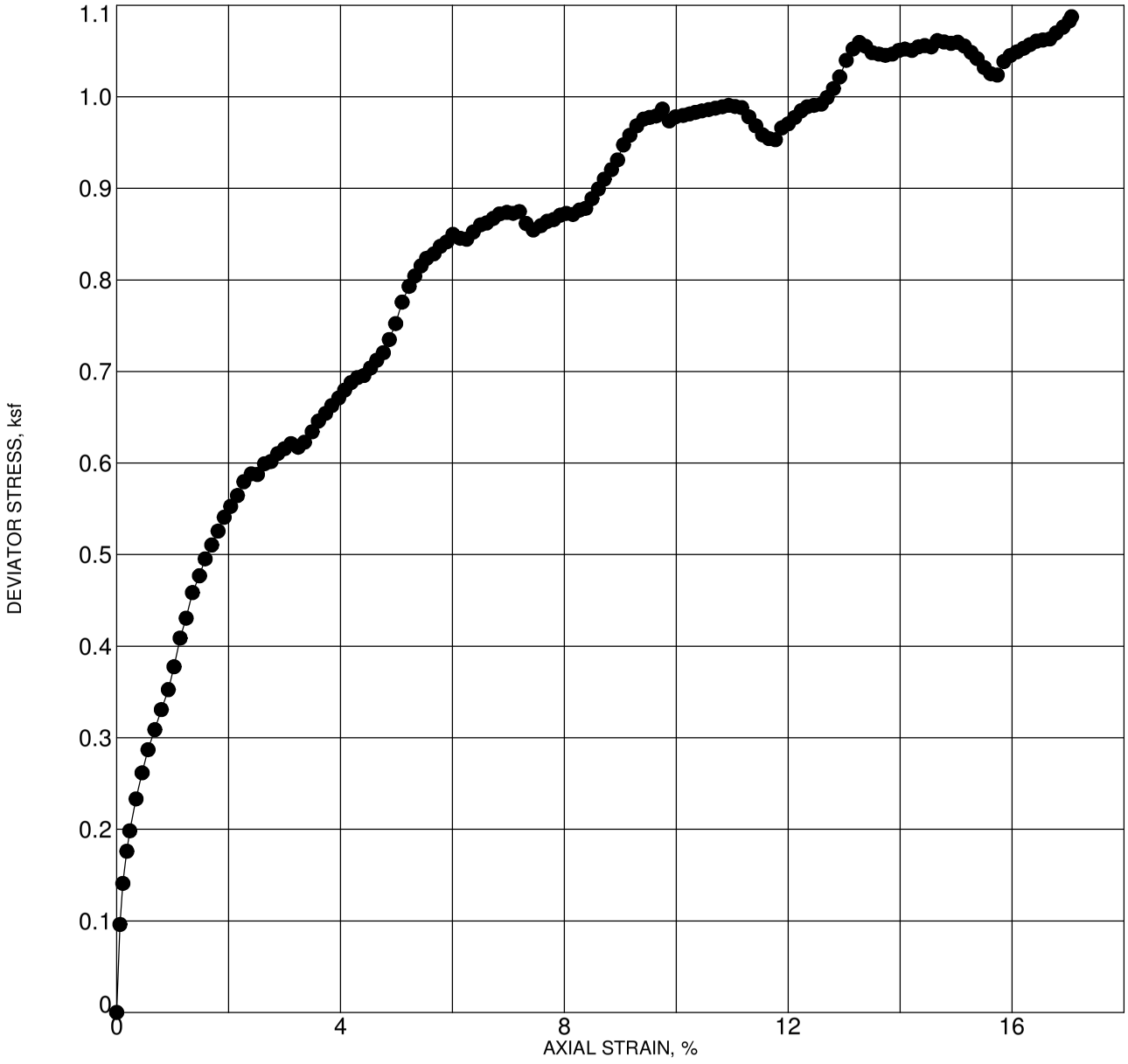
W.O. 8412-00(C)

TRIAXIAL UU COMPRESSION TEST - ASTM D2850

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 7

G_TXUU_8412-00(C).GPJ_GEOLABS.GDT_6/18/24



Max. Deviator Stress (ksf):	1.1
Confining Stress (ksf):	2.5

Location: B-102
Depth: 51.0 - 52.5 feet
Description: Brownish gray clayey silt with some gravel and sand
Test Date: 3/11/2024

Dry Density (pcf)	54.8	Sample Diameter (inches)	2.413
Moisture (%)	72.0	Sample Height (inches)	5.033
Axial Strain at Failure (%)	14.9	Strain Rate (% / minute)	0.70

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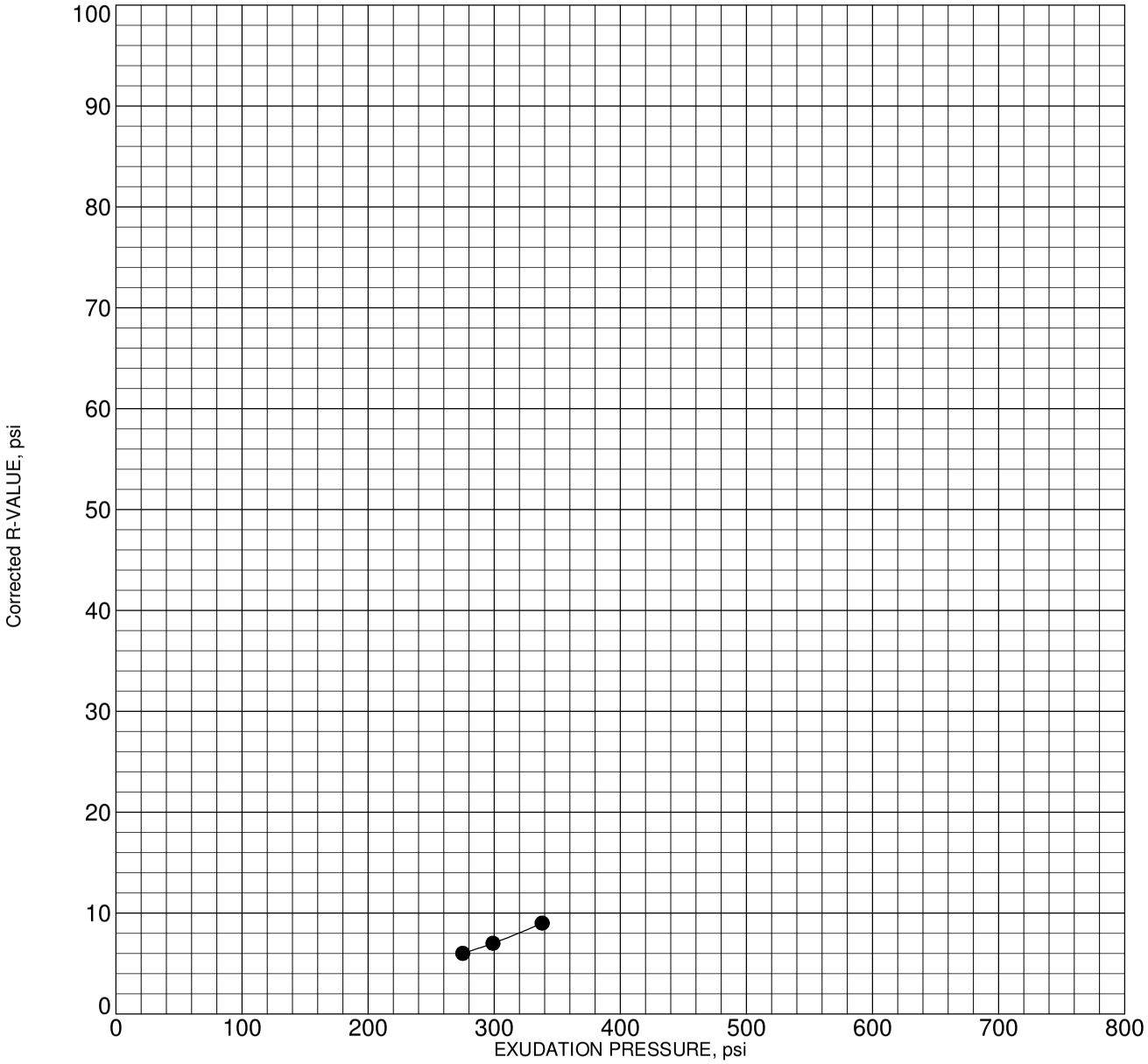
W.O. 8412-00(C)

TRIAXIAL UU COMPRESSION TEST - ASTM D2850

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 8

G_TXUU_8412-00(C).GPJ_GEOLABS.GDT_6/18/24



Sample: Bulk-101

Depth: 1.5 - 5.0 feet

Description: Brown sandy silt with traces of clay and gravel

R-Value at 300 psi Exudation Pressure:	**7**

R-Value Test Performed by Ninyo & Moore

No.	Compaction Pressure	Density	Moisture Content	Horizontal Pressure @160 psi	Sample Height	Exudation Pressure	R-Value	Corrected R-Value
	(psi)	(pcf)	(%)	(psi)	(in)	(psi)		
1	50	83.6	42.1	0	2.49	338	9	9
2	50	80.8	42.6	0	2.56	299	7	7
3	50	79.5	43.1	0	2.55	275	6	6

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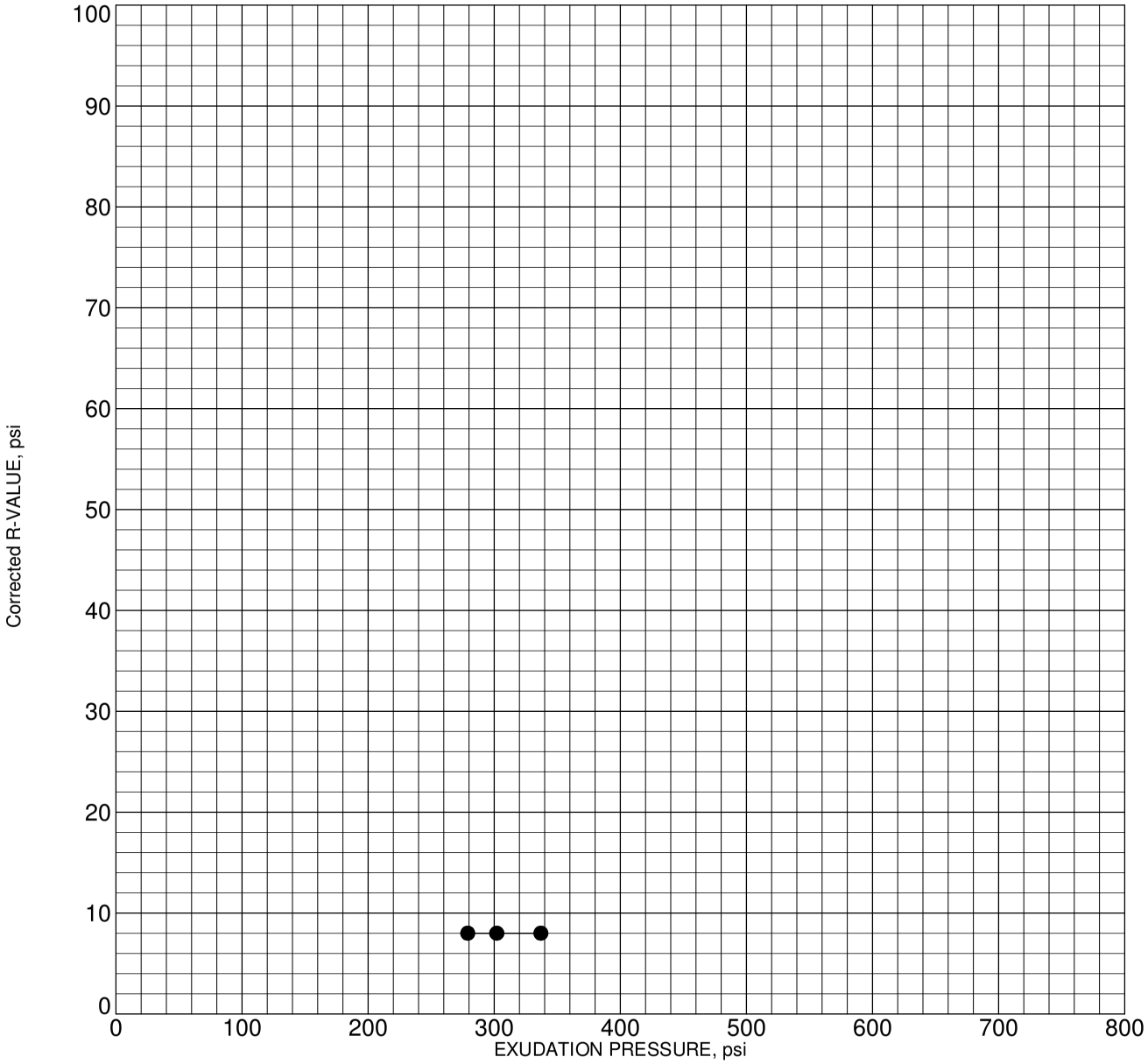
W.O. 8412-00(C)

R-VALUE AND EXPANSION PRESSURE - ASTM D2844

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 9

R-VALUE TEST-NINYO&MOORE 8412-00(C).GPJ GEOLABS.GDT 6/18/24



Sample: Bulk-102

Depth: 1.0 - 5.0 feet

Description: Brown clayey silt with a little gravel

R-Value at 300 psi Exudation Pressure:	**9**

R-Value Test Performed by Ninyo & Moore

No.	Compaction Pressure	Density	Moisture Content	Horizontal Pressure @160 psi	Sample Height	Exudation Pressure	R-Value	Corrected R-Value
	(psi)	(pcf)	(%)	(psi)	(in)	(psi)		
1	50	86.1	41.4	0	2.53	337	8	8
2	50	82.2	41.9	0	2.56	302	8	8
3	50	81.0	42.4	0	2.55	279	8	8

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

W.O. 8412-00(C)

R-VALUE AND EXPANSION PRESSURE - ASTM D2844

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 10

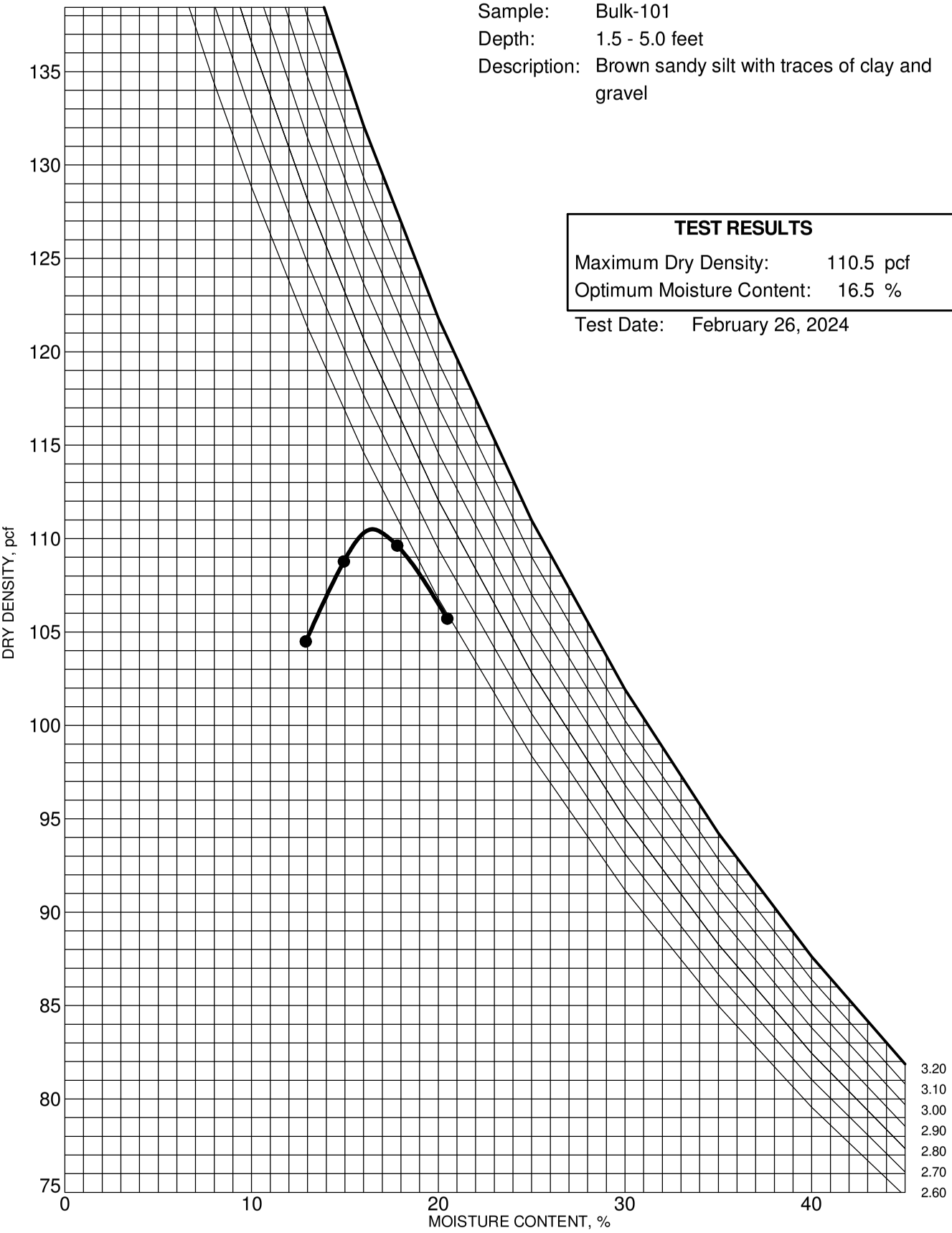
R-VALUE TEST-NINYO&MOORE 8412-00(C).GPJ GEOLABS.GDT 12/6/24

Sample: Bulk-101
Depth: 1.5 - 5.0 feet
Description: Brown sandy silt with traces of clay and gravel

TEST RESULTS

Maximum Dry Density:	110.5 pcf
Optimum Moisture Content:	16.5 %

Test Date: February 26, 2024



GEOLABS, INC.
GEOTECHNICAL ENGINEERING

W.O. 8412-00(C)

MOISTURE-DENSITY RELATIONSHIP - ASTM D1557 A

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 11

G_COMPACTION_8412-00(C).GPJ GEOLABS.GDT 6/18/24

Location	Depth (feet)	pH Value	Minimum Resistivity (ohm-cm)	Chloride Content (mg/kg)	Sulfate Content (mg/kg)
B-101	1.5 - 5.0	8.06*	300*	1000	620
B-102	1.5 - 5.0	7.24*	510*	630	360

TEST METHODS (by CERCO Analytical, Inc.)

pH Value	Method 9045C
Minimum Resistivity	SM 2510B
Chloride Content	EPA 300.0
Sulfate Content	EPA 300.0

TEST METHODS (by Geolabs, Inc.)*

pH Value	ASTM G51
Minimum Resistivity	ASTM G57
Chloride Content	N/A
Sulfate Content	N/A

ND: Not Detected Within Reporting Limits

GEOLABS, INC.
GEOTECHNICAL ENGINEERING

W.O. 8412-00(C)

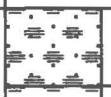
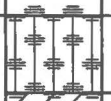
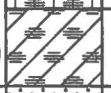
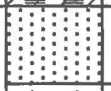
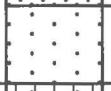
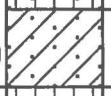
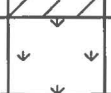
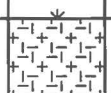
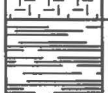
SUMMARY OF CORROSIVITY TESTS

WAIPILOPILO STREAM BRIDGE REPLACEMENT
HAUULA, OAHU, HAWAII

Plate
B - 12

G_SUMMARY OF CORROSIVITY TESTS 8412-00(C).GPJ GEOLABS.GDT 6/18/24

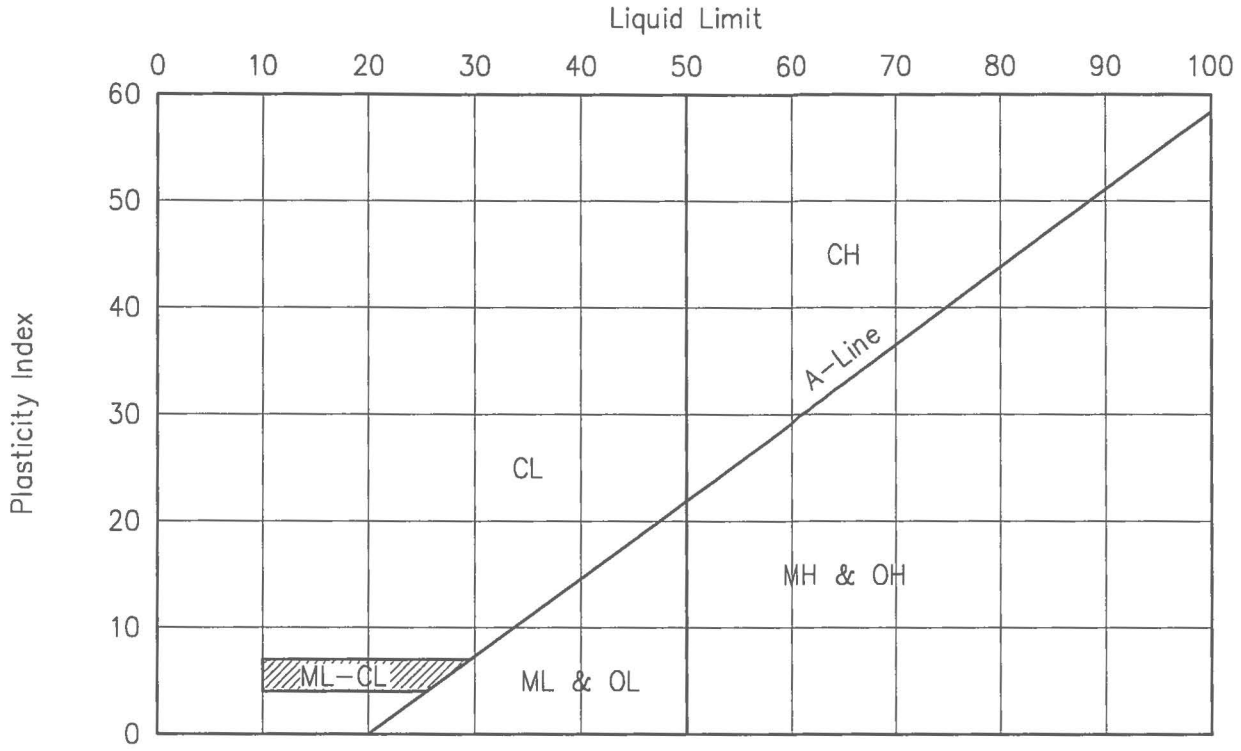
APPENDIX C

MAJOR DIVISIONS			GROUP SYMBOLS		TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of the material is LARGER than No. 200 sieve size.)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines.)		GW	Well graded gravels, gravel–sand mixtures, little or no fines.
				GP	Poorly graded gravels or gravel–sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines.)		GM	Silty gravels, gravel–sand–silt mixtures.
				GC	Clayey gravels, gravel–sand–clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size.)	CLEAN SANDS (Little or no fines.)		SW	Well graded sands, gravelly sands, little or no fines.
				SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines.)		SM	Silty sands, sand–silt mixtures.
				SC	Clayey sands, sand–clay mixtures.
FINE GRAINED SOILS (More than 50% of the material is SMALLER than No. 200 sieve size.)	SILTS AND CLAYS (Liquid limit LESS than 50.)			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
				OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50.)			MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
				CH	Inorganic clays of high plasticity, fat clays.
				OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic soils.
					FRESH TO MODERATELY WEATHERED BASALT
					VOLCANIC TUFF / HIGHLY TO COMPLETELY WEATHERED BASALT
					CORAL

SAMPLE DEFINITION		
2" O.D. Standard Split Spoon Sampler	Shelby Tube	RQD Rock Quality Designation
3" O.D. Split Tube Sampler	NX / PQ/ 4" Coring	Water Level

W.O. 11–5064	Waipilopilo Stream Bridge, Kamehameha Highway
Hirata & Associates, Inc.	BORING LOG LEGEND Plate A3.1

PLASTICITY CHART



GRADATION CHART

COMPONENT DEFINITIONS BY GRADATION	
COMPONENT	SIZE RANGE
Boulders	Above 12 in.
Cobbles	3 in. to 12 in.
Gravel Coarse gravel Fine gravel	3 in. to No. 4 (4.76 mm) 3 in. to 3/4 in. 3/4 in. to No. 4 (4.76 mm)
Sand Coarse sand Medium sand Fine sand	No. 4 (4.76 mm) to No. 200 (0.074 mm) No. 4 (4.76 mm) to No. 10 (2.0 mm) No. 10 (2.0 mm) to No. 40 (0.42 mm) No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and clay	Smaller than No. 200 (0.074 mm)

W.O. 11-5064	Waipilopilo Stream Bridge, Kamehameha Highway
Hirata & Associates, Inc.	UNIFIED SOIL CLASSIFICATION SYSTEM Plate A3.2

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B1 DRIVING WT. 140 lb. START DATE 5/23/11

SURFACE ELEV. 9±* DROP 30 in. END DATE 5/26/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0			74	95	10	Silty SAND (SM) – Brown, moist, dense, with coral gravel. Covered by 4 inches of asphaltic concrete over 6 inches of aggregate base material.
			24	82	27	Clayey SILT (MH) – Brown, moist, stiff, with sand and coral gravel.
5			5	80	38	Medium stiff to firm at 5 feet.
▽						Silty SAND (SM) – Gray, medium dense, with coral fragments.
10			21	109	19	
15			7	85	28	Loose from 14 feet, with increase in silt content.
20			6	83	40	
25			6	89	32	
30			6	65	62	Sandy SILT (ML/SM) – Dark gray, soft, with fine sand.

Plate A4.1

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B1 (continued) DRIVING WT. 140 lb. START DATE 5/23/11

SURFACE ELEV. 9± DROP 30 in. END DATE 5/26/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
30						
35			3	65	59	
40			19	55	77	Medium stiff from 39 feet, with gravel and cobbles. Begin PQ coring at 40.5 feet. 23% Recovery from 40.5 to 44 feet.
45			13	No Recovery		52% Recovery from 45.5 to 49 feet.
50			9	58	56	Clayey SILT (MH) – Brown, medium stiff, with sand, gravel, and cobbles. (Alluvium)
55			10	60	68	57% Recovery from 55.5 to 59 feet.
60			22	60	56	

Plate A4.2

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B1 (continued) DRIVING WT. 140 lb. START DATE 5/23/11

SURFACE ELEV. 9± DROP 30 in. END DATE 5/26/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
60						
65			19	59	67	
70			44	63	62	Stiff to hard, slightly cemented. 57% Recovery from 70.5 to 74 feet.
75			50/4"	54	36	COBBLES AND BOULDERS – Mottled gray and brown, dense to hard, mixed in a silt, sand ,and gravel matrix, partially to strongly cemented. 100% Recovery from 74.5 to 79 feet.
80						35% Recovery from 79 to 84 feet.
85			50/5"	72	16	23% Recovery from 85 to 90 feet.
90						

Plate A4.3

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B1 (continued) DRIVING WT. 140 lb. START DATE 5/23/11

SURFACE ELEV. 9± DROP 30 in. END DATE 5/26/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
90			50/5"	70	24	Clayey SILT (MH) – Brown, stiff to medium hard, with sand, gravel, and cobbles, partially to strongly cemented. (Cemented Alluvium) 85% Recovery from 90.5 to 95 feet.
95						27% Recovery from 95 to 100 feet.
100						100% Recovery from 100.5 to 104 feet. Sandy pocket from 102 to 104 feet, medium dense.
105			40	70	50	69% Recovery from 105.5 to 109 feet.
110			32/6" 50/2"	63	61	Clayey SILT (MH) – Dark brown, stiff to very stiff, with sand.
115			50/5"	63	59	
120			35	60	66	

Plate A4.4

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B1 (continued) DRIVING WT. 140 lb. START DATE 5/23/11
SURFACE ELEV. 9± DROP 30 in. END DATE 5/26/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
120						
125			50/3"	Tip Recovery		CEMENTED SILT – Brown, medium hard. 100% Recovery from 125 to 129 feet.
130						90% Recovery from 129 to 134 feet.
135						98% Recovery from 134 to 139 feet.
140						End boring at 140 feet. Groundwater encountered at 7 feet on 5/23/11 at 10:15 am.
145						* Elevations based on an AutoCAD file of topographic survey map provided by Sato & Associates, Inc.
150						

Plate A4.5

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B2 DRIVING WT. 140 lb. START DATE 6/2/11

SURFACE ELEV. 9± DROP 30 in. END DATE 6/9/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						
		□	40	97	17	Silty SAND (SM) – Brown, moist, medium dense to dense, with gravel. Covered by 6.5 inches of asphaltic concrete over 8 inches of aggregate base material. Brown clayey silt at 2 feet.
5		□	16	94	14	Silty SAND (SM) – Tan, moist, medium dense, with gravel. Cobbles and boulders from 5.5 feet.
		□	50		16	Gray color from 8 feet.
10						Loose from 12 feet.
		□	9		20	Decomposed wood at 13 feet.
15						
		▭	10/No Penetration			Cobbles and boulders at 18 feet.
20						
						Sandy SILT (ML/SM) – Gray, soft, with fine sand.
		□	9	74	48	
25						
		□	7	77	45	
30						

Plate A4.6

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B2 (continued) DRIVING WT. 140 lb. START DATE 6/2/11

SURFACE ELEV. 9± DROP 30 in. END DATE 6/9/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
30						
		☐	5	74	45	
35						
		☐	4	58	68	
40						
		☐	4	57	71	
45						
		☐	4	60	44	
50						
		☐	7	59	69	
55						
		☐	5	63	65	
60						

Plate A4.7

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B2 (continued) DRIVING WT. 140 lb. START DATE 6/2/11

SURFACE ELEV. 9± DROP 30 in. END DATE 6/9/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
60						
			4	66	61	
65						
			13	62	63	
70						Begin PQ coring from 69.5 feet. 39% Recovery from 69.5 to 73 feet. Medium stiff from 70 feet, with gravel and cobbles.
			10/No Penetration			
75						52% Recovery from 73 to 78 feet.
			64	110	17	Clayey SILT (MH) – Mottled brown, stiff to very stiff, with weathered sand, gravel, and cobbles. (Old Alluvium)
80						14% Recovery from 79.5 to 83 feet.
			50/5"	Tip Recovery		
85						5% Recovery from 83.5 to 88 feet.
			50/3"	No Recovery		
90						

Plate A4.8

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B2 (continued) DRIVING WT. 140 lb. START DATE 6/2/11

SURFACE ELEV. 9± DROP 30 in. END DATE 6/9/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
90						5% Recovery from 88.5 to 93 feet.
			50/3"	Tip Recovery		
95						0% Recovery from 93.5 to 98 feet.
			28	62	59	
100						93% Recovery from 99.5 to 103 feet. Stiff to very stiff, partially cemented from 99 feet.
			47	63	60	
105						68% Recovery from 104.5 to 108 feet.
			51	68	59	
110						88% Recovery from 109.5 to 113 feet.
			38	71	53	
115						17% Recovery from 114.5 to 118 feet.
			26/6" 50/2"	60	67	
120						

Plate A4.9

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B2 (continued) DRIVING WT. 140 lb. START DATE 6/2/11

SURFACE ELEV. 9± DROP 30 in. END DATE 6/9/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
120						95% Recovery from 118.5 to 123 feet. Stiff to hard, moderately cemented.
			18/6" 50/3"	Tip Recovery		
125						100% Recovery from 123.5 to 128 feet.
			63	No Recovery		
130						54% Recovery from 129.5 to 133 feet.
						COBBLES AND BOULDERS – Gray, hard, mixed in a silt, sand, and gravel matrix, strongly cemented.
			10/No Penetration			
135						53% Recovery from 133 to 138 feet.
			10/No Penetration			
						End boring at 138 feet.
140						Groundwater encountered at 6.5 feet on 6/2/11 at 11:29 am.
145						
150						

Plate A4.10

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B3 DRIVING WT. 140 lb. START DATE 7/11/11

SURFACE ELEV. 8± DROP 30 in. END DATE 7/11/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty SAND (SM) – Brown, moist, dense, with coral gravel.
			33	119	11	
			16	99	10	
5 ▽			18	88	25	
10			30	109	12	Silty GRAVEL (GM) – Mottled dark gray, medium dense, with sand and cobbles.
15			4	49	88	Sandy SILT (ML/SM) – Dark gray, soft, with fine sand and shell fragments.
20			10	96	23	Increase in sand content at 19 feet.
25			4	57	77	
30			4	59	69	End boring at 30.5 feet. Groundwater encountered at 5.3 feet on 7/11/11 at 1:49 pm.

Plate A4.11

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5064

BORING NO. B4 DRIVING WT. 140 lb. START DATE 7/12/11

SURFACE ELEV. 8± DROP 30 in. END DATE 7/12/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						
			18	88	17	Silty SAND (SM) – Brown, moist, medium dense, with gravel.
			10	104	10	Loose to medium dense at 2 feet.
5 ▽			16	108	22	
			7	75	56	Sandy SILT (ML) – Dark gray, soft, with fine sand.
10						
			13	75	38	Silty SAND (SM) – Gray, loose to medium dense, with gravel.
15						
			6	80	42	Sandy SILT (ML) – Dark gray, soft, with fine sand and gravel.
20						
			8	74	48	
25						
			5	66	59	End boring at 29.5 feet. Groundwater encountered at 5.8 feet on 7/12/11 at 10:30 am.
30						

Plate A4.12

APPENDIX D TRAFFIC EVALUATION TECHNICAL MEMORANDUM

TRAFFIC EVALUATION

Waipilopilo Bridge Replacement

Prepared for HDOT
September 2, 2025

WSP USA Inc.
1001 Bishop Street Suite 2400 Honolulu
Hawaii 96813

This traffic memo describes existing and future traffic conditions on Kamehameha Highway at the Waipilopilo Stream Bridge as well as conditions during construction.

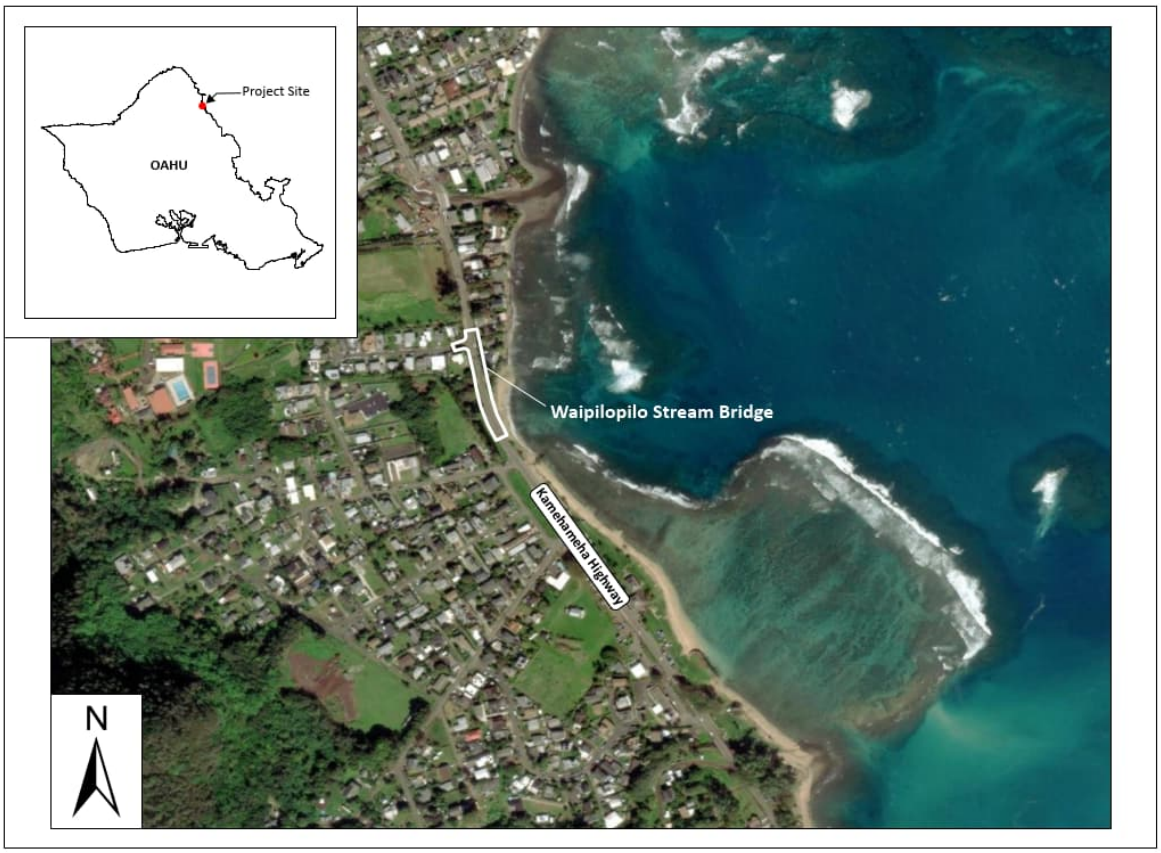
Project Description

As shown in Figure 1, the Waipilopilo Bridge is located at milepost 20.956 in Hau'ula on windward coast of Oahu on Kamehameha Highway between Imua Place to the north and Waikulama Street to the south. At the bridge location, Kamehameha is an undivided, two-lane roadway with a posted speed limit of 35 miles per hour (mph). It is classified as a principal arterial and is on the National Highway System (NHS). Two 11-foot lanes are provided with no shoulder. Pedestrian crossing is provided via a wooden pedestrian bridge attached to the mauka side of the Waipilopilo Bridge.

HDOT is responsible for maintaining the functional and structural integrity of its bridges on all State highways. The project will address bridge maintenance concerns, improve traffic safety for motorists and pedestrians, and meet projected demands on Kamehameha Highway, Route 83, on the north shore of Oahu.

The bridge was constructed in 1932 and has a Structural Rating of 47.8 on a scale of 0-100 by the Federal Highways Administration (FHWA) National Inventory Bridge Standards. The State of Hawaii Department of Transportation (HDOT) is proposing bridge replacement to meet current Federal and State design standards. The reconstructed bridge will be widened to the edge of the right of way, providing a sidewalk on the mauka side to replace the existing pedestrian bridge, and a paved shoulder on the makai side. As part of the regional transportation system, the long-term safety and functionality of bridges are an important component of the system. In the Koolauloa District, there are no other roadways and bridges capable of providing emergency access across streams. Kamehameha Highway is also classified as a rural principal arterial. For the local community, the bridge is also used by people traveling on foot and by bicycle.

Figure 1 Project Vicinity Map



Project Vicinity

Existing Traffic Conditions

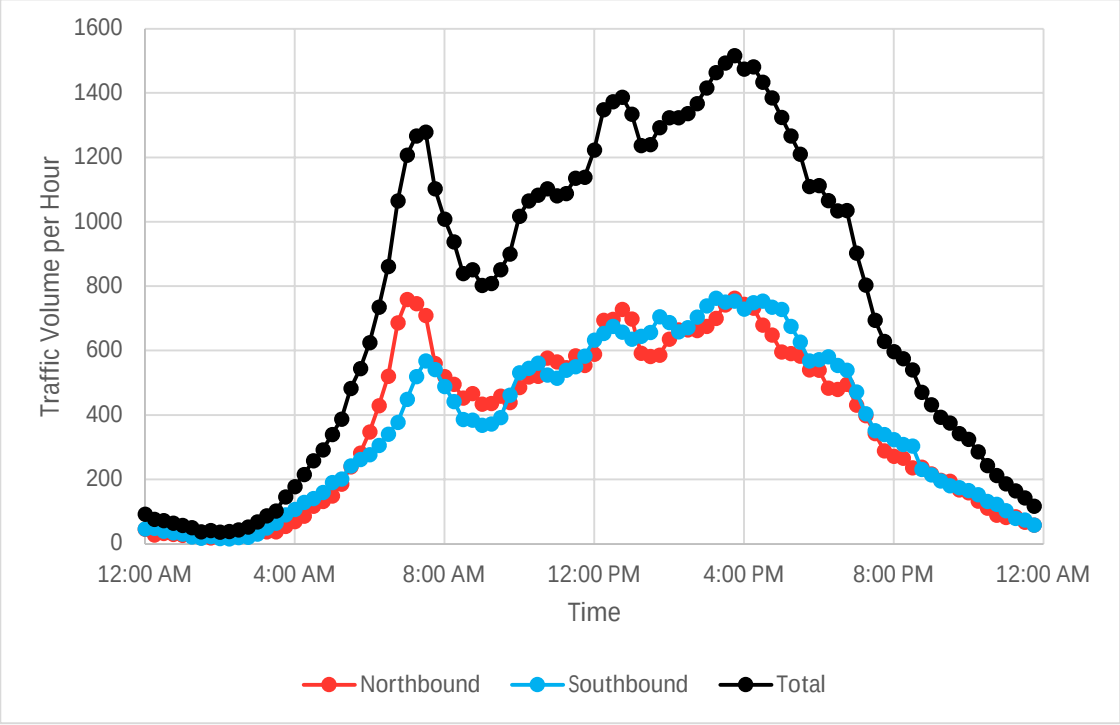
The HDOT Highways Traffic Division (HWY-T) has provided daily traffic data at the bridge location, shown in Table 1 below. The Annual Average Daily Traffic (AADT), Design Hourly Volume (DHV), Design Hour Factor (K), Directional Distribution Factor (D), and Daily Truck Factor (T24).

Table 1 Existing and Projected AADT and DHV

2024 AADT	18,000 vehicles per day (vpd)
2044 AADT	21,200 vpd
2024 DHV	1,440 vpd
2044 DHV	1,700
K	8.0%
D	55/45
T24	4.5%

The closest HDOT traffic count station is located at the Laiemaloo Bridge between M.P. 19.19 and 19.5. 24-hour counts at the Waipilopilo Bridge were estimated using March 2024 AADT and 24-hour counts at the Laiemaloo Bridge count station along with 2024 AADT data at the Waipilopilo Bridge and are shown in Figure 2.

Figure 2 Estimated 2024 Hourly Traffic: Kamehameha Hwy at Waipilopilo Bridge



As shown in Figure 2, the AM peak hour occurs at 7:30 AM-8:30 AM, during which the day's highest directional split occurs. Following the AM peak period, traffic volumes increase steadily around 9:30 AM with a mid-day peak and PM peaks occurring at 12:30 PM-1:30 PM and 3:45 PM-4:45 PM, respectively. The AM, mid-day, and PM peak hour volumes are shown in Table 2.

Table 2 Existing Peak Hour Traffic Volumes

		Northbound	Southbound	Total
AM Peak	7:30 AM-8:30 AM	710	569	1279
Mid-Day Peak	12:45 PM-1:45 PM	729	658	1387
PM Peak	3:45 PM-4:45 PM	763	754	1517

As shown in Table 2, the mid-day peak hour is higher than the AM peak hour, while the highest two-way traffic volumes occur during the PM peak hour.

Traffic Conditions During Construction

As shown in Table 1, the 2024 AADT and projected 2044 AADT are 18,000 vpd and 21,200 vpd, respectively. Historical AADT at Waipilopilo Bridge from 2022-2024 is shown in Table 3.

Table 3 Recent History of AADT at Waipilopilo Bridge

Year	AADT
2022	15,100
2023	14,500
2024	13,900

As shown, AADT has decreased by 600 vehicles per day annually between 2022 and 2024. Because the project is expected to be completed within two years, 2024 volumes were used to analyze traffic conditions during construction.

Up to one travel lane will be closed at a time during construction, during which one-lane, two-way operations would be utilized. A mixture of day and night work is anticipated and lane closures will be utilized during both. Two travel lanes will be preserved outside day time and night time working hours. Full closure is not anticipated to be necessary and at least open lane will be provided during construction. Night work may be subject to seasonal restrictions. There are no local detour roads around the Waipilopilo Bridge.

In order to identify the construction impacts during daytime work hours, one-lane, two-way operations were analyzed using Synchro 11. Only mid-day peak hour conditions were analyzed because it is anticipated that day work will conclude by approximately 3:00 PM, prior to the PM peak hour (3:45 PM-4:45 PM). The work zone with flaggers was modeled as a signalized intersection with cycle length and splits based on work zone characteristics. A 300-foot work zone and a construction zone speed limit of 25 mph were assumed. HCM2000 methodologies were used.

Level of Service (LOS), delay, and volume/capacity (v/c) ratios for work zone traffic are shown in Table 4. Traffic conditions were analyzed to demonstrate that traffic demand through the work zone would not exceed capacity. The results shown are based on a cycle length of 190 seconds, representing the shortest cycle length at which the v/c < 1. Longer cycle lengths would increase the number of vehicles allowed to pass through the work zone at a time and would lower the v/c ratio.

Table 4 Projected Mid-Day Traffic Operations During Construction

	LOS	Delay	v/c
Northbound Kamehameha Hwy	F	80.7	0.99
Southbound Kamehameha Hwy	F	84.2	0.99

As shown, delays during worst-case conditions during the work day are projected to be at LOS F levels. The v/c ratios indicate that the work zone would approach but not exceed capacity. It should be noted that the analysis results are conservative because flaggers would be able to adjust how much vehicular queue to discharge every cycle in real time.

Fewer cycles per hour would mean that less vehicle clearance time would need to be provided (i.e. waiting for the final vehicle in a queue to clear the work zone before the opposing direction is allowed to go). While motorists would experience higher delay, the v/c would decrease.

In addition, it should be noted that the work zone would only approach capacity for approximately 15 minutes within the mid-day peak hour. The existing mid-day peak hour factor (PHF) is 0.86 and the highest 15-minute period is 22% higher than the rest of the peak hour. Based on analysis results, day time lane closures are recommended to occur between 8:30 AM and approximately 3:00 PM. Traffic conditions should be monitored during day time working hours. If queuing and delay conditions last for longer than 15 minutes during the mid-day peak, flagger behavior should be adjusted.

Future Traffic Conditions

As shown in Table 1, the Waipilopilo Bridge AADT is projected to increase from 18,000 vpd in 2024 to 21,200 vpd in 2044, which represents a 0.9% linear annual growth rate. Likewise, the DHV is projected to increase from 1,440 vpd to 1,700 vpd. K, D, and T24 factors are projected to remain unchanged.

Attachments

Appendix

- Traffic Data
- Synchro Analysis

COVER SHEET

State of Hawaii
Department of Transportation
Highways Division
Planning Branch

ROUTINE TRANSMITTAL FORM

TO: HWY-DS DATE: March 1, 2024

ATTN: Andrew Hirano

FROM: HWY-PH CC

SUBJECT: Kamehameha Highway, Waipilopilo Stream Bridge Replacement, Island of Oahu

Route 83 (MP 20.90 to 21.10) Project No. BR-083-1(57) TA24-11

THIS IS TO: TRANSMIT X REQUEST

FOR: C&R ___ AA&A ___ INFO/FILES ___ AS REQUESTED ___

SUSPENSE DATE: _____

BY: Richard Akana

TITLE: **PLANNING SURVEY ENGINEER**

March 1, 2024
Date

MEMORANDUM

TO: HWY-DS

ATTN: Andrew Hirano

FROM: HWY-PH

The following data are submitted for your information:

NAME OF PROJECT: Kamehameha Highway, Waipilopilo Stream Bridge Replacement, Island of Oahu, District of Koolauloa, Route 83 (MP 20.90 to 21.10)

PROJECT NO.: BR-083-1(57)

SECTION:	**Kamehameha Highway,** Naniloa Loop to Hauula Homestead Road Route 83 (MP 18.70 to 21.70)
TRAFFIC DATA:	
2024 ADT	18,000
2034 ADT	19,600
2044 ADT	21,200
2034 DHV	1,570
2044 DHV	1,700
Design K	8.0
Design D	55/45
Design T	4.5
T24	5.5
	24-HOUR TRUCK COMPOSITION
CLASSIFICATION	PERCENT
BUS	27.53
2D	53.55
3X	8.21
4X	0.72
2S1, 3S1, 2S2	3.90
3S2, 3-2, 2-3	4.86
6/6+X S-TLR	0.69
5X M-TLR	0.16
6X M-TLR	0.02
7X M-TLR	0.37

REF. NO. TA 24-11

SIGNATURE:

EMAIL: clement.p.chan@hawaii.gov

Run Date: 17-JUL-25

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B72008301919
Functional Class: URBAN:PRINCIPAL ARTERIAL - OTHER
Location:

Town: Oahu
Count Type: CLASS
DATE: 27-MAR-24

DIR 1: +MP
Counter Type: Tube

DIR 2: -MP

Final AADT: 13900
Route No: 83

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 to 08:30 AM		
AM - PEAK HR VOLUME	441	550	991
AM - K FACTOR(%)			7.03
AM - D(%)	44.5	55.5	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 to 08:30 AM	07:00 to 08:00 AM	
AM - PEAK HR VOLUME	441	588	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 to 04:45 PM		
PM - PEAK HR VOLUME	585	591	1,176
PM - K FACTOR(%)			8.35
PM -D(%)	49.74	50.26	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 to 04:15 PM	03:45 to 04:45 PM	
PM - PEAK HR VOLUME	591	591	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 to 08:30 AM		
AM - PEAK HR VOLUME	441	550	991
AM - K FACTOR(%)			7.03
AM - D(%)	44.5	55.5	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 to 04:45 PM		
PM - PEAK HR VOLUME	585	591	1,176
PM - K FACTOR(%)			8.35
PM -D(%)	49.74	50.26	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	12:45 to 01:45 PM		
PEAK HR VOLUME	510	565	1,075
DIRECTIONAL PEAK			
PEAK HR TIME	01:45 to 02:45 PM	12:45 to 01:45 PM	
PEAK HR VOLUME	547	565	

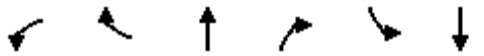
6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	2,040	2,413	4,453
AM 12-HR PERIOD (00:00-12:00)	2,369	2,683	5,052
PM 6-HR PERIOD (12:00-18:00)	3,222	3,056	6,278
PM 12-HR PERIOD (12:00-24:00)	4,658	4,378	9,036
24-HR PERIOD (12:00-24:00)	7,027	7,061	14,088
D%	49.88	50.12	100

TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	9	16	25
12:15 - 12:30	10	6	16
12:30 - 12:45	7	7	14
12:45 - 01:00	10	6	16
01:00 - 01:15	11	2	13
01:15 - 01:30	3	10	13
01:30 - 01:45	3	5	8
01:45 - 02:00	7	4	11
02:00 - 02:15	4	4	8
02:15 - 02:30	0	3	3
02:30 - 02:45	7	4	11
02:45 - 03:00	2	5	7
03:00 - 03:15	3	6	9
03:15 - 03:30	3	4	7
03:30 - 03:45	8	10	18
03:45 - 04:00	10	9	19
04:00 - 04:15	18	6	24
04:15 - 04:30	15	4	19
04:30 - 04:45	28	23	51
04:45 - 05:00	23	21	44
05:00 - 05:15	34	19	53
05:15 - 05:30	24	28	52
05:30 - 05:45	43	34	77
05:45 - 06:00	47	34	81

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	43	48	91
06:15 - 06:30	56	70	126
06:30 - 06:45	58	67	125
06:45 - 07:00	58	85	143
07:00 - 07:15	65	112	177
07:15 - 07:30	83	140	223
07:30 - 07:45	87	195	282
07:45 - 08:00	113	141	254
08:00 - 08:15	120	102	222
08:15 - 08:30	121	112	233
08:30 - 08:45	66	80	146
08:45 - 09:00	72	109	181
09:00 - 09:15	84	84	168
09:15 - 09:30	78	78	156
09:30 - 09:45	64	91	155
09:45 - 10:00	60	84	144
10:00 - 10:15	87	85	172
10:15 - 10:30	94	96	190
10:30 - 10:45	118	75	193
10:45 - 11:00	114	120	234
11:00 - 11:15	98	111	209
11:15 - 11:30	106	98	204
11:30 - 11:45	89	119	208
11:45 - 12:00	106	111	217

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	117	97	214
12:15 - 12:30	115	126	241
12:30 - 12:45	115	96	211
12:45 - 01:00	144	138	282
01:00 - 01:15	133	178	311
01:15 - 01:30	132	129	261
01:30 - 01:45	101	120	221
01:45 - 02:00	127	115	242
02:00 - 02:15	140	95	235
02:15 - 02:30	141	122	263
02:30 - 02:45	139	123	262
02:45 - 03:00	113	153	266
03:00 - 03:15	118	118	236
03:15 - 03:30	151	122	273
03:30 - 03:45	164	122	286
03:45 - 04:00	140	163	303
04:00 - 04:15	136	137	273
04:15 - 04:30	142	154	296
04:30 - 04:45	167	137	304
04:45 - 05:00	122	149	271
05:00 - 05:15	150	128	278
05:15 - 05:30	146	113	259
05:30 - 05:45	153	113	266
05:45 - 06:00	116	108	224

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	109	124	233
06:15 - 06:30	108	108	216
06:30 - 06:45	108	80	188
06:45 - 07:00	119	107	226
07:00 - 07:15	116	81	197
07:15 - 07:30	87	105	192
07:30 - 07:45	96	92	188
07:45 - 08:00	67	57	124
08:00 - 08:15	64	55	119
08:15 - 08:30	46	61	107
08:30 - 08:45	87	50	137
08:45 - 09:00	54	45	99
09:00 - 09:15	53	50	103
09:15 - 09:30	42	38	80
09:30 - 09:45	31	52	83
09:45 - 10:00	41	29	70
10:00 - 10:15	38	35	73
10:15 - 10:30	30	36	66
10:30 - 10:45	26	31	57
10:45 - 11:00	34	22	56
11:00 - 11:15	28	15	43
11:15 - 11:30	14	19	33
11:30 - 11:45	19	14	33
11:45 - 12:00	19	16	35



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑			↑
Traffic Volume (vph)	0	0	729	0	0	658
Future Volume (vph)	0	0	729	0	0	658
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			12.0			12.0
Lane Util. Factor			1.00			1.00
Frt			1.00			1.00
Flt Protected			1.00			1.00
Satd. Flow (prot)			1863			1863
Flt Permitted			1.00			1.00
Satd. Flow (perm)			1863			1863
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	0	0	848	0	0	765
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	848	0	0	765
Turn Type			NA			NA
Protected Phases			2			4
Permitted Phases						
Actuated Green, G (s)			87.0			79.0
Effective Green, g (s)			87.0			79.0
Actuated g/C Ratio			0.46			0.42
Clearance Time (s)			12.0			12.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			853			774
v/s Ratio Prot			c0.46			c0.41
v/s Ratio Perm						
v/c Ratio			0.99			0.99
Uniform Delay, d1			51.2			55.0
Progression Factor			1.00			1.00
Incremental Delay, d2			29.4			29.1
Delay (s)			80.7			84.2
Level of Service			F			F
Approach Delay (s)	0.0		80.7			84.2
Approach LOS	A		F			F

Intersection Summary			
HCM 2000 Control Delay	82.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	190.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX E ARCHAEOLOGICAL INVENTORY SURVEY (AIS)

FINAL REPORT

Archaeological Inventory Survey Report In Support of the Waipilopilo Stream Bridge Replacement Project, Hauʻula Ahupuaʻa, Koʻolauloa District, Island of Oʻahu, Hawaiʻi

TMKs: (1) 5-4-002:022 por.; (1) 5-4-004:001 por. & 009;
(1) 5-4-017: por. 015–018 por. & 021–023

Federal Aid Project No. BR-083-1(57)

Prepared for:

Environmental Planning Solutions, LLC
945 Makaiwa Street
Honolulu, HI 96816

June 2016

PACIFIC CONSULTING SERVICES, INC.
720 Iwilei Road, Suite 424, Honolulu Hawaii 96817

FINAL REPORT
Archaeological Inventory Survey Report In Support of the
Waipilopilo Stream Bridge Replacement Project
Hauʻula Ahupuaʻa, Koʻolauloa District, Island of Oʻahu, Hawaiʻi
TMKs: (1) 5-4-002:022 por.; (1) 5-4-004:001 por. & 009; (1) 5-4-017:015–018 por. & 021–023
Federal Aid Project No. BR-083-1(57)

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June 2016

MANAGEMENT SUMMARY

On March 16 and 17, 2015, Pacific Consulting Services, Inc. (PCSI) conducted an Archaeological Inventory Survey (AIS) in support of the Waipilopilo Stream Bridge Replacement Project in Hauʻula Ahupuaʻa, Koʻolauloa District, Oʻahu Island, Hawaiʻi. The Area of Potential Effect (APE) consists of a 0.75 hectare (1.85 acres) area along Kamehameha Highway between Imua Place and Waikulama Street. Funding for the project (Federal Aid Project No. BR-083-1(57) came from both the Federal Highway Administration (FHWA) and the Hawaiʻi Department of Transportation (HDOT). In 2011, the Hawaiʻi State Historic Preservation Division (SHPD) determined that Waipilopilo Stream Bridge is eligible for listing to both the Hawaii Register of Historic Places (HRHP) and the National Register of Historic Places (NRHP), and the replacement or widening of the bridge would be an adverse effect on this historic property (6 October 2011; Log No. 2011.2252, Doc. No. 1109MA08). Currently the bridge is not listed on either the HRHP or the NRHP.

This project has been determined to be an undertaking due to the use of Federal funds and thus is subject to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. All work has been done in accordance with the Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation, and in accordance with the Archaeological Inventory Survey Plan (AISP) prepared for the project (O'Hare et al. 2014), which was reviewed and accepted by the SHPD on January 16, 2014 (Log No. 2013.6297, Doc. No. 1312NN05). Pursuant to Hawaii Revised Statutes (HRS), Chapter 6E and Hawaii Administrative Rules (HAR), Subtitle 13 (State Historic Preservation Division Rules), the project was conducted in compliance with Chapter 276 (Rules Governing Standards for Archaeological Inventory Survey and Reports), and Chapter 275 (Rules Governing Procedures for Historic Preservation Review for Governmental Projects Covered Under Sections 6E-8, HRS).

Subsurface testing consisted of the excavation of five (5) backhoe trenches. No evidence of the previously documented cultural deposit designated as State Inventory of Historic Places (SIHP) Site No. 50-80-05-4795 (Site 4795) or any additional traditional Hawaiian or Historic subsurface archaeological deposits or features were encountered during the AIS excavations. Site 4795 was previously identified during an earlier AIS (Masterson et al. 1997) and was assessed as significant under Criteria d and e (incorrectly recorded as D and E) in Masterson et al. (1997), and re-affirmed as significant under both criteria in Masterson et al. (1998). The current AIS recovered two late historic artifacts and one vertebra from a medium mammal, probably *Canis familiaris*. Both finds lack contextual integrity for designation as a site, but nonetheless contribute information about the land history of the area and about the types of cultural remains associated with earlier residences in the area.

The presence of the subsurface archaeological deposits associated with Site 4795 and a native Hawaiian burial that has since been disinterred and re-interred elsewhere, both of which were identified by Masterson et al. (1997), indicate potential exists for buried historic properties to be encountered during the Waipilopilo Bridge Replacement project. It is anticipated that Site 4795 will be encountered as shallow as 30 cmbs (12 inches) on the east side (*makai* side) of the highway during construction excavations associated with the pedestrian pathway and bridge replacement. Based on this high potential for encountering subsurface deposits of Site 4795 and additional burials, full-time, on-site archaeological monitoring is recommended during future ground disturbing activities that extend 30 cm (12 inches) or more below ground surface on the east side of Kamehameha Highway and in the vicinity of the existing Waipilopilo Stream Bridge within the project's APE (Area of Potential Effect).

The Waipilopilo Stream Bridge is a historic property identified within the APE, and SHPD made the determination that the demolition of this historic property would be an “adverse effect” requiring mitigation. SHPD requested (incorrectly) either bridge design drawings (HABS II) or preparation of new measured drawings (HABS I) (6 October 2011; Log No. 2011.2252, Doc. No. 1109MA08). Architectural mitigation involved preparation of a Historic American Engineering Record (HAER) study which was completed by Mason Architects, Inc. (MAI) for this bridge (Ruzicka 2015). The National Park Service (NPS) reviewed the HAER, assigned a HAER number (HI-124), and approved this study.

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INTRODUCTION

Under contract to Environmental Planning Solutions, LLC (EPS), Pacific Consulting Services, Inc. (PCSI) has completed an Archaeological Inventory Survey (AIS) in support of Federal Aid Project No. BR-083-1(57), Waipilopilo Stream Bridge Replacement Project in Hauʻula Ahupuaʻa, Koʻolauloa District, Oʻahu Island, Hawaiʻi. The Archaeological Inventory Survey consisted of the mechanical excavation of five (5) test trenches with a backhoe. This work was conducted prior to the proposed ground disturbing activities that would include construction of a temporary bypass bridge upstream of Waipilopilo Bridge, construction of a temporary pedestrian bridge downstream of the bridge, and replacement of the existing bridge. This project has been determined to be an undertaking due to the use of Federal funds and thus is subject to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. The archaeological work completed for this project, including the current AIS has been done in accordance with the Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation, and in accordance with Hawaii Revised Statutes (HRS), Chapter 6E, and the following chapters of Title 13 of the Hawaii Administrative Rules (HAR), Subtitle 13 (State Historic Preservation Division Rules):

- Chapter 275: Rules Governing Procedures for Historic Preservation Review for Governmental Projects Covered Under Sections 6E-8, HRS.
- Chapter 276: Rules Governing Standards for Archaeological Inventory Survey and Reports

In addition, the AIS investigations were completed in accordance with the Archaeological Inventory Survey Plan (AISP) prepared for the project (O'Hare et al. 2014), which was reviewed and accepted by the SHPD on January 16, 2014 (Log No. 2013.6297, Doc. No. 1312NN05).

PROJECT LOCATION AND AREA OF POTENTIAL EFFECT

Waipilopilo Bridge spans Waipilopilo Gulch on Kamehameha Highway. Figure 1 shows the project area location between Imua Place and Waikūlama Streets in Hauʻula Ahupuaʻa, Koʻolauloa District, on the northeast coast of Oʻahu. The project is at milepost 20.96 on the highway and includes the Tax Map Key (TMK) parcels listed in Table 1 and illustrated in Figure 2. The highway right-of-way (ROW) is State of Hawaiʻi land. The area of potential effect (APE) for the project is the approximately 1.85 acre (0.75 hectare [ha]) footprint that includes the bridge, the pedestrian and vehicle detour routes, and the staging area.

Table 1. List of TMKs in the APE.

TMK	OWNER
5-4-002:022, 5-4-017:017, 5-4-017:022, & 5-4-017:023	State of Hawaii
5-4-004:001 & 5-4-017:016	North Shore Estate LLC
5-4-004:009	Howard J. Pacheco and Sarah K. Pacheco
5-4-017:015 & 5-4-017:018	City and County of Honolulu
5-4-017:021	Marcelina D. Rabaino

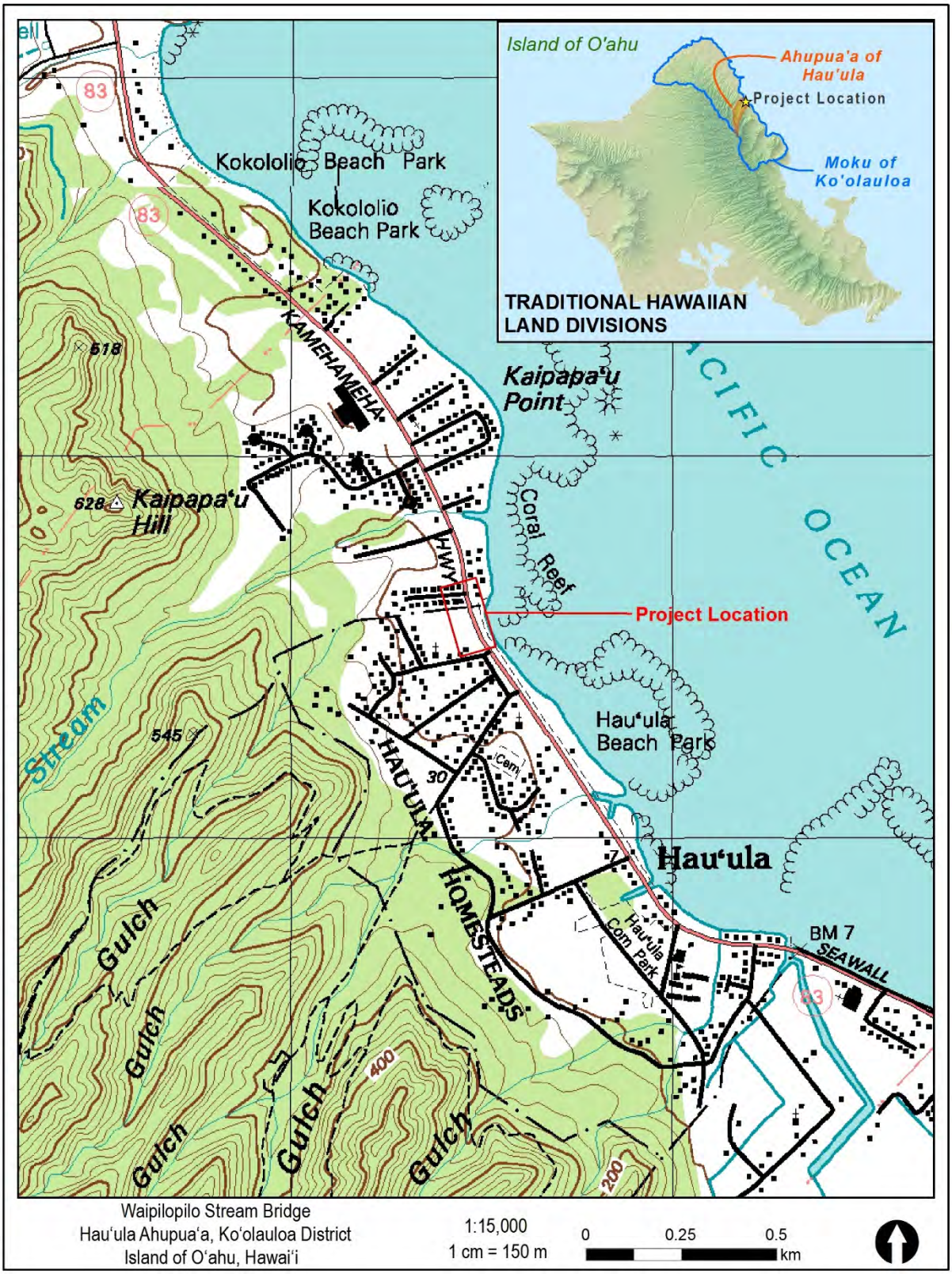


Figure 1. Project Location Shown on USGS 7.5-minute Hau'ula and Kahana Topographic Quadrangles (1998a,b).



Figure 2. APE and TMKs Displayed on Satellite Imagery.

The staging area is accessed via an unmaintained road in TMK (1) 5-4-004:001 and is situated on a portion of TMK (1) 5-4-017:016. Recent archaeological survey and testing resulted in no significant findings in the latter parcel (O'Day 2014). It was determined by the State Historic Preservation Division that no further work is needed at this time (Lebo 2014); therefore, archaeological testing for this project was limited to the east portion of the APE along Kamehameha Highway.

SCOPE OF WORK

The Waipilopilo Bridge is being replaced because it is functionally obsolete and structurally deficient (O'Hare et al. 2014:1). The bridge replacement project involves four main activities, the locations of which are illustrated in Figure 3:

1. Staging area related activities;
2. Construction of a temporary bypass bridge upstream of Waipilopilo Bridge as a detour for vehicle traffic;
3. Construction of a temporary pedestrian bridge downstream of the bridge as a detour route for foot and bicycle traffic; and
4. Replacement of the existing bridge with a new bridge that meets or exceeds current Federal Highway Administration (FHWA) and American Association of State Highway and Transportation Officials (AASHTO) standards.

The new single-span bridge will measures approximately 41.0 feet (ft) (12.5 meters [m]) long and 40 ft (12.2 m) wide. It will be made of pre-cast, pre-stressed solid planks with a composite concrete topping. Two water lines are attached to the existing bridge. These will be moved to the sides of the new bridge. The proposed staging area is in a privately own parcel on the west side of the project area.

Funding for the project comes from both the FHWA (Federal Aid Project No. BR-083-1(57) and the Hawai‘i Department of Transportation (HDOT). Land jurisdiction for the project area is both private and state (HDOT and the Department of Land and Natural Resources [DLNR]).

PROJECT OBJECTIVE

The objective of the archaeological testing was to determine if known or previously unknown significant historic properties were present within the project area. An historic property is defined as "…any building, structure, object, district, area, or site…which is over fifty years old" (HAR §13-279-2; see also HAR §13-275-2, §13-276-2, and §13-277-2). Following HAR §13-275-6, historic properties are considered significant if they "possess integrity of location, design, setting, materials, workmanship, feeling, and association and…meet one or more of the following criteria:

(a) Associated with events that have made an important contribution to the broad patterns of our history;

(b) Associated with the lives of persons important in our past;

(c) Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value;

(d) Have yielded, or is likely to yield, information important for research on prehistory or history; or

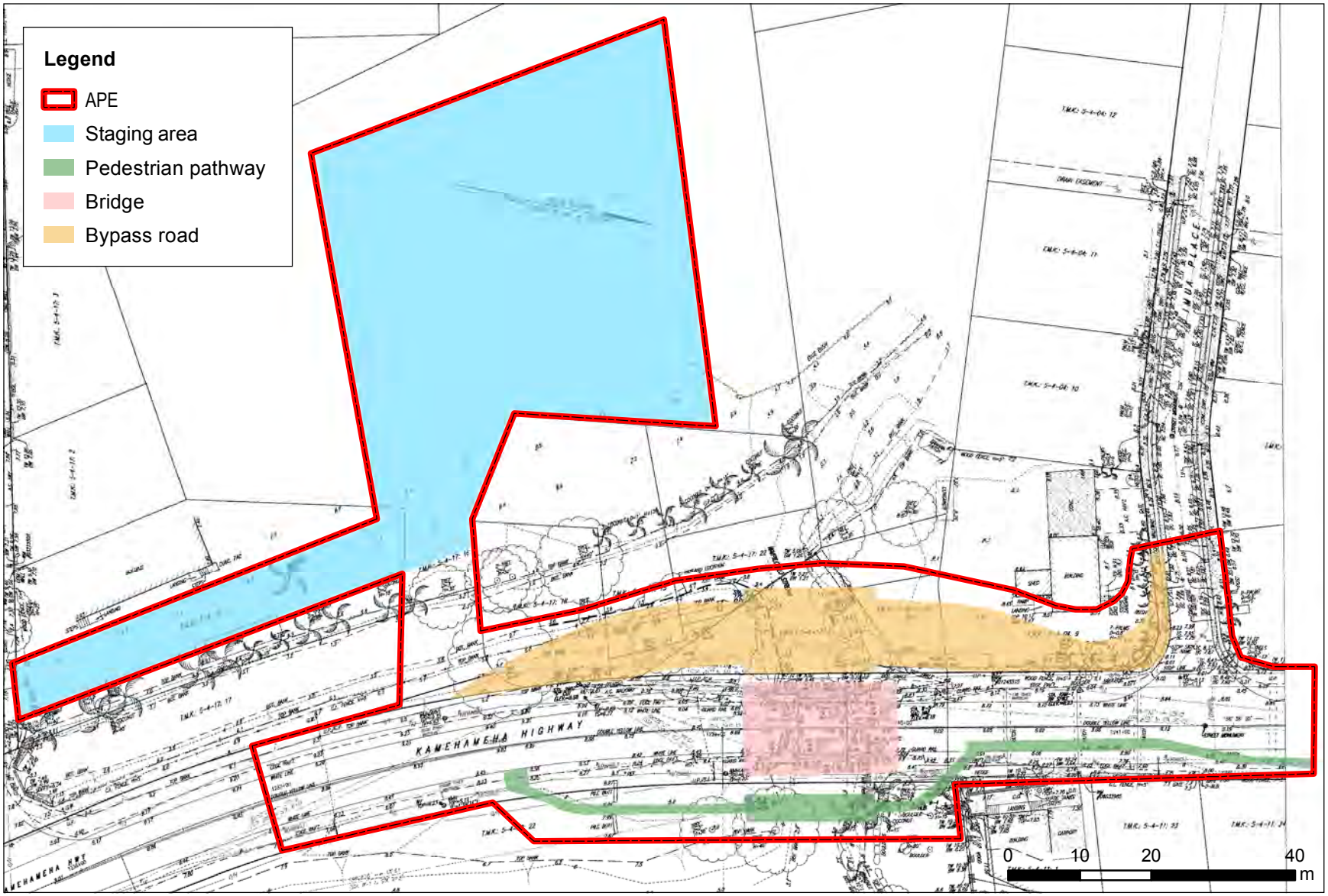


Figure 3. Locations of Bridge Replacement Project Related Activities Displayed on Topographic Map (Environmental Planning Solutions 2015).

(e) Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity (HAR §13-275-6).

For a significant historic property to be eligible for the Hawaii register, it must possess the "quality of significance in Hawaiian history, architecture, archaeology, and culture, which is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association," and meet the following criteria:

(A) Associated with events that have made a significant contribution to broad patterns of our American or Hawaiian history;

(B) Associated with the lives of persons significant in our past;

(C) Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(D) Have yielded, or may be likely to yield, information important in prehistory or history (HAR §13-198-8).

For a significant historic property to be eligible for the National Register, a property must possess "integrity of location, design, setting, materials, workmanship, feeling, and association," and meet one or more of the following criteria:

A. Associated with events that have made a significant contribution to the broad patterns of our history;

B. Associated with the lives of significant persons in or past;

C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. Have yielded or may be likely to yield, information important in history or prehistory (National Park Service 1991).

ENVIRONMENTAL BACKGROUND

The study area is situated in the *ahupua'a* of Hau'ula, which extends from the coast to the ridge of the Ko'olau Mountain range. The toponym Hau'ula is derived from the Hawaiian name for *Hibiscus tiliaceus*, or *hau*, and translates literally as "red *hau*" (Pukui et al. 1974:80). *Hau* is an indigenous species of hibiscus that blooms yellow in the summer, then turns red by the time the blossom falls to the ground (Clark 2001:95, O'Hare et al. 2014:12). Many of the physical features mentioned in the following section are depicted in Figure 4.

PHYSICAL SETTING

The project area's built environment includes Waipilopilo Bridge, Kamehameha Highway, utility infrastructure, and single-family residences. The Waipilopilo Stream Bridge was constructed in 1932 by L.L. McCandles. It is a one-span reinforced concrete deck girder structure that crosses Kamehameha Highway (Route 83) between Imua Place and Waikūlama

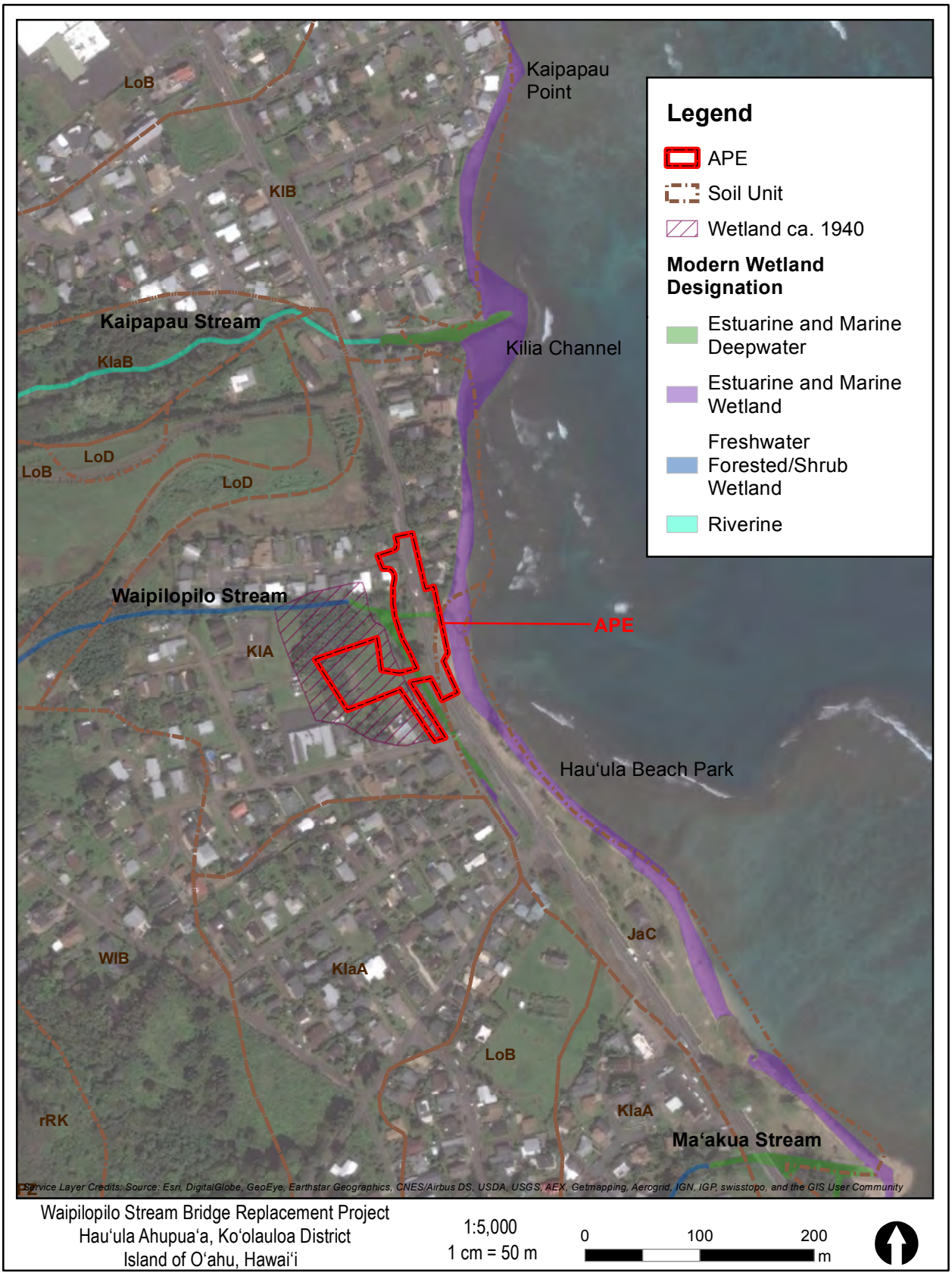


Figure 4. Soil Units, Wetlands, and Other Physical Features Near the APE.

Street (Thompson 1983:VII:145 in O'Hare et al. 2014:9). The bridge measures 7.6 m (25 ft) long and approximately 8.5 m (28 ft) wide. On the west side of the bridge there is a wooden walkway (O'Hare et al. 2014:9).

Hauʻula Beach Park is east and south of the project area. Maʻakua Stream flows along the south border of the park to the ocean. At the mouth of the stream there is a *muliwai* (a pond of brackish standing water) because of a sand bar blocking flow to the sea. Waipilopilo Stream ("very stagnant water" [Pukui et al. 1974:227]), is a minor stream usually not depicted on maps. During the dry season the water becomes stagnant and vegetation may rot in pools causing a stench. North of the beach park is Kilia Channel. According to the source *Hawaiʻi Place Names*, *kilia* is a type of wave and this is a popular surfing break, currently known as "Suddenlys" (Clark 1977:192).

The shore and the sea adjacent to the project area is called Wahi o Pua ("small-fry place") (Sterling and Summers 1978:161). Offshore there is a partially artificial reef known as Pāpua ("small-fry fence") that according to legend was built by the *menehune* (a legendary small race of Hawaiian builders) (Sterling and Summers 1978:161). In 1835, coral blocks from the reef were used to construct Lanakila Church in Hauʻula (Thrum 1918:78), which is now the site of Hauula Congregational Church, located less than 200 m (656 ft) west of the project area.

Based on historic maps, the project area is situated on former marsh land. During an archaeological investigation in 2014, a local resident, Mr. Randy Tausinga, was interviewed concerning recent land use. Mr. Tausinga stated that the area was previously swamp, or wetland, that connected with Waipilopilo Stream, and that it was filled in the 1990s (O'Day 2014:14).

TOPOGRAPHY AND SOILS

The project area is situated in a moderately sloping to level area approximately 1.5 to 3 m (4.9 to 9.8 ft) above mean sea level (amsl). Soil units found in the vicinity of the project area are displayed in the previously referenced Figure 4. Soils include Kawaihapai clay loam (KIA) (6–12 percent slopes) and Jaucas sand (JaC) (2-6 percent slopes). The Kawaihapai series (KIA) consists of well-drained soils that formed in alluvium derived from basic igneous rock in humid uplands (Soil Survey Staff 2015). These soils are typically found in drainage-ways and alluvial fans of coastal plains. Historically the soils were used for irrigated sugarcane. The natural vegetation for this soil type includes *kiawe* (*Prosopis pallida*), feather fingergrass (*Chloris virgata*), bristly foxtail (*Setaria verticillata*), lantana (*Lantana camara*), *koa-haole* (*Leucaena glauca*), bermudagrass (*Cynodon dactylon*), and guava (*Psidium guajava*).

The Jaucas series are found on vegetated beach areas along the shore. These soils formed in calcareous sand deposits. They are very deep, excessively drained, and have very rapidly permeability (Soil Survey Staff 2015). Areas containing these soils are typically used for recreation and as marine wildlife refuges. Vegetation consists of sea grape (*Coccoloba uvifera*), coconut (*Cocos nucifera*), and other xerophytic and salt-tolerant plants.

RAINFALL AND VEGETATION

Annual rainfall in this part of windward Oʻahu averages about 1632.7 millimeters (mm) (64.28 inches [in]) per year, with most rain falling in the winter months between November and March (Giambelluca et al. 2013). The project area is in a developed environment that includes manicured exotic grasses, casuarina (*Casuarinaceae equisetifolia*) and false *kamani* (*Terminalia catappa*) trees along the roadway, and landscaping around residential houses that consists of native and non-native plants and trees.

HISTORICAL BACKGROUND

This section presents the ethno-historical and archaeological background information for the project area. Previous archaeological research in the study area is reviewed along with recorded sites. The reader is referred the background section of the Work Plan for a broader historical review of the region (O'Hare et al. 2014:12–56).

TRADITIONAL HISTORY

The project area is situated near an area traditionally known as Helumoa, or "chicken scratch" (Sterling and Summers 1978:161). The name Helumoa may refer to the stealing of chickens by the Hawaiian pig god, Kamapua'a (Thrum 1918:77). It is also suggested in Thurman (2014) that the place name refers to animals disturbing agricultural fields, which is based on Kamakau's writings: "The patches must not be trodden upon, lest nesting places be made for caterpillars and cutworms; and chickens must not be allowed to scratch there" (Kamakau 1976:27).

A traditional Hawaiian myth, or *mo'ōlelo*, associated with coastal Hau'ula is that of Halemano. In this myth, Hau'ula is mentioned multiple times as a landing place. Fornander (1919) recounts how Kumukahi, the brother of Halemano's abducted lover Kamalalawalu, traveled from Puna on Hawai'i Island and landed in Hau'ula. On the shore he saw the image of Malaekahana, which enticed him to stay:

> In this flight to Oahu, one canoe, the one in which was Kumukahi, landed at Hauula, Koolauloa. There was at this place an image standing, Malaekahana by name; upon seeing this image, Kumukahi took such a fancy to it that he remained there [Fornander 1919:236].

Halemano and Laenihi, his supernatural sister, went to Hau'ula at the request of Kamalalawalu and took Kumukahi back to Hawai'i. At a later point in time, Halemano and his family were fleeing from the army of Aikanaka and they "traveled to the Kolekole stream; from this place they proceeded to Waialua; then to Laiewai; then to Hau'ula and from there on to Kualoa, Kahaluu and Moelana" (Fornander 1919:238).

Later, Halemano was married to Kikeka'ala, after Kamalalawalu left to go to the King of Puna. He became dissatisfied in his relationship with his new wife, and he decided to leave Hawai'i and return to O'ahu (Fornander 1919:258). He was reunited with Kamalalawalu. Fornander offers the following account:

> From Waikolu Halemano next touched at Kailua, Oahu; and from this place continued on to Kualoa at the Kaoio point; then on to Hauula; then to Malaekahana; then Laiewai; then Waialua; and then to the Kaena point at Waianae where he staid. Kamalalawalu, on the other hand, after leaving Molokai, landed at Waikiki; then from this place she next landed at Ewa; then at Pokai; and from this place she continued on to Kauai, landing at Wailua where she staid.
>
> Halemano in the meantime also set out and he too landed at Wailua, where he met Kamalalawalu and had a friendly talk, but their living together was not harmonious as before. Kamalalawalu therefore returned with a sad heart. She then took a canoe and set out from Kauai and landed at Kaena Point; from this place she continued on her way to Waialua. From there she journeyed to Kahuku; then to Hauula; and then to Kualoa, where she met Waiahole, a chief of that place who was a single man. He took Kamalalawalu as his wife and they resided there together [Fornander 1919:260].

Hauʻula is also an important place in the story of why *hilu* fish area striped. According to Wetervelt's account[1], two fish, which were canoes filled with men, set off from Tahiti. They arrived at Makapuʻu on the north coast of Oʻahu and one traveled south and the other north. The north bound canoe, or fish, stopped at Hauʻula where it was caught and prepared as food. The second "fish" circled the island and landed at Kahuku where it turned itself into men to search on land for the lost companion. Being unsuccessful in their quest, they stopped at the village of Kahuku. During a feast, portions of the fish caught at Hauʻula were served to the men who recognized their companion. According to Westervelt:

> They could not partake of the feast, but by kindliness and strategy they managed not only to decline the invitation, but also to secure some portions of the flesh to carry down to the sea. These were thrown into the water, and immediately came to life. They had the color of blood as a reminder of the death from which they had been reclaimed. Ever after they bore the name "Hilu-ula," or "the red Hilu" [Westervelt 1915:143–144].

From this legend comes the taboo that red *hilu* fish may only be eaten cooked, while blue *hilu* fish may be eaten raw.

TRADITIONAL LAND USE

At the time European explorers arrived to Oʻahu, there were extensive *loʻi* (irrigated terrace) across the floodplain of Hauʻula, and the area supported a large population. This was possible because of the abundant arable land, fresh water, and good fishing grounds in this portion of Koʻolauloa (Handy et al. 1991:271). Handy (1940) describes the area as follows:

> The flats along the coast in Hauʻula were once all in terraces, irrigated by the valley's five streams. . . There are the remains of a few small terrace sections in the interior of Makua. A number of small wet taro plantations are still under continuous cultivation between Papale and Makua Streams. Some of the old terraces between these streams, just inland from the highway, were being rehabilitated in 1935 [Handy 1949:91].

Further supporting Handy's description of dense population in the *ahupuaʻa* of Hauʻula is the number land claims made in the mid-1800s. These claims were for *loʻi*, *kula* (field), and *pahale* (house lot), following the traditional Hawaiian settlement pattern. Permanent residences were found on the coast, agricultural fields were situated in the lowlands and the base of the Koʻolau mountain range, and forest resources were available for gathering in the uplands and mountain region (O'Hare et al. 2014: 22).

During the 1930s, McAllister documented archaeological sites in Hauʻula that included two *heiau* (temple). More recent archaeological investigations have documented traditional Hawaiian burials and cultural deposits, with limited radiocarbon dating conducted. In the current project area, a sample from a cultural deposit at SIHP Site 4794 yielded calibrated date ranges of AD 1800–1910 and 1690–1730 (Masterson et al. 1999). Approximately .6 km (.37 miles) north of the current project area, materials from a cultural deposit (SIHP Site 1430) yielded date ranges of 1804–1939 and AD 1805–1937 (Elmore and Kennedy 2001).

HISTORIC PERIOD

There are few early accounts of Koʻolauloa Distict during the early historic period. In 1826, the missionary Levi Chamberlain traveled around Oʻahu inspecting English language schools and communities. After passing from Lāʻie Wai to Lāʻie Maloʻo, he walked two hours to reach Hauʻula. Here he found:

[1] Another account can be found in Pukui and Curtis 1994.

> . . . 108 persons assembled to repeat the kanawai. The head man of Hauula conducts the school which unites the people of this land and Kaipapau and adjoining land – He teaches the scholars the kanawai, Baptiso and Pule, and would instruct them in the Ka Be A Ba but has no books [Chamberlain 1826:15-16].

Two years later he again traveled around the island, this time reversing his route. When arriving at Hauʻula he found two schools. He recorded the following description:

> From Makao we passed on to Hauula and examined two schools one of which consisted of sandal wood cutters from the mountains and exhibited on the slate. The scholars wrote down the alphabet both the capital and small letters; the letters were not very accurately formed; but the disposition to learn was commendable, and with a view of encouraging to persevere, I gave each of them a spelling book [Chamberlain 1956:35].

Missionary records from 1832 calculated the population of Koʻolauloa to have been 2,891 (Schmitt 1977:3,12). This low figure likely reflects population decline occurring in previous years due to disease and out-migration (O'Hare et al. 2014:25). In the subsequent years the population showed an overall decreasing trend through 1878 when it reach 1,082 persons (Schmitt 1977:12–13). It should be noted that Mahele records most likely understate the earlier population of Hauʻula (O'Hare et al. 2014:25).

The 1848 Mahele introduced private property into Hawaiian society (Kamakau 1991:54). At this time, Kauikeaouli, Kamehameha III, relinquished authority over the land, while designating some land as crown lands and the remainder as government, *konohiki* (land agent for the *aliʻi* [chief]), or *kuleana* (commoner) land. A Board of Commissioners to Quiet Land Titles was established to oversee the process, which required the Hawaiian chiefs and *konohiki* to present their claims to the Land Commission. In return they were granted awards for the land quit-claimed to them by Kamehameha III. The remaining unclaimed land was then sold publicly, "subject to the rights of the native tenants" (Chinen 1958:29). The new western system of ownership resulted in many losing their land. Often claims would be made for discontiguous cultivated plots with varying crops, but only one parcel would be awarded.

Kauikeaouli, Kamehameha III, retained the entire *ahupuaʻa* of Hauʻula as crown land (Board of Commissioners 1929:27). With the Kuleana Act of 1850 that granted individual *kuleana* lots, 35 of 43 claims were granted in the *ahupuaʻa* of Hauʻula (O'Hare et al. 2014:22). A majority of these Land Commission Awards (LCA) were clustered in the south half of the *ahupuaʻa* between today's Homestead Road and the coast. Near Waipilopilo Bridge, four awards were granted, which are presented in Table 2. The LCAs in the current project area consisted of *pahale* and *loʻi*. Claim denials in Hauʻula may have been the result of pigs uprooting crops. For example, C.G. Hopkins, the King's Lands Agent, denied Land Claim 8591 to Koekoe because the areas "were entirely without signs of cultivation" (Land Commission 1846:28). It has been speculated that the large population of pigs in Hauʻula was related to their sale at Honolulu Harbor, which may have been more profitable than cultivating taro (O'Hare et al. 2014:24).

Beginning in the 1850s, Chinese immigrated to Hawaiʻi as contract workers (Char and Char 1988:25). In Hau'ula the laborers worked in rice fields, the locations of which are illustrated in Figure 5. At Waipilopilo in 1900, approximately 6.5 ha (16 acres) were cultivated in rice adjacent to the current project area. Other features in the vicinity include an irrigation ditch and an artesian well.

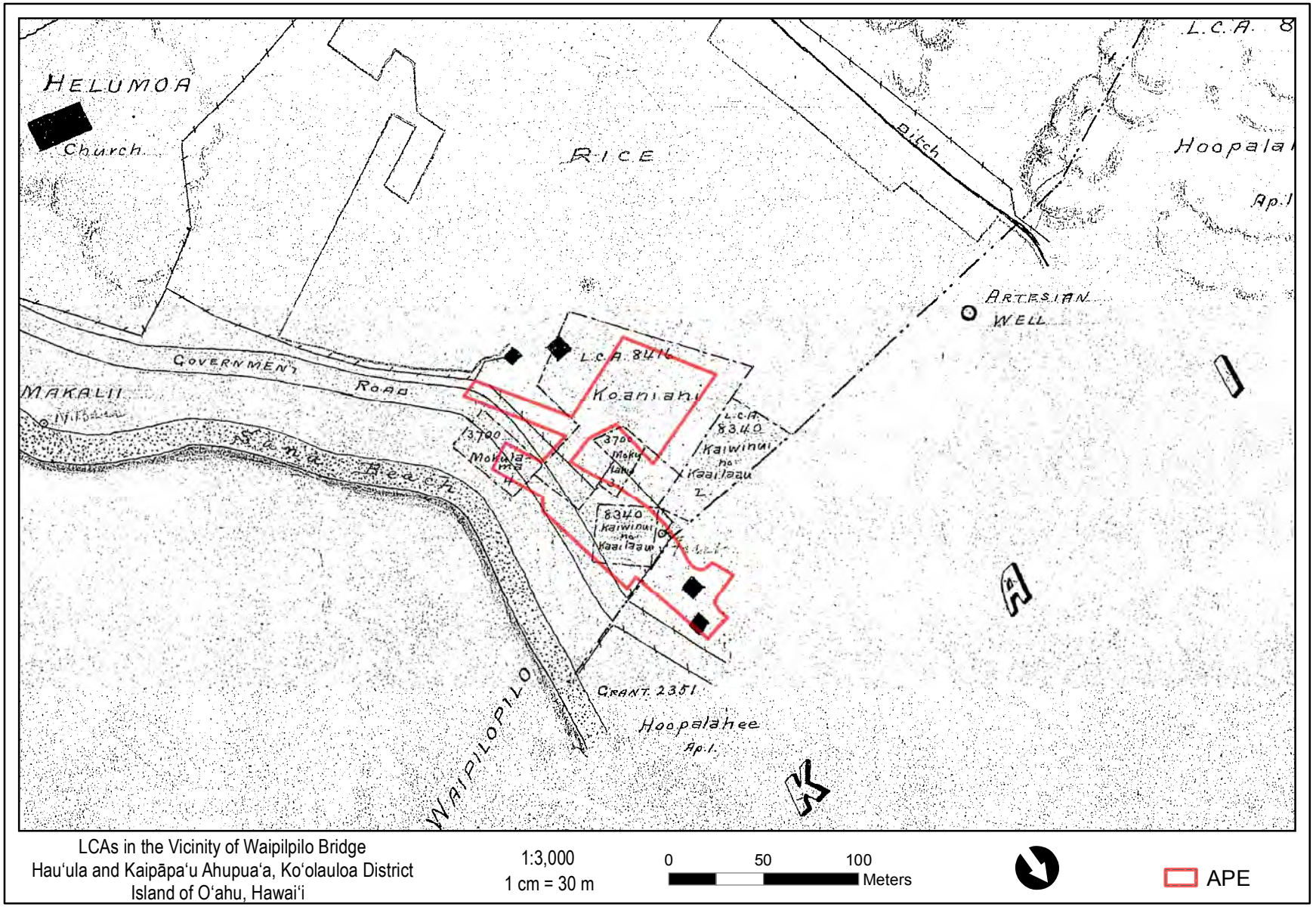


Figure 5. Portion of Hauʻula Map Dating to 1900 Showing Approximate Location of Current APE (Monserrat 1900).

Table 2. LCAs in the Vicinity of the APE (O'Hare et al 2014:Table 1).

CLAIMANT	LCA	ʻĀPANA	AHUPUAʻA	ʻILI	DESCRIPTION
Mokulama	3700	1	Kaipapau	-	*ʻĀina kula* totaling 6 acres
		2	Hauʻula	-	Three *loʻi* totaling 0.78 acres
		3	Hauʻula	Waipilopilo	One *loʻi* totaling 0.15 acres
		4	Hauʻula	Waipilopilo	*Pahale* totaling 0.25 acres
Hoʻopalahe	8171	1	Kaipapau	Kalaipahoa *moʻo* (garden)	Four *loʻi*, *kula ʻāina*, and *pahale* totaling 22 acres
		2	Hauʻula		Two *loʻi* totaling 0.75 acres
Kaiwinui	8340	1	Hauʻula		*Pahale* totaling 0.25 acres
		2	Hauʻula		Three *loʻi* totaling 0.48 acres
Koaniani	8416	1	Hauʻula	Waipilopilo	Six *loʻi*, one *pahale* totaling 1.80 acres

Another change in the 1850s was the establishment of the Protestant mission in Hauʻula. The Lanakila Church was constructed soon afterward using stone from Wahi o Pua (the off-shore enclosure) and coral mixed with lime (Thrum 1918:78). Services were discontinued in 1897 when the church's Reverend departed and a smaller church was erected in a more populous area of Hauʻula using materials from Lanakila. Consequently, the church was left in ruins. In 1926, a new building was constructed, however, remnants of the orginal church, along with the graveyard, are still present (Kugle 1991:15; O'Hare et al. 2014:27).

In 1884 a Homestead Act was passed that allowed settlement on public lands. Land was surveyed and divided into parcels of two to 20 acres in dry, or *kula*, land and two or less acres in wet, or taro, land (Thrum 1890:120). One lot was allowed per person, or two if one was dry and the other wet land. Cost was 10 dollars for the application and the quarterly rent or interest in advance. Additionally:

> By this agreement, the applicant is allowed to occupy the lot for five years free from taxes for the same, on condition that he build a dwelling house upon it within one year, and fence it within two years, and pay quarterly in advance, the quarterly interest of the purchase price at ten per cent., and at the end of the five years pay the purchase price or the unpaid balance of it in full, or deliver a mortgage to secure his note for the unpaid balance with interest [Thrum 1890:120].

In Hauʻula, 37 homestead lots were established for "natives who have long been residents on the land" (Executive and Foreign Office 1900 in Thurman 2014:45). The lots and roads were delineated in the lowlands of Hauʻula during a survey in 1900, which can be seen in Figure 6. Near Waipilopilo Bridge was the 7.12 acre Lot 12 (Land Grant 5656) of Abraham K. Kekai (misspelled as Kahai on the map).

At the end of the 19th century in Hauʻula, agricultural land was slowly converted to residential and commercial development parcels. The Kahuku Plantation Company, the Koolau

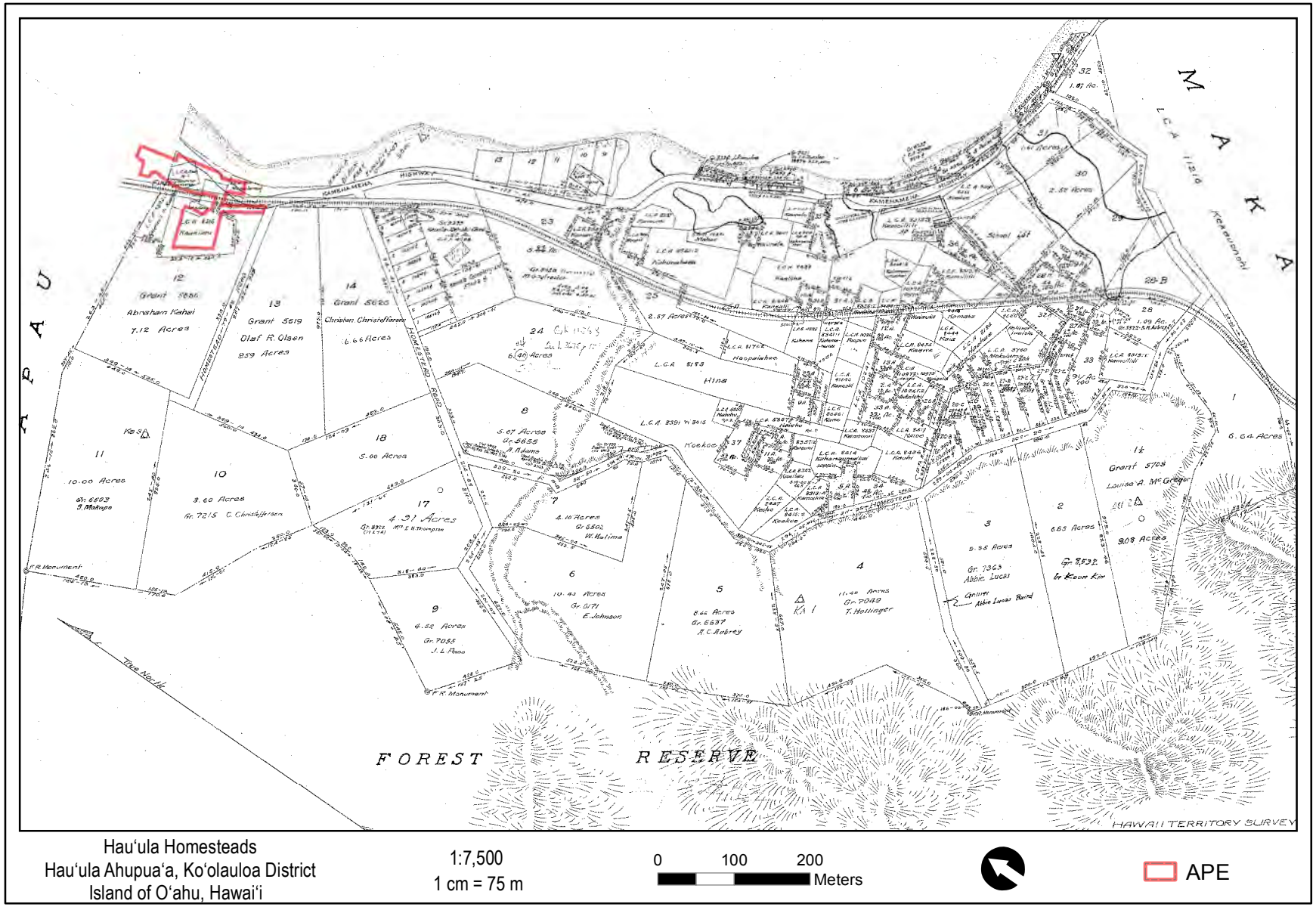


Figure 6. Map of Hau'ula Homestead Lots Showing Current APE (Wall 1914).

Railway Company, and the Waiahole Water Company all operated in Koʻolauloa in the early 1900s. Koolau Railway Company built 11 miles of railroad track, which passed through the current project area. The development of the rail was seen as a boon for windward agriculture, which is described in a newspaper article from 1908:

> The completion of the first eleven miles of the new Koolau railroad has already had a wonderfully stimulating effect on the agricultural activity of the windward side of Oahu and when the line is continued from Kahana, the present terminus, to Heeia, that entire section will be brought into a state of agricultural possibility as healthy as any portion of the islands. This completion is promised by the end of the present year, at which time automobile stages will be put on between Heeia and Honolulu and tourists and others will be brought within easy reach of Oahu and enabled to make a comfortable and cheap one day trip around the island.
>
> What the building of this railroad is going to mean for the Koolau District is shown to a certain extent at present, plans being well under way for the opening of thousands of acres of land for cane planting, for the cultivation of rubber trees, for the planting of pineapples on a large scale, for the planting of experimental patches of cotton, for transplanting thousands of coconut palms for the manufacture of copra, for putting in upland rice, for the raising of manioc for starch, and for the cultivation of lesser branches of the possible diversified farming industries [Hawaiian Gazette 1908].

In Thrum's *Hawaiian Annual* from 1911, Hauʻula is described as "a station of growing importance" along the railway (Thrum 1910:132). The location of the former station is unknown, but it is possible that the train stop was at Helumoa, where the Congressional Church is located (O'Hare et al. 2014:33). The route of the rail line can be seen in Figure 7 on a map dating to 1928–1929. It was operational in the 1940s when major roadway construction increased (Thurman 2014:52). Although the railway passed through the current project area, no evidence of the tracks has been encountered.

Kamehameha Highway was built in 1932, as was Waipilopilo Bridge. Construction was carried out under Lincoln Loy McCandless, a businessman and owner of a construction company (O'Hare et al. 2014:34). A topographic map dating to 1936, shown in Figure 8, illustrates the project area surround by wetland. Two decades later, the number of houses increased in the vicinity and the wetland was no longer present, which is illustrated on a 1956 topographic map in Figure 9.

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

Several archaeological investigations have been conducted in the vicinity of the current project area. Previous work, summarized in Table 3, has included archaeological literature review and field inspection, inventory survey, testing, and monitoring. Three instances of the discovery human remains have also occurred. The following section focuses on projects conducted within 0.5 km (0.31 miles) of the current study area in order to compare previous findings of land use. These previous investigations and recorded sites are illustrated in Figure 10.

A reconnaissance survey was carried out by the Bishop Museum (Riford 1984) for the Shell Oil Company property located 0.35 km (0.22 miles) southeast of the current project area. No historic properties were identified, likely due to previous grading in the parcel.

Archaeological testing was conducted for the Kaipaupau Look Relief Drain Project at a parcel located 0.37 km (0.23 miles) north of the current project area. A letter report prepared by DLNR/Division of State Parks (Smith 1987) states that no historic properties were identified during testing.

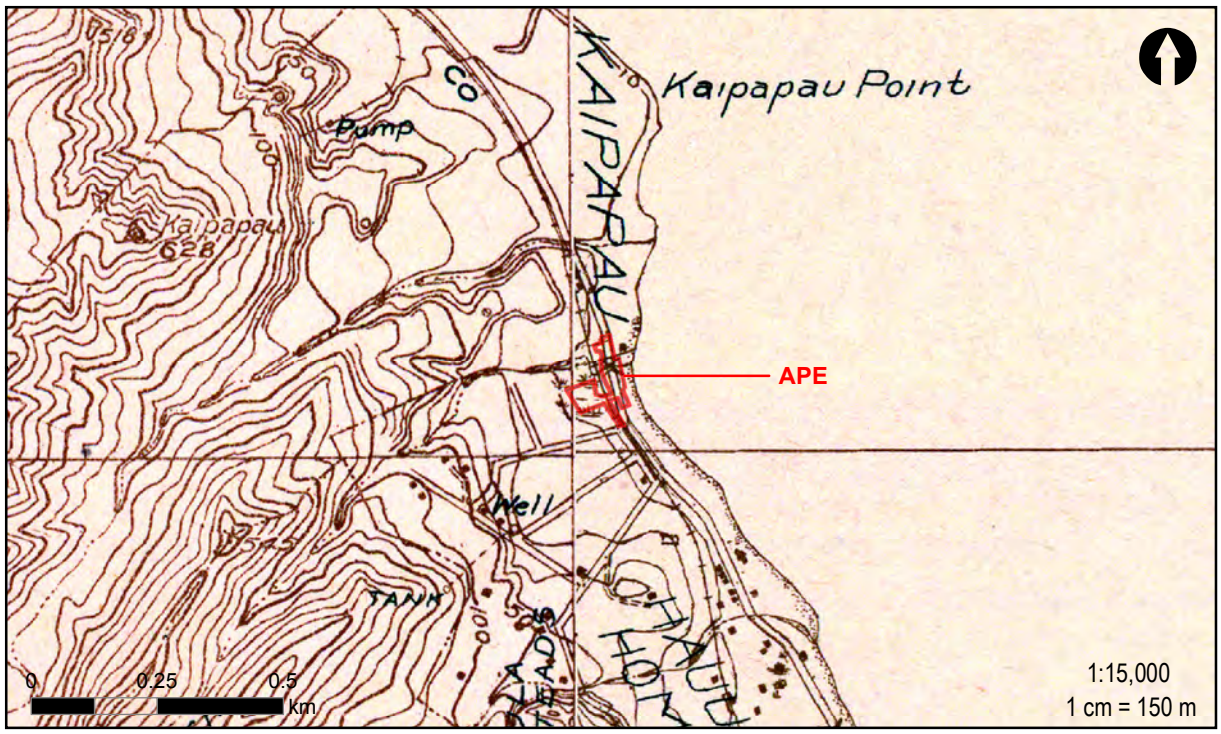


Figure 7. 1928–1929 Topographic Map Showing Railway Line in the APE (USGS 1928, 1929).

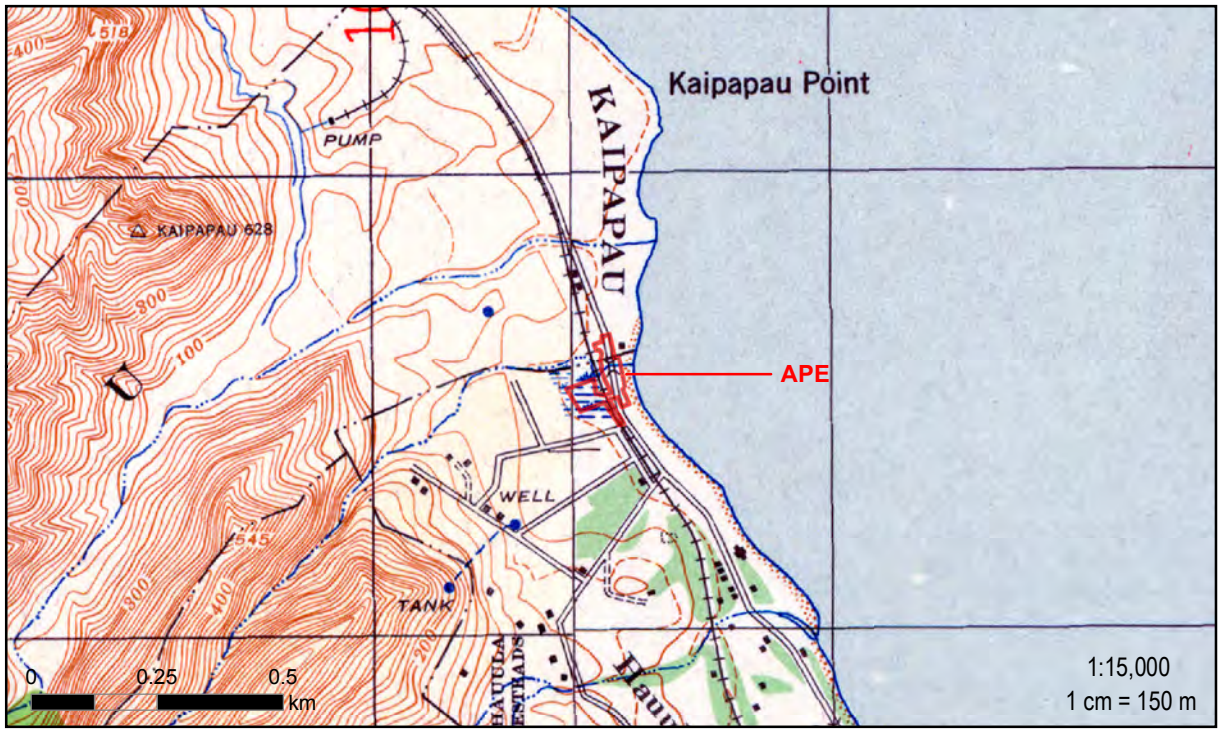


Figure 8. 1936 Topographic Map Showing Wetlands in the APE (USGS 1936a,b).

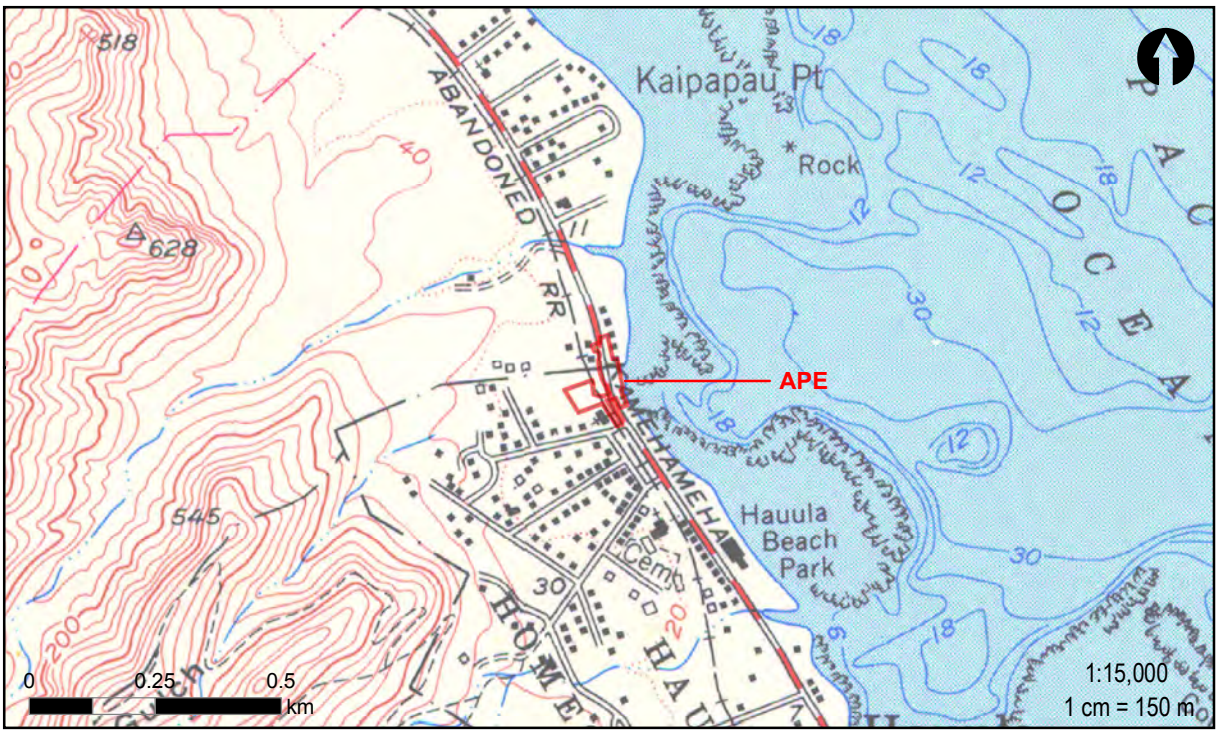


Figure 9. 1953–1954 Topographic Map Showing New Development in the APE (USGS 1953, 1954).

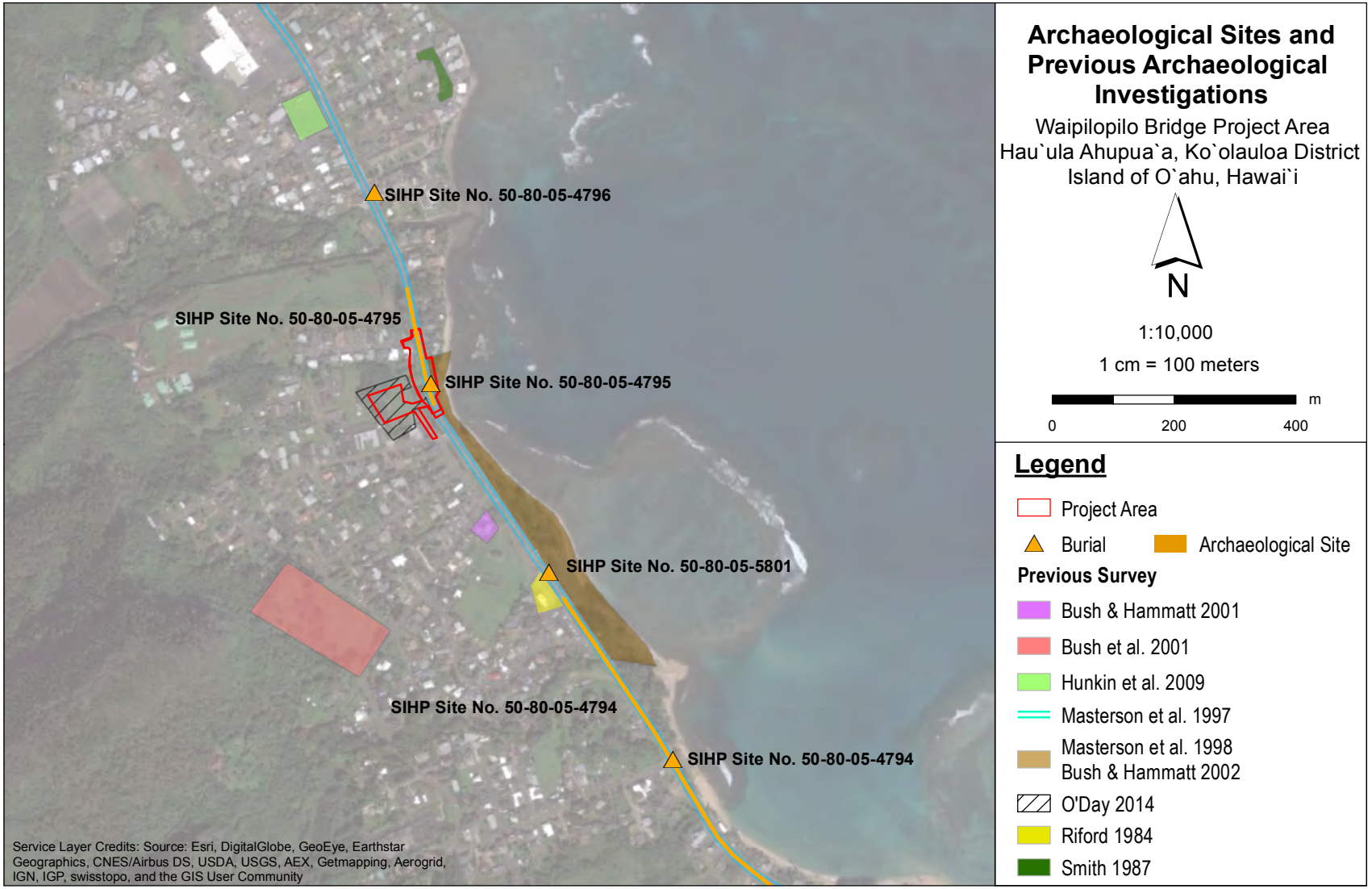


Figure 10. Known Archaeological Sites and Previous Archaeological Investigations Near the Project Area.

Table 3. Previous Archaeological Investigations and SIHP Sites near the Project Area.

Author Year	TMK(s)	Nature of Study	SIHP[1] No. 50-80-05-	Results
Riford 1984	5-4-002:008	Archaeological Reconnaissance	-	No significant findings.
Smith 1987	5-4-012:various	Archaeological Testing	-	No significant findings.
Masterson et al. 1997	5-3-012–016; 5-4-001, 003, 004, 009, 010–012, & 018; 5-5-001 & 0 02	Archaeological Monitoring	4796 4795 4794	Human burial. Cultural deposit and associated human burial; burial removed and reinterred at Hau'ula Congregational Church Cemetery. Cultural deposit and associated human burial.
Masterson et al. 1998	5-4-002:022	Archaeological inventory survey	-	No new sites recorded.
Bush and Hammatt 2001	5-4-002:012	Archaeological Monitoring	-	No significant findings.
Bush and Hammatt 2002	5-4-002:022	Archaeological Monitoring	5801	Inadvertently discovered human remains.
Bush et al. 2002	5-4-014:003	Archaeological inventory survey	-	No significant findings.
Hunkin et al. 2009	5-4-018:065	Literature review and field inspection	-	No significant findings.
Runyon et al 2013	5-4-002, 004, 011, & 017	Literature review and field inspection	-	Waipilopilo Bridge found to be a significant historic property.
O'Day 2014	5-4-017:016	Archaeological inventory survey	-	No significant findings.

[1]State Inventory of Historic Properties

Archaeological monitoring was carried out during ground disturbing actives related to a waterline project in coastal Koʻolauloa (Masterson et al. 1997). Excavations traversed the current project area. Stratigraphy revealed prior disturbance due to previous utilities excavations and road, highway, and bridge construction (Masterson et al. 1997:111). Nine archaeological sites comprising 44 significant localities were recorded. Three of these sites[2] are located in the vicinity of the current project area. These site boundaries are depicted in Figure 10; the boundaries are narrow because the water line trench in which they were found was excavated to a 2.0 m (6.5 ft) width. SIHP Site 4795 consists of a cultural layer that yielded traditional artifacts, midden, charcoal, and an associated human burial encountered below the cultural layer. The charcoal was not submitted for radiocarbon dating. The burial was removed and reinterred at the Hauʻula Congregational Church Cemetery (Masterson et. al 1998:27–28). Abundant midden materials and pre- and post-Contact artifacts were present. The cultural deposit and the burial were situated in a pocket of beach sand where Kawaihapai clay loam is typically found. The deposit averages 60 centimeters (cm) (24 in) thick south of the stream and 30 cm (12 in) thick north of stream, between approximately 30 (12 in) and 90 (36 in) cm below surface (cmbs). According to Masterson et al. (1999:13): “The sand pocket is probably associated with the naturally obtrusive point of Kaipapau, the stream action of Waipilopilo, and high-wave action moving up the stream mouth and bringing in sand.”

Site 4794 is located approximately 350 m (1,148 ft) south of the current project area. The site extends 300 linear meters (984 linear ft) and consists of a buried cultural deposit and a human burial (removed) in a pocket of beach sand. The site is discontinuous due to historic disturbances and the presence of Maʻakua and Hauʻula streams. The cultural deposit averaged 20 cm (8 in) thick, with a maximum thickness of 40 cm (16 in), and was encountered at 50 cmbs (20 in). The human burial originated in the Stratum II, a Jaucas Sand layer, and was intrusive into Stratum III, a sterile sand layer. Due to the nature of the project, only a two-meter-wide linear area was excavated. The horizontal extent of the deposit is unknown.

Another human burial was documented on the east side of Kamehameha Highway and north of Kaipapau Stream at 80 cmbs (32 in). The burial was left in situ and designated Site 4796.

During a subsequent inventory survey and subsurface testing in Hauʻula Beach Park (Masterson et al. 1998), no new sites were documented. Two trenches excavated near Site 4795 encountered an isolated charcoal deposit and no evidence of a continuous cultural deposit. The charcoal sample yielded a calibrated date range of A.D. 1390–1530. Additional test trenching through the beach park revealed extensive modern disturbance that likely impacted the layer where prehistoric or early historic cultural deposits would be present (Masterson et al. 1999:16). Generally, the parcel is dominated by sandy soils with some clay loams present closer to Kamehameha Highway.

Archaeological monitoring was carried out for development at the Hauʻula Base Yard located 0.2 km (0.12 miles) southeast of the current project area (Bush and Hammatt 2001). An alignment of six curbstones (historic chipped basalt blocks) was documented as possible remnants of the former Kahuku Railroad line. No other historic properties were encountered.

Archaeological monitoring for the proposed Hauʻula Beach Park expansion identified one historic property 0.3 km (0.18 miles) southeast of the current project area (Bush and Hammatt 2002). Site 5801 consists of previously disturbed human remains. The remains are most likely

[2] Previous reports reference these sites as SIHP Site No. 50-80-***06***-4794 and -4795, however, the sites are located on the Hauʻula quadrangle map, therefore, the site numbers should begin with SIHP Site No. 50-80-***05***-.

associated with a nearby LCA parcel and it is speculated that more human remains are present below fill layers in the beach park (Bush and Hammatt 2002:25).

Pedestrian survey was conducted for the proposed Hauʻula Fire Station at a parcel located 0.35 km (0.22 miles) southwest of the current project area (Bush et al. 2002). The entire area was previously bulldozed. No historic properties were recorded.

Literature review and field inspection were carried out for another proposed Hauʻula Fire Station location 0.35 km (0.22 miles) north-northwest of the current project area (Hunkin et al. 2009). The area was previously graded and no historic properties were observed.

In 2013, literature review and field inspection was carried out for the current project area (Runyon et al. 2013). It was determined that Waipilopilo Bridge is a significant historic property and the bridge was recommended for inclusion on the Hawaiʻi Register. It was recommended that an archaeological inventory survey be conducted prior to construction of the new bridge to identify and document subsurface deposits. Additionally, an archaeological monitoring program was suggested depending upon the results of the inventory survey.

Immediately west of the current project area, surface survey and subsurface testing was conducted on a 1.5 acre (0.6 ha) parcel (O'Day 2014). No evidence of traditional Hawaiian or historic deposits or features was encountered during the mechanical excavation 166 linear meters (544 linear feet) of trench. Soil stratigraphy indicates the area was extensively graded and modified in the modern period (O'Day 2014:33).

PREVIOUS GEOTECHNICAL STUDIES IN THE PROJECT AREA

Sato and Associates Inc. explored subsurface conditions for the Waipilopilo Bridge Replacement Project by drilling and sampling borings (Sato and Associates Inc. 2012). The boring locations are displayed in Figure 11 and results are summarized in Table 4. Boring samples primarily displayed silty sandy soils.

ANTICIPATED FINDS

Previous archaeological investigations and historical records indicate that traditional Hawaiian settlement in Hauʻula Ahupuaʻa occurred along the coast, with intensive agriculture along the streams dissecting the coastal floodplain, and dryland agriculture in the upland areas. The current project area is situated along the coast where LCA documents and archaeological evidence indicate house lots and *loʻi* were present.

Kuleana land claims in the vicinity of the project area were clustered adjacent to the fresh water sources at Waipilopilo, Kaluakaua, Maʻakua, and Hauʻula Streams. These were mainly comprised of *loʻi*, interspersed with houses. By the mid-twentieth century these lands had developed into residential parcels, including the Hauʻula Homesteads. In the vicinity of the current undertaking, impacts from urbanization include the construction of the Kamehameha Freeway, Waipilopilo Bridge, and residential streets.

Two historic properties have been identified in the project area, including a buried cultural deposit with an associated human burial (Site 4795) and the Waipilopilo Stream Bridge. The previous documentation of these resources indicate a high possibility for encountering the Site 4795 cultural deposit and additional associated human burials. The Waipilopilo Stream Bridge, constructed in 1932 by L.L. McCandles, was one of seven bridges built under Federal Aid Project (FAP) No. 1D, and is a one-span reinforced concrete deck girder structure (Ruzicka 2015). It is a good example of early twentieth century workmanship (O'Hare et al. 2014). An Historic American Engineering Record (HAER) study was conducted by Mason Architects, Inc. (MAI) for this bridge, and was recently submitted separately from this AIS report. The National

Park Service (NPS) reviewed the HAER, assigned a HAER number (HI-124), and approved this study in July, 2015.

Table 4. Results of Samples from Exploratory Boring Holes in the Project Area.

Boring No.	Depth (m)	Description
1	0–.76	Silty Sand
	.76–2.13	Clayey Silt
	2.13–7.92	Silty Sand
	7.92–14.63	Sandy Silt
	14.6–22.25	Clayey Silt
	22.25–33.22	Cobbles and Boulders and Clayey Silt
	33.22–37.18	Clayey Silt
	37.18–42.67	Cemented Silt
2	0–1.22	Silty Sand
	1.22–6.7	Silty Sand
	6.7–23.47	Sandy Silt
	23.47–39.93	Clayey Silt
	39.93–42.06	Cobbles and Boulders
3	0–2.13	Silty Sand
	2.13–3.66	Silty Gravel
	3.66–9.3	Sandy Silt
4	0–2.13	Silty Sand
	2.13–3.5	Sandy Silt
	3.5–5.18	Silty Sand
	5.18–8.99	Sandy Silt



Figure 11. Locations of Boreholes 1–4 (Sato and Associates 2012).

METHODS AND PROCEDURES

The Archaeological Inventory Survey was conducted on March 16 and 17, 2015. Field work involved visually inspecting the ground surface in the immediate vicinity of the five (5) test trench locations and mechanical excavation of the trenches. All field activities were conducted in compliance with HAR §13-276 (Rules Governing Standards for Archaeological Inventory Surveys and Reports), as well as the AISP (O'Hare et al. 2014) for the project.

PROJECT PERSONNEL

Nicole I. Vernon, M.A. served as the Principal Investigator for the project, while Richard Nees, B.A. served as the Project Director. Stephan D. Clark, B.S., Keola Nakamura, B.A., and Katharine Shiroma, B.A. served as the archaeologists in the field.

FIELD METHODS

Archaeological field work consisted of subsurface testing with a backhoe. The following section describes the methods employed during the undertaking.

Subsurface Testing

The subsurface testing was guided by the AISP prepared by O'Hare et al. (2014). The locations of the five (5) backhoe trenches (Trenches 1 through 5) followed those previously determined in the AISP (O'Hare et al 2014). The purpose of the subsurface testing was to identify and document any subsurface archaeological deposits. Additionally, soil stratigraphy was recorded and assessed for potential subsurface cultural resources.

Prior to mechanical excavation, all native vegetation was flagged during pedestrian survey so that backhoe trenches could be oriented or moved for avoidance. Additionally, the ground surface in the immediate vicinity was inspected and the trench location was fagged by an archaeologist. Trench 1 was placed on the east side of Kamehameha Highway, within approximately 10-15 m (33-50 ft) of the former location of the burial associated with SIHP Site No. 50-80-06-4795. Trenches 2 and 3 were placed on the west side of Kamehameha Highway and south of the bridge, approximately 13-20 m (43-66 ft) west/southwest of the former location of the burial associated with SIHP Site No. 50-80-06-4795. Trenches 4 and 5 were placed within the yard of a private residence on the west side of Kamehameha Highway and north of the bridge, and 13-18 m (43-59) west of the cultural deposit associated SIHP Site No. 50-80-06-4795.

The archaeological monitors closely observed all excavations and examined the soils as they were removed. After the soil was removed, trench faces were examined for cultural material and/or subsurface features. Standard archaeological documentation was carried out, including to-scale maps (in this case using GPS), profile drawings, and photographs.

Backhoe excavations were conducted using a Case 580L Extendahoe backhoe with a 36-inch-wide bucket. Prior to each backhoe excavation, photographs were taken of the trench location. The orientation of the trench's long axis was documented in degrees Magnetic North (MN). Each backhoe excavation was monitored by two archaeologists to ensure that the excavation was halted if subsurface archaeological materials or features were encountered. The locations of backhoe trenches were recorded using a Trimble GeoExplorer 3 GPS unit.

Each trench was a minimum of 6.2 m (20.0 ft) long by 0.7 m (2.3 ft) wide and excavated down to coral reef or into the water table. At the base of excavation, one to three auger holes were excavated to examine underlying deposits, or determine the depth to the water table, with the exception of Trench 5 where auger testing was not possible.

After each trench excavation, at least one side of the trench was faced and cleaned with a trowel to facilitate examination of the stratigraphic sequence and determine the presence/absence of buried surface layers (buried A Horizons) containing archaeological materials and/or features. Representative profiles of the stratigraphic sequences observed in the backhoe trenches were designated as profile locales (PL). Documentation of representative stratigraphy included to-scale profiles, soil descriptions, and photographs. Soil samples of stratigraphic layers were collected to aid in stratigraphic descriptions. Fill deposits were designated as "Fill" with an appended uppercase alphabetic label, in order of stratigraphic position ("Fill A"), and intact stratigraphic layers were designated as "Layer" with an appended Roman numeral label in order of stratigraphic position ("Layer I"). Soils were described using United States Department of Agriculture Soil Conservation Service standards and a field manual for soil descriptions (Schoeneberger et al.1998). Soil characteristics described include color (Munsell Color Company 2000), texture, consistence, and lower boundary topography.

LABORATORY METHODS

Cultural materials encountered during excavations were collected and transported to the PCSI Archaeology Laboratory in Honolulu for further analysis. An inventory catalog was compiled and relevant attributes were identified and recorded. This involved measuring, weighing, and photographing materials as appropriate.

Documentation of a single historic glass artifact included manufacture method and diagnostic decorations. For glass bottles, method of manufacture is determined by mold seams, shape or form, color, and embossed lettering or designs identifying the product or the bottle maker.

A single ceramic artifact was classified in terms of the hardness of the "body" or "paste" from which the item was fashioned (e.g. earthenware pottery is permeable and must be covered by a glaze to be impervious to liquids [Worthy 1982:134-137]). The ceramic artifact was additionally described through form and function and decorative techniques. Ceramic maker's marks were not present on the fragment in the present assemblage.

A single faunal artifact collected was identified to the lowest possible taxa. Dimensional measurements and weight were also recorded.

DISPOSITION OF MATERIALS

All field records, maps, photographs, related documents, and artifacts are temporarily curated at PCSI's Archaeology Laboratory in Honolulu. Final disposition of these records and related materials will be determined in consultation with the land owner and State Historic Preservation Division (SHPD).

RESULTS

This section presents the results of fieldwork. No human skeletal remains were encountered, nor were any pre-Contact or traditional Hawaiian archaeological materials or features encountered during excavations. Additionally, no surface evidence of historic properties was present. However, historic and possibly recent artifacts were encountered, and representative specimens were collected and analyzed further. This section concludes with the presentation of laboratory analyses results.

SUBSURFACE TESTING AND STRATIGRAPHY

The following section presents a detailed description of the five (5) test trenches excavated. The locations of these excavations are shown in Figure 12 and a summary of the



Figure 12. Locations of Test Trenches and Profile Locales in Relation to Previously Documented SIHP Site No. 50-80-05-04795, a Cultural Deposit and Associated Burial (Masterson et al. 1997).

excavations is presented in Table 5. Stratigraphic sequences were documented for each of the five trenches. These locations were designated Profile Locales 1a, 1b, and 2–5 (PL-1a, PL1-b, PL-2 through PL-5). The locations of PL-1 through 5 are displayed in the previously referenced Figure 12 and Table 6 presents a summary of the stratigraphy by trench number and profile locale.

Table 5. Excavation Summary of Trenches 1–5.

Trench No.	Length (m)	Maximum Width (m)	Maximum Depth (cmbs)	Cultural materials	Profile Locale
1	6.5	0.7	175	Plastic and Aluminum	PL-1a & PL-1b
2	6.8	0.7	2.25	-	PL-2
3	6.8	0.7	2.8	One glass bottle & medium mammal vertebra, probably *Canis familiaris*	PL-3
4	6.2	0.7	2.15	Historic ceramic shard	PL-4
5	6.8	0.7	1.4	-	PL-5

Trench 1, Profile Locales 1a and 1b

Trench 1, shown in Figures 13 through 15, was oriented north-northwest/south-southeast (358°/158°), measured 6.5 m (21.3 ft) long by 0.7 m (2.3 ft) wide. During excavation of Trench 1, sediments in lower proveniences kept collapsing, creating an unsafe and unstable environment within the trench. Excavations in Trench 1 reached 140+ cmbs (55 in) with the backhoe. An auger hole was excavated from the bottom of the trench to determine the depth to the water table: it was reached at 175 cmbs (69 in). No archaeological material or features were observed. Only modern rubbish was encountered. Two stratigraphic profiles designated PL-1a and PL-1b were recorded in Trench 1.

PL-1a was recorded along the west face of the trench, and measured 1.5 m (4.9 ft) wide and 140 cmbs (4.6 ft). The profile documented two modern fill layers, Fill A (0–25 cmbs; 0-10 inches [in]) and Fill B (18–70 cmbs; 7-28 in), underlain by two in situ, non-cultural soil layers, Layer I (45–68 cmbs; 18-27 in) and Layer II (110–140+ cmbs; 43-55+ in). A piece of plastic and a piece of aluminum were observed at the interface of Fill A and B, indicating that the fill is modern. Figure 16 illustrates the stratigraphy observed at PL-1a.

PL-1b was recorded along the east face of the trench, and measured 1.4 m wide and documented four stratigraphic layers to a depth of 1.4 mbs. The profile documented one modern fill layer, Fill A (0–30 cmbs; 0-12 in), underlain by three in situ, non-cultural soil layers, Layer I (30–110 cmbs; 12-43 in), Layer II (95–115 cmbs; 37-45 in), and Layer III (98–140+ cmbs; 38-55+ in). Fill A is known to be modern because modern rubbish was present. Figure 17 illustrates the stratigraphy observed at PL-1b. A detailed description of the stratigraphy recorded in Trench 1, including PL-1a, PL-1b, and the auger testing results follow.

Table 6. Stratigraphic Layer Descriptions for Profile Locales.

PL No.	Trench No.	Fill or Layer	Depth Range (cmbs)	Mean Thickness (cm)	Layer Description	Interpretation
1a, b	1	Fill A	0–30	28	Brown (10YR 5/3, dry), loamy sand; loose, non-sticky, non-plastic; few, fine to coarse, interstitial and tubular roots; contains less than 5%, by volume, sub-rounded coral cobbles and pebbles; clear, wavy lower boundary; one piece of plastic.	Modern A Horizon
		Fill B	28–70	40	Dark brown (10YR 3/32, dry) loamy sand, loose, non-sticky, non-plastic; few, fine to coarse, interstitial roots; contained less than 5%, by volume, sub-angular basalt coral cobbles and pebbles; clear, wavy lower boundary; one piece of aluminum.	Modern fill
		Layer I	30–135	80	Pale yellow (2.5YR 7/4, dry) fine sand; loose, non-sticky, non-plastic; few, fine to coarse, interstitial roots; clear, wavy lower boundary; non-cultural.	Possible in situ Jaucas Series sand
		Layer II	95–140+	20	Dark yellowish brown (10YR 3/5, dry) clay loam; very friable, moderately sticky, slightly plastic; no roots; clear, wavy lower boundary; non-cultural.	In situ soil layer
		Layer III	98–140+	-	Very dark grayish brown (10YR 3/2, dry) sandy loam; very friable, slightly sticky, non-plastic; no roots; clear, wavy lower boundary when reached; non-cultural.	In situ soil layer
		Layer IV (Auger)	165–175+	-	Pale yellow (2.5YR 8/3, dry) coarse sand; loose, non-sticky, non-plastic; no roots; lower boundary not reached; non-cultural.	In situ marine sand
2		Fill A	0–30	25	Light olive brown (2.5YR 5/4, dry) loamy sand; loose, non-sticky, non-plastic; many, very fine to coarse roots; contains less than 5% sub-angular coral cobbles and pebbles; clear, smooth lower boundary.	Modern A Horizon
		Fill B	20–64	35	Very dark grayish brown (10YR 3/2, dry) clay loam; friable, moderately sticky, moderately plastic; few, very fine to fine roots; contained less than 5% sub-angular coral cobbles and pebbles; clear, smooth lower boundary.	Modern fill

PL No.	Trench No.	Fill or Layer	Depth Range (cmbs)	Mean Thickness (cm)	Layer Description	Interpretation
		Fill C	52–66	10	Strong brown (2.5YR 4/6, dry) silty clay loam; loose, very sticky, moderately plastic; few fine roots; contained less than 5% coral pebbles; clear, smooth lower boundary.	Modern fill
		Fill D	66–88	10	Very dark brown (10YR 2/2, dry) loamy sand; loose, non to slightly sticky, slightly plastic; common, very fine to fine roots; diffuse, smooth lower boundary.	Modern fill
		Fill E	73–98	18	Black (10YR 2/1, dry) loamy sand; loose; non-sticky, non-plastic; many, very fine to coarse roots; diffuse, smooth lower boundary.	Modern fill
		Layer I	94–150	50	Olive brown (2.5Y 4/3, dry) loamy sand; loose, non to slightly sticky, slightly plastic; few, fine to coarse roots; diffuse, smooth lower boundary; non-cultural.	In situ soil layer
		Layer II	134–174+	20	Dark olive brown (2.5Y 3/3, dry) loamy sand; loose, non to slightly sticky, slightly plastic; few, fine to coarse roots; diffuse, smooth lower boundary; non-cultural.	In situ soil layer
		Layer III	138–164	10	Very dark grayish brown (2.5Y 3/2, dry) loamy sand; loose, non to slightly sticky, slightly plastic; none; clear, smooth lower boundary; non-cultural.	In situ soil layer
		Layer IV	150–170+	20+	Olive (5Y 3/2, dry) loamy sand; loose, non-sticky, non-plastic; none; lower boundary not observed; non-cultural.	In situ soil layer
		Layer V (Auger)	220–225+	-	Very dark grayish brown (2.5Y 3/2, dry) loamy sand; loose, non-sticky, non-plastic; none; lower boundary not reached; non-cultural.	In situ soil layer
3	3	Fill A	0–24	20	Olive brown (2.5Y 4/3, dry) loamy sand; very friable, non-sticky, non-plastic; common, very fine to fine roots; contained less than 5% coral pebbles; diffuse, wavy lower boundary.	Modern A Horizon
		Fill B	14–68	42	Very dark grayish brown (2.5Y 3/2, dry) sandy clay loam; very friable, moderately sticky, moderately plastic; few, very fine to fine roots; contained less than 5% coral pebbles; diffuse,	Modern fill

PL No.	Trench No.	Fill or Layer	Depth Range (cmbs)	Mean Thickness (cm)	Layer Description	Interpretation
					smooth lower boundary; one historic glass bottle and tin can fragments.	
		Fill C	58–120	50	Black (10YR 2/1, dry) sandy loam; loose, slightly sticky, non-plastic; common, very fine to fine roots; clear, smooth lower boundary; one vertabra from a medium mammal, probably *Canis familiaris*.	Modern fill
		Layer I	108–160	40	Olive brown (2.5Y 4/3, dry) loamy sand; loose, non-sticky, non-plastic; few, very fine to fine roots; clear, irregular lower boundary; non-cultural.	In situ soil
		Layer II	142–160+ (Auger hole to 180)	-	Dark olive brown (2.5YR 3/3, dry) loamy sand; loose, non-sticky, non-plastic; none; lower boundary terminates at layer of cobbles and small boulders; non-cultural.	In situ soil
4	4	Fill A	0–55	50	Black (10YR 2/1, dry) fine sandy loam; loose, slightly sticky, slightly plastic; common, fine roots; contained less than 5% coral pebbles; abrupt lower boundary.	Modern A Horizon
		Soil pocket	50–98	10	Very dark grayish brown (2.5Y 3/2, dry) loamy fine sand; loose, non-sticky, non-plastic; very few, fine roots; abrupt lower boundary.	Modern fill
		SSF 1	48–198	45	Very dark grayish brown (10YR 3/2, dry) loamy sand; loose, non-sticky, non-plastic; common, fine to medium roots; abrupt lower boundary.	Modern fill
		Fill B	52–110	55	Brown (10YR 4/3, dry) loamy sand; loose, non-sticky, non-plastic; very few, very fine to fine roots; abrupt lower boundary.	Modern fill
		Fill C	104–156	42	Very pale brown (10YR 8/3, dry) loamy sand; loose, non-sticky, non-plastic; very few, very fine roots; abrupt lower boundary.	Modern fill
		Fill D	148–174	20+	Very dark grayish brown (10YR 3/2, dry) loamy sand; loose, non-sticky, non-plastic; none; lower boundary not reached.	Modern fill
		Layer I	174–215+ (Auger)	-	White (Gley 8/N8/) loamy sand; non-cultural.	In situ marine deposit

PL No.	Trench No.	Fill or Layer	Depth Range (cmbs)	Mean Thickness (cm)	Layer Description	Interpretation
5	5	Fill A	0–32	35	Very dark brown (10YR 2/2, dry) clay loam; friable when wet, moderately sticky, moderately plastic; common, very fine to fine roots; clear, wavy lower boundary.	Modern A Horizon
		Fill B	28–47	14	Dark gray (10YR 4/1, dry) silty clay; extremely friable when wet, moderately sticky, very plastic; none; diffuse lower boundary.	Modern fill
		SSF-2	40–124	-	Brown (7.5YR 4/2, dry) sandy clay loam; loose, slightly sticky, slightly plastic; none; lower boundary terminated at coral reef.	Septic tank fill
		Fill C	40–72	20	Very dark brown (10YR 2/2, dry) loamy sand; loose, non-sticky, non-plastic; none; diffuse, wavy lower boundary.	Modern fill
		Fill D	62–124	60	Dark olive (2Y 3/3, dry) loamy sand; loose, non-sticky, non-plastic; none; many, water-rounded basalt and coral cobbles and small boulders; diffuse, lower boundary terminated at coral reef.	Modern fill



Figure 13. Trench 1 at Start of Excavation, Facing Southwest.



Figure 14. Trench 1 During Excavation, Facing Northwest.



Figure 15. Trench 1, Excavation Terminated at Water Table, Facing South.

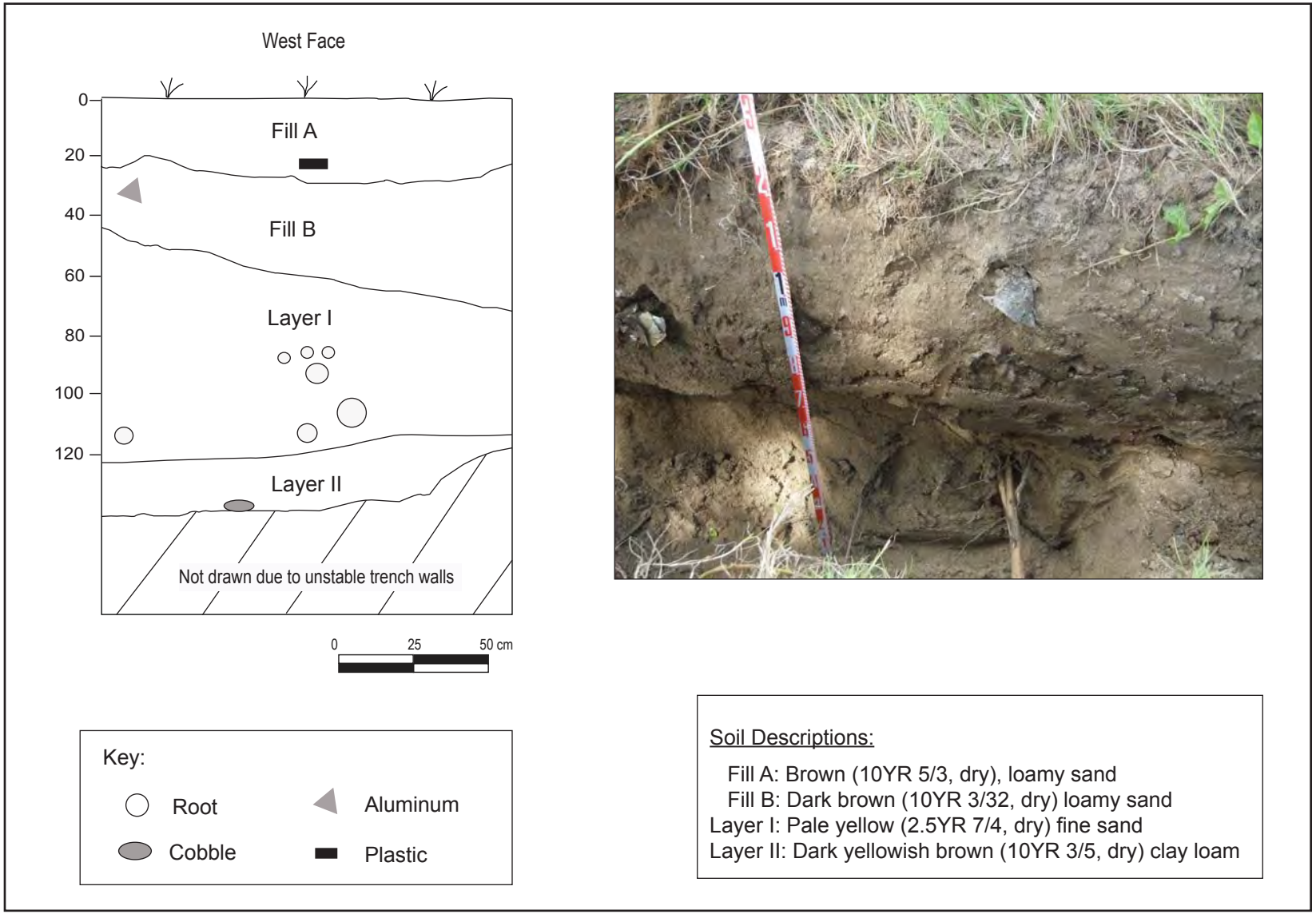
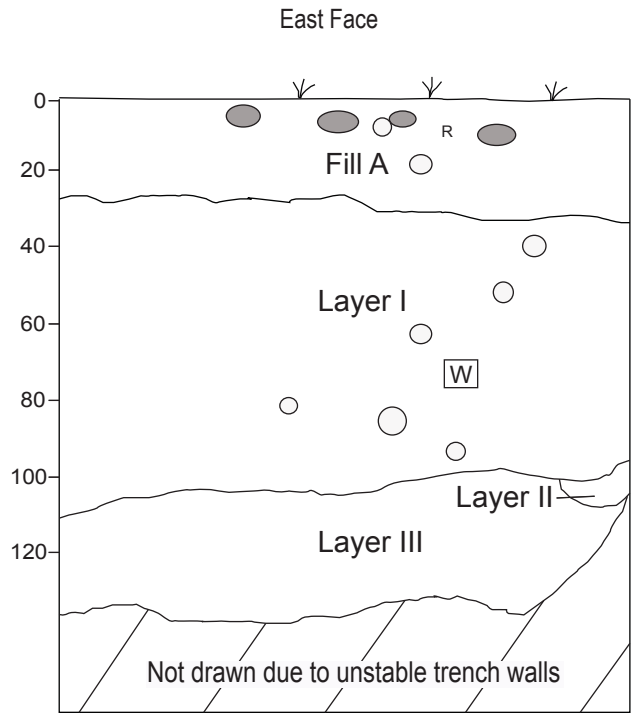


Figure 16. West Face of Trench Profile Locale 1-a, with Photograph.





Soil Descriptions:

Fill A: Brown (10YR 5/3, dry), loamy sand
Layer I: Pale yellow (2.5YR 7/4, dry) fine sand
Layer II: Dark yellowish brown (10YR 3/5, dry) clay loam
Layer III: Very dark grayish brown (10YR 3/2, dry) sandy loam

Figure 17. East Face of Trench 1 at Profile Locale 1-b, with Photograph.

Fill A

Fill A is a brown (10YR 5/3, dry) loamy sand. It contains approximately 5%, by volume, angular and subangular coral cobbles and pebbles. The Fill A matrix is non-sticky and non-plastic with common, very fine interstitial and tubular roots. The lower boundary is clear. Fill A deposits range from 0 to 30 cmbs (0 to 12 in); average thickness is 28 cm (11 in). The layer was not continuously present throughout the project area. Fill A directly overlies Fill B. Based on its stratigraphic position and color, Fill A is interpreted as an imported topsoil functioning as a modern A Horizon. One piece of plastic was present in Fill A at 22 cmbs (9 in).

Fill B

Fill B is a dark brown (10YR 3/3, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with very few, fine to coarse tubular roots. The Fill B matrix is non-sticky and non-plastic. The lower boundary is clear and smooth. Fill B deposits range from 28 to 70 cmbs (11 to 28 in); average thickness is 40 cm (16 in). Fill B directly overlies Layer I. One piece of aluminum was present at 30 cmbs (12 in). This layer is interpreted as a modern fill.

Layer I

Layer I is a pale yellow (2.5YR 7/4, dry) fine coral sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with very few, fine to coarse tubular roots. The Layer I matrix is non-sticky and non-plastic. The lower boundary is clear and smooth. Layer I deposits range from 30 to 135 cmbs (12 to 53 in); average thickness is 80 cm (32 in). Layer I directly overlies Layer II and III (see Figures 16 and 17). This layer is interpreted as in situ, non-cultural soil.

Layer II

Layer II is a dark yellowish brown (10YR 3/5, dry) clay loam. It contains less than 5%, by volume, angular coral cobbles and pebbles with no roots. The Layer II matrix is moderately sticky and slightly plastic. The lower boundary is clear and smooth. Layer II deposits range from 95 to 140 cmbs (37 to 55 in); average thickness is 20 cm (8 in). Layer II directly overlies Layer III. This layer is interpreted as an in situ, non-cultural soil.

Layer III

Layer III is a very dark grayish brown (10YR 3/2, dry) sandy loam. It contains less than 5%, by volume, angular coral cobbles and pebbles with no roots. The Layer III matrix is slightly sticky and non-plastic. The lower boundary was not reached. Layer III was recorded from 98 to 140+ cmbs (39 to 55+ in); average thickness is unknown. This layer is interpreted as an in situ, non-cultural soil.

Auger Testing

Excavation of one auger hole at the base of the trench revealed Layer IV, a pale yellow (2.5YR 8/3, wet) coarse sand. The water table was encountered at 175 cmbs (69 in). This layer is interpreted as an in situ, non-cultural marine sand.

Trench 2, Profile Locale 2

Trench 2, shown in Figures 18 and 19, was oriented northwest/southeast (316°/136°), measured 6.8 m (22 ft) by 0.7 m (2.3 ft) wide, and reached a maximum depth 170 cmbs (67 in) with the backhoe. An auger hole was excavated from the bottom of the trench to determine the depth of the water table: it was reached at 225 cmbs (89 in). No subsurface cultural features or materials were encountered. PL-2 was documented in Trench 2.



Figure 18. Trench 2 at Start of Excavation, Facing North.



Figure 19. Trench 2, Backfilling After Excavation, facing South.

The profile (PL-2) was recorded along the east face of the trench, and measured 2.0 m (6.6 ft) wide and 170 cmbs (67 in). The profile documented five layers of modern fill, Fill A (0–30 cmbs; 0-12 in), Fill B (20–64 cmbs; 8-25 in), Fill C (52–66 cmbs; 20-26 in), Fill D (66–88 cmbs; 26-35 in), and Fill E (73–98 cmbs; 29-39 in),underlain by four in situ, non-cultural soil layers, Layer I (94–150 cmbs; 37-59 in), Layer II (134–174+ cmbs; 53-69+ in), Layer III (138–164 cmbs; 54-65 in), and Layer IV (150–170+ cmbs; 59-67+ in). Fills A–E are known to be modern because the area was filled during the 1990s (O'Day 2014:14). Figure 20 illustrates PL-2, and a detailed description of the stratigraphy recorded and the auger testing results for Trench 2 follow.

Fill A

Fill A is a light olive brown (2.5Y 5/4, dry) loamy fine sand. It contains approximately 5%, by volume, angular and subangular coral cobbles and pebbles. The matrix is non-sticky and non-plastic with many, very fine interstitial and tubular roots. The lower boundary is clear and smooth. Fill A deposits range from 0 to 40 cmbs (0 to 16 in); average thickness is 35 cm (14 in). The layer was discontinuously present throughout the project area. Fill A directly overlies Fill B. Based on its stratigraphic position and color, Fill A is interpreted as an imported topsoil functioning as a modern A Horizon.

Fill B

Fill B is a very dark grayish brown (10YR 3/2, dry) clay loam. It contains less than 5%, by volume, angular coral cobbles and pebbles with few, very fine to fine interstitial roots. The matrix is moderately sticky and moderately plastic. The lower boundary is clear and smooth. Fill B deposits ranged from 20 to 64 cmbs (8 to 25 in); average thickness is 35 cm (14 in). Fill B directly overlies Fill C. This layer is interpreted as a modern fill.

Fill C

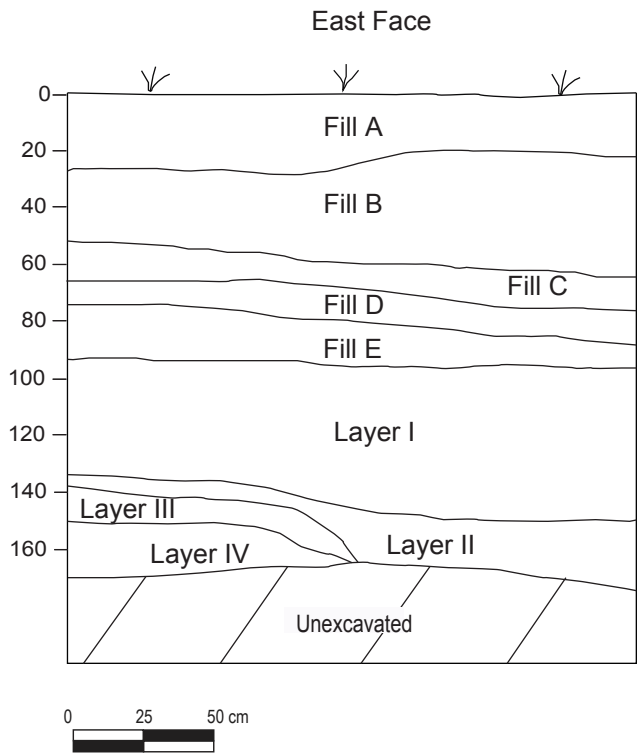
Fill C is a strong brown (2.5YR 4/6, dry) silty clay loam. It contains less than 5%, by volume, angular coral cobbles and pebbles with few, fine roots. The matrix is very sticky and moderately plastic. The lower boundary is clear and smooth. Fill C deposits ranged from 52 to 66 cmbs (20 to 26 in); average thickness is 12 cm (5 in). Fill C directly overlies Fill D. This layer is interpreted as a modern fill.

Fill D

Fill D is a very dark brown (10YR 2/2, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with common, very fine to coarse tubular roots. The matrix is non-sticky and non-plastic. The lower boundary is diffuse and smooth. Fill D deposits ranged from 66 to 78 cmbs (26 to 31 in); average thickness is 16 cm (6 in). Layer IV directly overlies Layer V. This layer is interpreted as a modern fill.

Fill E

Fill E is a black (10YR 2/1, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with many, very fine to coarse roots. The matrix is non-sticky and non-plastic. The lower boundary is diffuse and smooth. Fill E deposits ranged from 73 to 94 cmbs (29 to 37 in); average thickness is 15 cm (6 in). Fill E directly overlies Layer I. This layer is interpreted as an in situ, non-cultural soil.





Soil Descriptions:

Fill A: Light olive brown (2.5YR 5/4, dry) loamy sand
Fill B: Very dark grayish brown (10YR 3/2, dry) clay loam
Fill C: Strong brown (2.5YR 4/6, dry) silty clay loam
Fill D: Very dark brown (10YR 2/2, dry) loamy sand
Fill E: Black (10YR 2/1, dry) loamy sand

Layer I: Olive brown (2.5Y 4/3, dry) loamy sand
Layer II: Dark olive brown (2.5Y 3/3, dry) loamy sand
Layer III: Very dark grayish brown (2.5Y 3/2, dry) loamy sand
Layer IV: Olive (5Y 3/2, dry) loamy sand

Figure 20. East Face of Trench 2 at Profile Locale 2, with Photograph.

Layer I

Layer I is an olive brown (2.5Y 4/3, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with few, fine to coarse roots. The matrix is non-sticky and non-plastic. The lower boundary is diffuse and smooth. Layer I deposits ranged from 94 to 150 cmbs (37 to 59 in); average thickness is 46 cm (18 in). Layer I directly overlies Layer II. This layer is interpreted as an in situ, non-cultural soil.

Layer II

Layer II is a strong brown (2.5Y 4/6, dry) silty clay loam. It contains less than 5%, by volume, angular coral cobbles and pebbles with few, fine roots. The matrix is non-sticky and non-plastic. The lower boundary is diffuse and smooth. Layer II deposits ranged from 134 to 170 cmbs (53 to 67 in); average thickness is 15 cm (6 in). Layer II directly overlies Layer III. This layer is interpreted as an in situ, non-cultural soil.

Layer III

Layer III is a very dark grayish brown (2.5Y 3/2, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with no roots. The matrix is non-sticky and non-plastic. The lower boundary is clear and smooth. Layer III deposits ranged from 138 to 164 cmbs (54 to 65 in); average thickness is 8 cm (3 in). Layer III directly overlies Layer IV. This layer is interpreted as an in situ, non-cultural soil.

Layer IV

Layer IV is an olive (2.5Y 3/2, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with no roots. The matrix is non-sticky and non-plastic. The lower boundary was not reached. Layer IV deposits were encountered from 150 cmbs (59 in) to the base of excavation at 170 cmbs (67 in); average thickness is 18 cm (7 in). Layer IV directly overlies Layer V, which was documented during auger testing. This layer is interpreted as an in situ, non-cultural soil.

Auger Testing

One auger hole excavated at the base of the trench revealed Layer V, a very dark grayish brown (2.5Y 3/2, wet) loamy sand. The excavation encountered the water table at 225 cmbs (89 in). This layer is interpreted as an in situ, non-cultural soil.

Trench 3, Profile Locale 3

Trench 3, shown in Figures 21, 22, and 23, was oriented approximately north/south (340°/160°), measured 6.8 m (22.3 ft) long by 0.7 m (2.3 ft) wide, and reached a maximum depth of 160 cmbs (63 in) with the backhoe. Three auger holes, evenly spaced, were excavated from the base of Trench 3 to determine the depth of the water table. The auger holes were terminated at a depth of 180 cmbs (71 in) due to the presence of coral cobbles and small boulders. One glass bottle was recovered from Fill B and one vertebra from a medium mammal, probably *Canis familiaris*, were recovered from Fill C. Aluminum can fragments were observed in Fill B but not collected. PL-3 was documented in this trench.

The profile (PL-3) was recorded along the east face of the trench, and measured 1.2 m (4 ft) and 160 cmbs (63 in). The profile documented three layers of modern fill, Fill A (0–24 cmbs; 0-9 in), Fill B (14–68 cmbs; 6-27 in), and Fill C (58–120 cmbs; 23-47 in), underlain by two in situ, non-cultural soil layers, Layer II (108–160 cmbs; 43-63 in), and Layer III (142–160+



Figure 21. Trench 3 at Start of Excavation, Facing South.



Figure 22. Trench 3 After Excavation, Facing East.



Figure 23. Trench 3 During Backfilling, Facing South.

cmbs; 56-63+ in). Fills A–C are known to be modern because the area was filled during the 1990s (O'Day 2014:14). Figure 24 illustrates PL-3, and a detailed description of the stratigraphy recorded and the auger testing results for Trench 3 follow.

Fill A

Fill A is an olive brown (2.5Y 4/3, dry) loamy sand. It contains approximately 5%, by volume, angular and subangular coral cobbles and pebbles. The matrix is non-sticky and non-plastic with common, very fine to fine interstitial and tubular roots. The lower boundary is diffuse and wavy. Fill A deposits ranged from 0 to 24 cmbs (0 to 9 in); average thickness is 20 cm (8 in). Fill A directly overlies Fill B. Based on its stratigraphic position and color, Fill A is interpreted as an imported fill functioning as a modern A Horizon.

Fill B

Fill B is a very dark grayish brown (2.5Y 3/2, dry) sandy clay loam. It contains less than 5%, by volume, angular coral cobbles and pebbles with few, very fine to fine interstitial roots. The matrix is moderately sticky and moderately plastic. The lower boundary is diffuse and smooth. Fill B deposits ranged from 14 to 68 cmbs (6 to 27 in); average thickness is 40 cm (16 in). Fill B directly overlies Layer I. Two tin can fragments and one glass bottle were recorded. This layer is interpreted as a modern fill.

Fill C

Fill C is a black (10YR 2/1, dry) sandy loam. It contains less than 5%, by volume, angular coral cobbles and pebbles with common, very fine to fine roots. The matrix is non-sticky and non-plastic. The lower boundary is clear and smooth. Fill C deposits ranged from 58 to 120 cmbs (23 to 47 in); average thickness is 45 cm (18 in). Fill C directly overlies Layer I. One medium mammal vertebra, probably *Canis familiaris*, was collected. This layer is interpreted as a modern fill.

Layer I

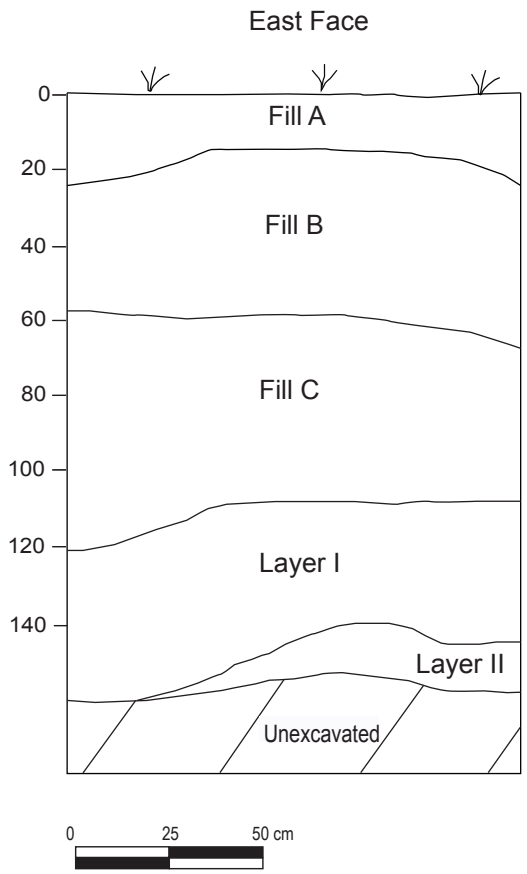
Layer I is an olive brown (2.5Y 4/3, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with few, very fine roots. The matrix is slightly sticky and non-plastic. The lower boundary is clear and irregular. Layer II deposits ranged from 108 to 160 cmbs (43 to 63 in); average thickness is 35 cm (14 in). Layer I directly overlies Layer II. This layer is interpreted as an in situ, non-cultural soil.

Layer II

Layer II is a dark olive brown (2.5YR 3/3, dry) fine loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with no roots. The matrix is non-sticky and non-plastic. The lower boundary was not reached. Layer II deposits were encountered from 142 cmbs (56 in) to the base of excavation at 160 cmbs (63 in); average thickness is 12 cm (5 in). No archaeological cultural material or subsurface features were observed with Layer II. Layer II directly overlies a layer of coral cobbles and small boulders, which was documented during auger testing. This layer is interpreted as an in situ, non-cultural soil.

Auger Testing

The excavation of three auger holes revealed a continuation of Layer III. Auger testing terminated at a depth of 180 cmbs (71 in) due to the presence of coral cobbles and small boulders.





Soil Descriptions:

Fill A: Olive brown (2.5Y 4/3, dry) loamy sand
Fill B: Very dark grayish brown (2.5Y 3/2, dry) sandy clay loam
Fill C: Black (10YR 2/1, dry) sandy loam
Layer I: Olive brown (2.5Y 4/3, dry) loamy sand
Layer II: Dark olive brown (2.5YR 3/3, dry) loamy sand

Figure 24. East Face of Trench 3 at Profile Locale 3, with Photograph.

Trench 4, Profile Locale 4

Trench 4, shown in Figures 25 and 26, was oriented approximately north/south (342°/162°), measured 6.2 m (20.3 ft) by 0.7 m (2.3 ft) wide and reached a maximum depth of 174 cm (69 in). An auger hole was excavated from the base of the trench to determine the depth of the water table: it was reached at 215 cmbs (85 in). One ceramic shard was recovered from the back dirt. PL-4 was documented in Trench 4.

A profile (PL-4) was recorded along the east face of the trench, and measured 1.0 m (3.3 ft) wide and 174 cmbs (69 in). The profile documented four layers of modern fill, Fill A (0–55 cmbs; 0-22 in), Fill B (52–110 cmbs; 20-43 in), Fill C (104–156 cmbs; 41-61 in), and Fill D (148–174 cmbs; 58-69 in), underlain by an in situ, non-cultural soil layer, Layer I (174–215+ cmbs; 69-85+ in) identified in the auger. Fills A–D are known to be modern because the area was filled during the 1990s (O'Day 2014:14). One modern subsurface pit feature (SSF-1) was recorded at a depth range of 48–98 cmbs (19-39 in). One historic ceramic shard was recovered from the back dirt originating from Fill B. PL-4 is illustrated in Figure 27. A detailed description of the stratigraphy recorded at PL-4 and the auger testing results for Trench 4 follow.

Fill A

Fill A is a black (10YR 2/1, dry) fine loamy sand. It contains approximately 5%, by volume, angular and subangular coral cobbles and pebbles. The matrix is slightly sticky and slightly plastic with common, fine interstitial and tubular roots. The lower boundary is clear and wavy. Fill A deposits ranged from 0 to 55 cmbs (0 to 22 in); average thickness is 50 cm (20 in). Fill A directly overlies Fill B. Subsurface Feature 1(SSF-1) originates at the base of Fill A (see Figure 27).Based on its stratigraphic position and color, Fill A is interpreted as imported top soil functioning as an A Horizon.

Soil Pocket

A very dark grayish brown (10YR 3/2, dry) loamy sand soil pocket was observed in Fill A. The loamy sand contained less than 5%, by volume, angular coral cobbles and pebbles with very few, fine roots. The matrix is non-sticky and non-plastic. The lower boundary is clear and smooth. The depth of the pocket ranged from 40 to 50 cmbs (16 to 20 in). The soil pocket is believed to be a remnant of Fill B, as it overlies a subsurface pit feature (SSF-1).

Subsurface Feature 1 (SSF-1)

Subsurface Feature 1 (SSF-1) is an oval-shaped pit that measures 55 by 50 cm (22 by 20 in); it ranges in depth from 48 to 98 cmbs (19-39 in). It originates from Fill A and intrudes into Fill B. The soil from SSF-1 appears to be a mixture of Fill A and Fill B, a very dark grayish brown (10YR 3/2, dry) loamy sand. No archaeological materials were present in the fill of SSF-1. The feature is interpreted as a recently excavated pit associated with the modern residence where Trench 4 was excavated.

Fill B

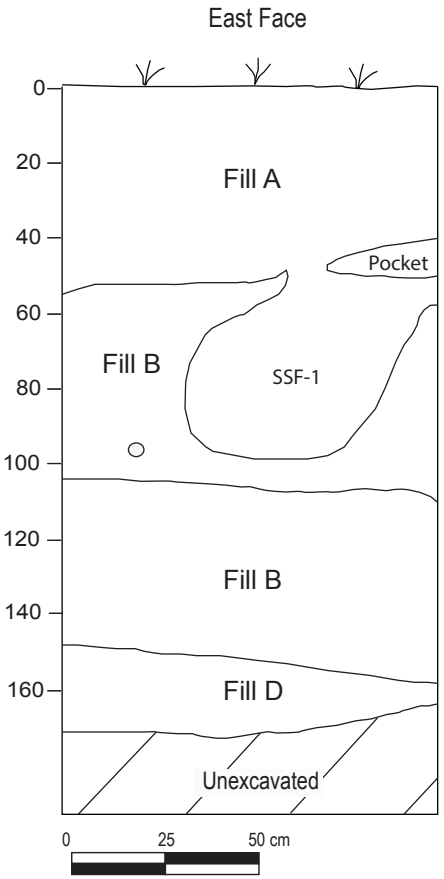
Fill B is a brown (10YR 4/3, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with very few, very fine to fine interstitial roots. The matrix is non-sticky and non-plastic. The lower boundary is clear and smooth. Fill B deposits ranged from 52 to 110 cmbs (20 to 43 in); average thickness is 50 cm (20 in). Fill B directly overlies Fill C. One blue and white ceramic shard was collected from backfill dirt for analysis. This layer is interpreted as a modern fill.



Figure 25. Trench 4 at Start of Excavation, Facing South.



Figure 26. Trench 4 After Excavation. Facing North.



Key:

○ Root



Soil Descriptions:

Fill A: Black (10YR 2/1, dry) fine loamy sand
Soil Pocket: Very dark grayish brown (10YR 3/2, dry) loamy sand
SSF-1: Very dark grayish brown (10YR 3/2, dry) loamy sand
Fill B: Brown (10YR 4/3, dry) loamy sand
Fill C: Very pale brown (10YR 4/3, dry) loamy sand
Fill D: Very dark grayish brown (10YR 3/2, dry) loamy sand

Figure 27. East Face of Trench 4 at Profile Locale 4, with Photograph.

Fill C

Fill C is a very pale brown (10YR 4/3, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with very few, very fine roots. The matrix is non-sticky and non-plastic. The lower boundary is clear and smooth. Fill C deposits ranged from 104 to 156 cmbs (41 to 61 in); average thickness is 45 cm (18 in). Fill C directly overlies Fill D. This layer is interpreted as a modern fill.

Fill D

Fill D is a very dark grayish brown (10YR 3/2, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with no roots. The matrix is non-sticky and non-plastic. The lower boundary is clear and smooth. Fill D deposits ranged from 148 to 174 cmbs (58 to 69 in); average thickness is 15 cm (6 in). Fill D directly overlies Layer I, which was documented during auger testing. This layer is interpreted as a modern fill.

Auger Testing

One auger hole excavated at the base of Trench 4 revealed Layer I, a white (Gley 8/N8/) loamy sand. The excavation encountered the water table at 215 cmbs (85 in). Layer I is interpreted as an in situ, non-cultural marine deposit.

Trench 5, Profile Locale 5

Trench 5, shown in Figures 28 through 30, was oriented approximately north/south (340°/160°), measured 6.8 m (22.3 ft) long by 0.7 m (2.3 ft) wide and reached a maximum depth of 124 cmbs (49 in). Auger testing was not conducted due to the presence of coral bedrock. No subsurface cultural materials were encountered. PL-5 was documented in Trench 5.

The profile (PL-5) was recorded along the east face of the trench, and measured 1.2 m (4.0 ft) in length and 124 cmbs (49 in) in depth. The profile documented four layers of modern fill, Fill A (0–32 cmbs; 0-13 in), Fill B (28–47 cmbs; 11-19 in), Fill C (40–72 cmbs; 16-28 in), and Fill D (62–124 cmbs; 24-49 in). Fills A–D are known to be modern because the area was filled during the 1990s (O'Day 2014:14). A modern septic tank feature (SSF-2;40–124 cmbs;16-49 in) was also recorded. The current landowner stated that the Trench 5 locale is the former location of a septic tank. No archaeological materials or features were observed. PL-5 is illustrated in Figure 31. A detailed description of the stratigraphy recorded at PL-5 follows.

Fill A

Fill A is a very dark brown (10YR 2/2, dry) clay loam. It contains approximately 5%, by volume, angular and subangular coral cobbles and pebbles. The matrix is moderately sticky and moderately plastic with common, very fine to fine interstitial and tubular roots. The lower boundary is clear and wavy. Fill A deposits ranged from 0 to 32 cmbs (0 to 12.6 in); average thickness is 30 cm (12 in). The layer was not continuously present throughout the project area. Fill A directly overlies Fill B. Based on its stratigraphic position and color, Fill A is interpreted as the modern surface A horizon. This layer is interpreted as a modern fill.

Fill B

Fill B is a dark gray (10YR 4/1, dry) silty clay. It contains less than 5%, by volume, angular coral cobbles and pebbles with no roots. The matrix is moderately sticky and very plastic. The lower boundary is diffuse and smooth. Fill B deposits ranged from 28 to 47 cmbs (11 to 19 in); average thickness is 14 cm (6 in). Fill B directly overlies Fill C. This layer is interpreted as a modern fill.



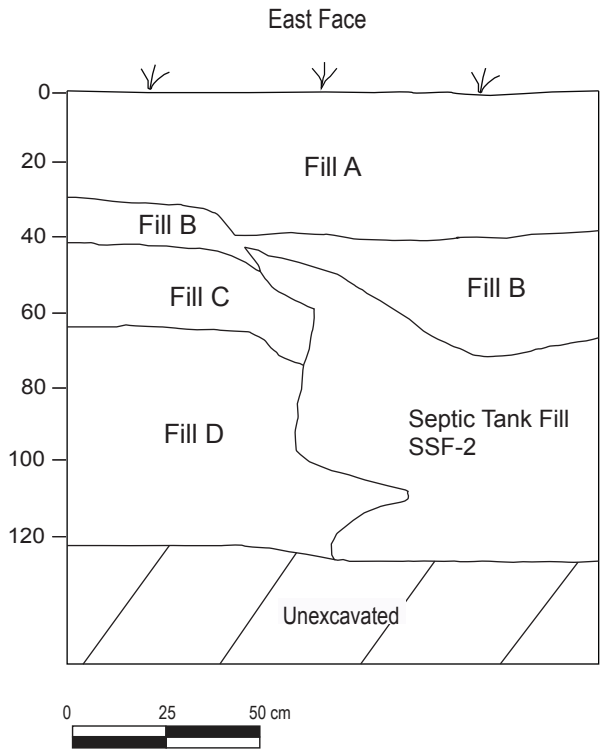
Figure 28. Trench 5 at Start of Excavation, Facing South.



Figure 29. Trench 5 After Excavation, Facing South.



Figure 30. Trench 5 During Backfilling, Facing South.





Soil Descriptions:

Fill A: Very dark brown (10YR 2/2, dry) clay loam
Fill B: Dark gray (10YR 4/1, dry) silty clay
SSF-1 (Septic Tank Fill): Brown (7.5YR 4/2, dry) sandy clay loam
Fill C: Very dark brown (10YR 2/2, dry) loamy sand
Fill D: Dark olive (2.5Y 3/3, dry) loamy sand

Figure 31. East Face of Trench 5 at Profile Locale 5, with Photograph.

Subsurface Feature 2 (SSF-2)-Modern Septic Tank Feature

The SSF-2 pit is large, measuring 2.0 m (6.6 ft) wide and 124 cm (49 in) deep. It originates in Fill A and extends to the base of excavation. The soil from SSF-2 is a brown (7.5YR 4/2, dry) sandy clay loam. It contains less than 5% by volume, angular coral cobbles and pebbles with roots at the top levels. The matrix is slightly sticky and slightly plastic. Based on information from the land owner, this pit is associated with a modern septic tank (see Figure 31).

Fill C

Fill C is a very dark brown (10YR 2/2, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with no roots. The matrix is non-sticky and non-plastic. The lower boundary is diffuse and smooth. Fill C deposits ranged from 40 to 72 cmbs (16 to 28 in); average thickness is 22 cm (9 in). Fill C directly overlies Fill D. This layer is interpreted as a modern fill.

Fill D

Fill D is a dark olive (2.5Y 3/3, dry) loamy sand. It contains less than 5%, by volume, angular coral cobbles and pebbles with no roots. The matrix is non-sticky and non-plastic. The lower boundary was not reached. Fill D deposits ranged from 62 to 124 cmbs (24 to 49 in); average thickness is 55 cm (22 in). Excavation halted due to the presence of coral reef. This layer is interpreted as a modern fill.

LABORATORY ANALYSIS

This section presents the results of limited laboratory analysis conducted on archaeological materials recovered during backhoe trenching. The recovered materials include two historic artifacts and one piece of vertebrate fauna which are summarized in Table 7. The materials were recovered from Trenches 3 and 4.

Table 7. Artifacts and Faunal Remains Recovered During Archaeological Testing.

Artifact No.	Provenience	Type	Dimensions (cm)	Weight (g)	Description
1	Trench 3 Layer II	Complete clear, cylindrical bottle	Height=24.0 Diameter=6.0	390.7	Crown cap; ABM; Embossing: OK Beverages; Maker's mark: Owens-Illinois; Date: 1960–present.
2	Trench 4 Layer II (backdirt)	Ceramic shard	Length=4.3 Width=3.5 Thickness=.5	6.85	Refined earthenware whiteware with blue transfer print; Date:1830–present.
	Trench 3 Layer III	Vertebrate faunal	< 2.0 cm^3	2.0	Medium mammal vertebra, probably *Canis familiaris*

Historic Artifacts

Two historic artifacts were recovered during backhoe excavations. The historic artifacts include items fashioned from glass and ceramic.

Glass Artifact

Artifact No. 1 is a complete machine made bottle. The bottle is illustrated in Figures 32 and 33. The bottle exhibits a mold seam typical of the automatic bottle machine (ABM): a seam encircles the heal near the base; two seams extend up the body and around and over the top of the finish (Munsey 1970:45). The bottle is fashioned from clear glass and is 24.0 cm (9.4 in) in height and 6.0 cm (2.3 in) in diameter. This bottle has a crown cap closure and contained soda. An applied color label (ACL) (Sweeney 2002), now faded, on the body of the bottle reads “OK Beverages.” The backside of the bottle reads: “Bottled by OK Beverage CO LTD Honolulu Hawaii.” The base of the bottle is embossed with the manufacture code, plant code, bottle type, mold number, date code, and “NET CONT 10 oz.” Based on the embossed data the “maker mark” is that of the Owens-Illinois Glass Company and the plant code indicates it was manufactured in Portland, Oregon. This mark was used by Owens-Illinois between 1960 and the present (Toulouse 1971:395).

Ceramic Artifact

Artifact No. 2 is ceramic shard that was recovered from backfill dirt from Layer II at Trench 4. The shard, shown in Figure 34, is refined earthenware whiteware with blue transfer print. The shard weighs 6.85 g and measures 4.3 cm by 2.5 cm and .5 cm thick (1.7 by 1.0 and 0.2 in). This type of refined earthenware dates from 1830 to the present and was produced in England (FMNH 2015). A ceramic “maker mark” is not present on the fragment. Below are the characteristics for refined earthenware (Brown 1982).

- Paste: off-white color. Soft but harder than either pearlware or creamware. Sticks to tongue, can be marked with knife, powders little.
- Glaze: clear resulting in a “white ware”. Early whiteware tinted blue like pearlware. Glaze deeper than pearlware. Tends to crackle.
- Decoration: various
- Form: usually thicker & heavier than pearlware. But can also be thin.
- Types of vessels: table & tea wares, kitchen & toilet wares.

Faunal Remains

The piece of vertebrate fauna has been identified as a single lumbar vertebra from a medium mammal, probably *Canis familiaris*. The vertebra was recovered from Fill C in Trench 3. The skeletal element, shown in Figure 35, weighs 2.0 grams.

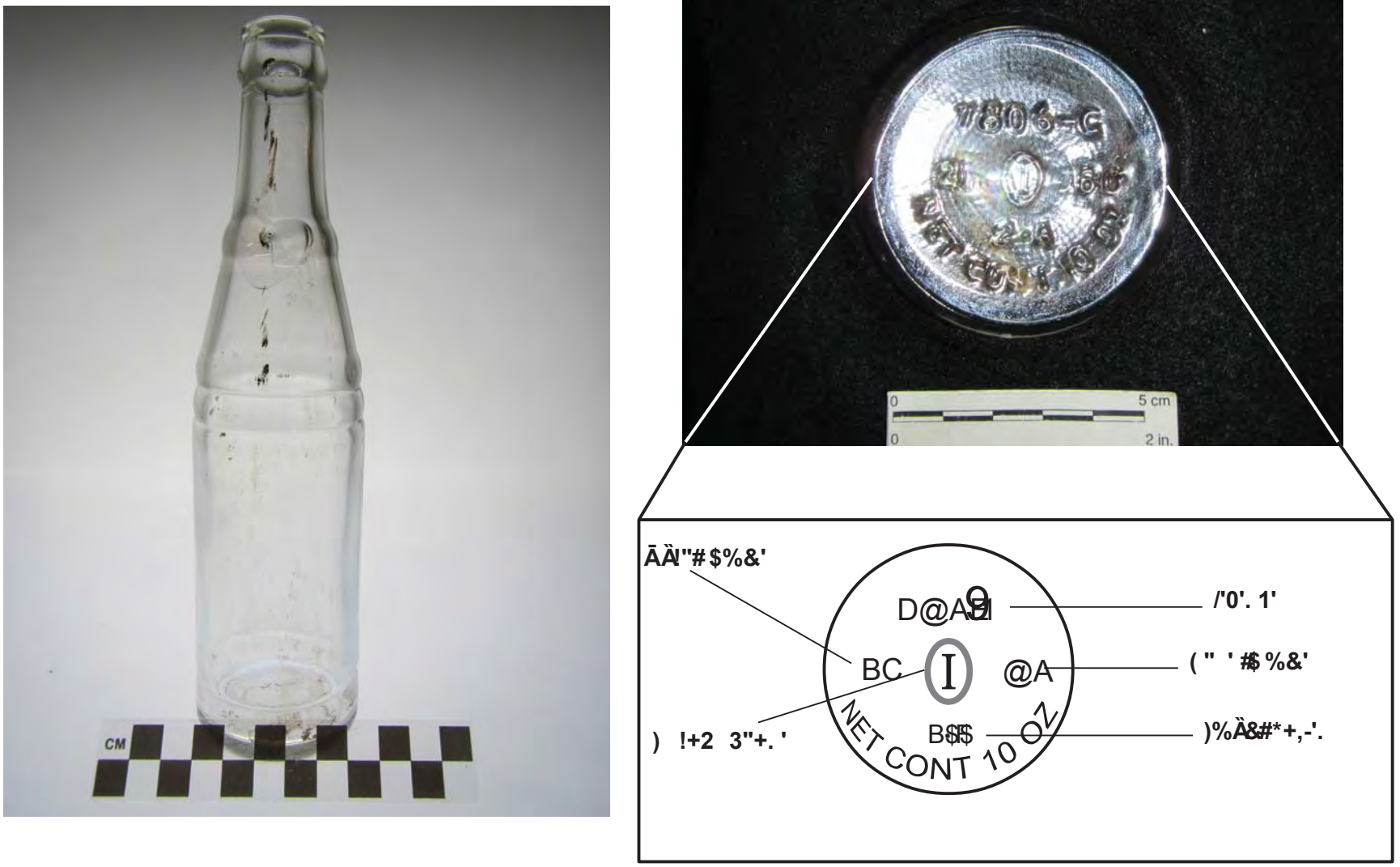


Figure 32. Photographs of Glass Bottle (Artifact No. 1) Collected From Trench 3

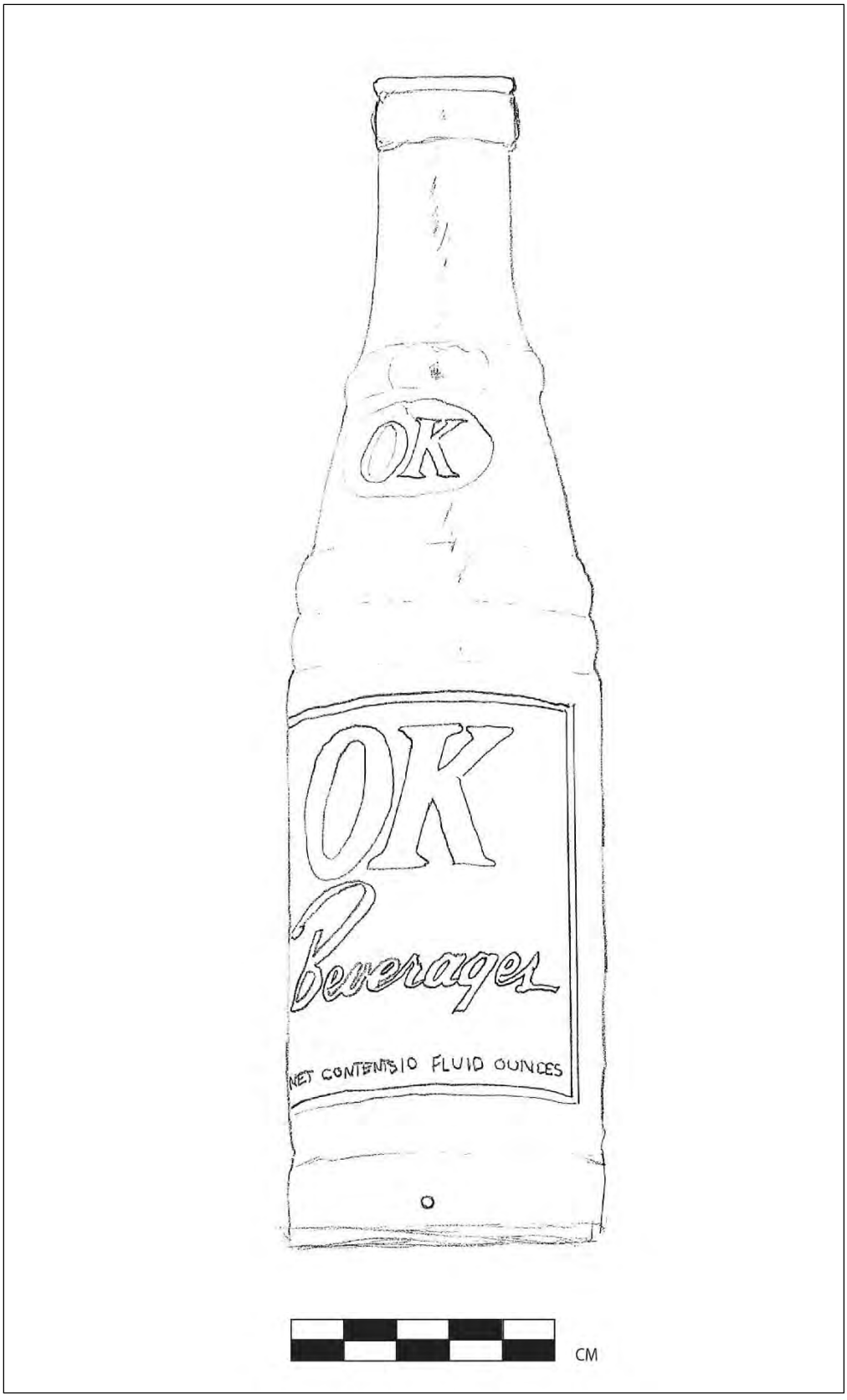


Figure 33. Sketch of Artifact 1, an OK Soda Bottle.

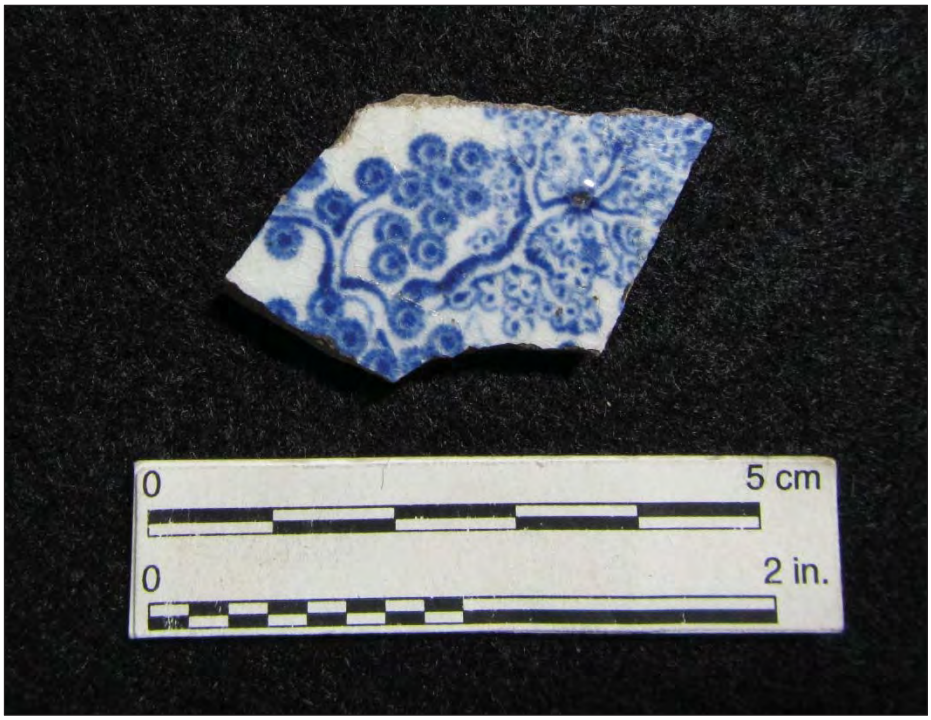


Figure 34. Refined Earthenware Whiteware with Blue Transfer Print.



Figure 35. Artifact No. 3, Lumbar Vertebra From a Medium Mammal, Probably *Canis familiaris* .

SUMMARY AND INTERPRETATION

On March 16 and 17, 2015, PCSI conducted the current archaeological inventory survey with subsurface testing in support of the Waipilopilo Stream Bridge Replacement Project in Hauʻula Ahupuaʻa, Oʻahu Island, State of Hawaiʻi. Because traditional Hawaiian burials and other subsurface archaeological deposits and features associated with Site 50-80-06-4795 were previously documented in the current project area (Masterson et al. 1997, 1998), it was anticipated that pre-Contact and/or post-Contact subsurface cultural materials and features, including human burials, might be encountered. Subsurface testing was conducted in accordance with the AISP (O'Hare et al. 2014) to assess the stratigraphy for potential subsurface cultural resources. Site 4795 was initially identified during an AIS by Masterson et al. (1997) and was assessed as significant under Criteria d and e (incorrectly recorded as D and E) for its information potential (Criterion d) and its significance to native Hawaiians (Criterion e).

Trenches were distributed across the project area and averaged 6.2 m (20.3 ft) long, 0.7 m (2.3 ft) wide, and reached a maximum depth of 225 cmbs (89 in). Additionally, auger testing was conducted at the base of Trenches 1–4 to explore deeper soil layers and ascertain the depth to water table. However, no human burials or traditional Hawaiian cultural deposits or features were encountered. Recovered artifacts were limited to one glass bottle, one ceramic shard, and one vertebra from a medium mammal, probably *Canis familiaris.* The artifacts were not associated with any cultural deposits and are most likely late historic to modern in origin. All artifacts were recovered from fill layers of a former marsh land.

The project area's stratigraphic sequences were documented at five profile locales (PL1-5). Trench 1, on the east side of Kamehameha Highway, encountered loamy sand and fine sand layers over clay and sandy loam layers. The upper 70 cm (28 in) consisted of modern fill. The lower layers consist of natural, non-cultural soils. These findings are consistent with the results of subsurface testing in the vicinity by Masterson et al. (1998).

On the west side of Kamehameha Highway, Trenches 2–5 were excavated in a former marsh land area. A resident of Hauʻula, Mr. Randy Tausinga, stated in 2014 that this portion of the project area was formerly a swamp, or wetland, that was filled during the 1990s (O'Day 2014:14). This is also supported by the area being depicted as a wetland on the historic maps shown in Figure 7 and Figure 8. Consistent with this scenario, Trenches 2–5 encountered modern fill in the upper layers, or approximately the first 100 cm or deeper. The stratigraphy at Trenches 2–4 predominantly consisted sandy loam or loamy sand layers. Trench 5 encountered clay loam and silty clay layers over loamy sand. Both Trenches 4 and 5 were excavated in a residential parcel and displayed signs of modern disturbance. At Trench 4 evidence of a modern excavation was encountered (SSF-1). At Trench 5, a resident of the property confirmed that there was once a septic tank at the excavation location, confirming that SSF-2 is modern septic tank fill.

No evidence of Site 4795 was encountered during the current project. Masterson et al. (1999) noted that the sand pocket where the cultural deposit and associated burial were encountered in 1997 may have resulted from a combination of the obtrusiveness of Kaipapau Point, the stream action of Waipilopilo, and high-wave action carrying sand up the stream mouth (Masterson et al.1999:13). Therefore, it can be speculated that the site has a narrow extent along Kamehameha Highway, situated between the shoreline and the former wetland. Furthermore, portions of the site were likely impacted by historic and recent activities, such as the railway, highway, and beach park development. Results from Masterson et al. (1998) and the current study, which encountered minimal to no evidence of the site, supports the hypothesis that the site is extant in a narrow sand deposit under the east side of Kamehameha Highway and the shoulder of the road.

SITE SIGNIFICANCE AND NATIONAL REGISTER ELIGIBILITY EVALUATION

Two known historic properties are within the APE of the Waipilopilo Stream Bridge Replacement Project: a buried cultural deposit with an associated human burial (Site 4795); and the Waipilopilo Stream Bridge. Table 8 summarizes the site significance assessments and the determinations of effect made for these historic properties.

The Waipilopilo Stream Bridge, constructed in 1932 by L.L. McCandless, was one of seven bridges built under Federal Aid Project (FAP) No. 1D, and is a one-span reinforced concrete deck girder structure (Ruzicka 2015). It is a good example of early twentieth century workmanship (O'Hare et al. 2014). In 2011, the SHPD determined that Waipilopilo Stream Bridge is significant under Criteria A (Events—development of land based transportation) and C (Architecture [Distinctive characteristics of a type, period, or method of construction]) and was eligible for listing in both the HRHP and NRHP. Based on this information, SHPD further stated that "SHPD determines that replacement or widening of the bridge would have an adverse effect on historic property" (6 October 2011; Log No. 2011.02252, Doc. No. 1109MA08). In 2013, HDOT-Highways published an updated inventory and evaluation of the state's historic bridges, and Waipilopilo Stream Bridge was then assessed as significant only under Criterion C "for its association with early developments in concrete bridge construction in Hawaii" (HDOT 2013: 4-282). Subsequently, a Historic American Engineering Record (HAER) study was conducted for the bridge by Mason Architects, Inc. (MAI). The National Park Service (NPS) reviewed the HAER study, assigned a HAER number (HI-124), and approved this study in July 2015.

Site 4795 was first identified and described during archaeological monitoring work conducted in support of a waterline installation and was assessed as significant under Criteria d and e (incorrectly recorded as D and E), pursuant to HRS Chapter 6E-8 and HAR §13-279 (Masterson et al. 1997). Based on these findings, the SHPD indicated that "Site 4795 is eligible for listing in the Hawaii Register under Criterion D (have yielded, or is likely to yield information important to prehistory or history), and under HAR 13-275-6 Criterion "e", for cultural value" (August 14, 2013; Log No. 2013.2014, Doc. No. 1308NN01).

Table 8. Final Site Significance Assessments, HRHP and NRHP Eligibility Evaluation, and Effect Determinations and Mitigation Recommendations for the Waipilopilo Stream Bridge and Site 50-80-06-4795

SIHP Site No. or Resource Name	Chapter 6E Significance Assessment	HRHP / NRHP Eligibility	Chapter 6E Effect Determination Recommendations	Chapter 6E Mitigation Recommendations	Section 106 Effect Determination Recommendations	Section 106 Mitigation Recommendations
Waipilopilo Stream Bridge	c	C	Effect, with proposed mitigation commitments	Architectural documentation	Adverse Effect	Completion of a HAER Study
50-80-06-4795	d, e	D	Effect, with proposed mitigation commitments	Data Recovery in the form of archaeological monitoring	Adverse Effect	Archaeological monitoring

Based on the previous studies and reviews, and the Ruzicka (2015) HAER study, the Waipilopilo Stream Bridge is determined eligible for listing in the NRHP under Criterion C. Similarly, Site 50-80-06-4795 is determined eligible for listing in the NRHP under Criterion D based on the previous archaeological documentation and the current AIS.

PROJECT EFFECT DETERMINATIONS AND MITIGATION RECOMMENDATIONS

Pursuant to HRS, Chapter 6E-8 and its implementing regulations at HAR §13-275-7(2), the recommended project effect determination provided in the AIS report is "effect, with proposed mitigation commitments" as the Waipilopilo Stream Bridge project will adversely impact the bridge and has potential to adversely impact Site 50-80-06-4795 (cultural deposit and features, including human burials). The recommended mitigation for Waipilopilo Stream Bridge is architectural documentation in the form of HAER documentation per HAR §13-275-8(a)(1)(B). For Site 50-80-06-4795 the recommended mitigation is data recovery in the form of archaeological monitoring per HAR §13-275-8(a)(1)(C).

Pursuant to applicable Federal regulations (36 CFR § 800.5(d)(2), the AIS report indicates that the proposed undertaking will have an "adverse effect" on historic properties eligible for listing in the NRHP. Consequently, the AIS report recommendation is that the "adverse effect" be mitigated through the preparation of a Memorandum of Agreement (MOA) which will include the recommended forms of mitigation: HAER documentation of the bridge; and implementation of on-site archaeological monitoring of the portion of the APE on the east side of Kamehameha Highway, as shown in Figure 36.

The recommendation for archaeological monitoring is based on the results of previous archaeological studies within the project APE and the current AIS. No subsurface historic properties, including Site 50-80-06-4795, were encountered during the current AIS. Subsurface AIS testing on the west side of Kamehameha Highway (Trenches 2–5) indicated that this area consists of at least 70 cm (28 in) of modern fill over natural, non-cultural soil layers. Therefore, no additional work is recommended in this portion of the APE. However, archaeological monitoring is recommended for the east side of Kamehameha Highway, as potential remains for ground disturbance to encounter Site 50-80-06-4795 within the portion of the APE although Trench 1 did not expose this site. Previous archaeological investigation recorded human burials and cultural deposits on the east side of Kamehameha Highway, both in the current APE and to the north and south along Kamehameha Highway (Sites 4794, 4795, and 4796) (see Masterson et al. 1997). Based on these past findings and land use history that includes houses associated with LCAs in the vicinity of the APE, the probability remains high that additional human burials may be present.

Future work in the project area, as shown in Figure 36, has the potential to disturb Site 4795. Figure 36 shows the pedestrian pathway and the bridge construction traversing the Site 4795 buried cultural deposit. It is anticipated that Site 4795 may be encountered as shallow as 30 cmbs (12 in) on the east side of the highway during project-related ground disturbing activities. Thus, full-time, on-site archaeological monitoring is recommended during future ground disturbing activities that extend 30 cm (12 inches) or more below ground surface on the east side of Kamehameha Highway and in the vicinity of the existing Waipilopilo Stream Bridge in the project's APE.



Fgure 36. Location Where Archaeological Monitoring is Recommended During Future Ground Disturbing Work in the APE.

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APPENDIX F HISTORIC AMERICAN ENGINEERING RECORD (HAER)

WAIPILOPILO BRIDGE **HAER No. HI-124**
Kamehameha Highway (Rt. 83) and Waipilopilo Stream
Hauula
Honolulu County
Hawaii

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
U.S. Department of the Interior
National Park Service
San Francisco, California

HISTORIC AMERICAN ENGINEERING RECORD

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Waipilopilo Bridge HAER No. HI-124
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Hauula
Honolulu County
Hawaii

David Franzen, Photographer March 2015

HI-124-1 OVERVIEW OF WAIPILOPILO BRIDGE AND APPROACH. VIEW FACING NORTH.

HI-124-2 OVERVIEW OF WAIPILOPILO BRIDGE AND APPROACH. VIEW FACING SOUTH.

HI-124-3 ELEVATION OF BRIDGE WITH SCALE DEVICE IN 1' INCREMENTS. VIEW FACING WEST.

HI-124-4 OBLIQUE VIEW OF BRIDGE PARAPET, ROAD-FACING SIDE. VIEW FACING SOUTHWEST.

HI-124-5 OBLIQUE VIEW OF BRIDGE PARAPET SHOWING THE ADDED WALKWAY ON OUTBOARD SIDE OF UPSTREAM PARAPET. VIEW FACING NORTHEAST.

HI-124-6 OBLIQUE VIEW OF THE UNDERSIDE OF THE BRIDGE. NOTE THE PILES SUPPORTING THE ABUTMENT. VIEW FACING NORTHWEST.

PHOTO KEY



HISTORIC AMERICAN ENGINEERING RECORD

WAIPILOPILO BRIDGE

HAER No. HI-124

Location: Kamehameha Highway (Rt. 83) and Waipilopilo Stream
Hauula
Honolulu County, Hawaii

U.S.G.S. Hauula, HI quadrangle 1992
7.5 Minute Series (Topographic) (Scale – 1:24,000) NAD83 datum.
Universal Transverse Mercator Coordinates: 04.612460.23906000

Lat./Long. Coordinates:
21° 36' 53.80" N
157° 54' 47.60" W

Adjacent to TMKs
[1] 5-4-002, 004, 011, and 017.

Date of Construction: 1932

Owner: State of Hawaii

Present Use: Vehicular bridge

Significance: Waipilopilo Bridge is significant for its association with the development of Route 83, Kamehameha Highway portion of the belt road that circles the Island of Oahu. The belt road was an important transportation improvement for Oahu and provided easier access to outlying communities.

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Date of Report: April 2015

DESCRIPTION:

The Waipilopilo Bridge is a concrete deck girder bridge with solid panel concrete parapets that carries two lanes of traffic on Kamehameha Highway (Rt. 83) over Waipilopilo Stream. The bridge is about 22'-0" in a single span between its concrete abutments. Parapets are about 25'-6" long and the roadway is about 23'-8" wide between the curbs at the base of the parapets. The area around the bridge is rural, with houses and open space. The highway south of the bridge runs near the seashore and a sand beach borders the road on the southeast. North of the bridge, the highway runs slightly inland enough for houses to line both sides of the road.

The parapets have curved end stanchions that are each about 3'-10" long and curved away from the roadway on an approximate 4'-10" radius. The stanchions have a low hipped top rail that is 10" high and 1'-3" wide. Below this is a 10" thick center section that is 1'-8" high and has recessed panels on the front and rear sides that measure about 2'-1" wide x 1'-2" high. The stanchion rests on a 1'-6" wide base that rises about 5" above the asphalt surface of the roadway to form a curb. All four end stanchions have added thrie-beam rails attached to their road-facing curved front panels by through bolts. This has nearly obscured the incised lettering on the front recessed panels, but by careful inspection between the beams, the inscriptions "1932" can be made out on the southeast and northwest stanchions, and the inscriptions "Waipilopilo" can be made out on the northeast and southwest stanchions.

The parapets between the end stanchions have a 1'-0" wide, 7" high low-hipped top rail with an 8" thick center section that is 1'-8" high. Each parapet is divided into three, 5'-10" wide sections by a narrow expansion joint. Between the expansion joints each section has a recessed panel on front and rear sides that measures about 5'-3" wide x 1'-1" high. The parapets between the end stanchions rest on the same 1'-6' wide base that extends as a continuation of the curb from the base of the stanchions.

The total thickness of the concrete deck of the bridge with its asphalt surfacing is about 10". The underside of the bridge deck has four longitudinal concrete beams on approximate 7'-6" centers. The beams are 1'-3" wide and about 2'-2" high. The concrete abutments are about 32'-0" wide and about 4'-6" high. Each abutment is supported on seven concrete piles which are about 1'-2" square. Concrete wing walls, typically 7' to 9' long, extend back at right angles at the ends of the abutments.

At the west side of the bridge there is an added wooden walkway attached to the outboard side of the upstream parapet. The walkway is supported by steel angle brackets bolted to the concrete of the bridge. The outboard edge of the walkway has a rail of vertical 4 x 4 wood posts on variable spacing of between 4'-8" to 5'-8" that are spanned by horizontal wood 2 x 6 and 2 x 10 boards. The decking of the walkway is longitudinal 2 x 10 boards.

HISTORIC CONTEXT

Waipilopilo Bridge was one of seven bridges built under Federal Aid Project (FAP) No. 1D. This project consisted of the construction of about 5.1 miles of Kamehameha Highway (Rt. 83) extending south from near Adams Field in Kahuku to about Punaiki Gulch just south of Hauula. Included in FAP 1D were seven concrete bridges. Original plans for FAP 1D are dated April 1932 and were approved and signed by Lyman H. Bigelow, Hawaii Territorial Highway Engineer. The contract for FAP 1D was let to contractor Lincoln L. McCandless of Honolulu for $190,117.51 in fiscal year 1931-32 (July 1 to June 30). Construction was underway by June 30, 1932, and the last of the seven bridges in the contract was completed by the end of 1933.

Table 1: Concrete bridges built under FAP 1D.

Bridge Name	Location	FAP 1D Bridge # *	Total Span, Yr completed	National Bridge ID Number
Waipuhi	Papau Stream, 0.23 mi SE of Kukuna Road	14	22', 1932	003000830302186
Hauula	Hauula Stream, 0.06 mi SE of Kukuna Road	15	22', 1932	003000830302169
Muliwai	Maakua Stream, 0.21 mi SE of Hauula Homestead Road	15A	106', 1932	003000830302151
Waipilopilo	Waipilopilo Stream, 0.03 mi SE of Imua Place	16	22', 1932	003000830302112
Kaipaupau	Kaipaupau Stream, 0.01 mi SE of Pipilani Place	17	82', 1932	003000830302099
Laiemaloo	Koloa Stream, 0.10 mi N of Laie Beach Park	18	88', 1933	003000830301970
Laiewai	Kahawainui Stream, 0.17 mi NW of Naniloa Loop	21	88', 1933	003000830301785

*The column "FAP 1D Bridge #" shown the original identifier number for each bridge that was used on the original 1932 project plans.

The contract for FAP 1D called for the roadway to be asphalt-macadam paved, 20' wide with 6' shoulders. All seven bridges were specified to have a 24' wide roadway.

The approximate 5 mile length of FAP 1D was interrupted in two places where bridges were built under a separate project, FAP 1C. This project consisted of three concrete bridges and approaches that were built at Malaekahana Stream (adjacent to the north boundary of FAP 1D), Laieloa Stream (just north of Laie Point), and Laie Stream (Kokololio Gulch). FAP 1C was let to contractor Ralph E. Wooley for $33,133.86. The portion of Kamehameha Highway south of FAP 1D was built under FAP 1A, an approximate 9.27 mile section that extended to about present day Kualoa Beach Park.

In late 1931, Hawaii received a windfall federal road aid package that amounted to $1.5 million, that was authorized to construct 531 miles of roads in the Territory of Hawaii under a roadway plan devised by Lyman H. Bigelow. Part of this plan was the paving of five miles of road near Hauula, which would become FAP 1D.[1]

Contractor, Lincoln Loy McCandless

The contractor for the 1932 Waipilopilo Bridge,the other six bridges (shown in Table 1), and approximately five miles of road associated with FAP 1D, was Lincoln Loy McCandless. He was born on September 18, 1859 in Indiana County, Pennsylvania, the fifth of seven children.

[1] "Early Start on Federal Roads Here Expected." Honolulu Star-Bulletin. November 18, 1931. P. 1.

In 1867 his family relocated to Volcano, West Virginia, where his father, Thomas McCartney McCandless, speculated in the newly found petroleum reserves there. During the family's time in West Virginia, McCandless and his three brothers learned to drill wells. In late 1880, McCandless' older brother James, en route to the California oil fields, heard of the opportunity to drill water wells on Oahu, and shipped there in December. Brother John joined James McCandless in Hawaii in 1881 with a well boring outfit. John and James drilled wells for the next two years, purchasing a second boring outfit. In 1882 Lincoln L. McCandless arrived in Hawaii from West Virginia to join his two brothers in the well-drilling business. The McCandless brothers cashed in on the "craze for artesian wells" for the next several years in Hawaii.[2] Although the actual partnership of the brother's well drilling operations lasted until 1930, by about the 1890s, the brothers' business interests had diverged, and the well drilling operation was McCandless Brothers in name only. Only James remained active in well drilling while John ventured into other business interests and Lincoln began to diverge into ranching and construction. In 1893 each of the three McCandless brothers "took active parts in the overthrow of the Hawaiian monarchy."[3]

Lincoln L. McCandless, often known as L.L. or Link, began accumulating ranch lands shortly after he arrived in Hawaii, initially leasing acreage in Waimalu and Kalawao. One of his first construction projects was the 1907 office building (McCandless Building) at the corner of King and Bethel Streets in Honolulu that was built in conjunction with his brothers.

McCandless started in the construction business in 1911, when he partnered with John H. Wilson to offer bids to build segments of Oahu's belt road. Wilson, a road-builder who had taken up politics, had engineering experience and McCandless was able to bankroll the partnership. The business partnership dissolved in 1915, with McCandless taking all equipment and assuming the partners' liabilities.[4] McCandless remained in the road and bridge contracting business. In 1922 he completed over 9 miles of road (Farrington Highway) and ten bridges from Honouliuli Station toward Waianae, including the 22' span Farrington Highway Bridge over Palehua Stream. In 1927 he built the 42' span Honouliuli Bridge on Fort Weaver Road, and in 1930 he completed the 60' span Wailupe Bridge on Kalanianaole Highway.

Link McCandless became active in politics shortly after the overthrow of the Hawaiian monarchy, was elected Senator in the provisional government and advocated for Hawaiian annexation. After annexation he was elected to the Territorial Senate. He campaigned unsuccessfully several times to be elected Territorial delegate to U.S. Congress before gaining the seat in 1932.

SOURCES

A. Architectural Drawings:

Historic drawings for FAP 1D are available at the Hawaii Department of Transportation, Highway Division. Drawing set no. 4251. 1932.

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[2] James Sutton McCandless, *A Brief History of the McCandless Brothers and their part in the Development of Artesian Well Water in the Hawaiian Islands, 1880-1936.* (Honolulu: Privately published). 1936. P. 20.
[3] McCandless, *A Brief History*. 1936. P. 7-24.
[4] Bob Krauss, *Johnny Wilson. First Hawaiian Democrat.* (Honolulu: University of Hawaii Press). 1994. Pp. 108-115, 138.

B. Early Views:

No early views were located for this report.

C. Bibliography:

Hawaii Department of Public Works. *Annual Report to the Governor of the Territory of Hawaii by the Superintendent of Public Works*. Honolulu. Various years.

Hawaii Highway Planning Department, Territorial Highway Department. *Bridge Inventory for the Island of Oahu.* Hawaii Highway Planning Department, Territorial Highway Department. September 1950.

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"Costly Road Faulty; Blame to be Fixed." June 30, 1913. P. 1.

"Road Progress in Hawaii is Told in Report." December 9, 1930. P. 3.

"Territory May Get $400,000 Road Fund Gift." December 16, 1930. P.1.

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Krauss, Bob. *Johnny Wilson, First Hawaiian Democrat*. Honolulu: University of Hawaii Press. 1994.

McCandless, James Sutton. *A Brief history of the McCandless Brothers and their part in the Development of Artesian Well Water in the Hawaiian Islands, 1880-1936*. Honolulu: Privately published. 1936.

MKE Associates LLC, and Fung Associates, Inc. *Hawaii State Historic Bridge Inventory and Evaluation*. Prepared for State of Hawaii Department of Transportation, Highways Division. November 2013.

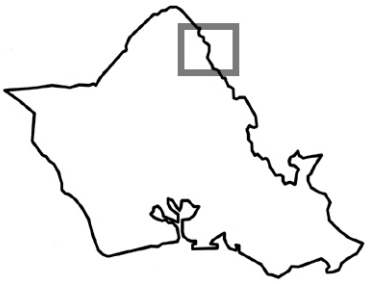
Thompson, Bethany. *Historic Bridge Inventory, Island of Oahu*. Prepared for State of Hawaii Department of Transportation, Highways Division. June 1983.

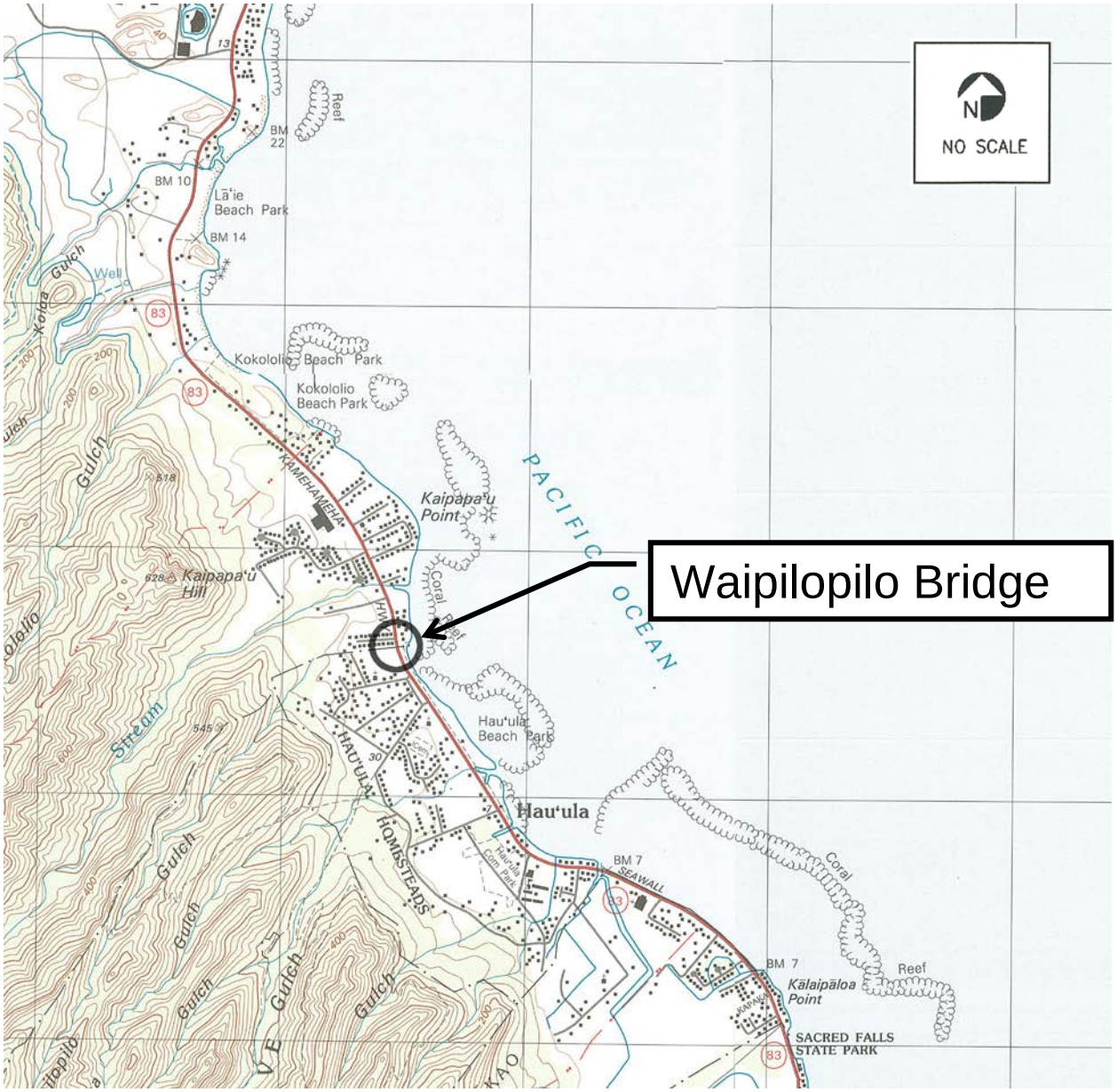
PROJECT INFORMATION

This HAER documentation was produced in advance of a project to widen and lengthen the Waipilopilo Bridge, resulting in either its replacement or major rehabilitation. Hawaii State Historic Preservation Division has determined that the bridge is eligible for the National and Hawaii State Register of Historic Places in a letter dated October 6, 2011 (Log 2011.2252, Doc 1109MA08). Federal involvement in this project stems from Federal Aid Project, Permit # BR-083-1(57), which was issued for this project.

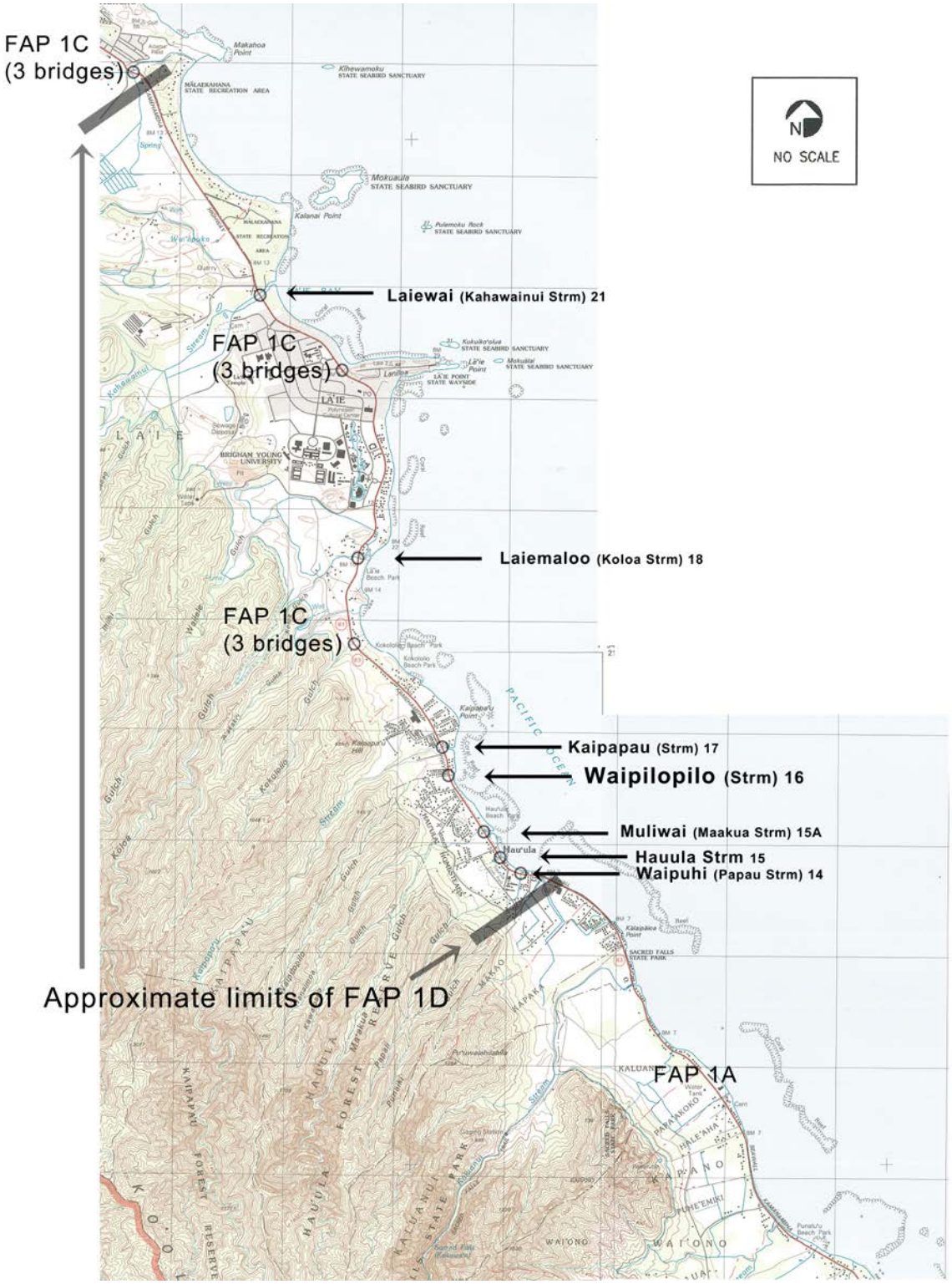
This report was researched and written by Dee Ruzicka of Mason Architects, Inc., Honolulu, Hawaii. Archival photographs were taken by David Franzen of Franzen Photography, Inc., Kailua, Hawaii.

Location map.



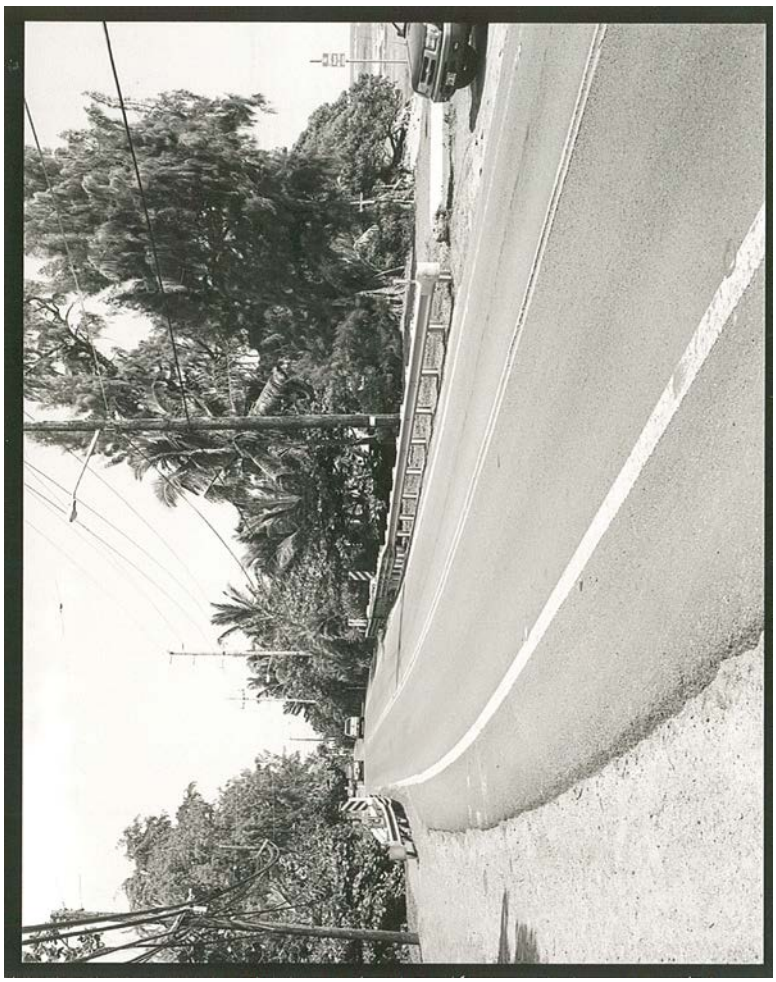


Map showing FAP 1D project area and locations of all 7 FAP 1D bridges. Also shown are the 3 FAP 1C bridges. *Map: composite of USGS 1:24,000 topographic maps of Kahana, HI (1992), Hauula, HI (1992), and Kahuku, HI (1998).*



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTIONS

HAER No. HI-124-1



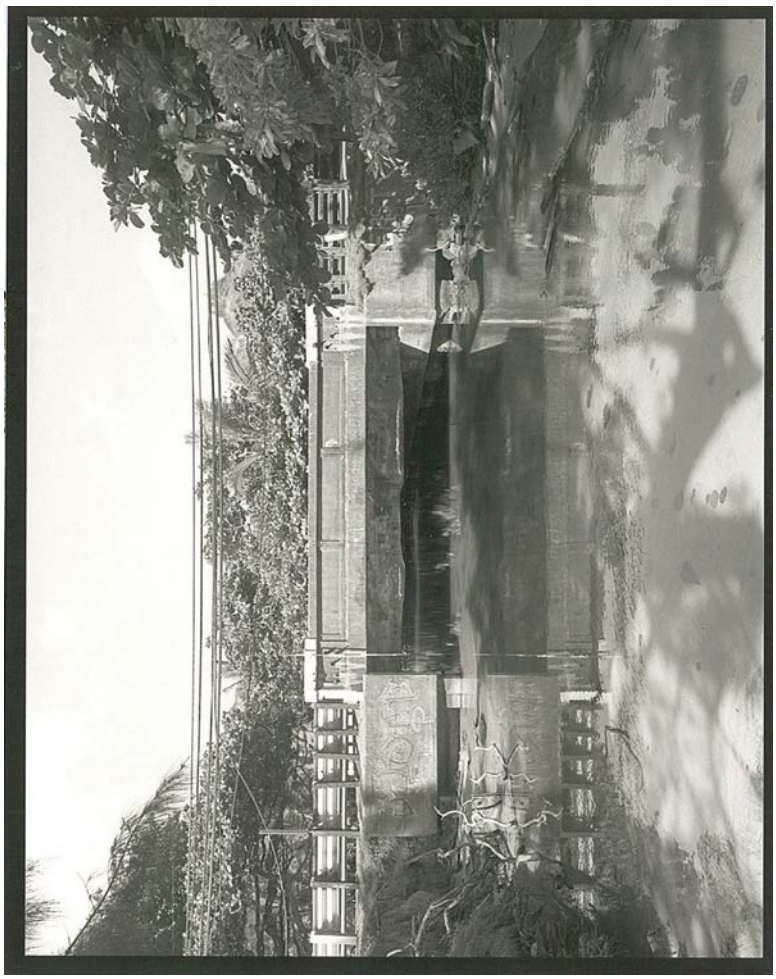
HISTORIC AMERICAN ENGINEERING RECORD
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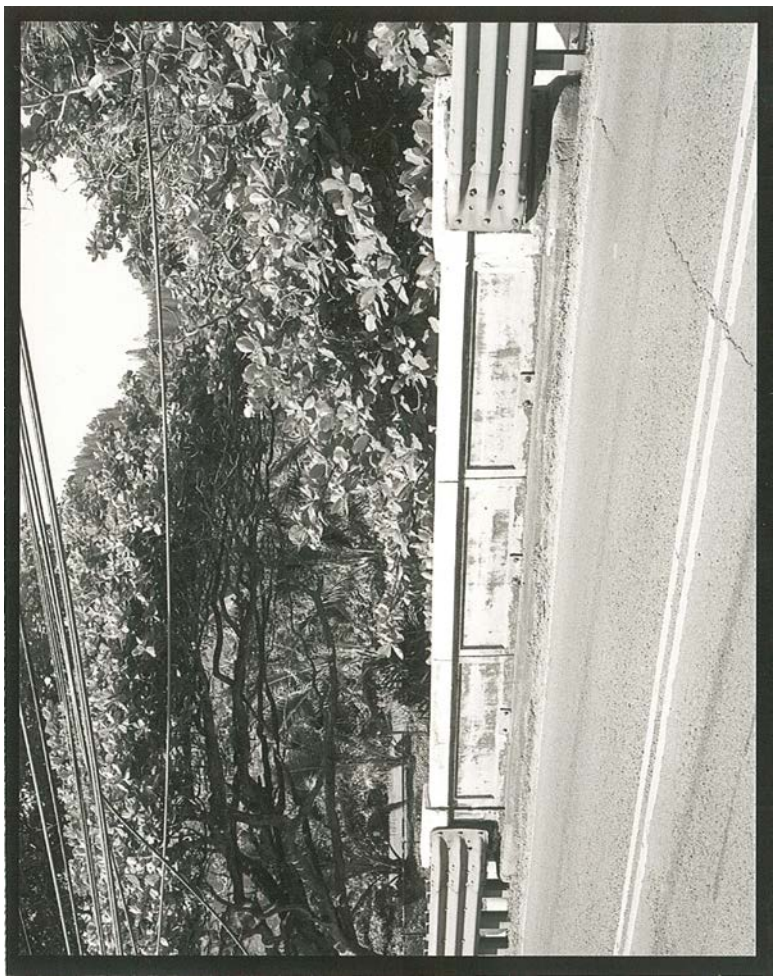
HISTORIC AMERICAN ENGINEERING RECORD
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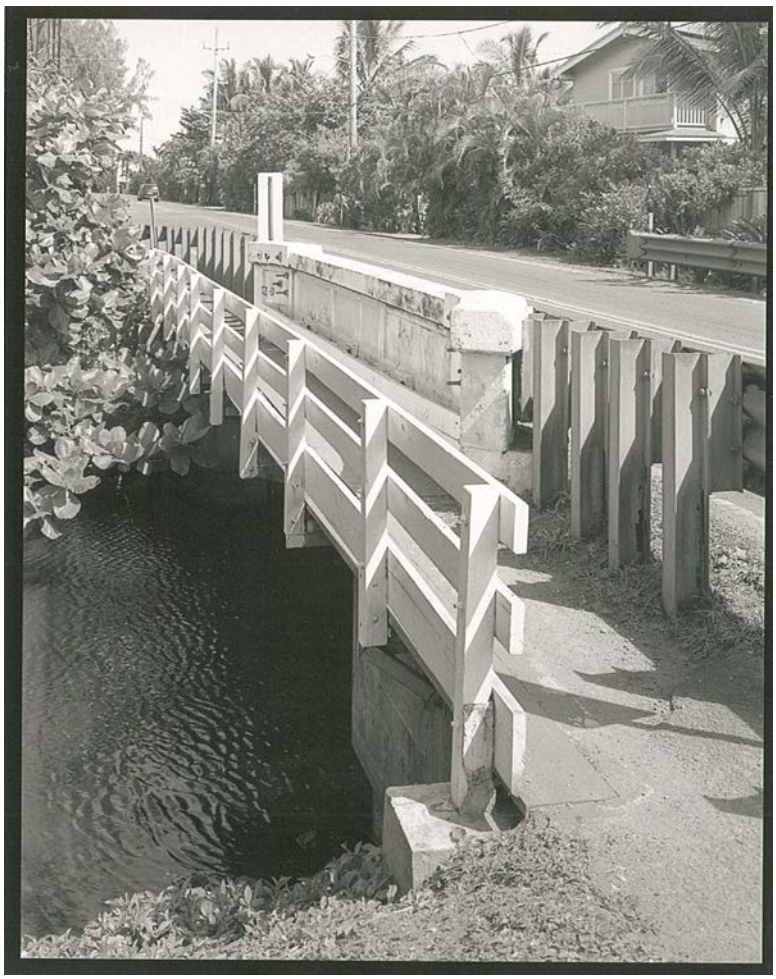
HISTORIC AMERICAN ENGINEERING RECORD
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HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTIONS

HAER No. HI-124-5



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTIONS

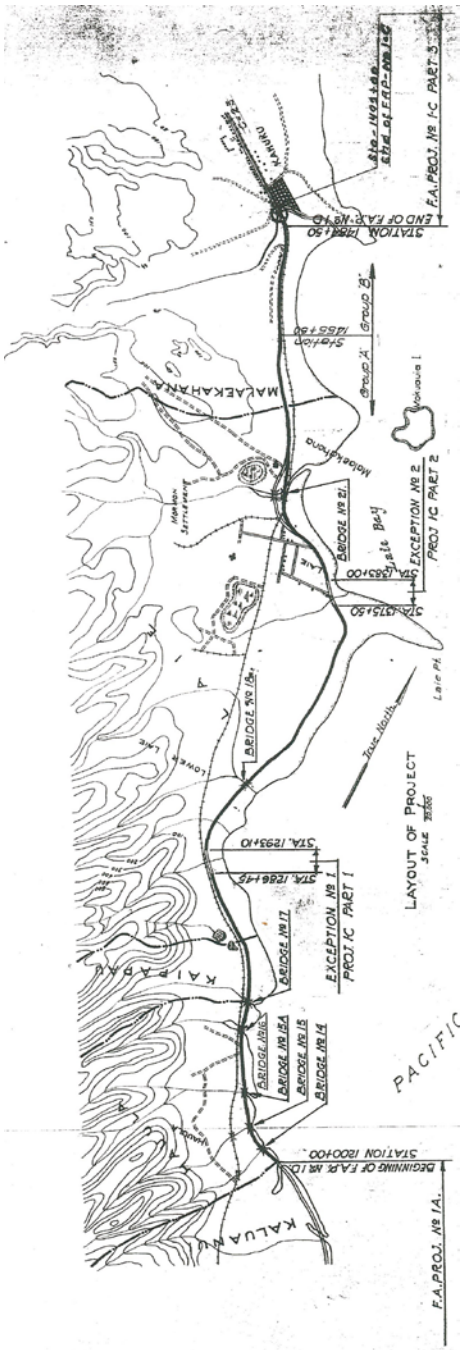
HAER No. HI-124-6



Portion of drawing dated April 1932 showing the layout of FAP 1D. *Hawaii Department of Transportation, Highways Division plan files archive, "Kamehameha Highway Federal Aid Project No. 1D, Hauula to Kahuku." Title sheet for 57 sheet drawing series 4251. April 1932.*

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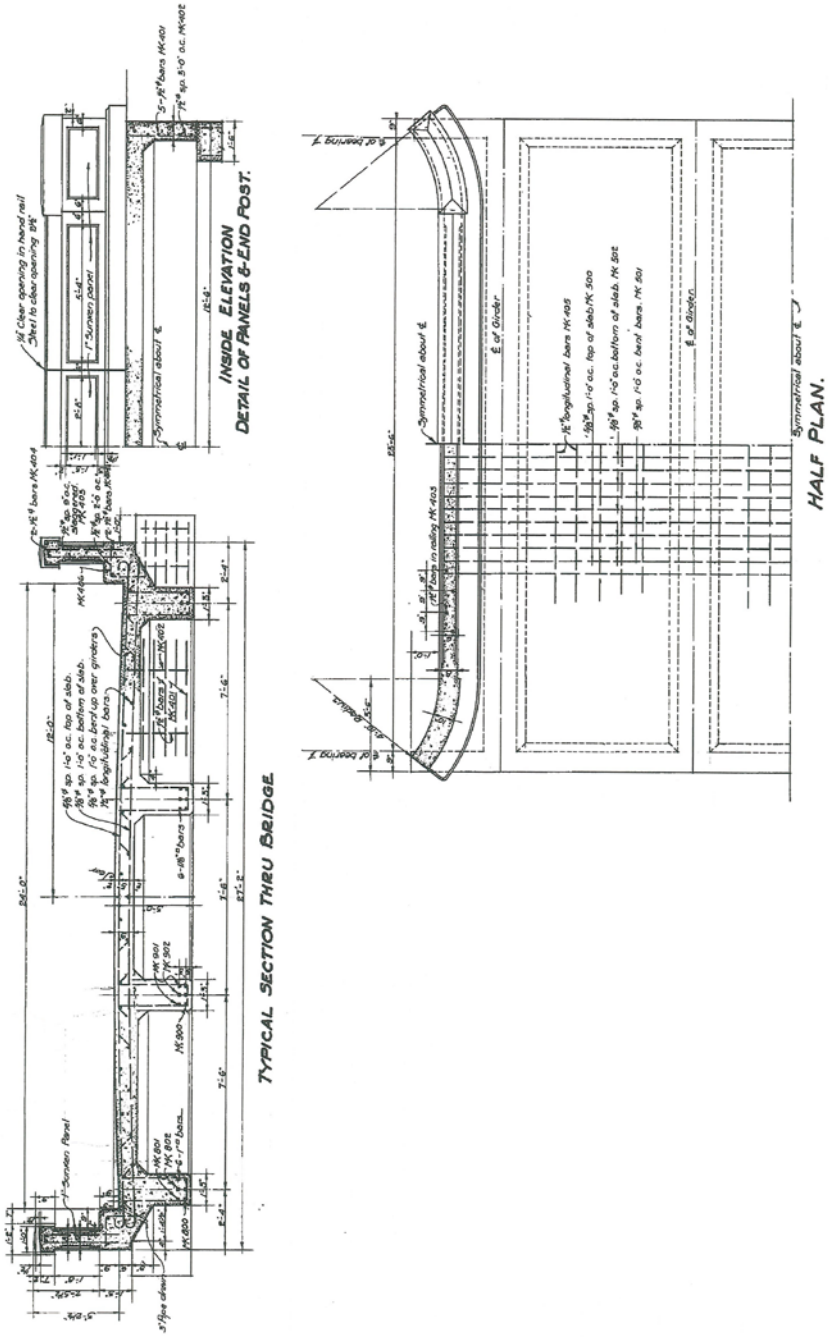
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Portion of drawing dated July 1932 showing a cross section of the Waipilopilo Bridge. *Hawaii Department of Transportation, Highways Division plan files archive, "Kamehameha Highway Federal Aid Project No. 1D, Hauula to Kahuku." Sheet 4251.34, "Standard Deck Girder Superstructure." Sheet 34 of 57 sheet drawing set, series 4251. July 1932.*

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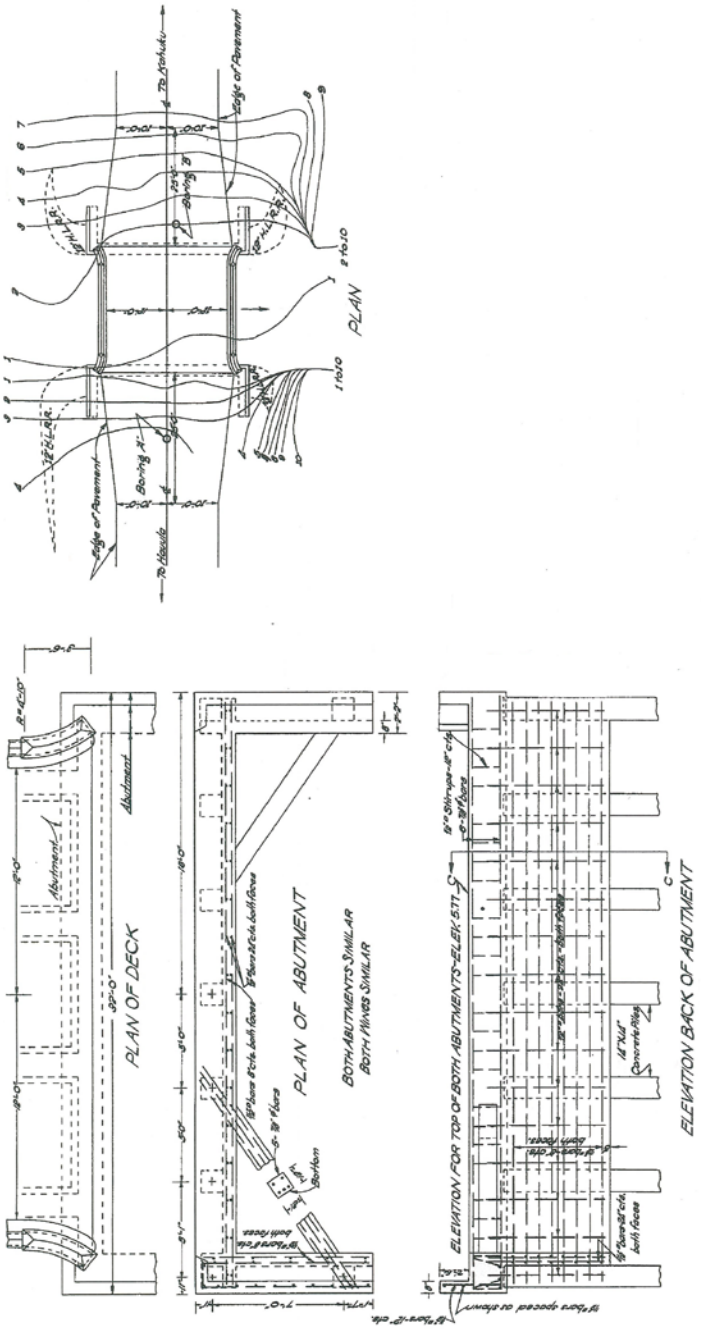


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Portion of drawing dated February 1932 showing plans of the Waipilopilo Bridge. *Hawaii Department of Transportation, Highways Division plan files archive, "Kamehameha Highway Federal Aid Project No. 1D, Hauula to Kahuku." Sheet 4251.29, "Waipilopilo Bridge." Sheet 29 of 57 sheet drawing set, series 4251. February 1932.*

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APPENDIX G CULTURAL IMPACT ASSESSMENT

Cultural Impact Assessment
for the Waipilopilo Stream Bridge Replacement Project
Hauʻula Ahupuaʻa, Koʻolauloa District, Island of Oʻahu
TMK [1] 5-4-002, 004, 011, and 017

Prepared for
Kimura International, Inc.

Prepared by
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and
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Cultural Surveys Hawaiʻi, Inc.
Kailua, Hawaiʻi
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Prefatory Remarks on Language and Style

A Note about Hawaiian and other non-English Words:

Cultural Surveys Hawai‘i (CSH) recognizes that the Hawaiian language is an official language of the State of Hawai‘i, it is important to daily life, and using it is essential to conveying a sense of place and identity. In consideration of a broad range of readers, CSH follows the conventional use of italics to identify and highlight all non-English (i.e., Hawaiian and foreign language) words in this report unless citing from a previous document that does not italicize them. CSH parenthetically translates or defines in the text the non-English words at first mention, and the commonly-used non-English words and their translations are also listed in the *Glossary* (Appendix A) for reference. However, translations of Hawaiian and other non-English words for plants and animals mentioned by community participants are referenced separately (see explanation below).

A Note about Plant and Animal Names:

When community participants mention specific plants and animals by Hawaiian, other non-English, or common names, CSH provides their possible scientific names (Genus and species) in the Common and Scientific Names of Plants and Animals Mentioned by Community Participants (Appendix B). CSH derives these possible names from authoritative sources, but since the community participants only name the organisms and do not taxonomically identify them, CSH cannot positively ascertain their scientific identifications. CSH does not attempt in this report to verify the possible scientific names of plants and animals in previously published documents; however, citations of previously published works that include both common and scientific names of plants and animals appear as in the original texts.

Management Summary

Reference	Cultural Impact Assessment for the Waipilopilo Bridge Replacement Project, Hau‘ula Ahupua‘a, Ko‘olauloa District, Island of O‘ahu, TMK [1] 5-4-002, 004, 011, and 017 (Ishihara and Hammatt 2011)
Date	November 2011
Project Number (s)	Cultural Surveys Hawai‘i (CSH) Job Code: HAUULA 6
Project Location	The Project area is located on O‘ahu’s windward coast within the town of Hau‘ula along the Kamehameha Highway. The rehabilitation effort includes Waipilopilo Stream Bridge and its immediate environs.
Land Jurisdiction	State of Hawai‘i
Agencies	Hawai‘i State Office of Environmental Quality Control, Department of Health (OEQC/DOH); Hawai‘i Department of Transportation (HDOT); and Hawai‘i State Historic Preservation Division (SHPD)
Project Description	The proposed Project involves the construction of widening and lengthening the existing Waipilopilo Stream Bridge to two 12-foot lanes with two 8-foot shared shoulders. Other proposed componenets include upgrades to bike rails, guardrails, posts, and end treatments; drainage system and lighting improvements; relocation of utilities; new signage and stripping.
Project Acreage	Approximately 0.5-acres
Area of Potential Effect (APE)	For the purposes of this Cultural Impact Assessment (CIA), the Project’s area of potential effect (APE) is defined as the entire 0.5-acre Project area (the Waipilopilo Bridge) as well as an expanded area for the temporary bypasses and associated construction. While this investigation focused on the Project area and APE, the study area included the entire *ahupua‘a* of Hau‘ula and the island of O‘ahu, as well as the larger context of Hawaiian beliefs (e.g. *mo‘olelo*, or stories and oral histories, as well as, *wahi pana*, or storied places), resources and practices.
Document Purpose	The Project requires compliance with the State of Hawai‘i environmental review process (Hawai‘i Revised Statutes [HRS] Chapter 343), which mandates consideration of a proposed Project’s effect on cultural practices and resources. At the request of AECOM Pacific, Inc., CSH is conducting this Cultural Impact Assessment (CIA). Through document research and cultural consultation efforts,

	this report provides information pertinent to the assessment of the proposed Project's impacts to cultural practices and resources (per the *Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts*) which may include Traditional Cultural Properties (TCP) of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places, in accordance with Hawai‘i State Historic Preservation Statute (Chapter 6E) guidelines for significance criteria (HAR §13–275) under Criterion E. The document is intended to support the Project's environmental review and may also serve to support the Project's historic preservation review under HRS Chapter 6E and Hawai‘i Administrative Rules (HAR) Chapter 13–275.
Results of Background Research	The background research reveals the following salient information: 1. The *mo‘olelo* of Hau‘ula describes physical phenomena such as Helumoa ("chicken scratch") and Makaluhi ("tired eyes"), suggesting a connection to the epic of Kamapua‘a, the chicken stealing swine who escaped from Olopana's tired warriors (Pukui et. al 1974:141; Thrum 1904:77). 2. Lanakila Church was built on the area known as Helumoa during the early 1850s. The stones used for the original church construction was from Wahi o Pua, an off-shore enclosure said to be constructed by *menehune* (legendary race of small people). The pieces of coral used for the construction were burned to create lime through a process known as *umu*. A new chapel (now known as the Hau‘ula Congregational Church) was constructed near the original stone structure in 1926. Remnants of the original stone church and graveyard still remain. 3. J.H. Napela (Na-pela-kaupu-o-Namahanaikaleonalani) was the first native Hawaiian to convert to the Morman faith and baptized in 1869. He was a former member of the Congregational Church. 4. In 1908, the Ko‘olau Railway Company laid 11 miles of the proposed 35 miles of rail system between Kahuku and Kahana thus stimulating the agricultural community. Between 1908 to 1921, most of the native residents of Kaluanui sold their Kuleana lands to the rail company. By 1950, the rail system folded and never reached its ultimate destination of Honolulu via Kāne‘ohe. 5. Kamehameha Highway was built in 1932 by the City and County of Honolulu, Department of Public Works. The highway reflected a major shift in transportation thus changing

	the agricultural industry from railway to roadway. 6. Hau‘ula is in the middle of the Ko‘olau Ridge Trail Complex, also known as Castle Trail, a 20-mile summit trail with numerous junctions to the surrounding valleys and ridges including the Lā‘ie Trail. The trail is lined with cabins on the summit such as the Kaipapau Cabin and Malaekahana Cabin. Other trails within the *ahupua‘a* (land division generally running from the mountain to the sea) include the Hau‘ula Loop Trail, Ma‘akua Ridge Trail, and the Ma‘akua Gulch Trail. 7. In 1997, CSH conducted Archaeological Monitoring on Kamehameha Highway from Kapaka Ahupua‘a to Lā‘ie Ahupua‘a (Masterson et. al 1997). Nine historic properties consisting of 19 human burials, two complete dog burials, numerous cultural deposits, 15 indigenous artifacts, and five historic artifacts were found (SIHP #50-80-06-4792 to -4798, -5457, and -5458). Artifacts included a basalt pounder, basalt flakes, adz fragment, pounders, sinkers, hammerstone, and manuports. A charcoal sample was tested for radio-carbon analysis which produced a calibrated date of either AD 1690 to AD 1730 or AD 1820 to AD 1920 (Masterson et. al 1997:28). 8. From the Archaeological Monitoring done by CSH, SIHP #50-80-05-4795 is in the immediate Project area. Site -4795 contained a subsurface cultural deposit, five indigenous artifacts, one historic artifact, and one human burial. Excavations were done on the shoulder of Kamehameha Highway and both sides of the Waipilopilo Bridge. The human burial was reinterred at Hau‘ula Congregational Church Cemetary (Masterson et. al 1997:27-28). 9. In 2002, CSH conducted archaeological monitoring for the expansion of Hau‘ula Beach Park. SIHP #50-80-06-5801 was discovered which contained previously disturbed human cranial and post-cranial remains (Bush and Hammatt 2002:18-20).
Results of Community Consultation	CSH contacted 45 individuals. After receiving initial contact letters from CSH, six participants responded in writing and two formal interviews were conducted. A summary of the information from these consultation efforts is as follows: 1. Water resources were abundant in the *moku* (district) of Ko‘olualoa. Both Mr. Bridges and Mr. Gorai spent their childhood fishing for *o‘opu* (goby) in the rivers, and *weke* (goatfish) and *pāpio* (crevalle, jack) in the ocean. Mr. Bridges also gathered *wana* (sea urchin), *he‘e* (octopus), and *limu* (seaweed) in the ocean as well as *‘opae* (shrimp) in the river. Mr. Gorai recalls laying net,

	throwing net, and catching black crabs with his father during the early morning hours. 2. Forest resources were also abundant in the *moku* of Ko‘olauloa. Mr. Bridges recalls his family having a *lo‘i* (taro patch) on their property that they frequently utilized. The family also owned cows and chickens which were on their property as well. 3. There are several cultural sites in the *ahupua‘a* of Hau‘ula. Mr. Bridges spoke of an unnamed *heiau* at the intersections of Hanimoa Street and Hau‘ula Homestead Road. He shares in an on-going community debate that Maunawila Heiau may have possibly been a *luakini*-class *heiau* (large temple where ruling chiefs prayed and human sacrifices were offered). Mr. Bridges reports there are one or two *ko‘a* (fishing shrines) near the Project area. Mr. Becket met with CSH for a site visit to Maunawila Heiau, Kaunihokahi Heiau, and two undocumented enclosures near the Hau‘ula Loop trailhead. Maunawila Heiau has since been destroyed and is covered with *hau* (hibiscus) and strawberry guava. Kaunihokahi Heiau still has a long wall intact with rocks scattered amongst the area. Mr. Becket removed some bushes of *laua‘e* (fern) which resembled what he thought might be an *ahu* (shrine). The undocumented enclosures found half a mile from the Project area, are intact and in excellent condition. Mr. Becket felt the walls were too low for the enclosure to be an animal pen. However, a small piece of white coral was found at the front wall of a larger enclosure. Mr. Becket recalls a cultural practitioner informing him that branch coral at a structure might indicate a ceremonial function or a burial. 4. Mr. Bridges shares the *mo‘olelo* of Makuakaumana, a healing priest from Tahiti who refused to return to his homeland. A whale beached itself on land and later carried Makuakaumana back to Tahiti. The swale itself is called Ka Lae o ka Palaoa or “the cape of the whale” to describe the event of Makuakaumana. 5. *Iwi* (bones) are a major concern of the community, especially during the construction process of the proposed Project. Mr. Matoon is concerned if any *iwi kupuna* (ancestor’s bones) are found within the Project area. Mr. Bridges is not aware of any burials in the area. Mr. Gorai was a former employee for Fletcher Pacific where he worked on installing 18-inch waterlines from Sacred Falls to the Hau‘ula Shopping Center. Mr. Gorai recalls unearthing animal and human burials near the Mormon Church in Hau‘ula. He is unsure what was done with the *iwi*. Community participants expressed the following concerns and recommendations: a. Mr. Gorai recommends a catwalk or walkway should be added

	to the Waipilop*ilo Bridge.* Due to the construction of a new bridge in the *ahupua‘a* of Kahana, he finds that the temporary bypass roads do not impact the environment too much. He recommends the bypass run on the *makai* (towards the sea*)* side of the bridge, not interfering with anyone’s property. b. Mr. Nihipali, a community member, is concerned about a nearby cemetery and whether the Project area will affect the burials. c. Mr. Bridges reports there are one or two *ko‘a* near the Project area.
Recommendations	Based on background research and community consultation detailed in the CIA report, CSH recommends the following measures to mitigate potentially adverse effects of the proposed Project on cultural resources and practices: 1. SIHP #50-80-06-4795 (Masterson et. al 1997) contained a subsurface cultural deposit, five indigenous artifacts, one historic artifact, and one human burial. Excavations were done on the shoulder of Kamehameha Highway on both sides of the Waipilopilo Stream. Resident of Imua Place, Mr. Pacheco, has expressed his knowledge of burials in the area. Mr. Bridges has acknowledged that there are one or two *ko‘a* near the Project area. Although it is not in the immediate Project area, Mr. Gorai has unearthed animal and human burials near the Hau‘ula Shopping Center. Based on the findings of SIHP #50-80-06-4795 and Mr. Bridges and Pacheco’s knowledge of *ko‘a* and burials in the immediate Project area, land disturbing activities during construction may uncover presently undetected burials or other cultural finds. It is recommended that all personnel involved in the reconstruction of the Project be informed of the possibility of any inadvertent cultural findings and burials. Should any burials be identified during excavation, all construction work should be ceased and the proper agencies and authorities are contacted pursuant to applicable law. 2. Based on the findings of SIHP #50-80-06-4795 and community knowledge of burials and cultural finds within the immediate Project area, an archaeological monitoring plan is recommended. 3. The Hawai‘i Department of Transportation should consult with community members to develop a reinterment plan and cultural preservation plan in the event that any human remains or cultural sites or artifacts be uncovered during construction or long-term maintenance for the Project.

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Section 1 Introduction

1.1 Project Background

At the request of Kimura International, Inc., Cultural Surveys Hawai‘i (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed Hawai‘i Department of Transportation HDOT Waipilopilo Bridge Replacement Project. Waipilopilo Bridge, which crosses Waipilopilo Gulch, is located on Kamehameha Highway between Imua Place and Waikulama Streets. Specifically, the Waipilopilo Bridge Replacement Project is at Kamehameha Highway at milepost 20.81, Hau‘ula Ahupua‘a, Ko‘olauloa District, on the island of O‘ahu (TMK [1] 5-4-002, 004, 011, and 017). The location of the Waipilopilo Bridge and Project area is shown on a U.S. Geological Survey (USGS) map (Figure 1), a 2005 aerial photograph (Figure 2), and a TMK map (Figure 3). The Waipilopilo Bridge is a concrete T-bridge, 25 feet long and 28 feet wide.

The proposed Project involves the construction of a temporary bypass bridge across Waipilopilo Stream and the replacement of the existing bridge with a new bridge which meets current design standards and is able to accommodate present day vehicular loads. The new bridge will have a longer and wider span than the existing bridge, in order to accommodate future drainage improvements planned for the Hau‘ula community. Travel lanes will increase to two 12-foot lanes. Shoulders will increase to 8-feet wide and will accommodate pedestrian, wheelchair, and bicycle use. The project will also include relocation and/or adjustment of existing utility structures and final repaving and landscaping to restore the construction area.

1.2 Document Purpose

The Project requires compliance with the State of Hawai‘i environmental review process (Hawai‘i Revised Statutes [HRS] Chapter 343), which requires consideration of a proposed project’s effect on cultural practices. CSH is conducting this CIA at the request of Kimura International. Through document research and cultural consultation efforts this report provides information pertinent to the assessment of the proposed Project’s impacts to cultural practices and resources (per the *Office of Environmental Quality Control’s Guidelines for Assessing Cultural Impacts*), which may include Traditional Cultural Properties (TCP) of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places, in accordance with Hawai‘i State Historic Preservation Statute (Chapter 6E) guidelines for significance criteria (HAR §13-275) under Criterion E which states to be significant an historic property shall:

> Have an important value to the Native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

The document is intended to support the Project’s environmental review and may also serve to support the Project’s historic preservation review under HRS Chapter 6E and Hawai‘i Administrative Rules Chapter 13-275.

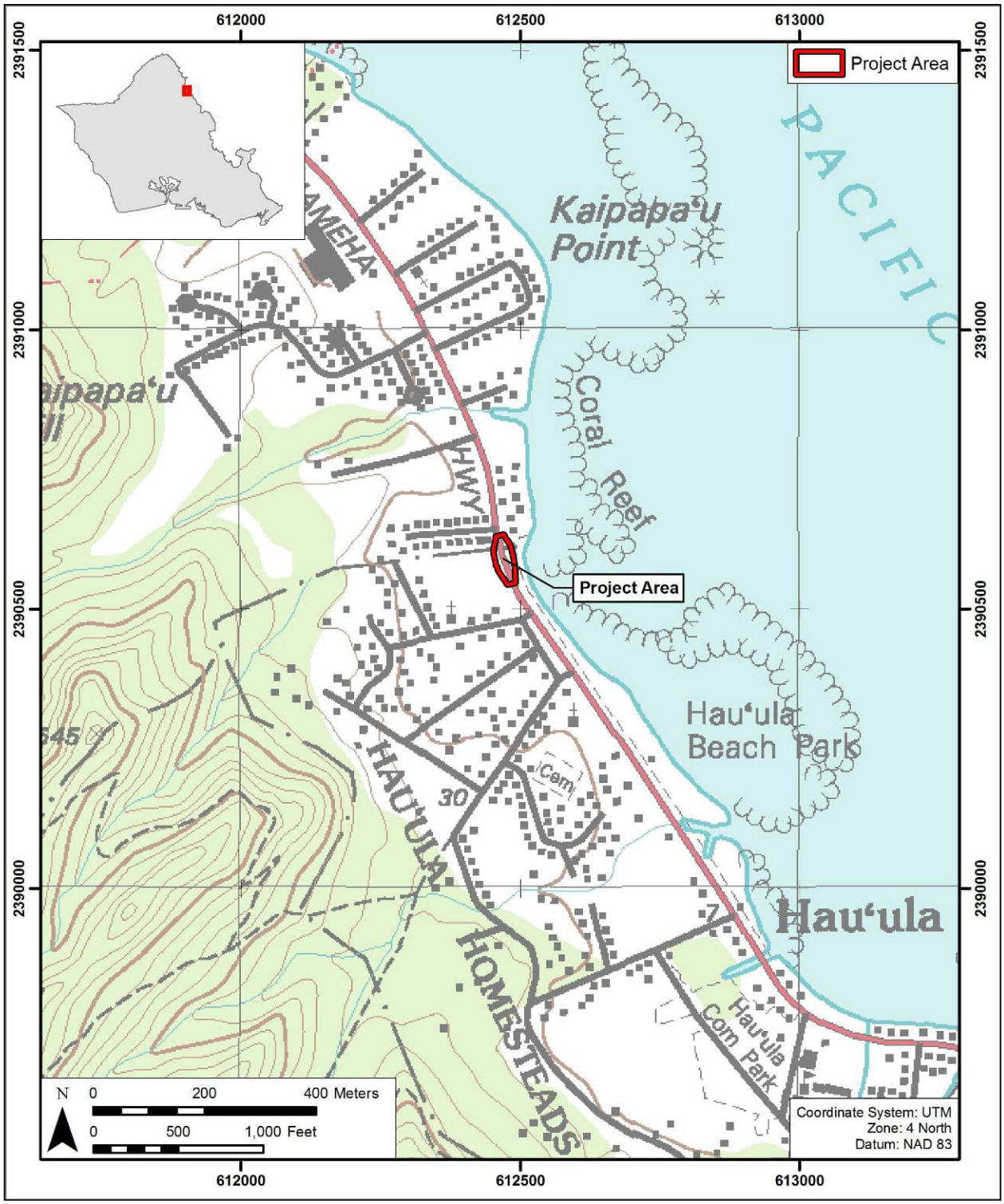


Figure 1. U.S. Geological Survey 7.5-Minute Series topographic map, Hau‘ula Quadrangle (1998); showing the Project area which includes temporary bypasses and associated construction



Figure 2. Aerial photograph (U.S. Geological Survey Orthoimagery 2005) of Hau‘ula showing the Project area which includes temporary bypasses and associated construction

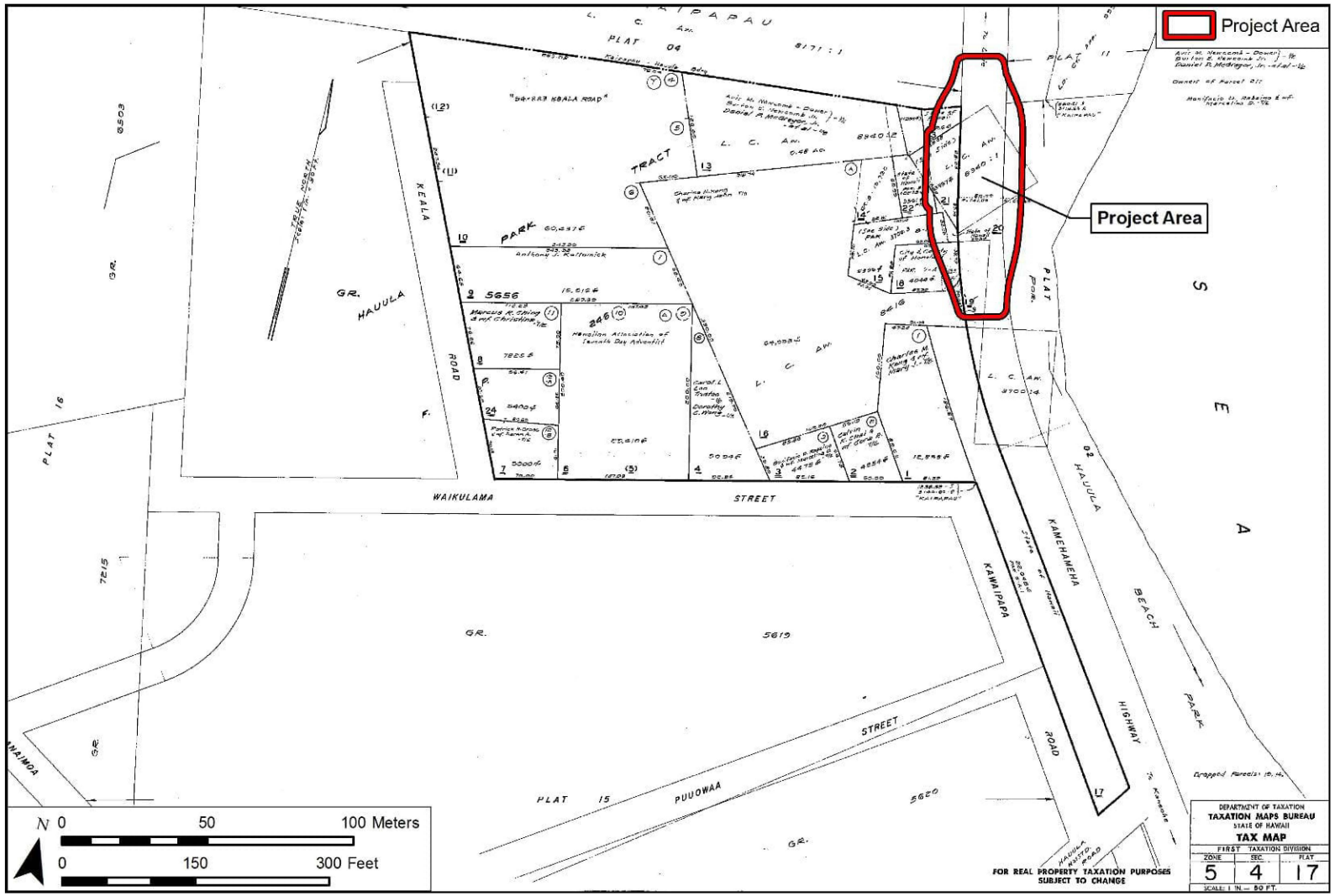


Figure 3. TMK [1] 5-4-17 showing the Project area which includes temporary bypasses and associated construction (Hawai‘i TMK Service 2011)

1.3 Scope of Work

The scope of work for this CIA includes:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

1.4 Environmental Setting

The Project area is situated along the coastal plain of the north windward coast of O‘ahu in the town of Hau‘ula at an elevation of 5–10 feet AMSL (above mean sea level). The Project area receives 60–80 inches of rain annually, however the rainfall gradient increases rapidly to nearly 150 inches near the Ko‘olau summit (Juvik and Juvik 1998). The northeast margin of the Ko‘olau Mountain Range is deeply dissected by numerous narrow and small gulches. The bridge replacement Project spans Waipilopilo Stream, a small stream that arises from the coastal plain.

1.4.1 Natural Environment

Soils in the Project area consist of Jaucas sand (JaC), Kawaihapai clay loam (KIA), and Lolekaa silty clay (LoD) (Figure 4).

The Jaucus series consists of excessively drained, calcareous soils on coastal plains, which developed in wind and water-deposited sand from coral and seashells. These soils are used for pasture, sugarcane, truck crops, alfalfa, recreational areas, wildlife habitat, and urban development. The natural vegetation consists of *kiawe* (Algeroba), *koa haole*, Bermuda grass, fingergrass, bristly foxtail, and Australian saltbush. Jaucus sands were formed in ‘back beach’ dunes, and these stabilized sand-dune deposits were favored places in pre-Contact times for burial of the dead, especially commoners (Foote et al. 1972:48-49).

The Kawaihapai series consists of well-drained soils usually found in drainage-ways and alluvial fans on coastal plains. This soil is used for sugarcane, truck crops, pasture, and orchards. The natural vegetation consists of *kiawe*, *koa haole*, lantana, and Bermuda grass (Foote et al. 1972: 63-64).

The Lolekaa series consists of well-drained soils on fans and terraces found mostly on the windward side of the island of O‘ahu. These soils are used for pasture, homesites, orchards, and truck crops. The natural vegetation consists of guava, Christmas berry, California grass, Hilo grass, and rice grass (Foote et al. 1972: 83-84).



Figure 4. Soils in and surrounding the Project area (Foote et al. 1972 soil map overlay on 2005 USGS Orthoimagery aerial photograph)

1.4.2 Built Environment

The Waipilopilo Stream Bridge, built in 1932 by L.L McCandless, is a one-span reinforced concrete deck girder structure (Figure 5; Thompson 1983:VII-145). The Waipilopilo Stream crosses Kamehameha Highway between Imua Place and Waikulama Street (Figure 6). Specifically, the Waipilopilo Stream Bridge Replacement Project is at Kamehameha Highway at milepost 20.81 in Hau‘ula; approximately 180 feet from Imua Place (Thompson 1983:VII-145). The existing structure is approximately 25 feet long and 27.3 feet wide. Abutments and parapets are made from reinforced concrete; a wooden walkway exists on the *mauka* (towards the mountain) side of the bridge (Thompson 1983:VII-145).

The Project area extends on both sides of Kamehameha Highway. Land uses within the Project area consist of market priced single-family homes and vacation rentals. Hau‘ula Beach Park is located *makai* (towards the ocean) of the bridge and is owned by the City and County of Honolulu. *Mauka* of the bridge are market priced single-family homes and the Waipilopilo Stream.



Figure 5. *Mauka* view of the Waipilopilo Bridge and Stream (CSH August 9, 2011)



Figure 6. *Makai* view of the Waipilopilo Bridge and Stream (CSH August 9, 2011)

Section 2 Methods

2.1 Archival Research

Historical documents, maps and existing archaeological information pertaining to Hau‘ula Ahupua‘a were researched at the CSH library and other archives, including the University of Hawai‘i at Mānoa’s Hamilton Library, the State Historic Preservation Division (SHPD) library, the Hawai‘i State Archives, the State Land Survey Division, and the archives of the Bishop Museum. Previous archaeological reports for the area were reviewed, as were historic maps and photographs and primary and secondary historical sources. Information on Land Commission Awards was accessed through Waihona ‘Āina Corporation’s Māhele Data Base (www.waihona.com) as well as a selection of CSH library references.

Research for the Traditional Background section centered on Hawaiian activities including: religious and ceremonial knowledge and practices; traditional subsistence land use and settlement patterns; gathering practices and agricultural pursuits; as well as Hawaiian place names and *mo‘olelo* (stories and oral histories), *mele* (songs), *oli* (chants), *‘ōlelo no‘eau* (proverbs) and more. The Historic Background section research focuses on land transformation, development and population changes beginning in the early post–European Contact era to the present day (see Scope of Work above).

2.2 Community Consultation

2.2.1 Sampling and Recruitment

A combination of qualitative methods, including purposive, snowball, and expert (or judgment) sampling, were used to identify and invite potential participants to the study. These methods are used for intensive case studies, such as CIAs, to recruit people that are hard to identify, or are members of elite groups (Bernard 2006:190). Our purpose is not to establish a representative or random sample. It is to “identify specific groups of people who either possess characteristics or live in circumstances relevant to the social phenomenon being studied. . . . This approach to sampling allows the researcher deliberately to include a wide range of types of informants and also to select key informants with access to important sources of knowledge” (Mays and Pope 1995:110).

We began with purposive sampling informed by referrals from known specialists and relevant agencies. For example, we contacted the SHPD, Office of Hawaiian Affairs (OHA), O‘ahu Island Burial Council (OIBC), and community and cultural organizations in Hau‘ula for their brief review of the Project and to identify potentially knowledgeable individuals with cultural expertise or knowledge of the Project area and vicinity, cultural and lineal descendants of Hau‘ula Ahupua‘a, and other appropriate community representatives and members. Based on their in–depth knowledge and experiences, these key respondents then refered CSH to additional potential participants who were added to the pool of invited participants. This is snowball sampling, a chain referral method that entails asking a few key individuals (including agency and organization representatives) to provide their comments and referrals to other locally recognized experts or stakeholders who would be likely candidates for the study (Bernard 2006:192). Cultural Surveys Hawai‘i also employs expert or judgment sampling which involves assembling

a group of people with recognized experience and expertise in a specific area (Bernard 2006:189–191). CSH maintains a database that draws on over two decades of established relationships with community consultants: cultural practitioners and specialists, community representatives and cultural and lineal descendants. The names of new potential contacts were also provided by colleagues at CSH and by the researchers' familiarity with people who live in or around the study area. Researchers often attend public forums (e.g., Neighborhood Board, Burial Council and Civic Club meetings) in (or near) the study area to scope for participants. Please refer to Table 3 in Section 6, for a complete list of individuals and organizations contacted for this CIA.

CSH focuses on obtaining in-depth information with a high level of validity from a targeted group of relevant stakeholders and local experts. Our qualitative methods do not aim to survey an entire population or subgroup. A depth of understanding about complex issues cannot be gained through comprehensive surveying. Our qualitative methodologies do not include quantitative (statistical) analyses, yet they are recognized as rigorous and thorough. Bernard (2006:25) describes the qualitative methods as "a kind of measurement, an integral part of the complex whole that comprises scientific research." Depending on the size and complexity of the Project, CSH reports include in-depth contributions from about one-third of all participating respondents. Typically this means three to twelve interviews.

2.2.2 Informed Consent Protocol

An informed consent process was conducted as follows: (1) before beginning the interview the CSH researcher explained to the participant how the consent process works, the Project purpose, the intent of the study and how his/her information will be used; (2) the researcher gave him/her a copy of the Authorization and Release Form to read and sign (Appendix E); (3) if the person agreed to participate by way of signing the consent form *or* providing oral consent, the researcher started the interview; (4) the interviewee received a copy of the Authorization and Release Form for his/her records, while the original is stored at CSH; (5) after the interview was summarized at CSH (and possibly transcribed in full), the study participant was afforded an opportunity to review the interview notes (or transcription) and summary and to make any corrections, deletions or additions to the substance of their testimony/oral history interview; this was accomplished either via phone, post or email or through a follow-up visit with the participant; (6) the participant received the final approved interview and any photographs taken for the study for record. If the participant was interested in receiving a copy of the full transcript of the interview (if there is one as not all interviews are audio-recorded and transcribed), a copy was provided. Participants were also given information on how to view the report on the OEQC website and offered a hardcopy of the report once the report is a public document.

2.2.3 Interview Techniques

To assist in discussion of natural and cultural resources and cultural practices specific to the study area, CSH initiated semi-structured interviews (as described by Bernard 2006) asking questions from the following broad categories: gathering practices, *mauka* and *makai* resources, burials, trails, historic properties and *wahi pana* (storied places). The interview protocol is tailored to the specific natural and cultural features of the landscape in the study area identified through archival research and community consultation. These interviews and oral histories supplement and provide depth to consultations from government agencies and community

organizations that may provide brief responses, reviews and/or referrals gathered via phone, email and occasionally face-to-face commentary.

2.2.3.1 In-depth Interviews and Oral Histories

Interviews were conducted at a place of the study participant's choosing (usually at the participant's home or at a public meeting place) and/or—whenever feasible—during site visits to the Project area. Generally, CSH's preference is to interview a participant individually or in small groups (two–four); occasionally participants are interviewed in focus groups (six–eight). Following the consent protocol outlined above, interviews may be recorded on tape and in handwritten notes, and the participant photographed. The interview typically lasts one to four hours. In addition to questions outlined above, the interviewee is asked to provide biographical information (e.g., connection to the study area, genealogy, professional and volunteer affiliations, etc.).

2.3 Compensation and Contributions to Community

Many individuals and communities have generously worked with CSH over the years to identify and document the rich natural and cultural resources of these islands for cultural impact, ethno-historical and, more recently, Traditional Cultural Properties (TCP) studies. CSH makes every effort to provide some form of compensation to individuals and communities who contribute to cultural studies. This is done in a variety of ways: individual interview participants are compensated for their time in the form of a small honorarium and/or other *makana* (gift); community organization representatives (who may not be allowed to receive a gift) are asked if they would like a donation to a Hawaiian charter school or nonprofit of their choice to be made anonymously or in the name of the individual or organization participating in the study; contributors are provided their transcripts, interview summaries, photographs and, whenever possible, a copy of the CIA report; CSH is working to identify a public repository for all cultural studies that will allow easy access to current and past reports; CSH staff do volunteer work for community initiatives that serve to preserve and protect historic and cultural resources (for example in, Lāna‘i and Kaho‘olawe). Generally our goal is to provide educational opportunities to students through internships, share our knowledge of historic preservation and cultural resources and the State and Federal laws that guide the historic preservation process, and through involvement in an ongoing working group of public and private stakeholders collaborating to improve and strengthen the Chapter 343 environmental review process.

Section 3 Traditional Background

3.1 Place Names of Hau‘ula

Hau‘ula Ahupua‘a extends from the ocean towards the crest of the Ko‘olau Mountains and is bounded by Kaipapa‘u Ahupua‘a to the north and Makao Ahupua‘a to the south in the *moku* (district) of Ko‘olauloa. The *ahupua‘a* was named after the *hau,* a native hibiscus that blooms during the summer months (Clark 2001:95). The flowers bloom in yellow and by the time they fall to the ground they turn red, the *ahupua‘a* literally meaning “red *hau*.”

3.1.1 Coastal Hau‘ula

The following section on coastal place names is summarized from John Clark’s (1977:146-150) *Beaches of O‘ahu*, unless otherwise noted.

Hau‘ula is composed of two main beach parks: **Hau‘ula Beach Park** and **‘Aukai Beach Park**. There is one main channel, the **Kilia Channel**, and one archaeological site off-shore, **Wahi o Pua** (“small fry place”).

The beach fronting Hau‘ula Beach Park is fairly narrow and straight, measuring 1,000 feet long. The beach is relatively safe all year and is perfect for water activities. Facilities include a comfort station, a lifeguard tower used during the summer months, a volleyball court, and camping grounds.

North of the beach park lies the Kilia Channel**,** a sand-bottom channel named after a type of wave. The channel has a strong current and is deep, making it a hazard to inexperienced swimmers. At high tide, Kilia is a popular surfing spot.

Wahi o pua is located off-shore. It is said to be constructed by *menehune,* the legendary race of small people who worked at night, who built a stone enclosure connected to the shoreline. The enclosure was originally named **Papua** (“small fry fence”). Today it is broken and submerged in the ocean.

At the southern end of the beach park, **Ma‘akua Stream** flows down to the ocean, the only stream to flow to the shore. A bar of sand separates Ma‘akua from the sea creating a *muliwai* (“a pond of brackish standing water”).

‘Aukai Beach Park is south of Hau‘ula Beach Park. The 0.2-acre parcel of land is located in front of the *muliwai* once known as **Kaluakauwā**. The small beach park was named in honor after Alfred ‘Aukai ‘Āluli, the last private owner of the land the park sits on and of the homestead land directly across Kamehameha Highway. ‘Aukai was born in Ke‘anae, Maui and moved to Hau‘ula in 1910. Both properties in Hau‘ula were given to ‘Aukai by his uncle. ‘Aukai built a grass shack on the property, followed by a wooden house in 1912 which part of still stands today. In December of 1932, the Territory of Hawai‘i bought all rights to the beach and road area of ‘Aukai’s property for $87.35. In 1940 ownership of the beach portion was transferred to the City and County to create a public park. The shoreline of the beach is fronted with a raised coral reef making recreational swimming difficult. When the tide is high or rough, it creates a very strong current.

To the south of the beach park lies a small bay, **Kalaeokapalaoa** (“the point of the whale”), where the *muliwai* of **Meheiwi** flows into the bay.

3.1.2 Inland Hau‘ula

Hau‘ula Ahupua‘a contains a number of streams that irrigated the terraces in the valleys such as Hanaimoa, Kawaipapa, Makua, Papale, and Punaiki (Sterling and Summers 1978:160). Hau‘ula Ahupua‘a does not contain any *pu‘u* (“peaks”) because it does not extend to the mountains.

The *ahupua‘a* is bound by **Punaiki Gulch** to the south and **Waipilopilo Gulch** (“smelly water”) to the north. From south to north, the gulches that extend from the uplands to the sea are: Punaiki Gulch, **Papali Gulch** (“small cliff or slope, as along a ravine”), **Ma‘akua Gulch**, **Hanaimoa Gulch**, and Waipilopilo Gulch (Figure 7; Pukui 1974:137, 227).

Waipilopilo Stream (“very stagnant water”), in the current Project area, is so short it is not usually pictured or labeled on most maps. It seems to be called that because Waipilopilo Gulch naturally empties into the sea when it storms hard. The water tends to be particularly stagnant in the dry season when there is little runoff to flush out the vegetation rotting in the pools.



Figure 7. 1934 Photograph of Hau‘ula Forest Reserve with markings of gulches; From left to right: Ma‘akua, Honimoa (Hanaimoa), Waipilopilo (Hawai‘i State Archives)

3.1.3 Cultural and Historic Sites of Hau‘ula

The earliest documented research in Hau‘ula was completed by J. Gilbert McAllister (1933:158-160) during his survey of O‘ahu. Four archaeological sites were recorded in the *ahupua‘a.* Elspeth P. Sterling and Catherine C. Summers (1978) expanded McAllister’s survey by collecting additional testimonies and archival sources. See Figure 8 for a complete compilation of sites from McAllister and Sterling and Summers.

Site 286 is **Kaunihokahi Heiau** where the *mauka* platforms still remain. The lower platforms were dismantled to construct cattle pens for a nearby dairy. The remaining upper platform measures 160 feet by 40 feet which indicates it was a rather large heiau. The longest side, a high terrace wall, ranges between 10 to 15 feet long, parallel with the ocean and facing east (Figure 12).

Site 287 is **Maunawila Heiau**, Punaiki, Hau‘ula. The *heiau* sits near the mountain side of the Hau‘ula courthouse on the spur of the ridge overlooking the sea. The little that remains of the *heiau* is now covered with lantana and guava. The upper portion of the *heiau* is 53 feet long, the base is approximately 60 feet long, and stands five to six feet high and faces east. A second terrace is 3 feet higher than the aforementioned and faces north. Throughout the *heiau* large, natural stones have been utilized, some stones measuring 7 feet high which may have been a significant feature in the construction (Figure 9 to Figure 11).

Site 288 is an enclosure from Makao to Kapoho Valley. This may have been **Kapoho Heiau**. The enclosures are nearly obliterated. They form rectangles about 15 to 20 feet wide. One which is larger than the others has interior dimensions of 70 by 60 feet, side walls and walls on the mountain side appear to have been 8 feet thick, and a front wall with a 20-foot slope toward the sea. Cane has been planted and almost all of these sites and features have been destroyed. On the low level land below the sites old taro patches existed but where plowed for cane.

Site 289 was **Lua‘ali‘i Heiau**, Mākao, Hau‘ula. Mākao is a bay south of Hau‘ula Beach Park. The *heiau* was destroyed years ago but is still remembered. Lua‘ali‘i (“royal pit”) contained a pond within its walls and around the pond were placed images (Pukui et. al 1974:141).

Sterling and Summers also compiled historical sites which includes McAllister’s findings. Two additional sites were recorded from the authors (1978:161).

Helumoa (“chicken scratch”) is located where the former Lanakila Church (now known as Hau‘ula Congregational Church) stands (Sterling and Summers 1978:161). Thrum translates Helumoa as “count chickens” and suggests a connection to the legend of Kamapua‘a, the chicken stealing swine who escaped to Kaliuwa‘a (1919:77).

Formerly the site of Cooper Ranch Inn (fronting Hau‘ula Homestead Road), **Makaluhi** (“tired eyes”) was the resting place of Olopana’s warriors after searching for the demigod Kamapua‘a (Pukui et. al 1974:141).

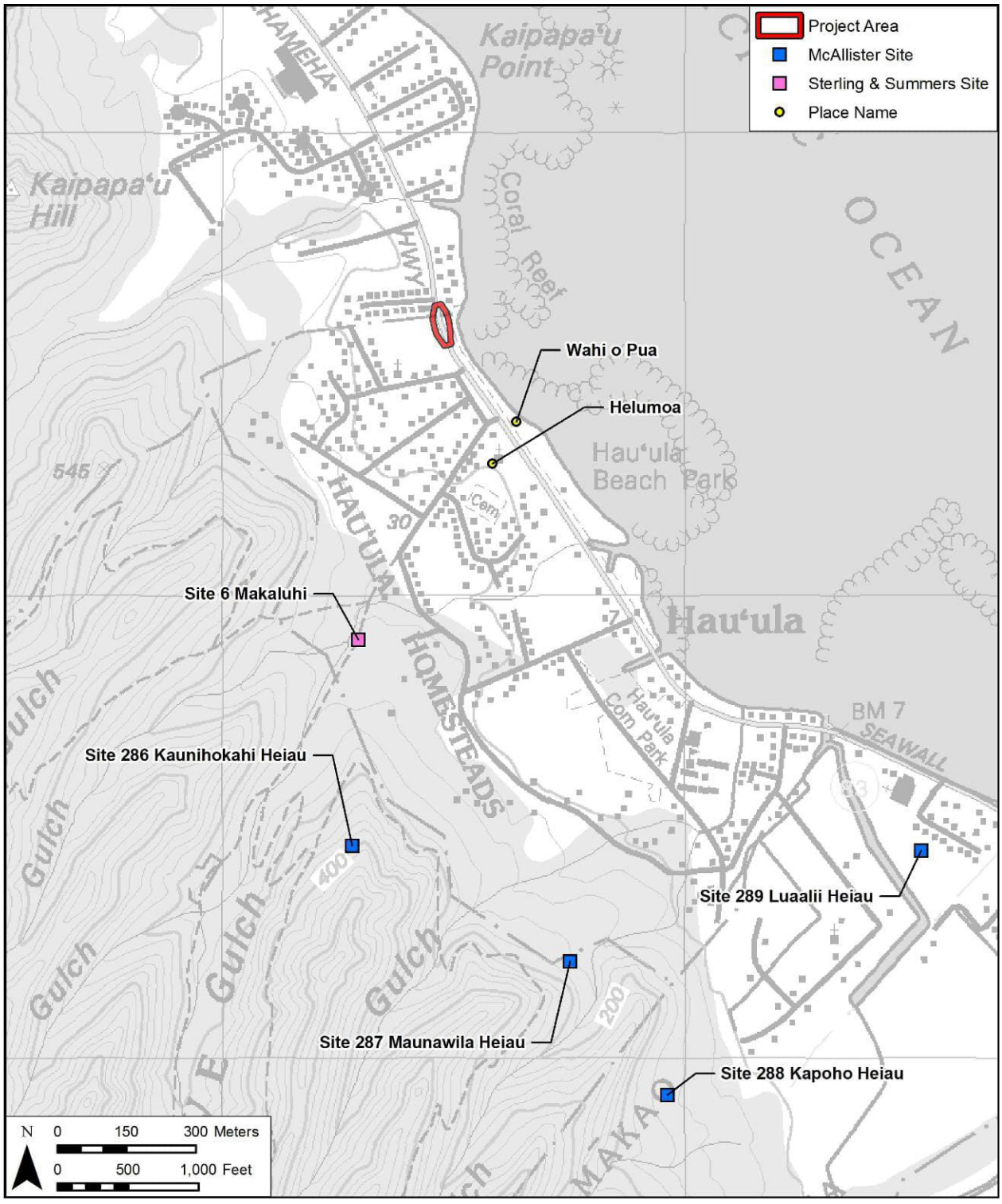


Figure 8. Compilation of McAllister (1933) and Sterling and Summers (1978) sites



Figure 9. Remaining wall of Maunawila Heiau (CSH June 15, 2011)



Figure 10. Large, irregular shaped stones scattered near Maunawila Heiau (CSH June 15, 2011)



Figure 11. Large stone shape *mauka* of Maunawila Heiau (CSH June 15, 2011)



Figure 12. Walls still intact at Kaunihokahi Heiau (CSH June 15, 2011)

3.2 Mo‘olelo

There are many oral histories associated with the *ahupua‘a* of Hau‘ula in the district of Ko‘olauloa. These accounts describe the development and naming of landmarks, the origin and presence of resources.

3.2.1 The Epic of Kamapua‘a

The epic of Kamapua‘a, the Hawaiian pig god, is an example of the Hawaiian tradition of orature that inspires and shapes cultural identity. Kamapua‘a was born in the *ahupua‘a* of Kaluanui and resided in Kaliuwa‘a with his grandmother and siblings. Kamapua‘a and his older brother Kahikihonuakele and Kekelei‘aikū, tended to the uplands of Kaliuwa‘a to farm taro. Kekelei‘aikū suggested that Kahikihonuakele stay by the sea to fish while him and Kamapua‘a finish planting taro tops (Kame‘eleihiwa 1996:13-24):

> Kekelei‘aikū fed his little pig-brother until he was satisfied. Then the two began to climb up to the place where they were to work.
>
> When they arrived there, Kekelei‘aikū said to this little pig of his, “Here is our work, we two shall plant together the taro tops of our elder brother, because this something eaten by all of us when the taro is mature.”
>
> This little pig of his began to dig, and the hands of Kekelei‘aikū seized the cuttings, thinking he would plant them, when this little pig ran up and thrust upward at Kekelei‘aikū’s hands.
>
> Then he asked this pig of his, “Don’t you want us to work together?”
>
> This little pig grunted. Therefore, Kekelei‘aikū returned to the side that was shaded by some trees and made himself comfortable until he was overcome with sleep. He was suddenly awakened by the rooting of this little pig beside him.
>
> He asked, “Is the work finished?” This little pig grunted.
>
> When he looked carefully at the pig’s work, he saw that all the taro tops had been planted from one edge of the garden to the other. So the two of them turned towards their home by the sea at Kaluanui. (Kame‘eleihiwa 1996:21)

Kamapua‘a’s supernatural feats includes his stealing of people’s chickens from the *ahupua‘a* of Punalu‘u to Kaleoka‘ō‘io which is at the boundary point between Ko‘olaupoko and Ko‘olauloa. One night Kamapua‘a was successful at stealing all the chickens of Ka‘alaea:

> The people followed this little pig for a great distance to Kaluanui, where his parents and older brothers were living.
>
> The people went and asked who owned that little pig, and indeed the natives of that area showed them.
>
> In no time the people were standing outside the threshold of their house asking, “Is the pig that ran here yours, perhaps?”

> “Our chickens have been persistently stolen, and so have the chickens of half of Ko‘olauloa and half of Ko‘olaupoko. People are very angry at this little chicken-stealing pig.”
>
> “Perhaps it may be that it wasn’t my little pig, for how could he gone all the way to Ko‘olaupoko? Here is my little pig inside his pen, fast asleep.”
>
> When they went to this little pig’s pen, the little pig was crouched down with a rather thin body, looking to them like a pig covered with sores.
>
> They were in doubt. This didn’t look like the pig they had chased, because that pig had had a fine body. He had been rather big and somewhat smooth and round
>
> The people said to Kekelei‘aikū, “Don’t you have any other pigs?”
>
> Kekelei‘aikū denied it, saying, “I don’t have any other pigs, only that little pig.”
>
> The people returned empty-handed, with their hopes disappointed. (Kame‘eleihiwa 1996:23-24)

This particular story indicates Kamapua‘a’s widespread presence throughout the wndward coast of O‘ahu, specifically his birthplace and residency at Kaluanui and Kaliuwa‘a, respectively.

3.2.2 The Legend of Halemano

The Legend of Halemano involves a story in which Laenihi assists her brother in capturing the woman of his dreams, Kamalalawalu, along with the aid of the latter’s brother Kumukahi (Elbert 1959:250-290).

Halemano was living with his grandmother, Kauka‘ali‘i, at Ka‘au in Wai‘anae. Kamalalawalu was the daughter of chiefs who ruled Kapoho located in the district of Puna on the island of Hawai‘i. She was under strict kapu; no one was allowed to see her and her only companion was her brother, Kumukahi. Halemano began to dream of the beautiful Kamalalawalu and fell deeply in love with her. Denying himself food and water because he was greatly enamored with Kamalalawalu, he became very ill and died. Laenihi, the sister of Halemano, restores her brother back to life and instructs him to fall asleep and ask where Kamalalawalu resides while dreaming. Halemano begins to dream:

> In this dream Halemano asked Kamalalawalu: “What is the name of the land of your birth and what is your name?”
>
> “Kapoho in Puna, Hawaii, is the land of my birth; it is where the sun rises, and not in the west. My name is Kamalalawalu.”
>
> Shortly after this Halemano awoke from his sleep, and he told Laenihi of his dream. When Laenihi heard this she said: “You must partake of some food and I will go and bring you your lover from Hawaii.” Halemano then consented and took some food. (Elbert 1959:252)

Laenihi is convinced Kamalalawalu and Kumukahi to sail from the island of Hawai‘i to O‘ahu. During this trip the party lands in Hau‘ula on O‘ahu where Kumukahi fancies the image of Malaekahana where he remained. The remaining party continues their journey and lands at

Ukoa in Waialua. Upon Kamalalawalu's arrival, orders were given to the people of Waialua and Wai‘anae to give presents to her. Kamalalawalu and Halemano lived together as husband and wife on O‘ahu.

As the news of their companionship spread, the king of O‘ahu Aikanaka, requested messengers to retrieve the beauty for him. Kamalalawalu refused to see Aikanaka, angering the king and declaring a war on Halemano and his parents.

Halemano leaves with his wife and grandmother and travels from Waialua to Lāi‘ewai to Hau‘ula, Kualoa, Kahalu‘u and Moelana. The party then traveled from island to island where the party split: Ka‘aeali‘i, Halemano's grandmother stayed in Kohala; Halemano and Kumukahi resided in Waiakea; while Kamalalawalu was taken to the king of Puna, Hua‘a.

Kamalalawalu never returned to Waiakea for Halemano and became the wife of Kumoho. Halemano learned of Kamalalawalu's infidelity and once again dies. Again his sister Laenihi restored him back to life where he vowed to win back his wife through a skill.

Halemano began to study the art of singing and chanting. Halemano began chanting one day and Kamalalawalu arrived. After seeing her husband, Kamalalawalu longed for him once again. Halemano began courting Kikeka‘ala, the daughter of Nunulu, a high chief of Kohala. Kikeka‘ala issued an order to all in the Kohala area to play a game of *kilu*, a game where a small gourd is cut lengthwise and then thrown towards a target; if a person hit the target, he or she would claim their prize (Pukui et. al 1986:152).

> Upon his arrival, Kikeka‘ala said to him: "I will make a wager with you. If I beat you in the kilu throwing then you shall belong to me. And if you should beat me, I shall belong to you."
>
> Halemano then said: "The wager is satisfactory." (Elbert 1959:274)

Halemano agreed to a game with Kikeka‘ala. When he saw Kamalalawalu in the audience, he began chanting to her and their great love, however, at the close of each verse he threw the *kilu* hitting the mark successfully each time. Kikeka‘ala eventually won the game of *kilu* and claimed Halemano as her prize while Kamalalawalu was led away.

Halemano and Kikeka‘ala lived together as husband and wife where she followed him very closely. One day Halemano suggested to Kikeka‘ala that he fish for *aku* (bonito)*:*

> Kikeka‘ala said: "We must go together."
>
> Halemano said: "It will only delay me. You must stay home. I will go alone and shall return in no time." The wife at last consented and Halemano set out. (Elbert 1959:286)

Instead of fishing, Halemano sailed on a journey throughout the entire Hawaiian Island chain where Kamalalawalu followed him from Maui to Moloka‘i and then around O‘ahu continuing from Kualoa to Hau‘ula, Malaekahana, Laiewai, and Waialua. The pair met in Waialua where they had a friendly talk and their stay proved to not be as harmonious as before, saddening Kamalalawalu.

3.2.3 The Legend of Makuakaumana

This *mo‘olelo* concerns the creation of the point of Makuakaumana, a *kahuna* (priest, sorcerer) that had traveled from the distant land of Kahiki:

> Makuakaumana lived in the nearby valley of Kaipapa‘u. One day his son, who had long been searching for his father, located the kahuna’s home. He entreated his father to return to Kahiki with him, but Makuakaumana refused. Disappointed and angered by his father’s refusal, the son made a prophecy and left. He prophesied that one day Makuakaumana would go down to the beach and never return. Some time later, a large whale was washed ashore at Meheiwi. Thinking it dead, the people of Hau‘ula played on its back and jumped from it into the ocean. Makuakaumana, hearing the shouts of laughter, left his home and joined in the play. As he climbed upon the great creature to make his third jump, the whale suddenly came to life and carried Makuakaumana off to Kahiki. From then on, the point was known as Kalaeokapalaoa. (Clark 1977:149)

3.2.4 The Story of Why Hilu Fish Are Striped

Kaululena and Mā‘io were brothers and gods who sometimes transformed into fish. One day while in the form of the *hilu* (black striped wrasse) fish they visited the island of O‘ahu and separated at Makapu‘u. Kaululena swam towards Waikīkī, while Mā‘io swam to Hau‘ula where he was caught by fishermen. The village ran to see the great fish brought onto shore where a fisherman agreed to divide it to every family.

> “No!” People looked up, startled by the tone of the old man who spoke. “Do not cut that fish,” he told them. “It is a god. It is Mā‘io, one of the gods to whom I pray. He sometimes takes the form of a *hilu* fish and this is he. Oh, do not harm him! Throw him back into the sea!” (Pukui 1994:144)

The villagers laughed at the old man, each family taking home a portion of the fish while the old man took none, weeping and praying at home. While the *hilu* fish started to cook on the fires, the sea began to turn red. Kaululena saw the sea turning red and realized that his brother had been killed. Leaping from the ocean, Kaululena took to his god-form and strode to Hau‘ula angrily. The villagers stared at Kaululena upon his arrival. Overhearing the old man’s prayers, Kaululena stepped into the home:

> “Come in traveler,” the old man said. “My food is ready. Come and eat with me.”
>
> “I have no time to eat,” the stranger answered. “I heard your prayer and stopped to ask about the gods to whom you pray.”
>
> “They are Kaululena and Mā‘io, the gods to whom my father prayed and my grandfather. Sometimes they take the form of hilu fish. This morning fishermen caught a huge fish. I thought it was one of my gods and begged the men to throw it back into the sea. They would not listen. Evil will come upon Hau‘ula.” (Pukui 1994:145)

Kaululena became angered with the villagers and instructed the old man to gather his family and hang streamers of *kapa* (also known as tapa, cloth made from *wauke* or *māmaki* bark) around

his home then disappeared. The old man heeded Kaululena’s warning, gathering his relatives and hung the kapa streamers about (Pukui 1994:145*)*.

Kaululena began to walk upstream (Kaipapa‘u Stream according to Margaret Titcomb [1972:75], Ma‘akua Stream according to John R.K. Clark [1977:147]) reaching the source, a bowl of rock with steep sides in the mountains. Kaululena took to his fish form, layed in the mouth of the stream creating a dam, praying for rain. It began to rain, filling up the rock bowl. When the bowl was full of rain water, Kaululena lept aside, flooding Hau‘ula. The villagers heard the water thundering down the land but could not escape. All you attemped to cook the hilu fish were swept away, only the old man and his family were spared, the waters parting and flowing around the homes where the *kapa* streamers were hung. According to Titcomb, the old man was the keeper of the two demi-god brothers (Titcomb 1972:76). According to Clark, the old man and his relatives lived on a hill in Hau‘ula called Lanakila (“to rise to a high place”) where the former Lanakila Church was built below the hillside (Clark 1977:147).

Mā‘io was brought back to life and lives today as the *hilu* fish again. The spots and stripes of the *hilu* fish are from rocks in the fire that touched his body or slashes for salting.

Section 4 Historical Background

4.1 Early Historic Period

The first historical reference to windward O‘ahu was in 1779 when the H.M.S. *Resolution* passed along the north side of O‘ahu. Lieutenant James King wrote:

> It [O‘ahu] is by far the finest island of the whole group. Nothing can exceed the verdure of the hills, the variety of wood and lawn, and the rich cultivated valleys, which the whole face of the country displayed. (Cook 1784, Vol. 3:115, cited in McAllister 1933:153)

On February 28, 1779, in the log of the *Resolution*, now captained by Charles Clerk, due to the untimely death of Captain James Cook at Kealakekua Bay on February 14, we find a description of the northwest coast of O‘ahu:

> Run round the Noern [Northern] Extreme of the Isle which terminates in a low point rather projecting [Kahuku Point]; off it lay a ledge of rocks extending a full Mile into the Sea, many of them above the surface of the Water: the Country in this neighborhood is exceedingly fine and fertile: here is a large Village, in the midst of it is run up a high pyramid doubtlessly part of a Morai [*heiau*]. I stood into a Bay just to the Westward of this point the Eastern Shore of which was far the most beautifull [*sic*] Country we have as yet seen among these Islands, here was a fine expanse of Low Land bounteously cloath’d with Verdure, on which were situated many large Villages and extensive plantations; at the Water side it terminated in a fine sloping, sandy Beach . . . (Beaglehole 1967:572)

In 1794, British Captain George Vancouver noted:

> In every other respect our examination confirmed the remarks of Captain King: excepting, that in point of cultivation or fertility, the country did not appear in so flourishing a state, nor to be so numerously inhabited, as he represented it to have been at that time, occasioned most probably by the constant hostilities that had existed since that period. (Vancouver 1798, Vol. 3:71)

It is presumed from these early descriptions that in the thirteen years that separated Captain Cook’s voyage from Captain Vancouver's, the cultural landscape of the north shore of O‘ahu had undergone significant changes. The probable cause for the decrease in cultivation was the decline in population due not only to “the constant hostilities” of the inhabitants, but also to the spread of venereal disease and other diseases introduced by Cook’s expedition in 1778, as well as other visiting ships in the years that followed.

In 1826, the missionary Levi Chamberlain made the first of two trips around the island of O‘ahu to inspect English language schools and communities. On this section of the coast, traveling clockwise around the island, after traveling from Lā‘ie Wai and Lā‘ie Malo‘o, Chamberlain walked another two hours where he arrived in Hau‘ula:

> . . .we found 108 persons assembled to repeat the kanawai. The head man of Hauula conducts the school which unites the people of this land and Kaipapau and adjoining land- He teaches the scholars the kanawai, Baptiso & Pule, and would instruct them in the Ka Be A Ba but has no books… (Chamberlain 1826:15-16)

In 1828, Chamberlain made his second trip around O‘ahu, traveling counter-clockwise and found two schools in Hau‘ula, two schools in the Lā‘ie/Mālaekahana area, and one school house at Kahuku:

> From Makao we passed on to Hauula and examined two schools one of which consisted of sandal wood cutters from the mountains and exhibited on the slate. The scholars wrote down the alphabet both the capital and small letters; the letters were not very accurately formed; but the disposition to learn was commendable, and with a view of encouraging to perservere, I gave each of them a spelling book (Chamberlain 1956:35).

From this account, it would seem that the population of the area was increasing, as there were more schools along the coast in 1828 than in 1826, but this instead probably represents the trend in the early historic period for Hawaiians to move to house lots in villages, rather than live in homesteads scattered along the coast and in the uplands.

4.2 The Protestant Missionaries and Lanakila Church

The Protestant mission established itself in Hau‘ula with the construction of Lanakila Church. Founded as a mission chapel of Reverend John S. Emerson’s Hale‘iwa church, the original Lanakila Church (now known as the Hau‘ula Congregational Church) was built in the early 1850s through a united effort of the windward Native Hawaiian community and the Reverends Emerson, John Young, and George B. Rowell (Kugle 1991:14). Over the years this church persevered through many hardships, surviving to become a mainstay of the landscape and religious community.

The stone church, whose original name of Lanakila stemmed from the legend of the *hilu* fish (see 3.2 Mo‘olelo, 3.2.4 The Story of How Hilu Fish Are Striped), was built on the area known as Helumoa and took five years to complete its construction (Thrum 1904:77). According to John Clark, many of the stones used for Lanakila Church’s construction were obtained from Wahi o Pua, the off-shore enclosure said to be constructed by menehunes (Clark 1977:147). Pieces of coral were also removed from the area presently known as Hau‘ula Beach Park and burned to create lime through a process known as *umu*. The lime was then mixed with sand to create mortar, another component of the church’s construction. Wood was gathered from Hau‘ula, Punalu‘u, and Kahana (Thrum 1919:78). The measurements of the church were 96 feet by 34 feet with walls of 13 feet in height and 2 ½ feet thick on a foundation of 4 ½ feet. Due to a smallpox epidemic, only a quarter of the 4,000 Native Hawaiians who were involved in its construction lived to see its completion.

Worshipers attended services and buried their loved ones at this location until 1915**.** The downfall of the church seemed to be the departure of Reverend Soloman Nu‘uhiwa in 1897 and being unable to replace a “good live shepard” (Thrum 1919:78*).* A new wooden chapel was built towards Punalu‘u, however, to maintain the church’s property rights to the original site and to

ensure preservation of the graveyard, a new building was constructed in 1926 (Figure 13; Kugle 1991:15). The remnants of the original stone church and graveyard still remain (Figure 14).

The Church of Jesus Christ of Latter Day Saints (known as the Mormon Church) acquired its first holdings in Lā‘ie in 1865, more than a decade after the intial missionaries arrived in the area. This acquisition, consisting of 6,000-acres of plantation land in Lā‘ie, served as a foundation for a religious, agricultural, and financial stronghold (Sterling and Summers 1978:157).

The first Native Hawaiian to convert to the Mormon faith was baptized in 1869, J.H. Napela (Na-pela-kapu-o-Namahanaikaleleonalani) was a man of royal lineage and was formerly active in the Congregational Church (Sterling and Summers 1978:157). The Mormon Church strengthened and in 1920 a Mormon temple was dedicated in Lā‘ie. A ward was built in Hau‘ula and is still in use today.



Figure 13. Original stone foundation of Lanakila Church (CSH June 15, 2011)



Figure 14. The current Hau‘ula Congregational Church (CSH June 15, 2011)

4.3 The Māhele

The *ahupua‘a* of Hau‘ula was densely populated during the time of the Māhele (redistribution of Hawaiian land to private ownership) in the mid-1800s as evidenced by numerous claims made by native Hawaiians testifying to the land commission between the years 1847 and 1853. Many of these claims were awarded and can be located on various historic and tax key maps.

Hau‘ula was Crown land, claimed by Kauikeaouli (Hawaii Commission of Public Lands 1929). Forty-three *kuleana* (right, priviledge) claims were registered by the Land Commissioners for Hau'ula (1848-1853), of which 35 were awarded (Table 1; Waihona ‘Āina 2000). Approximately 30 of these 35 claims are clustered southeast of Ma‘akua Stream between Kamehameha Highway and Hau‘ula Homestead Road particularly just west of Hau‘ula Elementary. A smaller cluster of five *kuleana* claims lies where Waipilopilo Gulch would empty into the sea (Figure 15; Waihona ‘Āina 2000).

A number of claims in Hau‘ula, such as Land Commission Award 3700 to Mokulama, utilized the mountain and sea for farming and gathering purposes. Mokulama was awarded land in Hau‘ula and Kaipapau, specifically in Waipilopilo which is in the Project Area. According to the Foreign Register and Native Testimony for Claim 3700, the claimant farmed three *kalo* patches since 1847 in Hau‘ula and another in the *‘ili* (subdivision) of Waipilopilo where a home was also built. No *kula* lands were being cultivated by the claimant in Hau‘ula, however, the claimant cultivated one parcel of land in Kaipaupau which he held for 20 years (OHA 2011).

The settlement pattern found for Hau‘ula evidenced by the information within the LCA testimonies mirrors the traditional Hawaiian settlement pattern for much of the seven islands. Permanent habitation existed along the sandy coastline. Agriculture was practiced in the lowlands behind the coast and along the fringes of the Ko‘olau. The gathering of forest resources occurred in the surrounding uplands and mountainous regions.

Table 1. Land Commission Award number, Awardee, Ahupua‘a, ‘Ili, Use of Land, and Miscellaneous Notes for Ko‘olauloa

LCA	Claimant	Ahupua‘a	‘Ili	Land Use	Notes
3700	Mokulama	Hau‘ula, Kaipapau	Waipilopilo Kumalaehau Paninao Iha‘a Kokoloilo	Lo‘i (irrigated terrace) Kula ‘āina (plain, field) House lot	
3944	Nakapalau	Makao Kapaka Hau‘ula Kaipapau Pupukea	Kalakala Kukuakua	Lo‘i Kula ‘āina House lot	
4281	Kaunahi	Lā‘ie, Hau‘ula	Kanepanui Hahakulou Koloa		Land is being used in Lā‘ie
4285	Kuhema	Hau‘ula	Eliwahine Kahokukae Kaweawe Pu‘ueo	Lo‘i	Kuhema’s mother reserved land for Konohiki; Kuhema always owned until his death in 1853; land was given to his daughter Kalou.
5357	Nalehu	Hau‘ula			
7328	Kamoili‘ili	Kaluanui, Hau‘ula			

LCA	Claimant	Ahupua‘a	‘Ili	Land Use	Notes
8167	Hikiau	Hau‘ula, Kaipapau	Kaipapau	House lot Sweet potatoes Melons	Bound by stream
8171	Ho‘opalahe	Hau‘ula	Kaipapau	Lo‘i Kula ‘āina House lot	Kula ‘āina bound by fence; House lot bound by stream
8174	Hoaai	Hau‘ula		Lo‘i	Kula ‘āina abandoned
8183	Hina	Hau‘ula		Lo‘i Watermelons	Kula ‘āina cultivated in 1848-1849 and enclosed
8184	Haehae	Hau‘ula		Lo‘i	
8164	Ho‘opi‘i	Hau‘ula		House lot Kula ‘āina	House lot enclosed, one side is hog wall
8164C	Kaneali‘i	Hau‘ula		Lo‘i House lot	Kaneali‘i, late school master
8271	Kaia	Hau‘ula		Lo‘i Kula ‘āina	Lo‘i and kula ‘āina have been abandoned due to animals trampling

LCA	Claimant	Ahupua‘a	‘Ili	Land Use	Notes
8313	Kamo‘oili‘ili	Hau‘ula		Lo‘i Three House lots	Kamo‘oili‘ili died in 1848, his widown Kuali‘i has taken over the land
8337	Kaneumi	Hau‘ula		Lo‘i House lot	House lot enclosed by stone wall
8338	Kealoha	Hau‘ula		Lo‘i	Kealoha died in 1848
8340	Kaiwinui	Hau‘ula, Kaipaupau			
8341	Kahunahana	Hau‘ula		Lo‘i Kula ‘āina 3 House lots	Some kula ‘āina destroyed by animals
8342	Kaailau	Hau‘ula		Lo‘i House lot Sweet potatoes	Claimant lives on someone else’s land
8356	Kane	Hau‘ula		Lo‘i Kula ‘āina Fish pond	Claimant claimed a river but Commissioner G.M. Robertson disputed

LCA	Claimant	Ahupua‘a	‘Ili	Land Use	Notes
8414	Kahanauimaikai, I.A	Hau‘ula		Lo‘i Coffee Two House lots	House lots bounded by fishpond, hog pen, stream, and lo‘i
8415	Koekoe, G.P.	Hau‘ula		Lo‘i Kula ‘āina House lot	Kula ‘āina was partially enclosed by wooden fence; House lot bounded by ocean, river, lauhala, and enclosed with a stone wall
8416	Koaniani	Hau‘ula			
8417	Kaioe	Hau‘ula		Lo‘i Kula ‘āina	Kula ‘āina uncultivated, on mountain
8418	Kamaka	Hau‘ula		Lo‘i Kula ‘āina	Abandoned/uncultivated land due to animals
8436	Kauhi	Hau‘ula			
8437	Keoho	Hau‘ula		Lo‘i Kula ‘āina	Claimaint died in 1848, granddaughter holds claim
8438	Keawe	Hau‘ula			
8442	Kaioe	Hau‘ula	Hanai	Lo‘i Kula ‘āina	Kula ‘āina uncultivated

LCA	Claimant	Ahupua‘a	‘Ili	Land Use	Notes
8444	Kaia	Hau‘ula		Same as 8271	
8411	Kaunele	Hau‘ula			
8413	Kahanauimaikai, I.A.	Hau‘ula			
8580	Keli‘iwaiwaiole	Lā‘ie, Hau‘ula	Mamauakapuao		
8582	Kaniho‘oi	Hau‘ula, Kaipapau	Waipilopilo Okole pia	Lo‘i	Uncultivated; Land was actually Kealoha’s land, Helu 8338
8591	Koekoe, G.P.	Hau‘ula		Same as 8415	
10241	Mahoe	Hau‘ula	Lihueiki		
10261	Makalohi	Hau‘ula	Papale		
10341	Mahoe	Hau‘ula		Lo‘i Kula ‘āina House lot	Kula ‘āina used as pasture for horses, no intention to cultivate; House lot bound by fishpond, hog wall
10726	Po‘opu‘u	Hau‘ula		Lo‘i	
10780	Pua‘a	Kapaka, Hau‘ula	Lelepa, Kiao	Lo‘i House lot	House lot bound by ocean

LCA	Claimant	Ahupua‘a	‘Ili	Land Use	Notes
10972	Waiauia	Hau‘ula	Kawaipapa		Withdrew claim
10975	Waiauia	Hau‘ula		Lo‘i Kula ‘āina	

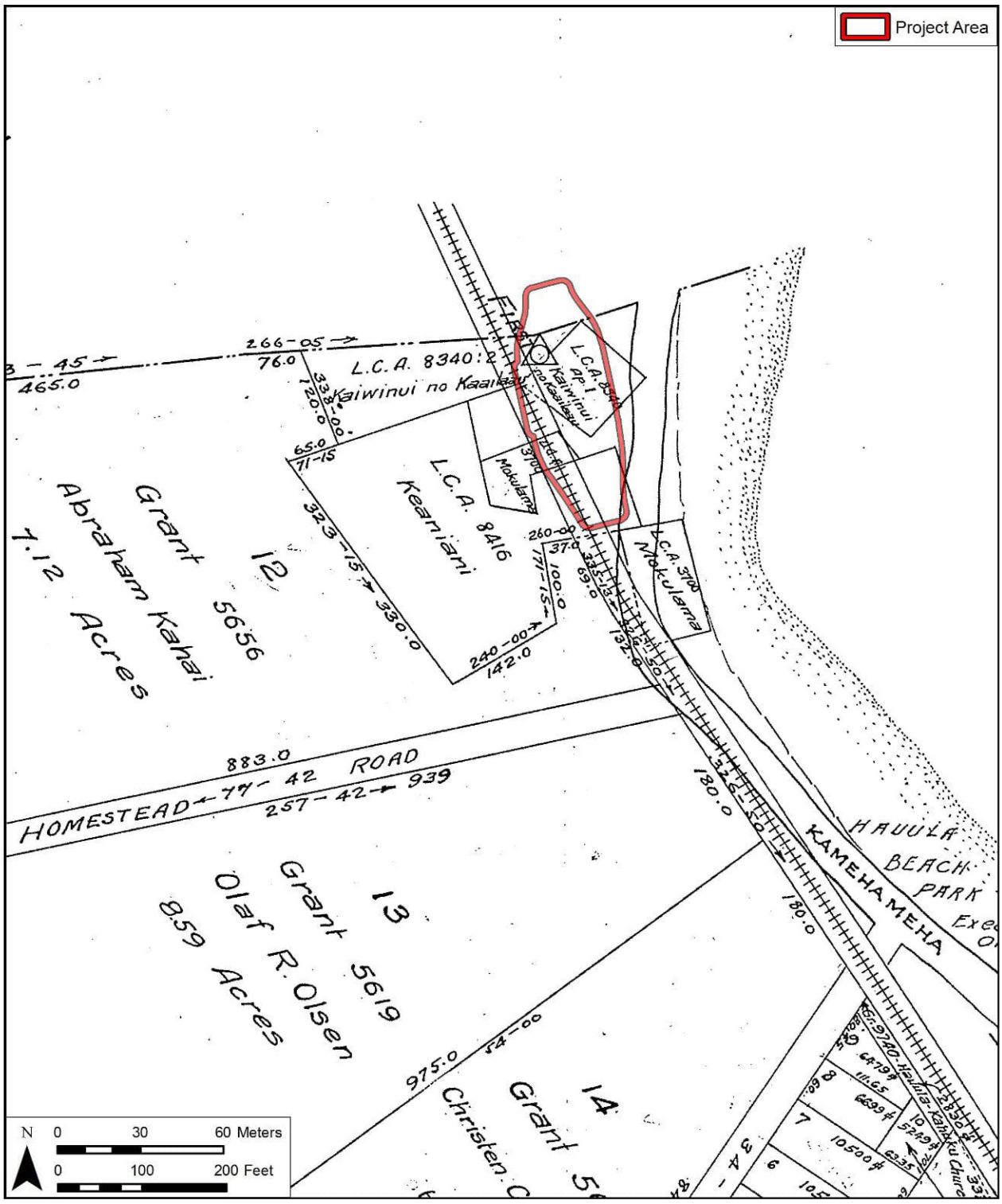


Figure 15. 1914 Hau‘ula Homesteads map showing Project area (Wall 1914)

4.4 1900s to the Present

The Twentieth century brought modernity to the *moku* of Ko‘olauloa with the emergence of new transportation and jobs from the construction of the Ko‘olau Railway and Kamehameha Highway. It also linked made it easier for those inside and outside the community to commute, boosting individualized mobility and social connections. Ko‘olauloa also has an intricate hiking system known as the Ko‘olau Ridge Complex which others chose to utilize rather than the railway or highway.

4.4.1 Ko‘olau Railway Company

There were three railroad companies that operated in Ko‘olauloa during the early 1900s: Kahuku Plantation Company, the Ko‘olau Railway Company, and the Waiāhole Water Company. The railway was envisioned as being the link between Kahuku, Kāne‘ohe, and Honolulu. The operations of these companies improved the dynamic of the sugar industry and provided a cultural and social connection for the people inhabiting windward O‘ahu (Condé and Best 1973:308).

In 1905, the Ko‘olau Railway Company, Limited (a conglomeration of businesses) was established by James B. Castle. In November of 1906, Castle had a joint lease with the Trustees of the Estate of Bernice Pauahi Bishop (Lease No. 1219) for 50 years. Castle began to purchase lease-hold *kuleana* lands in Kaluanui comprised of Native Hawaiian and Chinese tenants. In 1908, the Ko‘olau Railway Company laid 11 miles of the proposed 35 miles of rail system between Kahuku and Kahana (Condé and Best 1973:308).

Although the Ko‘olau Railway Company did not reach it’s ultimate destination of Honolulu, it benefited the agricultural industry and the windward community. As noted in the January 1908 issue of the *Pacific Commerical Advertiser:*

> The completion of the first eleven miles of the new Koolau railroad has already had a wonderfully stimulating effect on the agricultural activity of the windward side of Oahu and when the line is continued from Kahana, the present terminus, to Heeia, that entire section will be brought into a state of agricultural possibility as healthy as any portion of the islands. This completion is promised by the end of the present year, at which time automobile stages will be put on between Heeia and Honolulu and tourists ad others will be brought within easy reach of Oahu and enabled to make a comfortable and cheap one day trip around the island.
>
> What the building of this railroad is going to mean for the Koolau District is shown to a certain extent at present, plans being well under way for the opening of thousands of acres of land for cane planting, for the cultivation of rubber trees, for the planting of pineapples on a large scale, for the planting of experimental patches of cotton, for transplanting thousands of coconut palms for the manufacture of copra, for putting in upland rice, for the raising of manioca for starch, and for the cultivation of lesser branches of the possible diversified farming industries. (Pacific Commercial Advertiser 1908, cited in Conde and Best 1973:308*)*

Between 1908 and 1921, most of the native residents of Kaluanui or their heirs, sold their interests to Castle or other partners (Maly and Maly 2003:115). In 1926, the companies were bought out by Zions Securities in Lā‘ie and in 1931 were leased to the Kahuku Plantation Company (Maly and Maly 2003:115). The rail system was closed in the 1950s, however, sugar was still cultivated until the early 1970s (Maly and Maly 2003:115).

4.4.2 Kamehameha Highway

Kamehameha Highway was built in 1932 by the City and County of Honolulu, Department of Public Works. The highway reflected a major shift in transportation which resulted in the restructuring of the local community. By providing easier access to all parts of the island, the highway increased mobility and fostered urbanization. In the early to mid-1900s, the agricultural industry switched from railway to truck transportation rendered train hauling obsolete and with the introduction of automobiles to Hawai‘i marked an increase in individualized mobility, all of which furthered the development of an ungraded roadway.

4.4.3 Trails

Several trails are present within Hau‘ula Ahupua‘a. Some of these trails were constructed in the early 1900s. The Ko‘olau Ridge Trail Complex, also known as Castle Trail, is a 20-mile summit trail with numerous junctions to the surrounding valleys and ridges including the Lā‘ie Trail (Ball 2000:311). The trail is surrounded by dense rainforests and portions of the trail are eroded. The Kaipapau Cabin was constructed in 1932 to house pig hunters while eradicating the large feral pig population that was destroying native forests (Judd 1933:2). The socked in conditions made it difficult to hunt and return to a base camp in a day, so a second cabin was constructed above Malaekahana. Charles Sheldon Judd, president of the hiking group known as the Piko Club and Terretorial forester, wrote about the Kaipapau Cabin in 1933 discussing problems feral pigs were creating and the transportation of building materials to the summit:

> Their activities result in the destruction of the vegetative cover which is most valuable for water conservation and in the uprooting of the wet soil which causes earth slides and the contamination of the water at the very sources of the important mountain streams.
>
> To tote the material up this most difficult trail was a task which I did not feel justified in asking my men to perform. It was too great a waste of effort and also a risk of human life.
>
> In my dilemma over the transportation of the cabin material to this inaccessible height, it occurred to me to match the wit and wizardry of Kamapuaa against gasoline, staunch bombing planes and the intrepidity of air service pilots and I turned to my friends in the Hawaiian Department, Major General B.H. Wells, Commanding, and Lieutenant Colonel G.C. Brant of the Air Service to promptly, willingly, and most obligingly consented to take up the material for the cabin by army bombers provided I took the risk of breakage. (Judd 1933:1-4)

Other trails within the *ahupua‘a* include the Hau‘ula Loop Trail, the Ma‘akua Ridge Trail, and the Ma‘akua Gulch Trail. Each of these trails begin off of Ma‘akua Homestead Road which leads into the ridges and valleys of the Ko‘olau Ridge Complex. However, Ma‘akua Gulch is closed to the public due to deteriorating conditions.

4.4.4 Cooper Ranch Inn

Cooper Ranch Inn was located *mauka* of Kamehameha Highway on Hau‘ula Homestead Road. The Inn was approximately 10-acres and boasted 3,000 varieties of hibiscus as well as an avocado and mango orchard (*Honolulu Advertiser* 1951; *Honolulu Star Bulletin* 1952). The colonial style structure was owned by Will J. Cooper and his wife Lucy (Figure 16,

Figure 17). The Inn had a dining room that overlooked the ocean, five rooms for guests, and a few cottages on the grounds (Ball 2003: 179-187). The Inn was famous for its chicken and steak dinners and was a favorite spot for the hiking club started by Charles S. Judd known as the Piko Club. The Inn was a haunt for annual meetings and accommodations prior to hikes on the club’s beloved Ko‘olau Summit trail (Charles S. Judd Manuscript Collection 1932a and 1932b).

During the early 1950s, Mrs. Iris J. Cullen planned to reopen the Cooper Ranch Inn. Today it is closed but still serves as a landmark to local residents. Pukui references Cooper Ranch Inn as the site of Makaluhi, a resting place of Olopana’s warriors in the epic of Kamapua‘a (Sterling and Summers 1978:161; Pukui et al. 1974:141).

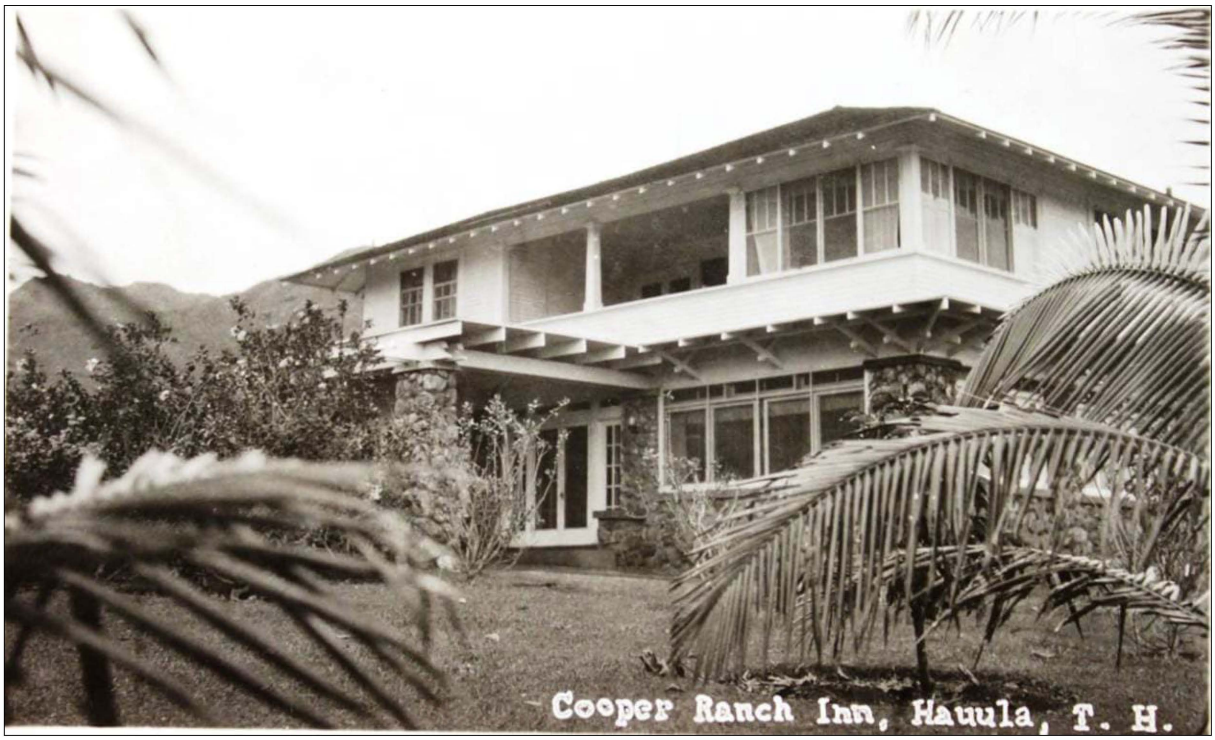


Figure 16. Side view of the Cooper Ranch Inn (Hawai‘i State Archives)

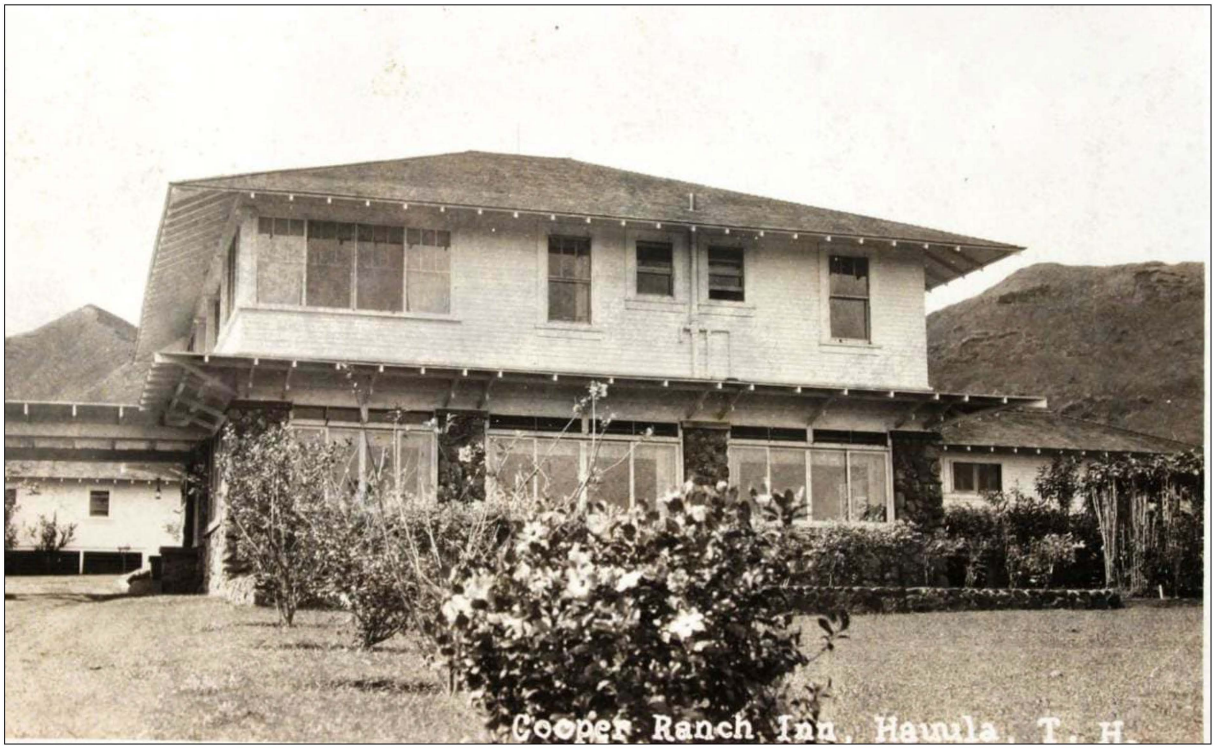


Figure 17. Front view of the Cooper Ranch Inn (Hawai‘i State Archives)

Section 5 Previous Archaeological Research

5.1 Previous Archaeological Research in the Area

Legendary and archaeological sites mentioned by McAllister (1933) in his 1930s survey and Sterling and Summers' compilation of archaeological sites of the island are labeled on Figure 8. Archaeological projects conducted in Hau‘ula Ahupua‘a are located in Table 2. Figure 18 displays previous archaeology work done in Hau‘ula Ahupua‘a. Figure 19 displays previous archaeology work done in Hau‘ula Ahupua‘a with SIHP numbers. Figure 20 displays LCAs that are near the Project area and are associated with previous archaeological findings.

In 1997, CSH (Masterson et al. 1997) conducted archaeological monitoring for the Kapaka to Lā‘ie waterline. Nine historic properties (SIHP #50-80-06-4792 to -4798, -5457, and -5458), consisting of 19 human burials, two complete dog burials, and numerous cultural deposits. One human burial (designated FP8) of SIHP #50-80-06-4794 was identified at the intersection of Kukuna Road and Kamehameha Highway. FP8 contained ten indigenous artifacts and four historic artifacts. Artifacts included a basalt pounder, basalt flakes, adz fragment, pounders, sinkers, hammerstone, and manuports. FP8 was considered a historic burial that was heavily disturbed during excavation of the waterline trench. Five charcoal samples were taken from site -4794. One of the samples was sent for radio-carbon analysis and produced two calibrated date ranges: AD 1690 to AD 1730 and AD1820 to AD 1920. This indicated the cultural deposit may represent prehistoric occupation of the area (Masterson et. al 1997:28).

SIHP #50-80-06-4795 contained subsurface cultural deposit, five indigenous artifacts, one historic artifact, and one human burial. Excavations were done on the shoulder of Kamehameha Highway and both sides of the Waipilopilo stream. Artifacts collected include a coral file fragment and saw fragment. Several metal fragments were also collected. Five charcoal samples were taken from various parts of the cultural deposit, however, none received radiocarbon analysis (Masterson et. al 1997:28). *Kuleana* awards within or adjacent to site -4795 include LCA 8340:1 and 3700:4. The burial and cultural deposit are believed to be associated with the LCA parcels (Masterson et. al 1997:30). All human burials found for were reinterred at Hau‘ula Congregational Church Cemetary (Masterson et. al 1998:27-28).

In 1998, CSH (Masterson et al. 1998) completed an archaeological inventory survey and subsurface testing for the proposed expansion of Hau‘ula Beach Park. Two historic properties (SIHP #50-80-05-4794 and -4795), which were previously identified during archaeological monitoring for the Kapaka to Lā‘ie waterline (Masterson et al. 1997) were documented within the study area. SIHP #50-80-05-4794 and -4795 were described as buried cultural deposits with associated human burials. SIHP #50-80-05-4795 was determined to be likely associated with nearby LCA parcel 8356:3 (Bush and Hammatt 2002:24). However, there were no new sites or findings. Archaeological monitoring was recommended for all future subsurface construction activities within the study area.

In 2002, CSH (Bush and Hammatt 2002) also completed archaeological monitoring for the proposed expansion of Hau‘ula Beach Park. Archaeological monitoring identified one additional historic property (SIHP #50-80-06-5801), consisting of previously disturbed human remains including cranial and post-cranial remains (Bush and Hammatt 2002:18-20). It was reported

there was a slight possibility, although highly unlikely, that the remains may be associated with Hau‘ula Cemetery. It was more likely that the remains were associated with three nearby LCA parcels 3700:4, 8340:1, 8356:3 (Bush and Hammatt 2002.:25). This particular discovery led to the conclusion that more human remains and burials probably exist beneath the fill layers of Hau‘ula Beach Park (Bush and Hammatt 2002:25).

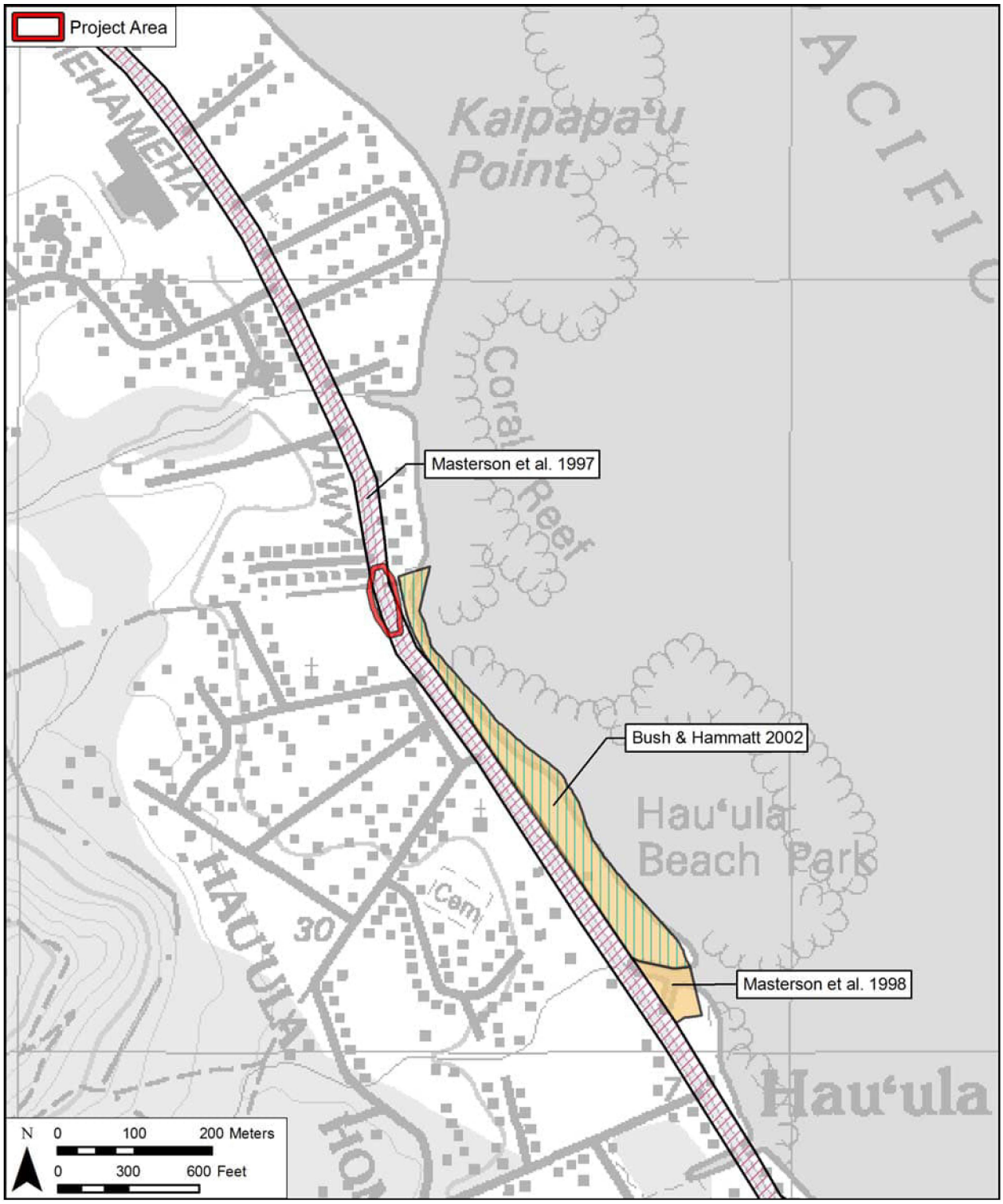


Figure 18. Previous archaeological work done in Hau‘ula and Project area (USGS 1998)



Figure 19. Previous archaeological work done in Hau‘ula with SIHP numbers and Project area (USGS 1998)

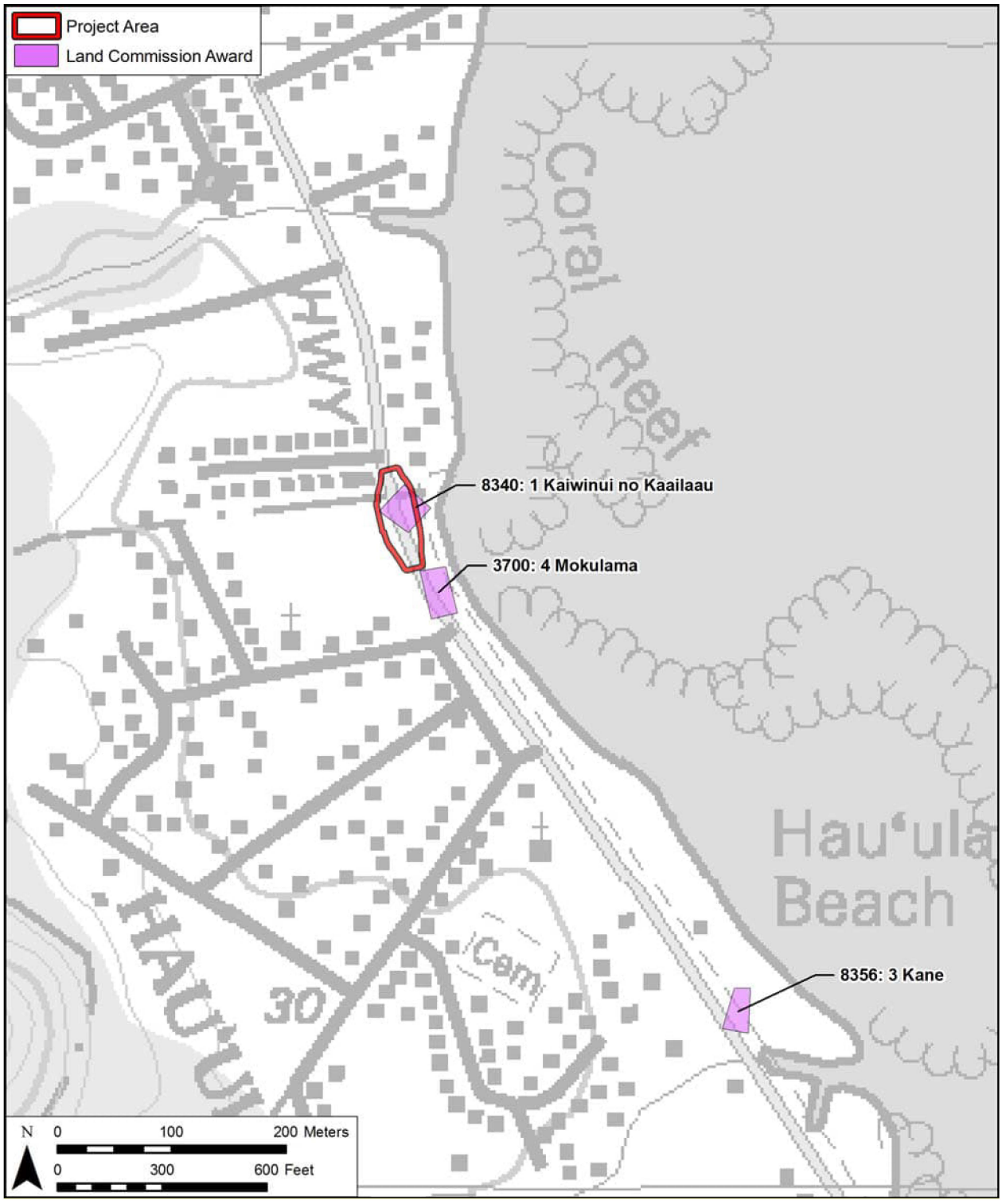


Figure 20. LCAs near Project area and associated with previous archaeological findings (USGS 1998)

Table 2. Previous archaeological investigations in Hau‘ula Ahupua‘a

Reference	General Location	Study Type	Historic Properties Identified
Within and in the Vicinity of the Project Area			
Masterson et al. 1997	Kamehameha Hwy. Kapaka to Lā’ie Waterline	Archaeological Monitoring	Identified SIHP #50-80-06-4792 to -4798, -5457, and -5458; 19 human burials, 2 complete dog burials, cultural deposits, 15 indigenous artifacts, and 5 historic artifacts
Masterson et al. 1998	Hau’ula Beach Park	Archaeological Inventory Survey	No new sites; testing done near sites SIHP #50-80-06-4794 and 4795
Outside the Project Area			
McAllister 1933	Island-wide	Archaeological Reconnaissance	Identified 4 sites in vicinity: -286 Kaunihokahi Heiau, -287 Maunawila Heiau, -288 Inclosures & -289 Luaali‘i Heiau
Steer and Morin 1978	Ma’akua Gulch	Site Survey	SIHP #50-80-05-4227, agricultural complex and isolated agricultural features
Connolly 1980	Hau’ula Playground	Archaeological Reconnaissance	No historic properties recorded
Barrera 1981	Hau’ula Kai Shopping Center	Archaeological Survey and Subsurface Testing	SIHP #50-80-05-1430, buried midden deposit, associated human burial, and coral concentration
Barrera 1984	Kaipapau Gultch	Archaeological Survey	No historic properties recorded. Noted previously recorded historic property (SIHP #50-80-05-1056) within the project area
Riford 1984	Hau’ula 7-11 Store	Archaeological Reconnaissance	No historic properties recorded
Smith 1987	Kaipapau Loop, Kaipapau Point	Archaeological Testing	No historic properties recorded
Walker and Rosendahl 1988a	Kaipapau Exploratory Well, Kaipapau Valley	Archaeological Reconnaissance	SIHP #50-80-06-4242, two agricultural features
Walker and Rosendahl 1988b	Back of central Hau’ula Town	Archaeological Test Excavation	SIHP #50-80-05-3394, enclosure

Reference	General Location	Study Type	Historic Properties Identified
Shun and Dies 1991	Ma’akua Exploratory Well, Ma’akua Gulch	Archaeological Monitoring	SIHP #50-80-05-4227, rectangular structure and associated wall
Landrum 1992	Ma’akua Exploratory Well, Ma’akua Gulch	Archaeological Site Evaluation and Impact Assessment	Additional features of SIHP #50-80-05-4227 were identified. Recommended preservation of SIHP #50-80-05-3394 and SIHP #50-80-05-4227
Dunn and Rosendahl 1992; Halpern and Rosendahl 1995	Lā‘ie master plan project	Archaeological Inventory Survey	A total of 23 historic properties identified including agricultural, habitation, irrigation/erosion control, and burial sites
Bordner 1992	Kaipapau Exploratory Well, Kaipapau Valley	Archaeological Inventory Survey	No additional historic properties recorded
Kennedy et al. 1992	Kokololio Beach Park	Archaeological Inventory Survey and Subsurface Testing	Eight historic properties (SIHP #50-80-02-3744 and -4476 to -4482) were identified including 4 human burials
Moore and Kennedy 1994	Kokololio Beach Park	Archaeological Monitoring	Seven additional burials encountered
Sarvak et al. 1996	Kokololio Beach Park	Archaeological Monitoring	SIHP # 50-80-06-5369 and 50-80-06-5362, two human burials
Wolforth 1997	Kukuna Road Central Hau’ula Town	Letter Report	Described five historic properties, SIHP #50-80-06-5449 (historic cemetery), -5450 (habitation site), -5451 (historic habitation), -5452 (taro pond field) and -5453 (wall).
Elmore and Kennedy 1999	Hau’ula Elementary School	Burial Recovery	SIHP #50-80-05-5765, inadvertently discovered human remains. Possible cultural layer also observed
Moore et al. 2001	Hau‘ula Elementary School	Archaeological Monitoring	SIHP #50-80-05-5917, inadvertently discovered human remains
Bush and Hammatt 2002	Hau’ula Beach Park	Archaeological Monitoring	SIHP #50-80-06-5801, inadvertently discovered human remains

Reference	General Location	Study Type	Historic Properties Identified
Perzinski and Hammatt 2004	Hau’ula Community Park	Memorandum on Inadvertent Discovery of Human Remains	SIHP #50-80-05-6541, inadvertently discovered human remains
Yucha and McDermott *in prep*	Hau’ula Community Park	Archaeological Inventory Survey	SIHP #50-80-05-6913 cultural layer and four human burials

Section 6 Community Consultation

Throughout the course of this assessment, an effort was made to contact and consult with Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about Hawaiian cultural practices, resources and beliefs related to to the Project area. This effort was made by letter, email, telephone and in-person contact. The initial outreach effort was started in April 2011 and completed in September 2011. In the majority of cases, an aerial photograph (Figure 1, Figure 2), maps (Figure 3), and a letter (Appendix C) of the Project area were mailed.

In most cases, two to nine attempts were made to contact individuals, organizations, and agencies apposite to the CIA for this Project. The results of the community consultation process are presented in Table 3. Written statements are presented in Section 6, and excerpts from interviews are presented in Section 7.

Table 3. Results of Community Consultation

Name	Affiliation	Comments
Ahuna, Gladys Pualoa	Historian for the Mission Complex Chapel at the Polynesian Cultural Center, seventh generation descendant of Lā‘ie	13 July, 2011; Sent letter.
Ailā, William	Hui Mālama i Nā Kūpuna o Hawai’i Nei	2 June, 2011; Sent letter.
Aoude, Brahim & Liana Petranek	Kaunihokahi Heiau is on their property	15 June, 2011; Site visit to heiau with Jan Becket. 17 June, 2011; Sent initial letter. 20 July, 2011; Sent Follow up letter.
Apuakehau, Oliver	Lives near Project area	9 August, 2011; CSH met in-person and left a letter.
Ayau, Halealoha	Hui Mālama I Na Kupuna ‘O Hawai’i Nei	3 June, 2011; Sent initial letter. 23 June, 2011; Sent Follow up letter.
Becket, Jan	Photographer, author, teacher at Kamehameha Schools	2 June, 2011; Sent initial letter. 15 June, 2011; Site visit to Maunawila Heiau, Kaunihokahi Heiau, and enclosures near Hau‘ula Loop Trailhead. Referred CSH to Pua Aiu, Davianna McGregor, and Brahim Aoude.
Beirne, Ululani	President, Ko‘olauloa Hawaiian Civic Club	2 June, 2011; Sent initial letter. 8 June, 2011; Initial letter was returned. 4 August, 2011; CSH called Ms. Beirne and sent a second letter at her request.

Name	Affiliation	Comments
Bridges, Cy	Polynesian Cultural Center-Hawaiian Cultural Advisor, Kumu Hula and Kahu, Ko‘olauloa lineal descendent.	2 June, 2011; Sent initial letter. 22 June, 2011; Follow up email sent. 18 July, 2011; Kekela Miller called CSH and referred Cy Bridges. 20 July, 2011; CSH called and Mr.Bridges said he was going on a month long vacation. 4 August, 2011; CSH called and left a message. 9 August, 2011; Field visit to Kekela Miller who informed CSH that Mr.Bridges was back from vacation and asked her to have CSH call him again. 10 August, 2011; CSH called and left a message. 11 August, 2011; CSH called and Mr.Bridges agreed to meet for an interview. 15 August, 2011; Interviewed Mr. Bridges at the Hau‘ula Shopping Center (see Section 7.4). 15 September, 2011; Mr. Bridges approved interview.
Brown, Harry	Resident of Hau‘ula	23 June, 2011; Sent initial letter. 20 July, 2011; Sent follow up letter.
Brown, Steve	Hawaiian Trail and Mountain Club	3 June, 2011; Sent initial email. 22 June, 2011; Sent follow up email.

Name	Affiliation	Comments
Cayan, Phyllis “Coochie”	State Historic Prservation Division	3 June, 2011; Sent initial email. 12 September, 2011; CSH sent follow up email. 15 September, 2011; CSH called Ms. Cayan to follow up on SHPDs response. At Ms. Cayan’s request, CSH sent an email with letter and aerials of Project area. 29 September, 2011; CSH sent an email to follow up on SHPDs response to Project.
Fornear, Mark	Resident of Imua Place	On 17 August, 2011; Mr. Fornear sent an email to CSH expressing concerns about impacts residents of Imua Place would face.
Gorai, Kaipolani	Resident of Ko‘olauloa	23 August, 2011; CSH called and left a message. 1 September, 2011; CSH interviewed Mr. Gorai at his home in Kahana (see Section 7.5). 13 September, 2011; Mr. Gorai approved interview.
Hale Ko‘olau North Shore Beach Rentals	Beach rental neighbors Project area	10 August, 2011; CSH called and left a message. 11 August, 2011; Zack Oda called CSH. 18 August, 2011; Zack Oda emailed CSH replied that the property owner, Mr. Martinez, “has no comments at this time.”
Ka‘ana‘ana, Penny	Lineal descendent, lives near Project area	9 August, 2011; CSH left a letter with Ms. Ka‘ana‘ana.
Kaluau, Moana	Treasurer for Ko‘olauloa Neighborhood Board, Subdistrict 3	23 June, 2011; Sent initial email. 20 July, 2011; Sent follow up email.

Name	Affiliation	Comments
Kelly-Paddock, Dotty L.	President for Ko‘olauloa Neighborhood Board, Subdistrict 3	23 June, 2011; Sent initial email. 4 August, 2011; Sent follow up email.
Ko‘olauloa Hawaiian Civic Club	Civic club	20 July, 2011; Sent email.
Kuhea, Kealoha	Cultural descendent	2 June, 2011; Sent initial letter. 8 June, 2011; Initial letter returned.
Logan, Roland “Ahí”	Lineal descendent	2 June, 2011; Sent initial letter. 22 June, 2011; Sent follow up letter.
Mainaaupo, Samuel K.	Fisherman and hunter	2 June, 2011; Sent initial letter. 22 June, 2011; Sent follow up letter.
Markell, Kai	Director of Native Rights, Land and Culture; Markell has special knowledge of archaeology and *iwi* (bones) in Ko‘olauloa District	2 June, 2011; Sent letter.
Matoon, Cathleen Piilani	Former President, Ko‘olauloa Hawaiian Civic Club	2 June, 2011; Sent initial letter. 23 June, 2011; Sent follow up letter.
Matoon, Creighton Ualani	Ko‘olauloa Neighborhood Board	2 June, 2011; Sent initial letter. 7 June, 2011; CSH sent a follow up email and he responded to CSH that he was concerned of “the possible disturbance of iwi kupuna” if found within the Project area.
McGregor, Davianna	Author, Professor of Ethnic Studies at University of Hawai‘i at Mānoa	13 June, 2011; Sent email.

Name	Affiliation	Comments
Miller, Kekela	Coordinator of Kūpuna Council of Lā‘ie, Kumu Hula for Halau O Kekela Kupuna, Customer Service Representative for Hawai‘i Reserves	18 July, 2011; CSH called and left a message; sent email; Kekela Miller called back and referred Cy Bridges. 2 August 2011 CSH called Ms. Miller for more referrals which include Jacob Nihipali, Maka Obina, and Wilda Paalua.
Naluai, Keala	Referred by Lynette Cruz	4 August, 2011; Sent initial letter; responded that she was unable to help; referred CSH to the Ko‘olauloa Hawaiian Civic Club.
Nāmu‘o, Clyde	OHA Administrator	2 June, 2011; CSH sent letter (see response in Section 6.1).
Nihipali, Jacob	Referred by Kekela Miller	2 August, 2011; CSH called Mr. Nihipali and he expressed hisconcerns about a nearby cemetery. At his request CSH sent an initial letter via email. 5 August, 2011; Email was returned to CSH. 8 August, 2011; CSH called and left a message.
Obina, Maka	Referred by Kekela Miller	2 August, 2011; CSH called and Ms. Obina referred Larry Nihipali (Jacob Nihipali’s father), Danette Pascual, and the Kaanaana family.
Oda, Zack	Hale Ko‘olau Beach Rentals	10 August, 2011; CSH called and sent intial email to Mr.Oda. 18 August, 2011; Mr. Oda responded to CSH with”no comment.”
Pa‘alua, Wilda	Referred by Kekela Miller	2 August, 2011; CSH called and Ms. Pa‘alua referred Cy Bridges.

Name	Affiliation	Comments
Pacheco, Brian	Lives near Project area	9 August, 2011; CSH met in person and left an initial letter. 11 August, 2011; Mr. Pacheco called CSH and left a message. 12 August, 2011; CSH returned Mr. Pacheco's call and left a message. 16 August, 2011; Mr. Pacheco called CSH and stated that Imua Place was once a cow pasture. Prior to homes built on Imua Place, there was a hill that measured 12-feet in height. He knows there are burials near Project area. 26 August, 2011; CSH called Mr. Pacheco and left a message.
Paglinawan, Richard	Queen Lili‘uokalani Children's Center, Ko‘olaupoko Unit	2 June, 2011; Sent initial letter. 23 June, 2011; Sent follow up letter.
Primacio, Junior	Ko‘olauloa Neighborhood Board	2 June, 2011; Sent initial letter; 22 June, 2011; Sent follow email.
Queen Lili‘uokalani Children's Center, Windward Unit	Foundation for children	22 June, 2011; Sent initial letter. 9 August, 2011; CSH visited the center scoping for referrals; QLCC staff had no further suggestions.
Santiago, Annette	Hau‘ula District Park Summer Fun Director	2 June, 2011; Sent initial letter. 8 June, 2011; Letter was returned to CSH.
Sproat-Fonoimoana, Kapua	Faculty at BYUH, Resident of Punalu‘u	2 June, 2011; Sent initial letter. 3 June, 2011; Letter was returned to CSH.
Steffen ‘Ohana	Lineal descendents	2 June, 2011; Sent initial letter. 23 June, 2011; Sent follow up letter.

Name	Affiliation	Comments
Sudlow, Michael F.	Resident of Hau‘ula	23 June, 2011; Sent initial email; replied that he was unable to comment on the cultural aspect.
Wooley, Jessica	House Representative for District 47	3 June, 2011; Sent initial email. 22 June, 2011; Sent follow up email.
Yent, Martha	Former archaeologist	3 June, 2011; Sent initial email. 22 June, 2011; Sent follow up email.

Six participants responded to CSH’s initial letter with letters of their own. One participant responded by letter and five participants responded by email.

6.1 Office of Hawaiian Affairs

CSH contacted Clyde Nāmu‘o, Chief Executive Office for OHA, on June 2, 2011. Mr Nāmu‘o responded on June 29, 2011 that “OHA has no substantive comments or referrals to individuals and organizations for consultation.” See Figure 21 for Mr. Namu‘o’s entire letter.

6.2 State Historic Preservation Division

CSH contacted Phyllis “Coochie” Cayan, SHPD History and Cultural Branch Chief, on June 3, 2011 continued by follow up calls and emails on September 12, 15, and 29 of 2011. Ms. Cayan expressed that the area is well documented with cultural literature and history which may reflect some of today’s cultural practices and resources. On behalf of SHPD, Ms. Cayan responded that she “is concerned with any burials that may be disturbed in the area as well as the use of the stream resources for gathering or water use.” Recommendations include “talk story sessions with the business and/or community groups in the area” as well as contacting community members such as Cy Bridges, Aaron Mahi, Hinaleimoana Wong, Kumu Hula Mapuana De Silva, University of Hawai‘i (UH) at Mānoa Oral History Department, UH Mānoa Hawaiian Studies Department, and Creighton Matoon. See Figure 22 for Ms. Cayan’s entire letter.

PHONE (808) 594-1888 FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD11/5783

June 29, 2011

Nicole Nishihara, Cultural Researcher
Cultural Surveys Hawai'i, Inc.
P.O. Box 1114
Kailua, Hawai'i 96734

Re: **Pre- Cultural Impact Assessment Consultation**
Waipilopilo Stream Bridge Rehabilitation
Hau'ula Ahupua'a, Island of O'ahu

Aloha e Nicole Nishihara,

The Office of Hawaiian Affairs (OHA) is in receipt of your June 1, 2011 request for comments ahead of a cultural impact assessment (CIA) for the rehabilitation of the Waipilopilo Stream Bridge (project). We anticipate that this CIA will be prepared as a part of this project's compliance with Chapter 343, Hawaii Revised Statutes.

OHA has no substantive comments or referrals to individuals and organizations for consultation to offer at this time. Thank you for initiating consultation at this early stage and we look forward to reviewing the CIA and providing additional comments at that time. Should you have any questions, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

Figure 21. Response from Clyde Nāmu'o of OHA

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAHUHIHEWA BUILDING
601 KAMOKILA BLVD, KAPOLEI HI 96706

October 18, 2011

Ms. Nicole Ishihara
Cultural Surveys Hawaii, Inc.
P.O. Box 1114
Kailua, Hawaii 96734

LOG NO: 2011.2790
DOC NO: 1110pc006

Subject: HAUULA 6: A Cultural Impact Assessment (CIA) for the proposed Kamehameha Highway Waipilopilo Stream Bridge Rehabilitation Project, Hauula Ahupua'a, Ko'olaupoko District, O'ahu Island. TMK: [1] 5-4-002, 004, 011, and 017.

Dear Nicole Ishihara:

Mahalo for the opportunity to comment on the aforementioned CIA for the proposed Waipilopilo Stream Bridge Rehabilitation Project at Hauula, O'ahu. This is an area with many kama'aina families who may have mana'o to share on gathering and access to the stream resources and its environs and its current cultural practices. As you well know, there are documented cultural literature and history of this area that may reflect some of today's resources and/or cultural practices, too. The SHPD is concerned with any burials that may be disturbed in the area as well as the use of the stream resources for gathering and or water use. Hopefully you all will be able to talk story with the residents there on their cultural practices at the stream environs.

The SHPD recommends some strategic ideas as follows:

1. Talk story sessions with the business and/or community groups in the area.
2. Mr. Cy Bridges, OIBC member — bridgesc@polynesia.com
3. Mr. Aaron Mahi, OIBC member — aaronmahi@aol.com
4. Ms. Hinaleimoana Wong, OIBC Vice chairman — tahine.hina@gmail.com
5. Kumu Hula Mapuana De Silva — no contact info available
6. University of Manoa Oral History Department
7. University of Manoa Hawaiian Studies Department
8. Dr. Creighton Mattoon of Punaluu may refer others — Phone: 293-5612

Last, but not least, my apologies for the late reply. Please call 808-692-8025 or email me at Phyllis.L.Cayan@hawaii.gov should you have any further questions on our comments above.

Sincerely,

Phyllis Coochie Cayan

Phyllis Coochie Cayan
SHPD History & Culture Branch Chief

Figure 22. Response from Phyllis "Coochie" Cayan of the State Historic Preservation Division (SHPD)

Section 7 Summaries of Interviews

7.1 Overview

Kama‘āina and *kūpuna* with knowledge of the proposed Project and study area participated in interviews for this CIA. Interviews for this study were conducted in June–September, 2011. CSH attempted to contact 45 individuals for this CIA report; of those, 12 responded; four gave referrals; two conducted a field visit; and two participated in a formal interview. CSH initiated the interviews with questions from the following five broad categories: Resource Gathering and Hunting, Ritual and Ceremonial Practices, Freshwater and Marine Resources, Burials, Trails, and Cultural and Historic Properties. Participants' biographical backgrounds (in brief), comments and concerns about the proposed development and Project area and environs are presented below the Acknowledgements section.

7.2 Acknowledgements

The authors and researchers of this report extend our deep appreciation to everyone who took time to speak and share their *mana‘o* with CSH whether in interviews or brief consultations. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and not in any way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s.

7.3 Jan Becket

Jan Becket is a professional photographer, author, and teacher at Kamehameha Schools who is well-recognized for his black-and-white photography of sacred sites and his multiple decade photo-documentation of cultural landscapes around Hawai‘i. CSH met with Mr. Becket on June 15, 2011 for a visit to several cultural sites in the vicinity of the Project area.

Maunawila Heiau is located approximately one mile mauka of the Project area on Hau‘ula Homestead Road in the *‘ili* of Punaiki. With the permission of the landowners, Mr.Becket visited and photographed Maunawila Heiau in 1993, 2000, 2006, and 2011. It sits on a hillside that overlooks the ocean. The upper portion of the *heiau*, 53 feet long with a base of approximately 60 feet and a height of five to six feet may be substantially intact (Figure 23; McAllister 1933:158-159). Portions of the facing terrace were evident on the visit, but the remaining structure would have to be cleared before measurements could be taken. According to McAllister, a second terrace stood at eight to nine feet in height (three feet above the first). Mr. Becket reports that a house once occupied by squatters stood on the north side of the upper terrace during his first visit in 1993 and appeared to have integrated portions of the *heiau* features into its yard landscaping. Smaller features of the *heiau* photographed by Mr. Becket in 1993 have since been destroyed by the construction of a dirt road along the east side of the main terrace. McAllister comments on the "large natural stones" that contributed to the "irregularity of the structure" (McAllister 1933:158-159). These were still very much in evidence during one of Mr. Becket's photography sessions (Figure 24). To the south of the *heiau* lies a dry stream bed and a small grove of *ti* (also known as *kī*; woody plant from the lily family) leaves. *Hau* (hibiscus) and strawberry guava cover the site of the *heiau.*

Kaunihokahi Heiau is approximately three-quarters of a mile *mauka* of Hau‘ula Homestead Road and Kukuna Road. Kaunihokauhi Heiau lies northwest of Maunawila Heiau. McAllister measured the *heiau* at 160 feet by 40 feet with a height of 10 to 15 feet (McAllister 1933:158). Today the *heiau* still has a long wall intact with rocks scattered amongst the area. The *heiau* sits on a rather steep hillside. Mr. Becket removed some *laua‘e* at the southeastern corner of the *heiau*, which resembled what he thought might be an *ahu* (Figure 25).

The last two cultural sites are undocumented enclosures approximately half a mile from the Project area. They are to the left of the Hau‘ula Loop trailhead which starts at the end of Kukuna Road. The enclosures are north of Maunawila Heiau and Kaunihokahi Heiau. McAllister mentions two different enclosures in Hau‘ula, an unnamed site in Makao and Lua‘ali‘i Heiau, citing that both are completely destroyed (McAllister 1933:158-159). The walls of the unnamed enclosures are intact and in excellent condition. The first enclosure is quite large. The front walls measure no higher than three to four feet with a width of three to four feet as well. The backside of the enclosure measures no higher than five feet with a width of five feet and a base of eight to 10 feet (Figure 26, Figure 27). A smaller enclosure is to the right of the larger enclosure. The walls of this enclosure are much smaller with walls no higher than three feet and a width of three feet. It’s about half the size of the first enclosure. Mr. Becket believes that the walls were too low for the enclosure to be an animal pen. However, a small piece of white coral was found at the front wall of the larger enclosure. Mr. Becket recalls being told by cultural practitioners that branch coral at a structure might indicate a ceremonial function or a burial.



Figure 23. Remaining structure at Maunawila Heiau, Photo courtesy of Jan Becket



Figure 24. Remaining structure of Maunawila Heiau in background; “Large natural stones” that contribute to the “irregularity of the structure” as described by McAllister in foreground; Photo courtesy of Jan Becket



Figure 25. Remaining retaining wall running from *mauka* to *makai* in background; To the right is a headstone and what Mr. Becket interprets as a possible *ahu*; Photo courtesy of Jan Becket



Figure 26. Undocumented enclosures off of Hau‘ula Loop trailhead; The walls are in excellent condition; Photo courtesy of Jan Becket



Figure 27. Backside of undocumented enclosure facing Ma‘akua Gulch; Photo courtesy of Jan Becket

7.4 Cy Bridges

CSH interviewed Cy M. Bridges at the Hau‘ula Kai Shopping Center in Hau‘ula on August 15, 2011. Mr. Bridges was born at Queens Hospital and raised in Kāne‘ohe until 1953. He currently holds the position of Cultural Director at the Polynesian Cultural Center in Lā‘ie.

Mr. Bridges’ mother was from Hau‘ula and his father’s family was from Lā‘ie. His mother’s family lived on Kuleana land in Hau‘ula prior to the conveyance of July 1850, where Mr. Bridges and his family now live. Mr. Bridges’ grandfather was a park keeper at Hau‘ula Beach Park for 40 years. Mr. Bridges’ great-great grandfather, Samuel Kahele Sr., was the building Supervisor and served as the first treasurer of Lanakila Church.

Mr. Bridges has a great interest in history. His father recorded his aunts, grandmothers, and great-grandmothers “talking story.” Growing up, Mr. Bridges often sat next to his *kūpuna* at family parties and functions to ask questions about how people are related or the history of Hau‘ula. Mr. Bridges describes his grandfather as a “walking encyclopedia.” Although Mr. Bridges asked a lot of questions growing up, he feels that there is “still a lot that wasn’t learned” from his grandfather and other *kūpuna*.

Mr. Bridges comes from a family of fishermen and hunters. Mr. Bridges recalls a story during his youth of Pahumoa Beach, popularly known as Pounders Beach, located in the *ahupua‘a* of Lā‘ie. Prior to the constructed parking lot at Pounders, the area was composed of only grass. Mr. Bridges recalls helping lay nets on the grass and patching them which covered the entire length of the park.

During his youth, Mr. Bridges recalls that all sustenance was within the vicinity of their home. His family cultivated *lo‘i*, There was a *lo‘i* nearby; maintained cows and chickens in the yard; and caught *o‘opu*, *aholehole, ‘opae*, and other fresh water animals in the river. Each family in Hau‘ula had their own reef gathering grounds for *wana*, *he‘e*, *limu*, and other aquatic life. For parties, Mr. Bridges’ family did everything, from the gathering to the preparation work (which included cleaning fish), cooking (which included preparing the *imu*) and cleaning up after the party.

The family Kuleana land is also a burial ground for ancestors. Next door to Mr. Bridges’ property there is a family burial plot. The property has attracted developers, but as an OIBC member, Mr. Bridges has disputed all proposals for development. The Kuleana land has been in the family for many years, boasting 12 generations.

Mr. Bridges shares his *mana‘o* on several cultural sites in Hau‘ula. Mr. Bridges speaks of an unnamed *heiau* near the intersections of Hanaimoa Street and Hau‘ula Homestead Road. Mr. Bridges speaks of an ongoing community debate that Maunawila Heiau may have possibly been a *luakini*-class heiau. The *kauwā* was a pariah caste whose members were used for sacrificial drowning. One rumor of the function of Maunawila Heiau was that members of the kauwā caste were drowned on the beach and later carried to the luakini heiau. Mr. Bridges is unsure of where the latter story originated from.

Mr. Bridges also shares a *mo‘olelo* about Makuakaumana, a healing priest who came to O‘ahu with four other priests (today known as the “Wizard Stones of Waikiki”) from Tahiti. Makuakaumana decided to stay on O‘ahu while the others returned to Tahiti. Today there is a

depression *makai* from an open field next to Hau‘ula Elementary School. It is reported to be the place where the whale from the *mo‘olelo* of Makuakaumana beached himself and later carried Makuakaumana back to Tahiti. The swale itself is called Ka Lae o ka Palaoa or “the cape of the whale” to describe the event of Makuakaumana.

Regarding the Project area, Mr. Bridges reported there are one or two *ko‘a* (fishing shrines) in the vicinity, between the river and Imua Place. He is not aware of any burials in the immediate Project Area. Mr. Bridges refered CSH to Henrietta Nihipali.

7.5 Kaipolani Gorai

CSH interviewed Kaipolani Gorai at his home in Kahana Ahupua‘a on September 1, 2011. Mr. Gorai was born at Kahuku Hospital and raised in Ka‘a‘awa and Kahana. His father, Tsuneo Gorai Sr. and mother Edith L.N. Gorai raised their family in Ka‘a‘awa. Mr. Gorai’s father was a construction worker who worked for various companies that helped build Kāne‘ohe town. Mrs. Gorai also worked for a number of companies and together they managed to raise their family.

His mother and grandmother, Mariah Naiapa‘akai, spoke Hawaiian and performed *la‘au lapa‘au* (traditional plant-based medicine). Growing up, Mr. Gorai was not allowed to speak Hawaiian in public because the Territory of Hawai‘i banned the language. La‘au lapa‘au was performed mostly on the residents of the Ka‘a‘awa/Kahana area and members of the Mormon church. Mr. Gorai states that there are drawbacks of being a healer. As a healer, you may take on the disease or sickness from the patient you are curing. In such a case, you would need to heal yourself or have someone heal you. Mr. Gorai’s mother and grandmother used medical plants for *la‘au lapa‘au*.

Mr. Gorai recalls “playing in the bushes” a lot growing up. As he grew older, he spent a lot of time near the ocean and river. Mr. Gorai has fond memories of laying net, throwing net, and catching black crabs with his father during the early morning hours. He fished for *weke* and *papio* in the ocean and *o‘opu* and *‘opae* in the streams.

Mr. Gorai recalls a railroad running through Kahana and the *ahupua‘a* being abundant with crops such as sugar cane, rice, and pineapple.

Mr. Gorai vaguely remembers visiting his grandmother’s home in Hau‘ula; however, he does remember the homestead housing and that there was a dirt road. He also noted that if you weren’t of the Mormon faith, you attended Lanakila Church.

As an adult, Mr. Gorai moved back to the *ahupua‘a* of Kahana. Between 1991-1992, he was employed by Fletcher Pacific and worked on installing an 18-inch waterline from Sacred Falls to the Hau‘ula Shopping Center. He recalls unearthing *‘iwi* near the Mormon Church in Hau‘ula. Everytime *‘iwi* was discovered work was halted, SHPD was called, and “a company from Kailua” was contracted to do archaeology. Due to looming deadlines, the discovery of *iwi* which resulted in having to stop construction, often strained the job. Mr. Gorai states that human and animal burials were found. He is unsure what was done with the *iwi*.

Today, Mr. Gorai considers himself a “culturalist” and planter. He is currently cultivating *‘ōlena* (turmeric), various varieties of chili pepper, *pōpolo* (black nightshade), *ti* leaves, pink torch ginger, and bird of paradise. He is continuing to expand his garden, but is currently having

a problem with feral pigs which have eaten and destroyed some of his plants, as well as invasive species which have choked the native vegetation.

Mr. Gorai recommends that a catwalk or walkway should be added to the Waipilopilo Bridge. Due to the construction of a new bridge in Kahana, he finds that the temporary bypass roads do not impact the environment too much. He recommends that the bypass should run on the *makai* side of the bridge, not interfering with anyone’s property.

He suggests that CSH contact the Hau‘ula Neighborhood Board and the Matoon family for more information.

Section 8 Cultural Landscape of Project Area

Discussions of specific aspects of traditional Hawaiian culture as they relate to the Project area are presented below. This section examines resources and practices identified within the Project area in the broader context of the encompassing Hau‘ula Ahupua‘a landscape. Here, information from Sections 3–7 will be integrated and summarized, anticipating the summary and recommendations to follow in Section 9.

Because this section contains segments from earlier parts of the report, please refer to my earlier edits; I don’t repeat them here.

8.1 Wahi Pana and Mo‘olelo

Often in Hawai‘i, stories offer explanations of physical phenomena. In Hau‘ula, these *wahi pana* and *mo‘olelo* are associated with landmarks such as a hill, depression, or general area. Kamapua‘a is the mischievous chicken stealing pig who was born in Kaluanui and lives in Kaliuwa‘a (Kame‘eleihiwa 1996:14-16). Helumoa (where the Hau‘ula Congregational Church stands today which translates to “chicken scratch”) and Makaluhi (where the former Cooper Ranch Inn stood on Hau‘ula Homestead Road translates to “tired eyes”), both suggest a connection to the *mo‘olelo* of Kamapua‘a. Makaluhi is where Olopana’s tired warriors rested while searching for the valiant pig (Sterling and Summers 1978:161). Stories such as the epic of Kamapua‘a help to explain how these landmarks were made and give the residents a sense of place. For example, Cy Bridges mentions the site of Helumoa which contains burials dating to the 1840s and 1850s.

Mr. Bridges’ also shared the *mo‘olelo* of Makuakaumana, a healing priest who came to O‘ahu with four other priests (today known as the “Wizard Stones of Waikiki”) from Tahiti. Makuakaumana wanted to stay on O‘ahu while the other four priests returned to Tahiti. One day a whale had beached itself onshore. As people jumped onto the whale, Makuakaumana thought he would join in. When Makuakaumana jumped onto the whale, it suddenly woke up and carried back the priest to Tahiti. Today there is a depression *makai* from an open field next to Hau‘ula Elementary School. It is reported to be the place where the whale from the mo‘olelo of Makuakaumana beached himself and later carried Makuakaumana back to Tahiti. The swale itself is called Ka Lae o ka Palaoa or “the cape of the whale” to describe the event of Makuakaumana.

8.2 Lanakila Church

The arrival of the Protestant Missionaries and the Church of Jesus Christ Latter-Day Saints have clearly impacted the *moku* of Ko‘olauloa. The Protestant Missionaries built the Lanakila Church during the early 1850s on the land known as Helumoa. The church was built from coral from Hau‘ula Beach Park, specifically from the off-shore enclosure called Wahi o Pua said to be constructed by *menehune*. The coral was burned to convert to lime through a process known as *umu*. Mr. Bridges’ great-great grandfather, Samuel Kahele Sr., served as the building Supervisor and first treasurer of Lanakila Church. In 1926, Lanakila Church was replaced by Hau‘ula

Congregational Church. Remanants of the original stone foundation and graveyard are still present.

Kaipolani Gorai, a former member of the Church of Jesus Christ Latter-Day Saints, recalls visiting the Mormon Church in the ahupua‘a of Kahana. Later when the Hau‘ula ward was established, he recalls attending church there regularly. Mr. Gorai also noted that if you were not of the Mormon faith, you would attend Lanakila Church.

8.3 Plant and Water Resources

Hau‘ula is bound by five gulches: Punaiki Gulch, Waipilopilo Gulch, Papali Gulch, Ma‘akua Gulch, and Hanaimoa Gulch. Waipilopilo Stream is in the current Project area. The stream is so short it is not usually pictured or labeled on most maps. Waipilopilo translates to “very stagnant water” and it seems to be called that because Waipilopilo Gulch naturally empties into the sea when it storms hard. The water tends to be particularly stagnant in the dry season when there is little runoff to flush out the vegetation rotting in the pools. LCA claimants generally tended their *lo‘i* and also cultivated sweet potatoes, melons, and coffee in Hau‘ula.

Mr.Bridges and Mr. Gorai recall gathering plants and fishing regularly. Growing up, Mr. Bridges’ sustenance was within the vicinity of his home. His family cultivated a *lo‘i*; there was a cow and chickens in the yard; *o‘opu* was available in the river. Each family who lived in Hau‘ula would have their own gathering grounds for ocean and river resources. He describes his childhood as being “country” because they cultivated and gathered all of their food.

Mr. Gorai shares a similar story of fishing regularly for *weke*, *papio*, and *o‘opu*, as well as catching black crabs. Because Mr. Gorai’s mother and maternal grandmother practiced *la‘au lapa‘au*, he regularly gathered medicinal plants and herbs with them. Mr. Gorai did not specify which plants were gathered. Today, Mr. Gorai continues to plant. He is currently cultivating *‘ōlena*, various types of chili peppers, *pōpolo*, *ti* leaves, pink torch ginger, and bird of paradise.

8.4 Historic and Cultural Properties

There are many historic properties in the *ahupua‘a* of Hau‘ula. Today the original stone foundation of Lanakila Church still stands. The structure is said to be made out of coral from the off-shore outcrop known as Wahi o Pua. Mr. Bridges stated that there are one or two *ko‘a* in the vicinity of the Project area.

According to McAllister, he documented four *heiau* in Hau‘ula; two of which were already destroyed; the other two were partially dismantled and/or covered with foliage. CSH met with photographer and teacher, Jan Becket, to visit the remaining *heiau*: Kaunihokahi and Maunawila. Both properties are privately owned. Mr. Becket contacted the landowners for him to guide CSH on a walking tour of the remaining structures. While at Kaunihokahi, Mr. Becket cleared *lauae* from a portion of the southeastern wall and uncovered what resembled an *ahu* (see Figure 25). Mr. Becket escorted CSH to a third site off of the Hau‘ula Loop trailhead. The third sites are two undocumented enclosures. A piece of white coral was found at the entrance of the larger enclosure. Mr. Becket recalls a cultural practitioner stating that branch coral found at a cultural site signifies either a ceremonial function or burial.

Although not much is documented about the Cooper Ranch Inn, it was a site for entertainment and also relaxation. The 10-acre ranch boasted over 3,000 varieties of hibiscus as well as avocado and mango orchards. The Inn was a regular resting spot and the site for annual meetings for Charles S. Judd's hiking group known as the Piko Club during the 1930s. During the early 1950s, Mrs. Iris J. Cullen planned to reopen the Cooper Ranch Inn. Today it is closed but still serves as a landmark to local residents. Pukui references Cooper Ranch Inn as the site of Makaluhi, a resting place of Olopana's warriors in the epic of Kamapua‘a.

In 1997, CSH (Masterson et. al 1997) conducted archaeological monitoring for the Kapaka to Lā‘ie waterline. Nine historic properties consisting of 19 human burials, two complete dog burials, and numerous cultural deposits were found (SIHP #50-80-06-4792 to -4798, -5457, and -5458). SIHP #50-80-06-4794 was found at the intersection of Kukuna Road and Kamehameha Highway. This particular site contained one human burial, ten indigenous artifacts, and four historic artifacts. Artifacts included a basalt pounder, basalt flakes, an adz fragment, pounders, sinkers, a hammerstone, and manuports. Five charcoal samples were taken from site -4794. One of these samples was sent for radio-carbon analysis and produced two calibrated date ranges: AD 1690 to AD 1730 and AD 1820 to AD 1920. This indicated the cultural deposit may represent prehistoric occupation of the area (Masterson et. al 1997:28). SIHP #50-80-06-4795 contained subsurface cultural deposit, five indigenous artifacts, one historic artifact, and one human burial. Exacavations were done on the shoulder of Kamehameha Highway and both sides of the Waipilopilo Stream. Artifacts included a coral file fragment and saw fragment. Several metal fragments were also collected. Five charcoal samples were taken, however, none were sent for radio-carbon analysis. The burial and cultural deposit for -4795 are believed to be associated with LCA parcels 8340:1 and 3700:4. All human burials were reinterred at Hau‘ula Congregational Church Cemetary (Masterson et. al 1998:27-28).

In 1998, CSH completed an AIS and subsurface testing for the proposed expansion of Hau‘ula Beach Park. Two historic properties (SIHP #50-80-06-4794 and -4795) were previously identified by CSH (Masterson et. al 1997). There were no new sites or findings. It was determined that site -4795 was also associated with LCA parcel 8356:3 (Bush and Hammatt 2002:24). Archaeological monitoring was recommended for all future subsurface construction activities within the study area.

In 2002, CSH (Bush and Hammatt 2002) also completed archaeological monitoring for the proposed expansion of Hau‘ula Beach Park. Archaeological monitoring identified one additional historic property (SIHP #50-80-06-5801) which consisted of previously disturbed human remains including cranial and post-cranial remains (Bush and Hammatt 2002:18-20). It was likely the remains were associated with nearby LCA parcels 3700:4, 8340:1, and 8356:3. This particular discovery led to the conclusion that more human remains and burials probably exists beneath the fill layers of Hau‘ula Beach Park.

8.5 Hawaiian Habitation

SIHP #50-80-06-4794, -4795, and -5801 demonstrate that habitation could have occurred at the earliest of AD 1690 or AD 1820. Human burials, animal burials, artifacts, and cultural deposits found within these historic properties are indicative of former coastal habitation and have been associated with nearby LCA parcels 3700:4, 8340:1, and 8356:3.

Although LCA claimants in Hau‘ula had access to *lo‘i* and *kula ‘āina*, most did not cultivate their land. Hau‘ula is an area of small *lo‘i* systems (Handy and Handy 1972:460). Most *kula ‘āina* was destroyed by roving animals discouraging claimants to cultivate their land.

8.6 Burials

Resident Brian Pacheco recalls burials being near the Project area. Between 1991 and 1992, Mr. Gorai, who worked on the installation of an 18-inch waterline from Sacred Falls to the Hau‘ula Shopping Center, recalls unearthing *‘iwi* near the Mormon Church in Hau‘ula. He states that everytime burials were found, work was stopped which caused time constraints. Mr. Gorai is unsure if the burials were reinterred or not.

In 1997, SIHP #50-80-06-4792 to -4798, 50-80-06-5457, and 50-80-06-5458 recovered 19 human burials, two complete dog burials, and numerous cultural deposits from Hau‘ula Beach Park (Masterson et. al 1997). SIHP #50-80-06-4794 was recovered from the shoulder of Kamehameha Highway where a distinct cultural layer with ten indigenous artifacts and four historic artifacts were found. SIHP #50-80-06-4795 was discovered on the shoulder of Kamehameha Highway on both sides of the Waipilopilo Stream which is the immediate Project area. A subsurface cultural deposit along with a human burial, five indigenous artifacts, and one historic artifact were found. The human burial was reinterred at Hau‘ula Congregational Church Cemetary. In 2002, SIHP #50-80-06-5801 was discovered at Hau‘ula Beach Park. The site contained previously disturbed human cranial and post-cranial remains.

Section 9 Summary and Recommendations

At the request of Kimura International, Cultural Surveys Hawai‘i (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed HDOT Waipilopilo Bridge Replacement Project. Waipilopilo Bridge, which crosses Waipilopilo Gulch, is located on Kamehameha Highway between Imua Place and Waikulama Streets. Specifically, the Waipilopilo Bridge Replacement Project is at Kamehameha Highway at milepost 20.81, Hau‘ula Ahupua‘a, Ko‘olauloa District, on the island of O‘ahu ([1] 5-4-002, 004, 011, and 017). The location of the Waipilopilo Bridge and Project area is shown on a U.S. Geological Survey map (Figure 1), a tax map (Figure 2), and a 2005 aerial photograph (Figure 3). The Waipilopilo Bridge is a concrete T-bridge, 25 feet long and 28 feet wide.

The proposed Project involves the construction of a temporary bypass bridge across Waipilopilo Stream and the replacement of the existing bridge with a new bridge which meets current design standards and is able to accommodate present day vehicular loads. The new bridge will have a longer and wider span than the existing bridge, in order to accommodate future drainage improvements planned for the Hau‘ula community. Travel lanes will increase to two 12-foot lanes. Shoulders will increase to 8-feet wide and will accommodate pedestrian, wheelchair, and bicycle use. The project will also include relocation and/or adjustment of existing utility structures and final repaving and landscaping to restore the construction area.

The proposed Waipilopilo Replacement Project complies with the State of Hawai‘i environmental review process (Hawai‘i Revised Statutes [HRS] Chapter 343), which requires consideration of a proposed Project’s effect on cultural practices and resources. Through document research and cultural consultation efforts, this report provides information pertinent to the assessment of the proposed Project’s impacts to cultural practices (per the Office of Environmental Quality Control’s (OEQC) *Guidelines for Assessing Cultural Impacts*). This document was prepared to support the proposed Project’s environmental review and may also serve to support the Project’s historic preservation review under HRS Chapter 6E-8 and Hawai‘i Administrative Rules (HAR) Chapter 13-13-275. Based on the findings of this study, cultural resource management recommendations are presented.

9.1 Results of Background Research

The background research reveals the following salient information:

1. The *mo‘olelo* of Hau‘ula describes the physical phenomena such as Helumoa (“chicken scratch”) and Makaluhi (“tired eyes”), suggesting a connection to the epic of Kamapua‘a, the chicken stealing swine who escaped from Olopana’s tired warriors (Pukui et. al 1974:141; Thrum 1904:77).
2. Lanakila Church was built on the area known as Helumoa during the early 1850s. The stones used for the original church construction was from Wahi o Pua, an off-shore enclosure said to be constructed by *menehune* (legendary race of small people). The pieces of coral used for the construction were burned to create lime through a process known as *umu*. A new chapel (now known as the Hau‘ula Congregational Church) was constructed near the original stone structure in 1926. Remnants of the original stone church and graveyard still remain.

3. J.H. Napela (Na-pela-kaupu-o-Namahanaikaleonalani) was the first native Hawaiian to convert to the Morman faith and baptized in 1869. He was a former member of the Congregational Church.
4. In 1908, the Ko‘olau Railway Company laid 11 miles of the proposed 35 miles of rail system between Kahuku and Kahana thus stimulating the agricultural community. Between 1908 to 1921, most of the native residents of Kaluanui sold their Kuleana lands to the rail company. By 1950, the rail system folded and never reached its ultimate destination of Honolulu via Kāne‘ohe.
5. Kamehameha Highway was built in 1932 by the City and County of Honolulu, Department of Public Works. The highway reflected a major shift in transportation thus changing the agricultural industry from railway to roadway.
6. Hau‘ula is in the middle of the Ko‘olau Ridge Trail Complex, also known as Castle Trail, a 20-mile summit trail with numerous junctions to the surrounding valleys and ridges including the Lā‘ie Trail. The trail is lined with cabins on the summit such as the Kaipapau Cabin and Malaekahana Cabin. Other trails within the *ahupua‘a* (land division generally running from the mountain to the sea) include the Hau‘ula Loop Trail, Ma‘akua Ridge Trail, and the Ma‘akua Gulch Trail.
7. In 1997, CSH conducted an Archaeological Monitoring on Kamehameha Highway from Kapaka Ahupua‘a to Lā‘ie Ahupua‘a (Masterson et. al 1997). Nine historic properties consisting of 19 human burials, two complete dog burials, numerous cultural deposits, 15 indigenous artifacts, and five historic artifacts were found (SIHP #50-80-06-4792 to -4798, -5457, and -5458). Artifacts included a basalt pounder, basalt flakes, adz fragment, pounders, sinkers, hammerstone, and manuports. A charcoal sample was tested for radio-carbon analysis which produced a calibrated date of either AD 1690 to AD 1730 or AD 1820 to AD 1920 (Masterson et. al 1997:28).
8. From the Archaeological Monitoring done by CSH, SIHP #50-80-05-4795 is in the immediate Project area. Site -4795 contained a subsurface cultural deposit, five indigenous artifacts, one historic artifact, and one human burial. Excavations were done on the shoulder of Kamehameha Highway and both sides of the Waipilopilo Bridge. The human burial was reinterred at Hau‘ula Congregational Church Cemetary (Masterson et. al 1997:27-28).
9. In 2002, CSH conducted archaeological monitoring for the expansion of Hau‘ula Beach Park. SIHP #50-80-06-5801 was discovered which contained previously disturbed human cranial and post-cranial remains (Bush and Hammatt 2002:18-20).

9.2 Results of Community Consultation

CSH contacted 45 individuals and traveled to Hau‘ula to scope for community members interested in participating. After receiving initial contact letters from CSH, six participants responded in writing. Besides the six written responses, two other respondents participated in formal interviews and two conducted a field visit. A summary of the information from these consultation efforts is as follows:

CSH contacted 45 individuals. After receiving initial contact letters from CSH, six participants responded in writing and two formal interviews were conducted. A summary of the information from these consultation efforts is as follows:

1. Water resources were abundant in the *moku* (district) of Ko‘olualoa. Both Mr. Bridges and Mr. Gorai spent their childhood fishing for *o‘opu* (goby) in the rivers, and *weke* (goatfish) and *pāpio* (crevalle, jack) in the ocean. Mr. Bridges also gathered *wana* (sea urchin), *he‘e* (octopus), and *limu* (seaweed) in the ocean as well as *‘opae* (shrimp) in the river. Mr. Gorai recalls laying net, throwing net, and catching black crabs with his father during the early morning hours.
2. Forest resources were also abundant in the *moku* of Ko‘olauloa. Mr. Bridges recalls his family having a *lo‘i* (taro patch) on their property that they frequently utilized. The family also owned cows and chickens which were on their property as well.
3. There are several cultural sites in the *ahupua‘a* of Hau‘ula. Mr. Bridges spoke of an unnamed heiau at the intersections of Hanimoa Street and Hau‘ula Homestead Road. He shares an on-going community debate that Maunawila Heiau may have possibly been a *luakini*-class heiau (large temple where ruling chiefs prayed and human sacrifices were offered). Mr. Bridges reports there are one or two *ko‘a* (fishing shrines) near the Project area. Mr. Becket met with CSH for a site visit to Maunawila Heiau, Kaunihokahi Heiau, and two undocumented enclosures near the Hau‘ula Loop trailhead. Maunawila Heiau has since been destroyed and is covered with *hau* (hibiscus) and strawberry guava. Kaunihokahi Heiau still has a long wall intact with rocks scattered amongst the area. Mr. Becket removed some bushes of *laua‘e* (fern) which resembled what he thought might be an *ahu* (shrine). The undocumented enclosures found half a mile from the Project area, are intact and in excellent condition. Mr. Becket felt the walls were too low for the enclosure to be an animal pen. However, a small piece of white coral was found at the front wall of a larger enclosure. Mr. Becket recalls a cultural practitioner informing him that branch coral at a structure might indicate a ceremonial function or a burial.
4. *Wahi pana* and *mo‘olelo* holds special cultural significance to Mr. Bridges. He shares the *mo‘olelo* of Makuakaumana, a healing priest from Tahiti who refused to return to his homeland. A whale beached itself on land and later carried Makuakaumana back to Tahiti. The swale itself is called Ka Lae o ka Palaoa or “the cape of the whale” to describe the event of Makuakaumana.
5. *‘Iwi* (bones) are a major concern of the community, especially during the construction process of the proposed Project. Mr. Matoon is concerned if any *‘iwi kupuna* (ancestor’s bones) are found within the Project area. Mr. Bridges is not aware of any burials in the area. Mr. Gorai was a former employee for Fletcher Pacific where he worked on installing 18-inch waterlines from Sacred Falls to the Hau‘ula Shopping Center. Mr. Gorai recalls unearthing animal and human burials near the Mormon Church in Hau‘ula. He is unsure what was done with the *‘iwi*. Mr. Pacheco, a resident near the Project area, states that he knows of burial sites near Imua Place.
6. Community participants expressed the following concerns and recommendations:

a) Mr. Gorai recommends a catwalk or walkway should be added to the Waipilopilo Bridge. Due to the construction of a new bridge in the *ahupua‘a* of Kahana, he finds that the temporary bypass roads do not impact the environment too much. He recommends the bypass run on the *makai* (towards the sea*)* side of the bridge, not interfering with anyone’s property.

b) Mr. Nihipali, a community member, is concerned about a nearby cemetery and whether the Project area will affect the burials.

c) Mr. Pacheco, a resident near the Project area, states that he knows of burial sites near Imua Place.

d) Mr. Bridges reports there are one or two *ko‘a* near the Project area.

9.3 Recommendations

Based on background research and community consultation detailed in the CIA report, CSH recommends the following measures to mitigate potentially adverse effects of the proposed Project on cultural resources and practices:

1. SIHP #50-80-06-4795 (Masterson et. al 1997) contained a subsurface cultural deposit, five indigenous artifacts, one historic artifact, and one human burial. Excavations were done on the shoulder of Kamehameha Highway on both sides of the Waipilopilo Stream. Resident of Imua Place, Mr. Pacheco, has expressed his knowledge of burials in the area. Mr. Bridges has acknowledged that there are one or two *ko‘a* near the Project area. Although it is not in the immediate Project area, Mr. Gorai has unearthed animal and human burials near the Hau‘ula Shopping Center. Based on the findings of SIHP #50-80-06-4795 and Mr. Bridges and Pacheco’s knowledge of *ko‘a* and burials in the immediate Project area, land disturbing activities during construction may uncover presently undetected burials or other cultural finds. It is recommended that all personnel involved in the reconstruction of the Project be informed of the possibility of any inadvertent cultural findings and burials. Should any burials be identified during excavation, all construction work should be ceased and the proper agencies and authorities are contacted pursuant to applicable law.
2. Based on the findings of SIHP #50-80-06-4795 and community knowledge of burials and cultural finds within the immediate Project area, an archaeological monitoring plan is recommended.
3. The Hawai‘i Department of Transportation should consult with community members to develop a reinterment plan and cultural preservation plan in the event that any human remains or cultural sites or artifacts be uncovered during construction or long-term maintenance for the Project.

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Appendix A Glossary

To highlight the various and complex meanings of Hawaiian words, translations from Pukui and Elbert (1986) are used unless otherwise noted. In some cases, alternate translations may resonate stronger with Hawaiians today; these are placed prior to the Pukui and Elbert (1986) translations and marked with "(common)."

Diacritical markings used in the Hawaiian words are the *‘okina* and the *kahakō*. The *‘okina*, or glottal stop, is only found between two vowels or at the beginning of a word that starts with a vowel. A break in speech is created between the sounds of the two vowels. The pronunciation of the *‘okina* is similar to saying "oh-oh." The *‘okina* is written as a backwards apostrophe. The *kahakō* is only found above a vowel. It stresses or elongates a vowel sound from one beat to two beats. The *kahakō* is written as a line above a vowel.

Hawaiian Word	English Translation
ahu	Heap, pile, collection, mound, mass; altar, shrine, cairn.
ahupua‘a	Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (ahu) of stones surmounted by an image of a pig (pua‘a), or because a pig or other tribute was laid on the altar as tax to the chief.
aku	Bonito, skipjack
hā	To breathe, exhale.
hau	A lowland tree, found in many warm countries: *Hibiscus tilaceus*.
he‘e	Octopus, commonly known as squid.
heiau	Pre-Christian place of worship, shrine, stone platforms, earth terraces.
hilu	Black Striped Wrasse, a species of reef fish.
‘ili	Land section, next in importance to ahupua‘a and usually a subdivision of an ahupua‘a.
imu	Underground oven.
iwi	Bone, carcass (as of a chicken), core (as of a speech).
iwi kūpuna	Ancestral bone remains (common).

kahuna	Priest, sorcerer, magician, wizard, minister, expert in any profession (doctors, surgeons, dentists, etc.).
kalo	A kind of aroid, tuber, corm cultivated for food; starchy root.
kapa	Tapa, as made from *wauke* or *māmaki* bark.
kama‘aina	Native-born, one born in a place, host.
kapu	Taboo, prohibition; special privilege or exemption from ordinary taboo; sacredness; prohibited, forbidden; sacred, holy, consecrated; no trespassing, keep out.
kauwā	Outcast, pariah, slave, untouchable, menial; a caste which lived apart and was drawn on for human sacrifices.
kiawe	Algaroba tree (Prosopis pallid), a legume from Peru, common in dry areas.
kilu	A game where a small gourd is cut lengthwise and then thrown towards a target; if a person hit the target, he or she would claim their prize.
ko‘a	Shrine.
koa	The largest of native forest trees (Acacia koa); fine, red wood with valuable lumber used for canoes, surfboards, calabashes, furniture, and ukuleles.
koa haole	A common roadside shrub or small tree (Leucana leucocephala) from tropical America; closely related to the koa. The small brown seeds are strung for leis, purses, mats.
konohiki	Headman of an *ahupua‘a* land division under the chief.
kula	Plain, field, open country, pasture. An act of 1884 distinguished dry or kula land from wet or taro land.
kuleana	Right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province.
kupuna (pl. kūpuna)	Grandparent, ancestor, relative or close friend of the grandparent's generation, grandaunt, granduncle. Kūpuna—plural of kupuna.

la‘au lapa‘au	Traditional plant medicine (common). Medicine. *Lit*. Curing medicine.
laua‘e	A fragrant fern (Pysmatosorus scolopendria); when crushed its fragrance is similar to the maile.
luakini	Place of worship where ruling chiefs prayed and human sacrafices were offered.
lele	A detached part or lot of land belonging to one *‘ili* and located in another.
limu	Lichen, moss, seaweed.
lo‘i	Irrigated terrace, especially for taro, but also for rice; paddy.
loko i‘a	Fishpond (common).
lua	Hole, pit, grave, den, cave, mine, crater.
luakini	Large heiau where ruling chiefs prayed and human sacrafices were offered.
Māhele	Redistribution of Hawaiian land to private ownership; land division of 1848.
makai	Ocean.
makana	Gift, present.
mana‘o	Thought, idea, belief, opinion, suggestion.
mauka	Inland.
mele	Songs.
menehune	Legendary race of small people who worked at night, building fishponds, roads, temples; if the work was not finished in one night, it remained unfinished.
moku	District, island, islet, section
mo‘olelo	Story, tale, myth, history, tradition, literature, legend, journal.
muliwai	River, river mouth, pool near mouth of a stream, behind a sand bar.

‘ōlelo no‘eau	Proverbs.
‘ōlena	Turmeric, a kind of ginger distributed from India into Polynesia, widely used as a spice and dye in foods, to color cloth, and medicinally for earache and lung trouble.
oli	Chants.
o‘opu	Fishes from such families as the Eleotridae, Gobiidae, and Blennidae. These particular fish can be found in salt, brackish, and fresh water.
‘ōpae	General name for shrimp.
pāpio	Immature trevally or jack weighing less than ten pounds.
papua	Small fry place.
pōpolo	The black nightshade (Solanum nigrum), a smooth cosmopolitan herb with small black edible berries. The leaves are eaten as greens, the plant is valued for medicinal properties and ceremonies.
pu‘u	Hill, peak, cone, hump, mound.
ti (kī)	A woody plant (Cordyline terminalis) in the lily family, native to tropical Asia and Australia.
tūtū	Grandparent.
umu	Process of burning coral to make lime.
wahi pana	Storied place (common). Legendary place.
wana	Sea urchin.
weke	Species of the Mullidae, surmullets, or goatfish. Red and light-colored weke were popular as offerings to the gods to turn away curses.

Appendix B Common and Scientific Names for Plants and Animals

Common Names		Possible Scientific Names		Source
Hawaiian	**Other**	**Genus**	**Species**	
hau	Beach hibiscus	*Hibiscus*	*tiliaceus*	Wagner et al. 1999
he‘e	Octopus, commonly known as squid	Multiple families and species		Pukui and Elbert 1986
kalo	Taro	*Colocasia*	*esculenta*	Wagner et. al 1999
kiawe	Mesquite	*Prosopis*	*pallida*	Wagner et. al 1999
koa haole		*Leucaena*	spp.*	Wagner et. al 1999
laua‘e		*Phymatosorus*	*grossus*	Imada et. al 2005
limu	Seaweed, algae	Multiple families and species		Pukui and Elbert 1986
moi	Threadfin	*Polydactylus*	*sexfilis*	Hoover 1993
‘ōlena	Turmeric	*Curcuma*	*longa*	Wagner et. al 1999

‘o‘opu	Goby, blennie	general name for fresh and salt water fishes included in the families Eleotridae, Gobiidae, Blennidae, Microdesmidae	spp.	Hoover 1993
‘ōpae	General name for shrimp	General name for shrimp		Pukui and Elbert 1986
pāpio	Juvenille bigeye jack	*Caranx*	*sexfasciatus*	Hoover 1993
pōpolo	Glossy nightshade	*Solanum*	*americanum*	Wagner et. al 1999
ti (kī)		*Cordyline*	*fruticosa*	Wagner et. al 1999
wana	Spiny seaurchin	*Diadema*	*paucispinum*	Pukui and Elbert 1986
weke	Various goatfish	*Mulloidichthys*	spp.	Hoover 1993

* spp. = multiple species

Appendix C Initial Community Letter

Cultural Surveys Hawai‘i, Inc.
Archaeological and Cultural Impact Studies
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Job code: HAUULA 6 nishihara@culturalsurveys.com www.culturalsurveys.com

Aloha mai e,

At the request of Kimura International, Cultural Surveys Hawai‘i Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed Kamehameha Highway Waipilopilo Stream Bridge Rehabilitation Project, Hau‘ula Ahupua‘a, Ko‘olauloa District, O‘ahu Island, TMK: [1] 5-4-002, 004, 011, and 017. Please note that TMK numbers currently do not include parcels. TMKs listed are a general area that may be affected and are subject to change. Please see the attached figures: Project map and an aerial photograph of the proposed Project area. Both figures display the Project Area and the Area of Potential Effect (APE).

The existing Waipilopilo Stream Bridge was built in 1932. It is approximately 25 feet long and 28 feet wide. This section of Kamehameha Highway is a two-lane, undivided highway with a posted speed limit of 35 mph. It is classified as a Primary Rural Arterial and is on the National Highway System. The project will be funded, in part, with federal monies.

The purpose of this project is to widen the existing Waipilopilo Stream Bridge to two 12-foot lanes with two 8-foot shared shoulders. The latter will provide a safe and accessible route for pedestrians, bicyclists, and handicapped persons.

The proposed scope of work consists of the following components: evaluating the existing structure for major repairs; roadway rehabilitation; bridge widening and lengthening; shoulder improvements; adding bike rails; upgrading guardrails, posts, and end treatments; drainage system improvements and maintenance, relocating some utilities; signing and striping; highway lighting improvements; and construction detours.

The purpose of the CIA is to gather information about the Project area and its surroundings through research and interviews with individuals that are knowledgeable about this area in order to assess potential impacts to the cultural resources, cultural practices and beliefs identified as a result of the planned Project. We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:

- **General history and present and past land use of the Project area. Although the redevelopment will be within the boundaries as stated above, this study will include the entire *ahupua‘a* of Hau‘ula.**
- **Knowledge of cultural sites which may be impacted by future development of the Project area - for example, historic sites and / or archaeological sites.**
- **Knowledge of traditional gathering practices in the Project area vicinity, both past and ongoing.**

Appendix D Authorization and Release

Cultural Surveys Hawai‘i, Inc.
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AUTHORIZATION AND RELEASE FORM

Cultural Surveys Hawai‘i (CSH) appreciates the generosity of the *kūpuna* and *kama‘āina* who are sharing their knowledge of cultural and historic properties, and experiences of past and present cultural practices for the Cultural Impact Assessment for the Waipilopilo Bridge Replacement Project, *ahupua‘a* of Hau‘ula, Ko‘olauloa.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our study. Here are the procedures we promise to follow:

1. The interview will not be tape-recorded without your knowledge and explicit permission.
2. If recorded, you will have the opportunity to review the written transcript of our interview with you. At that time you may make any additions, deletions or corrections you wish.
3. If recorded, you will be given a copy of the interview notes for your records.
4. You will be given a copy of this release form for your records.
5. You will be given any photographs taken of you during the interview.

For your protection, we need your written confirmation that:

1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.
3. If a photograph is taken during the interview, you consent to the photograph being included in any report/s or publication/s generated by this cultural study.
4. If you have been interviewed previously by CHS, you consent for that interview to also be used for this report.

I, _____, agree to the procedures outlined above and, by my
(Please print your name here)
signature, give my consent and release for this interview to be used as specified.

_____
(Signature)

_____
(Date)

APPENDIX H DRAFT BIOLOGICAL ASSESSMENT

Biological Assessment for the Waipilopilo Stream Bridge Replacement Project, O‘ahu

AUGUST 2025

PREPARED FOR

WSP USA

PREPARED BY

SWCA Environmental Consultants

BIOLOGICAL ASSESSMENT FOR THE WAIPILOPILO STREAM BRIDGE REPLACEMENT PROJECT, O‘AHU

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1 INTRODUCTION

WSP USA (WSP), on behalf of the Federal Highways Administration (FHWA) in cooperation with Hawai‘i Department of Transportation (HDOT), is currently planning the Waipilopilo Stream Bridge Replacement Project, (referred to hereafter as the project). The project is located at mile marker 21 on Kamehameha Highway, Route 83, in the vicinity of Hau‘ula Beach Park on O‘ahu’s North Shore, in the state of Hawai‘i (Figure 1).

WSP contracted SWCA Environmental Consultants (SWCA) to complete a biological assessment (BA) for the project. The purpose of this BA is to evaluate the proposed action in sufficient detail to determine its potential effects on federally listed threatened and endangered species (hereafter special-status species) and any associated critical habitat.

The species analyzed for this BA include the federally listed Hawaiian common gallinule (*Gallinula galeata sandvicensis*), Hawaiian coot (*Fulica alai*), Hawaiian duck (*Anas wyvilliana*), and Hawaiian stilt (*Himantopus mexicanus knudseni*) (collectively referred to as Hawaiian waterbirds); band-rumped storm petrel (*Oceanodroma castro*), Hawaiian petrel (*Pterodroma sandwichensis*), Newell’s shearwater (*Puffinus auricularis newelli*), and short-tailed albatross (*Phoebastria albatrus*) (collectively referred to as seabirds); green sea turtle (*Chelonia mydas*) and hawksbill sea turtle (*Eretmochelys imbricata*) (collectively referred to as Pacific sea turtles); Hawaiian hoary bat (*Lasiurus cinereus semotus*); and seven federally listed native plant species. In addition, the proposed project is adjacent to proposed critical habitat for the threatened green sea turtle.

Section 7(a)(1) of the Endangered Species Act of 1973 (as amended) (ESA) directs all federal agencies to participate in the conservation and recovery of threatened and endangered species. Section 7(a)(2) of the ESA states that each federal agency shall consult with the U.S. Fish and Wildlife Service (USFWS) to ensure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. The proposed action would be federally funded, and the FHWA is the lead agency for the Section 7 consultation. Because this BA includes impacts for terrestrial species, it will be submitted to the USFWS.

1.1 Consultation to Date

On May 15, 2025, an official list of federally threatened and endangered species, candidate species, species of special concern, and critical habitats that may be present within the project area was generated via the USFWS’ Information for Planning and Consultation website (Appendix A). Conservation measures from similar concurrent bridge and highway restoration projects on O‘ahu have been incorporated into the proposed project and are detailed in Section 2.2 of this report (SWCA 2025a, 2025b).



Figure 1. Proposed project location.

2 PROJECT DESCRIPTION AND PROPOSED ACTION

The Waipilopilo Stream Bridge (003000830302112) is located at milepost 20.81 on Kamehameha Highway (State Route 83) between Waikulama Street and Imua Place in the Koʻolauloa District of Oʻahu. Constructed in 1932, the bridge is situated at coordinates 21°36'53.9" N, 157°54'47.6" W. It is oriented southbound toward Kaneohe and northbound toward Laie, carrying Kamehameha Highway over Waipilopilo Stream.

Kamehameha Highway (State Route 83) is a vital corridor within the National Highway System and serves as the only emergency access route across streams in the Koʻolauloa District. Classified as a rural principal arterial, it provides essential connectivity for motorists, pedestrians, and bicyclists.

The proposed action is a bridge replacement to address the deterioration in the bridge girders and deck. Additionally, the project will include widening the bridge deck to improve traffic safety and meet current state and federal design guidelines.

The existing bridge superstructure, railings and pedestrian walkway will be completely removed. The new single span bridge superstructure will consist of concrete girders and a concrete surface. The existing 12-inch and 16-inch water lines will be relocated onto the bridge deck. The replacement bridge will have a span that is 56 feet in length and 49 feet wide. The bridge will accommodate two 11-foot travel lanes (one lane in each direction) with shoulders on both sides and a protected 6-foot walkway. The bridge deck is being widened to accommodate wider shoulders and improve traffic safety, which will not increase capacity or add additional lanes. The new bridge abutments will consist of drilled shafts connected to a cast-in-place reinforced concrete cap beam. The concrete girders will be supported by the cap beams and the concrete surface will be placed on the girders forming the riding surface. No in-water work will be conducted as part of the project.

During construction, Waipilopilo Bridge will remain open, consisting of contra-flow operation. There will be no temporary bridge or detour. To reduce traffic impact during the daytime, nightwork will occur and may last the full duration of the 18- to 24-month construction period. In addition, the location of the staging areas is yet to be determined by the Project Contractor.

2.1 Action Area

The ESA defines an *action area* as the area within which all of the direct and indirect impacts of the project would occur (50 Code of Federal Regulations 402.02). The action area was determined based on potential for construction noise to travel through the surrounding areas. This is because noise would be the most far-reaching impact resulting from the proposed action. This area extends 1,000 feet (305 meters [m]) from the project area, covering approximately 98 acres (39.6 hectares) (Figure 2). The 1,000-foot (305-m) buffer defines the action area based on the distance a 100-A-weighted-decibel (dBA) noise (such as a rock drill, paver, or impact pile driver) would attenuate to background levels (approximately 50 dBA) over flat terrain with little to no vegetation (FHWA 2017). The action area is conservatively defined and likely encompasses a larger area than where all impacts would occur. The distance over which noise effects would actually occur is likely smaller than the action area because quieter equipment could be used and local topography and vegetation would block the produced noise.

In contrast, the project area refers to the specific location where direct permanent and temporary activities such as ground disturbance, temporary staging, and vehicle parking will take place, and encompasses 0.62 acre for this project (Figure 2).



Figure 2. Project area and action area of the proposed Waipilopilo Stream Bridge Replacement Project.

2.2 Conservation Measures

Implementation of the proposed action would include a variety of conservation measures to reduce or eliminate project-related impacts and avoid adverse effects to special-status species. The following conservation measures, originally provided by the USFWS, have been minimally revised to align with the context of the current project.

2.2.1 Waterbirds

- In areas where waterbirds are encountered or are known to occur, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered waterbirds at the site.
- When working within or adjacent to water resources, best management practices for working around aquatic environments (Appendix B) shall be incorporated into the project design.
- A biological monitor that is familiar with the species' biology shall conduct Hawaiian waterbird nest surveys where appropriate habitat occurs within the vicinity of the proposed project site prior to project initiation. Surveys shall be repeated within 3 days of project initiation and after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest). If a nest or active brood is found:
    - Contact the USFWS within 48 hours for further guidance.
    - Establish and maintain a 100-foot buffer around all active nests and/or broods until the chicks/ducklings have fledged. Do not conduct potentially disruptive activities or habitat alteration within this buffer.
    - A biological monitor that is familiar with the species' biology shall be present on the project site during all construction or earth-moving activities until the chicks/ducklings fledge to ensure that Hawaiian waterbirds and nests are not adversely impacted.

2.2.2 Seabirds

- Fully shield all outdoor lights so the bulb can only be seen from below.
- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when construction activity is not occurring in the lighted area.
- Where possible, limit nighttime construction during the seabird fledging period, September 15 through December 15
- If nighttime work cannot be avoided during the seabird fledging season, a biological monitor shall be present at the project site to monitor for seabird fallout. If listed seabirds are observed flying over the project area, guidance will be sought from the USFWS biologist at the start of the following business day regarding any additional seabird avoidance and mitigation measures to implement.
- Where fences extend above vegetation, integrate three strands of polytape into the fence to increase visibility.
- For power lines, guywires and other cables, minimize exposure above vegetation height and vertical profile.

2.2.3 Pacific Sea Turtles

- Where possible, avoid nighttime work during the nesting and hatching season (May through December).

- At all times of the year, minimize the use of lighting on or near beaches and shield all project-related lights so the light is not visible from any section of the beach.
- If lights cannot be fully shielded or if headlights must be used, fully enclose the light source with light filtering tape or filters.
- Incorporate design measures into the project plan to reduce ambient outdoor lighting, such as:
    - Tinting or using automatic window shades for exterior windows that face the beach
    - Reducing the height of exterior lighting to below 3 feet and pointing lights downward or away from the beach
    - Minimizing light intensity to the lowest level feasible and, when possible, including timers and motion sensors
- Conduct work only on the existing roadway, avoiding sandy areas of dune and back shore.
- Avoid removing or damaging native dune vegetation.
- Integrate applicable best management practices for work in aquatic environments into the project design (see Appendix B).

2.2.4 Hawaiian Hoary Bat

- Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).
- Any fences that are erected as part of the project will have barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. No fences with barbed wire were observed in the project area; however, if fences are present and need to be moved or replaced, the top strand of barbed wire will be removed or replaced with barbless wire.

2.2.5 Special-status Native Plant Species

No conservation measures are provided for special-status native plant species due to the following reasons:

- The project area is situated in a highly modified roadside environment that has undergone ecological disturbance for over a century.
- No special-status plant species were recorded during a survey of the project area during December 2024.
- The project area lies outside the known range of special-status plant species and does not overlap with the critical habitat of these species.

3 METHODOLOGY AND SPECIES COVERED IN THE EVALUATION OF POTENTIAL IMPACTS

The USFWS maintains lists of endangered, threatened, proposed, and candidate species known or thought to occur in Hawai‘i. The USFWS also designates critical habitat in the state for some listed species. Endangered and threatened species are protected under the ESA (16 United States Code 1531 et seq.). The ESA specifically prohibits *take*, which is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to engage in any such conduct” of a listed species. *Harm* includes “significant habitat modification or degradation that kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.”

All information on the vegetation and wildlife in the project area and action area was derived from a biological survey conducted by SWCA in December 2024. In addition to recording wildlife and plants observed during the surveys, SWCA evaluated habitat for the possible occurrence of federally listed species.

The species evaluated in this report consist solely of federally protected (endangered and threatened) species, proposed species, and species that are candidates for federal listing.

The determination of potential for species occurrence was based on 1) existing information on distribution and 2) qualitative comparisons of the habitat requirements of each species with vegetation communities, landscape features, and/or habitat quality conditions in the project area. Possible impacts to these species were evaluated based on reasonably foreseeable project-related activities and the local loss of habitat.

Federally listed species were evaluated for potential to occur in the project area using the following categories:

- *Known to occur:* The species was documented in the project area either during or before the field surveys by a reliable observer.
- *May occur:* The project area is within the species' currently known range, and vegetation communities, soils, water quality conditions, etc., resemble those known to be used by the species.
- *Unlikely to occur:* The project area is within the species' currently known range, but vegetation communities, soils, water quality conditions, etc., do not resemble those known to be used by the species, or the project area is clearly outside the species' currently known range.

Species with the potential to occur in the project area were then further evaluated for possible impacts from the proposed action. Effect determination categories are defined differently based on the exact legal status of a species and the mandates and responsibilities of the agency tasked to manage or protect that species. Special-status species were assigned to one of three categories of possible effect, following USFWS guidelines:

- *No effect.*
- *May affect, is not likely to adversely affect.*
- *May affect, is likely to adversely affect.*

As directed by the USFWS, critical habitat and species proposed for listing or that are candidates for listing are evaluated using the effect determination categories listed below. *Jeopardy* is defined under the ESA as occurring when "an action is reasonably expected, directly or indirectly, to diminish a species' numbers, reproduction, or distribution so that the likelihood of survival and recovery in the wild is appreciably reduced."

- No jeopardy.
- Not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of proposed critical habitat.
- Likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of proposed critical habitat.

Once a species becomes federally listed as endangered or threatened, it becomes listed under the same classification (endangered or threatened) in the state of Hawai'i (Hawai'i Revised Statutes 195D-4). As such, state-listed species will not be mentioned further within the BA.

4 AFFECTED ENVIRONMENT

SWCA conducted a review of available scientific and technical literature regarding natural resources in the project area and action area. This literature review encompassed a thorough search of refereed scientific journals, technical journals and reports, environmental assessments and environmental impact statements, relevant government documents, and unpublished data that provide insight into the natural history and ecology of the area. SWCA also reviewed available geospatial data, aerial photographs, and topographic maps of the project area and action area.

On December 5, 2024, an SWCA biologist conducted a field survey of the project area. The survey consisted of pedestrian botanical and faunal surveys. The biologist walked through sections of the site that could serve as potential habitat for wildlife and plants, documenting vegetation types, fauna, wetlands or streams, and any known or suspected special-status species and their habitats.

4.1 Vegetation

The pedestrian botanical survey of the project area, on December 5, 2024, was conducted to document all vascular plant species and vegetation communities. Areas more likely to support native plants (e.g., areas of coastal strand and shady areas) were more intensively examined. Plants recorded during the survey were indicative of the season (rainy vs. dry) and the environmental conditions at the time of the survey. As environmental conditions change, it is likely that species composition and plant abundances also undergo temporal or seasonal changes.

No state or federally listed special-status species or otherwise rare native Hawaiian vascular plant species were observed in the project area. In all, 56 plant species were recorded during the survey. Of these, six species—kīpūkai (*Heliotropium curassavicum*), pōhuehue (*Ipomoea pes-caprae* ssp. *brasiliensis*), naupaka kahakai (*Scaevola taccada*), hau (*Hibiscus tiliaceus*), ʻaeʻae (*Bacopa monnieri*), and pōhinahina (*Vitex rotundifolia*)—are native to the Hawaiian Islands. All six species are indigenous to the Hawaiian Islands, occurring throughout Hawaiʻi as well as in other parts of the world (Wagner et al. 1999). Appendix C lists all plant species observed by the SWCA biologist in the project area during the survey.

SWCA compared the plant species observed during the survey (see Appendix C) to the Federal Noxious Weeds (U.S. Department of Agriculture [USDA] 2012) and the Hawaiʻi State-listed Noxious Weeds (Hawaiʻi Department of Agriculture 1992) lists. No federal or state noxious weeds were recorded during the survey.

4.1.1 Vegetation Communities

Three vegetation types were recorded within the project area: coastal strand, landscaped, and roadside ruderal. Photographs of the vegetation types are provided in Figures 3 through 5, below.

4.1.1.1 COASTAL STRAND

Coastal strand vegetation occurs as a narrow strip along shorelines and is influenced by salt spray, constant wind, high light intensity, high temperatures, and shifting sands. Consequently, plants in this zone are specially adapted to withstand these environmental stresses. Much of the coastal portions of the project area are vegetated with nonnative species such as ironwood (*Casuarina equisetifolia*) and beach heliotrope (*Tournefortia argentea*). The native strand species naupaka kahakai and pōhuehue make up much of what remains of the coastal strand vegetation in the area (Figure 3).



Figure 3. An example of the coastal strand vegetation type within the project area.

4.1.1.2 LANDSCAPED

Landscaped vegetation in the action area is located around businesses and private residences and consists mainly of ornamental trees and shrubs, such as areca palm (*Dypsis lutescens*), plumeria (*Plumeria rubra*), and common blue vitex (*Vitex trifolia*) (Figure 4). This is the most common vegetation type in the action area.



Figure 4. Landscaped vegetation type in the action area.

4.1.1.3 ROADSIDE RUDERAL

This vegetation type is composed of a mixture of nonnative grasses and weedy, mostly herbaceous, species (Figure 5). This vegetation is common throughout the project and action areas, along road verges, in pastures, and at the bases of fences and houses. The grasses that are common or abundant in these areas are bermudagrass (*Cynodon dactylon*), pitted beardgrass (*Bothriochloa pertusa*), and Guinea grass (*Urochloa maxima*). Common broadleaved herbaceous species within this vegetation type include the nonnative weeds wedelia (*Sphagneticola trilobata*), creeping indigo (*Indigofera spicata*), scarlet spiderling (*Boerhavia coccinea*), and narrow-leaved plantain (*Plantago lanceolata*). The vining species ivy gourd (*Coccinia grandis*) was present throughout this vegetation type.



Figure 5. Roadside ruderal vegetation in the project area.

4.2 Fauna

Fauna surveys consisted of a pedestrian survey within the project area conducted from 10:00 a.m. to 12:00 p.m. Visual and auditory observations were recorded. All birds, mammals, reptiles, amphibians, fish, and invertebrate species seen or heard were documented, and any signs (such as scat or tracks) were noted. Habitat surveys for the endangered Hawaiian hoary bat were conducted by noting areas of suitable foraging and roosting habitat as indicators of potential presence.

The following sections describe the wildlife observed in the project area during the December 2024 field survey. The fauna observed are species typically found in disturbed, low-elevation areas on the island of O‘ahu. In total, 12 species were documented.

4.2.1 Birds

In all, five nonnative bird species were recorded during the survey, including one species, cattle egret (*Bubulcus ibis*), that is protected under the Migratory Bird Treaty Act (MBTA) (Table 1).

Table 1. Birds Observed by SWCA in and Around the Project Area in December 2024

Common Name	Scientific Name	Status*	MBTA
Common myna	*Acridotheres tristis*	NN	
Cattle egret	*Bubulcus ibis*	NN	X
Feral chicken	*Gallus domesticus*	NN	
Spotted dove	*Streptopelia chinensis*	NN	
Zebra dove	*Geopelia striata*	NN	
	Total species	5	1

* Status: NN = nonnative established species

4.2.2 Mammals

Mammals detected during the survey included the domesticated dog (*Canis familiaris*) and small Indian mongoose (*Herpestes javanicus*). No other mammals were observed during the pedestrian surveys, although rats (*Rattus* spp.), and mice (*Mus musculus*) would be expected to be present within the project area.

The potential for the presence of Hawaiian hoary bat was assessed based on the presence of suitable habitat and vegetation types. The Hawaiian hoary bat has been documented roosting in ironwood, which was recorded on Hau‘ula Beach, and could roost in other tree species with similar branch structures found throughout the project and action areas. Hawaiian hoary bat has been previously detected near Hau‘ula (Thompson and Starcevich 2022) and could periodically forage throughout the action area.

4.2.3 Terrestrial Reptiles and Amphibians

Brown anoles (*Anolis sagrei*) were observed during the survey. No terrestrial reptiles or amphibians are native to Hawai‘i.

4.2.4 Terrestrial Invertebrates

Four invertebrate species were identified during the survey: honeybee (*Apis* sp.), housefly (*Musca domestica*), lesser grass blue butterfly (*Zizina otis*), and tropical fire ant (*Solenopsis geminata*). All these species are nonnative to the Hawaiian Islands.

5 SPECIES AND CRITICAL HABITAT CONSIDERED

The species evaluated in this report consist of all federally protected special-status species (i.e., endangered and threatened) with potential to occur in and near Hau‘ula, O‘ahu (see Appendix A).

5.1 Species

The USFWS lists 11 animal species that may occur in the project action area: nine endangered species and two threatened species (Table 2; see Appendix A). Based on current distribution and habitat requirements, one animal species, the green sea turtle, is known to occur in the action area, and six species—the Hawaiian common gallinule, Hawaiian coot, Hawaiian duck, Hawaiian stilt, hawksbill sea turtle, and Hawaiian hoary bat—may occur in the action area. The Hawaiian petrel, band-rumped storm petrel, Newell’s shearwater, and short-tailed albatross are unlikely to occur in the action area because suitable habitat does not exist; however, these seabirds, including fledglings, may be attracted to construction lights as they fly over the action area. These species and the impacts that may occur as a result of project construction are discussed in further detail in Section 6.

Table 2. Species Federally Listed as Endangered or Threatened with Potential to Occur within and Near the Action Area

Common Name (*Scientific Name*)	Status*	Range or Habitat Requirements	Potential for Occurrence in Action Area	Determination of Effect
Birds				
Hawaiian common gallinule (*Gallinula galeata sandvicensis*)	Endangered	**Range:** Hawaiian common gallinule is found only on Oʻahu and Kauaʻi, with a total population of about 930 birds, roughly split between the two islands (USFWS 2011). **Habitat:** This species inhabits lowland freshwater and brackish marshes, valley wetlands, streams, reservoirs, and occasionally high-elevation plunge pools (USFWS 2011). It prefers dense emergent vegetation near open water, shallow water under 3 feet (0.91 m) deep, and freshwater habitats. This species breeds year-round, with most nesting occurring from March to August. Nests are typically built in standing water less than 2 feet (0.60 m) deep, using folded emergent vegetation or on the ground if tall cover is nearby (USFWS 2011).	Has the possibility of occurring in the action area; suitable foraging habitat occurs in the action area and along Maʻakua Stream.	May affect, is not likely to adversely affect.
Hawaiian coot (*Fulica alai*)	Endangered	**Range:** Hawaiian coot is found on all main Hawaiian Islands except Kahoʻolawe (Paxton et al. 2021; USFWS 2011). The estimated total population is 1,815, with 80% of individuals on Kauaʻi, Oʻahu, and Maui (Paxton et al. 2021; USFWS 2011). **Habitat:** This species inhabits freshwater marshes, ponds, estuaries, reservoirs, taro fields (*Colocasia esculenta*), irrigation ditches, and sewage ponds, typically in lowlands up to 260 m, though is occasionally found in habitats as high as 1,067 m. While it prefers freshwater habitats, it can also use brackish and, rarely, saline water. The species forages in shallow water, dives up to 120 centimeters (cm), and shows a stronger preference for open water compared to Hawaiian moorhens (State of Hawaiʻi Department of Land and Natural Resources [DLNR] 2015a).	Has the possibility of occurring in the action area; suitable foraging habitat occurs in the action area along portions of Maʻakua Stream.	May affect, is not likely to adversely affect.
Hawaiian duck (*Anas wyvilliana*)	Endangered	**Range:** Fewer than 2,000 Hawaiian ducks remain, with about half the population located on Kauaʻi (Paxton et al. 2021). Most birds on Oʻahu are likely hybrids with invasive mallards (Wells et al. 2019). They are commonly seen in wetlands on Windward Oʻahu, including Kawainui, Hāmākua, Heʻeia Marshes, Kaʻelepulu and Nuʻupia Ponds, and Hoʻomaluhia Botanical Garden, as well as on the North Shore, southern Oʻahu, and the Waiʻanae Coast. **Habitat:** Hawaiian ducks occupy a variety of wetland habitats, such as freshwater marshes, coastal ponds, streams, and montane pools, from sea level up to 9,900 feet (3,000 m) (USFWS 2011). They nest on the ground near water, although little is known about their specific nesting habits (USFWS 2011).	Has the possibility of occurring in the action area; suitable foraging habitat occurs in Maʻakua Stream.	May affect, is not likely to adversely affect.

Common Name (*Scientific Name*)	**Status***	**Range or Habitat Requirements**	**Potential for Occurrence in Action Area**	**Determination of Effect**
Hawaiian stilt (*Himantopus mexicanus knudseni*)	Endangered	**Range:** Historically found on all main Hawaiian Islands except Lānaʻi and Kahoʻolawe, Hawaiian stilt is currently present on all main islands except Kahoʻolawe, with a statewide population of 1,932 individuals, including about 526 on Oʻahu (Paton and Scott 1985; Reed et al. 2011; Paxton et al. 2021). Key locations on Oʻahu include James Campbell National Wildlife Refuge, Kahuku aquaculture ponds, Pearl Harbor National Wildlife Refuge, and Nuʻupia Ponds (USFWS 2011). **Habitat:** This species prefers aquatic habitats such as open mudflats, sparsely vegetated pickleweed mats, and open pasture lands. Optimal foraging occurs in water depths of approximately 5 inches (13 cm). It nests on mudflats or low islands in fresh, brackish, or saltwater bodies, often in areas separate from feeding sites.	Has the possibility of occurring in the action area; suitable foraging habitat occurs along portions of Maʻakua Stream, and nesting could occur in portions of the action area.	May affect, is not likely to adversely affect.
Band-rumped storm petrel (*Oceanodroma castro*)	Endangered	**Range**: Band-rumped storm petrel is found in several areas of the subtropical Pacific and Atlantic Oceans. Recognized as the rarest breeding seabird in Hawaiʻi (Banko et al. 1991; Slotterback 2002), most of these birds nest on Kauaʻi, with smaller, scattered colonies on Hawaiʻi Island, Lānaʻi, and Lehua Islet (DLNR 2015b; USFWS 2021a). **Habitat:** This species is not known to breed on Oʻahu but could traverse the island while flying between foraging sites at sea. When not at nest locations, it forages on the open ocean.	Band-rumped storm petrel may fly over the action area at night but are not likely to land or use habitat because nesting habitat does not exist in the action area and this species is not known to nest on Oʻahu.	May affect, is not likely to adversely affect.
Hawaiian petrel (*Pterodroma sandwichensis*)	Endangered	**Range:** Hawaiian petrels primarily nest in remote, high-elevation areas on Maui, Hawaiʻi Island, Kauaʻi, Molokaʻi, and Lānaʻi. Significant colonies are found on Haleakalā (Maui) and the slopes of Mauna Loa and Mauna Kea (Hawaiʻi Island). Once thought to be extirpated from Oʻahu, Hawaiian petrels were detected in 2016 and 2017 during acoustic surveys on the windward slope of Mount Kaʻala, suggesting they regularly prospect the island and may potentially be breeding there (Young et al. 2019). **Habitat:** Hawaiian petrels prefer remote, high-elevation nesting areas on volcanic slopes and mountainous regions.	Although Hawaiian petrels rarely nest on Oʻahu, adults may fly over the action area at night while commuting between nesting sites and the ocean. However, they are unlikely to land or use the area, as suitable nesting habitat is not present. Fledglings may fly over the action area during nighttime hours and face a risk of fallout due to project lighting.	May affect, is likely to adversely affect.

Common Name (*Scientific Name*)	**Status***	**Range or Habitat Requirements**	**Potential for Occurrence in Action Area**	**Determination of Effect**
Newell's shearwater (*Puffinus auricularis newelli*)	Threatened	**Range:** The largest breeding population of Newell's shearwaters is on Kaua'i, where 90% of the estimated 27,000 total population either nests or fledges from the island (Ainley et al. 1997; Joyce 2013; USFWS 2017a). They nest on Kaua'i, Hawai'i, Maui, and Moloka'i, with possible, though unconfirmed, nesting on O'ahu and Lāna'i. Nesting colonies are found exclusively in Hawai'i (DLNR 2015c). **Habitat:** Newell's shearwaters nest in burrows under ferns on forested mountain slopes, requiring an open downhill flight path for takeoff. They forage across the eastern and central subtropical Pacific Ocean (DLNR 2015c).	Although Newell's shearwater are not known to nest on O'ahu, adults may fly over the action area at night. However, they are unlikely to land or use the area, as suitable nesting habitat is not present. If this species does nest on the island, fledglings may fly over the action area during nighttime hours and face a risk of fallout due to project lighting.	May affect, is likely to adversely affect.
Short-tailed albatross (*Phoebastria* [=*Diomedea*] *albatrus*)	Endangered	During the breeding season, this species nests in several colonies on small island groups south of Japan, with about 80% nesting on the slopes of Torishima Island (USFWS 2014). They have also been spotted on Midway Island in the Hawaiian Islands although are not known to breed in Hawai'i. Outside the breeding season, these birds are found across the temperate and subarctic North Pacific, ranging from Japan to the Bering Sea, Gulf of Alaska, and as far south as California. They typically stay near islands and coastlines rather than in mid-ocean areas, spending most of their time soaring over the ocean and only coming to land to nest.	Unlikely to occur in the action area. This species may fly over the action area, but they are not likely to land or use habitat because nesting habitat does not occur in the action area.	May affect, is not likely to adversely affect.
Reptiles				
Green sea turtle (*Chelonia mydas*)	Threatened	**Range:** Primarily nests at French Frigate Shoals, which accounts for 96% of nesting activity, with smaller numbers nesting on the main Hawaiian Islands. They forage along the coasts of O'ahu, Moloka'i, Maui, Lāna'i, Hawai'i, and the Northwestern Hawaiian Islands (National Marine Fisheries Service [NMFS] 1998a). Adults migrate hundreds to thousands of miles between foraging grounds and nesting beaches in spring for reproduction (NMFS 1998a). On O'ahu, they are commonly found at areas such as Kāne'ohe Bay, Hanauma Bay, and Laniakea Beach ("Turtle Beach") along both leeward and windward coasts. **Habitat:** Feeds in shallow waters like lagoons, reefs, bays, and shoals, typically in benthic habitats rich in marine grass and algae. They nest on minimally disturbed beaches with gently sloping platforms (NMFS 1998a).	Green sea turtles have a high likelihood of occurring in the action area; suitable resting and nesting habitat occurs along the beach within the action area.	May affect, is likely to adversely affect.

Common Name (*Scientific Name*)	**Status***	**Range or Habitat Requirements**	**Potential for Occurrence in Action Area**	**Determination of Effect**
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered	**Range:** Primarily nests on the east coast of Hawai‘i Island and forages along the Hāmākua Coast and west Maui waters (NMFS 1998b). It is occasionally seen in the Papahānaumokuākea Marine National Monument and rarely on O‘ahu (NMFS 1998b). **Habitat:** Hawksbills nest near or under coastal vegetation above the high tide line, typically at night. They inhabit nearshore areas, particularly healthy coral reefs, and utilize coral reef ledges, caves, rocky formations, high-energy shoals, and sponge-rich estuaries for shelter. Hatchlings spend 1–5 years in pelagic habitats, sheltering in floating algal mats and debris. As juveniles, they migrate to shallower coastal feeding grounds, especially coral reefs.	This species may occur within the action area, as suitable foraging habitat is present along coral outcrops on the shoreline, and potential nesting habitat exists on Hau‘ula beach.	May affect, is likely to adversely affect.
Mammals				
Hawaiian hoary bat (*Lasiurus cinereus semotus*)	Endangered	**Range**: Found on all the main Hawaiian Islands between sea level and 7,507 feet (Jacobs 1996; DLNR 2015d). They favor lowlands during warmer months and highlands in colder months. The bats have home ranges of up to 124 acres, and some may travel over 7 miles between roosting and foraging sites. Acoustic surveys on O‘ahu found the highest detections in the Wai‘anae Mountains, Central O‘ahu, and the mountains inland from the North Shore (Starcevich et al. 2020). **Habitat**: The bats roost in dense tree foliage at heights between 3 and 29 feet (1–9 m), though they also occasionally use lava tubes, rock cracks, or structures (DLNR 2015d). They forage in a variety of habitats, including forest gaps, clearings, roadsides, above tree canopies, and over streams, reservoirs, wetlands, and open ocean. Roosting sites typically feature dense canopy foliage or sparse canopies with open flight access.	This species may be present in the action area, with potential roosting habitat in the canopy and subcanopy of trees at least 15 feet tall, and possible foraging habitat over vegetation along roadsides.	May affect, is not likely to adversely affect.

* Federal (USFWS) status definitions:

Endangered: Any species considered by the USFWS as being in danger of extinction throughout all or a significant portion of its range. The ESA specifically prohibits the take of a species listed as endangered. *Take* is defined by the ESA as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to engage in any such conduct.

Threatened: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The ESA specifically prohibits the take (see definition above) of a species listed as threatened

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In addition to the animal species listed by the USFWS, seven plant species are also listed: ʻakoko species (*Euphorbia celastroides* var. *kaenana*), ʻena ʻena (*Pseudognaphalium sandwicensium* var. *molokaiense*), Carter's panicgrass (*Panicum fauriei* var. *carteri*), Hilo ischaemum (*Ischaemum byrone*), ʻihi (*Portulaca villosa*), kamanomano (*Cenchrus agrimonioides*), and *Microlepia strigosa* var. *mauiensis*. However, none of these plant species were observed during the survey, and the project area falls outside their known ranges. Furthermore, the disturbed roadside habitat at the project site is unlikely to support any of these species. The proposed action is likely to have *no effect* on any of these species. Because no critical habitat for listed plant species occurs in the project area, no listed plant species were found during pedestrian surveys, and all disturbance associated with the project will occur within existing developed or otherwise modified areas, impacts on listed plant species will not be further addressed in this BA.

5.2 Critical Habitat

No designated critical habitat for federally listed threatened or endangered species occurs in the project area. Proposed critical habitat for Pacific sea turtles occurs in the project action area (see Figure 2).

6 EFFECTS ANALYSIS

6.1 Special-Status Species Considered

Special-status species that may be affected by the proposed action are discussed in detail in this section. These species are Hawaiian common gallinule, Hawaiian coot, Hawaiian duck, and Hawaiian stilt (collectively referred to as Hawaiian waterbirds); band-rumped storm petrel, Hawaiian petrel, Newell's shearwater, and short-tailed albatross (collectively referred to as seabirds); Hawaiian hoary bat; and green sea turtle and hawksbill sea turtle (collectively referred to as Pacific sea turtles).

6.1.1 Hawaiian Waterbirds

6.1.1.1 STATUS AND DISTRIBUTION

The Hawaiian common gallinule, Hawaiian coot, Hawaiian duck, and Hawaiian stilt constitute the native waterbird group. Because these species share similar habitat needs and biological characteristics, they are discussed as a single group. These waterbirds were listed as endangered species in 1967 under the federal ESA. The Hawaiian common gallinule, Hawaiian coot, and Hawaiian duck nest throughout the year. The breeding season for the Hawaiian stilt is between February and August. All four species nest on the ground, making them vulnerable to predation by invasive mammals (USFWS 2011).

Hawaiian waterbirds are most likely to be found in areas associated with wetlands and waterways. These waterbirds are found in a variety of wetland habitats, such as freshwater marshes and ponds, coastal estuaries and ponds, artificial reservoirs, kalo or taro (*Colocasia esculenta*) loʻi or patches, irrigation ditches, sewage treatment ponds, and in the case of the Hawaiian duck, montane streams and marshlands (USFWS 2011).

The Hawaiian common gallinule historically inhabited all the main Hawaiian Islands except Lānaʻi and Niʻihau (Munro 1960; Banko 1987). Currently, the species is found only on Oʻahu and Kauaʻi, with approximately half of the estimated population (about 930 birds; Hawaiʻi Division of Forestry and Wildlife [HDOFAW] 1976–2008) residing on each island (USFWS 2011). On Oʻahu, these birds occupy emergent freshwater and brackish marsh habitats on lowland plains, as well as valley wetlands, streams, reservoirs, and occasionally high-elevation plunge pools (USFWS 2011). These habitats are especially

common along the northern and eastern coasts of the island from Haleʻiwa to Waimānalo (USFWS 2011). The Hawaiian common gallinule prefers dense emergent vegetation near open water, floating or barely emergent vegetation mats, and shallow water less than 3 feet (0.91 m) deep, with a strong preference for freshwater over saline or brackish conditions. Nests are typically built in standing freshwater less than 2 feet (0.60 m) deep by folding emergent vegetation into a platform. In areas without emergent vegetation, nests may be constructed on the ground if tall vegetative cover is present nearby (USFWS 2011).

The Hawaiian coot is found on all the main Hawaiian Islands except Kahoʻolawe, with an estimated population of 1,815 individuals (Paxton et al. 2021). Approximately 80% of these birds are concentrated on Kauaʻi, Oʻahu, and Maui (HDOFAW 1976–2008; USFWS 2011). The species primarily inhabits emergent freshwater and brackish marshes on lowland plains but can also be found in valley wetlands, streams, reservoirs, and occasionally high-elevation plunge pools (USFWS 2011). On Oʻahu, Hawaiian coots are most commonly observed in coastal wetlands and, less frequently, at human-made reservoirs such as Lake Wilson in Wahiawa and the Nuʻuanu Reservoir (USFWS 2011). Preferred habitats include a mix of water and emergent wetland vegetation (State of Hawaiʻi Department of Land and Natural Resources [DLNR] 2015a). Hawaiian coots forage in mud, sand, on water surfaces, and in grassy areas adjacent to wetlands (USFWS 2011). While they favor water depths of less than 12 inches (30 centimeters [cm]), they are capable of diving to depths of up to 4 feet (about 1.2 m). Nesting occurs year-round, with peak activity typically from March to September (DLNR 2015a). Nests are generally constructed on floating aquatic vegetation or within stable wetland vegetation clumps, but have also been documented on shorelines and rocky islets (USFWS 2011). The birds usually forage close to their nesting areas but will travel significant distances when food resources are scarce (Shallenberger 1977; Brisbin et al. 2002).

Hawaiian ducks historically inhabited all the main Hawaiian Islands except Lānaʻi and Kahoʻolawe (USFWS 2011). The population is estimated to be fewer than 2,000 individuals, with approximately half (about 947 birds) found on Kauaʻi (Paxton et al. 2021). On Oʻahu, genetic sampling suggests that most birds are likely hybridized with invasive mallards (Wells et al. 2019). This species or its hybrids are frequently observed in wetlands on Windward Oʻahu (Kawainui, Hāmākua, Heʻeia Marshes, Kaʻelepulu and Nuʻupia Ponds, and Hoʻomaluhia Botanical Garden), the North Shore (James Campbell National Wildlife Refuge, Kahuku aquaculture ponds, Punahoʻolapa, and Haleiwa), southern Oʻahu (Pearl Harbor National Wildlife Refuge and Puʻohala Marsh), and the Waiʻanae Coast at Lualualei. Hawaiian ducks utilize a variety of wetland habitats for nesting and foraging, including freshwater marshes, flooded grasslands, coastal ponds, streams, montane pools, and forest swamplands at elevations from sea level to 9,900 feet (3,000 m) (USFWS 2011). This species nests on the ground adjacent to water, although little is known about their specific nesting habits (USFWS 2011).

Hawaiian stilts historically occurred on all the main Hawaiian Islands except Lānaʻi and Kahoʻolawe (Paton and Scott 1985). Today, they are found on all the main islands except Kahoʻolawe, with a recent statewide population estimate of 1,932 individuals, including approximately 526 on Oʻahu (Paxton et al. 2021). The statewide population has been increasing over the past 30 years (Reed et al. 2011; USFWS 2011). On Oʻahu, relatively large populations are located at James Campbell National Wildlife Refuge, the aquaculture ponds at Kahuku, the Honouliuli and Waiawa units of the Pearl Harbor National Wildlife Refuge, and Nuʻupia Ponds in Kāneʻohe (USFWS 2011). Hawaiian stilts exploit various aquatic habitats but prefer open mudflats, sparsely vegetated pickleweed mats, and open pasture lands for loafing. Optimal foraging requires water depths of approximately 5 inches (about 13 cm). Nesting typically occurs on mudflats or low islands within fresh, brackish, or saltwater bodies, often separate from feeding sites.

The primary causes of decline for all four Hawaiian waterbird species are habitat loss and degradation of wetland habitat, along with predation by introduced animals such as rats (*Rattus* spp.), dogs, cats, American bullfrogs (*Rana catesbeiana*), introduced fish species, and small Asian mongoose. Additional

factors contributing to population declines include altered hydrology, changes in habitat structure and vegetation composition caused by invasive nonnative plants, loss of riparian vegetation, and water quality degradation due to grazing, disease (particularly avian botulism caused by the bacterium *Clostridium botulinum*), and environmental contaminants (USFWS 2011). Climate change is also identified as a significant future threat to all three waterbird species (USFWS 2011).

6.1.1.2 WATERBIRD HABITAT CHARACTERISTICS WITHIN THE SITE

Hawaiian waterbirds were not observed during field surveys, and the project site contains limited optimal foraging habitat for these species along Maʻakua Stream. Additionally, potential suboptimal nesting habitat for Hawaiian stilts may be present within the roadside vegetation type, in the pastures and open fields within the action area, and within the coastal strand vegetation between Hauʻula Beach and Kamehameha Highway.

6.1.1.3 EFFECTS ANALYSIS AND EFFECTS DETERMINATION

In the short term, the human noise, nighttime construction light, and disturbance associated with the activities related to this project could temporarily displace waterbirds from foraging habitat. Displacement from available forage could impact the health of these individuals; however, because of the relatively short timeframe of the project and the small amount of suboptimal foraging habitat that would be disrupted, it would not likely affect nest success or population growth. Furthermore, more ideal foraging habitat into which the waterbirds could move is available upstream of the project area.

In addition, construction activities that create standing or open water can attract Hawaiian waterbirds, which have adapted to human-altered lowland environments. These birds may use these habitats, increasing their risk of human-wildlife conflicts and predation. Hawaiian stilts, in particular, are known to nest in these types of suboptimal locations (USFWS 2014).

As all impacts on the Hawaiian gallinule, Hawaiian coot, Hawaiian duck, and Hawaiian stilt would be reduced to discountable levels through the implementation of conversation measures (see Section 2.2.1), the proposed action *may affect, is not likely to adversely affect*, individuals or populations of these species.

6.1.2 Seabirds

6.1.2.1 STATUS AND DISTRIBUTION

The endangered band-rumped storm petrel, Hawaiian petrel, short-tailed albatross, and the threatened Newell's shearwater constitute the seabirds group. Because these species share similar habitat needs and biological characteristics, they are discussed as a single group.

The Hawaiian petrel was designated as a federally endangered species on March 11, 1967. Historically, the Hawaiian petrel was plentiful on all the main Hawaiian Islands except Niʻihau (Mitchell et al. 2005; USFWS 2017b). The most recent population estimate is approximately 52,000 individuals (Joyce 2013). This species nests primarily in remote, high-elevation areas of Maui, Hawaiʻi Island, Kauaʻi, Molokaʻi, and Lānaʻi, with significant colonies on Haleakalā on Maui and the slopes of Mauna Loa and Mauna Kea on Hawaiʻi Island. Once thought to be extirpated from Oʻahu, Hawaiian petrels were detected in 2016 and 2017 during acoustic surveys on the windward slope of Mount Kaʻala on the northwest side of the island, suggesting they are regularly prospecting the island and may potentially be breeding there (Young et al. 2019).

The band-rumped storm petrel was listed as federally endangered on October 31, 2016. Recognized as the rarest breeding seabird in Hawaiʻi (Banko et al. 1991; Slotterback 2002), most of these birds nest on Kauaʻi, with smaller, scattered colonies on Hawaiʻi Island, Lānaʻi Island, and Lehua Islet (DLNR 2015b, USFWS 2021a). This species is not known to breed on Oʻahu but could traverse the island while flying between foraging sites at sea.

The Newell's shearwater, listed as threatened by the USFWS in 1975, has its largest breeding population on Kauaʻi (Ainley et al. 1997; USFWS 2017a). The estimated total population of this species is approximately 27,000 birds (Joyce 2013), with 90% either nesting or fledging from Kauaʻi. Newell's shearwaters nest on Kauaʻi, Hawaiʻi, Maui, and Molokaʻi, with possible, though unconfirmed, nesting on Oʻahu and Lānaʻi. Their nesting colonies are found exclusively in Hawaiʻi. At sea, they are distributed across the eastern and central subtropical Pacific Ocean (DLNR 2015c).

The short-tailed albatross was listed as endangered under the ESA on July 31, 2000, due to severe population declines from feather hunting and habitat loss. While this species primarily breeds on islands in Japan, such as Torishima and the Senkaku Islands, it is a rare visitor to the Hawaiian Islands (DLNR 2015). Sightings are most common at Midway Atoll and Kure Atoll within the Papahānaumokuākea Marine National Monument, though individuals occasionally appear near other Northwestern Hawaiian Islands. The species does not breed in Hawaiʻi but is known to visit the islands while foraging for food (DLNR 2015).

Key factors driving the population declines of ground-nesting seabirds include habitat degradation, loss of nesting areas, predation on eggs, hatchlings, and adults by introduced mammals (such as dogs, mongooses, cats, rats, and pigs), and urban lighting, which can lead to disorientation and fallout of juvenile birds (Ainley et al. 1997; Banko et al. 1991; Hays and Conant 2007; Mitchell et al. 2005).

The habitats used for seabird nesting are diverse, ranging from xeric environments with little or no vegetation, such as Haleakalā National Park on Maui, to wet forests dominated by ʻōhiʻa (*Metrosideros polymorpha*) with an uluhe (*Dicranopteris linearis*) understory, as found on Kauaʻi (Mitchell et al. 2005). Nests are located in various naturally occurring features such as lava tubes, cracks in tumuli (fractured hills on the surface of pāhoehoe flows), spaces created by uplift of pāhoehoe slabs, and other miscellaneous natural features (Hu et al. 2001; Mitchell et al. 2005; Pyle and Pyle 2009).

6.1.2.2 SEABIRD HABITAT CHARACTERISTICS WITHIN THE SITE

The project and action areas do not provide suitable nesting or foraging habitat for any listed seabird species. However, adults of all four seabird species may transit the area at night. Hawaiian petrels and Newell's shearwaters may nest in upland areas of Oʻahu, so fledglings of these species flying over the action area during the fledging season (March 1 to December 15) may be at risk of fallout due to project lighting. Neither band-rumped storm petrels nor short-tailed albatross are known to nest on Oʻahu; therefore, the presence of either species in the action area is considered highly unlikely.

6.1.2.3 EFFECTS ANALYSIS AND EFFECTS DETERMINATION

Outdoor lighting associated with night work for this project could lead to seabird disorientation, causing them to become attracted to lights, where they may circle, become exhausted, and collide with nearby structures like wires or buildings, or land on the ground. Once grounded, seabirds face higher risks of mortality from collisions with vehicles, starvation, and predation by dogs, cats, and other predators. Young fledglings, making their initial flights from mountain nests to the ocean between September 15 and December 15, are particularly susceptible to light attraction, so potential impacts to fledglings of endangered seabirds could occur during this time.

Notably, no power lines, cables, towers, or elevated structures are proposed for installation, either temporarily or permanently, during the construction phase or the operational life of the project. This significantly reduces the likelihood of fledgling seabirds colliding with such structures within the project area.

Although the conservation measures described in Section 2.2 related to nighttime lighting are expected to substantially reduce the potential for light-attraction impacts on the three listed seabird species during the fledging season (September 15 through December 15), the possibility of impacts to fledglings of Hawaiian petrels and Newell's shearwaters—both of which may nest on Oʻahu—cannot be entirely ruled out, as nighttime work will occur during this period.

To minimize potential impacts, the avoidance and minimization measures outlined in Section 2.2.2 should be implemented to the greatest extent practicable. These measures include restricting work to daylight hours whenever feasible, turning off unnecessary lights during the peak fallout period, shielding lights to prevent upward illumination, and employing a biological monitor to detect the presence of seabirds during nighttime operations.

Because potential impacts to fledglings of Hawaiian petrel and Newell's shearwater cannot be ruled out during the fledging season, the proposed action *may affect, is likely to adversely affect* these two species. In contrast, short-tailed albatross and fledglings of the band-rumped storm petrel are considered highly unlikely to occur in the action area during the project timeframe; therefore, the proposed action *may affect, is not likely to adversely affect* these species.

6.1.3 Pacific Sea Turtles: Hawaiian Green Sea Turtle and Hawksbill Sea Turtle

6.1.3.1 STATUS AND DISTRIBUTION

The green sea turtle was listed as endangered under the ESA in 1978, and in 2016, its listing was revised to designate three distinct population segments (DPSs), including the Hawaiian DPS, as endangered, and eight DPSs as threatened (National Oceanic and Atmospheric Administration – National Marine Fisheries Service [NMFS] 1998a). Hawaiian green sea turtles, or honu, primarily nest at French Frigate Shoals within the Papahānaumokuākea Marine National Monument, where approximately 96% of nesting activity occurs. A smaller number of turtles also nest on other islands in the main Hawaiian Islands. These turtles forage along the coasts of Oʻahu, Molokaʻi, Maui, Lānaʻi, Hawaiʻi, and several Northwestern Hawaiian Islands, including Lisianski Island and Pearl and Hermes Reef. Adult honu undertake long migrations, often traveling hundreds or thousands of miles between foraging grounds and nesting beaches, particularly when heading to French Frigate Shoals in the spring for reproduction (NMFS 1998a). When not migrating, they inhabit shallow waters such as lagoons, reefs, bays, and shoals, nesting on beaches and feeding in benthic habitats. On Oʻahu, green sea turtles are frequently seen in nearshore waters and are known to forage in areas such as Kāneʻohe Bay, Hanauma Bay, Laniakea Beach (popularly known as "Turtle Beach"), and other reef-rich regions along the island's leeward and windward coasts. This species nests from mid-April to September, though the season can occasionally extend into December (NMFS 1998a). Females typically nest at night, laying 75 to 100 eggs in a chamber dug above the high tide line, often near or under coastal vegetation. After about 2 months, hatchlings emerge, usually waiting until nightfall for protection. Although nesting activity on Oʻahu is rare, these turtles are an integral part of the coastal marine ecosystem and are often observed basking on beaches.

The hawksbill sea turtle was listed as endangered in the United States in 1970 under the Endangered Species Conservation Act, the predecessor to the ESA of 1973. In the Hawaiian Islands, hawksbill sea turtles nest primarily on the east coast of Hawaiʻi Island and forage along the Hāmākua Coast and west

Maui waters (NMFS 1998b). Nesting season occurs from mid-April to September but can extend into December. Female hawksbills nest at night, typically near or under coastal vegetation above the high tide line. They return every 2 to 8 years to the same beach where they hatched, laying clutches of 70 to 250 eggs (with an average of 180) and up to six nests per season (NMFS 1998b). This species is also occasionally spotted within the Papahānaumokuākea Marine National Monument but is not commonly seen on Oʻahu. Compared to green sea turtles, hawksbills are rare in Hawaiʻi, with a population estimated to be 100 times smaller.

Green sea turtles nest on sandy beaches, while hawksbill sea turtles are adaptable to various nesting substrates, ranging from sandy to crushed coral beaches. Both species show strong fidelity to their nesting sites.

6.1.3.2 SEA TURTLE HABITAT CHARACTERISTICS WITHIN THE SITE

Although no sea turtles were observed foraging, basking, or hauling out onto Hauʻula Beach during the December 2024 survey, it is highly likely that they occasionally use the beach for these activities. Hauʻula Beach experiences significant disturbances, including human encampments, illegal motorized vehicle use, and predation by both feral and domesticated animals such as dogs and cats. Other potential predators, including mongoose and rats, may also be present. These disturbances reduce the likelihood of sea turtles using the area as a nesting site. While no data indicate that either species nests on Hauʻula Beach, nesting attempts could still occur anywhere along the beach within the action area.

6.1.3.3 EFFECTS ANALYSIS AND EFFECTS DETERMINATION

Suitable habitat for turtle basking, nesting, foraging, and predator avoidance was observed within the project action area. Hauʻula Beach offers suitable sandy areas for basking and nesting, while the surrounding marine waters provide ideal conditions for foraging.

Construction activities (e.g., noise and light) could impact sea turtles by displacing individuals from the beach and marine habitats within the action area. This displacement could alter an individual's typical energy expenditure by forcing it to search for new foraging and basking locations. If they are disturbed, the likely response would be to return to the shallow water's edge and swim away.

Noise and light from construction may also temporarily discourage turtles from using the area as a potential nesting location. With regard to noise, the main concern would be loud, low-frequency sounds during the nesting period. The conservation measures outlined in Section 2.2 would help to avoid or mitigate these potential impacts. If sea turtles are displaced from nearshore marine habitats, they would flee to the open water or to other foraging locations along the shoreline.

As nighttime work during the turtle nesting season will occur as part of the project, this increased lighting could deter turtles from emerging to rest or lay eggs on Hauʻula Beach, assuming the beach is used for nesting. Artificial lighting is also known to disorient hatchlings, as they tend to move toward brighter lights after emerging from their nests.

Implementing conservation measures to manage nighttime lighting—such as conducting construction activities during daylight hours whenever feasible, using shielded lighting, and employing a biological monitor during nighttime work to halt operations and turn off lights if turtles are observed within the action area (see Section 2.2)—would help reduce potential impacts. However, these impacts cannot be entirely avoided, as nighttime work is scheduled to occur during the turtle nesting and hatching season (May through December).

Human-related disturbance (e.g., harassment) and mortality (e.g., impact from boat propellers, gill net entanglement, and fishing activities) are not likely to increase as a result of the proposed action as no work is proposed to be undertaken on Hauʻula Beach or within coastal waters.

Because impacts on sea turtles from nighttime lighting cannot be avoided during the turtle nesting and hatching season, the proposed action *may affect, is likely to adversely affect* the two sea turtle species.

6.1.4 Hawaiian Hoary Bat

6.1.4.1 STATUS AND DISTRIBUTION

The Hawaiian hoary bat, or ʻōpeʻapeʻa, is the only native terrestrial mammal still extant in the Hawaiian Islands (USFWS 1998). The species was listed as endangered under the ESA on October 13, 1970. It is found on Hawaiʻi, Maui, Lānaʻi, Molokaʻi, Oʻahu, and Kauaʻi, with intermittent sightings on Kahoʻolawe (Kahoʻolawe Island Reserve Commission 2017; USFWS 2021b). The bat has been observed at elevations ranging from sea level to approximately 11,800 feet (3,600 m) (USFWS 2021b).

Hawaiian hoary bats use both closed habitats near vegetation, such as tunneled roadways, and open habitats adjacent to forests, above tree canopies, and over open oceans (Jacobs 1996). Hawaiian hoary bats are insectivores and are regularly observed foraging over streams, reservoirs, and wetlands (Thompson and Starcevich 2022). This bat species, like most bats, begins actively foraging just before or after sunset. They feed on night-flying insects, including moths as well as on beetles, crickets, and termites, using echolocation (DLNR 2015d). Foraging flights occur in open, wooded, and linear habitats within a wide range of vegetation types (USFWS 2021b). The species roosts in both native and nonnative vegetation from 3 to 29 feet (1–9 m) tall (DLNR 2015d). Roosting sites typically contain dense canopy foliage or are in the subcanopy when the canopy is sparse, with open access for launching into flight (USFWS 2021b). They have only occasionally been observed using lava tubes, cracks in rocks, or human-made structures for roosting (DLNR 2015d).

Breeding is believed to occur between September and December, with bat birthing and pupping occurring from June 1 through September 15 (DLNR 2015d).

A comprehensive 5-year acoustic sampling study was undertaken throughout Oʻahu to determine where and in what season bats are present in a range of habitats throughout the island (Starcevich et al. 2020). Data from 86 detectors were subsequently used to model the likelihood of seasonal occupancy by the bat species within specific habitats. The study found that bats occurred throughout Oʻahu, but the greatest number of detections occurred in the Waiʻanae Mountains, Central Oʻahu, and mountains inland from the North Shore. Furthermore, the study found that bats are most widespread during the lactation and post-lactation periods (summer and fall).

Hawaiian hoary bats are believed to be threatened by habitat loss (tree cover), pesticides, predation, roost disturbance, and collision with human-made structures (DLNR 2015d). Reduction of tree cover and indirect impacts from the use of pesticides may be the primary causes of recent declines (USFWS 2021b).

6.1.4.2 HAWAIIAN HOARY BAT HABITAT CHARACTERISTICS WITHIN THE SITE

Acoustic surveys for Hawaiian hoary bats were not conducted for this project, but areas of suitable habitat for roosting and foraging were noted during the survey. The roadside vegetation type provides suitable habitat for bat foraging. The Hawaiian hoary bat has been observed roosting in ironwood and could roost in the limited number of tree species equal to or greater than 15 feet (4.6 m) within the action area.

6.1.4.3 EFFECTS ANALYSIS AND EFFECTS DETERMINATION

The risks of disturbance of bats at the site are low, as there are a limited number of potential roost trees within the project area. However, there is a small possibility of direct impact if roost trees or branches are removed during the time of year when juvenile bats are too small to fly but too large to be carried by a parent. These direct risks can be effectively mitigated by implementing restrictions on tree cutting during the bat pupping season, which runs from June 1 through September 15.

In the short term, the human noise and disturbance associated with construction activities could temporarily displace bats from roosting habitat. This displacement could alter an individual's typical roosting patterns, forcing it to expend energy to search for new roosting locations. Displacement from roosting habitat could lead to increased predation on individual bats, especially if a bat is forced to leave its roost during daylight hours, making it more visible to potential predators. The potential for these impacts is low considering the project will occur on and immediately adjacent to a heavily traveled roadway, and therefore any bats present in the area would already be accustomed to high levels of background activity. Furthermore, higher quality roosting areas occur nearby, into which bats could be displaced.

Because all impacts on the Hawaiian hoary bat would be discountable or insignificant through the implementation of conversation measures (see Section 2.2), the proposed action *may affect, is not likely to adversely affect*, individuals or populations of the species.

6.1.5 Critical Habitat

6.1.5.1 STATUS AND DISTRIBUTION

In July 2023, the National Oceanic and Atmospheric Administration, Fisheries and the USFWS proposed new critical habitat areas for green sea turtles, including additional beach areas on Hawaii's main islands. The proposed habitat extends from the mean high tide line to a depth of 20 m and aims to enhance protection of terrestrial areas that support basking, nesting, incubation, hatching, and seaward movement of green sea turtles.

Approximately 1.9 acres of Hauʻula Beach have been designated as proposed critical habitat. This narrow, sandy beach—about 2,100 feet (~650 m) in length—is located adjacent to Hauʻula Beach Park and Kamehameha Highway (see Figure 2).

6.1.5.2 EFFECTS ANALYSIS AND EFFECTS DETERMINATION

The project action area overlaps with approximately 1.7 acres of proposed critical habitat for green sea turtles at Hauʻula Beach (see Figure 2). However, since no work is planned within the beach footprint—or within the proposed critical habitat—there will be *no effect* on this designated area.

7 CONCLUSION

Seven federally listed animal species are known or have the potential to occur within the action area: Hawaiian common gallinule, Hawaiian coot, Hawaiian duck, Hawaiian stilt, green sea turtle, hawksbill sea turtle, and Hawaiian hoary bat. Additionally, four listed seabird species—band-rumped storm petrel, Hawaiian petrel, Newell’s shearwater, and short-tailed albatross—may transit the area during nighttime flights. No vascular plant species listed by the USFWS are known to occur within the action area, and none were observed during field surveys. Regarding listed plant species, there is no critical habitat present in the project area, none of the seven listed plant species identified by the USFWS as having potential to occur in the project area were found during pedestrian surveys, and all disturbances related to the project will take place within existing developed or modified areas. Thus, impacts on listed plant species are not anticipated.

Potential impacts to the Hawaiian common gallinule, Hawaiian coot, Hawaiian duck, Hawaiian stilt, and Hawaiian hoary bat are expected to be temporary, discountable, and insignificant due to the implementation of conservation measures.

In contrast, nighttime lighting associated with the proposed action is scheduled to occur during both the turtle nesting and hatching season, as well as the seabird fledging season. As a result, fledglings of Hawaiian petrel and Newell’s shearwater, and adults and hatchlings of green and hawksbill sea turtles (if nesting occurs at Hau‘ula Beach), may be affected by light-induced disorientation. Neither band-rumped storm petrels nor short-tailed albatrosses are known to nest on O‘ahu, so the likelihood of project lighting impacting these species is considered very low.

There is no designated critical habitat for any federally listed species within the project area. However, the action area does overlap with proposed critical habitat for Pacific sea turtles. Since no activities are planned within the footprint of Hau‘ula Beach, the proposed action will have *no effect* on this proposed critical habitat.

Based on this assessment, the proposed action *may affect, is not likely to adversely affect* the Hawaiian common gallinule, Hawaiian coot, Hawaiian duck, Hawaiian stilt, band-rumped storm petrel, short-tailed albatrosses, and Hawaiian hoary bat. Conversely, the proposed action *may affect, is likely to adversely affect* the Hawaiian petrel, Newell’s shearwater, green sea turtle, and hawksbill sea turtle. Lastly, the proposed action will have *no effect* on listed vascular plant species.

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APPENDIX A

U.S. Fish and Wildlife Species List

APPENDIX B

Best Management Practices for Work in and Around Aquatic Environments

Alongside conservation measures, the following Best Management Practices (BMPs) will be implemented to protect water quality, as recommended by the National Marine Fisheries Service (NMFS) Protected Resources Division (NMFS 2015). The application of these measures will depend on the specific construction methods selected for the project site. Additionally, the project will comply with all the requirements of applicable permits.

- Erosion and sediment control measures will be implemented prior to beginning any earth-moving activities and will be maintained in good working condition throughout the construction period.
- A contingency plan to control toxic materials will be developed.
- Materials needed to contain and clean potential spills will be stored on-site and kept readily accessible.
- All project-related materials and equipment used in water will be free of pollutants.
- The project manager and equipment operators will conduct daily pre-work inspections for equipment cleanliness and leaks. Operations with heavy equipment will be delayed or stopped if a leak is detected, and work will only resume once the leak is repaired and the equipment cleaned.
- Land-based vehicle and equipment fueling will occur at least 50 feet (15.2 meters) from water sources, preferably on an impervious surface. Vessel fueling will take place at approved fueling facilities
- Turbidity and siltation from project-related work will be minimized and contained through the appropriate use of erosion control practices, effective silt containment devices, and by pausing work during adverse weather, tidal, or flow conditions.
- A plan will be developed to prevent debris and other wastes from entering or remaining in the marine environment during the project.
- Project materials (fill, revetment rock, pipe, etc.) will not be stockpiled in water zones (intertidal areas, reef flats, stream channels, wetlands, etc.) or on beach habitats.
- Adjacent habitats (reef flats, channels, open ocean, stream channels, wetlands, beaches, forests, etc.) will be protected from contamination (e.g., trash, debris disposal, invasive species, or attraction of nonnative pests) related to project activities.
- Exposed soil near water will be protected from erosion (with plastic sheeting, filter fabric, etc.) following exposure and stabilized promptly (with native or non-invasive vegetation matting, hydroseeding, etc.).
- All debris removed from the marine/aquatic environment shall be disposed of at an approved upland or ocean dumping site.

APPENDIX C

Vascular Plant Species Observed within the Project Action Area in December 2024

Table C-1 provides a checklist of vascular plant species observed by SWCA on December 5, 2024, during surveys of the proposed Waipilopilo Stream Bridge Replacement project area. The plant names are arranged alphabetically by family and then by species into two groups: monocots and dicots.
The taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999) and Staples and Herbst (2005). Recent name changes are those recorded in Wagner et al. (2012).

Table C-1. Inventory Checklist of Vascular Plants Observed within the Proposed Action Area on December 5, 2024

Family	Scientific Name and Authorship	Hawaiian and/or Common Name	Status*
	MONOCOTS		
Agavaceae	*Dracaena reflexa* Lamarck		X*
Araceae	*Colocasia esculenta* (L.) Schott	kalo, taro	P
Araceae	*Epipremnum pinnatum* (L.) Engl.	taro vine, pothos, golden pothos	X
Arecaceae	*Cocos nucifera* L.	niu, ololani, coconut	P
Arecaceae	*Dypsis lutescens* (H.Wendl.) Beentje & J.Dransf.	areca palm	X*
Cannaceae	*Canna indica* L.	Indian shot, aliʻipoe, liʻipoe, poloka	X
Cyperaceae	*Cyperus involucratus* Rottb.	umbrella sedge, ʻahuʻawa haole, puʻukaʻa haole	X
Cyperaceae	*Cyperus rotundus* L.	nut grass, kiliʻoʻopu, mauʻu mokae	X
Cyperaceae	*Kyllinga nemoralis* (J.R.Forst. & G.Forst.) Dandy ex Hutch. & Dalziel	kiliʻoʻopu, mauʻu mokae	X
Liliaceae	*Crinum asiaticum* L.	giant lily	X*
Poaceae	*Bothriochloa pertusa* (L.) A.Camus	pitted beardgrass	X
Poaceae	*Chloris barbata* Sw.	swollen fingergrass, mauʻu lei	X
Poaceae	*Cynodon dactylon* (L.) Pers.	bermudagrass, mānienie, mānienie haole	X
Poaceae	*Dactyloctenium aegyptium* (L.) Willd.	beach wiregrass	X
Poaceae	*Paspalum dilatatum* Poir.	dallis grass	X
Poaceae	*Urochloa maxima* (Jacq.) R.D.Webster	Guinea grass	X
	DICOTS		
Acanthaceae	*Asystasia gangetica* (L.) T.Anderson	Chinese violet, coromandel	X
Acanthaceae	*Pseuderanthemum carruthersii (*Seeman) Guillaumin		X*
Aizoaceae	*Tetragonia tetragonioides* (Pall.) Kuntze	New Zealand spinach	X
Amaranthaceae	*Amaranthus viridis* L.	slender amaranth, pakai, ʻāheahea, pākaikai, pakapakai (Niʻihau)	X
Apocynaceae	*Plumeria rubra* L.	plumeria	X*
Asteraceae	*Bidens alba* var. *radiata* (Sch.Bip.) Ballard ex Melchert	Spanish needle, beggartick	X
Asteraceae	*Erigeron bellioides* DC.	fleabane	X
Asteraceae	*Sonchus oleraceus* L.	sow thistle, pualele	X
Asteraceae	*Sphagneticola trilobata* (L.) Pruski	wedelia	X
Bignoniaceae	*Spathodea campanulata* P.Beauv.	African tulip tree, fountain tree	X
Boraginaceae	*Heliotropium curassavicum* L.	kīpūkai, nena, seaside heliotrope, lau poʻopoʻohina (Niʻihau)	I

Family	Scientific Name and Authorship	Hawaiian and/or Common Name	Status*
Boraginaceae	*Tournefortia argentea* L.f.	tree heliotrope	X
Brassicaceae	*Coronopus didymus* (L.) Sm.	swinecress	X
Brassicaceae	*Lepidium oblongum* Small	pepperwort, peppergrass	X
Casuarinaceae	*Casuarina equisetifolia* L.	common ironwood, paina	X
Combretaceae	*Terminalia catappa* L.	tropical almond, Indian almond, false kamani, kamani haole, kamani ʻula	X
Convolvulaceae	*Ipomoea pes-caprae* subsp. *brasiliensis* (L.) Ooststr.	pōhuehue, puhuehue, beach morning glory	I
Cucurbitaceae	*Coccinia grandis* (L.) Voigt	ivy gourd, scarlet-fruited gourd	X
Euphorbiaceae	*Codiaeum variegatum* (L.) Blume	croton	X*
Euphorbiaceae	*Euphorbia thymifolia* L.	spurge	X
Euphorbiaceae	*Macaranga tanarius* (L.) Mūll.Arg.		X
Fabaceae	*Indigofera spicata* Forssk.	creeping indigo	X
Goodeniaceae	*Scaevola taccada* (Gaertn.) Roxb.	naupaka kahakai, huahekili, naupaka kai, auaka (Niʻihau)	I
Malvaceae	*Hibiscus rosa-sinensis* L.	hibiscus	X*
Malvaceae	*Hibiscus tiliaceus* L.	hau	I
Moraceae	*Ficus pumila* L.		X
Myrtaceae	*Syzygium cumini* (L.) Skeels	Java plum	X
Nyctaginaceae	*Boerhavia coccinea* Mill.		X
Nyctaginaceae	*Bougainvillea spectabilis* Willd.	bougainvillea	X*
Oxalidaceae	*Oxalis corniculata* L.	yellow wood sorrel, ʻihi ʻai, ʻihi ʻawa, ʻihi maka ʻula, ʻihi mākole	P?
Plantaginaceae	*Plantago lanceolata* L.	narrow-leaved plantain, English plantain, buckhorn	X
Plantaginaceae	*Plantago major* L.	broad-leaved plantain, common plantain, laukahi, kūhēkili	X
Polygonaceae	*Coccoloba uvifera* (L.) L.	sea grape	X
Portulacaceae	*Portulaca oleracea* L.	pigweed, ʻākulikuli kula, ʻākulikuli lau liʻi, ʻihi	X
Rubiaceae	*Richardia scabra* L.		X
Scrophulariaceae	*Bacopa monnieri* (L.) Wettst.	ʻaeʻae (Niʻihau)	I
Verbenaceae	*Citharexylum caudatum* L.	fiddlewood	X
Verbenaceae	*Vitex rotundifolia* L.f.	pōhinahina, pōlinalina (Oʻahu), beach vitex	I
Verbenaceae	*Vitex trifolia* L.	common blue vitex	X*

LEGEND: P – Polynesian introduced, P? – Possibly Polynesian introduced, X – nonnative, X* – nonnative cultivated, I – indigenous.