Telephone: (808) 270-7845
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**DEPARTMENT OF PUBLIC WORKS**

COUNTY OF MAUI
200 SOUTH HIGH STREET, ROOM NO. 434
WAILUKU, MAUI, HAWAI`I 96793
www.mauicounty.gov/publicworks

September 11, 2025

Ms. Mary Alice Evans, Director
Office of Planning and Sustainable Development
State of Hawaiʻi Department of Business, Economic Development and Tourism
235 South Beretania Street, Suite 702
Honolulu, Hawaiʻi 96813

**SUBJECT: FINAL ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT, WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT PROJECT, DISTRICT OF HĀNA, ISLAND OF MAUI**
**FEDERAL AID PROJECT NO. BR-0360(015)**
**TAX MAP KEYS: (2) 1-5-009:009, (2) 1-5-009:010, (2) 1-5-009:011, (2) 1-5-009:012, (2) 1-5-008:001, (2) 1-5-008:002, (2) 1-5-008:004, (2) 1-5-010:008, AND HĀNA HIGHWAY RIGHT-OF-WAY**

Dear Ms. Evans,

The County of Maui, Department of Public Works (DPW) hereby submits the Final Environmental Assessment and Finding of No Significant Impact (FEA-FONSI) for the Waikakoi and South Wailua Bridge Replacement Project for publication in the next available edition of *The Environmental Notice*. Construction of the proposed project will affect the Hāna Highway Right-of-Way and Maui Tax Map Key parcels (2) 1-5-009:009, (2) 1-5-009:010, (2) 1-5-009:011, (2) 1-5-009:012, (2) 1-5-008:001, (2) 1-5-008:002, (2) 1-5-008:004, (2) 1-5-010:008.

We are providing this FEA-FONSI electronically via the online “HRS Chapter 343 Publication Submittal Form.” This submittal includes a PDF file of the FEA-FONSI and a .zip file containing a shapefile of the action location boundary.

If you have any questions, please contact Mr. Ty Takeno, Project Manager, at (808) 270-7745 or via email at dpwbridges@hdrinc.com.

Sincerely,

for JORDAN MOLINA
Director of Public Works

JM/TT (ED25-0616)
S:\ENG\PROJECTS\01 FAP\BR\BR-0360(015) Waikakoi and S. Wailua Bridge Replacement\01 Design\C Environmental\Draft EA\Final EA\Waikakoi and S Wailua Agency FEA Publication Letter_08252025.docx

**From:** dbedt.opsd.erp@hawaii.gov
**To:** DBEDT OPSD Environmental Review Program
**Subject:** New online submission for The Environmental Notice
**Date:** Friday, September 12, 2025 1:53:29 PM

**Action Name**

Waikakoi and South Wailua Bridge Replacement Project

**Type of Document/Determination**

Final environmental assessment and finding of no significant impact (FEA-FONSI)

**HRS §343-5(a) Trigger(s)**

- (1) Propose the use of state or county lands or the use of state or county funds
- (2) Propose any use within any land classified as a conservation district
- (4) Propose any use within any historic site as designated in the National Register or Hawaiʻi Register

**Judicial district**

Hāna, Maui

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

Hāna Highway right-of-way; (2) 1-5-009:009; (2) 1-5-009:010; (2) 1-5-009:011; (2) 1-5-009:012; (2) 1-5-008:001; (2) 1-5-008:002; (2) 1-5-008:004; (2) 1-5-010:008

**Action type**

Agency

**Other required permits and approvals**

Clean Water Act (CWA) Section 404 Nationwide Permit No. 3; Section 106, National Historic Preservation Act consultation; Section 7, Endangered Species Act (ESA); State Historic Preservation Review (HRS Chapter 6E); Site Plan Approval or Conservation District Use Application; CWA Water Quality Certification, CWA Section 401, Blanket Certification; Clean Water Act, Section 402 National Pollutant Discharge Elimination System (NPDES) Permit; Coastal Zone Management (CZM), Federal Consistency Determination; Community Noise Permit; HRS Section 103-50 (Disability and Communication Access Board Review); Special Management Area (SMA) Use Permit (SMI); Flood Development Permit

**Proposing/determining agency**

County of Maui, Department of Public Works

**Agency jurisdiction**

County of Maui

**Agency contact name**

Ty Takeno

**Agency contact email (for info about the action)**

ty.takeno@co.maui.hi.us

**Email address for receiving comments**

dpwbridges@hdrinc.com

**Agency contact phone**

(808) 270-7745

**Agency address**

200 S. High Street
Room 410
Wailuku, Hawaii 96793
United States
Map It

**Is there a consultant for this action?**

Yes

**Consultant**

HDR, Inc.

**Consultant contact name**

Noelle Besa Wright

**Consultant contact email**

noelle.wright@hdrinc.com

**Consultant contact phone**

(808) 697-6297

**Consultant address**

1001 Bishop Street
Suite 400
Honolulu, Hawaii 96813
United States
Map It

**Action summary**

The Proposed Action consists of replacing the existing structurally deficient Waikakoi and South Wailua Bridges along Hāna Highway on Maui with new bridges consistent with current design standards. Each bridge will accommodate a single-lane configuration and be designed to current structural and safety standards. The new Waikakoi Bridge is anticipated to span approximately 48.5 feet long and 18.0 feet wide, and the new South Wailua Bridge is anticipated to span approximately 60.0 feet long and 18.0 feet wide. The new bridges would be of a similar size, scale, location, and design to the existing structures. To accommodate traffic during construction, temporary bypass bridges would be installed makai of each bridge. The Proposed Action also includes improvements to grading, drainage, and roadway approaches at the bridge sites. The purpose of the Project is to address the structural deterioration and load capacity deficiencies of both bridges by replacing them with new structures that meet current design standards. The Project is needed to ensure that the bridges, and therefore the Hāna Highway, remain safe and functional for highway users.

**Reasons supporting determination**

See discussion in Section 7.1 of the EA.

**Attached documents (signed agency letter & EA/EIS)**

- Waikakoi-South-Wailua_Final-EA_09112025_FINAL.pdf
- ED25-0616_Signed-agency-letter.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)."

**Shapefile**

- The location map for this Final EA is the same as the location map for the associated Draft EA.

**Action location map**

- Waikakoi_and_S_WailuaAPE.zip

**Authorized individual**

Noelle Besa Wright

**Authorized individual email**

noelle.wright@hdrinc.com

**Authorized individual phone**

(808) 697-6297

**Authorization**

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

# Waikakoi and South Wailua Bridge Replacement
# Final Environmental Assessment

**Hāna District, Island of Maui, Hawaiʻi**

Tax Map Keys: Hāna Highway Right-of-Way; (2) 1-5-008: 001, 002, and 004; (2) 1-5-009: 009, 010, 011, 012; and (2) 1-5-010: 008

**September 2025**


Proposing / Determining Agency:
County of Maui
Department of Public Works
200 South High Street, Room 434
Wailuku, Maui, Hawaiʻi 96793



**Prepared by:** HDR, Inc.

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# Waikakoi and South Wailua Bridge Replacement
# Final Environmental Assessment

**Hāna District, Island of Maui, Hawaiʻi**

Tax Map Keys: Hāna Highway Right-of-Way; (2) 1-5-008: 001, 002, and 004; (2) 1-5-009: 009, 010, 011, 012; and (2) 1-5-010: 008

## September 2025

Proposing / Determining Agency:
County of Maui
Department of Public Works
200 South High Street, Room 434
Wailuku, Maui, Hawaiʻi 96793


**Prepared by:**

HDR, Inc.
1001 Bishop Street, Suite 400
Honolulu, HI 96813


Prepared in accordance with Hawaiʻi Revised Statutes, Chapter 343 and Hawaiʻi Administrative Rules, Chapter 11-200.1

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# Table of Contents

# List of Figures

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# Appendices

# Abbreviations

| | |
|---|---|
| AASHTO | American Association of State Highway and Transportation Officials |
| ABC | Accelerated Bridge Construction |
| ADT | Average Daily Traffic |
| AECOS | AECOS, Inc. |
| AIS | Archaeological Inventory Survey |
| ALRFI | Archaeological Literature Review and Field Inspection |
| APE | Area of Potential Effect |
| ASEA | Aquifer Sector Area |
| ASL | Above sea level |
| ATA | Austin, Tsutsumi & Associates, Inc. |
| BMPs | Best Management Practices |
| C&D | Construction and Demolition |
| CAB | Clean Air Branch |
| CFR | Code of Federal Regulations |
| CIA | Cultural Impact Assessment |
| CIP | Cast-in-place |
| County | County of Maui |
| CO | Carbon monoxide |
| CRM | Concrete rubble masonry |
| CWA | Clean Water Act |
| CWB | Clean Water Branch |
| CWRM | Commission of Water Resource Management |
| CZM | Coastal Zone Management |
| CZMA | Coastal Zone Management Act |
| CZMP | Coastal Zone Management Program |
| dBA | A-weighted decibels |
| DBEDT | Department of Business, Economic Development, and Tourism |
| DLNR | State of Hawai'i Department of Land and Natural Resources |
| DOE | State of Hawaiʻi Department of Education |
| DOFAW | Division of Forestry and Wildlife |
| DPW | County of Maui Department of Public Works |
| EA | Environmental Assessment |
| EFH | Essential Fish Habitat |
| EIS | Environmental Impact Statement |
| EPA | Environmental Protection Agency |
| ERP | Environmental Review Program |
| ESA | Endangered Species Act |
| FEA | Final Environmental Assessment |
| FEMA | Federal Emergency Management Agency |
| FHWA | Federal Highway Administration |
| FIRM | Flood Insurance Rate Map |
| FONSI | Finding of No Significant Impact |
| FWPCA | Federal Water Pollution Control Act |

| | |
|---|---|
| GHGs | Greenhouse Gas Emissions |
| HAR | Hawaiʻi Administrative Rules |
| HAER | Historic American Engineering Record |
| HAZMAT | Hazardous materials |
| HDR, Inc. | HDR |
| HCP | Hāna Community Plan |
| HEPA | Hawaiʻi Environmental Policy Act |
| HEPCRA | Hawaiʻi Emergency Planning and Community Right-to-Know Act |
| HDOH | State of Hawaiʻi Department of Health |
| HDOT | State of Hawaiʻi Department of Transportation |
| HICRIS | Hawaiʻi Cultural Resource Information |
| HI-EMA | Hawaiʻi Emergency Management Agency |
| Honua | Honua Consulting |
| HRS | Hawaiʻi Revised Statutes |
| HSTP | Hawaiʻi Statewide Transportation Plan |
| IAL | Important Agricultural Lands |
| iHEER | Hazard Evaluation and Emergency Response System |
| IPCC | Intergovernmental Panel on Climate Change |
| LRFD | Load and Resistance Factor Design |
| LSB | Land Study Bureau |
| LUC | State of Hawaiʻi Land Use Commission |
| Makai | Ocean side |
| MASH | Manual for Assessing Safety Hardware |
| MASH TL-2 | MASH, Test Level 2 |
| Mauka | Mountain side |
| MCCRC | Maui County Cultural Resources Commission |
| MDWS | County of Maui Department of Water Supply |
| MECO | Maui Electric Company |
| Mgd | Millions of gallons per day |
| MID | Makaʻalae silty clay, 7 to 25 percent slopes |
| MIP | Maui Island Plan |
| MJD | Makaʻalae extremely stony silty clay, 7 to 25 percent slopes |
| MP | Mile post |
| MPO | Metropolitan Planning Organization |
| MPC | Maui Planning Commission |
| MPD | Maui Police Department |
| Mph | Miles per hour |
| MOA | Memorandum of Agreement |
| MRTDM | Maui Regional Travel Demand Model |
| NAAQS | National Ambient Air Quality Standards |
| NBI | National Bridge Inventory |
| NEHRP | National Earthquake Hazards Reduction Program |
| NCEI | National Centers for Environmental Information |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |

| | |
|---|---|
| $NO_2$ | Nitrogen dioxide |
| NOAA | National Oceanic and Atmospheric Administration |
| NRCS | Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | National Park Service |
| NWI | National Wetlands Inventory |
| NWP | Nationwide Permit |
| $O_3$ | Ozone |
| OCCL | Office of Conservation and Coastal Lands, State DLNR |
| OHWM | Ordinary High Water Mark |
| OPSD | Office of Planning and Sustainable Development |
| OSU-PRISM | Oregon State University (OSU)-PRISM Climate Group |
| PacIOOS | Pacific Islands Ocean Observing System |
| Pb | Airborne lead |
| PD | County of Maui Planning Department |
| $PM_{2.5}$ | Particulate matter smaller than 2.5 microns |
| $PM_{10}$ | Particulate matter smaller than 2.5 microns |
| PWS | Public water systems |
| REC | Recognized Environmental Conditions |
| RHA | Rivers and Harbors Act |
| ROW | Right-of-Way |
| rRT | Rough mountainous land |
| SCAP | Stream Channel Alteration Permit |
| SDA | Soil Data Access |
| SDG | Sustainable Development Goals |
| SHPD | State Historic Preservation Division |
| SHPO | State Historic Preservation Officer |
| SIHP | State Inventory of Historic Places |
| SLR-XA | Sea Level Rise Exposure Area |
| SMA | Special Management Area |
| SMI | Special Use Permit |
| $SO_2$ | Sulfur Dioxide |
| State | State of Hawaiʻi |
| STIP | Statewide Transportation Improvement Program |
| SWPPP | Stormwater Pollution Prevention Plan |
| TAR | Traffic Assessment Report |
| TIP | Transportation Improvement Program |
| TNWs | Traditional Navigable Waters |
| TRI | Toxic Release Inventory |
| UN | United Nations |
| USACE | U.S. Army Corps of Engineers |
| U.S.C. | U.S. Code |
| USCB | U.S. Census Bureau |
| USCG | U.S. Coast Guard |
| USDA | U.S. Department of Agriculture |

| | |
|---|---|
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| Vpd | Vehicles per day |
| Vph | Vehicles per hour |
| WQC | Water Quality Certification |

# 1.0 Introduction

## 1.1 Project Summary

The County of Maui (County) Department of Public Works (DPW), in coordination with the State of Hawaiʻi (State) Department of Transportation (HDOT) and the Federal Highway Administration (FHWA), is proposing to replace two existing structurally deficient bridges along Hāna Highway on the island of Maui, Hawaiʻi – the Waikakoi and South Wailua Bridges – with new bridges consistent with current design standards (referred to herein as the "Project," "Proposed Action," and "Build Alternative"). Table 1-1 below provides a summary of general Project information. Further description of the Project is provided in Chapter 2.0.

**Table 1-1: General Project Information Summary**

| Characteristic | Details |
|---|---|
| Proposing Agency/Accepting Authority | County of Maui<br>Department of Public Works, Engineering Division<br>200 South High Street, Room 410<br>Wailuku, HI 96793<br><br>Contact: Ty Takeno, Project Manager<br>Phone: (808) 270-7745<br>Email: ty.takeno@co.maui.hi.us |
| Name of Action | Waikakoi and South Wailua Bridge Replacement Project |
| Planning/Environmental Consultant | HDR, Inc.<br>1001 Bishop Street, Suite 400<br>Honolulu, HI 96813<br><br>Contact: Noelle Besa Wright, Senior Environmental Planner<br>Phone: (808) 570-6425<br>Email: dpwbridges@hdrinc.com |
| Project Location | Hāna District, Island of Maui (Figure 1-1) |
| Tax Map Keys | • Waikakoi Bridge (Figure 1-2): (2) 1-5-009: 009, 010, 011, 012 and Hāna Highway Right-of-Way (Figure 1-2)<br>• South Wailua Bridge: (2) 1-5-008: 001, 002, and 004; 1-5-010: 008; and Hāna Highway Right-of-Way (Figure 1-3) |
| Land Area | 2.73 acres |
| State Land Use District | See Figure 1-4:<br>• Waikakoi Bridge: Agricultural, Rural<br>• South Wailua Bridge: Conservation |
| County of Maui Zoning | See Figure 1-5:<br>• Waikakoi Bridge: AG (Agricultural), INT (Interim)<br>• South Wailua Bridge: INT (Interim) |
| County of Maui – Maui Island Plan | Portions within/adjacent to Community Growth Boundary (Figure 1-6) |
| Special Management Area (SMA) | Within the SMA (Figure 1-7) |
| Flood Zone | Zone X (Figure 1-8) |

**Figure 1-1: Project Location**

**Figure 1-2: Tax Map Keys – Waikakoi Bridge**

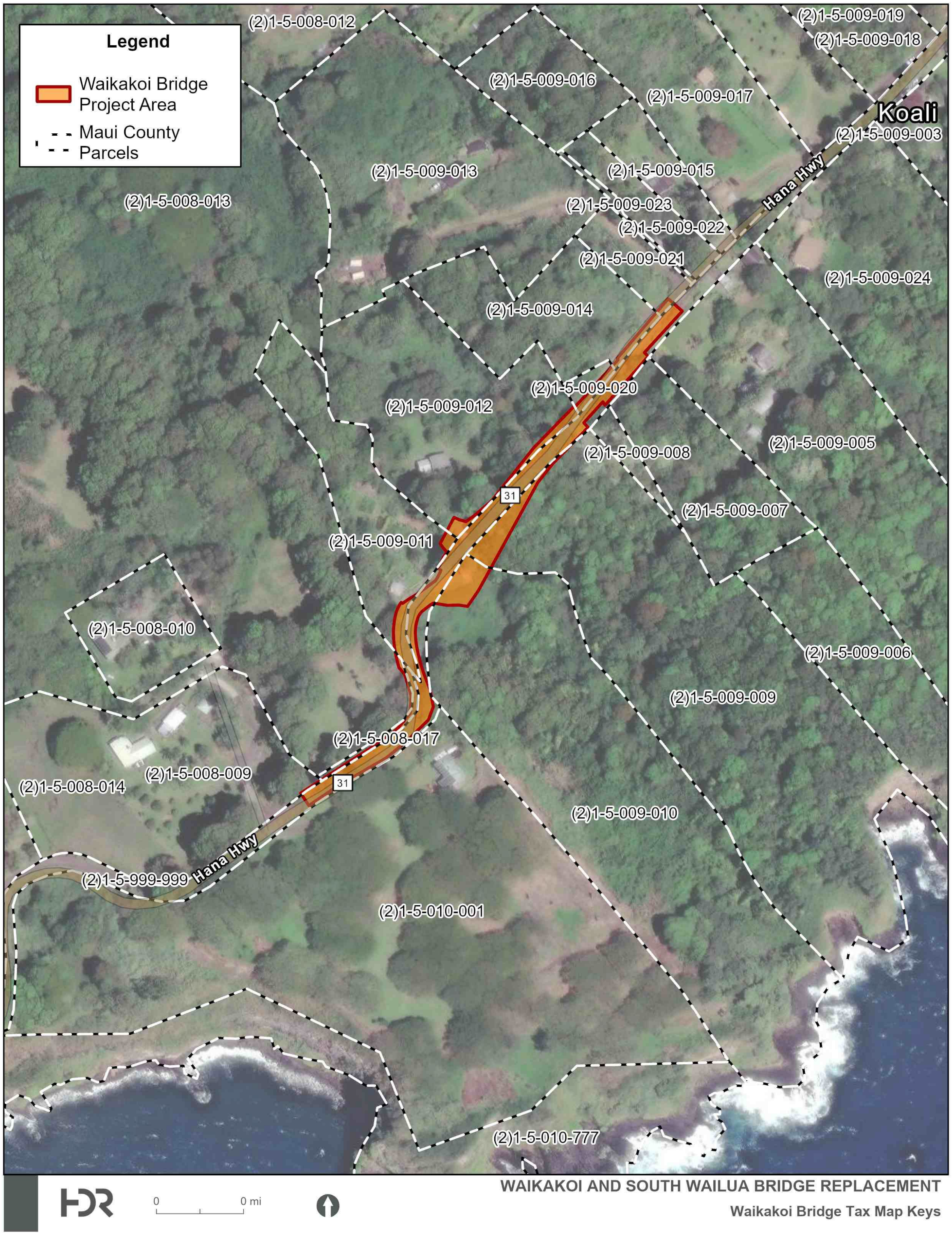


**Figure 1-3: Tax Map Keys – South Wailua Bridge**

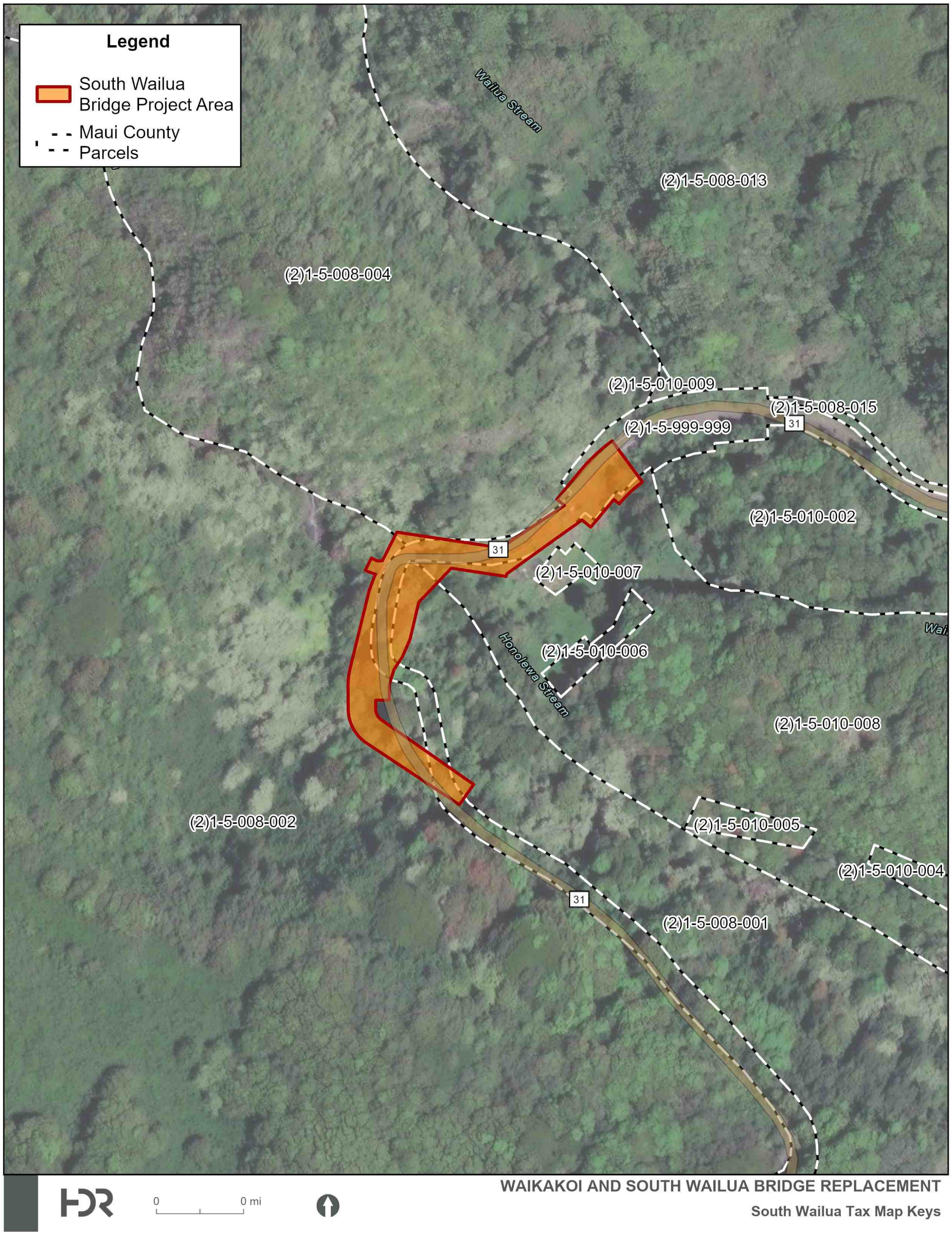


**Figure 1-4: State Land Use District**

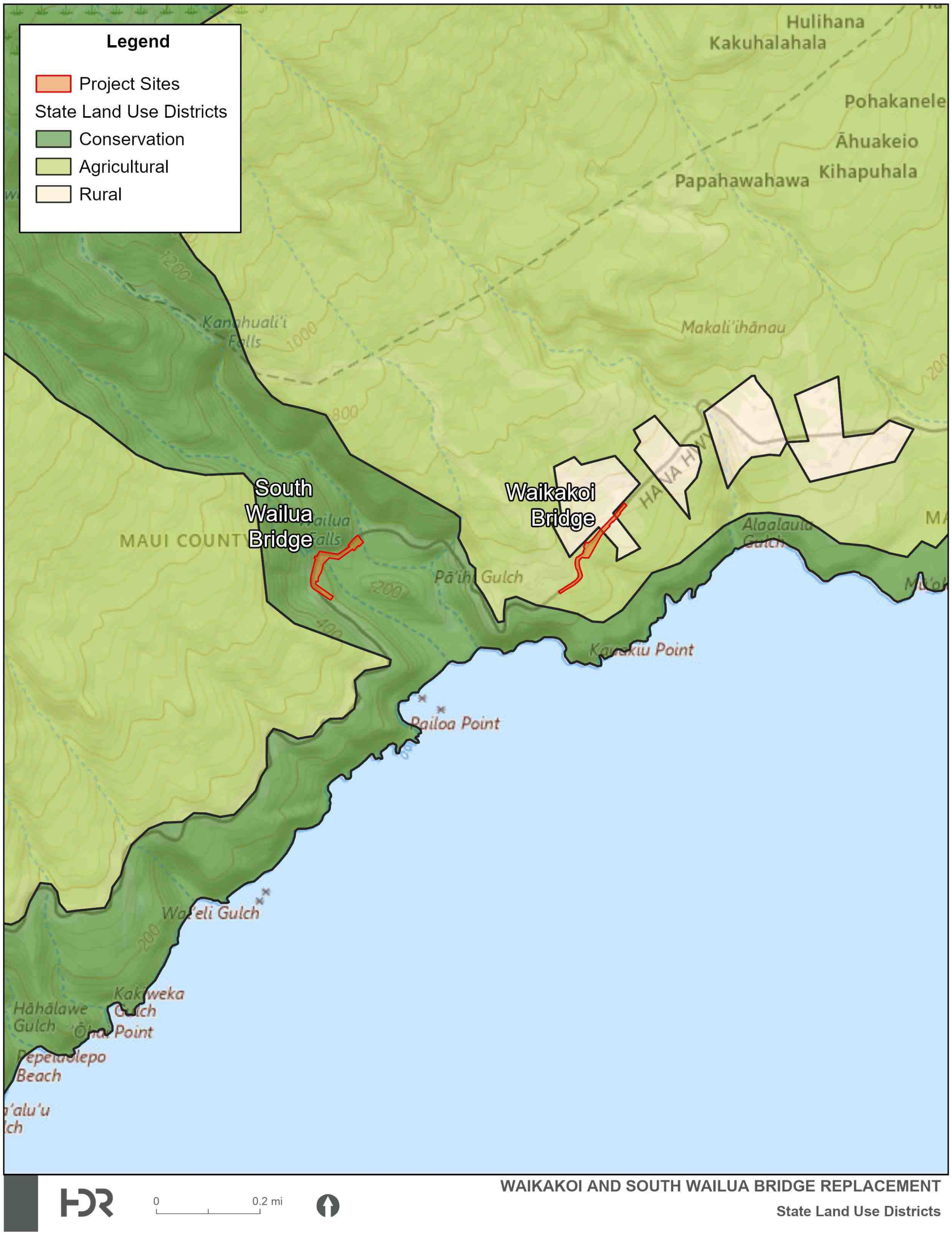


**Figure 1-5: County of Maui Zoning**

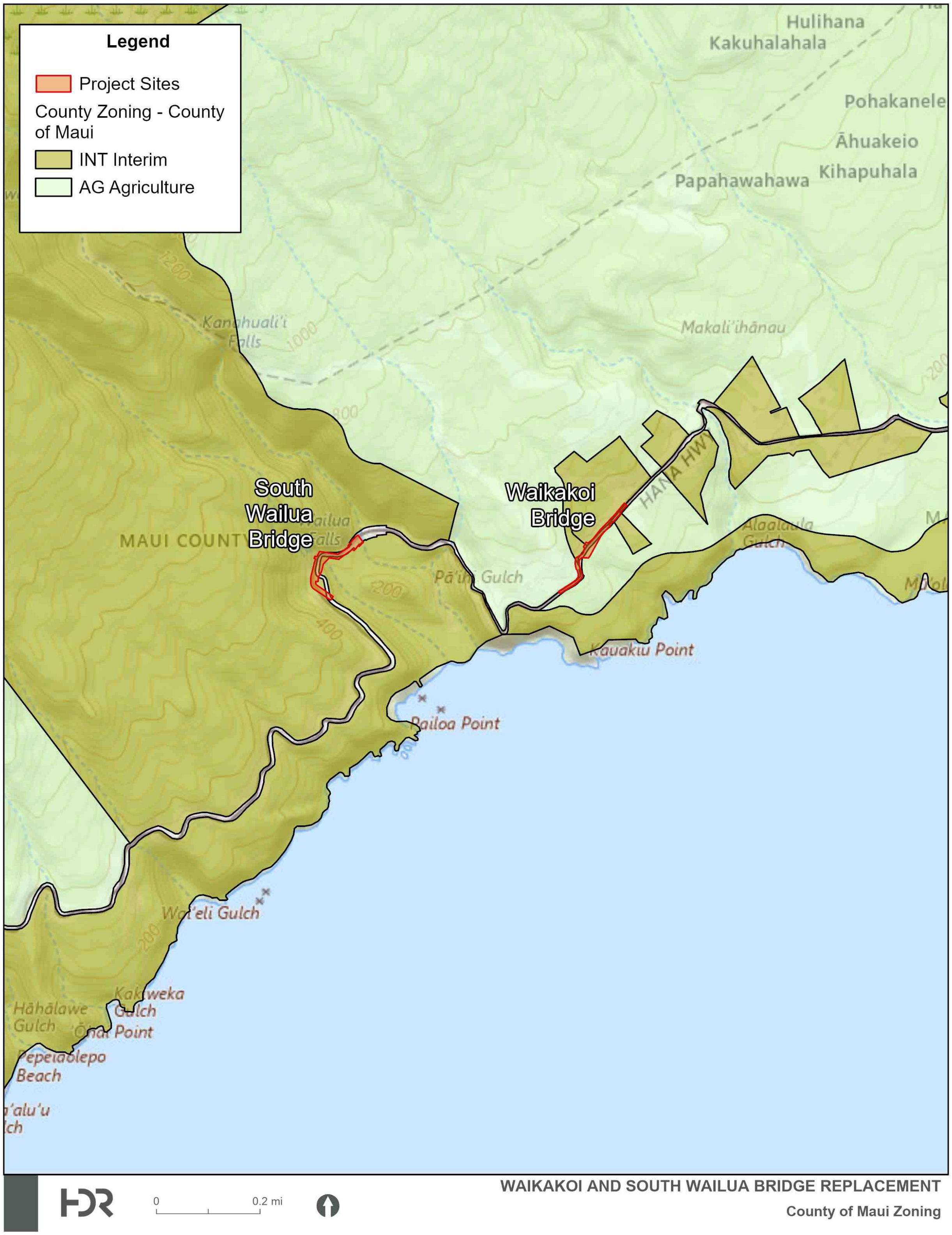


**Figure 1-6: County of Maui – Maui Island Plan, Community Growth Boundary (2012)**

**Figure 1-7: Special Management Area (SMA)**

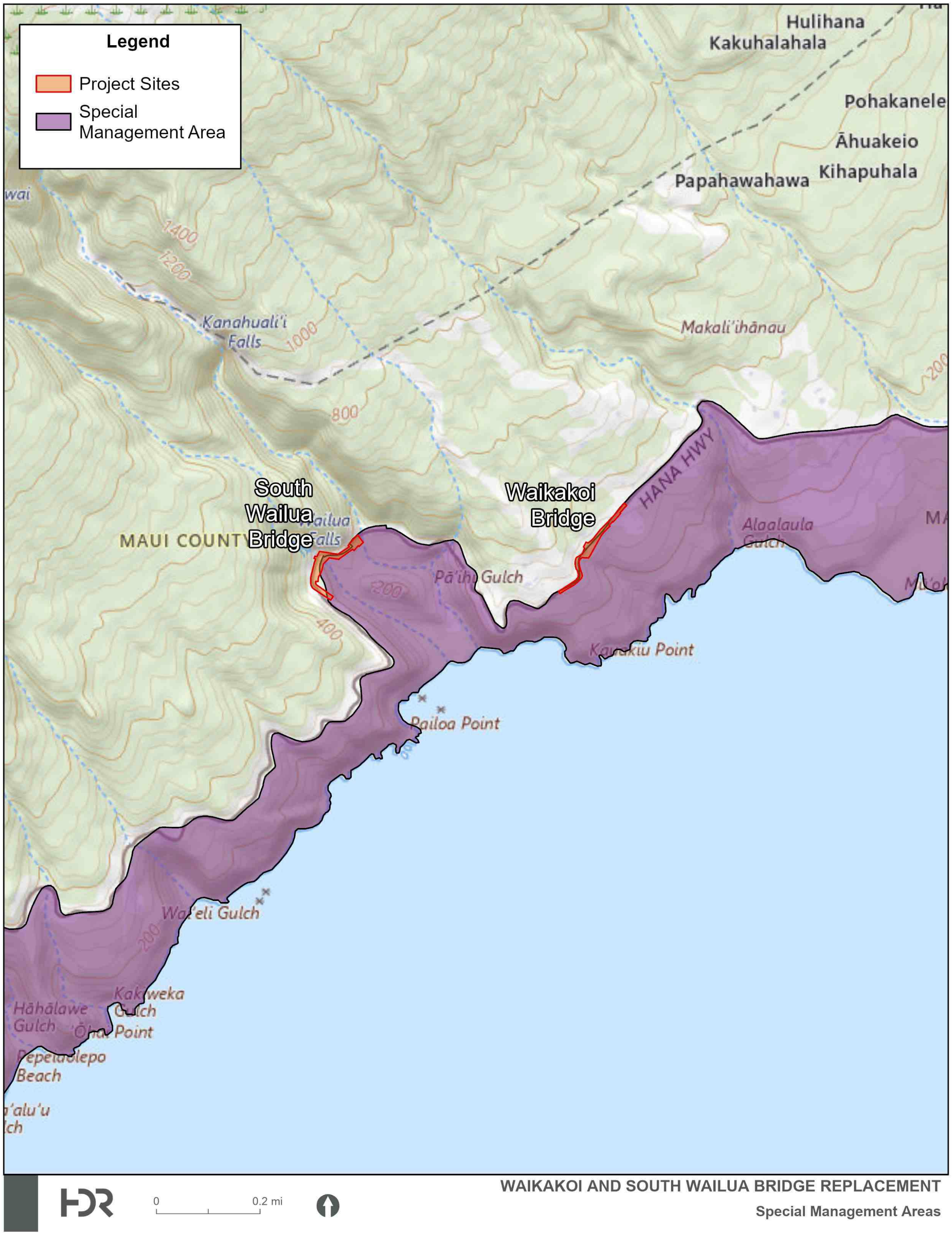
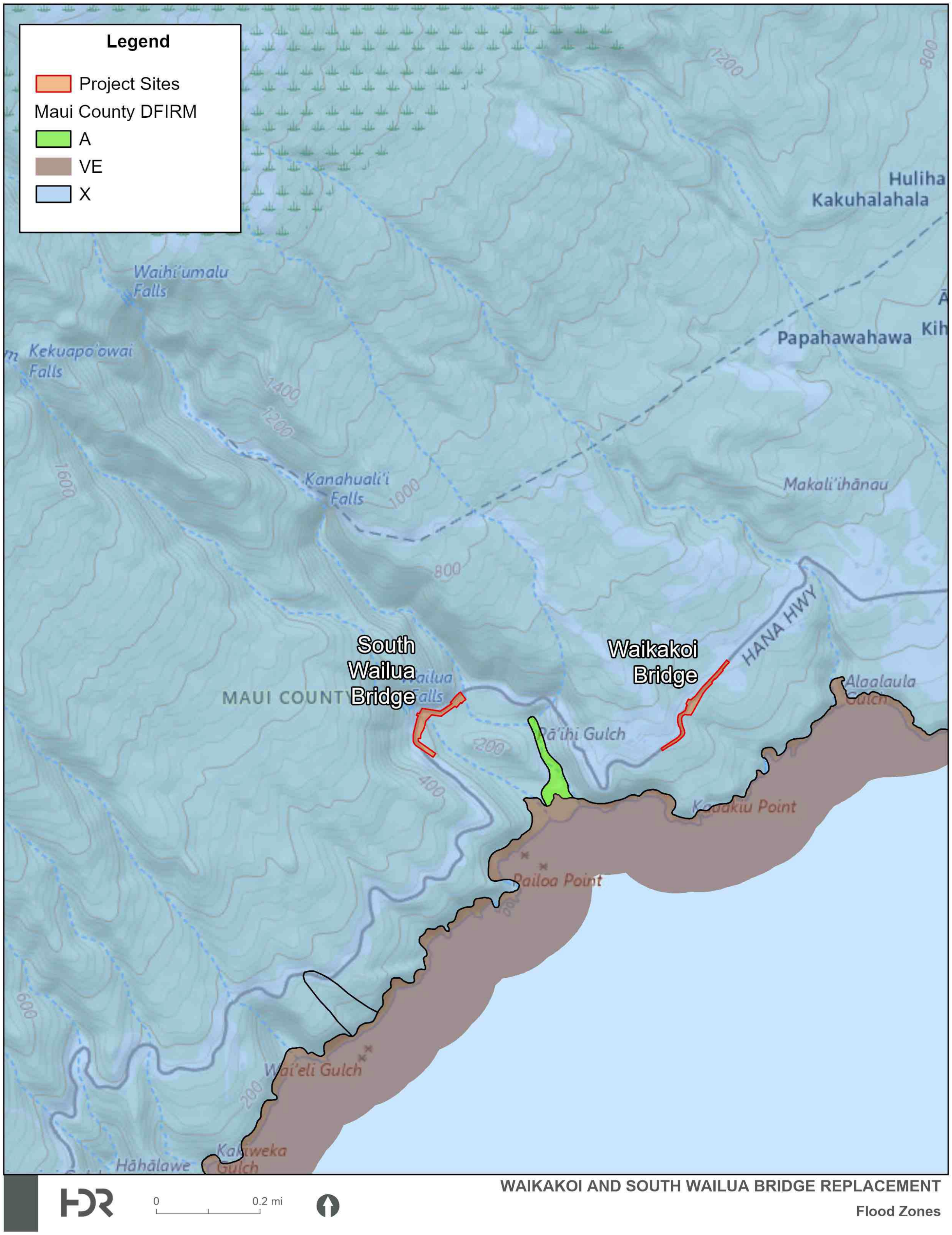


**Figure 1-8: Flood Zone**



## 1.2 Purpose of the Environmental Assessment

The Project would involve the use of County lands and funds, construction within the State-designated Conservation District, and use of a historic site as designated in the National Register, which trigger environmental review requirements pursuant to the Hawaiʻi Environmental Policy Act, Hawaiʻi Revised Statutes (HRS) Chapter 343 and Hawaiʻi Administrative Rules (HAR), Title 11, Chapter 200.1, Environmental Impact Statement (EIS) Rules.

Under HRS Chapter 343, agency actions or government actions are carried out by the Proposing Agency. The Proposing Agency is responsible for preparing the EA and defining the reasons to support the determination on the EA. For this Project, DPW is the Proposing and Determining Agency.

In accordance with HAR, Section 11-200.1-18(a), DPW consulted with agencies, organizations, and/or individuals who have jurisdiction, an area of expertise, or may be reasonably affected by the Project to help guide the scope and development of the Draft EA. See Chapter 6.0 for a list of parties that were consulted during the pre-assessment phase. A total of six agencies provided comments during the comment period, which began on March 18, 2025, and ended on April 18, 2025. See Table 6-2 for the comments provided, in addition to responses.

The Draft EA was published by the State Office of Planning and Sustainable Development (OPSD) Environmental Review Program (ERP) in *The Environmental Notice* on July 8, 2025. Publication was followed by a 30-day public comment period. A total of five agencies provided substantive comments received or postmarked during the statutorily mandated 30-day review period. Table 6-3 details the Draft EA comments and DPW responses. The Project team additionally gave a presentation to the Hāna Community Association on July 15, 2025, and coordinated a presentation to Kīpahulu Community Association on July 28, 2025, to solicit comments about the Project.

Notably, the Project also involves the use of Federal funds. As such, in coordination with HDOT and FHWA, separate environmental review documentation will be prepared to satisfy the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (Pub. L. 91-190, 42 United States Code [U.S.C.] §§ 4321–4347) and FHWA's implementing procedures pursuant to 23 Code of Federal Regulations (CFR) Part 771, *Environmental Impact and Related Procedures*. It is anticipated that a Categorical Exclusion will be prepared. See Section 5.1.1 for further discussion.

## 1.3 Project Background

The Hāna Highway (HI-360) serves as a critical transportation corridor for residents and tourists on the island of Maui, connecting the island's urban center of Kahului in the north and the remote communities of East Maui, including Hāna Town. The narrow, winding road spans approximately 64.4 miles long and includes 59 bridges that are primarily single-lane. Notably, approximately 42 miles of the Hāna Highway, also referred to in this EA as the Hāna Belt Road, has been recognized as historically significant through its listing as the Hāna Highway Historic District in the National Register of Historic Places (NRHP). The district is considered historic for its significance in engineering, social history, transportation, and commerce.

Portions of the Hāna Highway fall under Federal, State, and County jurisdiction. The County DPW is responsible for maintaining approximately 18 miles of Hāna Highway, which includes 14 bridges from Hāna Town to the south end of Koukouai Bridge near Kīpahulu. Amongst these, the Waikakoi Bridge (Bridge No. 26) and South Wailua Bridge (Bridge No. 23) are located at Hāna Highway mile posts (MP) 45.4 and 44.6 (HDOT, 2024), respectively. The Waikakoi Bridge carries Hāna Highway over Waikakoi Stream, while the South Wailua Bridge carries the highway over Honolewa Stream. Notably, South Wailua Bridge serves as a major attraction for tourists photographing Wailua Falls.

As publicly maintained bridges, Waikakoi and South Wailua Bridges are regularly inspected to ensure public safety and identify critical deficiencies. Routine bridge inspections indicate that both bridge superstructures have a National Bridge Inspection (NBI) rating of 3, which indicates "serious" condition. An NBI rating of 4 ("poor") or less is considered a "structurally deficient" bridge by the NBI Program. The Waikakoi Bridge deck has a NBI rating of 3, or "serious" condition and the South Wailua Bridge deck was given a rating a 4, or "poor" condition. In August 2022, emergency repairs were conducted on the Hāna-side abutment of the Waikakoi Bridge due to surface erosion of the concrete rubble masonry (CRM) abutment and supporting soils. Shotcrete and soil nails were installed to stabilize the soil channel wall, which was being scoured away by heavy stream flows. Also included in the emergency repairs was infill of the void area at the Hāna abutment. Given the deteriorated condition of both bridges, the emergency repairs to the Waikakoi Bridge, and the popularity of the South Wailua Bridge, these two bridges have been identified as priorities for replacement.

## 1.4 Purpose and Need

The purpose of the Project is to address the structural deterioration and load capacity deficiencies of both the Waikakoi and South Wailua Bridges by replacing the existing bridges with new structures that meet current design standards.

The Project is needed to ensure that the bridges, and therefore the Hāna Highway, remain safe and functional for highway users. The highway serves as a key corridor for local resident and visitor travel. As previously stated, periodic inspections have rated both bridge superstructures in "serious" condition, the lowest rating a bridge can receive through the NBI Program. This rating reflects the serious deterioration of critical structural components, which compromises the safety and reliability of the bridges. Without intervention, the continued degradation of these structures could result in load restrictions, increased maintenance costs, or potential closure, affecting the safety of the traveling public and disrupting access along the Hāna Highway. Structural failure or major access limitations could substantially disrupt daily life for the community, delay emergency response times, and adversely impact the area's tourism-based economy.

By addressing the structural deficiencies of these critical bridges, the Project fulfills the objectives set forth in the Maui General Plan 2030, the Maui Island Plan (MIP), and the Hāna Community Plan (HCP) to enhance roadway safety and ensure reliable access for residents and visitors alike.

Objectives advanced by the Project include the following:

1. Address structural deterioration and load capacity deficiencies by resolving the "serious" and "poor" condition ratings and restoring full functional capacity.

2. Improve safety and reliability for highway users by ensuring the bridges meet current design and safety standards.
3. Maintain reliable access to and from the Hāna region for residents, visitors, emergency services, and commercial deliveries.
4. Reduce long-term maintenance costs and burden on County resources by replacing aging structures with current infrastructure.
5. Utilize context-sensitive design that preserves the historic and scenic character of the Hāna Highway, consistent with the Hāna Highway Historic District, *Hāna Bridges Preservation Plan* (DPW, 2001), and County policies such as the HCP.
6. Avoid or minimize environmental and long-term right-of-way (ROW) impacts.

# 2.0 Description of the Proposed Action

## 2.1 Project Location and Area

The subject bridges are located in the Hāna District on the east side of Maui Island within the County ROW (Figure 1-1). The Hāna Highway is a critical road connecting the urban center of Kahului and the communities of East Maui. The road is highly traveled by residents and tourists. In addition, it serves as a route for emergency access and commercial traffic. Between Kahului and Hāna, the highway primarily follows the coastline, traversing steep, rock cut cliffs with narrow drops to the Pacific Ocean.

The Waikakoi Bridge carries Hāna Highway over the Waikakoi Stream in the vicinity of mile marker 45.4, approximately 6.9 miles south of Hāna Town. The bridge is located at an elevation of approximately 300 feet above sea level (ASL). The South Wailua Bridge carries Hāna Highway over Honolewa Stream in the proximity of mile marker 44.6, approximately 7.6 miles south of Hāna Town. The bridge is located at an elevation of approximately 200 feet ASL. The new replacement bridges will be located in the same location as the existing bridges within the existing County ROW.

For purposes of the EA, the "Project area" or "Project site" encompasses a total of approximately 2.73 acres comprised of the 1.21 acres surrounding Waikakoi Bridge and the 1.52 acres surrounding South Wailua Bridge. The area includes permanent and temporary bridge construction, roadway approaches, and anticipated staging areas. See Figure 2-1 and Figure 2-2.

The proposed Project would not require the permanent acquisition of private property outside of the existing County ROW. However, portions of the adjacent parcels outside of County ROW would be required for installation of the temporary bypass bridges and construction staging. Figure 2-1 and Figure 2-2 show the area outside of County ROW where the temporary bypass bridges and construction staging would occur. Of the 1.21-acre Waikakoi Bridge Project area, approximately 10,767 square feet (0.25 acres) would occur outside of the County ROW. Of the 1.52-acre South Wailua Bridge Project area, approximately 13,114 square feet (0.30 acres) would occur outside the County ROW.

**Figure 2-1. Waikakoi Bridge Project Area**

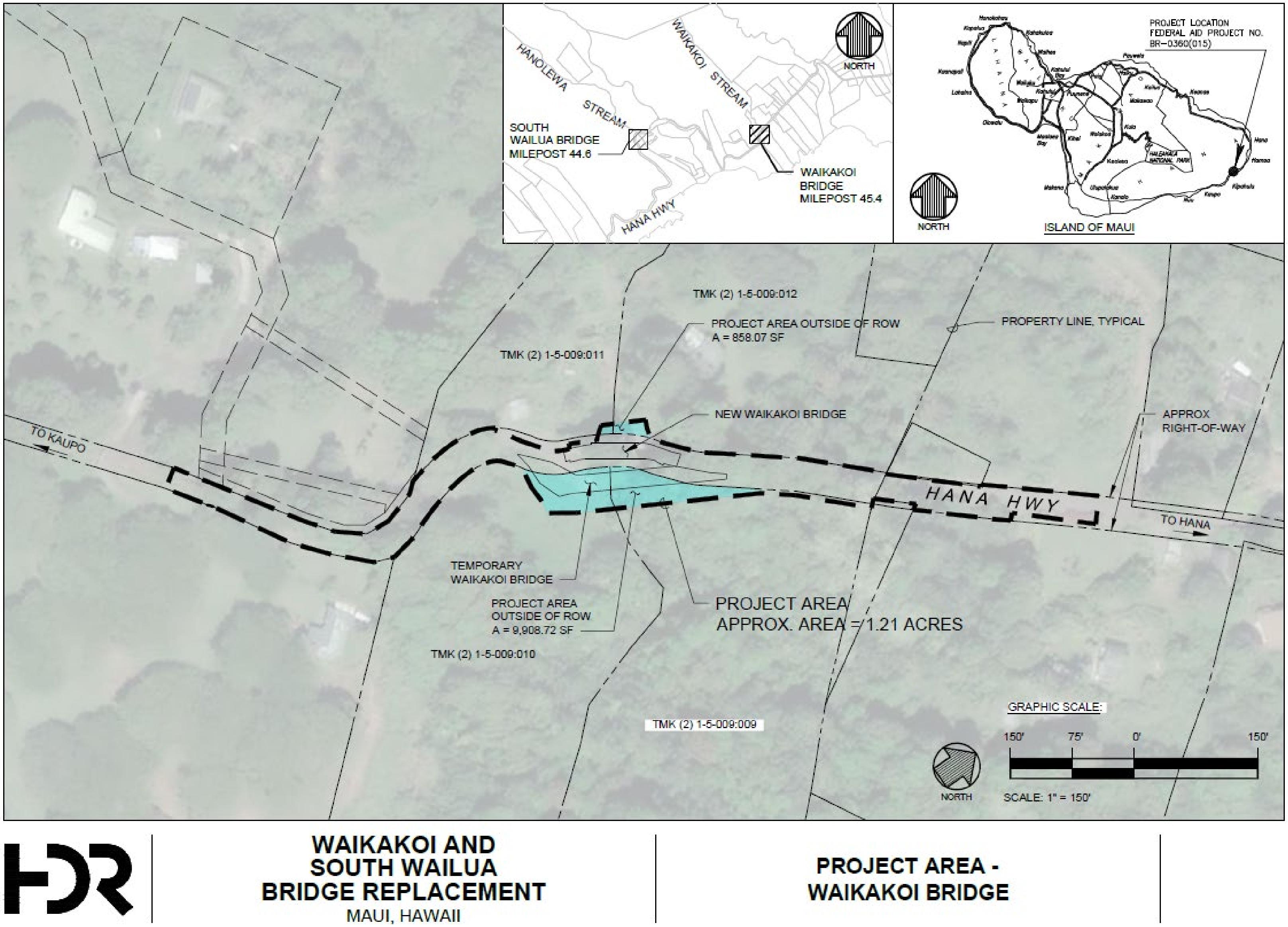
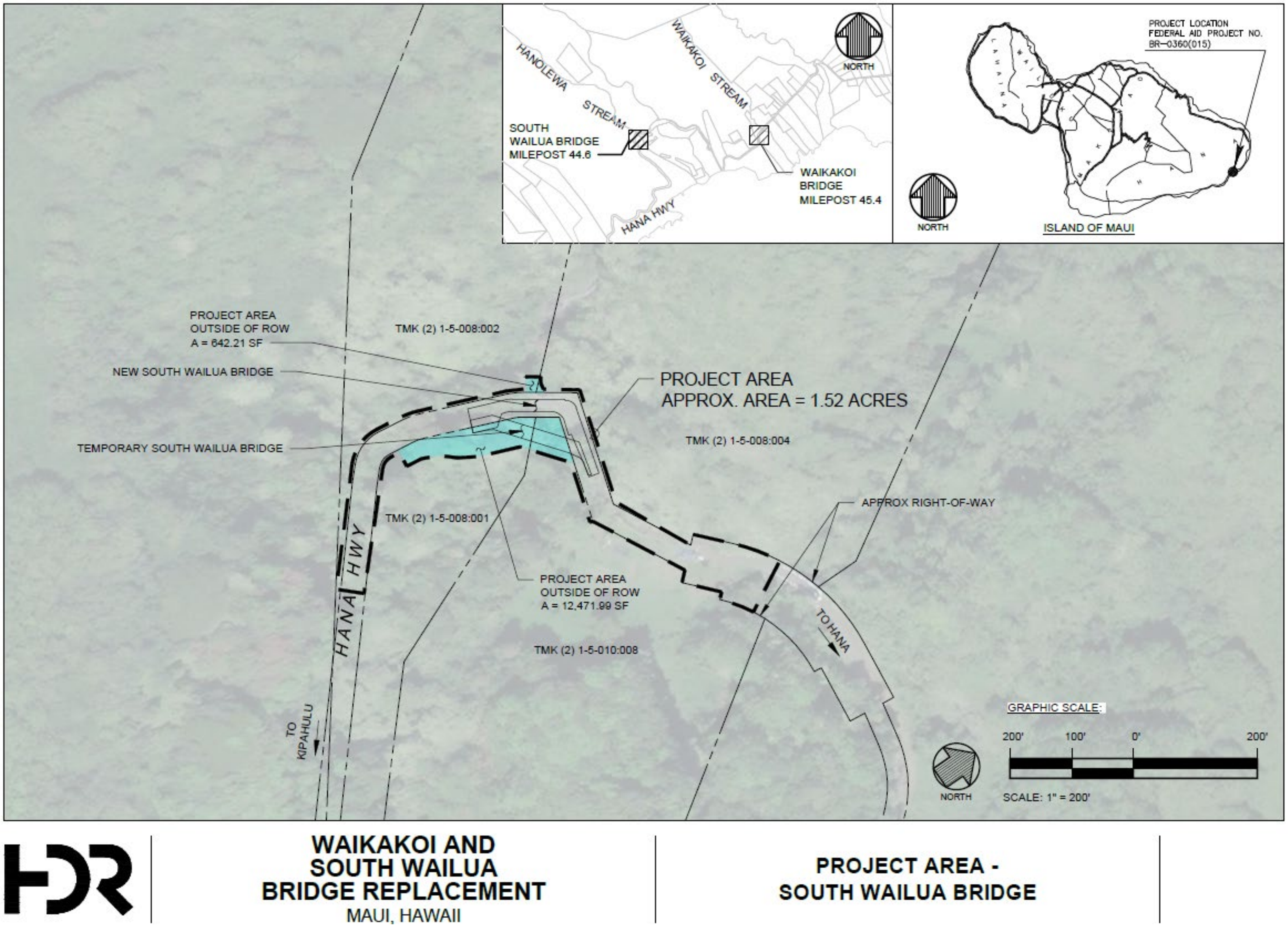


**Figure 2-2. South Wailua Bridge Project Area**



The affected properties are summarized in Table 2-1 (see also Figure 1-2 and Figure 1-3). No additional permanent easements for maintenance and operation of the bridges are needed. DPW has discussed the Project with the landowners and lessees and will continue to coordinate with them as the Project progresses.

**Table 2-1: Affected Tax Map Key Parcels**

| Bridge Area | Tax Map Key | Land Use, Zoning | Landowner of Record |
|---|---|---|---|
| **Waikakoi** | (2) 1-5-009: 009 | Undeveloped, Agriculture (AG) | Linden H. Joesting, Holt L Family Limited Partnership |
| | (2) 1-5-009: 010 | Undeveloped, Agriculture (AG) | Various (Private) |
| | (2) 1-5-009: 011 | Undeveloped, Agriculture (AG) | Various (Private) |
| | (2) 1-5-009: 012 | Undeveloped, Agriculture (AG) | Various (Private) |
| **South Wailua** | (2) 1-5-008: 001 | Undeveloped, Conservation (C) | Garrett Winston Jacobs |
| | (2) 1-5-008: 002 | Undeveloped, Agriculture (AG) | Garrett Winston Jacobs |
| | (2) 1-5-008: 004 | Undeveloped Conservation (C) | State of Hawaiʻi |
| | (2) 1-5-010: 008 | Undeveloped Conservation (C) | State of Hawaiʻi |

## 2.2 Surrounding Land Uses

The Waikakoi Bridge is bounded by undeveloped land designated by the State as Agricultural and Rural and zoned by the County as AG (Agriculture) and INT (Interim) (Figure 1-4 and Figure 1-5). Land abutting the Waikakoi Bridge consists of forested gulches and cliffs along the *mauka* (mountain) side of the highway. Further mauka side of the highway are various residences and farms. Adjacent to the Waikakoi Bridge on the *makai* (ocean) side is a steep, vegetated drop off to the Pacific Ocean. Further makai, the shoreline is rocky and generally unused by tourists due to its remote nature.

Land abutting the South Wailua Bridge area is primarily designated by the State for Conservation uses and zoned as INT (Interim) by the County (Figure 1-4 and Figure 1-5). On the mauka side of the highway, the terrain consists of forested gulches and cliffs that channel the Honolewa Stream and Wailua Falls. The bridge is a popular tourist destination for viewing the falls. Unstriped parking is provided south of the bridge to accommodate visitors and no crosswalks are provided. On the makai side of the highway, the landscape drops steeply into dense vegetation leading down to the Pacific Ocean.

## 2.3 Existing Bridge Conditions

The Waikakoi and South Wailua Bridges are situated along the Hāna Highway, which is characterized by narrow and winding passages, dense tropical vegetation or waterfalls on the mauka side, and steep drop offs on the makai side. According to the *State Historic Bridge Inventory and Evaluation (2024 Update),* the existing Waikakoi Bridge, constructed in 1911, has a length of approximately 33.0 feet and an out-to-out deck width of approximately 16.7 feet (HDOT, 2024). The bridge is located at Hāna Highway MP 45.4 and is approximately 300 feet ASL. The existing South Wailua Bridge, also constructed in 1911, has a length of approximately 57.0 feet and an out-to-out deck width of approximately 16.7 feet. The bridge is located at Hāna Highway MP 44.6 and is approximately 200 feet ASL. See Table 2-2 for a summary of existing bridge features.

**Table 2-2: Existing Bridge Summary**

| Bridge | Year Built | Hāna Highway Mile Post | Length (feet) | Deck Width[a] (feet) | Superstructure | Substructure | Elevation (feet ASL) | Project Area (acres) |
|---|---|---|---|---|---|---|---|---|
| **Waikakoi Bridge No. 26** | 1911 | 45.4 | ~33.0 | ~16.7 | Concrete Tee beam | Masonry Abutment and Concrete Double Column Pier | ~300 | 1.21 |
| **South Wailua Bridge No. 23** | 1911 | 44.6 | ~57.0 | ~16.7 | Concrete Tee Beam | Concrete Abutment Wall and Concrete Double Column Pier | ~200 | 1.52 |
| Source: HDOT, 2024 | | | | | | | | |

[a]The deck width is an “out-to-out” measurement. This refers to the total distance from the outermost point of one side of the bridge to the other outermost point of the other side.

Routine inspections of the existing Waikakoi and South Wailua bridges have been conducted and ratings for the existing conditions of the bridge deck, superstructure, and substructure using the FHWA’s NBI rating system were assigned to each bridge. The NBI system provides standardized assessment of various bridge conditions to assist in evaluating the overall condition of a bridge and to help states and counties with the prioritization of bridge maintenance, repair, or replacement projects. The NBI rating scale ranges from 9 to 0, where 9 represents excellent condition and 0 indicates a failed condition. Ratings for the existing conditions of the Waikakoi and South Wailua Bridges are within the range of 3 to 5, which are defined as follows:

- Three: Serious Condition, considered structurally deficient, characterized by advanced section loss, deterioration, spalling, or scour that has seriously affected primary structural components with local failures possible.
- Four: Poor Condition, considered structurally deficient, characterized by advanced section loss, deterioration, spalling, or scour.
- Five: Fair Condition, which suggests the elements are sound but may have minor section loss, cracking, or spalling.

Some of the deficiencies noted are significant spalls with exposed rebar for the entire length in both exterior girders, water staining and efflorescence in the deck and superstructure, scouring of the Hāna rock cliff embankment below abutment, cracking and vegetation growth on the abutments, and spalling with exposed rebar in the pier columns.

Further description of the existing structural conditions of each bridge is provided below.

### 2.3.1 Waikakoi Bridge

Originally constructed in 1911, the Waikakoi Bridge carries the Hāna Highway over Waikakoi Stream. The single-lane, two-span bridge has a length of approximately 30.0 feet, an out-to-out deck width of approximately 16.7 feet, and a center pier. The bridge consists of a conventionally reinforced concrete T-beam superstructure with four beams supported by a reinforced concrete abutment on the Kaupō side and a CRM abutment on the Hāna side. The pier height stands at approximately 21 feet and 7 inches and the roadway grade is fairly level.

As discussed in Section 2.2, the bridge is situated within an area of undeveloped land. At all four corners of the bridge, the terrain descends steeply from the abutments to the streambed below, creating pronounced embankments that characterize the bridge's immediate surroundings.

The existing bridge has an NBI condition rating of 3 for the deck condition, 3 for the superstructure condition, and 4 for the substructure condition. These ratings indicate that the bridge elements have advanced corrosion, deterioration, cracking or chipping. Some of the deficiencies noted include significant spalls with exposed rebar, water staining and efflorescence in the deck and superstructure, eroding of the downstream Hāna embankment, cracking and vegetation growth on the abutments, and spalling with exposed rebar in the pier columns. In August 2022, there was a significant erosion event near the Hāna side abutment which washed away a portion of the CRM abutment and supporting soil. An emergency project installed a ground nail wall to aid in stabilizing the existing abutment and streambed. Such conditions compromise the structural integrity and safety of the bridge, necessitating prioritized replacement to ensure continued safe passage along the Hāna Highway.

### 2.3.2 South Wailua Bridge

South Wailua Bridge is a single-lane, two-span bridge that carries the Hāna Highway over Honolewa Stream. The bridge is situated adjacent the Wailua Falls, which generates substantial tourist foot traffic. Constructed in 1911, it is a reinforced concrete tee beam bridge with an approximate length of 57.0 feet and an out-to-out deck width of approximately 16.7 feet. The superstructure consists of a reinforced concrete T-beam deck slab with an asphalt concrete pavement overlay. The substructure consists of reinforced concrete abutments and a reinforced concrete pier cap and columns.

The 2020 bridge inspection report shows the existing South Wailua Bridge has an NBI condition rating of 4 for the deck condition, 3 for the superstructure condition, and 5 for the substructure condition. Structural deficiencies include concrete spalling, delamination, exposed rebar, and cracks in the superstructure and deck, and spalls and scouring on pier columns. A recent site visit to this bridge in January 2024 found that the barrier at the makai/Hāna corner of the bridge has been broken away and there is currently a gap in the bridge railing. Traffic cones and temporary steel posts have been placed across the gap to warn bridge users. Such conditions compromise the structural integrity and safety of the bridge, necessitating prioritized replacement to ensure continued safe passage along the Hāna Highway.

## 2.4 Proposed Action (Build Alternative)

DPW proposes to replace the two existing structurally deficient bridges, the Waikakoi Bridge and South Wailua Bridge, with new, single-lane bridges in the same general location to provide safe and functional stream crossings. The purpose of the Project is to address the existing structural deterioration and load capacity deficiencies by replacing the structures to be consistent with current design standards. To accommodate traffic during construction, temporary bypass bridges would be installed makai of each bridge. The Project area is approximately 2.73 acres consisting of approximately 1.21 acres surrounding Waikakoi Bridge and approximately 1.52 acres surrounding South Wailua Bridge. The area encompasses permanent and temporary bridge construction, roadway approaches, and anticipated staging areas. The following sections describe the Project's primary components.

### 2.4.1 Demolition and Removal of Existing Bridges

The Project will include the demolition of both bridge decks, bridge abutments above the existing ground, bridge center piers above the stream bottom, existing pavement, guardrails, concrete retaining walls, and other associated infrastructure. Selected trees, signs, and other roadside elements within the Project areas may be removed or relocated where feasible. See Appendix A, Figures 1 through 4, for the existing conditions and demolition plan for the temporary and permanent bridge structures. Notably, the column foundation and concrete cap that the center pier columns sit on would remain in place, minimizing impacts to water quality and biological resources. The center pier would be cut at the base and removed. However, during center pier removal, installation of temporary Best Management Practices (BMPs) within the stream are anticipated to be required to isolate work areas, protect the stream from receiving construction debris, and divert the streams to maintain flow and allow for fish passage. BMPs are preliminarily anticipated to include sandbags and plastic sheeting to divert the streams around bridge center piers. The BMPs would remain in place for the duration of in-water demolition work and removed upon completion. DPW is consulting with USACE regarding the proposed temporary BMPs and the required approvals under Section 404 of the CWA.

### 2.4.2 Temporary Bypass Bridges

Temporary modular steel bypass bridges will be installed makai of each bridge to facilitate traffic flow, minimize disruption during construction, and allow for continuous emergency access. Each of the temporary bridges will accommodate a single lane of traffic and is anticipated to span approximately 100 feet long and have an out-to-out width of approximately 21.5 feet. The modular steel bridge structures will rest on reinforced concrete abutments with micropile foundations. Temporary gabion basket retaining walls will be installed at each bridge approach to mitigate potential erosion. Temporary signage, pavement markings, portable concrete barriers, and crash barrels will be placed at the bridge approaches to serve as safety and traffic control measures. See Appendix A, Figures 5 and 6. Design of the temporary bridges and associated features will be finalized as the Project progresses.

The bypass bridges will be constructed outside of the County ROW; therefore, temporary construction easements will be coordinated with adjacent landowners. Upon completion of the permanent bridges, the temporary bridge structures will be removed. The surrounding areas will be restored to original conditions to the extent practicable. Micropiles used for the temporary abutments will remain in place below ground and will be buried.

### 2.4.3 Replacement and Construction of New Waikakoi and South Wailua Bridges

The new Waikakoi and South Wailua Bridges will be constructed in their original general locations. Each bridge will accommodate a single-lane configuration and will be designed to current structural and safety standards, providing load-bearing capacities to accommodate current and future traffic demands. The new Waikakoi Bridge is anticipated to span approximately 48.5 feet long and have an out-to-out width of 18.0 feet, and the new South Wailua Bridge is anticipated to span approximately 60.0 feet long and have an out-to-out width of approximately 18.0 feet. Each bridge superstructure will be comprised of a reinforced concrete deck supported by reinforced concrete tee girders. The bridge decks will be surfaced with asphalt concrete pavement, extending beyond the bridge and tying into the existing roadway to provide a smooth transition.

The new bridges would be of a similar size, scale, location, and design to the existing structures. See Figure 2-3 for the existing Waikakoi Bridge and Figure 2-4 for an illustrative rendering of the new replacement bridge. See Figure 2-5 for the existing South Wailua Bridge and Figure 2-6 for an illustrative rendering of its replacement. The center pier of each existing bridge will not need to be replaced. The new bridges would not impact views of scenic or protected resources, including the Hāna Highway Scenic Corridor, and would match with the character of the Hāna Highway Historic District in compliance with the *Final Preservation Plan for county of Maui Bridges within the Hāna Highway Historic District* (County, 2001).

**Figure 2-3: Existing Waikakoi Bridge**

**Figure 2-4: Proposed Waikakoi Bridge (Illustrative Rendering)**

**Figure 2-5: Existing South Wailua Bridge**

**Figure 2-6: Proposed South Wailua Bridge (Illustrative Rendering)**

The new bridge barrier railings will be compliant with the Manual for Assessing Safety Hardware (MASH), Test Level 2 (MASH TL-2) in the similar style to the existing barriers. CRM barriers internally strengthened with steel-reinforced concrete will be connected to the barrier railings and extend off the bridge decks. The CRM barriers will be slightly realigned to reduce potential of being hit by vehicles. Design of the bridge railings and CRM barriers will match the historic character of the existing bridges and have been approved for use on bridge projects in Hawaiʻi by FHWA and HDOT (December 2021). The bridges will be supported on each end by reinforced concrete abutments with deep micropiles. CRM retaining walls will be installed at each end of the bridge decks for slope stability. See Appendix A, Figures 7 and 8.

Both bridges will be constructed within the County ROW; as such, no permanent acquisition of adjacent properties is anticipated. The new Waikakoi Bridge will follow the same alignment as the existing bridge, while the South Wailua Bridge will be partially online to the existing alignment but within the County ROW. Each bridge will be designed to accommodate existing hydrologic conditions, ensuring sufficient clearance above Waikakoi and Honolewa Streams to maintain natural flow patterns and minimize flood risks. During construction, BMPs will be implemented to protect water quality and maintain stream flows. Appendix A, Figures 9 through 12, show the erosion control plan for the temporary and permanent bridge structures.

Table 2-3 summarizes the features of the new bridges. However, the final design and mitigation measures will be determined as the design progresses.

**Table 2-3: Summary of New Bridges**

| Bridge | Length (feet) | Deck Width (feet)[a] | Superstructure | Substructure | Span | Alignment |
|---|---|---|---|---|---|---|
| **Waikakoi Bridge No. 26** | ~48.5 | ~18.0 | Cast-in-Place Reinforced Concrete T-Beams | Reinforced Concrete Abutments on Micropiles | Single | Online (within ROW) |
| **South Wailua Bridge No. 23** | ~60.0 | ~18.0 | Cast-in-Place Post-Tensioned Concrete Slab | Reinforced Concrete Abutments on Micropiles | Single | Partially online (within ROW) |

[a]The deck width is an "out-to-out" measurement. This refers to the total distance from the outermost point of one side of the bridge to the other outermost point of the other side.

### 2.4.4 Roadway Improvements and Utility Relocation

Roadway approaches on either side of each bridge will be reconstructed with asphalt pavement to provide smooth transitions onto the new bridge structures. Utility lines, including electrical, telecommunications, and water may be temporarily or permanently relocated or reinforced to prevent service disruptions. Slight roadway profile and cross slope adjustments and resurfacing will be conducted to enhance drainage and improve overall roadway safety. Additionally, appropriate signage and pavement markings will be installed.

### 2.4.5 Grading and Drainage Improvements

Grading will be required for installation of both temporary and permanent bridges. Additionally, roadway approaches may be regraded and resurfaced to provide a smooth transition onto the new bridge decks. Retaining walls and embankment protections will be installed where necessary to prevent erosion and provide slope stability. During construction, temporary erosion control measures such as compost filter socks, silt fences, and stabilized construction entrances will be used during construction to protect against erosion and prevent construction from negatively impacting water quality in the adjacent streams. Construction activities will adhere to Federal, State, and County standards. Permanent BMPs will include geotextile and hydromulch grassing on exposed soil surfaces.

### 2.4.6 Construction Traffic Control

During construction, traffic will be rerouted to the temporary bypass bridges described in Section 2.4.2. To maintain safe and efficient vehicular flow throughout the construction period, a construction Traffic Control Plan has been developed and will be finalized before implementation by the contractor. The plan identifies appropriate temporary traffic signage, lane closure protocols, and flagging operations placed at strategic locations to guide motorists. Temporary portable message signs will also be used to inform drivers of construction activity and lane shifts. Construction work affecting travel lanes will be scheduled to minimize impacts during peak traffic periods and will maintain access for emergency vehicles at all times. To mitigate potential traffic impacts during peak hours, nighttime construction work may be intermittently employed. The County DPW will coordinate with the Maui Police Department (MPD) and emergency responders to minimize traffic disruptions and maintain public safety throughout the temporary construction period.

## 2.5 No-Action Alternative

Under the No-Action or No Build Alternative, the Waikakoi and South Wailua Bridges would not be replaced, or improvements would be delayed to a later, undetermined time. Both bridges would remain in service in their current condition. No major structural improvements would be made, and only routine maintenance would occur as needed. As such, the No-Action Alternative does not meet the Project purpose and need. This alternative would not address structural deficiencies or safety concerns identified through routine inspections and could lead to further deterioration and disruption of access along the Hāna Highway. See further discussion in Section 4.1.

## 2.6 Alternatives Summary

The Project considers two alternatives: the No-Action Alternative and the Build Alternative. Under the No-Action Alternative, the existing Waikakoi or South Wailua Bridges would remain in their current deteriorated state  or improvements would be delayed to a later, undetermined time. This alternative would not address structural deficiencies or safety concerns identified through routine inspections and could lead to further deterioration and disruption of access along the Hāna Highway.

The Build Alternative, also referred to as the Preferred Alternative, proposes to replace both bridges with new, single-lane structures in the same general locations as described in Section 2.4. This alternative meets the Project purpose and need and will address structural deterioration and load capacity deficiencies of the bridges, improve safety and reliability for highway users, maintain consistency with the historic character of the Hāna Highway, and avoid or minimize environmental and long-term ROW impacts.

Prior to the selection of the Preferred Alternative, engineering studies were performed by HDR in 2024 which evaluated several structural alternatives for the bridge designs. Alternative alignments and designs were evaluated for feasibility based on Construction Impacts and Constructability, Historic Character, Construction Cost, Environmental Resources, and ROW Impacts. See Chapter 4.0 for further discussion.

## 2.7 Estimated Project Cost and Schedule

The estimated construction cost of the Project is $15.5 million. Construction is anticipated to start in late 2027, subject to the receipt of required permits and approvals. The estimated duration of construction is approximately one year for each bridge. It is anticipated that the bridges will be constructed in sequence to have the ability to use one temporary bridge for both locations. Therefore, the total construction period is estimated at up to two years.

## 2.8 Anticipated Permits and Approvals

Table 2-4 lists the Federal, State, and County permits and approvals that are anticipated to be required for the Project. Agency coordination is ongoing and final permitting requirements will be determined as the Project progresses.

**Table 2-4: Anticipated Permits and Approvals**

| Permit/Approval/Consultation | Agency |
|---|---|
| Clean Water Act (CWA) Section 404 Nationwide Permit No. 3 | USACE, Honolulu District |
| Section 106, National Historic Preservation Act consultation | State Historic Preservation Officer (SHPO) |
| Section 7, Endangered Species Act (ESA) | United States Fish and Wildlife Service (USFWS), National Marine Fisheries Service |
| State Historic Preservation Review (HRS Chapter 6E) | State Historic Preservation Division |
| Site Plan Approval or Conservation District Use Application | State Department of Land and Natural Resources (DLNR) Commission on Water Resource Management (CWRM) |
| CWA Water Quality Certification, CWA Section 401, Blanket Certification | State of Hawaiʻi Department of Health (HDOH) Clean Water Branch (CWB) |
| Clean Water Act, Section 402 National Pollutant Discharge Elimination System (NPDES) Permit | HDOH CWB |
| Coastal Zone Management (CZM), Federal Consistency Determination | Department of Business, Economic Development and Tourism (DBEDT), Office of Planning and Sustainable Development (OPSD) |
| Community Noise Permit | HDOH |
| HRS Section 103-50 (Disability and Communication Access Board Review) | HDOH Disability and Communication Access Board |
| Special Management Area (SMA) Use Permit (SMI) | County Planning Department (PD), Maui Planning Commission (MPC) |
| Flood Development Permit | County DPW |

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# 3.0 Environmental Setting, Potential Impacts, and Mitigation Measures

This section describes the existing environmental resources in the Project area and how these resources may be affected by the Project. Environmental resources were identified based on the potential for Project actions to result in a significant or adverse impact on these resources.

Under Hawaiʻi Environmental Policy Act (HEPA) implementation guidelines, in most cases, an agency determines that an action may have a significant impact on the environment if it meets any of the following criteria, as outlined in HAR Section 11-200.1-13.

(1) Irrevocably commit a natural, cultural, or historic resource;

(2) Curtail the range of beneficial uses of the environment;

(3) Conflict with the State's environmental policies or long-term environmental goals established by law;

(4) Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State;

(5) Have a substantial adverse effect on public health;

(6) Involve adverse secondary impacts, such as population changes or effects on public facilities;

(7) Involve a substantial degradation of environmental quality;

(8) Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions;

(9) Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat;

(10) Have a substantial adverse effect on air or water quality or ambient noise levels;

(11) Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;

(12) Have a substantial adverse effect on scenic vistas and view planes, during day or night, identified in County or State plans or studies; or

(13) Require substantial energy consumption or emit substantial greenhouse gases.

A discussion of the Project's potential impacts under the significance criteria is provided in Section 7.1.

# 3.1 Historic and Cultural Resources

## 3.1.1 Archaeological Sites and Historic Structures

The proposed Project is subject to review under Section 106 (36 CFR Part 800) of the NHPA of 1966, as amended, HRS Chapter 6E, and HAR Chapter 13-275. In order to support the review, a draft Archaeological Inventory Survey Report (AIS) for Waikakoi and South Wailua Bridge was prepared by Honua Consulting (Honua) in accordance with HAR Chapter 13-276. The AIS describes the land use history of the Project area and identifies archaeological and historic properties, including evaluations of their significance. The following section summarizes the AIS findings, which is provided in Appendix B (Honua 2025a).

***Affected Environment and Existing Conditions***

**Historic Context**

The Project's Area of Potential Effect (APE) is approximately 2.73 acres, which includes 1.21 acres surrounding Waikakoi Bridge and 1.52 acres surrounding South Wailua Bridge. Like the Project area defined in Section 2.1, the APE includes the permanent and temporary bridge construction footprint, as well as roadway approaches with temporary traffic control signs and anticipated staging areas.

From a traditional Hawaiian perspective, the Hāna Belt Road is the most recent formalization of the widespread phenomenon on all islands of some kind or ala nui, or main route (or ala loa, long route), around the shoreline or near-shoreline. Such routes were critical to Hawaiians, both makaʻāinana (commoners) as well as aliʻi (chiefs), as safe and effective ways to travel between ahupuaʻa and moku (districts) and for the effective administration and governing of different areas in the era of chiefdoms.

The areas surrounding the bridge sites within the APE were part of an extensive, integrated landscape used for traditional Hawaiian cultivation practices, including that of irrigated taro. In addition to its agricultural importance, the APE may have also included temporary shelters or "garden houses," but permanent house sites were likely built downslope, closer to the coastal and near-coastal portions of these ahupuaʻa. The region remained relatively isolated and retained traditional practices well into the 19th century.

The Māhele of 1848 and the Kuleana Act of 1850 introduced the concept of private property ownership; however, less than one percent of the land was awarded to commoners. Within and near the APE, numerous Land Commission Awards and Land Grants are documented, providing evidence of historic land tenure and land use, such as habitation, agriculture, and cultural features.

In the late 1800s, East Maui, like the rest of the Maui and the Hawaiian islands, saw increasing interest due to the growth of the commercial agricultural operations, primarily comprised of sugar but also including rubber and coffee. Linked to the growth of commercial sugar was the need for industrial-scale irrigation capabilities, processing facilities, and transportation facilities. Hāna Bay served as a major shipping port, triggering the need for a formal overland route through the Hāna Region to support trading. In 1877, 15 miles of unpaved road was constructed connecting central

Maui to Kailua was constructed in 1877, which was later extended farther east to Nahiku in 1899 by the Nahiku Rubber Company.

By the early 1900s, interest in promoting tourism, improving transportation infrastructure, and expanding commercial agriculture prompted efforts to develop a formal belt road to Hāna. Construction of the road and its bridges proceeded in a piecemeal and incremental fashion due to funding limitations, challenging terrain, and disagreements between the Territorial and County governments. Waikakoi and South Wailua Bridges were constructed in 1911 as part of the early phase of this effort, even before the adjacent roadway segments were fully paved. Road surfacing and connectivity between the bridge sites were completed in subsequent years as additional funding became available.

**Prior Archaeological Investigations and Historic Architectural Studies**

Early archaeological research conducted between 1916 and 1940 documented heiau (traditional Hawaiian temples), fishponds, and settlement and cultivation areas in the vicinity of the APE. Beginning in the 1970s, island-wide surveys that focused on above-ground sites were performed. A heiau (traditional Hawaiian temple) called Hale o Kāne (SIHP # 50-50-17-00129) was identified within 0.5 miles of the Project area.

More recent archaeological surveys and data recovery efforts have been conducted adjacent to Waikakoi Bridge but not closer than about 500 feet from South Wailua Bridge. The studies have identified several historic properties, including traditional Hawaiian habitation and agricultural complexes. While cultural material was not recovered during recent excavations, several features were documented and preservation plans were prepared.

In addition to archaeological investigations, several historic architectural studies have evaluated the Hāna Belt Road and its bridges. Forty-two miles of the Hāna Belt Road, including its bridges, was listed as the Hāna Highway Historic District on the NRHP in 2001 (SIHP # 50-50-vr-01638; NRHP #1000615). Within the APE are the following three historic bridges:

1. South Wailua Bridge (No. 23) constructed in 1911
1. Waikakoi Bridge (No. 26) constructed in 1911
2. Wailua Bridge (No. 24) constructed in 1947

All three bridges are listed in the NHRP and evaluated as having high preservation value in both the 2013 and 2024 State Historic Bridge Inventories (HDOT, 2024).

**Subject AIS Fieldwork**

An AIS was conducted for the Project and included fieldwork consisting of a pedestrian survey of the APE. Systematic transects and laboratory testing were not needed and no subsurface testing was performed. Photos from the fieldwork can be found in Appendix B.

**AIS Findings**

The following section summarizes the historic sites identified during the Project AIS and their significance eligibility under State and Federal standards.

To be considered a "significant historic property" under State criteria (HAR Section 13-275-6), the property must "possess integrity of location, design, setting, materials, workmanship, feeling, and association..." Additionally, the historic property must meet at least one of the following criteria:

> *a. Be associated with events that have made an important contribution to the broad patterns of our history;*
>
> *b. Be 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;*
>
> *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.*

Site significance evaluated under Federal criteria (CFR, Title 36, Part 60.4), includes:

> *The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:*
>
> *A. That are associated with events that have made a significant contribution to the broad patterns of our history; or*
>
> *B. That are associated with the lives of persons significant in our past; or*
>
> *C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*
>
> *D. That has yielded or may be likely to yield information important in prehistory or history.*

The AIS identified seven total archaeological sites and historic structures within the APE (Figure 3-1 and Figure 3-2). The historic structures consist of contributing elements of the Hāna Highway Historic District, including South Wailua Bridge (No. 23), Waikakoi Bridge (No. 26), and Wailua Bridge (No. 24), as well as associated rock walls and bridge features constructed during the early to mid-20th century. The archaeological sites include traditional Hawaiian subsistence agriculture features such as dry-stacked terraces and retaining walls (Honua 1 and Honua 2). All sites have been evaluated under State (HAR §13-275-6) and Federal (36 CFR Part 60.4) criteria for historic significance and are eligible for preservation consideration under HRS Chapter 6E and Section 106 of the NHPA. Further detail of each site is provided below:

1. **South Wailua Bridge Features (No. 23, Hāna Belt Road, State Historic Bridge Inventory #009003600904464):** Built in 1911, the bridge has a “high preservation value” due to its contribution to the Hāna Highway Historic Bridge District, serving as an intact example of a belt road system in the State. The three associated bridge features are the mortared basalt “wing walls” from original construction, which maintain integrity of location, setting, and feeling associated with the historic bridge (Figure 3-1). Feature 1 has been damaged and repaired; Feature 2 retains integrity of design, materials, and workmanship; and Feature 3 is structurally unsound and failing. The bridge features are significant under State and Federal criteria a and A (lowercase and uppercase criteria designations correspond to State and Federal criteria listed above) for their association with construction of the Hāna Belt Road and Bridge system, as well as criteria c and C for their embodiment of a distinctive period in bridge construction in the State.

2. **Hāna Belt Road Features at South Wailua Bridge (SIHP # -01638):** These features include two rock wall features south of the bridge (Features 1 and 2) and one north of the bridge (Feature 3) (Figure 3-1). Only Feature 1 appears to be from original construction, while Features 2 and 3 appear to be from late construction (middle twentieth century). All three features retain integrity of location, setting, feeling, and association with the historic road, and Feature 1 additionally retains integrity of design, materials, and workmanship. The bridge features are significant under State and Federal criteria a and A for their association with construction of the Hāna Belt Road and Bridge system, as well as criteria c and C for their embodiment of a distinctive period in bridge construction in the State.

3. **Honua 1 – Dry-Stacked Terraces:** Located at South Wailua Bridge, this pair of dry-stacked rock and soil terraces are just makai of the waterfall parking area and are interpreted as a traditional Hawaiian cultivation (gardening) site (Figure 3-1). The site retains integrity of location and design, with level soil areas on the naturally sloped terrain that indicate traditional Hawaiian subsistence agriculture. The site is degraded and damaged. It is significant under State and Federal criteria d and D for its contribution to the understanding of traditional subsistence agriculture in an area that has been otherwise modified by the construction.

4. **Wailua Bridge Features (No. 24, Hāna Belt Road, State Historic Bridge Inventory #009003600904475):** Built in 1947, the bridge has “high preservation value” due to its contribution to the Hāna Highway Historic Bridge District, serving as an intact example of a belt road system in the State, as well as associations with the post-World War II period. Features 1 through 4 are identified as buttresses at each of the bridge corners, and Features 5 through 8 are identified as sets of bollards/posts at the four bridge corners, some with guardrails and some without (Figure 3-1). Features 1 through 4 retain integrity of location, design, setting, materials, workmanship, feeling, and association with the historic bridge, while Features 5 through 8 are in disrepair. Features 1 through 4 are significant under State and Federal criteria a and A for their association with improvements to original Hāna Belt Road and Bridge system construction in the post-World War II era, as well as criteria c and C for their embodiment of a distinctive period in road and bridge improvements in the State. Use of the portion of the APE that includes the Wailua Bridge will be limited to temporary traffic control signage and no work to the bridge is required.

5. **Waikakoi Bridge Features (No. 26, Hāna Belt Road, State Historic Bridge Inventory #009003600904542):** Built in 1911, the bridge has a "high preservation value" due to its contribution to the Hāna Highway Historic Bridge District, serving as an intact example of a belt road system in the State. Features 1 through 4 are four bridge buttresses, Features 5 and 6 are two mortared basalt guardrail anchors and guardrails, and Feature 7 is a non-functional mortared basalt water-diversion structure (Figure 3-2). Features 1 through 4 appear to be from original construction, while 5 through 7 are likely 1950s or 60s modifications. While most of the features have generally retained integrity of location, setting, feeling, and association with the historic bridge, Feature 1 has been modified by the addition of rocks and soil on top of it and Feature 2 has been modified by a more recent feature (Feature 7) on top of it. Features 3 and 7 are structurally unsound and failing. Some of the features are significant under State and Federal criteria a and A for their association with the construction of the Hāna Belt Road and Bridge system, as well as criteria c and C for their embodiment of a distinctive period in bridge construction in the State.

6. **Hāna Belt Road Features at Waikakoi Bridge (SIHP # -01638):** The three identified features are located along the shoulders of the road on either side of Waikakoi Bridge (Figure 3-2). Feature 1 is a long, curvilinear retaining wall south of the bridge, and Feature 2 is a long retaining wall north of the bridge; both features date from original road construction. Feature 3 is a small concrete drainage structure built on top of Feature 2 for drainage and is likely a later addition. The three features retain integrity of location, design, setting, materials, workmanship, feeling, and association. They are significant under State and Federal criteria a and A for their association with the construction of the Hāna Belt Road and Bridge system, as well as criteria c and C for their embodiment of a distinctive period in bridge construction in the State.

7. **Honua 2 – Dry-stacked Retaining Wall:** Located on the mauka side of the road south of Waikakoi Bridge, this dry-stacked retaining wall structure was constructed by a private landowner at the adjacent private parcel (TMK (2) 1-5-009:011). Previous archaeological study within this parcel has likely not occurred. The constructed rock wall may be encroaching on highway ROW. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association, with a level soil area on naturally sloped terrain that indicates traditional Hawaiian subsistence agriculture. It is significant under State and Federal criteria d and D for its contribution to the understanding of traditional subsistence agriculture in an area that has been otherwise modified by the construction.

Table 3-1 provides a summary listing of the historic properties, their site features, and their significance as identified in the AIS, while Figure 3-1 and Figure 3-2 show the location of the identified historic sites.

**Table 3-1: Historic Properties in APE and Significance**

| Site Designation[1] | APE/project area | Other Resource #[1,2] | Formal Type | Feature/s | Functional Interpretation | Temporal Interpretation | Sign. Assess.[3] | Integrity[4] |
|---|---|---|---|---|---|---|---|---|
| S. Wailua Bridge Features | S. Wailua Bridge | 00900360090 4464 (Bridge No. 23) | Component features of bridge | Wing Walls (Features 1, 2 & 3) | Structural to bridge | 1911 | a, c<br>A, C | l, s, f, a, plus d, m, w (Fea. 2 only) |
| Hāna Belt Road Features at S. Wailua Bridge | S. Wailua Bridge | SIHP # 01638 (Hāna Belt Road) | Component features of Hāna Belt Road | Fea. 1 = Retaining wall for highway | Structural to highway | Early 20th century | a, c<br>A, C | l, s, f, a, plus d, m, w (Fea. 1 only) |
| | | | | Fea. 2 = Wall along highway shoulder | Upslope soil retention | Middle 20th century | | |
| | | | | Fea. 3 = Discontinuous boulder alignment along highway shoulder | Road safety | Middle 20th century | | |
| SIHP Site | S. Wailua Bridge | Honua 1 | Dry-stacked terraces | Pair of dry-stacked terraces (Features 1 & 2) | Cultivation (traditional agriculture) | Pre-Contact to early historic period | d<br>D | l, d |
| Wailua Bridge Features | S. Wailua Bridge | 00900360090 4475 (Bridge No. 24) | Component features of bridge | 4 buttresses (Features 1, 2, 3 & 4) | Structural to bridge | 1947 | a, c<br>A, C | l, d, s, m, w, f, a (Feas. 1-4 only) |
| | | | | 4 bollards/posts/guardrails (Feas. 1, 2, 3 & 4) | Road/bridge safety | | | |
| Waikakoi Bridge Features | Waikakoi Bridge | 00900360090 4542 (Bridge No. 26) | Component features of bridge | 4 buttresses (Features 1, 2, 3 & 4) | Structural to bridge | 1911 | a, c<br>A, C | l, s, f, a |
| | | | | 2 mortared rock guardrail anchors (Feas. 5 & 6) | Road/bridge safety | Early to middle 20th century | | |
| | | | | 1 water diversion feature (Fea. 7) | Water distribution | Early to middle 20th century | | |
| Hāna Belt Road Features at Waikakoi Bridge | Waikakoi Bridge | SIHP # 01638 (Hāna Belt Road) | Component features of Hāna Belt Road | Fea. 1 = Retaining wall for highway | Structural to highway | Early 20th century | a, c<br>A, C | l, d, s, m, w, f, a |
| | | | | Fea. 2 = Retaining wall for highway | | | | |
| | | | | Fea. 3 = Drainage for highway | | | | |

| Site Designation[1] | APE/project area | Other Resource #[1,2] | Formal Type | Feature/s | Functional Interpretation | Temporal Interpretation | Sign. Assess.[3] | Integrity[4] |
|---|---|---|---|---|---|---|---|---|
| SIHP Site | Waikakoi Bridge | Honua 2 | Dry-stacked retaining wall | Long dry-stacked retaining wall w. level soil area upslope | Cultivation (traditional agriculture) | Pre-Contact to early historic period | d<br>D | l, d, s, m, w, f, a |

Source: Appendix B (Honua, 2025a)

[1]Complete, formal SIHP number is preceded by "50-50-17-."

[2]Bridge reference numbers are from MKE and Fung (2013)

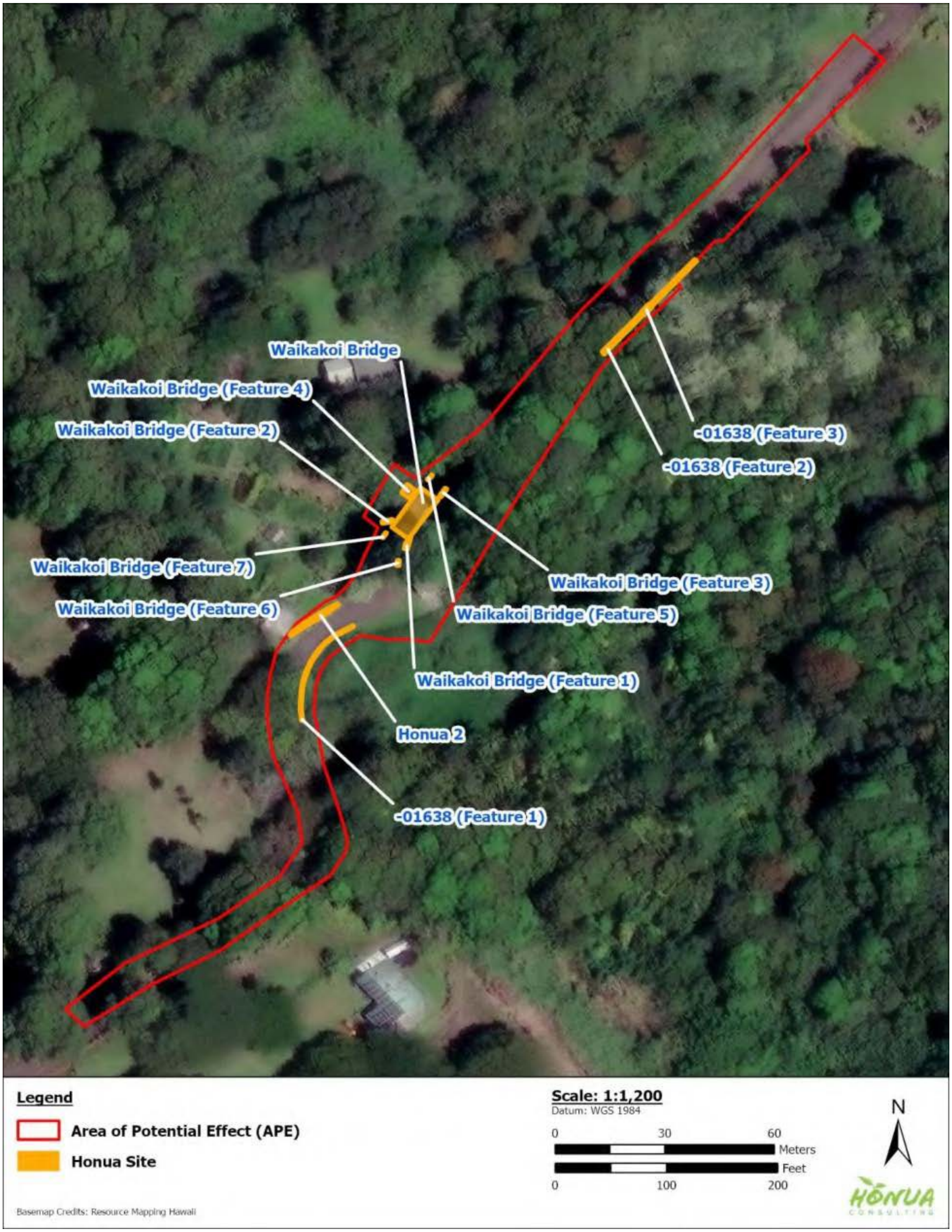
[3]Significance Assessments: lower case letters = State criteria; upper case letters = National criteria. See description of criteria above.

[4]Integrity criteria: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association

**Figure 3-1: Site Features identified in South Wailua Bridge APE**


Source: (Honua, 2025a)

**Figure 3-2: Site Features identified in Waikakoi Bridge APE**




Source: (Honua, 2025a)

***Potential Impacts and Mitigation Measures***

The AIS recommends a project determination of "effect, with proposed mitigation commitments" under HRS Chapter 6E (HAR § 13-275-7). Additionally, because the Project would involve historic properties listed on the NRHP, the AIS recommends the effect determination of "adverse effect" under Section 106 (36 CFR Part 800.5). The next step for resolution is consultation with SHPD and the development of a Memorandum of Agreement (MOA; 36 CFR Part 800.6). SHPD review of the Project and concurrence with the effect determinations under Section 106 and HRS Chapter 6E is ongoing (HICRIS Project No. 2025PR00098.001). The Section 106 consultation process is described further in Section 5.1.2.

The AIS recommends the following mitigation measures to satisfy State and Federal regulatory processes:

1. South Wailua Bridge and Associated Features: Perform an Architectural-Historical Assessment.
2. Honua 1: If resource can be avoided, no further mitigation is required. If the resource cannot be avoided, perform archaeological data recovery, including archaeological excavation.
3. Waikakoi Bridge and Associated Features: Perform an Architectural-Historical Assessment.
4. Honua 2: Perform consultation with adjacent landowner at TMK (2) 1-5-009:011 to establish whether site is within the roadway or on private property.

The following additional mitigation commitments under HRS Chapter 6E are proposed for potential impacts to the Waikakoi and South Wailua Bridges:

5. Conduct Historic American Engineering Record (HAER) documentation of the existing bridges with large format photographs before the historic features are removed.
6. Context Sensitive Design: The DPW shall ensure that the proposed improvements will be constructed in accordance with context-sensitive design guidelines to maintain the integrity of the Hana Highway Historic Bridge District. The replacement bridge shall be substantively designed as outlined below:
    a. The Project shall retain the single lane design with a width of approximately 16 feet between railings.
    b. The Project shall utilize MASH-compliant Hawaii Department of Transportation Crash Tested 34-inch Aesthetic Concrete Railings concrete parapets similar to the original railings. A MASH-compliant Hawaii Cement Rubble Masonry (CRM) barrier, which is internally strengthened with reinforced concrete, shall be utilized as an approach wall barrier.
    c. The new bridges shall be inscribed, similar to the original, with "AD 20XX" centered on the exterior face of the downstream parapet.

    See Figure 2-4 and Figure 2-6 for illustrative renderings of the proposed bridge replacements.

7. The Project shall incorporate archaeological monitoring for identification purposes during project-related ground disturbance. Additionally, the following measures will be implemented during the construction of the proposed improvements:

- 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, the HDOT shall follow Hawaiʻi Administrative Rules (HAR) Chapter 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 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 HAR §13-300 Subchapter 4 "Procedures for Property Treatment of Burial Sites and Human Skeletal Remains."

Wailua Bridge and Associated Features and Hāna Belt Road Features at Waikakoi Bridge are beyond the limits of ground disturbance and no mitigation measures are proposed. No additional mitigation measures are proposed for Hāna Belt Road Features at South Wailua Bridge.

Final mitigation commitments under HRS Chapter 6E will be determined as consultation with SHPD progresses. Additionally, an MOA will be developed to document appropriate mitigation measures under Section 106.

### 3.1.2 Cultural Impact Assessment

In order to analyze the potential impact of the proposed Project on cultural practices, a Cultural Impact Assessment (CIA) was developed by Honua. The following section summarizes the findings of this report, which is provided in full in Appendix C (Honua, 2025b).

***Affected Environment and Existing Conditions***

Honua gathered and analyzed historic cultural information, including archaeological and biological studies, as well as conducted interviews with descendants and cultural practitioners in the Project area. Based on the results of research and interviews, the following cultural resources were identified in the Project area:

- <u>Flora:</u> Species that have traditional uses or associations with Native Hawaiian culture were identified, including six native species (two endemic species and four indigenous species) and nine Polynesian-introduces species. Traditional practices involving identified flora include food cultivation, lei-making, medicine, and ceremonial use.
- <u>Fauna:</u> Endemic species with ecological and cultural importance, specifically for traditional Hawaiian fishing, storytelling, and spirituality, were either observed, reported, or considered potentially present. These include native freshwater fish (Iʻa Kahawai), native freshwater snail, native insects (Hawaiian Dragonfly), Hawaiian Hoary Bat (ʻŌpeʻapeʻa), and damselflies (Megalagrion spp.).
- <u>Water Resources:</u> Water has significant cultural spiritual significance. Water in the Hāna region within the Wailua watershed is important ecologically and linked to the health of fauna. The area surrounding the South Wailua and Waikakoi bridges includes several perennial streams, including Honolewa Stream and Waikakoi Stream.

- Historic Properties and Cultural Sites: A description of historic resources can be found in Section 3.1.1.
- Intangible Cultural Resources: Cultural practices without physical form, such as hula or mele, are not known or identified as currently taking place on the Project property.

Traditional or customary practices historically occurring in the larger geographic extent of the Project area include:

- Moʻolelo, or storytelling and developing oral histories.
- Habitation characterized by multi-generational living, subsistence practices, and strong community ties.
- Trail usage as the primary means to travel.
- Farming, which played central role to livelihoods, economies, and spirituality. Crops included loʻi kalo (irrigated taro terraces) and dryland field systems for ʻuala (sweet potato), maiʻa (banana), kō (sugarcane), and other crops.
- Clothes-making, dyeing, hala-weaving, and lei-making.
- Lāʻau lapaʻau, or practicing traditional Hawaiian medicine.
- Kilo, those who examine, observe, or forecast climate and weather.
- Ceremonial practices, which are not necessarily distinct ceremonies but part of performing traditional customs. Makahiki ceremonies occur along the coastline makai of the Project area.
- Haku Mele, Haku Oli, and Hula, which are related the composition of songs and chants.
- Ranching and paniolo culture.
- Modern hunting that has become a cultural practice throughout the State.
- Fishing and spearfishing, especially within the nearshore reef environment.
- Limu (seaweed) gathering, a particularly important cultural practice in Hāna.

***Potential Impacts and Mitigation Measures***

The CIA concluded that the Project would have impacts to the historic Waikakoi and South Wailua bridges, which would be mitigated under the HRS Chapter 6E and Section 106 processes. The Project would not adversely impact cultural resources or traditional or customary practices. There are wahi pana (storied places) within the overall property in which the Project area is located, but it is not currently anticipated that the resources or practices in the area would be adversely impacted as a result of the Project activities. The Project is also not anticipated to have cumulative or indirect impacts to cultural resources and practices.

The CIA recommends mitigation measures under HRS Chapter 6E will be implemented (discussed in Section 3.1.1) and that construction BMPs be implemented to limit impact to nearby water sources and minimize erosion (discussed in Sections 3.3 and 3.5). Additionally, the following specific avoidance and mitigation measures for potential impacts to cultural resources identified in the CIA include may be implemented to the extent practicable:

- Flora: Avoid unnecessary disturbance when possible and consider opportunities for cultural interpretation or restoration plantings, where appropriate. Use of native plants will be considered where practicable to revegetate disturbed areas.

- Fauna: Promote continued stewardship of resources, protecting them during and after construction. Construction BMPs to minimize potential impacts to listed and threatened species are discussed throughout Section 3.6.
- Historic Sites: Adverse impacts to the Waikakoi and South Wailua Bridge are anticipated and will be mitigated with the implementation of commitments under HRS Chapter 6E (see Section 3.1).
- Cultural Practices: During construction, the CIA recommends maintaining natural stream flow to the extent practicable, minimizing sedimentation or adverse water-quality impacts, avoiding springs or water sources that support cultural or subsistence practice, and coordinating with community members or cultural practitioners, where appropriate, to address concerns regarding use of water resources. Construction BMPs regarding these topics can be found in Sections 3.3, 3.5, and 3.6.

## 3.2 Atmospheric and Meteorological Environment

### 3.2.1 Climate and Rainfall

***Affected Environment and Existing Conditions***

The Project site is located along the eastern most slopes of Haleakalā on the island of Maui and is generally characterized by moderate temperatures, persistent trade winds, and high rainfall (Giambelluca et al., 2014). Mean annual temperatures in this region vary moderately during the year from 72 to 75 degrees Fahrenheit, with the greatest variation occurring during the nighttime of both the rainy and dry seasons. Winds in this region are dominated by prevailing northeasterly trade winds, whereas during the winter months, from November to April, trade winds shift southeasterly resulting in weakened and varied wind patterns.

The Köppen Climate Types of Hawaiʻi indicate this area is a tropical rainforest (Oregon State University [OSU]-PRISM Climate Group, n.d.). The Project area experiences an estimated mean annual rainfall of 77.29 inches based on a 30-year average of climatological variables from 1991 to 2020, according to the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) Climate Normals dataset (NOAA-NCEI, 2022). Rainfall occurs throughout the year but is highest during the wet season between November and April.

***Potential Impacts and Mitigation Measures***

The Proposed Action is not anticipated to cause long-term adverse impacts to area climate and rainfall; therefore, no mitigation measures are required. The Project would not increase vehicle capacity and would instead improve reliability and safety of bridge and roadway infrastructure. As such, the Project is not anticipated to increase resultant greenhouse gas emissions (GHG) emissions, which are known to warm global climate (see Section 3.2.2 for details).

### 3.2.2 Air Quality

***Affected Environment and Existing Conditions***

Under the Clean Air Act, EPA has established the National Ambient Air Quality Standards (NAAQS) for six air pollutants, which sets maximum allowable atmospheric concentration of the pollutants (EPA, 2024). The pollutants include carbon monoxide (CO), ozone ($O_3$), sulfur dioxide ($SO_2$), nitrogen dioxide ($NO_2$), airborne lead (Pb), and particulate matter ($PM_{10}$ and $PM_{2.5}$). The State has additionally established an ambient air standard for hydrogen sulfide. The State of Hawaiʻi Department of Health (HDOH) Clean Air Branch (CAB), provides a Statewide monitoring program for NAAQS and State criteria pollutants (HDOH, 2024a). HDOH also regulates fugitive emissions outlined in HAR Section 11-60.1-33, which states:

> *11-60.1-33(a) "No person shall cause or permit visible fugitive dust to become airborne without taking reasonable precautions."*
>
> *11-60.1-33(b) "...no person shall cause or permit the discharge of visible fugitive dust beyond the property lot line on which the fugitive dust originates" except when implementing the best practical operation or treatment.*
>
> *11-60.1-33(c) "...no person shall cause or permit visible fugitive dust emissions equal to or in excess of twenty percent opacity for more than twenty-four individual readings recorded during any one-hour period..."*

The HDOH CAB has been monitoring ambient air quality in the State since 1957. The network is comprised of 14 monitoring stations on the islands of Oʻahu, Kaua'i, Maui, and Hawaiʻi. According to the 2023 Hawaiʻi Air Quality Data report, there are two State-maintained, special purpose air-monitoring stations on Maui at Kihei and Kahului, approximately 27 miles west and 32 miles northwest of the Project area in straight-line distance, but approximately 65 and 52 miles away by road (HDOH, 2024a). The stations monitor $PM_{2.5}$ typically associated with agricultural burning and wildfires. The report recorded one instance of $PM_{2.5}$ exceeding allowable levels in January 2023 in Kahului. There were no recorded exceedances in Kihei; however, data at this station is considered preliminary as it was not active until August 2023 when it was restarted to monitor wildfire impacts. Overall, however, the island of Maui and entire State are currently classified as in "attainment" for all Federal and State standards based on air monitoring data.

Present air quality in the Project area is primarily affected by air pollutants from motor vehicles. Natural sources of air pollution emissions that could affect the Project area but cannot be quantified very accurately include the ocean (sea spray), plants (aero-allergens), wind-blown dust, agricultural activities, or distant volcanoes on Hawaiʻi Island.

In addition to conventional air pollutants, atmospheric GHGs are compounds in the Earth's atmosphere which play a critical role in determining temperature near the Earth's surface. GHGs include carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), and several chlorofluorocarbons. GHGs are commonly quantified in the equivalent mass of $CO_2$, denoted $CO_2e$, which considers the global warming potential of each individual GHG compound.

***Potential Impacts and Mitigation Measures***

The Project is intended to replace the existing single-lane bridges with new structures that will also support single-lane traffic. As such, the Project is not anticipated to induce demand and contribute to increases in vehicle traffic volume or changes in vehicle mix (See Section 3.10.1 for details on vehicle traffic forecasting). The Proposed Action would not contribute to a long-term increase in vehicle emissions that impact air quality or emit substantial GHGs.

The Project would result in short-term, localized impacts to air quality from fugitive dust and exhaust emissions caused by diesel-powered construction equipment and construction activities, such as demolition of existing structures, soil disturbance, grading, transport of materials, structure construction, and paving. Construction of temporary bridges during construction would shift vehicle traffic and associated emissions to a new location in the same general area. However, construction-related impacts would be temporary and minimal due to the construction timeframe of two years and the relatively small construction footprint, which would constrain the number of construction vehicles and equipment operating on-site at any given time, thereby reducing the potential for concentrated emissions.

Construction activities will comply with measures included in HAR Chapter 11-60.1, "Air Pollution Control," including HAR Section 11-60.1-33 Fugitive Dust, as well as in Maui County Code (MCC) Chapter 20.08, "Soil and Erosion and Sedimentation Control." An Erosion and Sediment Control Plan that incorporates BMPs to control airborne emissions and protect air quality during construction will be developed. These BMPs may include, but are not limited to, applying water during construction; stabilizing and revegetating disturbed soils as soon as practicable; covering material-transport trucks; stabilizing construction entrances at all exit points onto paved roads; and designating concrete washout areas. Additionally, construction equipment engines will be properly maintained and use appropriate exhaust controls to reduce particulate matter from exhaust. The Project will also comply with construction BMPs recommended by HDOH CAB, including developing a dust control management plan, phasing of construction, and locating potential dust-generating equipment in areas of the least impact.

## 3.3 Topography, Geology, and Soils

***Affected Environment and Existing Conditions***

The Island of Maui formed when Haleakalā (East Maui Volcano) and Mauna Kahālāwai (West Maui Volcano) merged (Foote et al., 1972). The Project sites are located in East Maui, an area dominated by the 10,025-foot-high Haleakalā volcano. The volcano is considered to be in the post-shield alkalic stage of Hawaiian volcanism, meaning there is a greatly reduced eruption rate (USGS, 2023). The youngest lava flow is located southwest of the volcano and likely erupted between 1420 and 1620. The Project sites are located east of Haleakalā. Volcanic soils at the Project site are of older Kula Volcanics dating from approximately one million years ago. More recent flows (dating between 5000 and 13,000 years ago) from the East Rift Zone descended through Kīpahulu and Waiohonu Valleys, extending into the Project areas (USGS, 2023).

Topographic maps indicate that the Project sites are surrounded by steep, vegetated terrain with various streams flowing beneath the bridges and into the ocean. The South Wailua Bridge is located at approximately 200 feet ASL. Land mauka of the bridge is characterized by sleep slopes that transition into a valley makai of the Project site before descending sharply into the ocean, with the exception of flatter terrain where Honolewa Stream discharges into the ocean and within the gulch where Waiua Stream and Pāʻihi Stream meet.

The topography surrounding Waikakoi similarly descends from the mauka into the ocean, with more gradual slopes that become steeper near the coastline. The Waikakoi Bridge site is located approximately 300 feet ASL. See Figure 3-3 for the area topography.

The U.S. Dept. of Agriculture-Natural Resources Conservation Service (USDA-NRCS) maps soils at Waikakoi Bridge as Maka‘alae extremely stony silty clay, 7 to 25 percent slopes (MJD; USDA-NRCS, 2022). Maka‘alae series soils are typically well-drained soils developed in volcanic ash (Foote et al., 1972). Approximately 3 to 15 percent of the total MJD soil surface is covered by stones and are typically used for pastures, as well as wildlife habitat and water supply.

The South Wailua Bridge is entirely comprised of Rough mountainous land (rRT); USDA-NRCS, 2022). The rRT land surrounding South Wailua Bridge is characterized by mountainous terrain, deep valleys, very steep side slopes, and many drainage channels (Foote et al., 1972). The soil mantle thickness ranges from 1 to 10 inches over saprolite, which is typically soft and permeable to roots and water. Twenty to 40 percent of rRT total land acreage consists of rock land, rock outcrop, soil slips, and eroded areas. The land type is often used for water supply and wildlife habitat, as well as recreation.

Neither of these soil types are listed as hydric soil in the Soil Data Access, Hydric Soils List – Island of Maui (USDA-NRCS, n.d.). Figure 3-4 shows the area soils. Additional information on natural and geological hazards can be found in Section 3.7.

***Potential Impacts and Mitigation Measures***

The Proposed Action would not have long-term adverse impacts to area geological or soil resources. The two new permanent bridge structures would be constructed in the same location as the existing structures, with no substantial changes to horizontal or vertical alignment of the existing roadway. This would avoid major alterations to the land, including rock cuts on the steeper slopes adjacent to the South Wailua Bridge. Each bridge superstructure would be comprised of a reinforced concrete deck supported by reinforced concrete tee girders. The bridges would be supported on each end by reinforced concrete abutments with deep micropiles, while CRM retaining walls would be installed at each end of the bridge decks for slope stability. Geotechnical investigations have been performed to inform design parameters for foundations, abutments, and slope treatments.

There would be short-term, minor to moderate impacts to area geological or soil resources from land and soil disturbance from construction activities, including the demolition of existing bridges, construction of temporary bypass bridges, grading, and excavation. The placement of the temporary bridge makai of the South Wailua Bridge makai of the permanent bridge locations would avoid rock cuts on the steep slopes on the mauka side, thereby minimizing the need for larger-scale earthwork. The temporary bridge structures will rest on reinforced concrete abutments with micropile foundations.

**Figure 3-3: Topography**

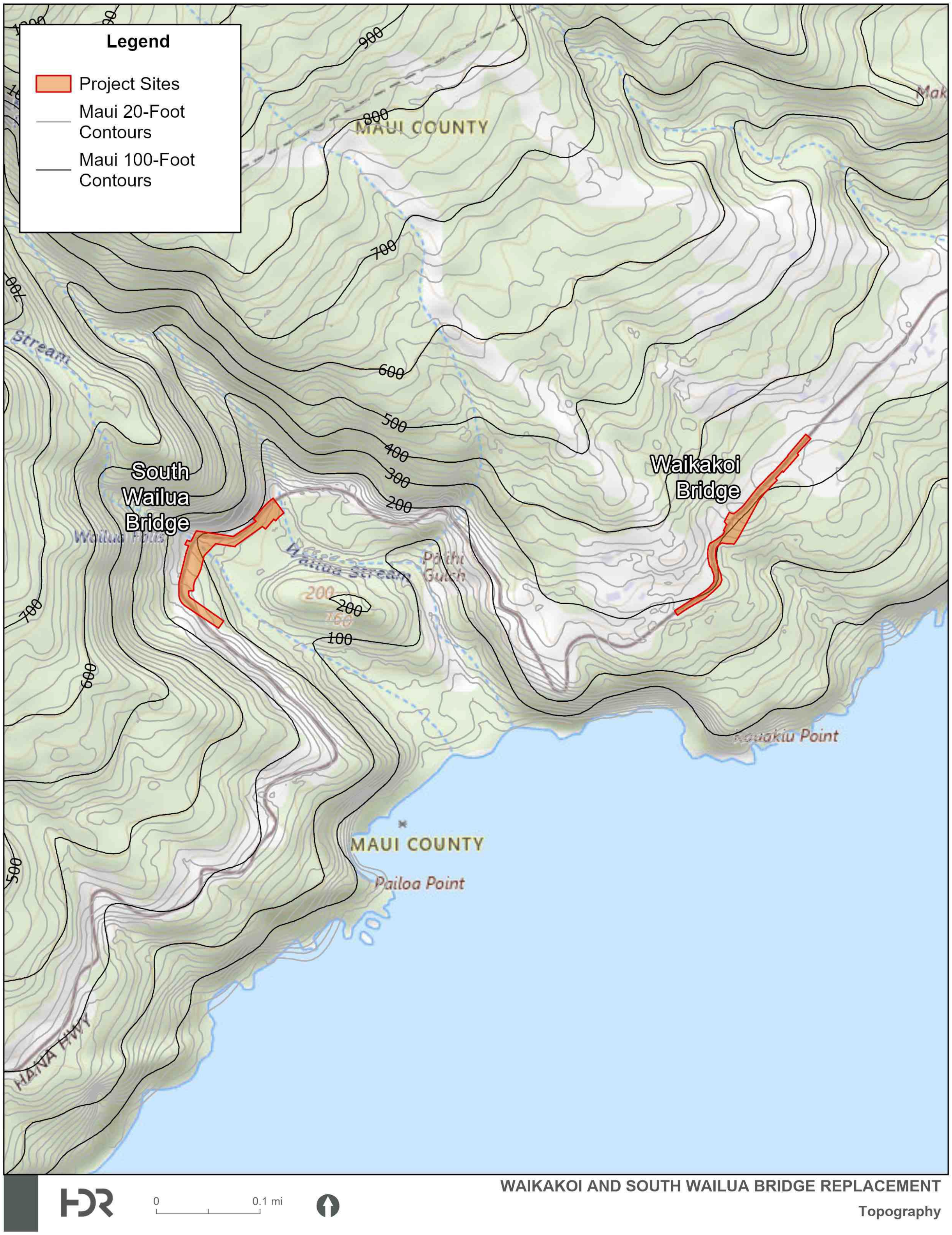
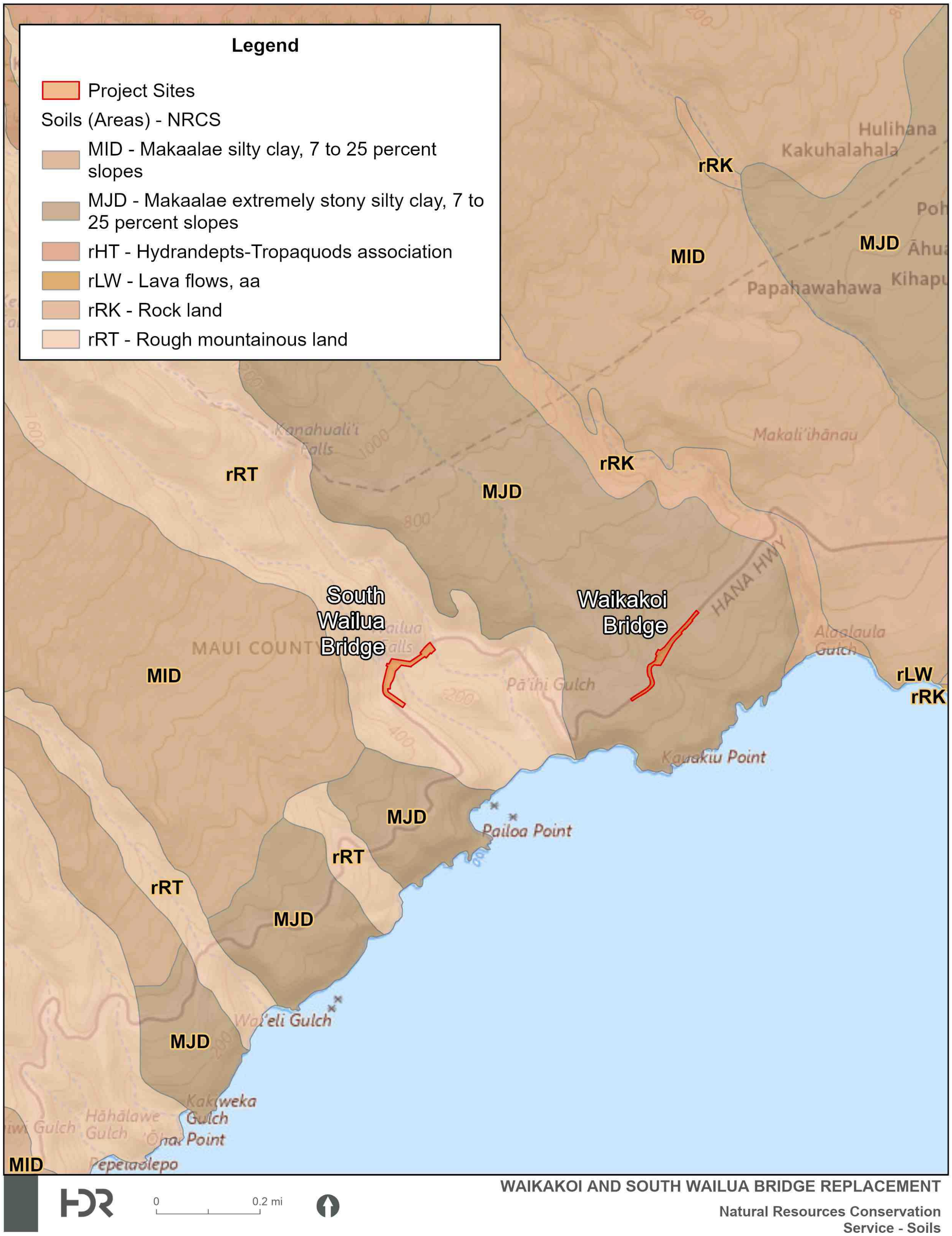


**Figure 3-4: Soils (USDA-NRCS)**



BMPs will be incorporated to mitigate potential impacts to area geological and soil resources during Project construction. Temporary gabion basket retaining walls will be installed at each bridge approach to mitigate potential erosion. Retaining walls and embankment protections will be installed where necessary to prevent erosion and provide slope stability. During construction, temporary erosion control measures such as compost filter socks, silt fences, and stabilized construction entrances will be used to protect against erosion. Excavation work will require stabilizing the ground to prevent potential slides, cave-ins, and settlement. Slopes and exposed areas will be resodded or replanted as soon as practicable to mitigate erosion; geotextile and hydromulch grassing would be incorporated. Grading work will be done in accordance with Chapter 20.08 of the Maui County Code of Ordinances, 2011, as amended, which relates to soil erosion and sediment control. Section 3.2.2 describes the Erosion and Sediment Control Plan that will be developed prior to construction.

## 3.4 Agricultural Lands

***Affected Environment and Existing Conditions***

As discussed in the previous section, soils mapped at Waikakoi Bridge are MJD, which are typically well-drained soils with moderate permeability and can be used for pastures (USDA-NRCS, 2022; Foote et al., 1972). The soils are typically located in low, rough mountain slope areas. According to the USDA-NRCS Soil Data Access (SDA) Prime and other Important Farmlands database, MJD soils are not considered prime farmland soils (USDA, 2025). The South Wailua Bridge area is entirely rRT. The soil type is located in steep mountainous terrain with deep valleys and numerous drainage channel and is characterized by a relatively thin soil mantle over permeable saprolite. According to the USDA-NRCS SDA, rRT soils are not considered prime farmland soils (USDA, 2025).

The State Land Use Commission (LUC) has designated some of the lands surrounding the Waikakoi Bridge as Agricultural (Figure 1-4; LUC, 1974). Lands directly surrounding the South Wailua Bridge are designated as Conservation, with Agricultural land located beyond. Agricultural District land is further classified according to Land Study Bureau (LSB) soil ratings, which assesses soil properties and productive capabilities. The five LSB classes include Class A, B, C, D, or E, with Class A representing the most productive soils and Class E representing the least productive soils. Soils with the Waikakoi Bridge area are rated LSB D, while soils within the South Wailua Bridge area are rated LSB E (Hawaiʻi Statewide GIS Program, 2013).

Important Agricultural Lands (IAL) refers to a State land use designation for a select class of farmland intended to be used in the long-term for active agricultural production. The IAL designation is a supplemental State land use classification for an exclusive sub-set of high-quality farmland within the State Land Use Agricultural District. There is no IAL in the vicinity of the Project area (Hawaiʻi Statewide GIS Program, 2014a).

***Potential Impacts and Mitigation Measures***

Because there are no LSB-classified productive soils, IAL, or prime farmland in the Project area and the Proposed Action is intended to replace the existing bridge structures in their existing locations, there are no anticipated long-term impacts to Agricultural District lands. Additionally, the Proposed Action would require no permanent ROW acquisition or land conversion of agricultural land.

Construction of the bypass bridges would require temporary construction easements outside of County ROW, within land designated as Agricultural District. There may be short-term, minor, and localized impacts to areas designated as Agricultural District due to construction activities such as land and soil disturbance. However, the affected lands are not classified as highly productive; therefore, adverse impacts to Agricultural District lands or resources are not anticipated. Temporary construction impacts would be mitigated through the use of BMPs to control erosion, prevent pollution, and minimize changes to soils. See detailed discussion of these BMPs in Sections 3.3 and 3.5.

## 3.5 Surface Waters

***Affected Environment and Existing Conditions***

A Jurisdictional Waters Determination survey was conducted by AECOS, Inc. (AECOS) in January 2023, and the findings were described in the accompanying Jurisdictional Waters Determination Report (Appendix D). The report describes surface water resources in the Project area and documents the results of the Jurisdictional Waters delineation, as summarized below.

**Streams**

The Project bridge locations are within the Wailua watershed in the Kahikinui Region of East Maui and located below Haleakalā Crater. The Wailua watershed occupies approximately 1.9 square miles along East Maui and has a maximum elevation of approximately 3,734 feet ASL. The watershed drains a portion of a large plateau between the larger Waiohonu Valley to the north and the Kīpahulu Valley to the east. The watershed drains into the Pacific Ocean, terminating at Wailua Bay along the Hāna coastline. The Atlas of Hawaiian Watersheds describes land use within this watershed as 73 percent conservation, 27 percent agriculture, and less than one percent urban (Parham et al., 2008). Three perennial streams are within or in the vicinity of the Project area, including the Wailua Stream, Honolewa Stream, and Pāʻihi Stream (Figure 3-5).

The Project involves two bridges that cross the following surface waters along Hāna Highway:

- **Waikakoi Stream at Waikakoi Bridge No. 26:** The stream feature that passes beneath Waikakoi Bridge is listed as Waikakoi Stream in the NBI (USDOT-FHWA, n.d.) and generates as a blue-line feature (which indicates a stream that is likely perennial flowing) when calculated with the USGS StreamStats GIS application (USGS, 2017a). However, it is not mapped in the U.S. Geological Survey (USGS) topography map (USGS, 2017b), National Hydrography Dataset (USGS, 2022), and U.S. Fish and Wildlife (USFWS) National Wetlands Inventory (USFWS, n.d.-a) and is therefore not visible in Figure 3-5. A pipeline diverts water from Wailua Stream to Hāna Town and crosses the Waikakoi drainage basin at approximately 1,000 feet ASL, approximately 0.5-mile upslope of the Waikakoi Bridge. Hāna Highway crosses Waikakoi Stream at the Waikakoi Bridge at approximately 300 feet ASL. Topography maps and aerial imagery indicate the stream terminates into the Pacific Ocean from a sea cliff at Kauakiu Point less than 980 feet downslope from the Waikakoi Bridge. The USDA-NRCS maps soils in this area as MJD, which is not listed as hydric soil.

**Figure 3-5: Surface Waters (Department of Land and Natural Resources, Division of Aquatic Resources, 2022)**

- **Honolewa Stream at South Wailua Bridge No. 23:** Honolewa Stream, alongside Wailua and Pāʻihi streams, drains a montane bog that spans the upper watershed and several adjoining valleys. Kekuapoʻowai Falls and Wailua Falls (not located on Wailua Stream) occur on Honolewa Stream. Wailua Falls is visible upstream of South Wailua Bridge, making it a popular tourist attraction. Honolewa Stream passes beneath South Wailua Bridge at approximately 200 feet ASL and discharges over an ʻiliʻili (pebble) beach into Wailua Cove and the Pacific Ocean approximately 1,800 feet downstream of the bridge. The outlet for the combined flow of Wailua and Pāʻihi streams is approximately 330 feet west of the Honolewa Stream mouth. The USDA-NRCS maps soils along Honolewa Stream as rRT, which is not listed as hydric soil.

**Federal Jurisdictional Waters Delineation**

Jurisdictional Waters of the U.S. are surface waters that are regulated by Federal jurisdiction as authorized by the Clean Water Act (CWA) and the Rivers and Harbors Act (RHA). Authority over these waters is granted to various Federal agencies, including the EPA and the U.S. Army Corps of Engineers (USACE), which maintains permit authority for some actions that impact Jurisdictional Waters (33 CFR 323).

Jurisdictional Waters include non-navigable tributaries that contribute relatively permanent flow to traditional navigable waters (TNWs). Hydrography datasets analyzed by AECOS as part of the study indicate that Honolewa Stream and Waikakoi Stream have a direct surface connection to the Pacific Ocean, which is a TNW. Additionally, Honolewa Stream contributes perennial, or year-round, flow to the Pacific Ocean (USGS, 2022; Parham et al., 2008). Waikakoi Stream has little relevant data and the duration of flow (perennial vs. intermittent) remains to be verified. As such, streams within the Project area are considered to be Jurisdictional Waters of the U.S.

The tributaries at the Project sites are elevated well above the influence of ocean tidal ebb and flow. The extent of Federal jurisdiction of non-tidal tributaries is drawn at the Ordinary High Water Mark (OHWM). The OHWM for each tributary was identified by AECOS in accordance with the *USACE Regulatory Guidance Letter 05-05: Ordinary High Water Mark Identification* (USACE, 2005). The mapped OWHM delineations are described in Appendix D.

No wetlands are identified in the USFWS National Wetlands Inventory (Figure 3-6). Based on the existing topography, mapped soils, hydrology, and observations of vegetation and site-characteristics in the field, no jurisdictional wetlands were determined to occur in or adjacent to the Project area.

**Clean Water Act, Section 303(d)**

The CWA requires states to collect and review surface water quality data and related information to prepare and submit to the EPA biennial lists of impaired waterbodies (i.e., not meeting State water quality standards). According to the 2024 State of Hawaiʻi Water Quality Monitoring Assessment Report, neither the Waikakoi Stream nor the Honolewa Stream are listed as impaired waterways (HDOH, 2024b).

***Potential Impacts and Mitigation Measures***

At each bridge, Project activities would involve excavation, grading, and construction above the streams and along or on top of streambanks. Minor encroachment into the streams may occur for purposes of BMP installation to prevent sediment from entering the streams or to provide a barrier between the adjacent work zone and flowing water. Due to the steep topography at each bridge site, most notably at the South Wailua Bridge, slope stabilization measures and BMPs will be required to support offline bridge construction and protect water quality.

Stormwater runoff will be minimized through compliance with State and County regulations for water quality. To mitigate potential stormwater runoff during construction and protect water quality, a site-specific Erosion and Sediment Control Plan with temporary BMPs to protect water quality would be developed and implemented, and may consist of, but not be limited to, the use of stabilized construction ingress/egress, compost filter sock perimeter controls, and silt fences. Additionally, a stormwater pollution prevention plan (SWPPP) will be developed.

According to the survey, Honolewa Stream and Waikakoi Stream are perennial tributaries to the Pacific Ocean and are therefore Jurisdictional Waters of the U.S. regulated under Section 404 of the CWA. Demolition of the existing bridges involves the removal of existing bridge piers and columns, which are within the OHWM. The foundation and footings of the columns would remain in place, minimizing impacts to water quality and biological resources. During column removal, installation of temporary BMPs within the stream are anticipated to be required to isolate work areas and divert the streams to maintain flow and allow for fish passage. BMPs are preliminarily anticipated to include sandbags and plastic sheeting to divert the streams around bridge columns. The BMPs would remain in place for the duration of in-water demolition work and removed upon completion.

DPW is consulting with USACE Honolulu District, which oversees all Hawaiian Islands, regarding the proposed temporary BMPs and the required approvals under Section 404 of the CWA. The USACE has preliminarily indicated that the Project could be authorized under a Nationwide Permit (NWP) No. 3. Notably, the most recent set of NWPs administered by the USACE Honolulu District will expire on March 14, 2026. Final permitting requirements pursuant to Section 404 of the CWA will be confirmed as the Project progresses.

When work requires a Section 404 permit, a Section 401 Water Quality Certification is also required. The HDOH CWB issued the Blanket Section 401 WQC, which became effective April 28, 2022, to the USACE for certain 2021 NWPs, including the NWP No. 3. It is anticipated that HDOH CWB will reevaluate the Blanket Section 401 WQC based on the reissuance of the NWPs in 2026, if applicable. Additionally, the need for a State Stream Channel Alteration Permit (SCAP) is anticipated and will be confirmed by the State DLNR CWRM.

Long-term impacts to the quality and physical characteristics of surface waters are not anticipated. Permanent fill within Jurisdictional Waters is not anticipated and new bridge components would be located outside of the stream. The Project has been designed to avoid and minimize effects on Jurisdictional Waters to the greatest extent practicable, and efforts will continue through the final design.

**Figure 3-6: USFWS National Wetlands Inventory**

# 3.6 Flora and Fauna

## 3.6.1 Botanical Resources

***Affected Environment and Existing Conditions***

The Waikakoi Bridge is located within a lightly developed area in Kīpahulu, which includes homes on the surrounding parcels. As such, ornamental plants are recorded as part of the vegetation. A forest of tall trees is present on the downslope side of the Hāna Highway near the bridge. The South Wailua Bridge crosses a moderately deep gorge surrounded by forest with a variety of tall trees and dense growth of herbs, shrubs, vines, and bamboo. The Köppen Climate Types of Hawaiʻi indicate that the Project area consists of a tropical rainforest (OSU-PRISM Climate Group, n.d.). Both sites are covered in broadleaf evergreen trees, predominantly of non-native species.

A Natural Resources Assessment for the Project was prepared by AECOS in March 2025 and is provided as Appendix E. The assessment included a pedestrian survey of the Project site, including the bridges, an approximately 5.8-acre area surrounding the Waikakoi Bridge, and an approximately 4.7-acre area surrounding the South Wailua Bridge. The assessment also considers information collected during a previous survey of the Waikakoi Project site conducted by Haley Aldrich in 2022. During AECOS' survey, 110 plant species were observed in the two study areas, 70 of which are listed. Haley Aldrich's survey identified an additional 12 species in these areas that were not recorded during AECOS' survey, for a total of 82 listed species occurring in the Project areas.

Of the 82 listed plant species, four are considered indigenous and two are endemic. The endemic species include the kikawaiō (*Christella cyatheoides*) identified at the Waikakoi Bridge survey area and niʻaniʻaniau (*Nephrolepis exaltata hawaiiensis*) identified at the South Wailua Bridge area. Two of the four indigenous natives are fern or fern allies referred to as kāʻapeʻape (*Cyrtomium caryotideum*) and moa (*Psilotum nudum*). Both moa and niʻaniʻaniau were observed in the Waikakoi Bridge area and are commonly encountered in a range of habitats across Hawaiʻi. The other two indigenous species recorded include the pōpolo (*Solanum americanum*) at Waikakoi Bridge and kāʻeʻe or sea bean (*Mucuna gigantea*) at South Wailua Bridge. A total of nine early Polynesian-introduced plant species, referred to as "canoe plants," were observed. Eight occur in the South Wailua Bridge area, four in the Waikakoi Bridge area, and three in both areas. Each of the nine species are considered common plants in the Hawaiian Islands.

***Potential Impacts and Mitigation Measures***

The Waikakoi Bridge survey area has minimal indigenous and endemic plants present in the area. None of the species observed are of conservation interest or listed as threatened or endangered under State or Federal statutes (DLNR, 1998; USFWS, n.d.-b, n.d.-c). The South Wailua Bridge survey area has a few indigenous/endemic natives and a large number of early Polynesian-introduced species, presumably reflecting less alteration of the forest since ancient times. However, no listed species were documented during the pedestrian survey. The Project will involve the removal of some trees to conduct demolition of the existing bridges and construction of the temporary and new bridges. Existing trees will remain in place to the extent practicable. As no protected plant species are anticipated to be affected, no mitigation measures are proposed.

## 3.6.2 Aquatic Fauna

***Affected Environment and Existing Conditions***

During the Natural Resources Assessment conducted by AECOS (Appendix E), the only aquatic fauna observed was the common guppy or rainbowfish (*Poecilia reticulata*), which was noted as present in the stream under the Waikakoi Bridge.

The aquatic fauna in the Wailua Stream within the South Wailua Bridge survey area is moderately diverse. Native aquatic species observed included ʻoʻopu naniha (*Stenogobius hawaiiensis*), ʻoʻopu nākea (*Awaous stamineus*), and hihiwai (*Neritina granosa*). The introduced Tahitian prawn (*Macrobrachium lar*) is commonly found in this stream. Two dragonflies, the native (*Anax strenuus*) and non-native Chinese dragonfly (*Crocothemus servilia),* were observed flying about the large pool at the base of Wailua Falls. No damselflies were observed in the vicinity of either stream.

The Hawaiʻi Stream Atlas (Parham et al., 2008) also provides data for Wailua Stream collected during surveys conducted by the State Department of Aquatic Resources, which include the ʻoʻopu nākea and Tahitian prawn identified in the AECOS surveys, in addition to the non-native Chinese mystery snail (*Cipangopaludina chinensis*), *Pila conica*, and Apple snail (*Pomacea canaliculate*), as well as the endemic ʻoʻopu alamoʻo (*Lentipes concolor*) and ʻoʻopu nōpili (*Sicyopterus stimpsoni*).

In summary, the aquatic fauna observed in Wailua Stream within the South Wailua Bridge survey area suggests a healthy stream system, as would be anticipated this region of East Maui. This stream is rated high by Parham et al. (2008), primarily for the absence of introduced fishes. In contrast, the presence of only a single, introduced poecilid fish at the Waikakoi Bridge indicates the opposite for the Waikakoi Stream system.

Approximately 26 species and subspecies of damselflies occur in Hawaiʻi. Although damselflies are considered terrestrial flying insects, all have aquatic juvenile stages and most tend to remain close to aquatic environments as adults. The genus, *Megalagrion*, is endemic to Hawaiʻi and 23 species and subspecies are currently recognized (Polhemus and Asquith, 1996). Of these, six are listed as endangered (USFWS, n.d.-b, n.d.-c), including *M. xanthomelas*, *M. nesiotes*, and *M. pacificum*. Species known to have populations in the Project vicinity are *M. calliphya*, *M. hawaiiense*, *M. nesiotes*, and *M. pacificum*. Of these four species, *M. pacificum* is a listed species that utilizes pools in overflow channels for breeding. Additionally, *M. nesiotes* is a listed species that may breed in vegetation but is not necessarily associated with stream habitats (Polhemus and Asquith, 1996).

***Potential Impacts and Mitigation Measures***

Potential impacts to aquatic fauna and their habitats are related to temporary construction activities. BMPs for work in aquatic environments will be implemented and maintained during construction to minimize the degradation of water quality and potential impacts to aquatic species. Proposed BMPs may include, but would not be limited to, the following:

- Downstream and upstream migration pathways would be maintained to the extent practicable during work within the streams by establishing fish-exclusion areas to protect aquatic species and allow continued passage where feasible. During the demolition of existing bridges, sandbags and plastic sheeting are anticipated to be used to divert the streams around bridge columns to maintain flow, allow for fish passage, and protect water quality. The foundation and footings of the columns would remain in place, minimizing impacts to water quality and biological resources. DPW is consulting with USACE regarding the proposed temporary BMPs and the required approvals under Section 404 of the CWA. Final permitting requirements will be confirmed as the Project progresses.

- New structures would not include drains or grates that may entrap drifting larvae, nor overhanging culverts that may obstruct upstream movement of recruiting juveniles.

Additionally, to mitigate potential stormwater runoff during construction and protect water quality, a site-specific Erosion and Sediment Control Plan would be developed and implemented, and may consist of, but not be limited to, the use of stabilized construction ingress/egress, compost filter sock perimeter controls, and silt fences.

No damselflies were identified in the Project area. Additionally, the listed *M. nesiotes* and *M. pacificum* are unlikely to breed in the Project area due to their preference for breeding in vegetation and overflow pools, respectively. As such, no impacts from Project activities on listed *Megalagrion* species are anticipated.

### 3.6.3 Birds

***Affected Environment and Existing Conditions***

As part of the Natural Resources Assessment conducted by AECOS (Appendix E), an avian (bird) survey was conducted at each bridge site. Given that the bridges are less than one mile apart and consist of similar, mostly forested habitat, data was combined from both count stations to provide a more complete picture of avifauna present within the Project areas.

A total of 39 individual birds of 11 species, representing eight separate families, were counted during the survey. Each of the 11 species recorded is alien to the Hawaiian islands. Avian diversity and densities are characteristic of the locations and vegetation present within the Project sites. Three species, including the Warbling White-eye (*Zosterops japonicus*), Scaly-breasted Munia (*Lonchura punctulata*), and Northern Cardinal (*Cardinalis cardinalis*), accounted for 54 percent of all birds recorded during station counts. No waterbirds were observed during the survey.

***Potential Impacts and Mitigation Measures***

Currently, the high level of human activity at Wailua Falls and Honolewa Stream by hundreds of tourists and local residents using the pools on a daily basis reduces the likelihood of listed waterbirds frequenting the area. The continuous presence of people, along with noise, movement, and direct water use, creates conditions that are generally unsuitable for waterbirds, which typically require undisturbed habitats for foraging and nesting. As a result, no suitable waterbird habitat occurs under or close to the Waikakoi Bridge.

Protected night-flying seabirds in Hawaiʻi include the Hawaiian Petrel (*Pterodroma sandwichensis*), Wedge-tailed Shearwater (*Ardenna pacifica*), Newell's Shearwater (*Puffinus newelli*), and Band-rumped Storm-petrel (*Hydrobates castro*). Hawaiian Petrel and Newell's Shearwater nest in upland, mountainous habitat. No suitable nesting habitat for seabird species occurs in the Project areas; however, it is possible that seabirds may fly over the areas.

In the summer and fall seasons, night-flying seabirds (especially fledglings) transiting to the sea from inland locations can become disoriented by exterior lighting. When disoriented, these birds can collide with man-made structures or with the ground. If individuals do not survive the impact or are left stunned or injured, birds are vulnerable to predation by feral mammals. The primary cause of mortality of the four protected species is predation by alien mammalian species at nesting colonies. Collision with man-made structures is considered the second most significant cause of mortality of these Hawaiian seabirds.

To mitigate potential impacts to Hawaiian seabirds that may be in the Project area during construction, the following mitigation measures are anticipated to be implemented:

- In the event that night-time construction is required, lighting will be "dark sky compliant" in accordance with State DLNR guidance (DLNR-DOFAW, 2016). Lights will be placed on poles high enough to allow lighting to point directly at the ground. Lights on structures will also point directly downward and, where possible, placed under eves to reduce upward glare.
- Outdoor lighting will be fully shielded such that the bulb can be seen only from below the light structure.
- To the extent practicable, night-time construction would be avoided during the seabird fledging season, which extends from September 15 through December 15.

### 3.6.4 Mammals

***Affected Environment and Existing Conditions***

Mammalian fauna identified by AECOS in the Project area is consistent with the habitats present in this location of Maui. During surveys conducted for the Project, two terrestrial mammalian species were observed: three small Asian mongoose (*Herpestes javanicus*) were observed along the roadways, and several dogs (*Canis lupus familiaris*) were audibly heard from properties outside of the survey areas. It is expected that one or more of the four alien *Muridae* (rats and mice) currently established on the Island of Maui utilize the area to some extent.

It is possible that the native Hawaiian hoary bat or ʻōpeʻapeʻa (*Lasiurus cinereus semotus*) utilizes resources within the Project vicinities for foraging and roosting. This species is potentially ubiquitous in this part of Maui.

***Potential Impacts and Mitigation Measures***

Generally, impacts to the Hawaiian hoary bat may occur during the clearing and grubbing phase of construction. Suitable roost trees overhang the streams; however, this species of bat uses multiple roosts within a home territory. As such, the disturbance associated with trimming of branches is expected to be minimal. An exception might be during the bat pupping season; if a female bat carrying a pup is unable to rapidly vacate a roost tree that is being felled or if an unattended pup is unable to flee a tree that is being felled or trimmed. To avoid the potential for adverse impacts, woody vegetation taller than 15 feet would not be cleared during the bat pupping season between June 1 and September 15. Additionally, barbed wire would not be utilized for fencing associated with construction activities.

### 3.6.5 Critical Habitat

***Affected Environment and Existing Conditions***

Federally designated Critical Habitat is not present in the Project areas (USFWS, n.d.-d).

***Potential Impacts and Mitigation Measures***

No adverse impacts to Federally designated Critical Habitat are anticipated, and mitigation measures are not required.

## 3.7 Natural Hazards

### 3.7.1 Earthquake

***Affected Environment and Existing Conditions***

An earthquake is sudden displacement of rock in Earth's crust, which creates shaking that occurs in waves (Maui Emergency Management Services, 2020). Shaking from earthquakes can cause damage to structures, including failure and collapse, as well as cause landslides, liquefaction, and tsunamis. Earthquake magnitude (M) is measured according to the Richter Scale, ranging from less than 3.5 (not usually felt but recorded) to 8 or greater (can cause serious damage across several hundred kilometers).

Hawaiʻi experiences moderately low- to highest-hazard earthquake risk, with Maui rated moderately high (Maui Emergency Management Services, 2020). Small earthquakes associated with volcanic activity, called swarms, are usually too small to cause damage. Swarms associated with Haleakalā occur in East Maui.

The nearest notable fault line to the Project sites is the West Maui fault; other notable faults on the other islands of the County include the East Molokaʻi Fault and a fault system on Lānaʻi. A major earthquake occurring in another area of Maui Island, in addition to events on other islands, could potentially impact the Project area. For example, the most recently recorded earthquakes in Hawaiʻi were the M-6.7 Kīholo Bay and M-6.0 Māhukona earthquakes in October 2006 that centered off the northwest coast of Hawaiʻi Island. The earthquakes caused a number of landslides and rockfall events in Maui that resulted in $28.1 million worth of damages for the County.

The last recorded earthquake in Maui was the January 1938 Maui Earthquake (Maui Emergency Management Services, 2020). The M-6.9 earthquake's epicenter was in the East Maui area. There were some injuries but no recorded deaths or tsunami events. The Maui County Multi-Hazard Mitigation Plan Update considers a significant future earthquake event in Maui County to have a 1 to 10 percent annual probability of occurring due to the presence of active fault lines, as well as the proximity of the island to high-risk earthquake areas such as the Hawaiʻi Island.

Liquefaction occurs when saturated, loose, granular soils temporarily lose strength and stiffness in response to strong ground shaking, causing the soil to behave like a liquid. Maui County does not currently have a liquefaction susceptibility map. However, the National Earthquake Hazards Reduction Program (NEHRP) classifies soils that are more susceptible to liquefaction, which include Class D, E, and F soils (Maui Emergency Management Services, 2020). While there are Class D soils present on Maui Island, the Project area is underlain by Class B soils, which are typically less susceptible to liquefaction (Maui Emergency Management Services, 2015).

***Potential Impacts and Mitigation Measures***

Earthquake events often occur with little warning, and events elsewhere in Hawaiʻi have the potential to impact Maui. The Proposed Action will have a long-term beneficial impact to earthquake resilience by replacing structurally deficient bridges with new crossings that meet current structural and safety standards. Both the temporary construction bridges and permanent replacements will be constructed to meet appropriate seismic load requirements for an essential bridge, with foundation design informed by geotechnical investigations. Potential short-term impacts to soil stability during construction activities would be mitigated using BMPs. See Section 3.3 for details on these BMPs.

## 3.7.2 Hurricanes and Tropical Storm

***Affected Environment and Existing Conditions***

In Hawaiʻi, northeast tradewinds predominate throughout most of the year and generally range in velocity between 10 and 20 mph with tradewinds of 40 to 60 mph periodically occurring. When wind speeds exceed 70 mph, the storms are characterized as hurricanes. Hurricanes are also characterized by widespread heavy rains in excess of 6 inches, which may result in destructive flooding.

Hurricanes are classified according to “Category” according to wind speeds as follows: Category 1 hurricanes have wind speeds between 74 to 95 mph; Category 2 hurricanes have winds between 96 to 110 mph; Category 3 (major) have wind speeds of 111 to 129 mph; Category 4 (major) have wind speeds from 130 to 156 mph; and, Category 5 hurricanes have wind speeds exceeding 157 mph (Hawaiʻi Emergency Management Agency [HI-EMA], 2023). Category 1 and 2 storms are still dangerous and require preventative measures.

The weather associated with hurricanes and tropical storms can lead to storm surge, which is a rise of water generated by a storm, over and above the predicted astronomical tides. Storm surge occurs when water is pushed toward the shoreline by the force of winds from the storm (HI-EMA, 2023). Coastal areas are particularly vulnerable to storm surge due to extreme flooding caused by the rise in water level.

NOAA depicts storm surge flooding vulnerability for hurricane-prone coastal areas in the U.S., including Hawaiʻi, through its National Storm Surge Risks maps. Data shows that the site could be vulnerable in Category 3 or 4 hurricane events (NOAA, n.d.). The State of Hawaiʻi is located in the Central Pacific basin where hurricane season runs from June 1 to November 30 (HI-EMA, 2023).

Hurricanes occasionally approach the Hawaiian Islands but rarely reach the islands with hurricane force wind speeds. Records show that strong windstorms have struck all major Hawaiian Islands. The first recognized hurricane in Hawaiian waters was Hurricane Hiki, a Category 4 storm that hit in August 1950. Since that time, five hurricanes have caused serious damage in Hawaiʻi: Nina (1957), Dot (1959), ʻIwa (1982), Estelle (1986), and ʻIniki (1992).

On the Island of Maui, the most recent tropical cyclone to make landfall was Tropical Storm Olivia on September 12, 2018. The island has also been subject to indirect effects such as heavy rain, strong winds, and storm surge when storms pass close to the Hawaiian Islands.

The County has developed a Multi-Hazard Mitigation Plan as part of an ongoing effort to reduce the negative impacts and costs from damages associated with natural hazards, such as floods, hurricanes, and sea level rise (Maui Emergency Management Services, 2020). According to the plan, the Hāna community planning area is vulnerable to various types of natural hazards. Notably, Hāna experiences flooding from heavy rainfall events on windward mountain slopes, and from hurricanes and tropical storms. In this region, it is common for heavy rainfall to trigger landslides and rockfalls throughout the area; however, Hāna Highway is especially vulnerable. Such flooding results in road closures. In addition, damaging winds are also a frequent hazard within the Hāna region.

#### *Potential Impacts and Mitigation Measures*

It is difficult to predict when these events may arise, but it is reasonable to expect that future events will occur and may be increasing in frequency due to global climate change. The entire State is vulnerable to the damaging impacts of hurricanes. Inland areas, especially those in the 1 percent and 0.2 percent annual chance flood areas designated by the Federal Emergency Management Agency (FEMA), are at risk due to heavy rain and flooding caused by storms. Neither of the Project sites are located within the 1 or 0.2 percent flood zones but are within FEMA Flood Zone X, which indicates areas of minimal flood hazard (see Figure 1-1 and Section 3.7.3). The Project site is no more or less vulnerable than the rest of Maui to the destructive winds and torrential rains associated with hurricanes.

The Proposed Action will have a long-term beneficial impact to resilience to winds, rains, and floods associated with hurricanes. The Project includes the replacement of structurally deficient bridges with new crossings designed to withstand wind and flood-related forces consistent with current structural and safety standards.  Both the temporary bypass and new permanent bridges will be constructed to accommodate appropriate wind loads, drainage capacity, and scour protection, supporting reliability of the road during severe weather events.

### 3.7.3 Flood Hazards

#### *Affected Environment and Existing Conditions*

The County experiences diverse flood hazards due to its topography, climate, and coastal exposure. Inland flood challenges in the County are primarily related to overflow of stream channels, overland flow, and standing water in areas with poor drainage (FEMA, 2015). High frequency, intense rainfall events common in Hawaiʻi contribute to stream channel overflow. These events are often exacerbated by the island's steep topography. Additional sources of flooding come from hurricane and tsunami events, which are discussed in Section 3.7.2 and 3.7.4, respectively. Additionally, coastal flooding from storm surge, high-wave flooding, and king tides occurs along all coastlines on Maui (Maui Emergency Management Services, 2020). There is also potential for coastal flooding associated with sea level rise, which is discussed in Section 3.7.5. Oftentimes, multiple types of flooding, such as coastal and stream/riverine flooding, can occur at the same time (Maui Emergency Management Services, 2020).

According to the Maui County Hazard Mitigation Plan, 21 inland flood events were reported in Maui County between 2014 and 2020 (Maui Emergency Management Services, 2020). All were categorized as flash floods, with some also experiencing stream flooding, and no damages, injuries, or deaths were reported. The area of Hāna has been identified as flood-prone by the

County and is considered particularly susceptible to inland high-velocity sheet flow floods, which have historically caused road damage. Based on historic events and expected future conditions, Hāna community planning area is considered to have a highly likely inland and coastal flood probability (Maui Emergency Management Services, 2020).

Infrastructure such as roads and bridges are highly vulnerable to the impact of floods. Flooding can lead to erosion, scour and undermine bridges, wash out roads, and overwhelm stormwater infrastructure. As discussed in Section 2.3.1, Waikakoi Bridge experienced a significant erosion event which washed away a portion of the CRM abutment and supporting soil, necessitating emergency repairs. Flooding may also trigger landslides that block or damage roadways, and the majority of reported flood impacts in Maui County are road closures. For example, during Hurricane Lane, Hāna Highway was blocked in several places due to landslides. When sections of a road are damaged or flooded during a hurricane, the entire system may be impacted.

There are 13 NBI bridges in FEMA Flood Hazard Areas and no NBI bridges within storm surge areas within the Hāna community planning area where the Project is located (Maui Emergency Management Services, 2020). Both the Waikakoi Bridge and South Wailua Bridge sites are outside of a Flood Hazard Area and located within a FEMA-designated Zone X floodplain, an area of minimal flood hazard located outside of the 0.2 percent annual chance floodplain (500-year flood event; FIRM Panel 1500030755F, revised September 19, 2012). See Figure 1-8. There is a small area east of the South Wailua Bridge site in Pāʻihi Gulch designated as Zone A, where the combined flow of Wailua Stream and Pāʻihi Stream gradually descends into the ocean. This zone corresponds to a 1 percent annual chance floodplain (100-year flood event), for which no base flood elevation is determined.

***Potential Impacts and Mitigation Measures***

All infrastructure in Maui County, whether located in coastal or inland areas, is considered at-risk of impacts from flooding (Maui Emergency Management Services, 2020). The proposed Project would enhance the resilience of County infrastructure against such hazards and create long-term beneficial impacts by upgrading structurally deficient bridges to meet current structural and safety standards. While the Project area is subject to inland flooding from stream overflow and flash flood events, the new structures will be designed to withstand such events. Additionally, the Proposed Action includes drainage improvements to the Project area as described in Section 2.4.5. Foundation design would be informed by geotechnical investigations and appropriate for local soil conditions. Any short-term impacts to soil stability during construction activities would be mitigated using BMPs, as described in Section 3.3. By replacing the bridges in the same locations with structures designed to meet current hydraulic and floodplain standards, the Proposed Action is not expected to cause adverse impacts to area flooding.

### 3.7.4 Tsunami Inundation

***Affected Environment and Existing Conditions***

Tsunamis consist of a series of large waves traveling at a high velocity created by submarine earth movements (FEMA, 2015). While landslides and volcanos can generate tsunamis, over 95 percent are caused by earthquakes (Maui Emergency Management Services, 2020). Tsunamis have had a devastating impact on Maui County in the past, especially in beach and low-lying coastal areas (FEMA, 2015). Tsunami events result in extensive beach and coastal erosion; damage to vegetation and crops from flooding ocean saltwater; and extensive damage to inland and coastal areas from the force of waves.

The majority of tsunamis that impact Hawaiʻi are not generated locally and instead form along the coasts of the Aleutian Islands, Kamchatka Peninsula, Japan, or South America (FEMA, 2015). Recent tsunamis that have impacted Maui County occurred in 1952, 1957, 1960, and 1964. The most destructive tsunami to impact Maui County occurred in April 1946, while the costliest tsunami occurred in March 2011 and resulted in nearly $6.4 million in damages.

Climate change may result in tsunami reach farther inland, as well as a loss of coral reef systems that would otherwise aid in dissipating wave energy against coastlines. The Maui County Hazard Mitigation Plan Update predicts a 1 to 10 percent annual chance of a tsunami hazard impacting the County, with larger, more damaging tsunamis occurring less frequently.

There is a Tsunami Evacuation Zone approximately 3 miles north of the Waikakoi Bridge site by way of the Hāna Highway. A tsunami wave height of 23 feet was recorded in 1946 near Hāmoa, north of the Project area, and a wave height of 16 feet was recorded in 1946 east of Alelele Stream near Kīpahulu, south of the Project site (Hawaiʻi Statewide GIS Program, 2014b). Figure 3-7 shows tsunami evacuation zones in relation to the Project area.

***Potential Impacts and Mitigation Measures***

Tsunami events are considered “likely” on Maui; however, more damaging events occur less frequently (Maui Emergency Management Services, 2020). The Hāna Highway is the sole transportation link connecting the urban center of Kahului to the remote communities of East Maui, including the Hāna area. Bridges on the alignment, including the Waikakoi Bridge and South Wailua Bridge, are critical components of the evacuation route for the nearby tsunami evacuation zone. By updating the bridge structures to meet current structural and safety standards under the Proposed Action, this Project would create a beneficial impact by improving the reliability of bridges during potential tsunami evacuation events. Additionally, foundation design would be informed by geotechnical investigations and appropriate for local soil conditions. Potential short-term impacts to soil stability during construction activities would be mitigated using BMPs. See Section 3.3 for details on the anticipated BMPs.

**Figure 3-7: Tsunami Evacuation Zones**

### 3.7.5 Climate Change and Sea Level Rise

***Affected Environment and Existing Conditions***

According to the *Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report* (2017) and the 2022 update, climate change-led warming of the atmosphere and ocean, as well as melting of glaciers and ice sheets, is contributing to sea level rise at increasing rates (Hawaiʻi Climate Change Mitigation and Adaptation Commission, 2022). Sea level rise exposure mapping in the report and the associated Hawaiʻi Sea Level Rise Viewer mapping tool (Hawaiʻi Climate Change Mitigation and Adaptation Commission, 2021) is based on the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (2013), which estimates that, if the rate of GHG emissions continues to increase at the current level, there would be a 3.2-foot rise in global sea level by 2100 under a high-end projection. Accordingly, the 3.2-foot Sea Level Rise Exposure Area (SLR-XA) provided in the Hawaiʻi Sea Level Rise Viewer is widely used by counties as a planning and policy benchmark. For example, a Maui County mayoral proclamation directs County agencies to use the 2017 report, Hawaiʻi Sea Level Rise Viewer, and SLR-XA in their plans, programs, and capital improvement decisions (County of Maui, 2018). Since the 2017 report, the scientific understanding of sea level rise has continued to advance and more recent scientific reports, including the IPCC Sixth Assessment Report (2021) and the NOAA-led interagency sea level rise report (Sweet et. al, 2022), increasingly point to 3 to 4 feet of sea level rise by 2100 as a mid-range rather than high-end scenario for Hawaiʻi (Hawaiʻi Climate Change Mitigation and Adaptation Commission, 2022). Hawaiʻi is becoming more susceptible to chronic coastal flooding and erosion due to rising sea levels and increasingly frequent El Niño events. Additionally, sea level rise may increase the extent of State land impacted by flooding during events such as tropical storms, hurricanes, and tsunamis, with higher base sea levels allowing these events to reach farther inland.

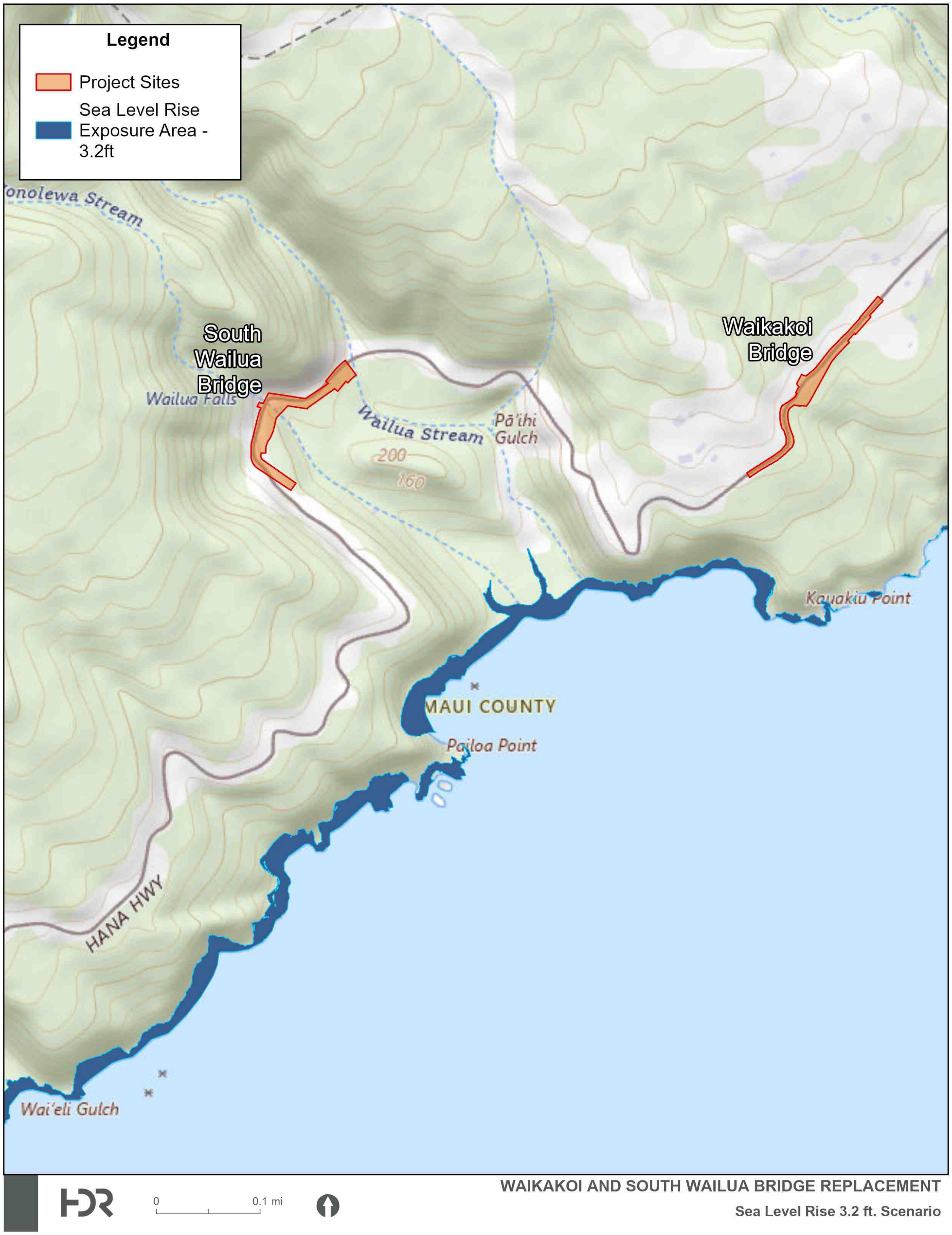
The Project site is inland from the coast at elevations ranging from approximately 200 to 300 feet ASL and is not located in the 3.2-foot SLR-XA (Figure 3-8).

In addition to contributing to sea level rise, the increased intensity and frequency of precipitation events associated with climate change may contribute to increased flooding impacts in Maui and the Project area (Maui Emergency Management Services, 2020). It is also anticipated that the frequency of hurricanes and tropical storms may increase due to warming ocean temperatures and more frequent El Niño and La Niña events associated with climate change. The impacts of flooding, hurricanes and tropical storms, and tsunamis are covered in detail in the previous sections.

***Potential Impacts and Mitigation Measures***

The Project sites are located less than 0.5 miles from the coastline but at elevations ranging from about 200 to 300 feet ASL. Additionally, the sites are not located in a mapped Sea Level Rise Exposure Area impacted by chronic flooding in a 3.2-foot sea level rise scenario (OCCL, p. 93, 2017; Pacific Islands Ocean Observing System [PacIOOS], 2025). By updating the bridge structures to meet current structural and safety standards under the Proposed Action, the Project would create a beneficial impact by improving resilience to storm or flooding events associated with climate change and flooding.

**Figure 3-8: 3.2-foot Sea Level Rise Exposure Area**



## 3.8 Hazardous Materials

### *Affected Environment and Existing Conditions*

According to the EPA's Toxic Release Inventory (TRI), there are 12 TRI sites in Maui County (County, 2020). However, none of these are located in the vicinity of the Project site or in East Maui. Additionally, the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. According to the PHMSA database, two "serious incidents" occurred in Maui County between 1990 and 2020, neither of which occurred in the vicinity of the Project site or in East Maui.

The State DOH's Hazard Evaluation and Emergency Response System (iHEER) maps all incidents (reported emergency releases), sites (discovery and remediation sites), and Hawaiʻi Emergency Planning and Community Right-to-Know Act (HEPCRA) facilities. No incidents, sites, or HEPCRA facilities are reported in the vicinity of the Project area (iHEER, 2025). The closest reported hazardous material (HAZMAT) release is located approximately 3.5 miles south of the Project at the former Kīpahulu Sugar Company site. The site was reported in 2012 due to the suspected historical release of herbicides (arsenical solutions) for weed control.

The Maui Hazard Mitigation Plan Update gave the Hāna community planning area a hazardous material incident probability rating of "Possible" – or a 1- to 10-percent annual chance of an incident (Maui Emergency Management Agency, 2020). Hazardous materials incidents may occur either at fixed sites or during transport and can include the release of substances that pose risks to human health, safety, or the environment. The plan gave the Hāna Highway a mobile primary impact buffer of 500 meters in its analysis, which represents the immediate area that could be impacted by HAZMAT spills on the roadway. Within the Hāna region, there are 1,520 at-risk parcels and 1,360 at-risk buildings within the 500-foot mobile primary impact buffer surrounding the highway, including parcels and buildings within the Project area. Along the Hāna Highway corridor, hazardous materials transport is limited to the routine movement of fuels, lubricants, and other regulated materials in commercial and personal vehicles.

### *Potential Impacts and Mitigation Measures*

There would be no long-term impacts to HAZMAT transport as the replacement bridge structures would support the same vehicle mix, routing, and traffic function as existing conditions. No long-term storage, handling, or treatment of hazardous materials would occur as part of the Project. Therefore, no impacts related to hazardous materials transport are anticipated. During construction, there is potential to encounter contaminated groundwater and soil, although no known hazardous sites are located within the Project area. Standard construction activities may involve the use of fuels or other materials that, if not contained properly, could result in localized spills. Risks will be minimized through implementation of BMPs described below.

Grading work will be done in conformance with applicable State and Federal requirements. All construction waste materials and trash will be collected and stored in a securely lidded metal dumpster or roll off container that will be emptied regularly. Hazardous waste materials will be disposed of in the manner specified by State and County regulations. The contractor will develop a spill-prevention plan to include measures to prevent and clean up spills. Additionally, site personnel will be made aware of spill prevention and cleanup procedures and emergency contacts will be designated.

## 3.9 Public Services

### 3.9.1 Police Protection

***Affected Environment and Existing Conditions***

Police protection services are provided by the MPD. The Hāna District police station is located at 4611 Hāna Highway, which is approximately 7.5 miles by road north of the Project site. Hāna is in MPD District III, which includes two beats (assigned patrol areas) in East Maui that cover Honomanū Bay, Keʻanae, Nāhiku, Hāna Town, Hamoa, Kīpahulu, and Kaupō (MPD, 2024). In 2023, there were 38 recorded violent crime incidents and 95 recorded property crime incidents in District III, a respective 22-percent and 5-percent reduction in incidents from the previous year (MPD, 2024).

***Potential Impacts and Mitigation Measures***

The Proposed Action is anticipated to have long-term, beneficial impacts to emergency response services due improved reliability and safety of the Waikakoi and South Wailua Bridge structures on the Hāna Highway.

There may be short-term impacts to traffic control and emergency service access through the Project area during construction. However, a bypass bridge will be provided during the construction period to mitigate potential impacts. Prior to Project construction, the Project team, traffic control lead, contractor, and representatives from MPD and the County Department of Fire and Public Safety will be held to coordinate service coverage, discuss the Traffic Control Plan, and develop contingency plans that ensure emergency access is maintained throughout construction and that impacts to response times are minimal. During construction, traffic flow will be managed using flaggers in accordance with the finalized Traffic Control Plan and applicable County requirements. Additional BMPs related to traffic control and diversion can be found in Section 3.10.1.

### 3.9.2 Fire Protection

***Affected Environment and Existing Conditions***

Fire protection services for the County of Maui are provided by the Department of Fire and Public Safety. The nearest fire station to the Project is Hāna Fire Station is located at 4655 Hāna Highway, approximately 7.5 miles north of the Project by road. The next-closest fire station to the Project is the Kula Fire Station located in the town of Kula, approximately 40 miles northwest of the Project. Fire department services include responding to fires, hazardous material incidents, motor vehicle accidents, rescues, and medical emergencies (County, n.d.-a).

***Potential Impacts and Mitigation Measures***

The Proposed Action will not adversely impact fire service and is anticipated to have long-term, beneficial impacts to within the Project area due improved reliability and safety of the Waikakoi and South Wailua Bridge structures on the Hāna Highway.

There may be short-term impacts to traffic control and emergency service access through the Project area during construction. However, a temporary bypass bridge will be provided during the construction period to mitigate potential impacts. The temporary bridge will be designed to accommodate Department of Fire and Public Safety fire trucks, ambulances, and emergency vehicles. Prior to Project construction, the Project team, traffic control lead, contractor, and representatives from MPD and the Department of Fire and Public Safety will be held to coordinate service coverage, discuss the Traffic Control Plan, and develop contingency plans that ensure emergency access is maintained throughout construction and that impacts to response times are minimal. Additional BMPs related to traffic control and diversion can be found in Section 3.10.1.

### 3.9.3 Emergency Medical and Hospital Services

***Affected Environment and Existing Conditions***

Emergency medical services are provided by the Department of Fire and Public Safety, as discussed in the previous section. The Maui Memorial Medical Center is the island's major medical facility and acute care hospital. It is located in central Maui, approximately 60 miles by road from the Project (Maui Health, 2025). The center provides emergency medical care and ambulatory care, among many other medical services. Part of the Maui Memorial Medical Center facility is the Maui Memorial Medical Center Wound Care and Hyperbaric Therapy, which provides wound care, and the Outpatient Clinic that provides primary care. Additionally, air ambulance helicopters serving Maui can land at Maui Memorial Medical Center 24 hours per day, seven days per week (Maui Health, 2020).

***Potential Impacts and Mitigation Measures***

The Proposed Action is anticipated to have long-term, beneficial impacts on emergency medical services – including transport to nearby medical facilities – due improved reliability and safety of the Waikakoi and South Wailua Bridge structures on the Hāna Highway.

There may be short-term impacts to traffic control and emergency service access through the Project area during construction. However, a temporary bypass bridge will be provided during the construction period to mitigate potential impacts. The temporary bridge will be designed to accommodate Department of Fire and Public Safety fire trucks, ambulances, and emergency vehicles. Additional BMPs related to traffic control and diversion can be found in Section 3.10.1.

### 3.9.4 Educational Facilities

***Affected Environment and Existing Conditions***

Public educational facilities in the County are operated by the State Department of Education (DOE), Maui District. The nearest school to the Project is Hāna High and Elementary School, located in Hāna Town, approximately 8 miles north of the Project sites. The school is administratively within the DOE Maui District Hāna-Lahainaluna-Lānaʻi-Molokai Complex Area. Several private schools are located on the island but are not located in the vicinity of the Project or within Hāna Town.

***Potential Impacts and Mitigation Measures***

The Project does not involve the construction of new residential units and is therefore not anticipated to impact the population at DOE-operated or private educational facilities. While temporary traffic impacts may occur along Hāna Highway, a bypass bridge will be provided during the construction period to mitigate potential impacts. Due to the Project's relatively far distance from schools, significant adverse impacts related to noise and pedestrian safety are not anticipated. No additional mitigation measures are proposed.

### 3.9.5 Libraries

***Affected Environment and Existing Conditions***

The nearest library to the Project is the Hāna Public Library, located in the town of Hāna approximately 8.5 miles north of the Project site.

***Potential Impacts and Mitigation Measures***

The proposed Project is not anticipated to impact library facilities. Due to the Project's relatively far distance from libraries, significant adverse impacts related to noise and pedestrian safety are not anticipated. While temporary traffic impacts may occur along Hāna Highway, a bypass bridge will be provided during the construction period to mitigate potential impacts. No additional mitigation measures are proposed.

### 3.9.6 Public Parks

***Affected Environment and Existing Conditions***

The Project site is not located within a public park or recreation area. Hāna Highway provides access to a several County and State parks. Haleakalā National Park is located approximately 1.5 miles southwest of the South Wailua Bridge site, while Hāna Forest Reserve is located approximately 1 mile northwest of the South Wailua Bridge site (DLNR-DOFAW, 2002). Neither resource overlaps with the Project sites. The nearest State park is Waiʻānapanapa State Park, which is located north of the Hāna Town (DNLR, Division of State Parks, 2025). Nearby Maui County park facilities are also located in the Hāna Town, including the Hāna Community Center and District Complex and Ball Park, Hāna Bay Beach Park, and Helene Hall (County, n.d.-b).

Land surrounding South Wailua Bridge is primarily privately owned, with the exception of adjacent land on the mauka of the bridge, which is owned by the State. Additionally, the land surrounding the bridge site is designated as State Land Use Conservation District. Land surrounding Waikakoi Bridge is privately owned and designated as Agricultural District or used for residential purposes.

***Potential Impacts and Mitigation Measures***

The proposed Project is not anticipated to impact public park resources. Since no parks are located at the Project sites, there are no anticipated impacts from construction noise or dust. While temporary traffic impacts may occur along Hāna Highway during construction, a bypass bridge will be provided to mitigate potential impacts. Access to public park facilities in the vicinity will be maintained. No additional mitigation measures are proposed.

## 3.10 Roadways and Circulation

A Traffic Assessment Report (TAR) was conducted for the Project by Austin, Tsutsumi & Associates, Inc. (ATA) in June 2021 and is provided as Appendix F. The study defines the existing and future traffic along Hāna Highway and provides recommended mitigation measures to address potential impacts of the Project.

## 3.10.1 Traffic

***Affected Environment and Existing Conditions***

Hāna Highway is generally an east-west, two-way, two-lane undivided arterial roadway connecting the island's urban center of Kahului in the north and the remote communities of East Maui . This roadway runs along Maui's steep, winding coastline providing local connectivity between Hāna and Kaupō and regional connectivity to Kula/Upcountry Maui. The existing Waikakoi Bridge is located at MP 45.4 with a deck width of approximately 16.7 feet and length of 33.0 feet. The existing South Wailua Bridge is located at MP 44.6 with a deck width of about 16.7 feet and length of 57.0 feet.

Both the Waikakoi Bridge and South Wailua Bridge are one-lane bridges that require yielding on either approach. In the vicinity of the Project, the posted speed limit is 15 miles per hour (mph). Due to the winding alignment of Hāna Highway, the frequency of narrow travel lanes, sharp turns, and one-lane bridges, warning signs recommend reduced speeds of 5 or 10 mph.

Traffic data was collected in March 2021 at one location along Hāna Highway, east of the Waikakoi Bridge. Table 3-2 below summarizes the traffic characteristics along Hāna Highway for the weekday 24-hour Average Daily Traffic (ADT) volumes, speed, and heavy vehicle axle breakdown. This segment of Hāna Highway experiences an ADT volume of approximately 962 vehicles per day (vpd). The 85th percentile speed was recorded at 29 miles per hour (mph), reflecting the roadway's winding and rural characteristics. During the morning peak hour, the traffic volume was 46 vehicles per hour (vph), with 65 percent traveling eastbound toward Hāna Town. In the evening peak hour, the volume increased to 151 vph, with 38 percent heading eastbound. This reflects an existing asymmetric directional distribution, where most traffic is going eastbound in the morning peak hour and westbound in the evening. The K-factor, representing the proportion of daily traffic occurring during the peak hour, was 4.8 percent in the morning and 15.7 percent in the evening.

Heavy vehicles constituted approximately 7.3 percent of the total traffic, indicating a predominance of passenger vehicles on this segment of the highway.

**Table 3-2: Existing 2021 Roadway Characteristics**

| Characteristic | Amount | |
|---|---|---|
| ADT | 962 vehicles per day (vpd) | |
| Eastbound D% | 53% | |
| Heavy Vehicle % | 7.3% | |
| 85th Percentile Speed | 29 miles per hour (mph) | |
| | **AM Peak[a]** | **PM Peak[b]** |
| Peak Hour Volume (vehicles per hour [vph]) | 46 | 151 |
| Eastbound D% | 65% | 38% |
| K Factor | 4.8% | 15.7% |

[a] AM peak 9:00-10:00AM

[b] PM peak 3:15-4:15PM

Notes: Eastbound is Hāna-bound and westbound is Kaupō bound. Saturday count was conducted on March 20, 2021, but not included since it yielded lower traffic data than weekday.

Source: ATA, 2025

Traffic projections were developed for future year scenarios over a 20-, 30- and 50-year build-out forecast scenario, which were based on the Maui Regional Travel Demand Model (MRTDM) growth for forecast years between 2007 and 2035. Based on this model, an annual growth rate of approximately 0.6 percent was applied to existing traffic volumes to estimate future conditions. See Table 3-3 below for the 20-year (Year 2041) forecast. In the forecast year 2041, ADT at the South Wailua Bridge is estimated to be approximately 1,084 vpd. The 85th percentile speed remains 29 miles per hour, consistent with the roadway's physical characteristics. Heavy vehicles are projected to continue to comprise 7.3 percent of the traffic mix, indicating sustained predominance of passenger vehicles on this segment of the highway. Peak hour volumes are estimated to slightly increase to 51 vph during the morning peak and 167 vph during the evening peak. Directional distribution during peak periods is expected to remain asymmetric, with 67 percent of vehicles traveling eastbound in the morning and 35 percent in the evening. The corresponding K-factors are 4.8 percent and 15.7 percent, respectively, reflecting the proportion of daily traffic occurring during these peak periods. Additional 30- and 50-year build forecasts can be found in Appendix F.

**Table 3-3: Future 2041 Roadway Characteristics (20-Year [Year 2041] Forecast)**

| Characteristic | Amount | |
|---|---|---|
| ADT | 1,084 vpd | |
| Eastbound D% | 53% | |
| Heavy Vehicle % | 7.3% | |
| 85th Percentile Speed | 29 mph | |
| | **AM Peak[a]** | **PM Peak[b]** |
| Peak Hour Volume (vph) | 51 | 167 |
| Eastbound Direction Distribution Factor (D%) | 67% | 35% |
| K Factor | 4.8% | 15.7% |

[a] AM peak 9:00-10:00AM

[b] PM peak 3:15-4:15PM

Notes: Eastbound is Hāna-bound and westbound is Kaupō-bound. Saturday count was conducted on March 20, 2021, but not included since it yielded lower traffic data than weekday.

Source: ATA, 2025

***Potential Impacts and Mitigation Measures***

The Proposed Action is intended to replace existing structurally deficient bridges with new, upgraded structures supporting single-lane traffic. As no change in roadway function or capacity is proposed, the Project is not anticipated to generate additional vehicle traffic or changes in vehicle mix. However, there is an anticipated long-term increase in ADT based on the regional growth forecasts developed using the MRTDM. The Project would more reliably support these future traffic levels than the existing, deficient bridge structures.

There would be short-term impacts to traffic during the Project construction duration of two years. Temporary bypass bridges at each location would be constructed to detour traffic around the Project area during construction and allow for a continued flow of traffic (Section 2.4.2). Upon completion of the new bridge structures, the temporary bridges will be removed, and the surrounding areas will be restored to original conditions to the extent practicable. The final design of the temporary bypass bridges will be determined as the design progresses.

Estimated work hours are from 7:30 a.m. to 4:00 p.m., Monday through Friday, which includes peak traffic volume according to the TAR. To mitigate potential traffic impacts during peak hours, nighttime construction work may be intermittently employed.

A Traffic Control Plan will be developed for construction to minimize traffic pattern disruptions and avoid access issues. During working hours, the contractor will maintain the roadways to be suitable for continuous flow of one-lane traffic using a construction flagger at both ends, who will alternate the direction of traffic flow. Additionally, temporary signage, pavement markings, portable concrete barriers, and crash barrels will be placed at the bridge approaches to serve as safety and traffic control measures during construction. First responders, the public, and commercial operators will be provided notice of planned highway closures and expected delays during construction.

Construction equipment and any other obstructions would be removed from the road at the end of the workday. Additionally, during non-working hours, roadway excavation areas will be covered with safe, non-skid bridging material that can support all vehicular traffic loads. Safe access to driveways, side roads, and streets will be maintained throughout construction.

## 3.10.2 Multimodal, Marine, and Air Facilities

***Affected Environment and Existing Conditions***

There are no multimodal facilities, including public transit access, sidewalks, or bicycle facilities, located in the vicinity of the Project area. Due to the remote nature of East Maui, vehicles are the primary mode of transportation. Any goods or passengers transported to the island via water or air would travel by vehicle using the Hāna Highway and would use the Waikakoi and South Wailua bridge structures if traveling through the Project area.

Transportation via air and water is essential to the island State of Hawaiʻi, which imports about 80 percent of goods (County, 2012). Commercial harbors provide the primary means for importing and exporting goods. There are three harbor facilities on Maui: Kahului Commercial Harbor, Lahaina Harbor, and Māʻalaea Harbor – with Kahului Commercial Harbor serving as the primary harbor for imports and exports. None of these harbors are located in the vicinity of the Project area.

Additionally, air travel is the primary means of passenger travel to the islands and, as such, airport transportation is essential to supporting the State tourism industry (County, 2012). There are three airports on Maui: Kahului, Kapalua, and Hāna. Kahului Airport is the second-busiest airport in the State and transports thousands of tons of cargo annually. None of these airports are located in the vicinity of the Project area; the Hāna Airport is approximately 9.5 miles north of the Project site by road.

***Potential Impacts and Mitigation Measures***

In East Maui, the Hāna Highway serves as an essential corridor within the island's wider transportation system. Disruptions to travel along the Hāna Highway, including due to the structurally deficient Waikakoi and South Wailua bridge structures, would interrupt this essential connection. The Proposed Action would have a long-term beneficial impact to multimodal transportation by improving the safety and reliability of the bridge structures. There would be short-term impacts to area traffic over the two-year construction period. However, these would be mitigated through BMPs related to traffic control and diversion. See Section 3.10.1 for details.

### 3.10.3 Access and Parking

***Affected Environment and Existing Conditions***

Access to the Waikakoi Bridge is primarily by vehicle on the Hāna Highway. The area is surrounded by undeveloped land, and the narrow highway and single-lane bridge structure does not provide pedestrian/non-motorized access. There is no formal parking area. Access to the South Wailua Bridge is also primarily by vehicle on the Hāna Highway, with the area generally surrounded by undeveloped conservation land. The bridge is popular for viewing the Wailua Falls, and there is an unstriped parking area south of the bridge where pedestrians park and use the roadway shoulder to access the bridge. There are no designated pedestrian crossings, sidewalks, or paths.

***Potential Impacts and Mitigation Measures***

There would be no long-term impacts to parking and access. There would be short-term, minor, adverse impacts to access associated with Project construction, such as temporary parking closures near the waterfall and temporary traffic detours. Additionally, Project construction may cause impacts to traffic flow through the area. However, these impacts would be mitigated using BMPs related to traffic control and diversion, including a temporary detour bridge. Safe access to driveways, side roads, and streets in the Project area will be maintained throughout construction, or property owners will be given other means of satisfactory access. See Section 3.10.1 for details.

## 3.11 Infrastructure and Utilities

### 3.11.1 Drainage

***Affected Environment and Existing Conditions***

The Waikakoi and South Wailua Bridges are surrounded by steep, vegetated terrain and are within the Wailua watershed that drains a portion of a large plateau between the larger Waiohonu Valley to the north and the Kīpahulu Valley to the east. The watershed drains into the Pacific Ocean, terminating at Wailua Bay along the Hāna coastline. Waikakoi Stream passes below Waikakoi Bridge, while Honolewa Stream passes under South Wailua Bridge. Flooding challenges in Maui County are primarily related to the overflow of stream channels, overland flow, and standing water in areas with poor drainage (FEMA, 2015). This is described in more detail in Section 3.7.3.

***Potential Impacts and Mitigation Measures***

The Proposed Action is anticipated to provide long-term beneficial impacts to roadway drainage. Grading will be required for the installation of both temporary and permanent bridges. This re-grading and resurfacing will be designed to enhance area drainage and improve overall roadway safety. There may be impacts from construction on area drainage due to ground and soil disturbance, but they are expected to be minimal and mitigated through the use of BMPs. Section 3.3 provides details on erosion-mitigation practices that would be used during construction.

### 3.11.2 Water Supply

***Affected Environment and Existing Conditions***

The Project sites are located in the Waihoi subdivided sector of the Hāna Aquifer Sector Area (ASEA; County, 2025). ASEAs represent regions of Maui with similar hydrogeological characteristics that are also located within existing hydrographic, topographic, and historical boundary lines (where possible). The Waihoi unit's aquifer has a sustainable yield of 18 millions of gallons per day (mgd). The Project area is located in the Wailua watershed, which includes three perennial streams: Wailua Stream, Honolewa Stream, and Pāʻihi Stream. A pipeline diverts water from Wailua Stream to Hāna Town and crosses the Waikakoi drainage basin at approximately 1,000 feet ASL, approximately 0.5-mile upslope of the Waikakoi Bridge.

In the Project area, there are high groundwater levels to the north and east of Haleakalā, where there is a high level of rain (County, 2025). The majority of groundwater reservoirs occur in freshwater lens areas, where a concave lens of freshwater floats on salt water due to a hydrological balance of inflow, outflow, and storage. Groundwater is the source of all potable water systems in the Hāna Region (County, 2020). Some water is supplied for domestic use (by domestic wells), irrigation use, and agricultural use, but 99 percent of well water supply in the Hāna ASEA is for municipal use. The municipal water systems that use groundwater in the Hāna ASEA include the County Department of Water Supply (MDWS), the National Park Service (NPS), and privately owned public water systems (PWS) – Hāna Water Resources and Hāna Water Company. The MDWS Hāna Water System supplies potable water to most area residents, representing 73 percent of withdrawn water from MDWS wells.

***Potential Impacts and Mitigation Measures***

The proposed Project would not have long-term impacts to water supply. Construction is not anticipated to impact water supply. However, the Project may relocate a small, unknown irrigation/water line within the Waikakoi Bridge Project area. Should the contractor encounter a line, they would coordinate with the affected party and/or utility to coordinate movement and minimize interruption in service.

### 3.11.3 Wastewater Treatment and Disposal

***Affected Environment and Existing Conditions***

The Department of Environmental Management, Wastewater Reclamation Division, manages the County's wastewater treatment plants and recycled water distribution systems. The nearest wastewater reclamation facility to the Project site is the Kahului Wastewater Treatment Plan in Central Maui. In the Hāna region, there are no reclamation facilities or large-scale stormwater reclamation projects (County, 2020). Instead, surrounding buildings or homes use septic systems and cesspools.

***Potential Impacts and Mitigation Measures***

There are no anticipated short- or long-term impacts to wastewater treatment or disposal as a result of the proposed Project.

### 3.11.4 Solid Waste

***Affected Environment and Existing Conditions***

The Department of Environmental Management, Solid Waste Division, manages the County's solid waste operations. The division operates four County landfills and six closed landfills (County, n.d.-c). The Hāna Landfill – Refuse and Recycling Center is located north of Hāna Town, approximately 4.5 miles north of the Project site. The division also operates over 2,600 collection routes – including curbside collection in Hāna. Construction and demolition (C&D) waste is only accepted at the Central Maui Landfill in Puʻunēnē, approximately 50 miles northwest of the Project site.

***Potential Impacts and Mitigation Measures***

There are no anticipated long-term impacts to solid waste from the proposed Project. There may be minor, short-term traffic impacts to collection routes associated with Project construction. Mitigation measures can be found in Section 3.10.1. Additionally, the Project would create C&D waste that would require proper handling during transportation and disposal. However, the volume of waste generated would not significantly affect capacity or operations at the County's processing facilities.

### 3.11.5 Power and Telecommunications

***Affected Environment and Existing Conditions***

Maui Electric Company (MECO) is the electric utility provider for the island. The island has its own independent grid that powers MECO's operations. The State has one local exchange carrier for telecommunication services (Hawaiian Telecom, Inc.) and several other providers based in the continental United States (Public Utilities Commission, 2025).

There are various MECO overhead lines present in the vicinity of the Waikakoi Bridge site.

***Potential Impacts and Mitigation Measures***

The proposed Project would avoid the relocation of utility lines, including electrical and telecommunications, thereby avoiding short- and long-term impacts.

The Project team will coordinate with utility providers during design and construction to minimize potential conflicts with existing utility infrastructure and service interruptions. Prior to construction, the contractor will verify the locations of MECO and Hawaiian Telecom facilities in the field, and the contractor will comply with applicable State regulations for work near exposed or energized underground or overhead electrical lines and equipment. The contractor will maintain appropriate clearance when working near overhead lines or excavating near utility poles or their anchor systems, as regulated by State law. If work must encroach within the minimum clearance, MECO will be contacted to implement necessary protections. MECO staff may be present on-site during excavation of an area with existing underground electrical cables. Appropriate sheeting and bracing of any excavation work adjacent to or beneath MECO's structures would be implemented to prevent slides or cave-ins.

### 3.11.6 Gas

***Affected Environment and Existing Conditions***

Hawaiʻi Gas is the State's only utility gas provider and provides service on Maui. According to the existing topographical survey, there are no gas lines in the vicinity of the Project sites.

***Potential Impacts and Mitigation Measures***

No gas lines are expected to be relocated during construction; as such, no long-term impacts are anticipated and mitigation measures are not proposed.

## 3.12 Noise

***Affected Environment and Existing Conditions***

The Project site is surrounded by forested gulches and steep, vegetated cliff drop-offs, as well as sparsely developed land with residences and farms interspersed in the vicinity of Waikakoi Bridge. Waikakoi Bridge is bounded by undeveloped land designated by the State for Rural and Agricultural uses and zoned by the County as Agriculture and Interim, while South Wailua bridge is surrounded by land designated by the State for Conservation uses and zoned as Interim by the County. The South Wailua Bridge experiences frequent tourist traffic as a popular destination for viewing the adjacent Wailua Falls.

The Hāna Highway serves as a major route for commuter traffic, tourists, emergency vehicles, and commercial traffic. Due to the presence of Hāna Highway, ambient noise in the Project area can be characterized primarily by vehicular traffic noise on the highway, in addition to visitor activity, natural sounds from flowing water and wind, and occasional agricultural or residential noise.

In the HDOH Community Noise Control chapter of HAR (Section 11-46.2), noise is defined as "…any sound that may produce adverse physiological or psychological effects or interfere with individual or group activities, including but not limited to communication, work, rest, recreation or sleep." Section 11-46.3 defines Class A zoning districts as areas zoned for residential, conservation, preservation, public space, open space, or similar, while Class C zoning districts are areas zoned for agriculture, country, industrial, or similar. Noise is measured in A-weighted decibels (dBA) to reflect how humans perceive sound, with limits set at 55 dBA during the daytime and 45 dBA at nighttime for Class A zones, and 70 dBA at all hours for Class C zones. Projects must comply with these thresholds or obtain a noise permit or variance from the HDOH if anticipated construction noise exceeds allowable levels.

***Potential Impacts and Mitigation Measures***

No long-term adverse impacts to noise are anticipated due to the replacement bridge structures using the same horizontal and vertical alignment and accommodating the same traffic capacity as the existing structures. As such, ambient noise attributed to vehicles, which is the primary sources of noise, would not increase.

There would be short-term impacts to noise levels as a result of construction activities, including blasting, drilling, and excavating. According to HAR Section 11-46.4(a), the maximum permissible sound level for Class A zoning districts is 55 dBA in the daytime (7 a.m. to 10 p.m.) and 45 dBA in the nighttime (10 p.m. to 7 a.m.). In Class C zoning districts, the maximum permissible sound level is 70 dBA in the daytime and 70 dBA in the nighttime.

Estimated work hours are from 7:30 a.m. to 4:00 p.m. from Monday to Friday. To mitigate potential traffic impacts during peak hours, nighttime construction work may be intermittently employed. Mitigation measures may also include muffling construction equipment. Because construction noise is anticipated to exceed regulatory thresholds, a Community Noise Permit and potentially a Community Noise Variance permit would be secured. Construction would be performed according to permit allowances and conditions.

## 3.13 Socio-Economic Characteristics

This section summarizes the existing conditions, potential effects, and proposed mitigation for the socio-economic conditions surrounding the Project area.

***Affected Environment and Existing Conditions***

The Hāna Highway is an essential corridor for residents connecting the remote communities of East Maui and the Hāna region to each other and to larger urban population centers such as Kahului. Section 3.9 provides detail of the Hāna region’s community facilities and public services. The majority of these services and facilities are located in Hāna Town. The highway also connects residents to community facilities and emergency services, while also allowing for the transport of goods. The scenic highway serves as a popular route for tourists.

**Population, Housing, and Community Character**

The Hāna region encompasses approximately 145,000 acres of the eastern shoreline area on East Maui (County Council, 1994). Hāna Town, located approximately 7 miles north of the Project sites, is the region’s major population center. Other nearby towns to the Project site include Kīpahulu (approximately 3.5 miles by road south of the Project sites) and Kaupō (approximately 8 miles south), which are small rural settlements dispersed along the Hāna Highway on the coast.

The population of Hawaiʻi and Maui County has grown over past decades and is forecasted to continue to grow. Table 3-4 shows historical and projected population numbers for the State and County. The Project site is located within U.S. Census Tract 301, Block Group 1, in Maui County. Within Census Tract 301, there are 1,307 residents, and the share of population over the age of 65 is larger than that of the County and State (Table 3-5). The County of Maui 2030 General Plan – *Countywide Policy Plan* notes that the population of the County is aging, based on data from 1990 to 2005 (County, 2010).

**Table 3-4: Resident Population, Historical and Projected (2010 – 2050)**

| Year | State of Hawaiʻi Population | Maui County Population |
|---|---|---|
| 2010[a] | 1,365,065 | 155,035 |
| 2020[a] | 1,451,043 | 164,840 |
| 2030[b] | 1,501,150 | 173,520 |
| 2040[b] | 1,542,570 | 181,000 |
| 2050[b] | 1,560,890 | 184,870 |

[a] U.S. Census Bureau (USCB) estimates for July 1 population using 2022 population estimates
[b] DBEDT projections for July 1 population
Source: DBEDT, 2024

**Table 3-5: Population and Age Distribution**

| Population and Age | State of Hawaiʻi | Maui County | Census Tract 301 |
|---|---|---|---|
| Total Population | 1,445,635 | 164,632 | 1,307 |
| Population 18 and under, percent | 20.9% | 21.2% | 11.2% |
| Population 65 and over, percent | 19.9% | 20.0% | 26.5% |

Note: USCB data was collected from 2023 American Community Survey (ACS) 5-Year Estimates that cover the period from 2019 to 2023.
Source: USCB, 2023

The Native Hawaiian population originally inhabited the island in large numbers; however, the population declined over time, mainly due to introduced epidemics and socio-economic changes following Western contact (County, 2010). In the late 19th and early 20th centuries, immigration of plantation workers from Asia and Europe associated with the sugar and pineapple industries contributed to a racially diverse population over time. See Table 3-6 for a current estimate of the racial composition across the State, county, and Census Tract 301, which includes the Project area. As shown in Table 3-6, the Project area has a higher concentration of Native Hawaiian and Other Pacific Islander residents (34 percent) and individuals identifying as Two or More Races (32 percent) compared to State and County averages.

**Table 3-6: Race and Ethnicity**

| Race | State of Hawaiʻi | | Maui County | | Census Tract 301 | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| White | 325,356 | 23% | 51,004 | 31% | 388 | 30% |
| Black or African American | 27,740 | 2% | 1,248 | 1% | 0 | 0% |
| American Indian and Alaska Native | 3,835 | 0% | 577 | 0% | 24 | 2% |
| Asian | 538,807 | 37% | 46,571 | 28% | 30 | 2% |
| Native Hawaiian and Other Pacific Islander | 149,030 | 10% | 17,197 | 10% | 444 | 34% |
| Some Other Race | 24,334 | 2% | 3,238 | 2% | 0 | 0% |
| Two or More Races | 376,533 | 26% | 44,797 | 27% | 421 | 32% |
| **Total** | **1,445,635** | **100%** | **164,632** | **100%** | **1,307** | **100%** |

Source: USCB, 2023

The Project area has a smaller average household size, lower median household income, and a notably smaller number of total households and housing units compared to the State and County (Table 3-7). Although the percentage of families living below the poverty level is slightly lower in Census Tract 301 than the County and State averages, the median income is significantly lower. These trends are consistent with the broader challenges facing East Maui with regard to affordable housing. The lack of affordable housing in the Hāna region and limited economic opportunities compatible with the rural character of the region – as well as overdependence on the tourism industry – were cited as major problems in the region in the 1994 *Hāna Community Plan* (County Council, 1994). Table 3-7 below provides a breakdown of housing and poverty characteristics.

**Table 3-7: Housing and Poverty Statistics**

| Housing | State of Hawaiʻi | Maui County | Census Tract 301 |
|---|---|---|---|
| Average household size | 2.88 | 2.92 | 2.24 |
| Median household income | $98,317 | $95,076 | $60,707 |
| Percentage of families and people whose income in the past 12 months is below the poverty level, all families | 6.9% | 6.8% | 5.3% |
| Total households (occupied housing units) | 488,991 | 55,485 | 583 |
| Total housing units | 564,905 | 72,303 | 843 |

Source: USCB, 2023

### Employment and Income Patterns

The Hāna Region's economy is based mainly on a mix of agriculture, tourism, government services, and subsistence activities (County Council, 1994). The State and national parks and preserves in the area, which offer scenic vistas and numerous recreational opportunities, make it attractive for visitors. When visiting East Maui, visitors typically stay in Hāna Town. Common agricultural activities include ranching, tropical fruit, flower and foliage, and taro cultivation.

While agriculture and tourism were dominant in the early 1980s, the growth rate of the resident population, housing, and jobs surpassed the visitor growth rate during the study period of the *Maui County General Plan 2030*, indicating the County has managed to diversify its economy beyond tourism (County, 2010). Today, the largest industries in the County are construction and tourism, with the largest employers being the State, the County, the Maui Memorial Medical Center, and several resorts. Today, 22.5 percent of the Maui County civilian population over 16 years old is employed in the "arts, entertainment, and recreation, and accommodation and food services" industry (USCB, 2023). Within Census Tract 301, nearly 30 percent of the civilian population over 16 years old is employed in the industry.

Unemployment in Census Tract 301 is relatively high at 11.4 percent when compared to the State and County at 5 and 5.6 percent, respectively. Table 3-8 provides details on area employment and income.

**Table 3-8: Employment and Income**

| Employment Status | State of Hawai'i | Maui County | Census Tract 301 |
|---|---|---|---|
| Civilian labor force, number | 703,472 | 85,690 | 685 |
| Civilian labor force, percentage | 59.8% | 64.2% | 59.1% |
| Unemployment rate, percentage | 5% | 5.6% | 11.4% |
| Median household income | $98,317 | $95,076 | $60,707 |
| Per capita income | $44,823 | $44,403 | $32,333 |

Notes: The civilian labor force represents all citizens 16 years or older who are either employed or unemployed and looking for work, excluding members of the armed forces.

Source: USCB, 2023

Hāna residents depend on the Hāna Highway due to the remote nature of the region and lack of multimodal transportation facilities. Approximately 92.1 percent of residents commute to work by vehicle (driving alone), while 7.9 percent work from home (USCB, 2023). The percentage of those who commute to work by car is substantially higher as compared to the State and County averages as shown in Table 3-9.

**Table 3-9: Travel Mode for Commuting to Work**

| Mode | State of Hawai'i | Maui County | Census Tract 301 |
|---|---|---|---|
| Car, truck, or van – drove alone, percent | 65.9% | 71.6% | 92.1% |
| Car, truck, or van – carpooled, percent | 13.8% | 12.7% | 0.0% |
| Public transportation (excluding taxicab), percent | 4.1% | 1.3% | 0.0% |
| Walked, percent | 4.2% | 2.3% | 0.0% |
| Other means, percent | 3.2% | 2.7% | 0.0% |
| Worked from home, percent | 8.8% | 9.4% | 7.9% |

Note: For all workers 16 years old and older.

Source: USCB, 2023

### *Potential Impacts and Mitigation Measures*

The Proposed Action would The Proposed Action will have long-term beneficial impacts to the area residents by improving safety and reliability of the bridge structures on this essential highway route. There would be minor, short-term adverse impacts due to slowdowns and interruptions in local traffic during Project construction, as there is no alternate route. However, temporary bypass bridges would be constructed to maintain the flow of traffic. Additionally, a Traffic Control Plan would be developed to ensure access for local residents and emergency services. Detailed information on mitigation measures related to traffic and area access can be found in Section 3.10.

## 3.14 Visual Resources

### *Affected Environment and Existing Conditions*

Maui is known for its unique, rare, and significant views, which consist of dramatic viewsheds and a scenic horizon (County, 2012, p. 2-44). Hāna Highway provides scenic views of the ocean, mountain, agricultural lands, rainforests, and the island's natural topography, including its notable cliffs and valleys. Various views of waterfalls are provided along the alignment and serve as popular tourist destinations for visitors of the Hāna Highway. The scenic views are considered public resources that support residents' quality of life. These views and landscapes are also tied to the culture and history of Hawaiʻi.

Additionally, the *Maui Island Plan – General Plan 2030* notes that scenic resources on Maui drive the tourism industry, making visual resources important for economic purposes, as well.

The *Maui County General Plan 2030 – Scenic & Historic Resources Inventory & Mapping Methodology Reports* surveyed the Hāna Highway (Hawaiʻi Routes 36 and 360) to identify and inventory important scenic resources to inform policy development (County, 2006). The quality of scenic resources were rated as exceptional, important, and not important based on such factors as land-sky interface, landform, land cover, water-form, surprise, clutter, unique visual element, magnitude, distinctiveness, intactness, and draw. Exceptional views often scored highly in the land-sky interface, unique visual element, magnitude, distinctiveness, and intactness categories. Roadway corridors were then rated as exceptional, high, medium, or low based on the value of the scenic resources they offered. Corridors with "exceptional" and "high" visual resources were classified as Scenic Resource Corridors for purposes of policy development. The area of the Hāna Highway where the Project sites are located is designated as an "exceptional" Scenic Corridor. Corridors rated as exceptional or high are "typically in a natural condition and unmarked by development" and located in areas with "dramatic and diverse resource values consistently throughout the corridor," (County, 2006, p. 9).

All of East Maui is in a proposed Heritage Area identified in the *Maui County General Plan 2030*, which designates an area where "natural, cultural, historic, and scenic resources combine to form a cohesive, distinct landscape arising from patterns of human activity shaped by geography" (County, 2006, Map, 2-2b). These areas are designated for the protection and conservation of such resources.

The Waikakoi Bridge Project area is characterized by forested gulches along the mauka side of the highway and a steep vegetated drop off to the Pacific Ocean on the makai side. Residences and farms are interspersed throughout the Waikakoi Bridge Project area and some properties can be seen from the roadway. Utility lines and poles run along the roadway, while one-lane bridge warning signs appear ahead of the bridge. Other than areas cleared for development, the Project area is densely vegetated with trees and brush; views from the bridge do not typically extend far into the distance due to the tree cover in the foreground.

While dense trees and vegetation are present in the South Wailua Bridge Project area, they do not overhang the entirety of the roadway such as in the Waikakoi Bridge Project area. This allows viewers to see farther into the distance and observe rolling terrain and some cliffs in the background in addition to trees and lush vegetation in the foreground. There are a number of parking signs and one-lane bridge warning signs near the South Wailua Bridge site. On the makai side of the bridge is a steep drop-off surrounded by dense vegetation and on the mauka side is Wailua Falls flowing into the Honolewa Stream. There are often numerous visitors present at the site viewing the waterfall. Other than the unstriped parking area adjacent to the South Wailua bridge site, there is little visible development in the South Wailua Bridge Project area. Additionally, land surrounding the South Wailua Bridge is designated for conservation uses. These lands are designated in part for the presence of scenic areas and historic sites that should be preserved (County Council, 1994).

***Potential Impacts and Mitigation Measures***

The Proposed Action would construct two bridges of a similar size, scale, location, and design to the existing structures. See Figure 2-3 for the existing Waikakoi Bridge and Figure 2-4 for an illustrative rendering of the new replacement bridge. See Figure 2-5 for the existing South Wailua Bridge and Figure 2-6 for an illustrative rendering of its replacement. The new bridges would not impact views of scenic or protected resources including the Hāna Highway Scenic Corridor, Wailua Falls, forested gulches, or the ocean. To match the historic character of the existing bridges, the use of a Hawaiʻi CRM barrier, which is internally strengthened with reinforced concrete, will replace the approach wall barriers. The design will maintain visual continuity with the scenic nature of the Hāna Highway scenic corridor and its bridge crossings, and there would likely be no noticeable changes to the viewshed. While the bridges will appear new upon completion (compared to a weathered appearance of current structures), these visual differences are expected to diminish over time as the materials weather naturally.

Short-term adverse impacts to visual resources would occur due to the presence of construction equipment, personnel, and signage, as well as ground disturbance and structure demolition and construction. Additionally, the temporary bypass bridges would be constructed makai of the existing bridges to maintain visual continuity with the existing structures. However, viewing of the landscape mauka of the bridge sites would be temporarily impacted, including views of the Wailua Falls. To mitigate potential construction impacts to visual resources, construction equipment will be removed from the roadway at the end of each workday, nighttime lighting (if required) would be minimized and shielded downward, and disturbed soil will be revegetated following construction (See Section 3.3).

## 3.15 Cumulative Impacts

As defined in HAR §11-200.1-2, "cumulative impacts" are the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." The cumulative impacts of implementing the Proposed Action, along with past and reasonably foreseeable future projects proposed, were assessed based on available information.

The Waikakoi and South Wailua Bridge Replacement project is a self-contained project that would have localized, short-term impacts that would be minor with the implementation of avoidance and minimization measures. The Project part of an overall effort and responsibility of government agencies to maintain a safe transportation system. The Project would not expand transportation facilities that could contribute to induced traffic or support increased development. Adverse effects would result from replacing features that contribute to the significance of the Hāna Highway Historic District. However, these would be effectively mitigated as discussed in this EA.

The numerous bridges on Hāna Highway, constructed between 1908 and 1947, have undergone various maintenance and modifications over the years by HDOT and DPW. Based on a search of ERP's online database of environmental review documents and the Maui Metropolitan Planning Organization's (MPO) current project status list (2022-2025), the following bridge projects on Hāna Highway are currently being planned for construction (Maui MPO, n.d.):

- **Kahawaiokapia Bridge Replacement:** DPW published a Final EA-FONSI in August 2016 for the replacement of the Kahawaiokapia Bridge, a County-managed bridge located north of the South Wailua Bridge. According to the Maui MPO website, the project is currently in its design and permitting phase and construction is unknown.

- **Hāna Highway Bridge Improvements Project:** HDOT published a Final EA-FONSI in September 2024 for improvements to six historic bridges, including the Kailua Stream Bridge, Makanali Stream Bridge, Puohokamoa Stream Bridge, Kopiliula Stream Bridge, ʻUlaʻino Stream Bridge, and Mokulehua Stream Bridge. Proposed improvements include replacement of superstructures at five bridges and the preservation of one bridge with a new bridge constructed makai of it. The purpose is to address structural deficiencies while preserving the historic character of the bridges through context-sensitive design. The project involves the use of FHWA funding and construction is estimated to begin in 2025.

In addition to bridge improvements, various rockfall mitigation projects are either under construction or being programmed on the Maui Transportation Improvement Program (TIP) (2025-2028) over the next several years (Maui MPO, 2024). Though not currently programmed, reasonably foreseeable actions include additional bridge replacement or improvement projects based on the age and condition of existing structures along the Hāna Highway.

No significant cumulative effects on land use are anticipated. No known major planned or ongoing land use development projects in rural East Maui were identified. Based on the County's policy documents, including the HCP and MIP, large-scale development projects are not anticipated in the Hāna region, as the plans focus on maintaining the area's rural character.

As identified above, several isolated HDOT and County bridge improvement projects along Hāna Highway are planned and, given the age and condition of existing structures, future projects could be anticipated. As such, cumulative impacts on the historic district effects are further analyzed.

In general, the historic character of the Hāna Highway Historic District is defined not only by the individually significant bridges within the District, but by the contributing aesthetic characteristics of all of the bridges. According to the NRHP nomination, the key character-defining features of the Hāna Highway Historic District that display its areas of significance include the alignment within East Maui's uniquely rugged topographical setting, engineering design features responsive to setting and topography, scenic vistas, and consistent stylistic elements. Various past maintenance and modification projects along Hāna Highway have shaped the current scenic character of the historic corridor. In recent years, several bridges have been improved or replaced by HDOT and the County. While some replacements have resulted in some loss of contributing materials, the Hāna Highway District retains a large number of representative bridge types and its overall historic integrity remains intact.

Adverse effects would result from replacing the Waikakoi and South Wailua Bridges, which include features that contribute to the significance of the Hāna Highway Historic District. However, these impacts would be mitigated. The new bridges would be designed in accordance with the *Hāna Bridges Preservation Plan*, developed by the County of Maui in consultation with SHPD in 2001. Under HRS Chapter 6E, DPW proposes to conduct HAER documentation of the bridges, to ensure the new bridges are designed in accordance with context-sensitive design guidelines, and to incorporate archaeological monitoring during construction. Similar context-sensitive design approaches have been employed by HDOT and DPW in its repair or replacement of other bridges. Mitigation under Section 106 will be determined through ongoing consultation and documented in an MOA.

Although the Project adds to a broader pattern of incremental bridge replacements along the historic corridor, it does not introduce design elements that are out of character, nor does it alter the road alignment, setting, or scenic views. The retention of the bridges' general location, scale, and visual relationships, combined with design compatibility and mitigation, ensures that the cumulative effect on the historic district is minimized.

Given the Project's scope, its alignment with the *Hāna Bridges Preservation Plan* (DPW, 2001), and the proposed mitigation measures, the Project is not expected to contribute to cumulative degradation of historic, visual, or natural resources. It does not involve or commit the County to larger infrastructure expansion or future undertakings that would require separate environmental review. Therefore, the Project is not anticipated to result in cumulative substantial adverse environmental effects.

# 4.0 Alternatives Considered

Two project-level alternatives were evaluated to determine their ability to meet the purpose and need and Project objectives discussed in Section 1.4: the No-Action Alternative and the Build Alternative (Preferred Alternative). For the Build Alternative, multiple feasible structural design alternatives were developed and assessed separately for each bridge during the preliminary engineering phase. These are described in Section 4.2.2.

## 4.1 No-Action Alternative

Under the No-Action or No Build Alternative, the Waikakoi and South Wailua Bridges would not be replaced or improvements would be delayed to a later, undetermined time. This alternative assumes that the existing Waikakoi and South Wailua Bridges would remain in service in their current condition. No major structural improvements would be made, and only routine maintenance would occur as needed. Potential environmental impacts and construction costs discussed in this EA would be avoided.

However, the No-Action Alternative does not meet the Project purpose and need as it does not address the substandard structural condition at each bridge as described in Section 2.3. Under this alternative, load and capacity deficiencies would persist and current design standards would not be met. In particular, emergency repairs conducted on the Waikakoi Bridge in August 2022 would not be addressed; therefore, the structural integrity and safety of the bridge would persist.

Should the failure of a structural component such as a girder or pier occur on either bridge, it would likely result an immediate closure. If either bridge is closed, there are no alternative routes. Until temporary bypass bridges could be installed, closure of either bridge would increase traffic along Hāna Highway and inconvenience residents and businesses who depend on this portion of the highway. Under this scenario, emergency repairs may be required under accelerated conditions and with limited planning, resulting in higher costs and potentially greater construction impacts.

## 4.2 Build Alternative – Preferred Alternative

The Build Alternative consists of the replacement of the Waikakoi and South Wailua Bridges as described in Section 2.4. Because it meets the Project purpose and need to address the structural deterioration and load capacity deficiencies associated with each bridge, it is the Preferred Alternative.

To undertake the Preferred Alternative, design and evaluation criteria was established to further refine and advance alignment and structural options for design and construction of the Proposed Action. Several design options were developed for each new bridge and evaluated by HDR in April 2024; the findings are presented in the *Waikakoi Structure Selection Report* (Appendix G) and *South Wailua Structure Selection Report* (Appendix H). A summary of the reports is provided in the following subsections.

### 4.2.1 Design and Evaluation Criteria

To provide a consistent methodology to assess each feasible design alternative, evaluation criteria were developed. Each evaluation criterion was further broken down into sub-criteria in order to adequately cover the aspects that affect a specific evaluation criteria. Each sub-criteria was given a qualitative rating of Good, Fair, or Poor.

- **Good:** The criteria are considered a positive for a given alternative.
- **Fair:** The alternative is neither a positive nor a negative when compared to others.
- **Poor:** The alternative being presented is not a good solution for the given criteria.

The design criteria for the structural design of the Project included the current 9th Edition of the Load and Resistance Factor Design (LRFD) American Association of State Highway and Transportation Officials (AASHTO) Bridge Design Specifications and was supplemented by the January 2018 HDOT Design Criteria for Bridges and Structures and relevant County-specific standards. The evaluation criteria and sub-criteria for evaluating feasible alternatives consisted of the following:

1. **Construction Impacts & Constructability:** Components that influence the difficulty of construction and construction time for each bridge.
    a. **Minimization of Traffic Impacts & Accelerated Bridge Construction (ABC) Potential:** How a particular solution may be suitable for ABC techniques that will reduce the duration of construction.
    b. **Local Availability:** Gives weight to whether an alternative can be sourced locally in Maui or if it needs to be brought from the mainland and/or other islands resulting in increased lead times, cost, and logistical challenges.
    c. **Complexity Risk:** How challenging the structural details of the specific alternative will be to implement in the field.
    d. **Constructability:** Weighs how challenging it may be to deliver materials and equipment to the site. Furthermore, this criterion evaluates the available area at the site to store and maintain necessary materials and/or equipment.
2. **Historic Character:** Historic character covers how well each alternative provides context sensitive solutions at the bridge. The structural solution will be subject to Section 106, NHPA, and HRS Chapter 6E review and potential mitigation, therefore each solution will be evaluated based on its ability to retain the historic character of the roadway and bridge.
3. **Construction Cost:** Cost criteria includes the cost components related to the bridge solution. These costs include initial costs for materials and construction of temporary bridges and the permanent structures.
4. **Environmental Resources:** This criterion covers impacts of a given solution to the physical environment around the bridge.
    a. **Hydraulic Opening Impacts:** This pertains to the effects a bridge solution will have on the hydraulics and hydrology of the site.
    b. **Resource Impacts:** This criterion considers how the construction effort and the final alignment will affect the sensitive site locations such as biological resources, wetlands, etc.

5. **Right of Way (ROW) Considerations:**
    a. **Permanent ROW Impacts:** This considers the final bridge configuration impact on adjacent ROW to the Hāna Highway.
    b. **Temporary ROW Impacts:** This considers the temporary impacts on adjacent ROW to the Hāna Highway during construction of the new bridge.

### 4.2.2 Alignment and Structural Design Options Considered

**Alignment Considerations**

For the replacement of Waikakoi Bridge, both online and offline alignments were evaluated. After analysis, an online replacement alignment was selected for the design. The new bridge will follow the general alignment of the existing structure but will be slightly wider and slightly shifted makai to allow existing mauka-side utility lines to remain undisturbed. Although temporary construction easements will be required for installation of temporary bypass bridges and staging areas, the online alignment minimizes permanent ROW impacts and will result in fewer disruptions to the surrounding community and environment.

Two alignment options were considered for the South Wailua Bridge replacement: a fully offline alignment makai of the existing bridge, and a partial online replacement. The offline alignment would allow the existing historic bridge to remain operational during construction. However, it would require ROW acquisition and would result in significant environmental impacts. The selected partial online alignment remains fully within the existing County ROW. This approach balances the need to preserve the historic setting, maintain traffic operations, and reduce impacts to adjacent properties.

**Waikakoi Bridge Structural Design Options**

Ten structural design alternatives were evaluated for the Waikakoi Bridge replacement, divided into two series based on the location of the new abutments. The first series of five designs (referred to in Appendix G as Alternative 1, options A through E) proposed superstructures placed on new pile-supported abutments constructed behind the existing ones. These included prestressed inverted tee girders, prestressed bridge planks, reinforced concrete T-beams, a cast-in-place (CIP) post-tensioned slab, and a reinforced concrete through girder. The second series of five designs (referred to in Appendix G as Alternative 2, options A through E) proposed similar superstructure types but on entirely new abutments constructed outside the existing footprint.

After evaluating each option against the Design and Evaluation Criteria (Section 4.2.1), Alternative 2 options were eliminated due to  potential for stream impacts related to removal of the existing ground nail repairs. Additionally, structural materials, such as steel, timber, and hybrid composite beams, were eliminated based on construction compatibility and historic character.

The selected design (referred to in Appendix G as Alternative 1C) consists of reinforced concrete T-beams on new abutments behind the existing ones was selected and is described in Section 2.4.3. This option best met the Project design criteria, minimizes potential conflicts with nearby slope stabilization work, allows for use of a temporary bridge to maintain traffic during construction, and offers a context-sensitive design that maintains the visual character of the corridor.

**South Wailua Bridge – Structural Design Options**

Five structural alternatives were evaluated for South Wailua Bridge, including prestressed inverted tee girders (Alternative A), prestressed bridge planks (Alternative B), reinforced concrete T-beams (Alternative C), CIP post-tensioned slab (Alternative D), and prestressed I-girders (Alternative E). These options were assessed using the established criteria (Section 4.2.1). Similar to the options evaluated for the Waikakoi Bridge replacement, various materials such as timber and steel and hybrid composite beams were considered but rejected due to construction compatibility and historic character.

Alternative D, a CIP post-tensioned slab, was selected as the preferred structural alternative and is described in Section 2.4.3. This option scored the highest in terms of historic preservation, constructability, and adaptability to site constraints. The slab structure will be constructed on a partial online alignment and traffic will be rerouted via a temporary bridge during construction.

## 4.3 Alternatives Comparison Results

Table 4-1 summarizes the extent to which each alternative fulfills the stated Project objectives provided in Section 1.4 and re-stated below:

1. Address structural deterioration and load capacity deficiencies by resolving the "serious" and "poor" condition ratings and restoring full functional capacity.
2. Improve safety and reliability for highway users by ensuring the bridges meet current design and safety standards.
3. Maintain reliable access to and from the Hāna region for residents, visitors, emergency services, and commercial deliveries.
4. Reduce long-term maintenance costs and burden on County resources by replacing aging structures with current infrastructure.
5. Preserves the historic and scenic character of the Hāna Highway consistent with the Hāna Highway Historic District, *Hāna Bridges Preservation Plan* (DPW, 2001), and County policies such as the HCP through mitigation measures including context-sensitive design.
6. Avoid or minimize environmental and long-term ROW impacts.

**Table 4-1: Alternative Comparisons to Meet Project Purpose and Need**

| Proposed Project Purpose and Need[a] | No-Action Alternative | Build Alternative (Proposed Action / Preferred Alternative) |
|---|---|---|
| 1. Address structural deterioration and load capacity deficiencies | N | Y |
| 2. Improve safety and reliability for highway users | N | Y |
| 3. Maintain reliable access to and from the Hāna region | N | Y |
| 4. Reduce long-term maintenance costs and burden on County resources | N | Y |
| 5. Preserves the historic and scenic character of the Hāna Highway | Y | Y (with mitigation commitments) |
| 6. Avoid or minimize environmental and long-term ROW impacts | Y (but temporary) | Y (through design and BMPs) |

[a] Yes (Y) or No (N) indicate whether the purpose and need of the Proposed Project would be met under the alternative described.

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# 5.0 Conformance with Existing Federal, State, and County Plans, Policies and Land Use Controls

Federal, State, and County policies, plans, and land use controls are established to guide development in order to enhance the environment and quality of life. These plans, policies, and land use controls at each level of the government have been put into effect to help promote the long-term social, economic, environmental, and land use needs of the community and region. The proposed Project's relationship to and conformance with land use policies, plans, and controls for the region are summarized in this chapter.

## 5.1 Federal

### 5.1.1 National Environmental Policy Act of 1969

The Project seeks to utilize Federal funding from FHWA, which subjects it to the environmental review requirements of NEPA. FHWA serves as the lead Federal agency responsible for the Project's compliance with NEPA documentation and processing requirements.

**Discussion:** DPW is coordinating with HDOT and FHWA to determine the applicable level of environmental review and documentation, which is anticipated to be a Categorical Exclusion.

### 5.1.2 Section 106 of the National Historic Preservation Act of 1966

The National Historic Preservation Act (NHPA) of 1966, as amended (PL 89-665, codified as 54 U.S.C. 470), recognizes the nation's historic heritage and establishes a national policy for the preservation of historic properties as well as the NRHP. Section 106 of the NHPA (16 U.S.C. 470f) requires that Federal agencies consider the effects of their projects on historic properties. The purpose of the Section 106 consultation process is to evaluate the potential for effects on existing historic sites, if any, resulting from the project. Section 106 consultation is required to fulfill the requirements of NEPA and as part of the CWA Section 404 authorization.

The Section 106 review process encompasses a "good faith effort" in ascertaining the existence and location of historic properties near and within a project site, establishing an Area of Potential Effect (APE) for the project, and identifying whether a potential for "adverse effects" on historic properties by the project exists. If an adverse effect on historic properties exists, mitigation measures in the monitoring and treatment of historic sites must be agreed upon by the agency, the SHPO, and consulting parties such as Native Hawaiian Organizations (NHOs) and lineal descendants.

**Discussion:** The Section 106 process for the proposed Project was initiated with SHPD on January 13, 2025, by DPW on behalf of FHWA and HDOT. Consultation request letters were sent to potential consulting parties on February 27, 2025, and a public notice was subsequently published on March 27, 2025, seeking participation from Native Hawaiian Organizations (NHOs) and interested parties in the Section 106 consultation process. The following parties were sent the Section 106 Consultation request letters:

1. Aha Moku o Maui Inc., including Moku o Hāna
2. Historic Hawaiʻi Foundation
3. Maui County Cultural Resources Commission
4. Maui//Lānaʻi Islands Burial Council
5. National Trust for Historic Preservation
6. Office of Hawaiian Affairs
7. Office of Hawaiian Affairs – Maui Office
8. Department of ʻŌiwi Resources, Maui County
9. Hanona Maui
10. Hui No Ke Ola Pono
11. Hui O Waʻa Kaulua
12. KAʻEHU
13. Kimokeo Foundation
14. Kuloloiʻa Lineage - I ke Kai ʻo Kuloloiʻa
15. Nohona Health, Inc.
16. Pili Koko
17. Na Moku ʻĀupuni o Koʼolau Hui – Keaʻnae, Maui

One response was provided from Manny Kuloloiʻa of the Kuloloiʻa Lineage, who noted no substantive comments on the Project and added support for DPW.

Identification of historic properties was made in accordance with NHPA Section 106 and the related HRS Chapter 6E requirements outlined in HAR §13-275-5 and 6. Findings relating to historic properties, archaeological resources, and cultural practices is provided in Section 3.1. The AIS is included in Appendix B.

As described in Section 3.1.1, there are seven historic properties identified within the APE, including the Waikakoi and South Wailua Bridges, component features of the Hāna Belt Road at each bridge, features of the Wailua Bridge, the newly identified Honua 1 (dry stacked terraces), and newly identified Honua 2 (dry stacked retaining wall). All sites have been evaluated under Federal (36 CFR Part 60.4) criteria for historic significance and are eligible for preservation consideration under Section 106 of the NHPA.

Based on the findings, the Project is determined to have an "adverse effect" on historic resources under Section 106 of the NHPA. Consultation with SHPD on this determination is ongoing.

An MOA will be developed as the Project progresses and will be signed by DPW, HDOT, FHWA, SHPD, and interested parties. Proposed mitigation measures include conducting HAER documentation of the bridges, designing the new bridges in accordance with context-sensitive design guidelines, incorporating archaeological monitoring during construction, and conducting consultations with adjacent landowners for Honua 2 to establish whether the site is within the roadway or on private property. Additionally, if necessary, archaeological data recovery will occur at Honua 1. Ongoing consultation with SHPD will be conducted to finalize the mitigation measures, which will also be documented in a MOA under Section 106. SHPD's concurrence with these determinations is pending, and consultation will continue as the Project progresses.

### 5.1.3 Coastal Zone Management Act of 1972

The 1972 Federal Coastal Zone Management Act (CZMA) ensures activities within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone will be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs. Under the CZMA, states are authorized to work in a unified manner with Federal and local governments to develop programs, policies, evaluation criteria, and development standards that lend to the effective protection and prudent use of coastal lands and waters.

The enforcement authority for the Federal Coastal Management Program (Public Law 104-150, as amended in 1996) has been delegated to the State under HRS Chapter 205A, Coastal Zone Management Program (CZMP). Hawaiʻi's CZMP was enacted to provide a common focus for State and County actions dealing with land and water uses and activities. Projects that require Federal permits are required by the CZMA to be consistent with Hawaiʻi's CZMP objectives and policies. The CZMP is administered by the State OPSD.

The State defines the coastal zone management area as the following: "All lands of the State and the area extending seaward from the shoreline limit of the State's police power and management authority, including the United States territorial sea."

> **Discussion:** The Project site, as with the entire State, is located within the Coastal Zone Management (CZM) area. The Project is seeking to obtain Federal FHWA funds and will also require CWA Section 404 authorization for work within jurisdictional waters. As such, the Project will coordinate with OPSD and undergo review through a CZM Federal Consistency Determination.
>
> A full discussion of the Project's compatibility with HRS, 205A is provided in Section 5.2.4.

### 5.1.4 Endangered Species Act of 1973

The 1973 Endangered Species Act (ESA; 16 U.S.C. 1531-1544) establishes a process for identifying and listing threatened and endangered species, as well as requires programs for the conservation of Federally listed endangered and threatened plants and wildlife and designated critical habitats for such species. The ESA prohibits actions by Federal agencies that would likely jeopardize the continued existence of those species or result in the destruction or adverse modification of designated critical habitat. Section 7 of the ESA requires consultations with Federal wildlife management agencies, such as the USFWS and NOAA National Marine Fisheries Service (NMFS).

> **Discussion:** A informal consultation with USFWS and NMFS was initiated requesting information on potentially affected resources in the study area.
>
> In a survey conducted of the Project area, no plant or faunal species of conservation interest or listed as threatened or endangered under State or Federal statutes was observed (Section 3.6). Species lists generated by the USFWS IPaC system on February 19, 2025 indicate that the Project could potentially impact the Hawaiian hoary bat, Band-rumped Storm Petrel, Hawaiian Petrel, and Newell's Shearwater. Measures will be implemented during construction and following Project completion to ensure that the Project minimizes impacts to listed species to the maximum extent practicable (refer to

minimization measures discussed in Section 3.6).

Based on the findings of the survey, information provided by USFWS and NMFS, and implementation of minimization measures DPW, on behalf of FHWA, is requesting USFWS and NMFS concurrence with a "may affect but not likely to adversely affect" determination for the Project. Consultation with USFWS is ongoing.

### 5.1.5 Magnuson-Stevens Fishery Conservation Management Act (1976), as amended

The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)), as amended, establishes provisions relative to Essential Fish Habitat (EFH), to identify and protect important habitats for Federally managed marine and anadromous fish species. EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, and/or growth to maturity. "Waters" include aquatic areas and their associated physical, chemical, and biological properties used by fish and may include areas historically used by fish where appropriate.

Federal agencies which fund, permit, or undertake activities that may adversely affect EFH (including actions outside EFH, such as upstream/upslope activities) are required to consult with NMFS regarding the potential effects of their actions on EFH, and respond to NMFS recommendations. An adverse effect is defined as any impact that reduces quality and/or quantity of EFH, including direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, species and their habitat, and other ecosystem components.

**Discussion:** The Project includes work in and adjacent to Waikakoi and Honolewa Streams. The streams are not mapped EFH but convey flow to the Pacific Ocean. A review of NOAA NMFS' EFH Mapper indicates that the Pacific Ocean surrounding the Hawaiian Islands may provide EFH for the Silver Jaw Jobfish (*Aphareus rutilansl*) and Thicklip Trevally (*Pseudocaranx cheilion)*.

The subject bridges are located between approximately 950 feet and 0.3 miles inland from the ocean, and work will occur within upland portions of the stream channel, well outside of the coastal marine environment. The potential for downstream impacts to EFH is minimal and BMPs will be implemented to prevent sedimentation and protect downstream water quality including, but not limited to, silt fencing, vegetated buffers, timing restrictions, and soil stabilization measures (see Section 3.3).

Based on the inland location of the work, the lack of in-water work near marine habitat, and the incorporation of BMPs, no adverse effects to EFH are anticipated, and EFH consultation under the Magnuson-Stevens Fishery Conservation and Management Act is not expected to be required. Coordination with NOAA NMFS is ongoing and will confirm if EFH consultation is not required.

### 5.1.6 Clean Water Act of 1972

The Federal Water Pollution Control Act (FWPCA) (33 U.S.C. §§1251 et seq.), is the Federal statute regulating the discharge of water pollution. Congress revised the FWPCA into the CWA in 1972. Section 404 of the CWA regulates discharge of dredge and fill material in the Waters of the U.S., including wetlands, and requires a Department of the Army permit from the USACE. When work requires a Section 404 permit, a Section 401 WQC is also required. Section 401 of the CWA directs States to establish WQC programs. In Hawai‘i, the Section 401 WQC is administered by the HDOH CWB. Additionally, Section 402 of the CWA requires an NPDES permit for point source discharges, including stormwater discharges associated with construction activities. The permit is required for construction activities that disturb one acre or more and discharge storm water from the project site to Waters of the U.S.

**Discussion:** A Jurisdictional Waters Determination survey was conducted by AECOS in January 2023 (see Appendix D and Section 3.5). According to the survey, Honolewa Stream and Waikakoi Stream are perennial tributaries to the Pacific Ocean and are therefore Jurisdictional Waters of the U.S. regulated under Section 404 of the CWA. Permanent fill within Jurisdictional Waters is not planned. However, the demolition of the existing bridges involves the removal of existing bridge piers and columns, which are within the OHWM. During column removal, installation of temporary BMPs within the stream are anticipated to be required to isolate work areas and divert the streams to maintain flow and allow for fish passage. BMPs are preliminarily anticipated to include sandbags and plastic sheeting to divert the streams around bridge columns. The BMPs would remain in place for the duration of in-water demolition work and removed upon completion. Notably, the existing bridge foundations and footings of the columns would remain in place, minimizing impacts to water quality and biological resources.

DPW is consulting with USACE Honolulu District, which oversees all Hawaiian islands, regarding the proposed temporary BMPs and the required approvals under Section 404 of the CWA. The USACE has preliminarily indicated that the Project could be authorized under a Nationwide Permit (NWP) No. 3. Notably, the most recent set of NWPs administered by the USACE Honolulu District will expire on March 14, 2026. Final permitting requirements pursuant to Section 404 of the CWA will be confirmed as the Project progresses.

The HDOH CWB issued the Blanket Section 401 WQC, which became effective April 28, 2022, to the USACE for certain 2021 NWPs, including the NWP No. 3. It is anticipated that HDOH CWB will reevaluate the Blanket Section 401 WQC based on the reissuance of the NWPs in 2026, if applicable.

Finally, the Project is anticipated to disturb greater than one acre of land and will therefore require a Section 402 CWA NPDES permit for stormwater discharges associated with construction activities.

### 5.1.7 Rivers and Harbors Act of 1899

The River and Harbor Act of 1899 (33 U.S.C. 401 et. seq.) requires that the Secretary of the Army issue permits for various activities to protect navigable and tidally influenced waterways. Section 9 of the Act requires authorization from USACE before construction of a bridge, dam, dike, or causeway over or in navigable waterways of the U.S. It requires that any agency planning to construct or modify a bridge apply for a U.S. Coast Guard (USCG) bridge permit.

Section 10 of the Act requires authorization from USACE before construction of any structure over, excavation from, or disposal of materials into navigable waters. Structures or work outside the limits defined for navigable waters of the U.S. require a Section 10 permit if the structure or work affects the course, location, or condition of the water body.

> **Discussion:** Although Honolewa Stream and Waikakoi Stream are tributaries with surface connections to a TNW (the Pacific Ocean), the Project sites are located well upstream of tidal influence. As such, the Project is not anticipated to require authorization under Section 10 of the Rivers and Harbors Act of 1899. Initial consultation with the USACE has also indicated that Section 10 authorization for this Project is not required.

## 5.2 State

### 5.2.1 Hawaiʻi State Plan

Under HRS Chapter 226 (Hawaiʻi State Planning Act), the Hawaiʻi State Plan (State Plan) serves as a guide for the future long-range development of the State. The Hawaiʻi State Plan identifies long-range goals, objectives, policies, and priorities for the State; provides a basis for determining priorities and allocating limited resources; improves coordination of Federal, State, and County plans, policies, programs, projects, and regulatory activities; and establishes a system for plan formulation and program coordination to provide for an integration of all major State and County activities.

The planned bridge replacement supports and is consistent with the following State Plan objectives.

*Economy in General*

*(a)(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people, while at the same time stimulating the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.*

> **Discussion:** The Project supports the objective of increasing and diversifying employment opportunities by creating construction-related jobs. While temporary in nature, the positions will contribute to local employment opportunities in a rural area where unemployment is relatively high as compared to the rest of the County and State (Table 3-8). The improved reliability of the transportation network will also benefit long-term community mobility and access to economic activity across the island.

*Physical environment– land-based, shoreline, and marine resources*

*(b)(3) Take into account the physical attributes of areas when planning and designing activities and facilities.*

*(b)(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii.*

**Discussion:** The Project includes the replacement of two bridges at the existing locations and in the same general alignment. The new bridges will be of similar size as the existing bridges and are not expected to have a significant adverse effect on the physical environment, as discussed in Section 3.3. Measures would be implemented to avoid and minimize any adverse effects on special-status avifauna, mammalian, or aquatic species that could potentially occur in the Project area. For example, downstream and upstream migration pathways for aquatic species would be maintained to the extent practicable during work within the streams. Nighttime construction would be avoided during the seabird fledging season, which extends from September 15 through December 15. In the event that night-time construction is required, lighting will be "dark sky compliant" and would be fully shielded to minimize potential impacts to avifauna. Woody vegetation taller than 15 feet would not be cleared during the Hawaiian hoary bat pupping season between June 1 and September 15 and barbed wire would not be utilized for fencing associated with construction activities.

*Physical environment– scenic, natural beauty, and historic resources*

*(a)(1) Promote the preservation and restoration of significant natural and historic resources.*

*(a)(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.*

*(a)(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage.*

**Discussion:** As discussed in Section 5.2.1, the Project would result in visual changes to the surrounding environment as a result of demolishing the original bridges and constructing new ones. However, the visual changes are considered minimal as the new bridges would be of a similar size, scale, location, and design to the original structures. The new bridges would not impact views of scenic or protected resources including the Hāna Highway Scenic Corridor, Wailua Falls, forested gulches, or the ocean. To match the historic character of the existing bridges, the use of a Hawaiʻi CRM barrier which is internally strengthened with reinforced concrete will replace the approach wall barriers. The design will maintain visual continuity with the scenic nature of the Hāna Highway scenic corridor and its bridge crossings and there would likely be no noticeable changes to the viewshed.

The Hāna Highway Historic District is listed in the NRHP. Although the Project is anticipated to adversely affect the two bridges, mitigation, as agreed upon with SHPD under HRS Chapter 6E and an MOA under Section 106 of the NHPA would be implemented to minimize the potential impacts. Mitigation measures as provided in Section 3.1.1 to satisfy State and Federal regulatory processes and minimize impacts during construction. See Section 3.1 for details.

*Physical environment – land, air, and water quality*

*(a)(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.*

*(b)(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.*

*(b)(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes,*

*earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.*

**Discussion:** The Project supports the State Plan objectives with regards to the physical environment. As discussed throughout Chapter 3.0, BMPs would be implemented during construction to control potential erosion, prevent sedimentation, and reduce pollutant runoff into surface and coastal waters, thereby protecting water quality. Air quality impacts during construction would be temporary and minimized through dust control measures such as water spraying and proper maintenance of construction equipment. No long-term adverse effects on air quality are anticipated.

The planned replacement of the bridges to meet current design and safety standards will include modern erosion and slope stabilization measures, which will benefit the physical environment in the long term. The new Waikakoi and South Wailua Bridges would potentially reduce flood risk associated with high-intensity rainfall events and stream overflow, minimize the potential for erosion, improve resilience of the overall highway network, and improve continued access for emergency response and evacuation, in this isolated region of East Maui.

*Facility systems–In General*

*(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.*

*(b)(1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans*

*Facility systems– Transportation*

*(a)(1) An integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods.*

*(a)(2) A statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the State.*

*(b)(2) Coordinate state, county, federal, and private transportation activities and programs toward the achievement of statewide objectives.*

*(b)(3) Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties.*

*(b)(6) Encourage transportation systems that serve to accommodate present and future development needs of communities.*

*(b)(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawaii's natural environment.*

**Discussion:** The Proposed Action supports the objectives of the Hawaiʻi State Plan related to facility systems and transportation by replacing two structurally deficient bridge crossings—Waikakoi Bridge and South Wailua Bridge—along the Hāna Highway, a critical traffic corridor serving East Maui communities. The improvements will support the continued safe and reliable movement of people, goods, and emergency services, in alignment with statewide transportation and infrastructure goals.

The Project will update deteriorating transportation infrastructure, thereby supporting the long-term needs of the community. The new bridges will meet current safety and design standards, addressing present and future transportation needs and supporting the long-term resiliency of the roadway. Finally, the Project will be coordinated with HDOT and FHWA in an effort to obtain Federal funds.

### 5.2.2 State Functional Plans

The Hawaiʻi State Plan establishes a statewide planning system to coordinate and guide major State and County activities and to implement the overall theme, goals, objectives, policies, and priority guidelines. The system implements the State Plan through the development of functional plans and county general plans. Functional plans set forth the policies, statewide guidelines, and priorities within a specific field of activity, when such activity or program is proposed, administered, or funded by a State agency. Functional plans are developed by the State agency primarily responsible for a given functional area, which include agriculture, conservation lands, education, energy, higher education, health, historic preservation, housing, recreation, tourism, and transportation.

***State Transportation Functional Plan***

The State Transportation Functional Plan, prepared by HDOT and approved in 1991, identified four critical issues of transportation: congestion, economic development, funding, and education (HDOT, 1991). Objectives, policies and implementing actions were identified for each issue. The following objectives and policies apply to the Project.

*Objective I.A. Expansion of the transportation system.*

*Policy I.A.1. Increase transportation capacity and modernize transportation infrastructure in accordance with existing master plans and laws requiring accessibility for people with disabilities.*

**Discussion:** Replacing these two critical bridges on Hāna Highway helps DPW fulfill its mission to provide a safe, efficient, accessible, and sustainable transportation system for the public. The Project would be consistent with existing plans described throughout this chapter and designed to meet current safety requirements.

*Objective I.G. Improved Transportation Maintenance Programs*

*Policy I.G.s. Conduct maintenance work to minimize disruption to the general public.*

**Discussion:** The Proposed Action includes the installation of temporary bypass bridges at each location allow the continued flow of traffic during construction of the new bridges. Additionally, nighttime construction work may be intermittently employed. With these measures to minimize impacts to traffic, the Project meets the above State Functional Plan objective and policy.

*Objective II.A. Development of a transportation infrastructure that supports economic development initiatives.*

*Policy II.A.2. Support tourism and economic development.*

**Discussion:** Hāna Highway serves as a key corridor for resident and visitor traffic. As a designated scenic corridor, many visitors come to Maui island with the intention of visiting the highway. Additionally, tourism remains one of the largest industries in the island and overall state. Replacement of the existing bridges with new ones that meet current safety and design standards will help Hāna Highway remain safe and functional for all highway users.

### 5.2.3 State Land Use Commission, Hawaiʻi Revised Statutes Chapter 205

Under HRS Chapter 205, all lands of the State are to be classified in one of four categories: Urban, Rural, Agricultural, and Conservation. The State Land Use Commission (LUC), an agency of DBEDT, is responsible for each district's standards and for determining the boundaries of each district. The LUC is also responsible for administering all requests for district reclassifications, special permits, and/or amendments to district boundaries, pursuant to HRS Chapter 205-4, and HAR, Title 15, Chapter 15 as amended. Each county supports the LUC by accepting, processing, and reviewing land use entitlement applications prior planning commission or LUC approval.

**Discussion:** The Waikakoi Bridge area is within land designated by the State as Agricultural District and Rural District, while the South Wailua Bridge area is designated by the State as Conservation District. Public roadway, bridge, and utility improvements within the County ROW are permissible within each land use district.

Work outside of the County ROW for the Waikakoi Bridge will occur in the Agricultural District on LSB D-rated soils, which indicates low productivity, as discussed in Section 3.4. As such, no additional approvals are anticipated, but will be confirmed with the County PD.

Portions of the work for the South Wailua Bridge, including temporary construction staging and temporary bypass bridge construction, will occur outside of the County ROW. During the pre-assessment consultation, OCCL acknowledged that this work is within the Conservation District's Limited and Resource subzones. As such, compliance with HAR Chapter 13-5 will be required. As the Project progresses, DPW will consult with OCCL to determine the appropriate level of permit or authorization, such as a Site Plan Approval or Departmental Permit.

### 5.2.4 Coastal Zone Management, Hawaiʻi Revised Statutes Chapter 205A

Under HRS Chapter 205A, CZM is a comprehensive program that establishes and enforces standards and policies to guide the development of public and private lands within coastal areas. The State CZM objectives and policies address the following 10 subject areas: (1) recreational resources, (2) historic resources, (3) scenic and open space resources, (4) coastal ecosystems, (5) economic uses, (6) coastal hazards, (7) managing development, (8) public participation, (9) beach protection, and (10) marine resources. The subject areas primarily relate to potential development impacts on the shoreline, nearshore, and ocean environments.

The Project site, as with the entirety of the state, is within the CZM area. However, the subject bridges are located between approximately 950 feet and 0.3 miles inland from the coast and at an elevation of approximately 200 and 300 feet ASL. The following discusses the Project's compliance with the relevant CZM objectives and policies articulated in HRS Chapter 205A or notes if they are not applicable.

*(1) Recreational resources: Provide coastal recreational opportunities accessible to the public.*

*(A) Improve coordination and funding of coastal recreational planning and management; and*

*(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by...*

> **Discussion:** The Project is not located along the coast; therefore, CZM objectives regarding recreational resources are not applicable.

*(2) Historic resources: Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.*

*(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:** Seven historic properties are identified within the APE, as discussed in Section 3.1.1 including the Waikakoi and South Wailua Bridges, component features of the Hāna Belt Road at each bridge, features of the Wailua Bridge, the newly identified Honua 1 (dry stacked terraces), and newly identified Honua 2 (dry stacked retaining wall). All sites have been evaluated under Federal (36 CFR Part 60.4) criteria for historic significance and are eligible for preservation consideration under Section 106 of the NHPA.
>
> The Project is determined to have an adverse effect on the historic properties under Section 106 of the NHPA and an “effect, with proposed mitigation commitments” under HRS Chapter 6E. The replacement of the Waikakoi and South Wailua Bridges is determined to have an adverse effect on the historic properties under Section 106 and an "effect, with proposed mitigation commitments" under HRS Chapter 6E. Proposed mitigation measures include conducting HAER documentation of the bridges, designing the new bridges in accordance with context-sensitive design guidelines, incorporating archaeological monitoring during construction, and conducting consultations with adjacent landowners for Honua 2 to establish whether site is within the roadway or on private property. Additionally, archaeological data recovery will occur at Honua 1 if necessary. Ongoing consultation with SHPD will be conducted to finalize the mitigation measures, which will also be documented in a MOA under Section 106. SHPD’s concurrence with these determinations is pending, and consultation will continue as the Project progresses.
>
> The new bridges will be of similar size, scale, location, and design to the existing structures, preserving the overall character of the Hāna Highway Historic Bridge District. To match the historic character of the existing bridges, the use of a Hawaiʻi CRM barrier which is internally strengthened with reinforced concrete will replace the approach wall barriers. The design will maintain visual continuity with the scenic nature of the Hāna Highway scenic corridor and its bridge crossings and there would be no noticeable changes to the viewshed. See Section 3.14 for further discussion.

*(3) Scenic and open space resources: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.*

*(A) Identify valued scenic resources in the coastal zone management 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; and*

*(D) Encourage those developments that are not coastal dependent to locate in inland areas.*

**Discussion:** Section 3.14 identifies valued scenic resources in the Project area, including the Hāna Highway Scenic Corridor, Wailua Falls, forested gulches, or the ocean. Temporary impacts to the surrounding scenic environment would occur during construction. However, construction equipment would be removed from the roadways, nighttime lighting (if required) would be minimized and shielded downward, and disturbed areas would be revegetated following construction. In the long term, no impacts to visual resources are anticipated. The new bridges will be of similar size, scale, location, and design to the existing structures. To match the historic character of the existing bridges, the use of a Hawaiʻi CRM barrier which is internally strengthened with reinforced concrete will replace the approach wall barriers. The design will maintain visual continuity with the scenic nature of the Hāna Highway scenic corridor and its bridge crossings and there would be no noticeable changes to the viewshed. No grading or fill will substantially alter natural landforms.

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

*(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; and*

*(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and non-point source water pollution control measures.*

**Discussion:** The Project is not located adjacent to coastal ecosystems; therefore, CZM objectives regarding coastal ecosystems are not applicable. The Waikakoi Stream passes beneath the Waikakoi Bridge, while the Honolewa Stream passes beneath the South Wailua Bridge. Both streams eventually discharge into the ocean. As discussed in Sections 3.3 and 3.5, BMPs in compliance with State and County regulations would be employed to protect downstream water quality. With the implementation of BMPs, no adverse impacts to coastal ecosystems are anticipated and no additional mitigation measures are proposed.

*(5) Economic uses: Provide public or private facilities and improvements important to the State's economy in suitable locations.*

*(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 coastal zone management area; and*

*(C) Direct the location and expansion of coastal development to areas designed 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; and (iii) The development is important to the State's economy.*

**Discussion:** The CZM law's objectives and policies regarding economic uses is not applicable to the Proposed Action, as no uses or development are proposed near the coastal area.

*(6) Coastal hazards: Reduce hazard to life and property from coastal hazards.*

*(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 the National Flood Insurance Program; and*

*(D) Prevent coastal flooding from inland projects.*

**Discussion:** The Project is not subject to coastal hazards as discussed throughout Section 3.7.3; as such, the CZM law's objectives and policies regarding coastal hazards is not applicable to the Proposed Action.

*(7) Managing development: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.*

*(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; and*

*(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.*

**Discussion:** The EA has been prepared in compliance with environmental requirements outlined in HRS Chapter 343 and HAR, Chapter 11-200.1. The Project will be conducted in compliance with all necessary State and County environmental rules and regulations as discussed throughout this EA. DPW has initiated consultation with relevant agencies regarding the required permits noted in Table 2-4, which will facilitate timely processing of approvals.

*(8) Public participation: Stimulate public awareness, education, and participation in coastal management.*

*(A) Promote public involvement in coastal zone management processes;*

*(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; and*

*(C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.*

**Discussion:** In accordance with HAR, Section 11-200.1(18)(a), DPW conducted a pre-assessment consultation seeking input from agencies, citizen groups, individuals with jurisdiction or expertise, and those reasonably affected by the Project to guide the scope and preparation of the Draft EA. A total of 6 agencies provided comments during the 30-day comment period, which commenced on March 18, 2025, and ended on April 18, 2025. See Table 6-1 for a listing of those who provided comments during the pre-assessment consultation and Table 6-2 for the comments and responses.

The Draft EA was published on July 8, 2025, and was followed by a 30-day public comment period to collect input on the document and the Project. Those listed in Table 6-1 were also be notified of the availability of this Draft EA. Comments received during the Draft EA public comment period, as well as DPW responses to comments, are provided in Table 6-3.

One public presentation was held with Hāna Community Association on July 15, 2025, following Draft EA publication to inform and encourage the public to provide comments during the 30-day public comment period. Additionally, Kīpahulu Community Association was provided with the opportunity for a public presentation, as well as presentation materials and a forum for commenting on the Draft EA.

*(9) Beach and coastal dune protection;*

*(A) Protect beaches and coastal dunes for: (i) Public use and recreation; (ii) the benefit of coastal ecosystems; and (iii) use as natural buffers against coastal hazards;*

*(B) Coordinate and fund beach management and protection.*

**Discussion:** The Project is not located adjacent to a beach or coastal dune; as such, the CZM law's objectives and policies regarding beach and coastal dune protection is not applicable to the Proposed Action.

*(10) Marine and coastal resources: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.*

*(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 and 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; and*

*(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.*

**Discussion:** Due to its location, the Project is not anticipated to impact marine or coastal resources; therefore, the above objectives are not applicable. The subject bridges are located between approximately 950 feet and 0.3 miles inland from the ocean, and work will occur within upland portions of the stream channel, well outside of the coastal marine environment. The potential for downstream impacts to marine resources such as EFH is minimal and BMPs will be implemented to prevent sedimentation and protect downstream water quality including, but not limited to, silt fencing, vegetated buffers, timing restrictions, and soil stabilization measures (see Section 3.3). Consultation with NOAA NMFS under the Magnuson-Stevens Fishery Conservation Management Act of 1976 will be conducted to confirm that the Project will not adversely affect marine resources.

### 5.2.5 Hawaiʻi Statewide Transportation Plan 2045 (Update, Draft 2022)

The Hawaiʻi Statewide Transportation Plan (HSTP) establishes the framework to be used in the planning of Hawaiʻi's transportation system. The goals and objectives identified in the HSTP provide the keys to the development of an integrated, multi-modal transportation system for the safe, efficient and effective movement of people and goods throughout Hawaiʻi.

The HSTP was established by HRS Chapter 279A to: (1) establish a comprehensive, multimodal statewide transportation planning process to develop coordinated transportation plans, (2) address the obligation of the statewide transportation system to clearly serve and address social, economic, and environmental objectives, and (3) provide a connection to and encourage coordination with the State's goals and other State agencies, such as the HDOH and DBEDT.

The HSTP is updated approximately every 10 years and has an outlook for 20 to 25 years. The last HSTP was completed in 2011. The HSTP is currently in draft form as of November 2022 and is awaiting final adoption. The following includes a discussion of the Project-relevant goals from the updated draft HTSP (HDOT, 2022).

*Goal: Infrastructure*

*Objective: Maintain the multimodal transportation system in a state of good repair*

*Policy-level Strategies: Manage transportation assets effectively and efficiently*

*Highways: Implement the Bridge and Pavement Management Systems*

**Discussion:** The Proposed Action will address the structural deterioration and load capacity deficiencies of both the Waikakoi and South Wailua Bridges by replacing the existing bridges with new structures that meet current design standards, supporting the continued effective operation of the highway and maintaining it in a state of good repair.

*Goal: Economy*

*Objective: Advance and diversify statewide and local economic development*

*Policy-level Strategies: Support sustainable development in urban and rural communities*

*Highways: Invest in infrastructure that supports the HDOT's mission of supporting economic vitality*

**Discussion:** Hāna Highway serves as a key corridor for resident and visitor traffic. As a designated scenic corridor, many visitors come to Maui island with the intention of visiting the highway. Additionally, tourism remains one of the largest industries in the island and overall state. Replacement of the existing bridges with new ones that meet current safety and design standards will help Hāna Highway remain safe and functional for all highway users.

*Goal: Environment*

*Objective: Improve and preserve the quality of air, water, land, and other natural and cultural resources*

*Policy-level Strategies: Avoid or mitigate the negative impacts of transportation systems and infrastructure*

*Incorporate federal NEPA and HEPA compliance on projects*

**Discussion:** The Project will comply with NEPA through the preparation of CE documentation as described in Section 5.1.1 and with HEPA through the publication and processing of this EA as described in Section 1.2.

### 5.2.6 Statewide and Regional Federal-Aid Highways 2035 Transportation Plan (2014)

The Statewide and Regional Federal-Aid Highways 2035 Transportation Plans sets the direction for land transportation system improvements and decisions through the year 2035. The Plans establish goals and needs, present potential multimodal solutions, and lay out priorities and funding alternatives. The Statewide Plan focuses on program-level needs and opportunities, while the three separate Regional Plans for the Districts of Hawaiʻi, Maui, and Kauai present potential solutions to address growing demand and capacity deficiencies, connectivity issues, and preservation and resilience at the project level.

HDOT is currently in the outreach state of its updates to the Statewide Federal-Aid Highways Transportation Plan, which was last revised in July 2014. The proposed project is consistent with the following relevant goals (HDOT, 2014a):

*1. Environment and Sustainability*

*1.1 Preserve and enhance the natural environment, including biological and aesthetic resources.*

*1.2 Preserve and enhance Hawaii's cultural resources environment, including archaeological and historical sites.*

*1.3 Meet the relevant environmental regulations and standards set by federal, state, and county/city agencies. Maintain collaborative working relationships with agencies and comply with goals of their relevant plans and policies.*

**Discussion:** The Project will comply with the applicable Federal, State, and County regulations to permit development and construction as noted in Section 2.7. The Project will meet environmental review requirements including NEPA through the preparation of CE documentation as described in Section 5.1.1 and with HEPA through the publication and processing of this EA as described in Section 1.2.

*3. System Preservation*

*Goal 3.1. Manage transportation assets and optimize investments.*

*Goal 3.2. Maintain safe, efficient, complete transportation system for the long term.*

**Discussion:** The Proposed Action will address the structural deterioration and load capacity deficiencies of both the Waikakoi and South Wailua Bridges by replacing the existing bridges with new structures that meet current design standards, supporting the maintenance of a safe, efficient, and complete transportation system for the long term.

*8. Safety*

*Goal 8.1. Maintain a safe transportation system for all land transportation modes.*

**Discussion:** As discussed above, the Proposed Action will address the structural deterioration and load capacity deficiencies of both the Waikakoi and South Wailua Bridges by replacing the existing bridges with new structures that meet current design standards, maintaining a safe transportation for highway users.

### 5.2.7 Hawaiʻi 2050 Sustainability Plan

Updated in June 2021, the Hawaiʻi 2050 Sustainability Plan serves as the State's sustainability and climate strategic action plan; aligns the State's goals, policies, and actions with the United Nations (UN) Sustainable Development Goals (SDGs); and recommends sustainability and climate change actions for 2020–2030. The revised plan guides the coordination and implementation of Hawaiʻi's sustainability and climate adaptation goals, principles, and policies, pursuant to HRS, Section 226-65. It also provides recommendations for a sustainable and resilient economic recovery for Hawaiʻi.

The Hawaiʻi 2050 Sustainability Plan identifies eight focus areas with 38 strategies and more than 250 recommended actions toward a sustainable Hawaiʻi. The focus areas align with priorities identified through public and stakeholder engagement, as well as ongoing commitments the State has made. The following focus area and SDG is applicable to the Project:

*Focus Area: Industry, Innovation, and Infrastructure*

*Sustainable Development Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation*

**Discussion:** The Proposed Action will address the structural deterioration and load capacity deficiencies of both the Waikakoi and South Wailua Bridges by replacing the existing bridges with new, resilient structures that meet current design standards.

## 5.3 County of Maui

### 5.3.1 County of Maui 2030 General Plan: Countywide Policy Plan

The Countywide Policy Plan, adopted on March 24, 2010, provides broad goals, objectives, policies, and implementing actions that portray the desired direction of the County's future. The Countywide Policy Plan is the outgrowth of, and includes the elements of the earlier General Plans of 1980 and 1990. This includes: (1) a vision statement and core values for the County to the year 2030; (2) an explanation of the plan-making process; (3) a description and background information regarding Maui County today; (4) identification of guiding principles; and (5) a list of countywide goals, objectives, policies, and implementing actions related to 11 core themes.

The following discusses the Project's compliance with the relevant Maui GP policies, including protecting the natural environment and diversifying transportation options and improving physical infrastructure:

A. Prote*ct the Natural Environment*

*Goal: Maui County's natural environment and distinctive open spaces will be preserved, managed, and cared for in perpetuity.*

*Objective: 1. Improve the opportunity to experience the natural beauty and native biodiversity of the islands for present and future generations.*

*Objective: 3. Improve the stewardship of the natural environment:*

*a. Preserve and protect natural resources with significant scenic, economic, cultural, environmental, or recreational value.*

*d. Improve efforts to mitigate and plan for the impact of natural disasters, human-influenced emergencies, and global warming.*

**Discussion:** Temporary impacts to the surrounding scenic environment would occur during construction. However, construction equipment would be removed from the roadways, nighttime lighting (if required) would be minimized and shielded downward, and disturbed areas would be revegetated following construction. In the long term, no impacts to visual resources are anticipated. The new bridges will be of similar size, scale, location, and design to the existing structures. To match the historic character of the existing bridges, the use of a Hawaiʻi CRM barrier which is internally strengthened with reinforced concrete will replace the approach wall barriers. The design will maintain visual continuity with the scenic nature of the Hāna Highway scenic corridor and its bridge crossings and there would be no noticeable changes to the viewshed. See Section 3.14 for further discussion.

The new bridges would be designed to offer more resiliency, seismic resistance, and improved safety compared to the existing bridges. This will be balanced with context-sensitive design elements to provide best match replacements for the bridges and maintain the character of the historic district.

*H. Diversify Transportation Options*

*Goal: Maui County will have an efficient, economical, and environmentally sensitive means of moving people and goods.*

*Objective: 1. Provide an effective, affordable, and convenient ground-transportation system that is environmentally sustainable.*

*Policies:*

*e. Ensure that roadway systems are safe, efficient, and maintained in good condition.*

*f. Preserve roadway corridors that have historic, scenic, or unique physical attributes that enhance the character and scenic resources of communities.*

*g. Design new roads and roadway improvements to retain and enhance the existing character and scenic resources of the communities through which they pass.*

**Discussion:** The Proposed Action will address the structural deterioration and load capacity deficiencies of both the Waikakoi and South Wailua Bridges by replacing the existing bridges with new structures that meet current design standards, supporting the maintenance of a safe, efficient roadway system for the long term.

As discussed above, the new bridges will be of similar size, scale, location, and design to the existing structures. To match the historic character of the existing bridges, the use of a Hawaiʻi CRM barrier which is internally strengthened with reinforced concrete will replace the approach wall barriers. The design will maintain visual continuity with the scenic nature of the Hāna Highway scenic corridor and its bridge crossings and there would be no noticeable changes to the viewshed. See Section 3.14 for further discussion.

### 5.3.2 Maui Island Plan (Adopted December 2012)

Supporting the Maui County General Plan are island-wide plans prepared by the County Planning Department (PD), Long Range Division. The MIP provides direction for future growth, the economy, and social and environmental decisions on the island of Maui through 2030 and establishes a vision, founded on core values that break down into goals, objectives, policies, and actions. The current MIP was adopted by Ordinance 4004 and took effect on December 28, 2012.

The MIP is used by the County Council, MPC, County staff, and the community as a policy foundation developing, implementing, and applying policies and regulations (e.g., zoning and other ordinances, including the Community Plans, that describe the kind of development that is allowed) and determining the appropriateness of discretionary development proposals. The following section discusses the MIP policies relevant to the Project:

*Chapter 2: Heritage Resources*

*Goal 2.4. Maui's natural areas and indigenous flora and fauna will be protected.*

*Goal 2.5. Maui will continue to be a beautiful island steeped in coastal, mountain, open space, and historically significant views that are preserved to enrich the residents' quality of life, attract visitors, provide a connection to the past, and promote a sense of place.*

*Objective: A greater level of protection for scenic resources*

*Policy 2.5.1.e Protect scenic resources along Maui's scenic roadway corridors.*

**Discussion:** The Project will support the protection of natural areas and indigenous flora and fauna. In a survey conducted of the Project area, no plant or faunal species of conservation interest or listed as threatened or endangered under State or Federal statutes was observed (Section 3.6). Species lists generated by the USFWS IPaC system on February 19, 2025, indicate that the Project could potentially impact the Hawaiian hoary bat, Band-rumped Storm Petrel, Hawaiian Petrel, and Newell's Shearwater. Measures will be implemented during construction and following Project completion to ensure that the Project minimizes impacts to listed species to the maximum extent practicable (refer to minimization measures discussed in Section 3.6).

The Project is located along the Hāna Highway scenic corridor. Temporary impacts to the surrounding scenic environment would occur during construction. However, construction equipment would be removed from the roadways, nighttime lighting (if required) would be minimized and shielded downward, and disturbed areas would be revegetated following construction. In the long term, no impacts to visual resources are anticipated. The new bridges will be of similar size, scale, location, and design to the existing structures. To match the historic character of the existing bridges, the use of a Hawaiʻi CRM barrier which is internally strengthened with reinforced concrete will replace the approach wall barriers. The design will maintain visual continuity with the scenic nature of the Hāna Highway scenic corridor and its bridge crossings and there would be no noticeable changes to the viewshed. See Section 3.14 for further discussion.

*Chapter 3: Natural Hazards*

*Goal 3.1: Maui will be disaster resilient*

*Objective 3.1.2 Greater protection of life and property*

*Policy 3.1.2.d. – Encourage the use of construction techniques that reduce the potential for damage from natural hazards.*

**Discussion:** The Proposed Action will address the structural deterioration and load capacity deficiencies of both the Waikakoi and South Wailua Bridges by replacing the existing bridges with new structures that meet current design standards. The new bridges will increase resilience of the great roadway, reducing the potential for damage from natural hazards.

*Chapter 6: Infrastructure and Public Utilities*

*Objective 6.4.2: Safe, interconnected transit, roadway, bicycle, equestrian, and pedestrian network.*

*Policy 6.4.2.d Identify and improve hazardous and substandard sections of roadways, drainage infrastructure, and bridges, provided that the historical integrity of the roads and bridges are protected.*

**Discussion:** The Proposed Action is consistent with the above objective of the MIP and will improve this substandard section of Hāna Highway. The Project will address the structural deterioration and load capacity deficiencies of both the Waikakoi and South Wailua Bridges by replacing the existing bridges with new structures that meet current design standards.

To match the historic character of the existing bridges, the use of a Hawaiʻi CRM barrier which is internally strengthened with reinforced concrete will replace the approach wall barriers. The design will maintain visual continuity with the scenic nature of the Hāna Highway scenic corridor

### 5.3.3 Hāna Community Plan (Updated 1994)

Within Maui Island, the County PD has prepared nine community plans which reflect current and anticipated conditions and identifies planning goals, objectives, policies, and implementation considerations to guide decision-making in the region. The Project is located within the East Maui region of the island and is therefore within the Hāna Community Plan (HCP) Area. The HCP was first adopted by Ordinance 1247 in 1982, and subsequently updated and adopted in 1994. The Project complies with the following planning goals, objectives, and policies of the HCP.

*Cultural Resources*

*Goal: Identification, preservation, protection, and where appropriate, restoration of significant cultural resources and practices, that provide a sense of history and identity for the Hāna region.*

*Objectives and Policies*

*1. Identify, preserve and protect historically, archaeologically and culturally significant areas, sites, and features within the Hāna District.*

*2. Acknowledge and respect family ancestral ties to cultural resources.*

*4. Promote the cultural resources of the Hāna region as an identifying characteristic of the people and the place.*

*6. Encourage and protect traditional mauka and makai accesses for traditional cultural uses and practices.*

*Implementing Actions*

*2. Require development projects to identify all cultural resources within or adjacent to the project area as part of the County development review process. Further require that all proposed development include appropriate mitigation measures including site avoidance, adequate buffer areas and interpretation.*

*3. General site types and areas that should be flagged for preservation during development review include the following:*

- *Hāna /Piʻilani Highways and historic bridges*

  **Discussion:** A discussion on the affected archaeological, cultural, and historic resources is provided in Section 3.1. No impacts to cultural resources or practices are anticipated (Honua 2025b).

  As described in Section 3.1.1, there are seven historic properties identified within the APE, including the Waikakoi and South Wailua Bridges, component features of the Hāna Belt Road at each bridge, features of the Wailua Bridge, the newly identified Honua 1 (dry stacked terraces), and newly identified Honua 2 (dry stacked retaining wall). All sites have been evaluated under Federal (36 CFR Part 60.4) criteria for historic significance and are eligible for preservation consideration under Section 106 of the NHPA.

The replacement of the Waikakoi and South Wailua Bridges is determined to have an adverse effect on the historic properties under Section 106 and an "effect, with proposed mitigation commitments" under HRS Chapter 6E. Proposed mitigation measures include conducting HAER documentation of the bridges, designing the new bridges in accordance with context-sensitive design guidelines, incorporating archaeological monitoring during construction, and conducting consultations with adjacent landowners for Honua 2 to establish whether site is within the roadway or on private property. Additionally, archaeological data recovery will occur at Honua 1 if necessary. Ongoing consultation with SHPD will be conducted to finalize the mitigation measures, which will also be documented in a MOA under Section 106. SHPD's concurrence with these determinations is pending, and consultation will continue as the Project progresses.

The new bridges will be of similar size, scale, location, and design to the existing structures, preserving the overall character of the Hāna Highway Historic Bridge District. To match the historic character of the existing bridges, the use of a Hawaiʻi CRM barrier which is internally strengthened with reinforced concrete will replace the approach wall barriers. The design will maintain visual continuity with the scenic nature of the Hāna Highway scenic corridor and its bridge crossings and there would be no noticeable changes to the viewshed. See Section 3.14 for further discussion.

*Urban Design*

*Goal: Harmony between the natural and man-made environments through building, infrastructure and landscaping design which ensures that the natural beauty and character of the Hāna region is preserved.*

*Objectives and Policies*

*2. Encourage roadway, drainage, landscaping and other public improvement standards which are in harmony with an informal rural or natural environment.*

*4. Preserve significant view corridors.*

*Implementing Actions*

*2. Develop and implement appropriate "rural standards" for public facilities and privately sponsored building improvements, roadways and subdivisions.*

*4. Limit the height of man-made walls to avoid visual obstruction of coastal and scenic mauka areas*

***Discussion:** Design of the new bridges will match the character of the surrounding rural environment. Walls associated with the bridges will avoid visual obstruction of coastal and scenic mauka areas. The bridges will use a Hawaiʻi CRM barrier, which has been used for similar projects. The design will maintain visual continuity with the rural and scenic nature of the Hāna Highway scenic corridor and its bridge* *crossings and there would be no noticeable changes to the viewshed. See Section 3.14 for further discussion.*

*Physical Infrastructure*

*Goal: Timely and environmentally sensitive development and maintenance of infrastructure systems which protect and preserve the safety and health of the Hāna region's residents and visitors, including the provision of domestic water, utility and waste disposal services, and effective transportation systems which meet the needs of residents and visitors while protecting the region's rural character.*

*Objectives and Policies*

*1. Ensure community participation, including resident Hawaiian, in all long-term infrastructure planning.*

*3. Encourage a program of roadway safety improvements, including shoulder widening, pull-over spots and installation of new signage and guardrails that do not detract from the region's scenic and rural character.*

*4. Balance traffic flow and safety requirements with the preservation of the Hāna region's historic bridges.*

**Discussion:** The Proposed Action is consistent with the HCP goal to support the timely and environmentally sensitive development and maintenance of infrastructure systems that protect public health and safety while preserving the rural character of the region. Specifically, the Project addresses the need for safe and reliable transportation infrastructure through the replacement of two structurally deficient bridges along the Hāna Highway, the Waikakoi Bridge and South Wailua Bridge.

Design of the new bridges will address safety deficiencies while maintaining the overall scale, alignment, and visual character of the existing structures. The new bridges will incorporate context-sensitive design measures, including the use of the Hawaiʻi CRM barrier, to preserve the visual integrity of the Hāna Highway scenic corridor and minimize visual impacts to the surrounding landscape. As discussed in Section 3.14, the Project is not anticipated to result in any significant alteration to viewsheds or the rural aesthetic of the corridor. The proposed design avoids the use of visually intrusive elements and is consistent with rural roadway standards.

Although the bridges are contributing elements of the Hāna Highway Historic District, and their replacement is anticipated to have an “adverse effect” under Section 106 of the NHPA, mitigation measures will be developed through formal consultation with SHPD and other consulting parties. Under HRS Chapter 6E, the Project has been determined to have an “effect, with proposed mitigation commitments” which include HAER documentation, archaeological monitoring, and design treatments to preserve historic character (Section 3.1). SHPD concurrence with this determination is pending, and consultation will continue as the Project progresses.

The Project further supports the HCP's objective to ensure community participation, including among Native Hawaiian residents, in long-term infrastructure planning. DPW has initiated early agency coordination and is providing opportunities for public input, including presentations, as part of the environmental review process (Chapter 7.0). Additionally, 17 NHOs were notified of the Project as part of Section 106 consultation and invited to participate as a consulting party in the process (Section 5.1.2). One response was received noting no substantive comments and support for DPW. An MOA will be developed to mitigate for "adverse effects" on historic resources and consultation with NHOs under Section 106 will continue as the Project progresses.

<u>Government</u>

*<u>Goal:</u> The provision of accessible, cost effective, and responsive government services and programs which meet the unique needs of residents and the cultural, geographic and socio-economic characteristics of the Hāna region.*

<u>Objectives and Policies</u>

*2. Encourage improved communication between government agencies and residents in order to improve residents' understanding of the development permit process and compliance with regulatory requirements.*

*5. Ensure the participation of native Hawaiian residents and community representatives in all CIP and program planning that impacts on the Hāna region.*

**Discussion:** Table 6-1 identifies the parties invited to participate in the pre-assessment consultation and those that provided comments. These parties were also provided notification of the Draft EA availability, which was published on July 8, 2025. Comments received during the Draft EA public comment period, as well as DPW responses to comments, are provided in Table 6-3.

Following the Draft EA publication, one presentation was held with Hāna Community Association on July 15, 2025, to inform the public about the Project and encourage comments during the 30-day public comment period. Additionally, Kīpahulu Community Association was provided with the opportunity for a public presentation, as well as presentation materials and information on how to comment on the Draft EA.

Additionally, 17 NHOs were notified of the Project as part of Section 106 consultation and invited to participate as a consulting party in the process (Section 5.1.2). One response was received noting no substantive comments and support for DPW. An MOA will be developed to mitigate for "adverse effects" on historic resources and consultation with NHOs under Section 106 will continue as the Project progresses.

<u>C. Planning Standards</u>

*4. Roadways: Highways and major roadways shall have a minimum pavement width of 16 feet, and shoulder width of two feet, to provide for the safe passage of two-way traffic, except in areas where natural landforms, historic structures and other environmental constraints preclude widening beyond existing roadway widths.*

*County-standard curbs, gutters, and sidewalks shall not be required in the Hāna district.*

**Discussion:** Design of the new bridges is consistent with the planning standards outlined in the HCP. The bridges will both have a width of 18.0 feet but will serve one-way traffic, which is allowed due to the surrounding natural landforms, the roadway and bridges' historic alignment, and environmental constraints. County-standard curbs, gutters, and sidewalks are not planned for the Project and are not required in the Hāna district.

### 5.3.4 County of Maui Zoning

MCC Title 19 regulates land use and development standards in the County of Maui, including the islands of Maui, Molokaʻi, and Lānaʻi. The purpose of the zoning code is to regulate the utilization of land in a manner that will encourage and contribute to the economic and social prosperity and welfare of the County. The provisions of MCC Title 19 are administered by the County PD.

**Discussion:** The Waikakoi Bridge area is zoned as AG (Agricultural) and INT (Interim) while the South Wailua Bridge area is zoned as INT (Interim) (Figure 1-5). The new bridges will also be located within the County ROW and will not introduce new uses. No zone change will be required. The bridge replacements will not induce additional traffic or development, but will serve the existing and future traffic projected in this rural area as discussed in Section 3.10.1.

### 5.3.5 Special Management Area, Maui County Code

A part of the State CZMP, the SMA Permit is a management tool administered by counties to assure that uses, activities, or operations on land or touching water within an SMA are designed and carried out in compliance with the CZM objectives and policies and SMA guidelines as articulated in MCC Chapter 12-202.

During the pre-assessment consultation, Maui County PD confirmed that the Proposed Action is considered to be a "development," and, because the Project will cost over $500,000, an SMA Use Permit (SMI) is required. The SMI involves a public hearing and the approving authority is the Maui Planning Commission. DPW will move forward with the SMI process following the conclusion of the HRS Chapter 343 environmental review process.

Issuance of the SMI is based on the consistency of the Proposed Action with the policies and objectives specified in the CZM Law (Section 5.2.4) and on the evaluation of a Proposed Action's potential significant adverse environmental or ecological effect as articulated in MCC Chapter 12-202-12.(e) The Project's compliance with the evaluation guidelines is discussed below:

*(e) In considering the significance of potential environmental and ecological effects, the director shall evaluate:*

*(2) (ii) Every phase of a proposed action, its expected primary and secondary consequences, and its cumulative and [short] short-term or long-term effects, including previous, ongoing and other proposed or completed actions on the same parcel or on related adjacent parcels that together with the subject parcel comprise a development, within the preceding two years. A proposed action may have a significant adverse effect on the environment when the proposed action potentially:*

*(A) Causes an irrevocable or substantial and detrimental effect on any natural or cultural resources;*

**Discussion:** No natural resources, including streams or critical habitat, will be permanently altered as a result of the Project. Temporary construction impacts to water quality will be mitigated through the implementation of BMPs as described in Section 3.3. During column removal of the existing bridges, installation of temporary BMPs within the stream are anticipated to be required to isolate work areas and divert the streams to maintain flow and allow for fish passage. DPW is consulting with USACE Honolulu District regarding the proposed temporary BMPs and the required approvals under Section 404 of the CWA.

The Project involves replacement of two existing bridges within the County-owned right-of-way. As discussed in Section 3.1, the Waikakoi Bridge and South Wailua Bridge are considered historic properties and are contributing elements to the Hāna Highway Historic District. The Project has been determined to have an adverse effect under Section 106 of the NHPA and an “effect, with proposed mitigation commitments” under HRS Chapter 6E. Mitigation measures, including HAER documentation, archaeological monitoring, and context-sensitive design, are being developed through ongoing consultation with SHPD. With implementation of these measures, the Project is not anticipated to cause irrevocable or substantially detrimental effects on cultural resources.

*(B) Significantly curtails the range of beneficial uses of the environment;*

**Discussion:** The Project will not curtail existing beneficial use of the environment. The replacement bridges will be located at the same location as the existing bridges within the County ROW. Work outside of the ROW will be required during construction but would be temporary and localized. Upon completion of the permanent bridges, the temporary bridge structures will be removed, and the surrounding areas will be restored to original conditions to the extent practicable. The replacement bridges will serve the same transportation function as the existing structures and will not introduce new land uses or modifications to access. The Project will maintain the safe operation of Hāna Highway in the long-term.

*(C) Conflicts with the County’s or the State’s long-term environmental policies or goals;*

**Discussion:** As discussed throughout Chapter 5.0, the Project is consistent with the visions, objectives, goals, and policies of various State and County long-term environmental policies.

*(D) Substantially and detrimentally affects the economic or social welfare and activities of the community, County, or State;*

**Discussion:** The Project would not substantially or detrimentally affect the economic or social welfare and activities of the community, County, or State. The Proposed Action would replace existing bridges that are in need of repair, thereby improving critical transportation infrastructure serving residents, visitors, and emergency response vehicles. Construction impacts will be temporary and minimized through the implementation of BMPs discussed throughout Chapter 3.0. In the long term, the Project would improve economic and social welfare of the residents of the Hāna region by improving the safety, reliability, and resilience of Hāna Highway, which serves as an essential transportation corridor on the island.

*(E) Causes substantial and detrimental effects on public facilities, such as increased demand on drainage, sewage, and water systems, beach access, recreational opportunities, and pedestrian walkways;*

**Discussion:** The Proposed Action includes the replacement of existing bridges along the Hāna Highway, which will not induce new traffic or generate demand for public facilities or services. The new bridges will be located within the County ROW and will not affect beach access or recreational facilities. Stormwater management will meet County requirements and is not expected to increase demand on drainage systems. Construction impacts will be temporary and minimized or mitigated through the implementation of BMPs discussed throughout Chapter 3.0.

*(F) In itself has no substantial and detrimental effects but cumulatively has substantial and detrimental effects upon the environment;*

**Discussion:** Cumulative impacts are discussed in Section 3.15. The Proposed Action is a complete, independent project and would not result in commitments to other projects. With proposed mitigation measures in place, the Project is not anticipated to contribute to cumulative significant environmental effects in the region.

*(G) Substantially and detrimentally affects a rare, threatened, or endangered species of animal or plant, or its habitat;*

**Discussion:** The Project would not substantially and detrimentally affect rare, threatened, or endangered animal or plant species or critical habitat. In a survey conducted of the Project area, no plant or faunal species of conservation interest or listed as threatened or endangered under State or Federal statutes was observed (Section 3.6). Species lists generated by the USFWS IPaC system on February 19, 2025 indicate that the Project could potentially impact the Hawaiian hoary bat, Band-rumped Storm Petrel, Hawaiian Petrel, and Newell's Shearwater. Measures will be implemented during construction and following Project completion to ensure that the Project minimizes impacts to listed species to the maximum extent practicable (refer to minimization measures discussed in Section 3.6). The potential for downstream impacts to EFH is minimal and BMPs will be implemented to prevent sedimentation and protect downstream water quality including, but not limited to, silt fencing, vegetated buffers, timing restrictions, and soil stabilization measures (see Section 3.3).

*(H) Is inconsistent with the State plan, County general plan including the Maui Island Plan and appropriate community plans, zoning, and subdivision ordinances;*

**Discussion:** As discussed throughout Chapter 5.0, the Project is consistent with State and County policies and regulations and its zoning designations.

*(I) Substantially and detrimentally affects air or water quality;*

> **Discussion:** Construction-phase air and water quality impacts such as dust or sedimentation will be temporary and mitigated through the implementation of BMPs outlined in the SWPPP and construction specifications. The Project will not result in long-term operational emissions or pollutant discharges. See Sections 3.2.2 and 3.3 for further discussion.

*(J) Substantially and detrimentally affects or is likely to suffer damage by being located in an environmentally sensitive area, such as flood plain, shoreline, coastal dune, tsunami zone, erosion-prone area, sea level rise exposure area, wetland, geologically hazardous land, estuary, fresh waters, or coastal waters;*

> **Discussion:** The subject bridges are not located within an environmentally sensitive area. The subject bridges are located between approximately 950 feet and 0.3 miles inland from the ocean and within an area designated as FEMA Flood Zone X, indicating those areas of moderate or minimal hazard. See further discussion in Section 3.7.3. All infrastructure in Maui County, whether located in coastal or inland areas, is considered at-risk of impacts from flooding, including erosion, as discussed in Sections 3.7.3 and 3.3. The Project site is therefore no more vulnerable than other sites on the island. While the Project area is subject to inland flooding from stream overflow and flash flood events, the new structures will be designed to withstand such events. Additionally, the Proposed Action includes drainage improvements to the Project area as described in Section 2.4.5. Foundation design would be informed by geotechnical investigations and appropriate for local soil conditions. Any short-term impacts to soil stability during construction activities would be mitigated using BMPs. See as described in Section 3.3 for details on these BMPs. By replacing the bridges in the same locations with structures designed to meet current hydraulic and floodplain standards, the Proposed Action is not expected to cause adverse impacts to area flooding.

*(K) Substantially and detrimentally alters natural land forms and existing public views, or curtails or forecloses potential improvements to public views, to and along the shoreline; or*

> **Discussion:** As described in Section 3.14, the replacement bridges will follow the same alignment and scale as the existing structures. The use of context-sensitive design elements, including low-profile barriers such as the Hawaiʻi CRM barrier, will maintain visual compatibility with the rural and scenic character of the corridor. No grading or fill will substantially alter natural landforms, and the use of visually compatible design features will preserve existing views of mauka and makai landscapes. No new visual obstructions will be introduced, and the Project will not limit future public access to protected views.

*(L) Is inconsistent with the objectives and policies of chapter 205A, Hawaii Revised Statutes.*

> **Discussion:** The Project is consistent with the objectives and policies of HRS Chapter 205A as discussed in Section 5.2.4.

# 6.0 Agencies, Organizations and Individuals Consulted

## 6.1 Consultation List

In accordance with HAR, Section 11-200.1(18)(a), DPW conducted a pre-assessment consultation seeking input from agencies, citizen groups, individuals with jurisdiction or expertise, and those reasonably affected by the Project to guide the scope and preparation of the Draft EA. Table 6-1 identifies the parties invited to participate in the pre-assessment consultation and those that provided comments. A total of six agencies provided comments during the 30-day comment period, which commenced on March 18, 2025, and ended on April 18, 2025.

Those listed in Table 6-1 were also notified of the availability of the Draft EA published on July 8, 2025. The table indicates a total of five parties that provided comments on the Draft EA during the 30-day comment period from July 8, 2025, to August 7, 2025.

**Table 6-1: Agencies, Organizations, and Individuals Contacted During the Pre-Consultation and Draft EA Publication**

| Respondents and Distribution | Pre-Consultation | Pre-Consultation Comments Received | Received Draft EA | Draft EA Comments Received |
|---|---|---|---|---|
| ***Federal Agencies*** | | | | |
| U.S. Army Corps of Engineers (USACE) | X | | X | |
| U.S. Fish and Wildlife Service (USFWS) | X | | X | |
| U.S. Coast Guard, District 14 | | | X | |
| National Oceanic and Atmospheric Administration (NOAA) – National Marine Fisheries Service (NMFS) | X | | X | |
| U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) | X | | X | |
| U.S. Department of the Interior, National Parks Service (NPS) | X | | X | |
| U.S. Environmental Protection Agency (EPA), Pacific Region | X | | X | |
| ***State of Hawaiʻi Agencies*** | | | | |
| Department of Accounting and General Services (DAGS) | X | | X | |
| Department of Business, Economic Development, and Tourism (DBEDT) – Office of Planning and Sustainable Development (OPSD) | X | X | X | X |
| Department of Defense (DoD), Hawaiʻi Emergency Management Agency (HiEMA) | X | | X | |
| Department of Education (DOE), Maui District Office | X | | X | |

| Respondents and Distribution | Pre-Consultation | Pre-Consultation Comments Received | Received Draft EA | Draft EA Comments Received |
|---|---|---|---|---|
| Department of Hawaiian Home Lands (DHHL) | X | | X | |
| Department of Health (HDOH) | X | | X | X |
| HDOH Clean Water Branch (CWB) | X | | X | |
| HDOH Maui Sanitation Branch | X | | X | |
| Department of Human Services (DHS) | X | | X | |
| Department of Land and Natural Resources (DLNR) Commission on Water Resources Management (CWRM) | X | X | X | |
| DLNR Office of Conservation and Coastal Lands (OCCL) | X | X | X | X |
| Department of Transportation (HDOT) | X | | X | |
| Hawaiʻi Tourism Authority (HTA) | X | | X | |
| Office of Hawaiian Affairs (OHA) | X | | X | X |
| State Land Use Commission | X | | X | |
| ***County of Maui Agencies*** | | | | |
| Department of Environmental Management | X | | X | |
| Department of Fire and Public Safety | X | | X | |
| Department of Human Concerns | X | X | X | |
| Department of ʻŌiwi Resources | | | X | |
| Department of Parks and Recreation | X | | X | X |
| Department of Planning | X | X | X | |
| Department of Transportation | X | | X | |
| Department of Water Supply | X | | X | |
| Emergency Management Agency | X | | X | |
| Maui Police Department | X | X | X | |
| ***Individuals and Organizations*** | | | | |
| Hāna Community Association, c/o Councilmember Shane Sinenci | X | | X | |
| Kaupō Community Association, Linda Clark | X | | X | |
| Kahikinui Hawaiian Homestead Association | X | | X | |
| Kīpahulu Community Association | X | | X | |
| ***Elected Officials*** | | | | |
| Senator Lynn DeCoite, District 7 | X | | X | |
| State Representative Mahinahina Poepoe, District 13 | X | | X | |

| Respondents and Distribution | Pre-Consultation | Pre-Consultation Comments Received | Received Draft EA | Draft EA Comments Received |
|---|---|---|---|---|
| Councilmember Shane Sinenci, East Maui District | X | | X | |
| ***Utilities*** | | | | |
| Hawaiian Electric Company, Maui Engineering Department | X | | X | |
| Hawaiian Telcom | X | | X | |
| Spectrum | X | | X | |

Notes: See Section 3.1 for additional information regarding consultation with cultural practitioners as part of the CIA and Section 5.1.1 for information regarding consultation under Section 106 of the National Historic Preservation Act.

## 6.2 Pre-Assessment Comment Letter Summary

A total of six agencies provided comments during the 30-day comment period, which commenced on March 18, 2025, and ended on April 18, 2025. Copies of the comment letters and responses are provided in Appendix I. In general, comments were regarding (A) land use and management, (B) water resources and quality, (C) climate change and sea level rise, (D) required permits and authorizations, and (E) construction impacts and BMPs. Additionally, a comment noting no anticipated Project impacts was provided and is categorized under (F) miscellaneous/other. Responses to the comments are provided in Table 6-2 and organized by topic.

## 6.3 Draft EA Comment Summary

Publication of the Draft EA in *The Environmental Notice* on July 8, 2025, was followed by a 30-day public comment period that ran from July 8, 2025, to August 7, 2025. A total of five agencies provided comments during this period. Copies of comments received on the Draft EA can be viewed in Appendix I. A summary of comments received, as well as DPW responses, is organized by topic in Table 6-3.

## 6.4 Public Outreach

One public presentation was held virtually with Hāna Community Association on July 15, 2025, following the Draft EA publication to inform and encourage the public to provide comments during the 30-day public comment period. The following includes a summary of the comments and questions received by community members at the meeting, as well as the responses provided by the Project team.

1. **Project Schedule:** A community member wanted to know if the proposed Project would overlap with the Kalepa project, as concurrent construction activities may impact travel. Response: No, the projects would not overlap as construction of the proposed Project is anticipated to begin in 2027. The temporary bypass bridges would  avoid the need for road closures and maintain traffic flow on Hāna Highway.

2. **Honolewa Stream Access:** One attendee asked if the Project would remove access to the walkway paths that lead to Honolewa Stream. Response: The proposed Project would replace the South Wailua Bridge and would not preclude access.

3. **Traffic Control:** One attendee asked if the road closures would involve traffic control via the use of a traffic light signal or a flagger. Response: Road closures are expected to limited to installation and removal of the temporary bridges, which may involve a total of two weekends for each bridge (one weekend for installation and one weekend for removal). This is similar to the construction of Mahalawa Bridge. Police officers may be hired to direct traffic as needed; however, the road would be fully closed to traffic during that time.

4. **Bridge Design:** A community member asked what the weight capacity of the bridge would be and whether it could accommodate buses and emergency vehicles. Response: The new bridges and the temporary construction bridges would be designed to current standards and capable of accommodating loads of up to 40 tons.

   Additionally, concern was expressed over the design of the temporary bridge, as a there was a previous instance of a temporary bridge's railings preventing passage of cattle trailers. Response: The Project engineers will ensure that both the permanent and temporary bridges and detour routes are designed with proper turning radii to accommodate trailers, emergency vehicles, school buses, and other large vehicles.

5. **Water Quality:** A commenter asked how stream water would be kept safe during construction. Response: The proposed Project will employ standard construction BMPs and environmental controls, such as filter socks, silt fences, and sandbags, to protect streams from potential debris.

6. **Construction:** A commenter asked where materials would be stored and staged for the proposed Project. Response: The construction contractor will identify the finalized storage and staging areas. DPW will provide an update to the Hāna Community Association once the areas are determined.

7. **Availability of Draft EA:** A community member asked if the Draft EA would be available at the library and if a copy can be provided to Maui County Councilmember Sinenci's office. Response: Yes, hard copies of the Draft EA were provided to the State and Hāna public libraries in accordance with HRS Chapter 343 and HAR Section 11-200.1. A hard copy was subsequently delivered to Councilmember Sinenci's office following the meeting.

   It was also requested that the Project team submit a press release to Hāna News with the QR code to the Draft EA document. Response: A press release was provided following the meeting.

Additionally, the Kīpahulu Community Association was provided with the opportunity for a public presentation on July 28, 2025, as well as presentation materials and a forum for commenting on the Draft EA. A copy of the presentation slides provided to Hāna Community Association and Kīpahulu Community Association is provided in Appendix J.

**Table 6-2: Pre-Assessment Consultation Summary of Comments and Responses**

| Comments | Commenter | Responses |
|---|---|---|
| ***(A) Land Use and Management*** | | |
| 3. Hawai‘i Coastal Zone Management (CZM) Program<br><br>Pursuant to HRS § 205A-4, in implementing the objectives of the CZM program, agencies shall consider ecological, cultural, historic, esthetic, recreational, scenic, open space values, coastal hazards, and economic development. The Draft EA should include an assessment as to how the proposed project conforms to each of the CZM objectives and supporting policies set forth in HRS § 205A-2, as amended.<br><br>Disclosure of impacts to CZM objectives and supporting policies, as it relates to HRS Chapter 343 requirements, will aid our office in determining impacts to the resources of the coastal zone, and evaluate the feasibility of potential mitigation measures. If a CZMA Federal consistency review is needed, then the information provided in the Draft EA can serve as support documentation for this review. | State DBEDT – OPSD | Section 5.2.6 discusses Project conformance with the CZM objectives and policies. The Project anticipates seeking a CZM, Federal Consistency Determination permit, as noted in Section 2.7 and Table 2-4. |
| ***(B) Water Resources and Quality*** | | |
| 5. Stormwater Runoff, Erosion Mitigation, and Water Resources<br><br>Pursuant to Hawai‘i Administrative Rules (HAR) § 11-200.1-18(d)(7) – identification and analysis of impacts and alternatives considered; to ensure that nearshore resources of Hāna, Maui remain protected, the negative effects of stormwater runoff and sediment loading from the proposed project site should be evaluated.<br><br>Issues that may be examined include, but are not limited to, project site characteristics in relation to flood and erosion prone areas, or vulnerability of the nearshore environment to volume or flow rate of stormwater runoff. As this project may involve work in and near the bed and banks of the Honolewa Stream, as well as associated land disturbing activity, the Draft EA should include mitigation measures for the protection of the nearshore coastal ecosystem and the maintenance of water quality, pursuant to HAR § 11-200.1-18(d)(8). | State DBEDT – OPSD | The short- and long-term impacts of the Proposed Action on stormwater runoff and sediment loading are evaluated in Section 3.5. Stormwater runoff will be minimized through compliance with State and County regulations for water quality. To mitigate potential stormwater runoff during construction and protect water quality, a site-specific Erosion and Sediment Control Plan with temporary BMPs to protect water quality would be developed and implemented, and may consist of, but not be limited to, the use of stabilized construction ingress/egress, compost filter sock perimeter controls, and silt fences. Additionally, a SWPPP will be developed.<br><br>The project will also include permanent BMPs to mitigate stormwater runoff in the proposed condition.<br><br>The EA also evaluates flood hazards (Section 3.7.3), soil disturbance/erosion (Section 3.3), and water quality (Section 3.5) in detail. |

| Comments | Commenter | Responses |
|---|---|---|
| The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://dlnr.hawaii.gov/cwrm. | State DLNR – Commission on Water Resources Management | The Project has been designed and reviewed for consistency with the State Water Code (HRS Chapter 174C) and HAR Chapters 13-167 through 13-171, as applicable. The Proposed Action involves replacement of two existing bridges crossing streams that convey intermittent or ephemeral surface flow. While no permanent stream diversions or withdrawals are proposed, construction is anticipated to involve work adjacent to or within streambeds. During column removal, installation of temporary BMPs within the stream are anticipated to be required to isolate work areas and divert the streams to maintain flow and allow for fish passage. BMPs are preliminarily anticipated to include sandbags and plastic sheeting to divert the streams around bridge columns. The BMPs would remain in place for the duration of in-water demolition work and removed upon completion. This portion of the Project may require a SCAP pursuant to HAR Section 13-169-50. A SCAP Determination will be submitted to CWRM for review and the Applicant will continue to consult with the agency as the Project progresses.<br><br>Anticipated water use during Project construction may include applying water during construction to mitigate air quality impacts. The short- and long-term impacts, as well as mitigation measures, on water quality and supply were evaluated in Sections 3.5 and 3.11.2 . |
| We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/ | State DLNR – Commission on Water Resources Management | Stormwater runoff will be minimized through compliance with State and County regulations for water quality. The proposed Project will incorporate permanent stormwater management BMPs as practicable and necessary during Project design and construction, as discussed in Section 3.5. A site-specific Erosion and Sediment Control Plan with temporary BMPs to protect water quality would be developed and implemented, and may consist of, but not be limited to, the use of stabilized construction ingress/egress, compost filter sock perimeter controls, and silt fences. |
| There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the | State DLNR – Commission on Water Resources Management | This Project anticipates obtaining the following permits related to water quality and following all outlined stipulations: CWA Section 404, Nationwide Permit; CWA Section 401, Blanket |

| Comments | Commenter | Responses |
| --- | --- | --- |
| developer's acceptance of any resulting requirements related to water quality. | | Water Quality Certification; and CWA Section 402, NPDES Permit. See Table 2-4 for details. |
| | ***(C) Climate Change/Sea Level Rise*** | |
| 6. Climate Change Adaptation/Sea Level Rise (SLR)<br><br>As HRS Chapter 343 Significance Criteria rules require analysis on climate change and SLR impacts, the Draft EA should include an examination of the potential vulnerability of the bridge and roadway to SLR. The Draft EA should evaluate the project site's vulnerability to SLR, and other natural threats associated with climate change.<br><br>To assess the potential environmental impacts and vulnerability of this site, we suggest the Draft EA refer to the findings of the Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report (2022), prepared by the State of Hawaiʻi Department of Land and Natural Resources, Office of Conservation and Coastal Lands. That report can be accessed via this link: https://dlnr.hawaii.gov/occl/files/2024/08/OCCL23-Sea-Level-Rise-Report-FY22-1.pdf<br><br>The Report and the Hawaiʻi SLR Viewer at: https://www.pacioos.hawaii.edu/shoreline/slrhawaii/ identifies a 3.2-foot SLR exposure area across the main Hawaiian Islands, as a starting evaluation point. The Draft EA should provide a map of the SLR exposure area in relation to the project area, evaluate potential SLR adaptation measures and safeguards when feasible. | State DBEDT – OPSD | Section 3.7.5 of the EA includes an analysis on climate change and sea level rise impacts and an evaluation of the Project's vulnerability to sea level rise. Information from the noted *Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report* (2017, updated in 2022 [OCCL 2022]) was incorporated into the analysis.<br><br>The Project sites are located less than 0.5 miles from the coastline but at elevations ranging from 200 to 300 feet ASL. Additionally, the sites are not located in a mapped Sea Level Rise Exposure Area impacted by chronic flooding in a 3.2-foot sea level rise scenario (Figure 3-8). By updating the bridge structures to meet current structural and safety standards under the Proposed Action, the Project would create a beneficial impact by improving resilience to storm or flooding events associated with climate change and flooding. |
| The shoreline setback for the project site is the erosion hazard line (EHL) that corresponds with 3.2 feet of sea level rise. Since the project site is located mauka of the EHL, the project is not subject to the Shoreline Rules for the MPC. | County Department of Planning | The Applicant acknowledges that the Project site is not subject to Shoreline Rules for the MPC. |

| Comments | Commenter | Responses |
|---|---|---|
| ***(D) Required Permits and Authorizations*** | | |
| 1. List of Permits and Agency Approvals/Maps & Diagrams<br><br>The Draft EA shall discuss the triggers for the preparation of an Environmental Assessment set forth in HRS Chapter 343, as well as a list of all required permits and approvals for the proposed bridge project. Furthermore, the Draft EA should include project location maps and drawings of the proposed bridge structure, and various maps and diagrams indicating actions taken within proximity to streams, flooding zones, and land use boundaries. | State DBEDT – OPSD | The discussion of EA triggers can be found in Section 1.2, while a list of required permits and approvals can be found in Table 2-4. The Project location map is provided as Figure 1-1, which shows the Project's proximity to streams. Flood zone designations and the 3.2-foot sea level rise scenario are provided as Figure 3-5 and Figure 1-8, respectively. The Project site's SLUD boundaries and County zoning are provided as Figure 1-4 and Figure 1-5, respectively. Drawings are provided in Appendix A. |
| 2. Coastal Zone Management (CZMA) Federal consistency<br><br>According to the review request, the South Wailua Bridge spans Honolewa Stream and located along Hāna Highway of east Maui. If any Federal permits or approvals are required, such as a Department of Army Permit, this project may be subject to CZMA Federal consistency. Furthermore, the role of the FHWA for this project needs to be discussed in the Draft EA. A CZMA Federal consistency review may be triggered if the FHWA is directly involved with this project, or mainly the funding agency via the Catalog of Domestic Federal Assistance (CDFA) 20.205 Highway Planning and Construction.<br><br>OPSD is the lead agency for the State of Hawaiʻi with the authority to perform Federal consistency reviews. At your earliest convenience, please consult our office on the applicability of Federal consistency for this project. | State DBEDT – OPSD | The Project seeks to obtain Federal FHWA funds for the Project, which triggers the need for compliance with NEPA and Federal cross-cutter regulations, such as Section 106 of the NHPA and Section 7 of the ESA. Additionally, Project authorization under Section 404 of the CWA will be required for proposed work within jurisdictional waters. As such, a CZMA Federal consistency review and determination by DBEDT-OPSD will be required as part of this authorization. This determination is listed in Table 2-4 as a required approval. DPW will consult with OPSD as the Project progresses. |
| 4. Special Management Area (SMA) Use Permitting<br><br>The Draft EA needs to provide a map of the proposed bridge project in relation to the County designated special management area. OPSD recommends that the County of Maui Planning Department be consulted on the applicability of SMA Use Permitting. | State DBEDT – OPSD | As shown in Figure 1-7, and confirmed by the County Planning Department, the Project Site is within the SMA. The Applicant acknowledges that the Project is considered a "development" and that an SMA Use Permit (SMI) will be required (Table 2-4). Section 5.3.5 discusses Project conformance with SMA objectives, policies, and guidelines outlined in the MCC, Title MC-12, Chapter 202. Following the completion of the environmental review process, an SMI application will be submitted to the County Planning Department for review and MPC approval. |
| The project location (multiple parcels) is also located in the County's Special Management Area (SMA). Pursuant to Chapter 205A-22, HRS, the proposed action is considered to be a "development" and does not qualify for an SMA exemption. For any development within the SMA that has a valuation over $500,000.00, an SMA Use Permit (SMl) is required. The SMl | County Department of Planning | |

| Comments | Commenter | Responses |
|---|---|---|
| involves a public hearing, and the approving authority is the Maui Planning Commission (MPC). | | |
| The above noted parcels are partially located in the Conservation District within the Limited and Resource subzones. The OCCL is unable to determine the type of permit needed at this time as it is unclear what work will be conducted outside the ROW within the Conservation District. Once sufficient details are provided for intended land uses, then the OCCL can make a determination as to what type of authorization may be required. The rules and regulations of the Conservation District, noted as the Hawaii Administrative Rules (HAR) Chapter 13-5, can be found at **https://dlnr.hawaii.gov/occl/rules/**. | DLNR OCCL | Portions of the Project's temporary construction staging and temporary bypass bridge construction will occur outside of the County ROW within the Conservation District, including areas classified as Limited and Resource subzones. As such, compliance with HAR Chapter 13-5 will be required. As the Project progresses, DPW will consult with OCCL to determine the appropriate level of permit or authorization, such as a Site Plan Approval or Departmental Permit. |
| ***(E) Construction Impacts and BMPs*** | | |
| In regard to the Waikakoi and South Wailua Bridge replacement project, we do not have any input to provide on the environmental review requirements. However, maintaining emergency services during road construction projects in East Maui presents unique challenges due to the rural nature of the district and the significant distances between communities. Even under normal conditions, response times can be delayed due to the terrain and winding roads. All emergency services including Police, Fire, and Medics are based out of Hāna Town, so any construction activity near South Wailua Bridge or Waikakoi Bridge will require advanced planning and coordination. | Maui Police Department, Hāna Patrol District | To maintain safe and efficient vehicular flow throughout the construction period, a construction Traffic Control Plan has been developed and will be implemented by the contractor. Prior to Project construction, a meeting between the Project team, contractor, traffic control lead, and representatives from MPD and County Department of Fire and Public Safety will be held to coordinate and develop contingency plans that preserve emergency access and minimize impacts on response times. Mitigation measures can be found in Sections 3.9 Public Services and 3.10 Roadways and Circulation. |
| In some cases, it may be more efficient to reroute resources from other districts rather than have East Maui crews delayed at construction zones. Will emergency vehicles and Fire Trucks be able to fit on and utilize the temporary bridges? To make those decisions effectively, it's crucial that we coordinate closely with the construction foreman and traffic control teams. | Maui Police Department, Hāna Patrol District | The Applicant acknowledges the comment. Emergency access will be maintained at all times during construction. The temporary bypass bridges would be designed to accommodate fire trucks, ambulances, and emergency vehicles and would have a span of approximately 100 feet long and an out-to-out width of approximately 21.5 feet. The final design will be determined as planning progresses. Prior to Project construction, a meeting between the Project team, contractor, traffic control lead, and representatives from MPD and County Department of Fire and Public Safety will be held to coordinate and develop contingency plans that preserve emergency access and minimize impacts on response times. Mitigation measures to address short-term traffic impacts are further discussed in Section 3.10. |

| Comments | Commenter | Responses |
|---|---|---|
| Please know that we fully support these much needed bridge repairs and are committed to assisting in any way to ensure the safety of both the community and the construction crews. As we approach the start of construction, I respectfully request a meeting between the project coordinator, job foreman, traffic control lead, and representatives from East Maui Police, Fire, and Medics. This will help establish clear communication, align expectations, and allow us to develop contingency plans that preserve emergency access and minimize impacts on response times. | Maui Police Department, Hāna Patrol District | The Applicant acknowledges that, prior to Project construction, a meeting between the Project team, contractor, traffic control lead, and representatives from MPD and County Department of Fire and Public Safety will be held to coordinate and develop contingency plans that preserve emergency access and minimize impacts on response times. |
| ***(F) Miscellaneous/Other*** | | |
| Upon review of the materials provided, I have determined that this project will not have an impact on any existing or proposed projects, plans, policies, or programs coordinated by the DHC. I have no additional comments to provide at this time. | Maui County, Department of Human Concerns | The comment is acknowledged. |

**Table 6-3. Draft EA Summary of Comments and Responses**

| Comments | Commenter | Responses |
|---|---|---|
| ***(A) Air Quality*** | | |
| You must obtain an air pollution control permit from the Clean Air Branch and comply with all applicable conditions and requirements. If you do not know if you need an air pollution control permit, please contact the Permitting Section of the Clean Air Branch.<br><br>Permit application forms can be found here: https://health.hawaii.gov/cab/permit-application- forms/ | HDOH | The Project does not involve the creation, operation, or modification of a stationary air pollution source or air pollution control equipment; therefore, an air pollution control permit is not applicable. |
| You must reasonably control the generation of all airborne, visible fugitive dust. Note that construction activities that occur near existing residences, businesses, public areas and major thoroughfares exacerbate potential dust concerns. It is recommended that a dust control management plan be developed which identifies and mitigates all activities that may generate airborne, visible fugitive dust. The plan, which does not require Department of Health approval, should help you recognize and minimize potential airborne, visible fugitive dust problems. | HDOH | The Project will implement applicable construction BMPs recommended by HDOH CAB, including development of a dust control management plan. See Section 3.2.2 for details on anticipated mitigation measures. |
| Construction activities must comply with the provisions of Hawaii Administrative Rules, §11- 60.1-33 on Fugitive Dust. In addition, for cases involving mixed land use, it is strongly recommended that buffer zones be established, wherever possible, in order to alleviate potential dust concerns. | HDOH | Construction activities will comply with measures included in HAR Chapter 11-60.1, "Air Pollution Control," including HAR Section 11-60.1-33 Fugitive Dust, as well as MCC Chapter 20.08, "Soil and Erosion and Sedimentation Control." See Section 3.2.2 for details on anticipated mitigation measures. The Project does not involve mixed land uses. |
| You must provide reasonable measures to control airborne, visible fugitive dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:<br>• Planning the different phases of construction, focusing on minimizing the amount of airborne, visible fugitive dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;<br>• Providing an adequate water source at the site prior to start-up of construction activities;<br>• Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;<br>• Minimizing airborne, visible fugitive dust from shoulders and access roads; | HDOH | Construction of the Project will incorporate applicable BMPs to control airborne emissions and protect air quality. These BMPs may include, but are not limited to, applying water during construction; stabilizing and revegetating disturbed soils as soon as practicable; covering material-transport trucks; stabilizing construction entrances at all exit points onto paved roads; and designating concrete washout areas. Additionally, construction equipment engines will be properly maintained and use appropriate exhaust controls to reduce particulate matter from exhaust. The Project will also implement applicable construction BMPs recommended by HDOH CAB, including the development of a dust control management plan, phasing of |

| Comments | Commenter | Responses |
|---|---|---|
| • Providing reasonable dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and<br>• Controlling airborne, visible fugitive dust from debris being hauled away from the project site. | | construction, and locating potential dust-generating equipment in areas of the least impact. |
| ***(B) Land Use Permits and Approvals*** | | |
| The proposed land use appears to be an identified land use, pursuant to Hawai'i Administrative Rules (HAR) §13-5-22, P-6 PUBLIC PURPOSE USES (D-1) *Not for profit land uses undertaken in support of a public service by an agency of the county, state, or federal government, or by an independent non-governmental entity, except that an independent non-governmental regulated public utility may be considered to be engaged in a public purpose use. Examples of public purpose uses may include but are not limited to public roads, marinas, harbors, airports, trails, water systems and other utilities, energy generation from renewable sources, communication systems, floor or erosion control projects, recreational facilities, community centers, and other public purpose uses, intended to benefit the public in accordance with public policy and the purpose of the conservation district.*<br><br>Please be advised, however, that this finding does not constitute approval of the proposal. The Board of Land and Natural Resources (BLNR) has the final decision to grant, modify, or deny the proposal. | State DLNR – OCCL | This comment is acknowledged. |
| Delineate the work being proposed within the Conservation District and outside the Right-of-Way in a figure. The OCCL requests the Final EA include a figure that identifies the County Right-of-Way in relation to proposed improvement or structure. | State DLNR – OCCL | The entirety of the approximately 1.52-acre South Wailua Bridge Project area is within the Conservation District; see Figure 1-4. Work being performed outside of County ROW and within the Conservation District involves the construction and removal of the temporary bypass bridge and installation of signage, and totals approximately 0.30 acres (13,114 square feet) as shown in Figure 2-2. |
| Should the staging area take place makai of the ROW, please consult with the County regarding a Special Management Area (SMA) determination. | State DLNR – OCCL | As discussed in Section 5.3.5, Maui County PD confirmed that an SMI will be required during the pre-assessment consultation phase of the EA. DPW will submit an application for an SMI following the completion of the environmental review process. |

| Comments | Commenter | Responses |
|---|---|---|
| As a government agency, DPW is responsible for Hawai'i Revised Statutes (HRS) 6E compliance. To help facilitate the processing of a CDUA for the project, please include an HRS 6E determination letter with the application. | State DLNR – OCCL | DPW will comply with HRS Chapter 6E and consultation with SHPD is ongoing. |
| 1. Issues of Programmatic Concern<br>We acknowledge that the Draft EA addresses our previously expressed concerns found in our Early Consultation letter, DTS202503211430HE, dated April 11, 2025. These included: a comprehensive list of the permits and approvals needed; as well as analysis on the applicability of Hawaiʻi Revised Statutes (HRS) § 205A; Special Management Area Use Permitting; stormwater runoff mitigation measures and surface water resources; and includes sea level rise/climate change adaptation measures. | State DBEDT – OPSD | This comment is acknowledged. |
| 2. Coastal Zone Management Act (CZMA) federal consistency<br>Section 5.1.3, page 87 of the Draft EA acknowledges that DPW will consult OPSD on a CZMA federal consistency. This project intends to use funding from the U.S. Department of Transportation, Federal Highway Administration (FHWA). Additionally, DPW will consult with the U.S. Army Corps of Engineers on a Department of the Army Permit, Section 404 of the Clean Water Act, and a Nationwide Permit #3 (Maintenance). All of these are potential triggers for a federal consistency review. Please contact our office on federal consistency, as OPSD is the lead state agency with the authority to conduct federal consistency reviews. | State DBEDT – OPSD | This comment is acknowledged. DPW will coordinate with OPSD for federal consistency review. |
| ***(C) Cultural and Archeological Resources*** | | |
| OHA supports the decision to conduct archaeological monitoring for this project. Additionally, we further support the recommendations within the AIS to avoid site Honua 1 if possible, and to otherwise conduct data recovery work. For site Honua 2, we support the AIS's call to consult with the neighboring landowner to determine ownership. As with Honua 1, we recommend avoidance if at all possible for Honua 2. | OHA | This comment is acknowledged. |
| ***(D) Miscellaneous/Other*** | | |
| Thank you for the opportunity to review and comment on the subject project. The Department of Parks and Recreation has no comment at this time. | County Department of Parks & Recreation | This comment is acknowledged. |

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# 7.0 Determination and Findings

This EA finds that the potential effects associated with the Proposed Action will not be significant or adverse, or will be avoided, minimized or mitigated sufficiently to reduce potential significant or adverse effects. Potential Project effects are generally temporary, occurring during construction, and would not be expected to adversely impact the long-term environmental quality of the Project area. This section summarizes the significance criteria used to determine whether the Proposed Action would have a significant impact on the environment.

## 7.1 Significance Criteria

The potential effects of the Proposed Action were evaluated based on the Significance Criteria specified in HAR Section 11-200.1-13. Discussion of the Project's conformance to the HAR criteria is presented as follows.

(1) *Irrevocably commit a natural, cultural, or historic resource*

No natural resources, including streams or critical habitat, will be permanently altered as a result of the Project. Temporary construction impacts to water quality will be mitigated through the implementation of BMPs as described in Sections 3.3 and 3.5. During column removal of the existing bridges, installation of temporary BMPs within the stream are anticipated to be required to isolate work areas and divert the streams to maintain flow and allow for fish passage. DPW is consulting with USACE Honolulu District regarding the proposed temporary BMPs and the required approvals under Section 404 of the CWA.

The Project involves replacement of two existing bridges within the County-owned ROW. As discussed in Section 3.1, the Waikakoi Bridge and South Wailua Bridge are considered historic properties and are contributing elements to the Hāna Highway Historic District. The Project has been determined to have an adverse effect under Section 106 of the NHPA and an "effect, with proposed mitigation commitments" under HRS Chapter 6E. Mitigation measures, including HAER documentation, archaeological monitoring, and context-sensitive design, are being developed through ongoing consultation with SHPD. With implementation of these measures, the Project is not anticipated to cause irrevocable or substantially detrimental effects on cultural resources.

(2) *Curtail the range of beneficial uses of the environment*

The Project will not curtail existing beneficial use of the environment. The replacement bridges will be located at the same location as the existing bridges within the County ROW. Work outside of the ROW will be required during construction but would be temporary and localized. Upon completion of the permanent bridges, the temporary bridge structures will be removed, and the surrounding areas will be restored to original conditions to the extent practicable. The replacement bridges will serve the same transportation function as the existing structures and will not introduce new land uses or modifications to access. The Project will maintain the safe operation of Hāna Highway in the long-term.

*(3) Conflict with the State's environmental policies or long-term environmental goals established by law.*

As discussed throughout Chapter 5.0, the Project is consistent with the visions, objectives, goals, and policies of various State and County long-term environmental policies.

*(4) Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State.*

The Project would not substantially or detrimentally affect the economic or social welfare and activities of the community, County, or State. The Proposed Action would replace existing bridges that are in need of repair, thereby improving critical transportation infrastructure serving residents, visitors, and emergency response vehicles. Construction impacts will be temporary and minimized through the implementation of BMPs discussed throughout Chapter 3.0. In the long term, the Project would improve economic and social welfare of the residents of the Hāna region by improving the safety, reliability, and resilience of Hāna Highway, which serves as an essential transportation corridor on the island.
The CIA concluded that the Project would have impacts to the historic Waikakoi and South Wailua bridges, which would be mitigated under the HRS Chapter 6E and Section 106 processes. The Project would not adversely impact cultural resources or traditional or customary practices. See Section 3.1.2 for further discussion.

*(5) Have a substantial adverse effect on public health.*

The Project would not result in long-term permanent impacts to public health. Construction-phase air and water quality impacts such as dust or sedimentation will be temporary and mitigated through the implementation of BMPs outlined in the SWPPP and construction specifications. The Project will not result in long-term operational emissions or pollutant discharges. See Sections 3.2.2, 3.3, and 3.5 for further discussion.

*(6) Involve adverse secondary impacts, such as population changes or effects on public facilities.*

The Project involves the replacement of existing bridges for safety and reliability purposes and would not result in adverse secondary impacts such as population growth, adverse impacts to public services, or the need to expand public facilities. The Proposed Action includes the replacement of existing bridges along the Hāna Highway, which will not induce new traffic or generate demand for public facilities or services.

*(7) Involve a substantial degradation of environmental quality.*

The Project would not result in any impacts that would substantially degrade environmental quality. Construction activities associated with the proposed Project would result in temporary impacts and would not be substantial (Chapter 3.0). Construction impacts will be temporary and minimized or mitigated through the implementation of BMPs discussed throughout Chapter 3.0.

(8) *Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions.*

The Proposed Action involves the replacement of the Waikakoi and South Wailua Bridges at their existing locations within the County ROW. The Project is a complete, independent project and would not result in commitments to other projects. The Project does not involve expansion of capacity and does not commit the County to a larger program of infrastructure expansion or corridor redevelopment.

Cumulative impacts are discussed in Section 3.15. While other bridge replacement or infrastructure improvement projects may be planned along the Hāna Highway, the Project has been designed to avoid contributing to incremental degradation of environmental or cultural resources. The new bridges incorporate context-sensitive design to maintain the historic and scenic character of the Hāna Highway corridor. The Project will also include mitigation measures to address anticipated adverse effects to historic properties under Section 106 and HRS Chapter 6E. Finally, BMPs to minimize construction-related impacts such as erosion, sedimentation, and stormwater runoff will be implemented. With proposed mitigation measures in place, the Project is not anticipated to contribute to cumulative significant environmental effects in the region.

The Project does not preclude or necessitate future actions beyond routine maintenance and does not represent a segment of a larger phased undertaking by DPW. Therefore, while the Project is part of DPW's ongoing efforts to maintain aging infrastructure, it does not result in a cumulative substantial adverse effect on the environment, nor does it involve a commitment to larger actions requiring future environmental review.

(9) *Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat*

The Project would not adversely affect rare, threatened, or endangered animal or plant species or critical habitat. In a survey conducted of the Project area, no plant or faunal species of conservation interest or listed as threatened or endangered under State or Federal statutes was observed (Sections 3.6.1, 3.6.2, 3.6.3, 3.6.4, and 3.6.5). Species lists generated by the USFWS IPaC system on February 19, 2025, indicate that the Project could potentially impact the Hawaiian hoary bat, Band-rumped Storm Petrel, Hawaiian Petrel, and Newell's Shearwater. Measures will be implemented during construction and following Project completion to ensure that the Project minimizes impacts to listed species to the maximum extent practicable (refer to minimization measures discussed in Sections 3.6.1, 3.6.2, 3.6.3, 3.6.4, and 3.6.5). The potential for downstream impacts to EFH is minimal and BMPs will be implemented to prevent sedimentation and protect downstream water quality including, but not limited to, silt fencing, vegetated buffers, timing restrictions, and soil stabilization measures (see Section 3.3).

(10) *Have a substantial adverse effect on air or water quality or ambient noise levels.*

Only minor, short-term, and temporary impacts on air quality and noise levels are anticipated during the operation of construction equipment. BMPs would be implemented to prevent adverse impacts to water quality and the project would adhere to permitting requirements to protect water quality. No long-term, direct or indirect, adverse impacts to these resources are anticipated from implementation of the Project. See Sections 3.2.2, 3.3, and 3.5 for further discussion.

(11) *Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.*

The subject bridges are not located within an environmentally sensitive area. The subject bridges are located between approximately 950 feet and 0.3 miles inland from the ocean and within an area designated as FEMA Flood Zone X, indicating those areas of moderate or minimal hazard. See further discussion in Section 3.7.3.

All infrastructure in Maui County, whether located in coastal or inland areas, is considered at-risk of impacts from flooding, including erosion, as discussed in Section 3.7. The Project site is therefore no more vulnerable than other sites on the island. While the Project area is subject to inland flooding from stream overflow and flash flood events, the new structures will be designed to withstand such events. Additionally, the Proposed Action includes drainage improvements to the Project area as described in Section 2.4.5. Foundation design would be informed by geotechnical investigations and appropriate for local soil conditions. Any short-term impacts to soil stability during construction activities would be mitigated using BMPs. See as described in Section 3.3 for details on these BMPs. By replacing the bridges in the same locations with structures designed to meet current hydraulic and floodplain standards, the Proposed Action is not expected to cause adverse impacts to area flooding.

(12) *Have a substantial adverse effect on scenic vistas and view planes, during day or night, identified in county or state plans or studies.*

As described in Section 3.14, the replacement bridges will follow the same alignment and scale as the existing structures. The use of context-sensitive design elements, including low-profile barriers such as the Hawaiʻi CRM barrier, will maintain visual compatibility with the rural and scenic character of the corridor. No grading or fill will substantially alter natural landforms, and the use of visually compatible design features will preserve existing views of mauka and makai landscapes. No new visual obstructions will be introduced, and the Project will not limit future public access to protected views.

(13) *Require substantial energy consumption or emit substantial greenhouse gases.*

Construction of the proposed Project would not require substantial energy consumption. Fuel would be consumed by construction vehicles and equipment on a short-term and intermittent basis. However, this would be comparable to other construction projects. The Proposed Action is intended to replace the existing structurally deficient bridges with new structures that will also support single-lane traffic. As such, the proposed Project is not anticipated to induce traffic demand and contribute to increases in vehicle traffic volume or changes in vehicle mix (Section 3.10.1). As such, the Proposed Action would not contribute to a long-term increase in vehicle emissions that impact air quality or emit substantial GHGs.

## 7.2 Conclusion

Through bridge design, impact avoidance and minimization actions, and proposed BMPs and mitigation measures, the analysis contained in this EA has determined that Project-related impacts would be mitigated to less than significant levels, such that the proposed Project would not result in significant adverse impacts.

## 7.3 HRS Chapter 343 Determination

Based on the information presented and examined in this document, the proposed Project is not expected to produce significant adverse social, economic, cultural, or environmental impacts. Therefore, DPW has made a Finding of No Significant Impact (FONSI) determination for the Project pursuant to HRS Chapter 343 and the provisions of HAR Subchapter 7 of Chapter 11-200.1.

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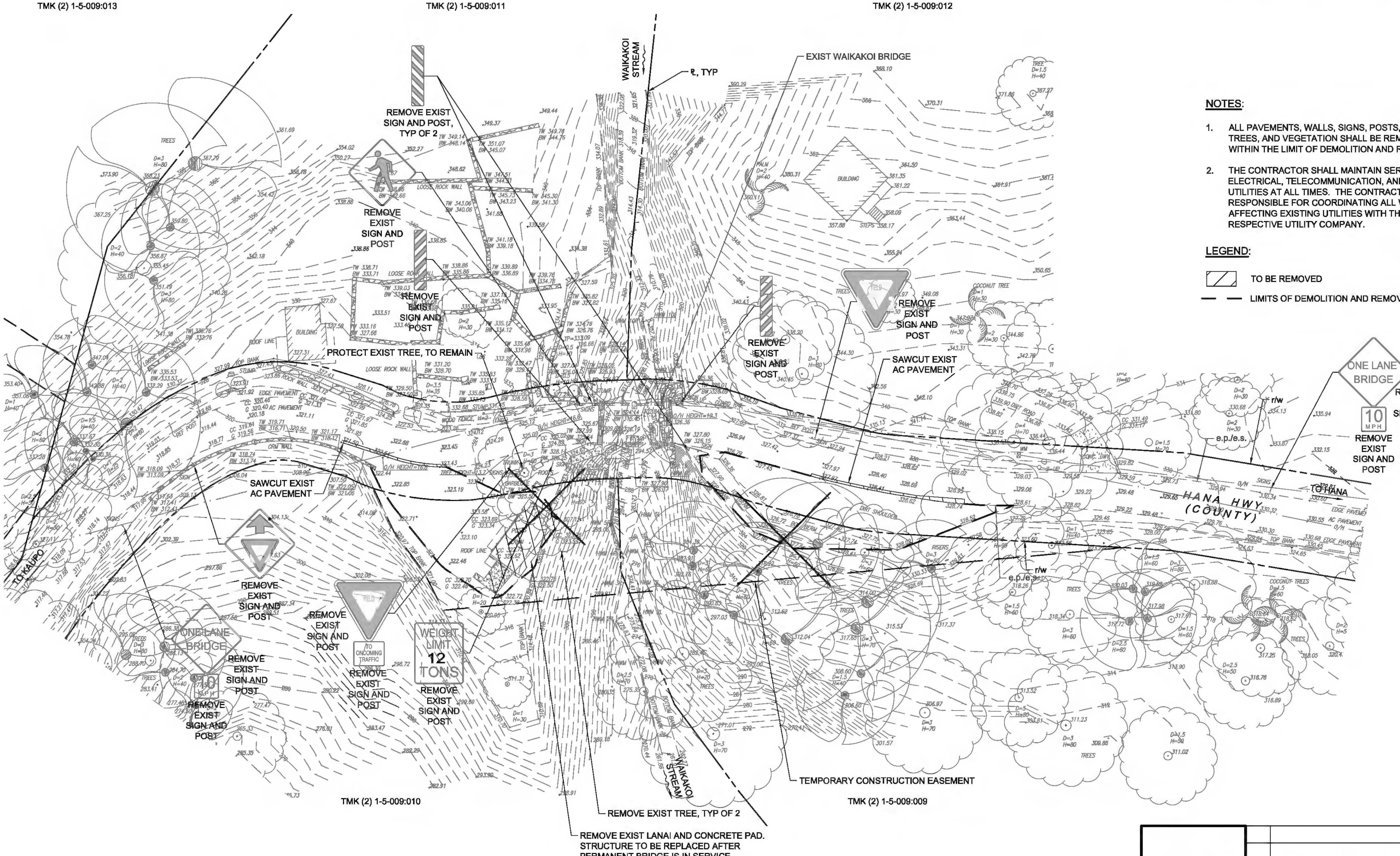
# Appendix A. Waikakoi and South Wailua Bridge Replacement 60-percent Drawings. HDR, Inc. 2024.

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 020 | 084 |




NOTES:

1. ALL PAVEMENTS, WALLS, SIGNS, POSTS, BOULDERS, TREES, AND VEGETATION SHALL BE REMOVED WITHIN THE LIMIT OF DEMOLITION AND REMOVAL.
2. THE CONTRACTOR SHALL MAINTAIN SERVICE TO ALL ELECTRICAL, TELECOMMUNICATION, AND WATER UTILITIES AT ALL TIMES. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL WORK AFFECTING EXISTING UTILITIES WITH THE RESPECTIVE UTILITY COMPANY.

LEGEND:

TO BE REMOVED

LIMITS OF DEMOLITION AND REMOVAL

**Figure 1** WAIKAKOI TEMPORARY BRIDGE EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:

20' 10' 0' 20' 40'

SCALE: 1" = 20'

60% DESIGN

NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE
EXISTING CONDITIONS AND DEMOLITION PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, EU, DK
Drawn By: CT, DA, EU, DK

PROJ. NO.: 2020040
Date Saved:Fri, 30 Aug 2024 – 5:56pm
CAD File Name: C:\pwworking\west01\d1900569\C-035 – Waikakoi Temporary Existing Conditions and Demolition Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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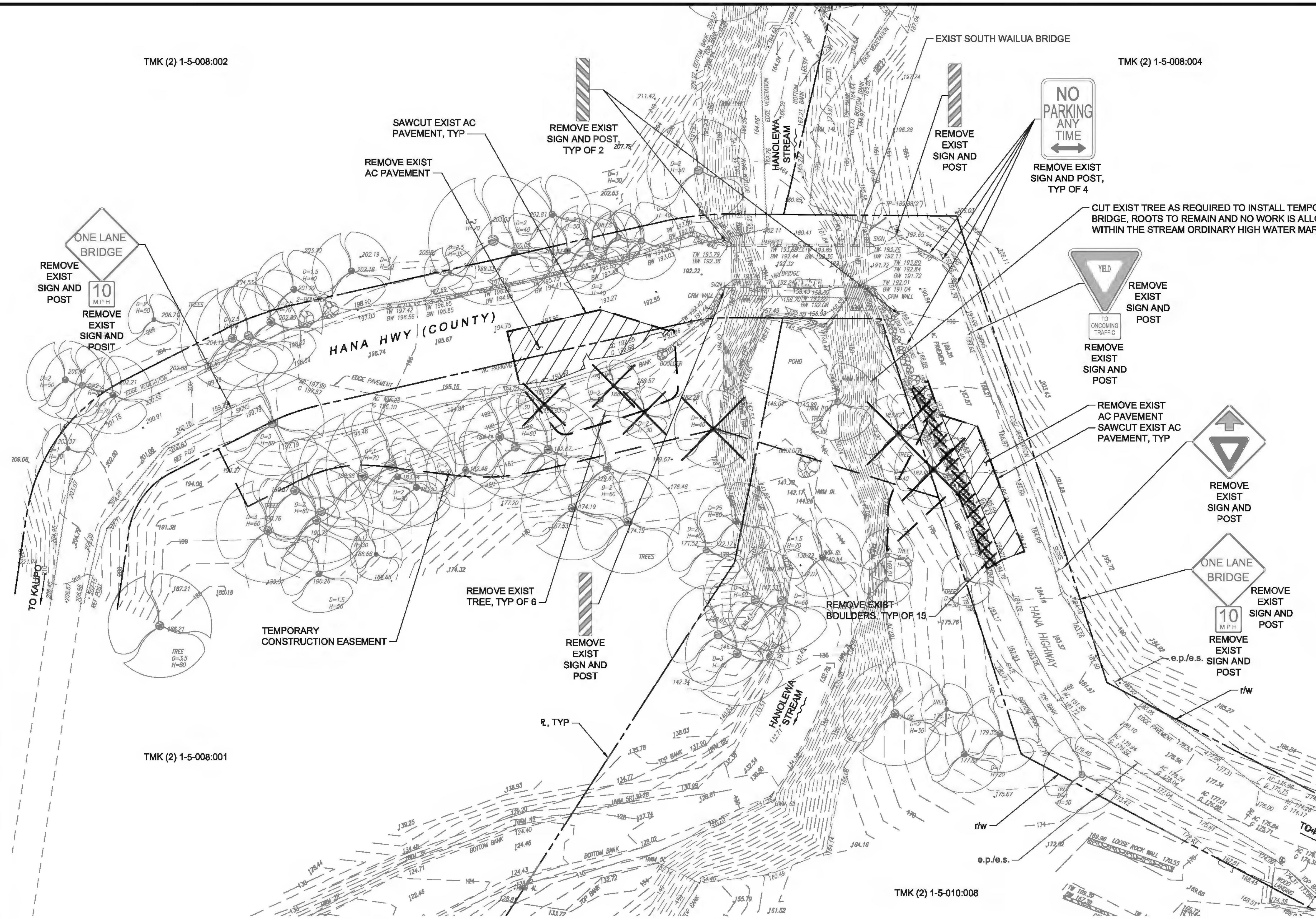


NOTES:

1. ALL PAVEMENTS, WALLS, SIGNS, POSTS, BOULDERS, TREES, AND VEGETATION SHALL BE REMOVED WITHIN THE LIMIT OF DEMOLITION AND REMOVAL.
2. THE CONTRACTOR SHALL MAINTAIN SERVICE TO ALL ELECTRICAL, TELECOMMUNICATION, AND WATER UTILITIES AT ALL TIMES. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL WORK AFFECTING EXISTING UTILITIES WITH THE RESPECTIVE UTILITY COMPANY.

LEGEND:

TO BE REMOVED

LIMITS OF DEMOLITION AND REMOVAL

**Figure 2** S. WAILUA TEMPORARY BRIDGE EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:

20' 10' 0' 20' 40'

SCALE: 1" = 20'

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

S. WAILUA TEMPORARY BRIDGE
EXISTING CONDITIONS AND DEMOLITION PLAN

Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:56pm
CAD File Name: C:\pwworking\west01\d1900569\C-020 – South Wailua Temporary Existing Conditions and Demolition Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
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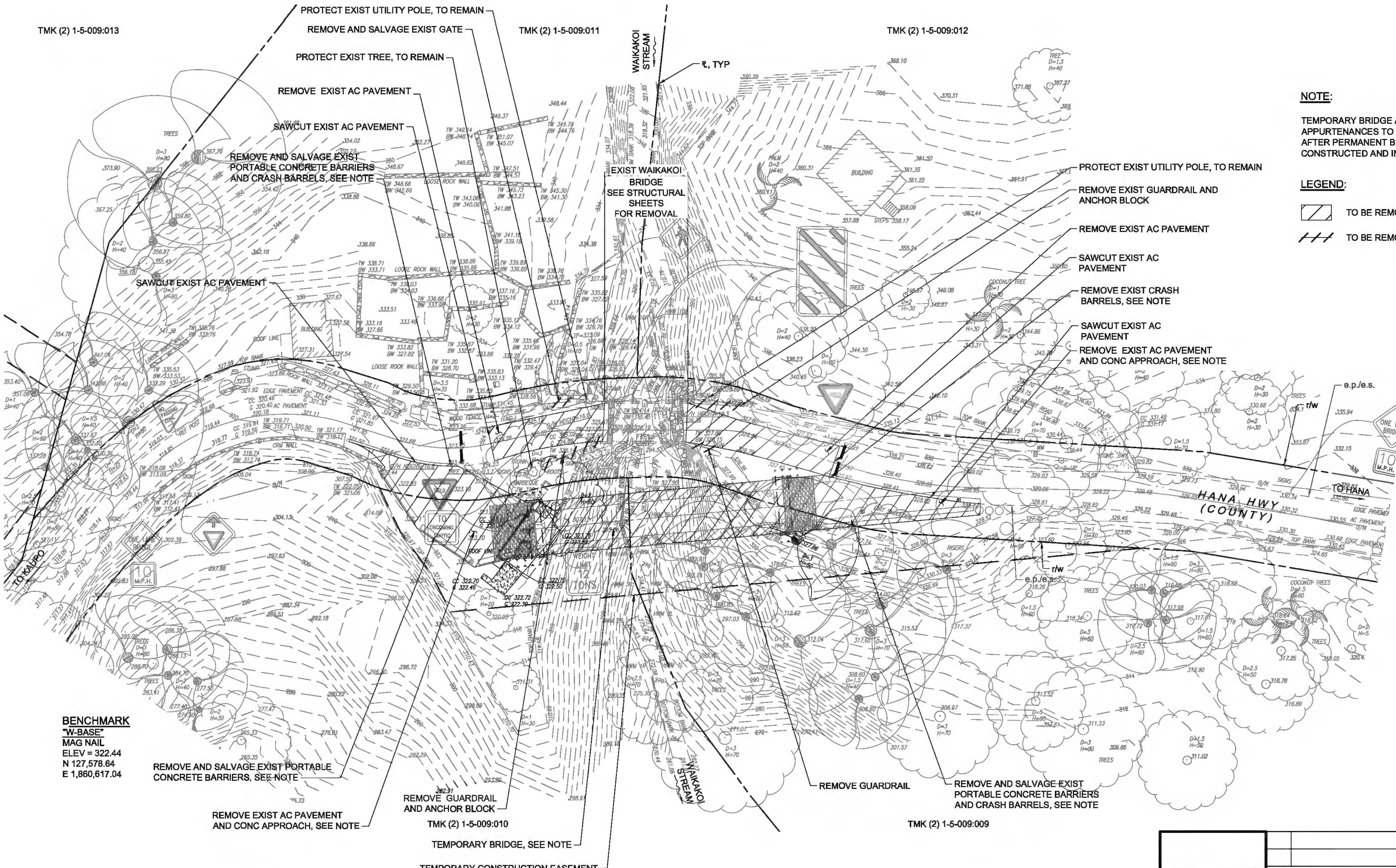


NOTE:

TEMPORARY BRIDGE AND RELATED APPURTENANCES TO TO BE REMOVED AFTER PERMANENT BRIDGE IS CONSTRUCTED AND IN SERVICE.

LEGEND:

TO BE REMOVED

TO BE REMOVED

**Figure 3** WAIKAKOI PERMANENT BRIDGE EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:

20' 10' 0' 20' 40'

SCALE: 1" = 20'

60% DESIGN

NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

WAIKAKOI PERMANENT BRIDGE
EXISTING CONDITIONS AND DEMOLITION PLAN

PROJ. NO.: 2020040

Date Saved: Fri, 30 Aug 2024 – 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-043 – Waikakoi Permanent Existing Conditions and Demolition Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
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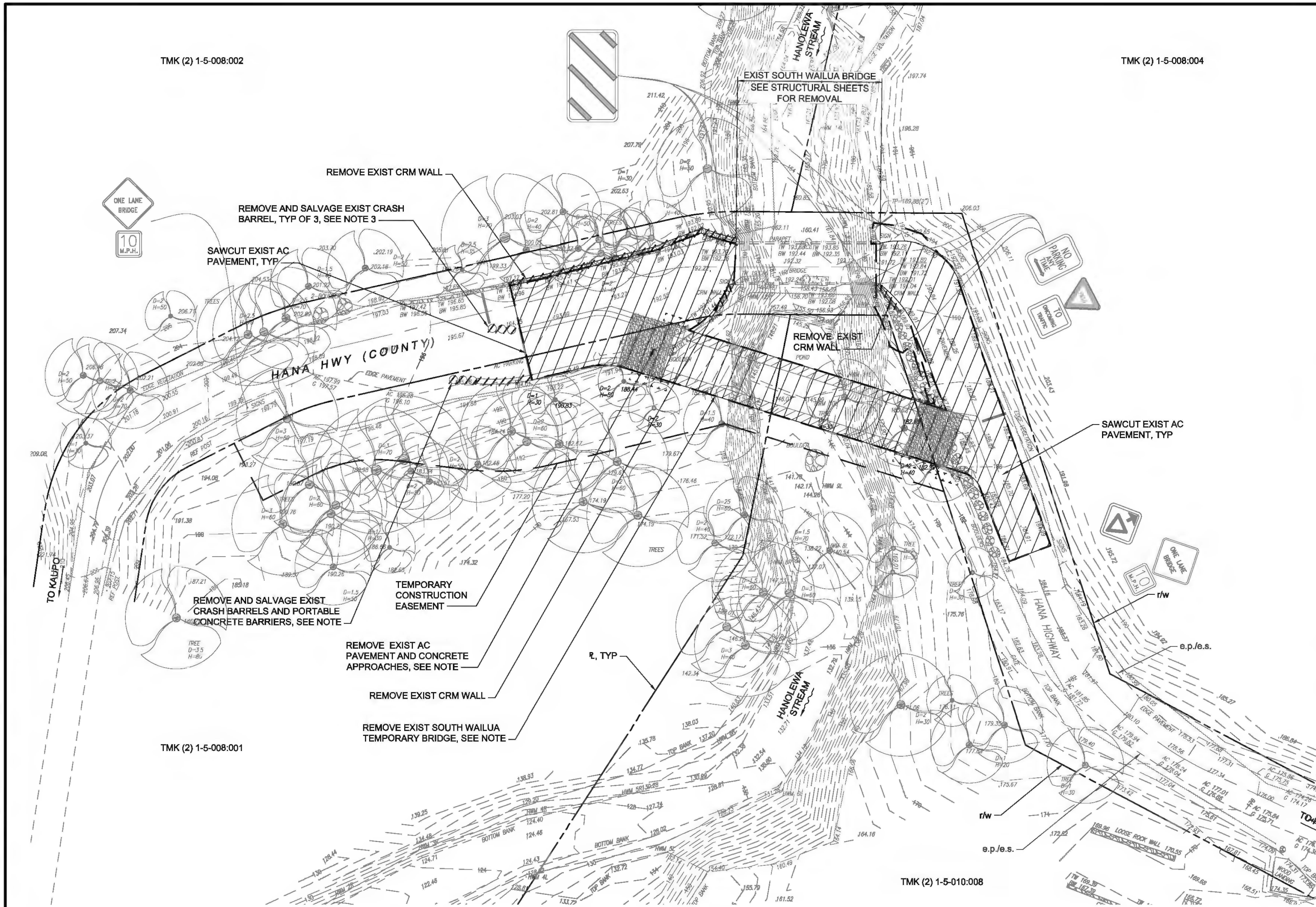


NOTES:

1. ALL PAVEMENTS, WALLS, SIGNS, POSTS, BOULDERS, TREES, AND VEGETATION SHALL BE REMOVED WITHIN THE LIMIT OF DEMOLITION AND REMOVAL.
2. THE CONTRACTOR SHALL MAINTAIN SERVICE TO ALL ELECTRICAL, TELECOMMUNICATION, AND WATER UTILITIES AT ALL TIMES. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL WORK AFFECTING EXISTING UTILITIES WITH THE RESPECTIVE UTILITY COMPANY.
3. TEMPORARY BRIDGE TO TO BE REMOVED AFTER PERMANENT BRIDGE IS CONSTRUCTED AND IN SERVICE.

LEGEND:

TO BE REMOVED

TO BE REMOVED

LIMITS OF DEMOLITION AND REMOVAL

**Figure 4** S. WAILUA PERMANENT BRIDGE EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
EXISTING CONDITIONS AND DEMOLITION PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:58pm
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| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 026 | 084 |

℄ WAIKAKOI TEMP BRIDGE CURVE RETURN DATA

| CURVE | Ⓐ | Ⓑ | Ⓒ |
|---|---|---|---|
| Δ | 32° 56' 04" | 20° 00' 30" | 05° 23' 25" |
| Δ/2 | 16° 28' 02" | 10° 00' 15" | 02° 41' 42" |
| R | 25.00' | 68.10' | 421.04' |
| T | 7.39' | 12.01' | 19.82' |
| Ch | 14.17' | 23.66' | 39.60' |
| Lc | 14.37' | 23.76' | 39.61' |

LEGEND:

- ASPHALT PAVEMENT
- CONCRETE

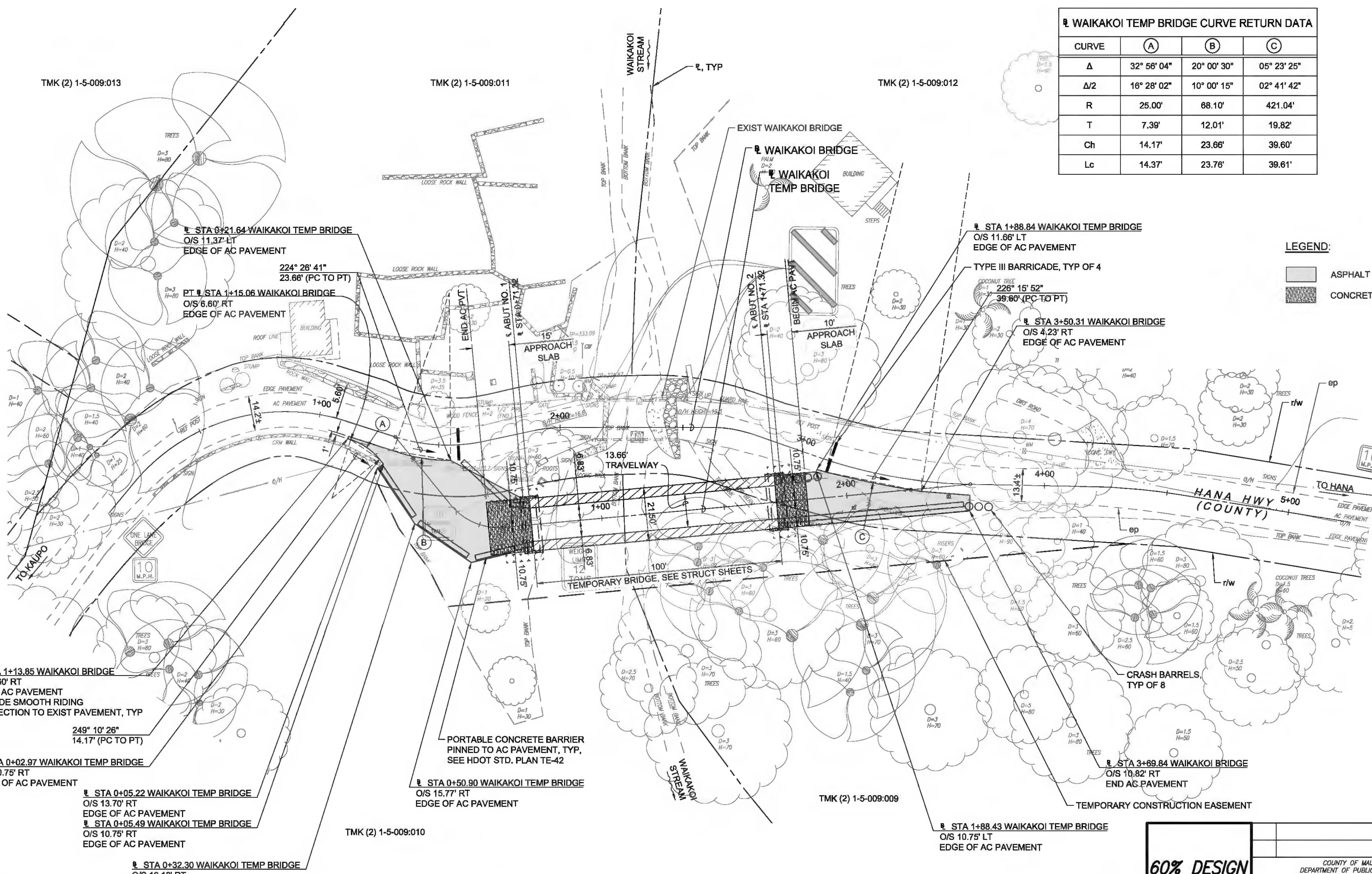



**Figure 5** WAIKAKOI TEMPORARY BRIDGE SITE PLAN
SCALE: 1" = 20'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

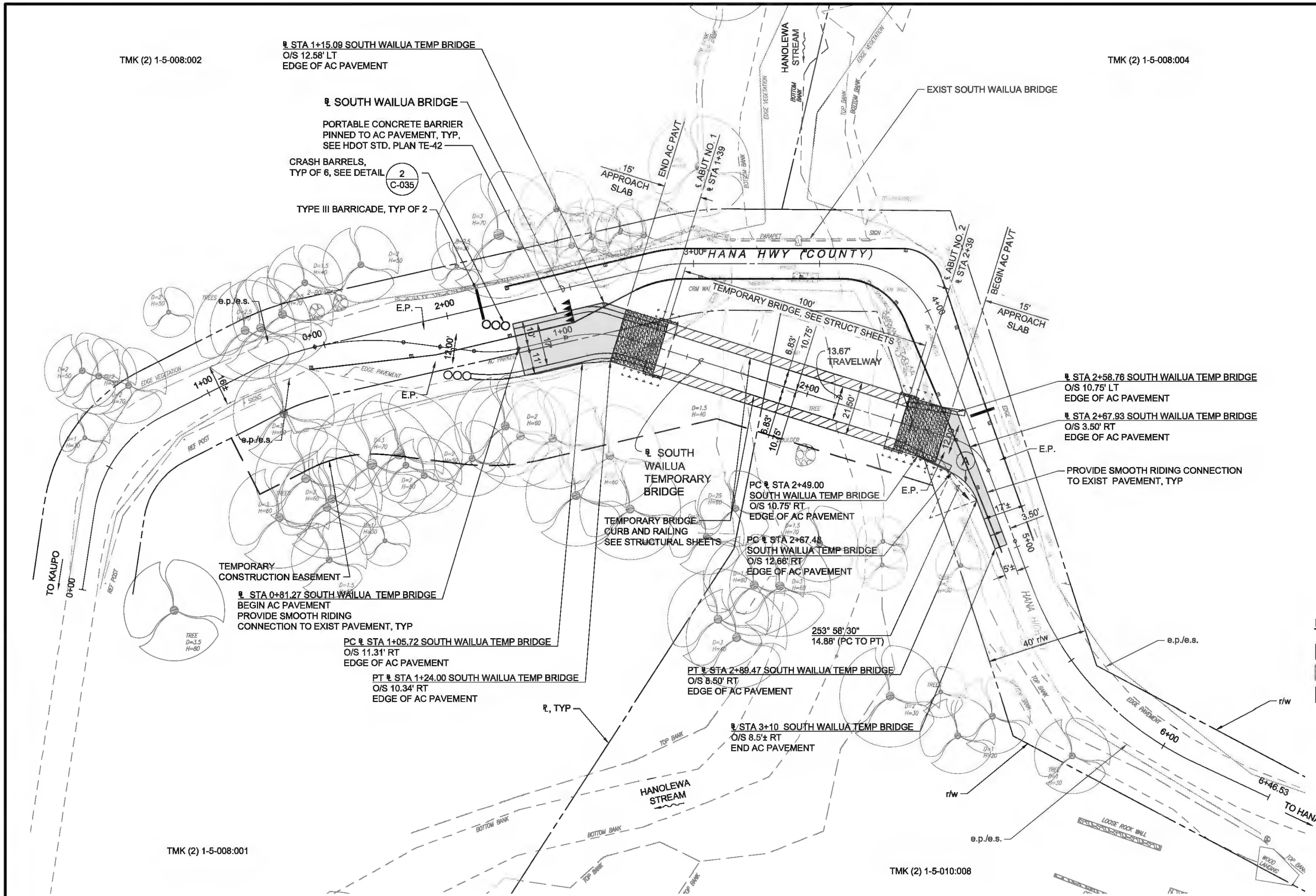
WAIKAKOI TEMPORARY BRIDGE SITE PLAN

Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-037 – Waikakoi Temporary Bridge Site Plan_2024-08-29.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 024 | 084 |

| ℄ SOUTH WAILUA TEMP BRIDGE CURVE RETURN DATA | |
|---|---|
| CURVE | (A) |
| Δ | 43° 41' 24" |
| Δ/2 | 21° 50' 42" |
| R | 20.00' |
| T | 8.02' |
| Ch | 14.88' |
| Lc | 15.25' |




LEGEND:

- ASPHALT PAVEMENT
- CONCRETE APPROACH SLAB
- TEMPORARY BRIDGE RAILING

# Figure 6

## S. WAILUA TEMPORARY BRIDGE SITE PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:

20' 10' 0' 20' 40'

SCALE: 1" = 20'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE SITE PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:00pm
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| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 027 | 084 |

WAIKAKOI BRIDGE CURVE RETURN DATA

| CURVE | A | B | C | D |
|---|---|---|---|---|
| Δ | 12° 09' 42" | 12° 09' 42" | 19° 16' 02" | 19° 16' 02" |
| Δ/2 | 06° 04' 51" | 06° 04' 51" | 09° 38' 01" | 09° 38' 01" |
| R | 40.00' | 60.00' | 80.00' | 40.00' |
| T | 4.26' | 6.39' | 10.18' | 6.79' |
| Ch | 8.47' | 12.71' | 20.08' | 13.39' |
| Lc | 8.49' | 12.74' | 20.18' | 13.45' |

LEGEND:

- ASPHALT PAVEMENT
- CONCRETE
- CRM WALL

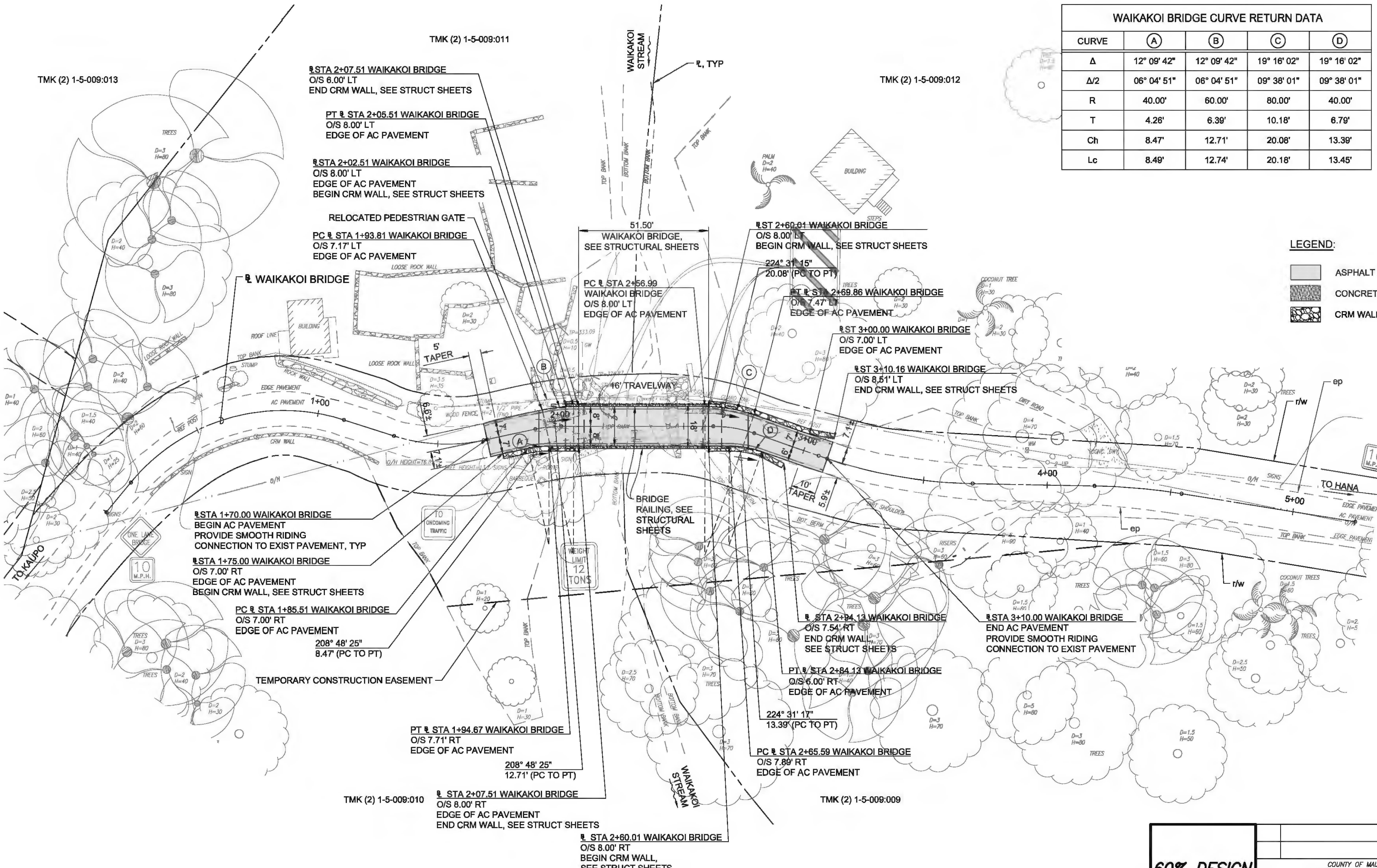



**Figure 7** WAIKAKOI PERMANENT BRIDGE SITE PLAN
SCALE: 1" = 20'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI PERMANENT BRIDGE SITE PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-044 - Waikakoi Permanent Bridge Site Plan_2024-08-29.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 025 | 084 |

℄ SOUTH WAILUA BRIDGE CURVE RETURN DATA

| CURVE | A | B | C |
|---|---|---|---|
| Δ | 25° 43' 14" | 69° 22' 02" | 66° 55' 12" |
| Δ/2 | 12° 51' 37" | 34° 41' 01" | 33° 27' 36" |
| R | 42.00' | 20.00' | 25.00' |
| T | 9.59' | 13.84' | 16.52' |
| Ch | 18.70' | 22.76' | 27.57' |
| Lc | 18.85' | 24.21' | 29.20' |

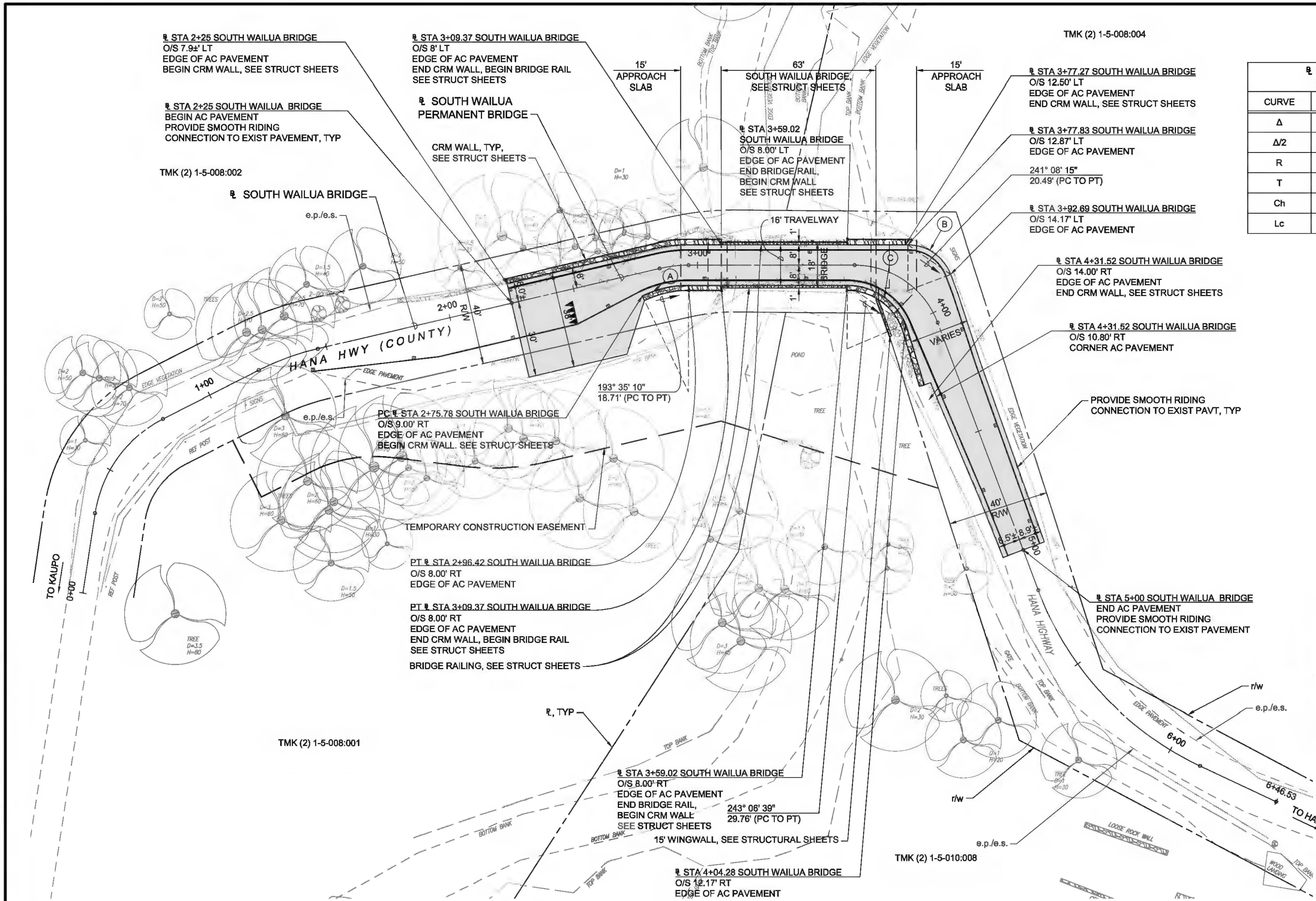



**Figure 8** S. WAILUA PERMANENT BRIDGE SITE PLAN

SCALE: 1" = 20'

GRAPHIC SCALE: 20' 10' 0' 20' 40'
SCALE: 1" = 20'

60% DESIGN
NOT FOR CONSTRUCTION

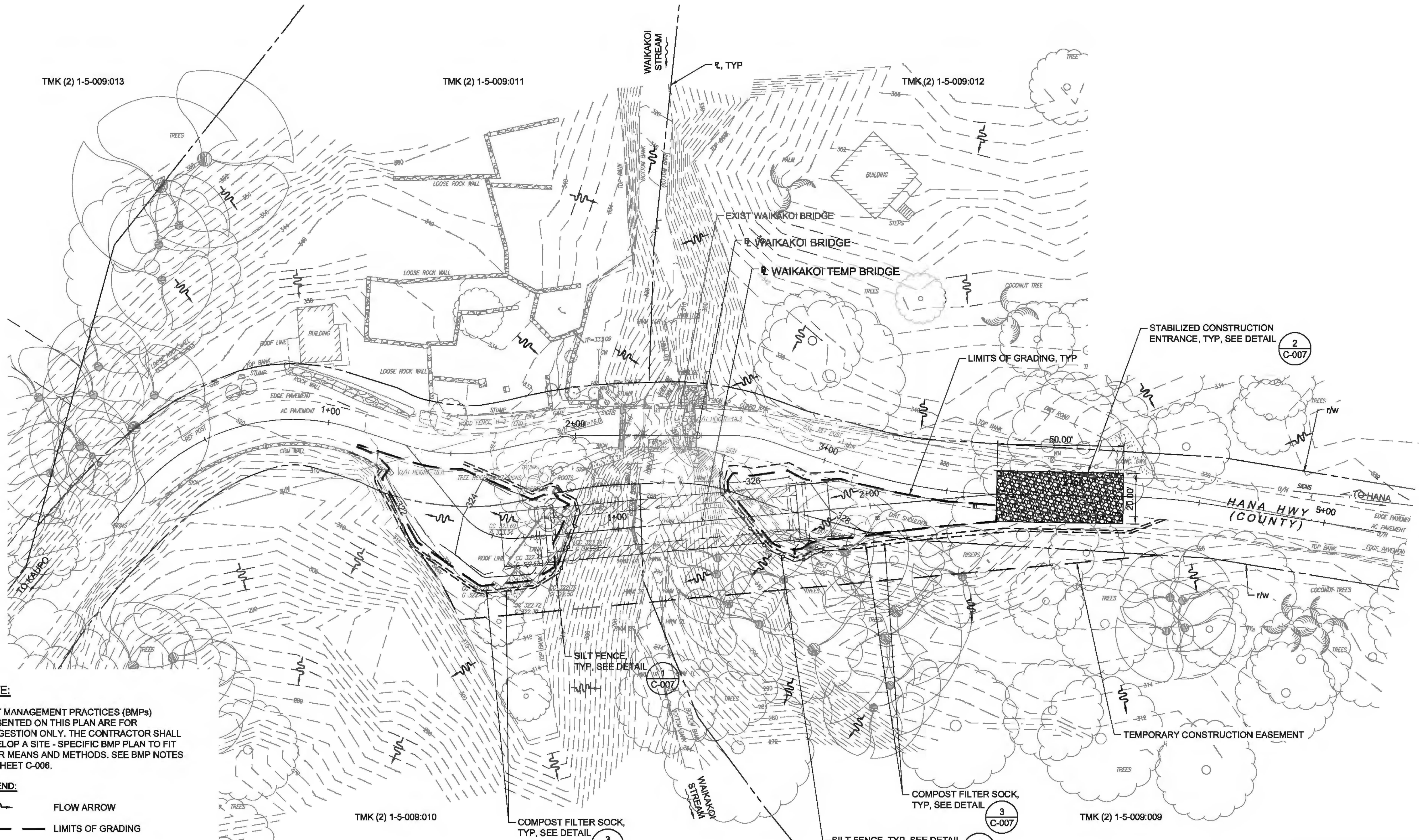
COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE SITE PLAN

Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-029 – South Wailua Permanent Bridge Site Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 011 | 084 |




NOTE:

BEST MANAGEMENT PRACTICES (BMPs) PRESENTED ON THIS PLAN ARE FOR SUGGESTION ONLY. THE CONTRACTOR SHALL DEVELOP A SITE - SPECIFIC BMP PLAN TO FIT THEIR MEANS AND METHODS. SEE BMP NOTES ON SHEET C-006.

LEGEND:

FLOW ARROW
LIMITS OF GRADING
SILT FENCE, SEE SHEET C-007
COMPOST FILTER SOCK, SEE SHEET C-007
10 EXISTING MAJOR CONTOUR LINE
EXISTING MINOR CONTOUR LINE
190 PROPOSED MAJOR CONTOUR LINE
185 PROPOSED MINOR CONTOUR LINE

**Figure 9** NORTH WAIKAKOI TEMPORARY BRIDGE EROSION CONTROL PLAN
SCALE: 1" = 20'

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE EROSION CONTROL PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:59pm
CAD File Name: C:\pwworking\west01\d1900569\C-011 – Waikakoi Temporary Erosion Control Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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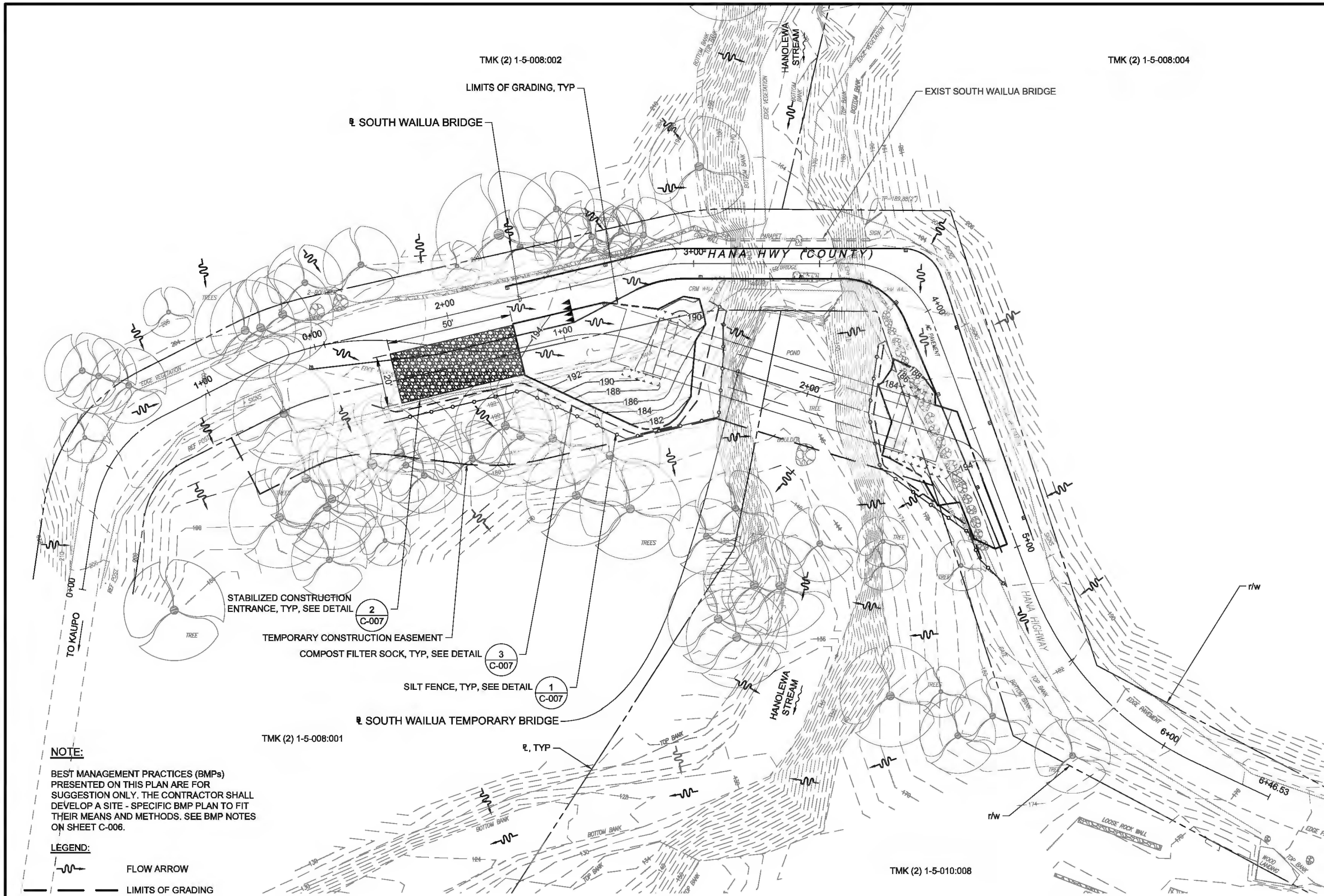


NOTE:

BEST MANAGEMENT PRACTICES (BMPs) PRESENTED ON THIS PLAN ARE FOR SUGGESTION ONLY. THE CONTRACTOR SHALL DEVELOP A SITE - SPECIFIC BMP PLAN TO FIT THEIR MEANS AND METHODS. SEE BMP NOTES ON SHEET C-006.

LEGEND:

- FLOW ARROW
- LIMITS OF GRADING
- SILT FENCE, SEE SHEET C-007
- COMPOST FILTER SOCK, SEE SHEET C-007
- 10 EXISTING MAJOR CONTOUR LINE
- EXISTING MINOR CONTOUR LINE
- 190 PROPOSED MAJOR CONTOUR LINE
- 185 PROPOSED MINOR CONTOUR LINE

**Figure 10** SOUTH WAILUA TEMPORARY BRIDGE EROSION CONTROL PLAN

SCALE: 1" = 20'

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

S. WAILUA TEMPORARY EROSION CONTROL PLAN

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:58pm
CAD File Name: C:\pwworking\west01\d1900569\C-009 – South Wailua Temporary Erosion Control Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
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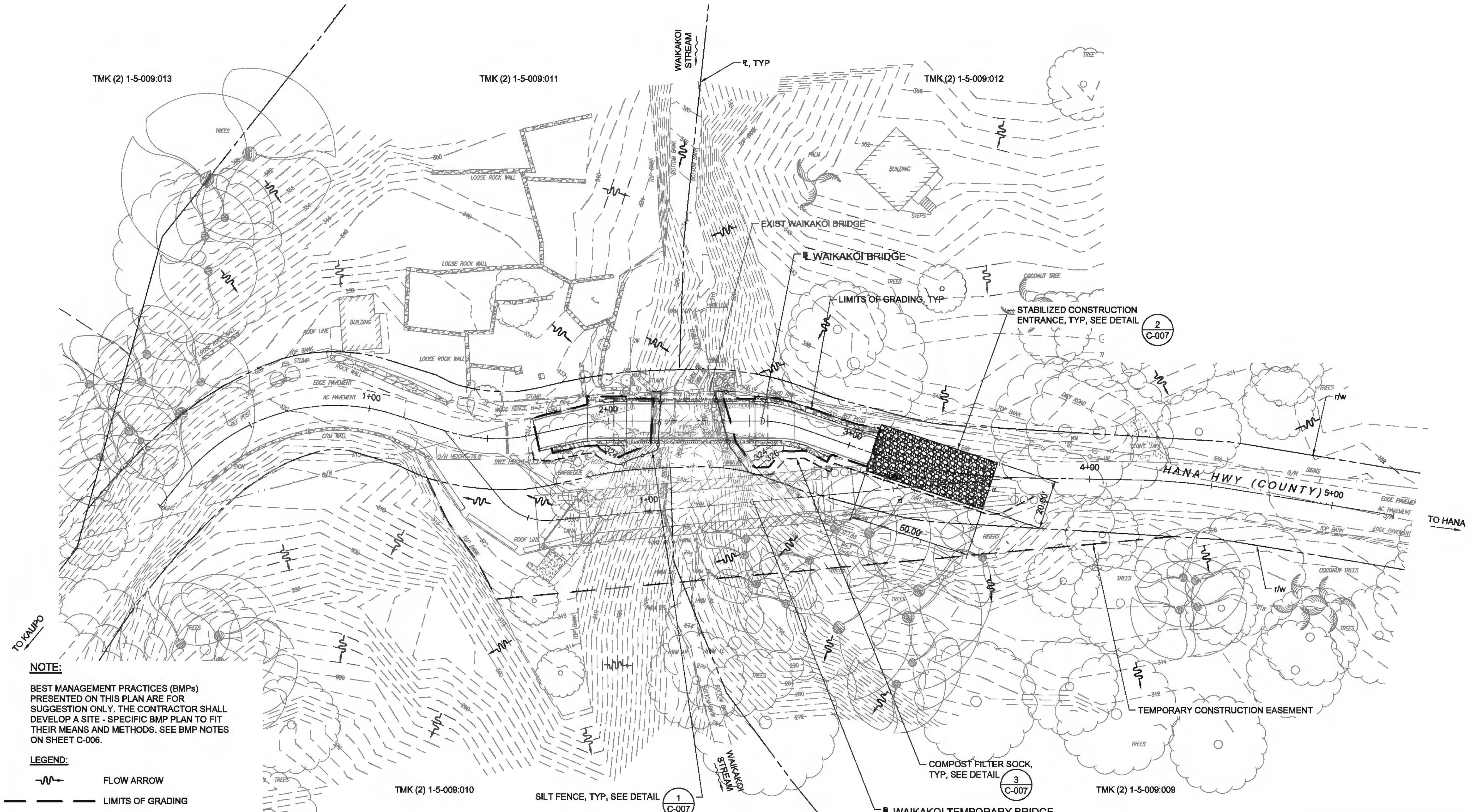



## NOTE:

BEST MANAGEMENT PRACTICES (BMPs) PRESENTED ON THIS PLAN ARE FOR SUGGESTION ONLY. THE CONTRACTOR SHALL DEVELOP A SITE - SPECIFIC BMP PLAN TO FIT THEIR MEANS AND METHODS. SEE BMP NOTES ON SHEET C-006.

## LEGEND:

- FLOW ARROW
- LIMITS OF GRADING
- SILT FENCE, SEE SHEET C-007
- COMPOST FILTER SOCK, SEE SHEET C-007
- 10 EXISTING MAJOR CONTOUR LINE
- EXISTING MINOR CONTOUR LINE
- 190 PROPOSED MAJOR CONTOUR LINE
- 185 PROPOSED MINOR CONTOUR LINE

**Figure 11** NORTH WAIKAKOI PERMANENT BRIDGE EROSION CONTROL PLAN
SCALE: 1" = 20'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

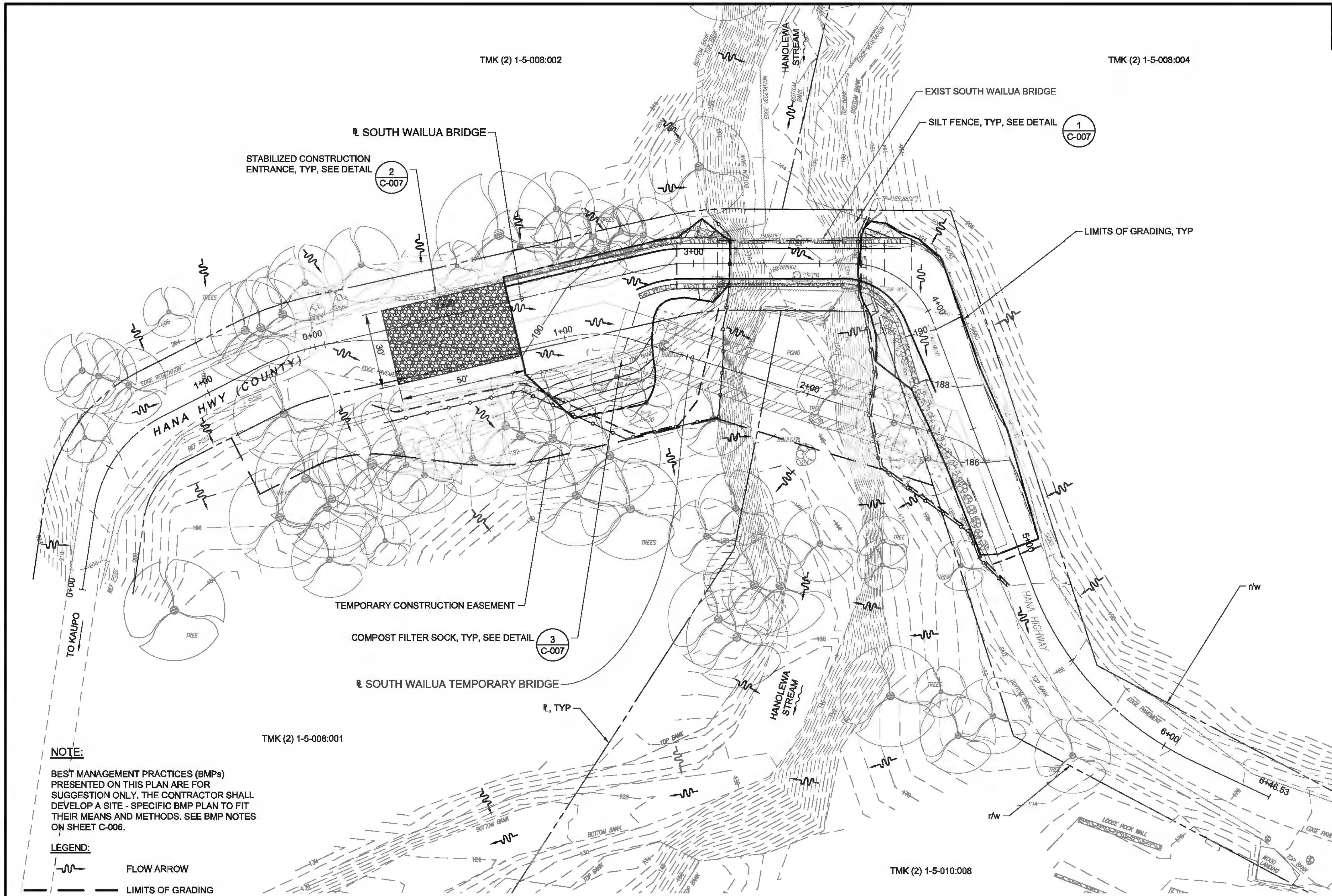
COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

WAIKAKOI PERMANENT BRIDGE EROSION CONTROL PLAN

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:58pm
CAD File Name: C:\pwworking\west01\d1900569\C-012 – Waikakoi Permanent Erosion Control Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 010 | 084 |




NOTE:

BEST MANAGEMENT PRACTICES (BMPs) PRESENTED ON THIS PLAN ARE FOR SUGGESTION ONLY. THE CONTRACTOR SHALL DEVELOP A SITE - SPECIFIC BMP PLAN TO FIT THEIR MEANS AND METHODS. SEE BMP NOTES ON SHEET C-006.

LEGEND:

- FLOW ARROW
- LIMITS OF GRADING
- SILT FENCE, SEE SHEET C-007
- COMPOST FILTER SOCK, SEE SHEET C-007
- EXISTING MAJOR CONTOUR LINE (10)
- EXISTING MINOR CONTOUR LINE
- PROPOSED MAJOR CONTOUR LINE (190)
- PROPOSED MINOR CONTOUR LINE (185)

**Figure 12** SOUTH WAILUA PERMANENT BRIDGE EROSION CONTROL PLAN

SCALE: 1" = 20'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

Date: 8/30/24
Design By: DN, CT, DA, DK
Drawn By: CT, DA, EU, DK

S. WAILUA PERMANENT BRIDGE EROSION CONTROL PLAN

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:58pm
CAD File Name: C:\pwworking\west01\d1900569\C-010 – South Wailua Permanent Erosion Control Plan.dwg

# Appendix B. Archaeological Inventory Survey Report, Waikakoi and South Wailua Bridge Replacement Project, Honua Consulting. June 2025.

**DRAFT FOR SHPD REVIEW**

# Archaeological Inventory Survey Report
# Waikakoi and South Wailua Bridge Replacement Project
# Wailua & Puʻuhaoa Ahupuaʻa (South Wailua Bridge) and Kawaipapa (Koali) Ahupuaʻa (Waikakoi Bridge)
# Hāna District, Island of Maui, Hawaiʻi

**TMK (2) 1-5-008:portions of 001, 002 & 004 (South Wailua Bridge APE) & (2) 1-5-009:portions of 009, 010, 011 & 012 (Waikakoi Bridge APE)**

View of South Wailua Bridge from the roadway on its south side; facing north

Prepared for
HDR, Inc.
Honolulu, Hawaiʻi


Prepared by
Christopher M. Monahan, Ph.D.
Nathan DiVito, B.A.
and
Trisha K. Watson, Ph.D.

HONUA CONSULTING
Honolulu, Hawaiʻi


June 2025

# Management Summary

This archaeological inventory survey (AIS) was completed on behalf of HDR, Inc. in support of a proposed bridge replacement project south of Hāna, Maui, on the National Register of Historic Places (NRHP) listed Hāna Belt Road. The South Wailua Bridge in Wailua and Puʻuhaoa Ahupuaʻa and Waikakoi Bridge in Kawaipapa (Koali) Ahupuaʻa are in Hāna District, Island of Maui, TMK (2) 1-5-008: portions of 001, 002 and 004 (South Wailua Bridge APE/project area) and (2) 1-5-009: portions of 009, 010, 011 and 012 (Waikakoi Bridge APE/project area). The APE includes permanent and temporary bridge construction, roadway approaches (including temporary traffic control warning signage) and anticipated staging areas.

The proposed undertaking is subject to review under Section 106 (36 CFR Part 800) of the National Historic Preservation Act of 1966, as amended. The project is also reviewable under Hawaiʻi Revised Statutes (HRS) Chapter 6E-8 and Hawaiʻi Administrative Rules (HAR) Chapter 13-275. The purpose of the AIS was to determine the land-use history of the project area, to identify and evaluate any archaeological historic properties, and to provide recommendations for review and acceptance by the State Historic Preservation Division (SHPD). The AIS was conducted in accordance with HAR Chapter 13-276.

Fieldwork was conducted by Christopher M. Monahan, Ph.D., who served as the principal investigator for the project, Nathan DiVito, M.A. (project director), Theo Ikaikakoa Monahan and Cassandra Pascua, B.A., on March 13–15 and May 15, 2025.

Seven historic properties, including component features of previously identified historic properties, were identified. Detailed site-feature descriptions and documentation are provided in Section 5 (Results, see Table 5). Significance assessments (evaluations) and project effect determination are provided in Section (Conclusion, see Table 6).

Under HRS Chapter 6E, this AIS supports a project effect determination (HAR § 13-275-7) of "effect, with proposed mitigation commitments."

Under Section 106 (36 CFR Part 800.5), because the proposed undertaking involves historic properties listed on the NRHP, the effect determination is "adverse effect," and the next step regarding resolution is (36 CFR Part 800.6) consultation with the State Historic Preservation Division (SHPD) to complete a Memorandum of Agreement (MOA).

Recommended mitigation commitments, which can be used to satisfy both State and Federal regulatory processes, are as follows: (1) <u>South Wailua Bridge and Associated Features</u> – Complete an Architectural-Historical Assessment; (2) <u>Hāna Belt Road Features at South Wailua Bridge</u> – No further work required; (3) <u>(Honua 1)</u> – If resource can be avoided by the proposed undertaking / project, no further work required; if resource cannot be avoided by the proposed undertaking / project, archaeological data recovery to include archaeological excavation; (4) <u>Wailua Bridge and Associated Features</u> – No further work required (resource will not be impacted by ground disturbance during the proposed undertaking / project; (5) <u>Waikakoi Bridge and Associated Features</u> – Complete an Architectural-Historical Assessment; (6) <u>Hāna Belt Road Features at Waikakoi Bridge</u> – No further work required; and (7) <u>(Honua 2)</u> – Consultation with adjacent landowner at TMK (2) 1-5-009:011 to establish whether site is within the roadway or on private property

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# Section 1 Introduction

## 1.1 Project Background

This archaeological inventory survey (AIS) was completed on behalf of HDR, Inc. (HDR) in support of a proposed bridge replacement project south of Hāna, Maui, on the National Register of Historic Places (NRHP) listed Hāna Belt Road (a.k.a., Hāna Highway) (Figure 1 and Figure 2). The South Wailua Bridge in Wailua and Pu‘uhaoa Ahupua‘a and Waikakoi Bridge in Kawaipapa Ahupua‘a are in Hāna District, Island of Maui, TMK (2) 1-5-008: portions of 001, 002 and 004 (South Wailua Bridge APE/project area) and (2) 1-5-009: portions of 009, 010, 011 and 012 (Waikakoi Bridge APE/project area) (Figure 3 and Figure 4).[1]

The Area of Potential Effects (APE)/project area is approximately 2.73 acres: 1.21 acres at and around Waikakoi Bridge and 1.52 acres at and around South Wailua Bridge. The APE includes permanent and temporary bridge construction, roadway approaches (including temporary traffic control warning signage) and anticipated staging areas.

The purpose of the AIS was to determine the land-use history of the project area, to identify and evaluate any archaeological historic properties, and to provide recommendations for review and acceptance by the State Historic Preservation Division (SHPD).

The proposed project, based on language adapted from an Environmental Assessment (EA), is as follows (a more detailed scope is included in Appendix A):

> The County of Maui (County), Department of Public Works (DPW), in coordination with the Federal Highway Administration (FHWA) and the State of Hawai‘i (State), Department of Transportation (HDOT), proposes to replace the two existing structurally deficient bridges, the Waikakoi Bridge and South Wailua Bridge, with new single-lane bridges to provide safe and functional stream crossings (Project). Waikakoi Bridge and South Wailua Bridge are located at mileposts 45.4 and 44.6, respectively, on Hāna Highway (HI-360) on the island of Maui. The Waikakoi Bridge carries Hāna Highway over Waikakoi Stream, while the South Wailua Bridge carries the highway over Honolewa Stream. The purpose of the Project is to address the existing structural deterioration and load capacity deficiencies by upgrading the structures to be consistent with current design standards and guidelines. To accommodate traffic during construction, it is anticipated that temporary bypass bridges would be installed makai of each bridge. Additionally, the Project will involve roadway improvements, utility relocations, grading improvements, and drainage improvements.

Construction plans of the proposed construction footprint are provided in Figure 5 and Figure 6. Note, in these figures, the area of construction and potential ground disturbance is indicated by the limits of the construction drawings; the APE extends further than the construction drawings to indicate the areas where temporary traffic control warning signage will be placed. Appendix B is a complete set of construction drawings.

[1] The terms APE (Area of Potential Effects) and project area are used interchangeably in this report, which is reviewable under both federal and state historic preservation statutes; likewise, the terms proposed undertaking (federal) and proposed project (state) are also used interchangeably.

Fieldwork was conducted by Christopher M. Monahan, Ph.D., who served as the principal investigator for the project, Nathan DiVito, M.A. (project director), Theo Ikaikakoa Monahan and Cassandra Pascua, B.A., on March 13–15 and May 15, 2025.

### 1.1.1 Regulatory Context

The proposed undertaking is subject to review under Section 106 (36 CFR Part 800) of the National Historic Preservation Act of 1966, as amended. The project is also reviewable under Hawaiʻi Revised Statutes (HRS) Chapter 6E-8 and Hawaiʻi Administrative Rules (HAR) Chapter 13-275.

The AIS was conducted in accordance with HAR Chapter 13-276.

## 1.2 Environmental Setting

### 1.2.1 Natural Environment

The APE/project area is on the lower southeastern flanks of Haleakalā in windward East Maui several miles south of Hāna Bay. Precipitation in the immediate area is approximately 70-75 inches (1778-1905 millimeters), making it a favorable place for rain-fed cultivation (traditional agriculture) (Giambelluca et al. 2013). Upslope areas, however, receive significantly more rainfall—on the order of 3-4 times what the near-coastal region receives—meaning that there is also abundant, through-flowing fresh water in many streams and smaller drainages down to the ocean. As discussed in the Cultural and Historical Context (Section 3) below, Hawaiians practicing a subsistence lifestyle in the past in the APE/project area would have potentially had access to large volumes of fresh water if it could be managed and distributed effectively.

Elevation in the APE/project area is approximately 200 feet (ft.) (70 meters [m]) above mean sea level (amsl) at the South Wailua Bridge and approximately 300 ft. (91 m) amsl at the Waikakoi Bridge. The terrain at both bridges slopes down moderately to steeply to the east. Honolewa Stream, with its popular tourist attraction of Wailua Falls, passes under the APE/project area at the South Wailua Bridge. The far (north) end of the South Wailua Bridge APE/project is defined by another permanent stream, known as Wailua. Waikakoi Stream passes through the Waikakoi Bridge APE/project area. In the uplands of Wailua, on both of its main streams, there are numerous waterfalls. An extensive marshy bog is in the uplands of Koali (Waikakoi Bridge APE/project area).

Naturally-occurring soils in the APE/project area (

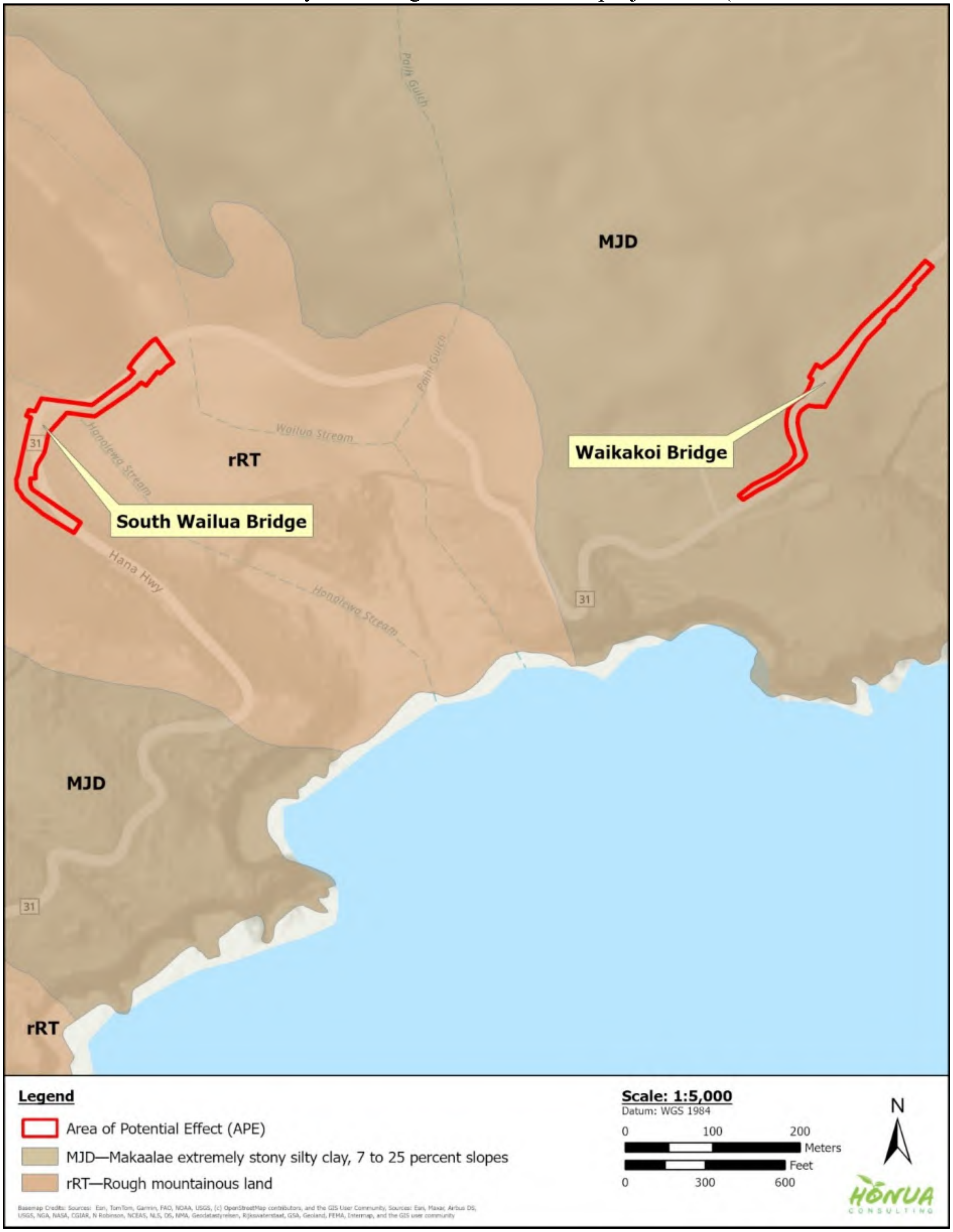


Figure 7) consist of two main types (Foote et al. 1972): native soils in and around the South Wailua Bridge are classified as "rough mountainous land" (rRT), described as "not prime farmland," in gulches and slopes on the flanks of mountains. Native soils in and around the

Waikakoi Bridge are classified as Makaʻalae extremely stony silty clay (MJD) on 7 to 25 percent slopes, also described as "not prime farmland," on slopes of drainages.

General classification of the native flora describes the APE/project area environs as lowland mesic forest, woodland and shrubland with substantive alteration by human clearing related to the highway and bridge construction and other activities upslope (e.g., ranching and pineapple cultivation above Koali) (Juvik and Juvik 1998).

Native vegetation in this area once would have been characterized by "grasslands of pili (*Heteropogon contortus*) or kawelu (*Eragrostis variabilis*)" with "dry or mesic shrublands of ʻaʻaliʻi (*Dodonaea viscose*), ʻākia (*Wikstroemia* sp.), koʻokoʻolau (*Bidens* sp.)" and forests of ʻōhiʻa, koa, lama (*Diospyros sandwicensis*) and wiliwili (*Erythrina sandwicensis*)" (ibid:127). Today, the APE/project area contains native and non-native vegetation such as bamboo, hau, Indian ink berry, yellow and strawberry guava (*Psidium* sp.), kī (ti leaf, *Cordyline terminalis*), ʻulu (breadfruit tree, *Artocarpus altilis*), kukui (candlenut tree, *Aleutites moluccana*), mango (Magnifera indica), passionfruit (*Passiflora* sp.), wild heliconia, wild banana, cocopalm (*Cocos nucifera*), papaya (*Carica* sp.) and a variety of ferns and grasses (including California grass).

### 1.2.2 Built Environment

The APE/project area contains elements of the Hāna Belt Road and three historic bridges (i.e., South Wailua, Wailua and Waikakoi), which are the subject of this study, and various infrastructure and appurtenances. Informal roadside stands that appear to be periodically open for business to sell to tourists are located on the southeast side of Waikakoi Bridge and the northwest side of Wailua Bridge. There is a relatively large asphalt parking area south of Wailua Falls (i.e., south of South Wailua Bridge) along the makai shoulder of the roadway.


Figure 1. Portion of 2024 USGS topographic map (Kipahulu quadrangle) showing project area location (base map source: ESRI's ArcMap 10.8.2)

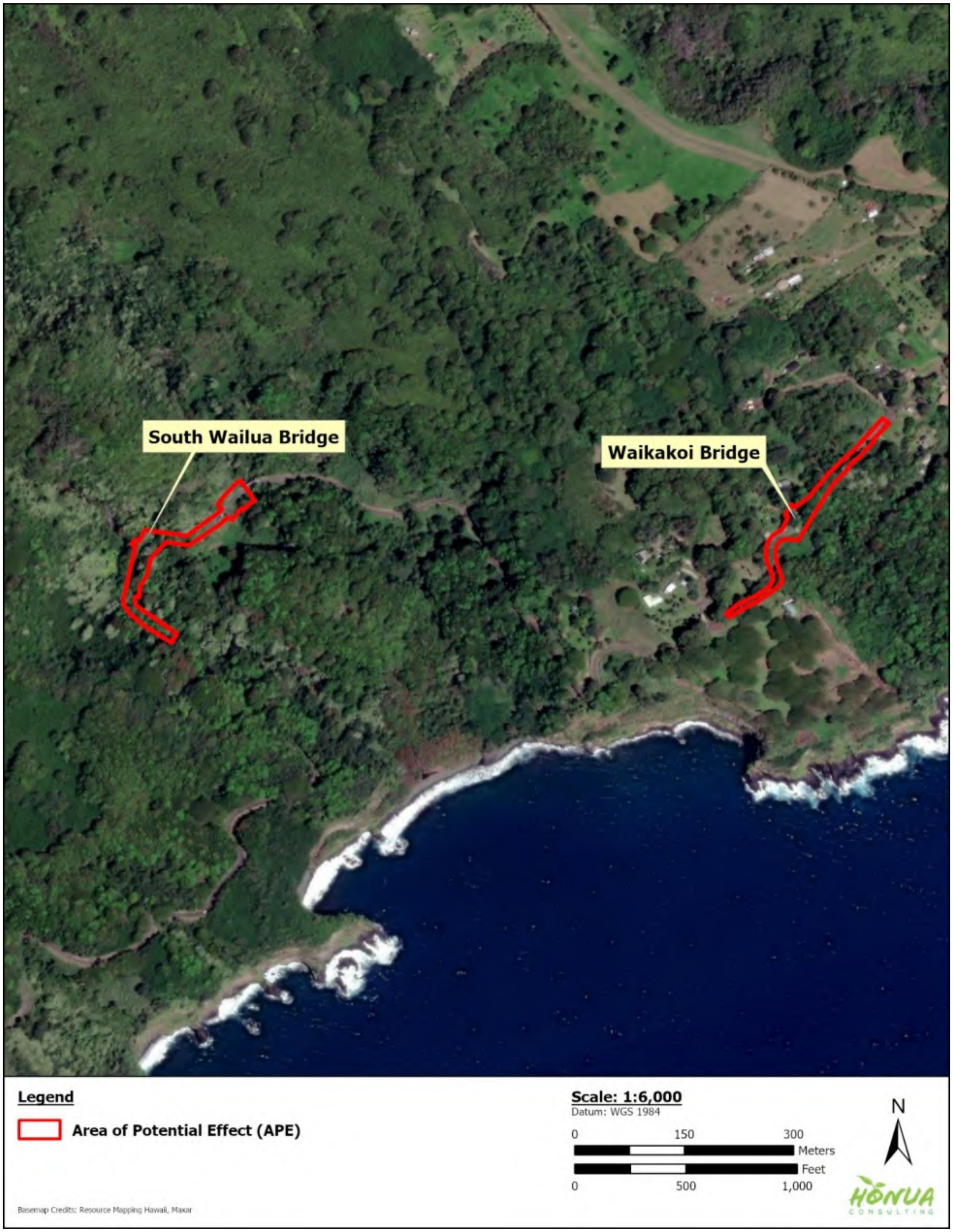


Figure 2. Aerial image showing project area location (base image source: ESRI's ArcMap 10.8.2)

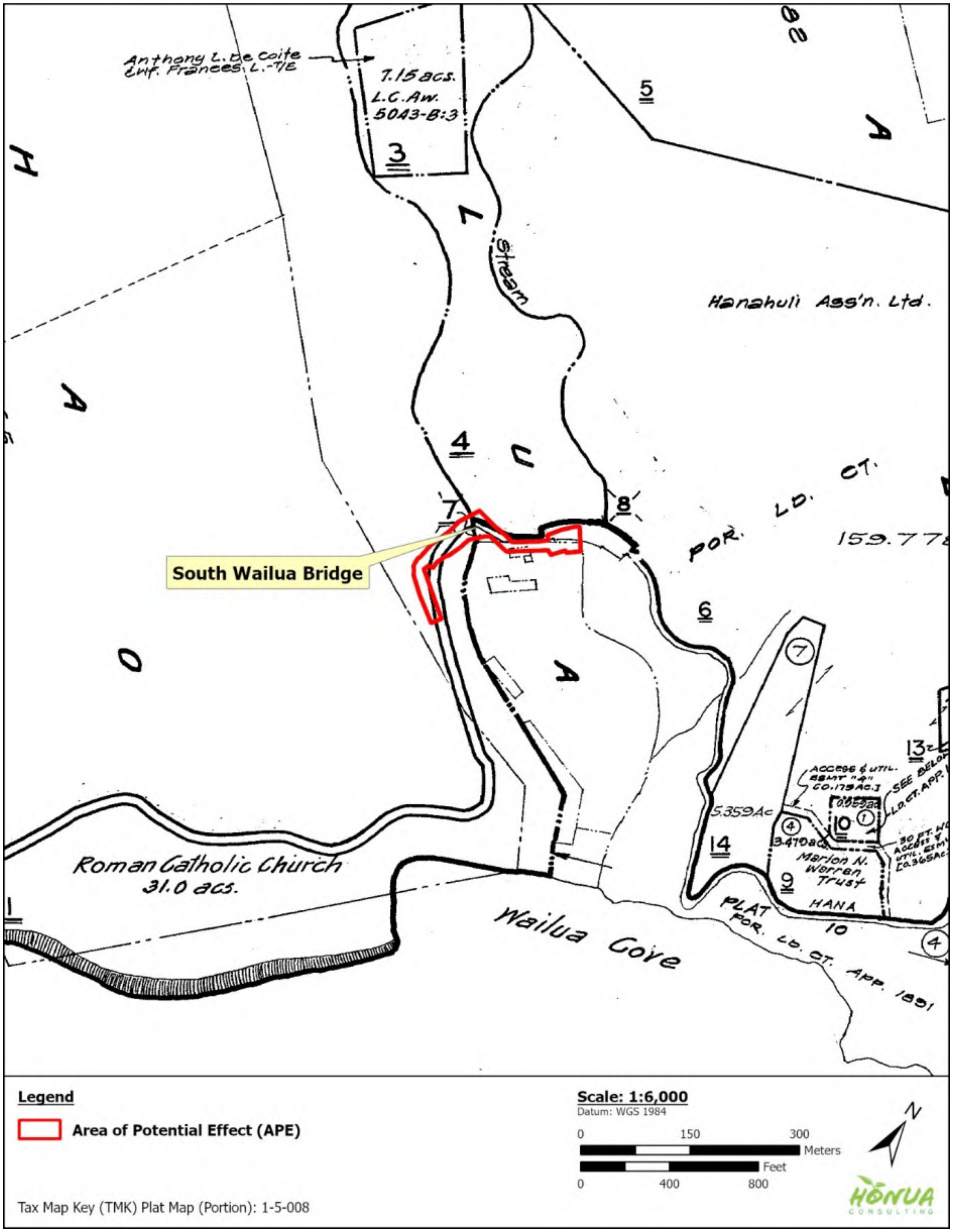


Figure 3. Tax Map Key (TMK) (2) 1-5-008 (portion) showing project area location (base image source: Maui County website, http://www.mauicounty.gov/757/Tax-Map-Information, accessed April 2025)

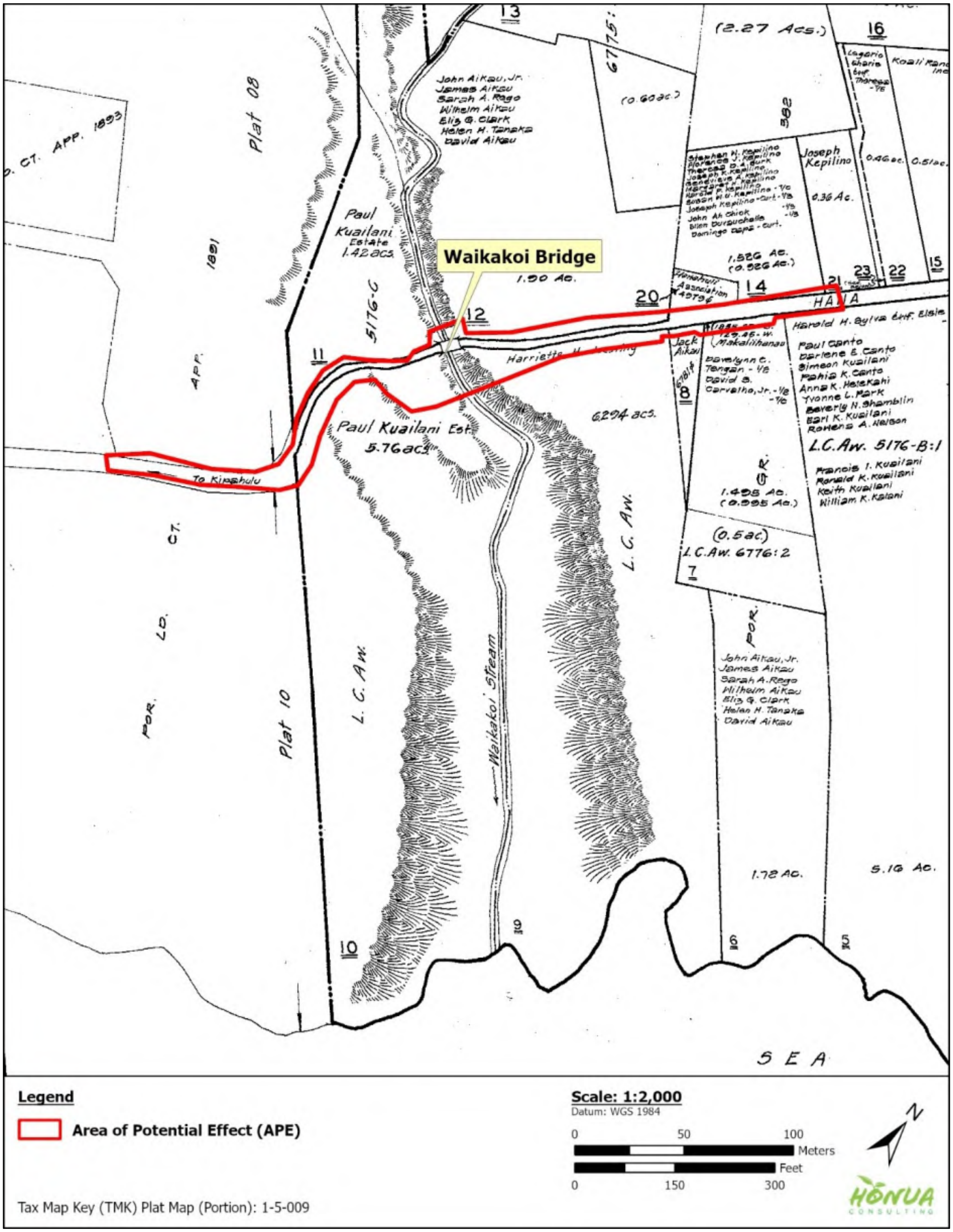


Figure 4. Tax Map Key (TMK) (2) 1-5-009 (portion) showing project area location (base image source: Maui County website, http://www.mauicounty.gov/757/Tax-Map-Information, accessed April 2025)

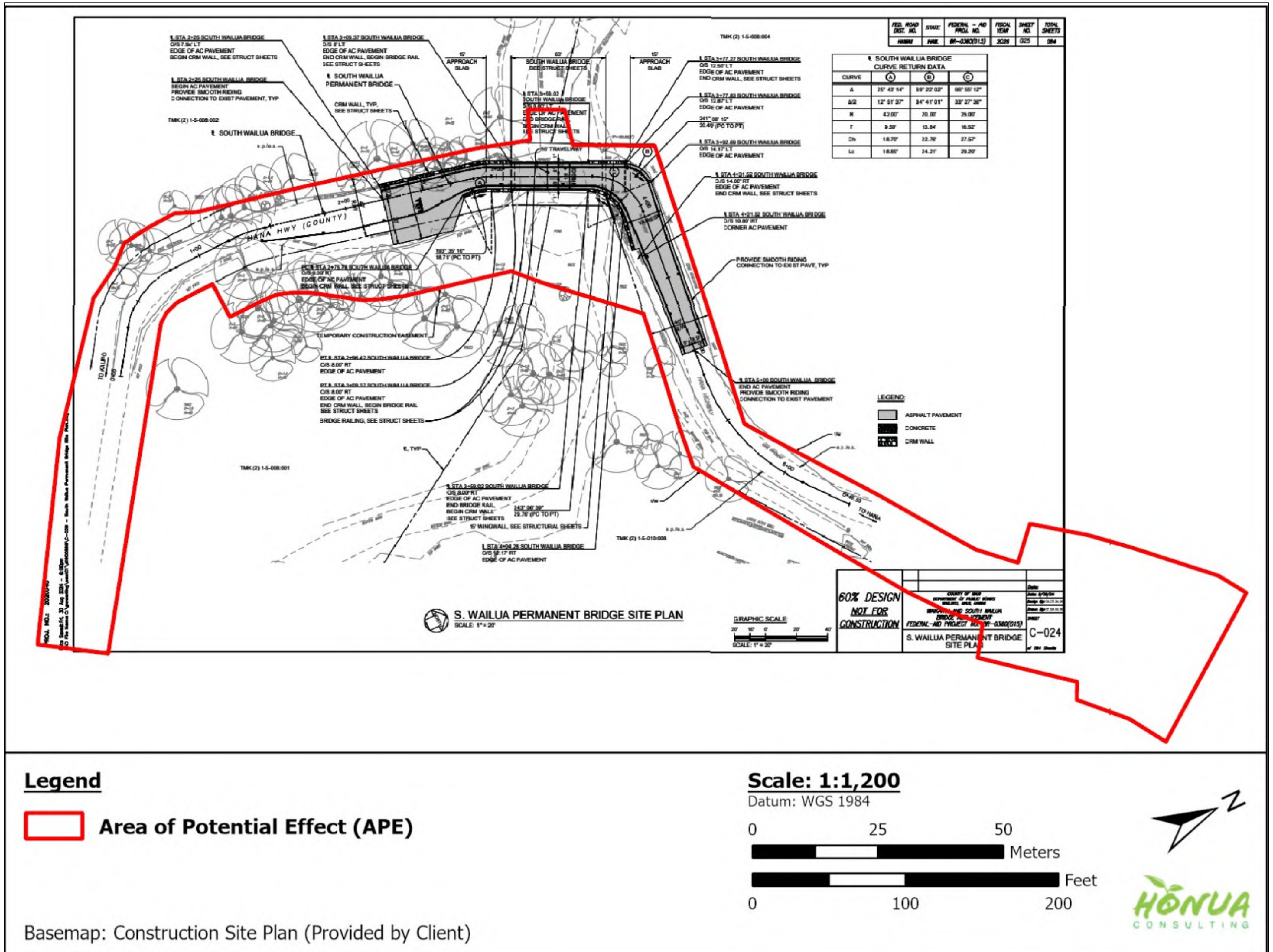


Figure 5. Construction site plan for South Wailua Bridge APE (base image provided by client); note, the area of construction and potential ground disturbance is indicated by the limits of the construction drawing; the APE extends further than the construction drawing to indicate areas where temporary traffic control warning signage will be placed

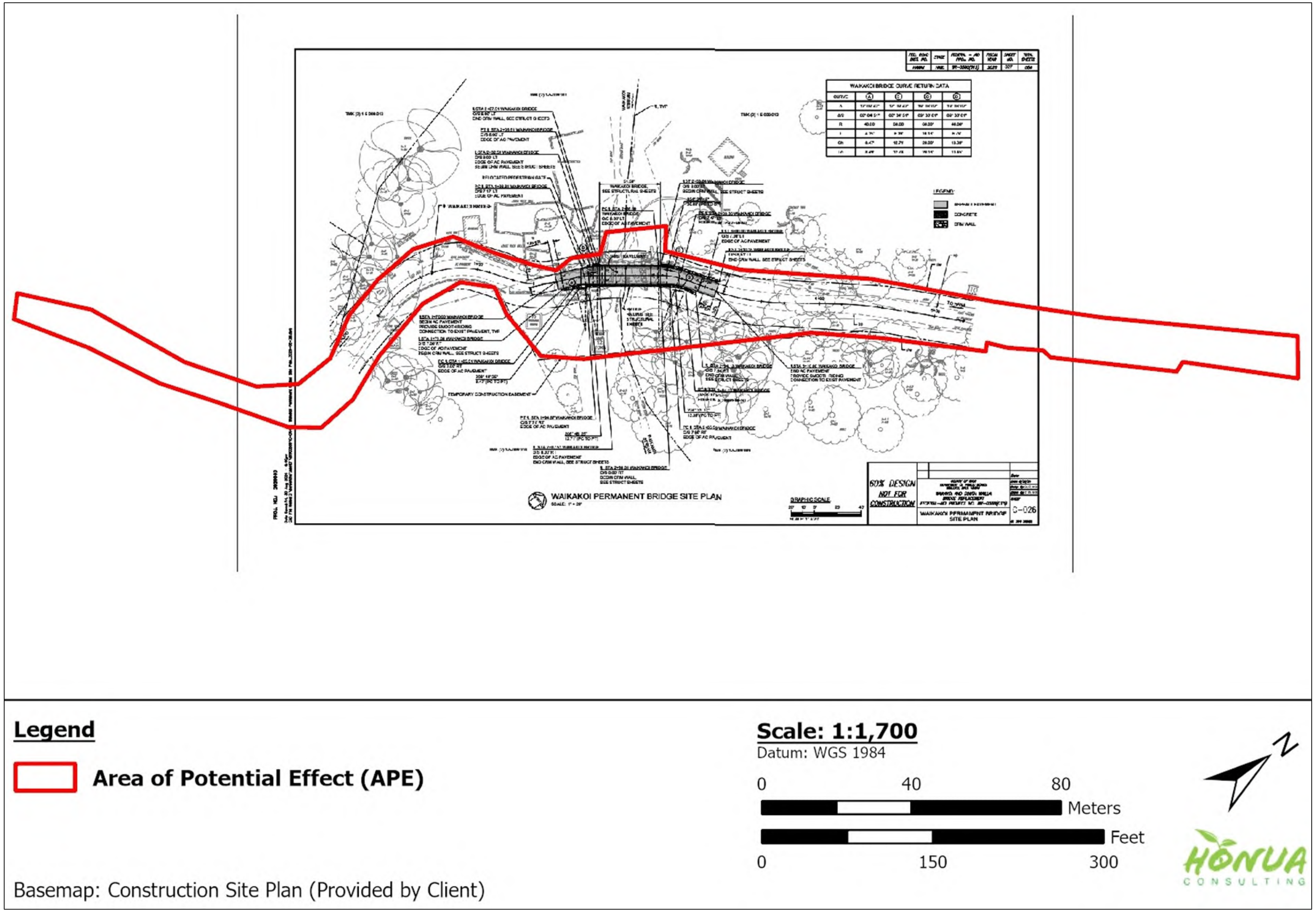


Figure 6. Construction site plan for Waikakoi Bridge APE (base image provided by client); note, the area of construction and potential ground disturbance is indicated by the limits of the construction drawing; the APE extends further than the construction drawing to indicate areas where temporary traffic control warning signage will be placed

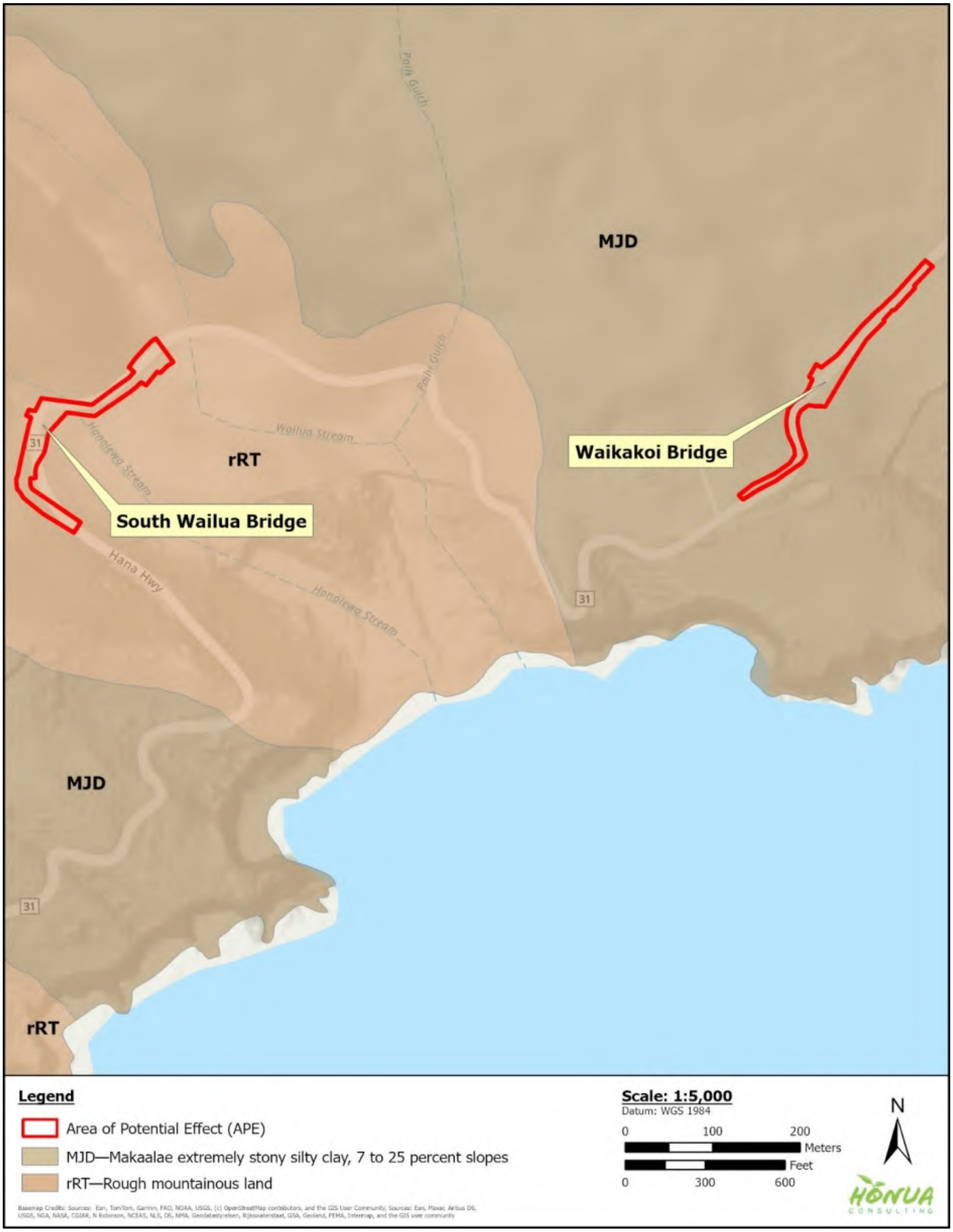


Figure 7. Soils native to the project area (soil data source: USDA-NRCS Soil Survey - https://www.nrcs. usda.gov/wps/portal/nrcs/main/soils/survey/, accessed April 2025; and Foote et al. 1972)

# Section 2 Methods

This section summarizes the methods of archival research, fieldwork and post-fieldwork activities.

## 2.1 Archival Research

Several previous studies with relevant archival information—including cultural, historical and archaeological accounts—provided useful background data that is cited in this report (e.g., MKE and Fung 2013; Conte 2017; Yucha et al. 2018; Tam Sing 2019). In addition to referencing these previous studies, we also conducted a records search at the SHPD's library in Kapolei, as well as the on-line database of the Environmental Review Program (ERP), within the Office of Planning and Sustainable Development, which publishes EIS and EA documents; we also reviewed Honua's proprietary database, and utilized the following on-line sources to obtain cultural, historical and archaeological data:

- OHA's Papakilo database (http://papakilodatabase.com/main/main.php)
- OHA's Kipuka database (http://kipukadatabase.com/kipuka/)
- Bernice P. Bishop Museum archaeological site database (http://has.bishopmuseum.org/index.asp)
- Bishop's Hawaii Ethnological Notes (http://data.bishopmuseum.org/HEN/browse.php?stype=3)
- University of Hawaiʻi-Mānoa's digital maps (http://magis.manoa.hawaii.edu/maps/index.html)
- DAGS' State Land Survey (http://ags.hawaii.gov/survey/map-search/)
- Waihona ʻAina website (www.waihona.com)
- Digital newspaper archive "Chronicling America, Historic American Newspapers" (http://chroniclingamerica.loc.gov/lccn/sn82014681/)
- Hawaiʻi State Archives digital collections (http://archives1.dags.hawaii.gov/)
- U.S. Library of Congress digital map collections (https://www.loc.gov/maps/)
- USGS Information Service, including digital map collections (https://nationalmap.gov/historical/index.html)
- AVA Konohiki's website (http://www.avakonohiki.org/)

## 2.2 Fieldwork

Fieldwork was conducted by Christopher M. Monahan, Ph.D., who served as the principal investigator for the project, Nathan DiVito, M.A. (project director), Theo Ikaikakoa Monahan and Cassandra Pascua, B.A., on March 13–15 and May 15, 2025. Fieldwork for this project was performed under the archaeological permit number 25-28 issued to Honua Consulting by the SHPD/DLNR in accordance with HAR Chapter 13-282.

Fieldwork consisted of a pedestrian survey of the entire APE/project area. Since the APE/project is relatively small and consists primarily of roadways and bridges, pedestrian survey did not follow systematic transects, which were not needed. Pedestrian survey resulted in the inspection of 100% of the APE/project area with no specific limitations regarding ground visibility.

No subsurface testing (archaeological excavation) was conducted during this project.

Several hundred digital photographs—with a detailed photo log (captions)—of the current condition of the APE/project area were recorded. APE/project area boundaries, points of interest and historic properties and their component features were recorded with a handheld Trimble GeoXH 6000 global positioning system (GPS) unit that consistently achieved (with post-processing) sub-meter accuracy.

One scaled plan view sketch map was created of a traditional Hawaiian terrace (archaeological historic property) using tape and compass.

Site-feature forms were created for all designated site-features reported herein.

All data, including field notes and site-feature forms, are stored and backed up in Honua's database.

## 2.3 Post-fieldwork Activities

In addition to post-processing of GPS/GIS data, post-fieldwork activities included digital drafting of the scaled plan view sketch map and preparation of other maps and graphics using ESRI ArcMap software.

Since no portable materials of interest were observed or collected, no laboratory analysis was conducted.

# Section 3 Cultural and Historical Context

This section includes a brief synthesis of relevant cultural and historical information related to the types of land uses in and around the project area from pre-Contact, traditional Hawaiian times into the historic period. The main objective here, primarily through the analysis of historical documents, maps and aerial images, is to provide a project area-specific picture of land use and modification over time.

## 3.1 Hawaiian Cultural Landscape

### 3.1.1 Regional Overview – Moku (Districts) of Hāna and Kīpahulu

On Maui, as with the other Hawaiian islands, determining a project area's traditional district (moku) and ahupuaʻa can be difficult because varied configurations and names appear in different historical and modern sources. Reasons for this include political changes (both traditional and historic), conquest of one island by another, and so on. For example, despite how the ahupuaʻa concept is explained in some sources as "ancient," some knowledgeable cultural historians argue that the so-called ahupuaʻa system was introduced to Oʻahu in the late or terminal pre-Contact period (i.e., at or around the time of Kahekili [circa 1783] or Kamehameha [circa 1795]) and, thus, it is not necessarily ancient nor endemic to Oʻahu Island.[2]

Table 1, Figure 8 and Figure 9 illustrate the research problem of differing land divisions for the current APE/project area (see Table 1) and for Maui generally. The former configuration (see Figure 8), which places the APE/project area in the moku of Kīpahulu and the ahupuaʻa of Wailua (South Wailua Bridge) and Koali (Waikakoi Bridge), is based on research conducted by the Aha Moku Advisory Committee (see website in figure caption). In contrast, the latter map (see Figure 9) is the result of research by Maui Nui Ahupuaʻa Project (see website in figure caption), the SHPD GIS program and the Office of Hawaiian Affairs (OHA). This latter moku/ahupuaʻa configuration seems to be the most widely accepted model at the current time. According to this, almost entire APE/project area is in the moku of Hāna and the ahupuaʻa of Wailua (South Wailua Bridge) and Kawaipapa (Waikakoi Bridge). This latter ahupuaʻa designation for the area in and around Waikakoi Bridge, although widely adopted in current use, does not seem to be consistent with how Hawaiians referred to their lands in traditional times. For example, as illustrated in the section below on Land Commission Awards are other middle nineteenth century records, Hawaiian inhabitants of parcels near the APE/project area consistently referred to their parcels around Waikakoi Bridge as Koali, never Kawaipapa. Similarly, inhabitants of both areas did not refer to their district as "Kipahulu" but, rather, "Hana." Thus, it would appear that elements of both of these ahupuaʻa/moku configurations—illustrated in Table 1, Figure 8 and Figure 9—are more reflective of traditional Hawaiian ideas about land unit names and identities. For the purposes of this report, we focus in this section on the APE/project's relationship to Hāna Moku, while recognizing its association with Kīpahulu; and the ahupuaʻa of Wailua and Koali, in particular.

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[2] On Oʻahu, a possibly older concept than the ahupuaʻa was known as kaʻānaniʻau, defined by Pukui and Elbert (186:108) as "Same as *ahupuaʻa*, the altar marking the land division. *Oʻahu. Rare.*" See Genz (2011) for a perspective on this topic.

Table 1. Different Land Division Names for Bridge Locations and APE/Project Area

| Source[1] | Project Area/APE | Moku | Ahupuaʻa |
|---|---|---|---|
| Aha Moku Advisory Committee | South Wailua Bridge APE | Kīpahulu | Wailua (bridge) & Puʻuhaoa (southern end of APE) |
| | Waikakoi Bridge APE | | Koali |
| Maui Nui Ahupuaʻa Project | South Wailua Bridge APE | Hāna | Wailua (bridge) & Puʻuhaoa (southern end of APE) |
| | Waikakoi Bridge APE | | Kawaipapa |

[1] See http://www.ahamoku.org for Aha Moku Advisory Committee details; see http://www.mauinuiahupuaaproject.com for Maui Nui Ahupuaʻa Project, which is the configuration endorsed by the SHPD and OHA

In Hawaiian traditions, Hāna is famous as a favored place for settlement, particularly by the aliʻi (chiefly) classes.[3] There are numerous interpretations and translations of the meaning of this place name. Beckwith (1940:380) wrote that,

> Hana is called ʻa land beloved of chiefs because of the fortress of Kaʻuiki and the ease of living in that place.ʼ In time of war the hill was reached by a ladder of ohia poles bound together with withes. On the summit was spread a springy plant to serve as bed. Fishponds below furnished unlimited stores of fish. Heaps of ʻawa root ʻdelighted the nostrils of the dear firstborn chiefs.ʼ

The prolific Hawaiian language expert, Mary Kawena Pukui (quoted in Handy and Handy 1972:504), mentioned two reasons why the chiefs favored Hāna as a place of residence: "(1) there grew in abundance the best wood for making scaffolds and ladders (to scale the fortress [i.e., Kaʻuiki]), and (2) there were found the best round smooth stones to be used by warriors as slingshots" (brackets added).

Kaʻuiki (literally, "the glimmer"), the prominent headland defining the south side of Hāna Bay and "fortress" of old, is an extremely famous place in Hawaiian traditions as both the home of Māui, the demi-god, and birthplace of Kaʻahumanu, one of the most storied women in Hawaiian history (Pukui et al. 1974:92).

In their entry for Hāna, although they do not directly interpret or translate the place name Hāna, Pukui et al. (ibid.:40) also describe the birthplace of Kaʻahumanu as Pōnaha-ke-one ("circle [of] sand"), and then direct the reader to the entry for Nā-nuʻa-lele, which is the opposite (northern) point of Hāna Bay, across from Kaʻuiki. Under this entry (Nā-nuʻa-lele), we learn that "[s]tones were carried from here to Honua-uka, inland of Ka-ʻuiki, for Piʻi-lani-hale *heiau* being built by Kiha-a-Piʻilani. A surfing area here is known as Hāna." It is interesting to consider a possible kaona (hidden meaning) of the place name Hāna: one of the meanings of the word hāna listed in Pukui and Elbert (1986:55) is "alert," perhaps reflecting Hāna's prominent geographic location for keeping an eye on the northwestern side of Hawaiʻi Island (i.e., Hāwī and Kawaihae

[3] One way of comparing or quantifying a place's renown in Hawaiʻi is to count the number of entries it receives in Pukui's (1983) *ʻŌlelo Noʻeau, Hawaiian Proverbs & Poetical Sayings* in which Hāna has no less than 10.

in Kohala) where invasions and cross-channel battles with its larger neighbor frequently occurred in late pre-Contact to early historic-period times.

Kīpahulu, with which the APE/project area is also associated, is translated literally as “fetch [from] exhausted gardens (*kī* is short for *ki‘i*)” (Pukui et al. 1974:112), possibly reflecting its relatively drier and less fertile qualities compared with Hāna. According to Pukui et al. (ibid.), quoting Nathanial Emerson’s *Unwritten Literature of Hawaii: The Sacred Songs of the Hula* (first published in 1909), Kīpahulu is the birthplace of Laka, the male demi-god (not to be confused with the female goddess of hula) venerated by canoe-makers and denizen of the forest (similar to the female Laka).

The two primary ahupua‘a with which the ALE/project area is associated are Wailua (literally “two [fresh] waters”), a common place name in the Hawaiian Islands, and Koali. Looking at Wailua first, it is interesting that the ahupua‘a of Wailua is unusually narrow and defined on both sides by a fresh-water stream (i.e., Honolewa to the south and Wailua to the north), hence, perhaps, the reference to “two waters.” It should be noted that an ahupua‘a of this configuration—bound by streams rather than (e.g., in places on older, more eroded islands such as O‘ahu or Kaua‘i) having one main stream come down through the center—undoubtedly reflects East Maui’s rugged terrain and deeply dissected stream drainages that lack extensive floodplains and, thus, serve more as boundaries than central foci of traditional settlement.

Pukui et al. (1974:114) have nothing specific to say about Maui’s Koali, other than suggesting it may have something to do with varieties of morning-glory (*Ipomoea* sp.) (and see Pukui and Elbert 1986:157).

Other famous mo‘olelo (oral-historical accounts) associated with Hāna, which are not recounted here in detail but nonetheless are important to the area’s cultural and historical context, included the story of Kiha-a-Pi‘ilani, a son of the famed sixteenth-century Maui chief Pi‘ilani and part of the lineage who built one of the largest heiau (temples) in the Hawaiian Islands and even all of Polynesia, Pi‘ilanihale (or “house of Pi‘ilani”).

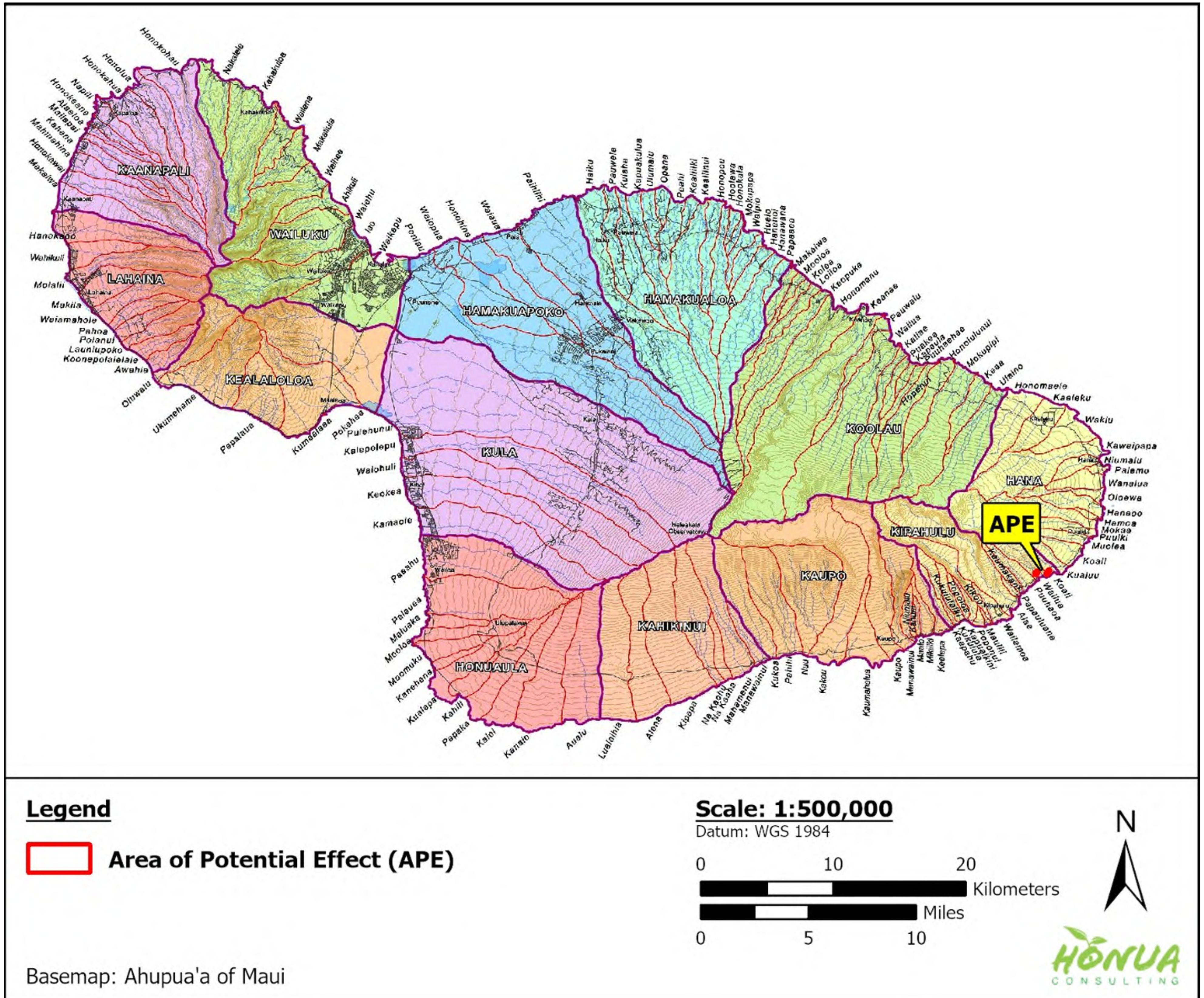


Figure 8. Traditional moku (districts) and ahupuaʻa of Maui according to the Aha Moku Advisory Committee (base map source: http://www.ahamoku.org)

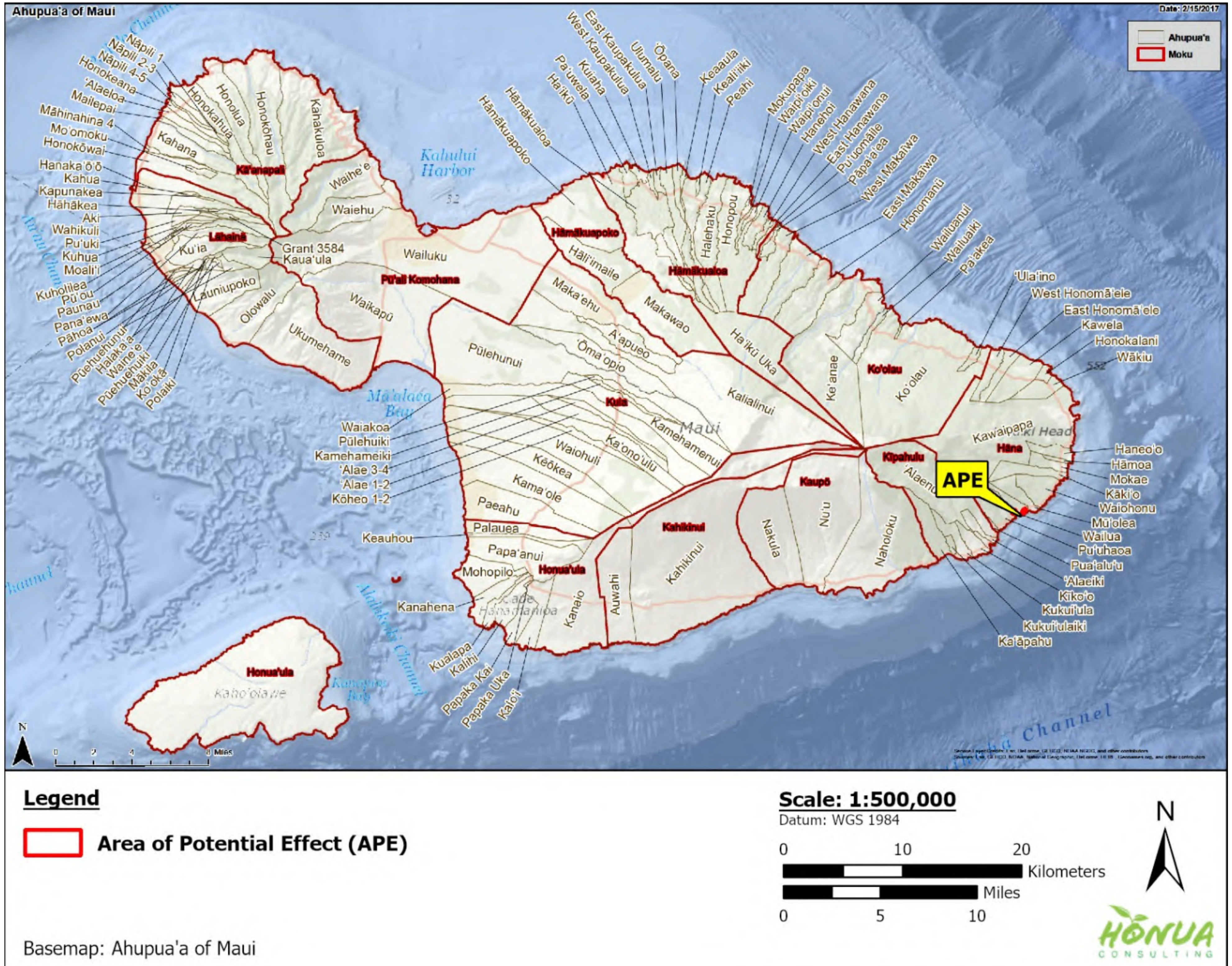


Figure 9. Traditional moku (districts) and ahupuaʻa of Maui according to the Maui Nui Ahupuaʻa Project (base map source: http://www.mauinuiahupuaaproject.com)

## 3.1.2 Traditional Trails to East Maui and Hāna

From a traditional Hawaiian perspective, the Hāna Belt Road is simply the most recent formalization of the widespread phenomenon on all islands of some kind or ala nui, or main route (or ala loa, long route), around the shoreline or near-shoreline. Such routes were critical to Hawaiians, both makaʻāinana (commoners) as well as aliʻi (chiefs), as safe and effective ways to travel between ahupuaʻa and moku (districts) and for the effective administration and governing of different areas in the era of chiefdoms.

Regarding the Hāna Belt Road, in particular,

> Portions of the road corridor are much older than the existing historic highway. It has predecessors as early as the time of the Maui King Piʻilani's Alaloa ("long road") and Kihapiʻilani's addition to the Alaloa known as "The Kings Trail" in the 1600s, to the time of the "Ditch Trail" that ran alongside the early water catchment and diversion ditches for agriculture in the early 1900s. (Yucha et al. 2018:118)

A more expansive treatment of traditional trail building as a precursor to the Hāna Belt Road is provided by MKE and Fung (2013:2-13):

> Before about 1450AD, Maui was divided into two separate kingdoms, one with a court at Lahaina and one with a court at Hana. The two were constantly at war, but eventually Piilani of the Maui Ulu line at Lahaina conquered the east and south parts of the island. His rule is remembered as one of peace, prosperity, and the construction of public works, including the largest *heiau*, or temple, in the Hawaiian Islands. Called Piilanihale, it was built near Honomaele and incorporated massive yet un-mortared stone walls, some up to fifty feet high, as well as an immense stone platform covering nearly five acres. Of greater importance to his reign and to his subjects was the creation of a network of unpaved roads extending throughout Maui, a process that symbolized his unifying power. Each road was laboriously constructed of hand-fitted, adze-trimmed basalt blocks about two feet on a side, and laid in a mosaic to form paths four to six feet wide. One of these roads ran all the way from Wailuku to Hana - a distance of approximately sixty miles. In circa 1490AD, Piilani's son, Kihaapiilani, had the road extended beyond Hana, through Kaupo Gap, and across Haleakala Crater.
>
> The original route to Hana was well maintained for over 250 years, because it was the only land link between the two ends of the island. Around 1759, the king of the Big Island, Kalaniopuu, captured Hana and held it for more than twenty years. During this time, the road fell into disrepair and was purposely closed to thwart incursions from the north. Nonetheless, in about 1780 Kahekili, the King of north Maui (or Maui Iki) retook Hana and reopened the road, which by then needed extensive repairs. Not only was the road cleared, but where stream canyons were deepest wooded bridges were built to replace the old, treacherous staircases painstakingly carved into the cliffs centuries prior. Even so, the roads could support no more than foot traffic, and much of it served that function until 1900, though by then Hana had become a thriving sugar plantation community.

### 3.1.3 Traditional Subsistence and Land Use in Hāna and Kīpahulu

The chronicler of traditional Hawaiian land use, planting areas and subsistence practices, E.S. Craighill Handy (Handy 1940; Handy and Handy 1972), had this to say about Hāna, which includes commentary on native agriculture as well as other political and cultural observations (Handy and Handy 1972:502):

> This farthest part of Maui on the very eastern end of Haleakala is one of the wettest and most verdant coastal areas in the Hawaiian Islands. It has no flatlands along streams; in the upper reaches there is much boggy land. Yet a great deal of upland taro was grown there, as well as bananas, yams, *wauke* [paper mulberry, *Broussonetia papyrifera,* used to make kapa cloth] and *olona* [native shrub, *Touchardia latifolia*, whose fibers were used to make nets and cordage]. Hana is famous for its *ʻawa* [kava, *Piper methysticum,* used to make mildly narcotic beverage].
>
> The coast line is very rough, but not high like that of the Koʻolau [here, referring to Maui's Koʻolau District, adjacent to, and north of, Hāna Moku]. There are rich level lands lying between the shore and the gently sloping *kula* land, which was, in the 1930's, planted with sugar cane, then later sold as ranch lands [here, referring to the establishment of Hana Ranch in the mid-1940s]. (brackets added)

Veering into political history, he writes:

> Hana Bay and its small volcanic hillock Kaʻuiki, are famous in the annals of the *aliʻi* of Maui and Hawaii. This was due to a variety of causes, discussed below. Perhaps an original cause was its closeness to the north coast of Hawaii. Alanuihaha Channel, between the southeast and south coast of East Maui and ʻUpolo Point (the northwest tip of Hawaii) could easily be crossed in either direction in a couple of hours when a trade wind was blowing. As a sanctuary, both in wartime and peacetime, Hana was an ideal seat for ruling *aliʻi* of either island, as well as a much pleasanter and more beautiful place in which to live. (ibid.)

Handy, working his way down from Hāna Bay towards the current APE/project area, makes a few observations about traditional settlement and land use in Koali and then Wailua (ibid.:506):

> South of Hamoa the land is less rugged and streams are more plentiful. The Hawaiian homesteads at Makaʻalae, Waiohonu, Puʻuiki, Pohue, Pukuilua, Haou, Hulihana, Muolea, and Koali have extensive plantations but only a small proportion of the cultivation is devoted to dry taro. There is no evidence of wet-taro cultivation in Hana District north of Koali. Here, however, both above and below the road, there were small groups of terraces in 1934, some of which were still used for wet taro. The group nearest Wailua is a picturesque example of high terracing with stone facing on a steep slope.

It is important to note that Handy, in the end of the previous quote, may be referring specifically to the adjacent private parcel (TMK [2] 1-5-009:011, which is also a portion of LCA 5176-C to Liilii) at Waikakoi Bridge, where many traditional Hawaiian site-features are extant.

Handy (ibid.) continues on to Wailua:

> Beyond Koali is the deep little valley of Wailua, plenteously watered by three converging streams falling from the slopes of Kaumakani. It harbors the most extensive wet plantations on the eastern end of Maui. Altogether there are about as many old terraces as at Ke‘anae, although fewer were under cultivation in 19343. The wet patches at Wailua are at four levels. There were groups above the upper falls between the two main streams. Immediately below the falls, behind the small rocky hill in the center of the valley, was an extensive plantation of well-watered terraces in which taro flourished in 1934. At a slightly lower level, beneath the southwest wall of the central hill is a group of half a dozen patches which were brought back into cultivation in 1934. In the valley bottom, almost at sea level, is the most extensive area of terraces in Wailua, extending from the beach to the mountain and up into the little valleys on either side. These patches are no longer used and are coverd [sic] by heavy brush and trees.

It is important to note that Handy’s “second level” of lo‘i kalo, in the quote above, is right below the South Wailua Bridge, and probably a bit north of Honolewa Stream.

### 3.1.4 Project Area Specific

From a Hawaiian cultural landscape perspective, the current APE/project area, consisting of areas directly around South Wailua and Waikakoi bridges, is clearly characterized by Handy’s comments above from nearly 100 years ago. His observations about extensive and active Hawaiian cultivation of these areas, including irrigated taro, formal rock terraces, and so on, both above and below the highway, is consistent with, and complementary to, data gleaned from the records of the Māhele (see Section 3.2.2 below). Collectively, these independent lines of evidence make clear that the current project area/APE was once part of an extensive, integrated landscape dedicated to traditional Hawaiian cultivation practices. In addition to its agricultural importance, the current APE/project area may have also included temporary shelters or “garden houses,” but permanent house sites were likely built downslope, closer to the coastal and near-coastal portions of these ahupua‘a. As discussed below, Manu’s kuleana parcel (Land Commission Award [LCA] 5043-B) exemplifies this pattern of upland growing areas and permanent house site at the coast.

Conte’s (2017:12) archaeological inventory survey (AIS) of a large portion of Koali Ahupua‘a, adjacent to the current APE/project, provides some relevant analysis of traditional Hawaiian land use very close to (just mauka of) Waikakoi Bridge:

> A portion of one of those, LCA 6775 Apana 2 to Kekuli [note, see Section 3.2.2 below], is situated in the *‘ili* of Papakea and comprises the entirety of one of the subject parcels (TMK [2] 1-5-008:013) [ . . . ]
>
> The testimony provided by Kekuli stated the land he claimed had belonged to him since 1819, noted the presence of a *poalima* (the chief’s plantation where commoners worked on Fridays or “the fifth day”) and that he had already sent the award to Mr. Robertson at the Land Office to get a Royal Patent. The *mahele* record indicates only the presence of a road/path, the sea/shore/dunes and a Government road; however, the entire location of the LCA also comprises a portion of Site 50-50-17-7456, a large agricultural terrace complex identified during the current survey. (brackets added)

## 3.2 Historical Period

This section included subsections: the Early Historical Period, the Middle Nineteenth Century and the Māhele ʻĀina, the Late Nineteenth Century and Early Twentieth Century, and the History of the Hāna Belt Road and Bridges.

### 3.2.1 Early Historical Period

General aspects of the early history of the Hawaiian Islands and Maui are well known and have been written about in many cultural, historical and archaeological reports and publications. Most of this information is far beyond the scope or relevancy of the subject report, with its focus on two relatively small projects areas along the Hāna Belt Road.

The proto-historical period (late 1700s) saw the high chiefs Kahekili of Maui and Kalaniʻōpuʻu of Hawaiʻi compete for power and engage in battles between the two "windward isles." With the arrival of Captain James Cook in the Hawaiian Islands (1778), the archipelago was opened up to a series of European explorers, commercial interests and, ultimately, American missionaries (1820) over the course of three or four decades. This tumultuous period in Hawaiian history also witnessed the unification of the Hawaiian Islands by Kamehameha the Great (1810) following several decisive military campaigns (e.g., the Battle of Nuʻuanu on Oʻahu, 1795) and the capitulation of the "separate kingdom" of Kauaʻi.

Through all of this, including the death of Hawaiʻi's last traditional warrior-king, Kamehameha in 1819, and the systemic collapse of the kapu ("taboo") system of ancient law, Hawaiians experienced a period of monumental change from a relatively isolated nation of subsistence farmers (including aqua-culturalists) and fishers to a participant in the "world system" economy with new economic opportunities and constraints on land and resources, the introduction of deadly communicable diseases from Europe, America and Asia that ravaged indigenous people, and great uncertainty as to the long-term prospects for Kānaka Maoli (native Hawaiians).

The rest of this brief subsection highlights some information that is most relevant to the current APE/project area.

In 1778, before Captain Cook's ships returned to Kealakekua Bay from their North American explorations (and was famously killed during an attempt to kidnap Kalaniʻōpuʻu), they anchored at Hāna where locals boarded their ships (Cordy 2000:294). Another British sea captain, William Douglas, commanding *The Iphigenia*, visited Hāna Bay in 1788, and recorded some general comments (Yucha et al. 2018:60-61).

In the lead up to Kamehameha's conquest and unification of the Hawaiian Islands, he readied his warriors for an invasion of Maui:

> In 1790, Kamehameha then began to muster his armies for a planned invasion of Maui. That summer, Kamehameha landed at Hāna. In a battle known as Kaua o Kawaʻanui (Battle of Great Canoes), Kamehameha defeated the Maui advance guard there, after which he sailed for Hāmākua Loa, sweeping the remaining Maui defenders along the coast and back into ʻĪao Valley, and annihilating them at the battle called Kaua o Kapaniwai o ʻĪao (Battle of the Dammed Water of ʻĪao), during which the slain warriors were said to have been so numerous, that

> they dammed the water of ʻĪao Stream. Kamehameha then returned to Hawaiʻi to settle disputes there. In his absence, both Kahekili and the High Chief of Kauaʻi, Kaeokulani formed an alliance to retake Hāna. After that success, both chiefs launched an attack on Kamehameha at Waipiʻo on Hawaiʻi, where they were both defeated. After the death of Kahekili in 1793, Kamehameha assumed the rule over all of Maui, through his victory over the High Chief Kahekili's successor, the High Chief Kalanikupule, in the battle of Nuʻuanu on Oʻahu in 1795 (McGregor 2007:99, quoted in Yucha et al. 2018:61).

Early missionaries frequently maintained records and notes of their activities and visits to various parts of the islands to establish their churches and convert locals to Christianity. Several excerpts from some of these missionaries provide glimpses of life in and around Hāna. For example, Conte (2017), referencing Bartholomew and Bailey (1994:135) provide a population estimate for the district of Hāna in 1837, calculated by nineteenth-century missionaries Daniel Conde and Mark Ives of 3,000. Yucha et al. (2018:62), referring to missionary writings from 1825 about a visit to Hāna in 1823, state that,

> The Hāna region of Maui was known as "one of the most isolated places in these islands, remote and difficult to access" (Bishop 1861). Because of the many treacherous ravines and unpredictable flooding, Native Hawaiians usually rode on horseback to a point before Keʻanae, then completed the journey to Hāna by canoe. Before the establishment of the Hāna protestant mission in 1837, missionaries reached East Maui no more than once or twice a year. From the early writings of the protestant missionaries in the Sandwich Islands, it appears that the first excursion to Hāna by an American protestant teacher was made in 1823.

According to Richards and Stewart (1825:141), this American Protestant teacher "found [the natives] wholly uninstructed, and exceedingly attached to their idols, and disposed to resist every argument in favor of a change in their religion"; in other words, Hawaiians in Hāna were still living a traditional lifestyle in 1823 and following the old gods and religious practices. As a side note, this quote also relates that "Before he [one of the missionaries] left the place, he ascended a neighboring hill which overhangs the sea on the top of which were several huge stones erected, covered with tapa (native cloth) . . . he succeeded in displacing them from their beds, and rolled them into the sea" (ibid.).

These glimpses of life in and around Hāna into the 1820s make it clear that the region was relatively conservative in its maintenance of the old, traditional ways and slow to embrace drastic change, no doubt largely a reflection of the remoteness of the area.

### 3.2.2 Middle Nineteenth Century and the Māhele ʻĀina

Beginning in the 1840s, the concept of private property was introduced to Hawaiʻi through formation of the Board of Commissioners to Quiet Land Titles, and the adoption of the Māhele ʻĀina (division of Hawaiian lands), or simply the Māhele. In 1845, King Kamehameha III waived his right to full authority over the land, portioning out land for his personal use (crown lands) and dividing the rest into government land, land for the aliʻi (chiefs) and konohiki (land overseers), and land for commoners (kuleana land) (Alexander 1891; Board of Commissioners 1929; Moffat and Fitzpatrick 1995). The Kuleana Act of 1850 created Land Commission Awards (LCAs), which formalized makaʻāinana ownership of so-called kuleana parcels in fee simple; some higher-status individuals including malihini (foreigners) also received LCAs in some parts of the archipelago.

In many cases, LCA documents (which typically include witness testimony from both the claimant as well as his/her neighbors, and also simple survey [sketch] maps) provide data on who resided on the land, how the land was used and/or improved (e.g., house sites, gardening or cultivation, fishponds and irrigation ditches, animal-grazing or pasture, etc.) and other cultural and natural resources in and near the parcel. Local place names otherwise unrecorded on commonly accessible historic maps and deeds—e.g., for individual garden plots or complexes—are sometimes also included in LCA documents. One caveat regarding commoner ownership was that they had to be actively living on and/or cultivating the specific parcels in question; thus, in many cases, fallow lands or parcels located in the uplands that were dedicated to growing certain resources (e.g., koa trees for canoes) or only visited periodically (e.g., slash-and-burn garden plots) were typically not awarded. In general, LCAs awarded to high chiefs or politically well-connected individuals did not have to supply detailed parcel information.

Specific numbers regarding commoner awards differ depending on the source, but the overall picture is one of widespread disenfranchisement of many (perhaps most) Hawaiians. Chinen (1958) estimated approximately 10,000 commoners received awards. Kameʻeleihiwa's (1992:295) research resulted in a total of 14,195 claims filed and 8,421 awarded for about 29% of the 29,220 adult Native Hawaiian males living at the time of the Māhele, averaging 3 acres per award. Out of the potential 2,500,000 acres of Crown and Government lands, 28,658 acres were awarded to the makaʻāinana, or less than 1% of the total acreage of Hawaiʻi (ibid.). Van Dyke (2008) reported approximately 8,000 individuals received about 2.5 acres each.

Another common form of land ownership starting in the middle nineteenth century was purchasing government land, typically considered "excess" parcels, known as Land Patents or Grants, or simply Grants in some historic documents. These purchases of government land were typically larger than kuleana (commoner) parcels and were often made by relatively wealthy individuals and institutions. Both types of land ownership, LCAs and Land Grants (LG), are in and near the subject project area. Another type of legal information on land ownership documents is Land Court Applications, in short, efforts to "quiet title" to lands; these documents can sometimes contain information about old LCAs and other land resources and uses.

Table 2 summarizes historical land ownership in and adjacent to the two bridge APE/project areas. Figure 10 shows LCAs in and near the APE/project areas. A brief discussion of these data for the two bridge APE/project areas follows.

Table 2. Historical Land Ownership Documents in and near South Wailua Bridge APE

| Parcel #/s[1] | Awardee / Ahupuaʻa | Details | Other Comments |
|---|---|---|---|
| LCA 4930:2 (RP 4997) | Kahili / Wailua | Tiny parcel (0.14 acres) just below bridge on north side of Honolewa Stream; identified as "Wailua Ahupuaʻa, Hana Moku" in *Indices of Awards** | Location (probably its ʻili) also known as Pukuilua; described in Native Testimony as having "6 loi," i.e., irrigated taro patches |
| LCA 5043 (RP ?) | Kenoi / Koali | Parcel bounded by Hāna Belt Road on makai side extends upslope northeast of bridge; Kenoi indicates his land (ʻili) was called Manini; no land use indicated | May be an unawarded LCA; it appears in some documents as part of current TMK (2) 1-5-009:017; there is no RP # listed in the *Indices of Awards** |
| LCA 5043-B:1 | Manu / Wailua | Makai-most (near shoreline), small (~1-acre) parcel on north bank of Honolewa Stream described as house site ("pahale") and "loi kalo" (i.e., irrigated taro) | Different sources describe these 3 ʻāpana as being in either or both Wailua and/or Koali Ahupuaʻa; current TMK maps place them all in Wailua Ahupuaʻa; 2 RP #s (3110 and 3113) for this LCA are listed in *Indices of Awards** |
| LCA 5043-B:2 | | Small (~1-acre) parcel just below bridge on north side of Honolewa Stream described as "3 loi ma Wailua" (i.e., irrigated taro patches drawing from Wailua Stream) | |
| LCA 5043-B:3 | | Large (7.15 acres), ~0.25 miles mauka of APE/project area between Honolewa & Wailua streams; 3 loʻi kalo and also pōʻalima (i.e., land worked for chief) | |
| LCA 5176-B:1 (RP 4069) | Kalea (Kaleo) / Koali | Large (5.16 acres), extends from Hāna Highway, north of Waikakoi Bridge, to shoreline | Mentions pōʻalima for "konohiki" Whittlesey (see LG 382 below) |
| LCA 5176-B:2 (RP 4069) | | ~0.3-miles mauka and northwest of APE/project area in Koali Ahupuaʻa described as loʻi kalo; mentions pōʻalima for "konohiki" Whittlesey (see LG 382 below) | Location (probably its ʻili) also known as Haleolono; relatively large (for makaʻāinana) parcel of 4.1 acres; Kalea had another ʻāpana north of Waikakoi Bridge |
| LCA 5176-C (RP 6275) | Liilii / Koali | This LCA includes portion of the APE | Land use details are sparse but include mention of planting patches |
| LCA 6775:1 (RP 3331) | Kekuli (Kuli) / Koali | This LCA includes portion of the APE | Mentions loʻi kalo and pōʻalima |
| LCA 6775:2 (RP 3331) | | Mauka of APE/project area | Mentions loʻi kalo and pōʻalima |
| LCA 6776:1 (RP 3342) | Kaaikaikalepo & Kanahele / Koali | Mauka of APE/project area | Mentions loʻi kalo and pōʻalima |
| LCA 6776:2 (RP 3342) | | 0.5-acre parcel east and makai of Waikakoi Bridge | Mentions loʻi kalo and pōʻalima |
| LG 1165 | Catholic Church / Wailua | Large (260-acre) parcel west of the bridge | -- |
| LG 382** | Rev. E. Whittlesey / Koali | Large parcel mauka and northwest of APE/project area – surrounds Kalea's LCA 5176-B:2 | Original 1850 sale of 672 acres in Koali was to Rev. Whittlesey, missionary sent by A.B.C.F.M. in 1843 |

[1] LCA = Land Commission Award, LCAp = Land Court Application, LG = Land Grant, RP = Royal Patent
* See Board of Commissioners (1929) in References Cited
** Today, there are several discrete parcels in this region under this LG # owned by Hanahuli Association, Ltd.

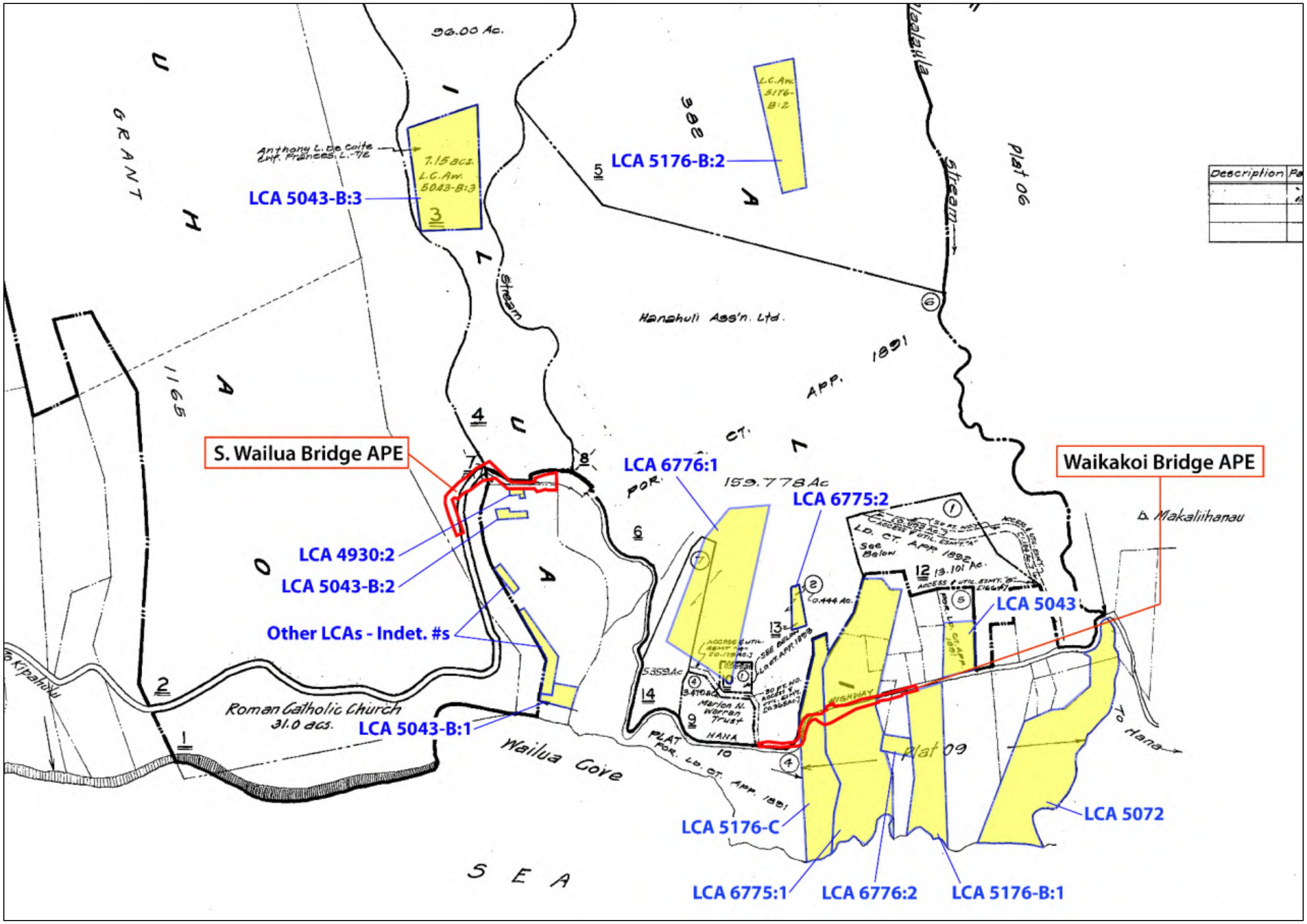


Figure 10. Land Commission Awards in and near the South Wailua Bridge APE and Waikakoi Bridge APE

LCAs in and near South Wailua Bridge APE

Documented LCAs in Wailua Ahupuaʻa that are near the South Wailua Bridge APE include several small parcels downslope from (makai of) the bridge extending down to the shoreline, and one relatively large (7.15-acre) (as far as makaʻāinana are concerned) parcel upslope (mauka).

All of these kuleana parcels are between the two streams that define this ahupuaʻa: Honolewa and Wailua.

One individual, Manu, was awarded three of these parcels: the large, mauka one (LCA 5043-B:3) that contained multiple loʻi kalo (irrigated taro gardens) and mentioned pōʻalima (garden plot or plots worked for the chief), one right below the bridge (LCA 5043-B:2), described as "3 loi ma Wailua," or irrigated taro gardens drawing water from Wailua Stream, and another (LCA 5043-B:1) down at the shoreline where his "pahale" (house site) was located.

Kahili (LCA 4930:2) was awarded a tiny (0.14-acre) parcel right along the makai road shoulder northeast of the bridge that nonetheless (given its very small size) was described as containing "6 loi." This parcel was known as Pukuilua.

Two other, small parcels below the bridge, for which we have not identified LCA #s for, may be unawarded claims.

LCAs in and near Waikakoi Bridge APE

Tam Sing's (2019) archaeological work in Koali Ahupuaʻa includes a useful synthesis of historical land ownership in and around the Waikakoi Bridge APE/project, portions of which are reproduced below.

> A total of thirteen Land Commission Awards (LCAw.) were claimed in Koali, but only seven were actually awarded [ . . . ] All of the kuleana claims in Koali Ahupuaʻa were awarded in 1852, and lands were originally obtained by the claimants between at least 1819 and 1843. *ʻIli* names mentioned in Koali are Haleolono, Manini, Papakea, Wailena, and Wailuā. An examination of Native Registers and Native Testimonies for the awarded claims indicates that five out of the seven awardees claimed agricultural use for at least a portion of the award. Land use is not specified for two of the claims (LCAw. 5043 to Kenoi and 5072 to Kapu), and one claim (LCAw. 5176C to Liilii) makes only a vague mention of patches. *Loʻi* (irrigated terraces) are explicitly mentioned in two of the claims (LCAw. 5043-B:3 to Manu and 6776:1 to Kaaikaikalepo and Kanahele), the former of which is located within the current project area and contained three *loʻi kalo* (taro patches) and general *kalo* land and the latter containing eight *loʻi*: two for the *konohiki* and six for an individual named Paewahine. *Pōʻalima*, or *loʻi* traditionally worked only on the fifth day (Friday) for the chief, are mentioned in three of the claims (LCAw. 5043-B:3 to Manu, 5176B:2 to Kaleo, and 6775:2 to Kekuli (Kuli). Kekuli's *kuleana* claim lists the location of a *pā hale* (house lot) in *ʻāpana* 1 and an unspecified amount of *loʻi kalo* within *ʻāpana* 2 which is situated within the current project area. The Foreign Testimony for his claim further clarifies the presence of a *pōʻalima*, although it does not state which *ʻāpana* it was present in [ . . . ] Kaleo's claim (LCAw. 5176B:2) also indicates the presence of a *pōʻalima* and relates it is for Eliphalet Whittlesey (referred to in the documentation as the *konohiki*). (Tam Sing 2019:8) (brackets added)

## Additional Observations

One salient piece of information about all of these kuleana awards—from both Wailua and Koali—is that their supporting documents (i.e., Native Registers and Native Testimonies) always mention the names of other Hawaiians with adjoining parcels who do not otherwise appear in the records of awarded parcels. Therefore, the number and density of LCAs illustrated in Figure 10 is without a doubt an underestimate of the true number of Hawaiians living a subsistence lifestyle in and near the APE/project area in the middle nineteenth century.

Also, the Māhele records only refer to the awards documented in and around the APE/project area as either Koali or Wailua and not Kawaipapa (contra the ahupuaʻa configuration currently endorsed by the Maui Nui Ahupuaʻa Project, the SHPD GIS program and OHA (see Figure 9 above).

Coulter's (1931) demographic reconstruction of Hawaiian settlement areas and population centers circa 1853—that is, at the time of the Māhele (Figure 11)—the project area as part of a dispersed (rather than dense) series of moderate-sized settlements (villages) stretching from Hāna Bay down to Kīpahulu.

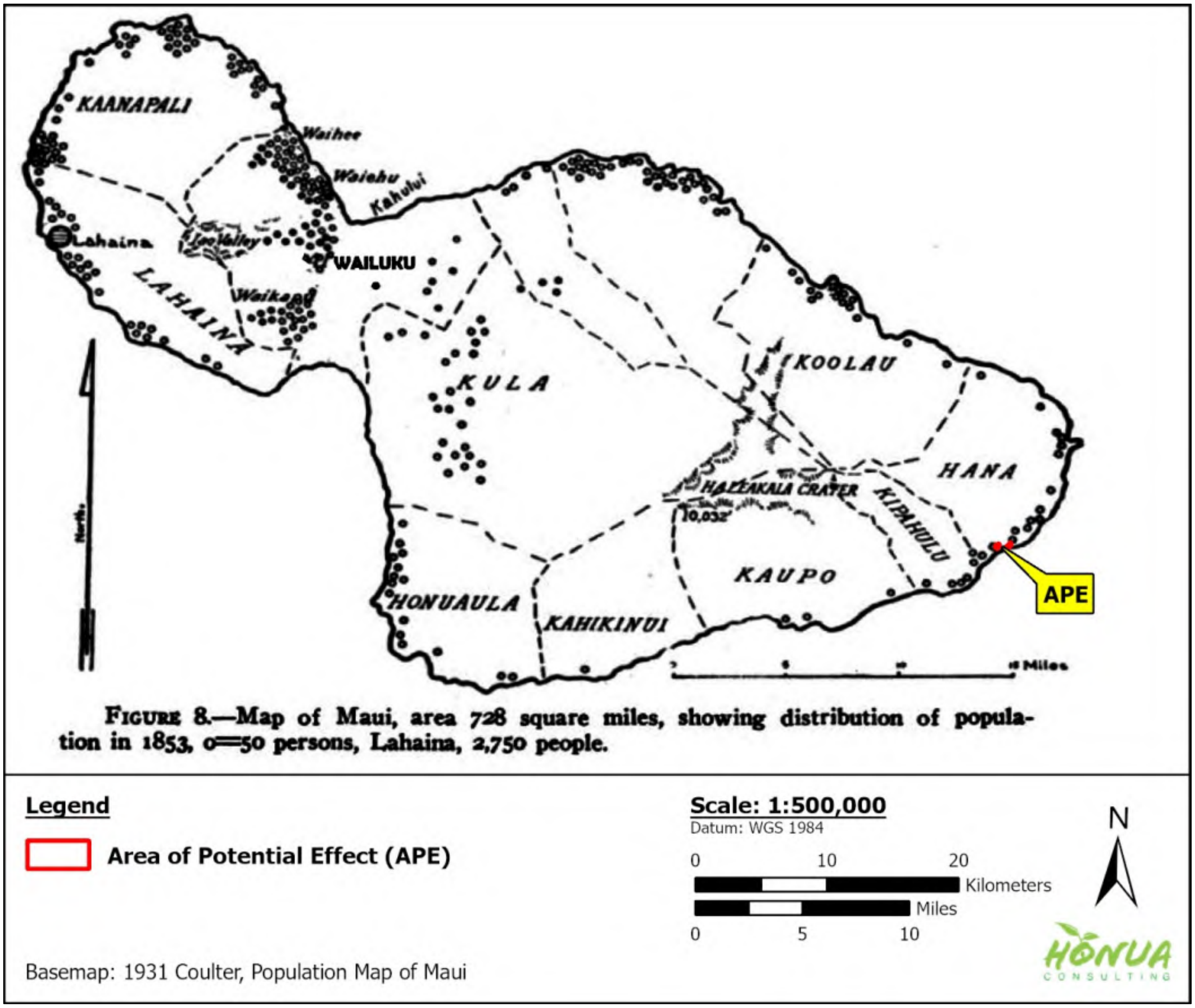


Figure 11. Main population centers on Maui circa 1853 according to demographer Coulter (1931:22); each circle represents 50 people; approximate location of current project area indicated by star symbol

### 3.2.3 Late Nineteenth Century and Early Twentieth Century

Yucha et al.'s (2018) research on the northern portions of the Hāna Belt Road, extending from the Huelo area down to Nāhiku, discusses the commercial development of East Maui in the last few decades of the nineteenth century. The economic drivers at this time, as in other parts of Maui and the Hawaiian Islands, were prospects for profiting from large-scale, commercial agriculture—primarily sugar cane but also rubber and coffee. This commercial expansion in the Hawaiian Kingdom took place in the context of various "world systems" economic factors, such as the decline of the whaling industry (1860s) due to the discovery of crude oil in Pennsylvania, the American Civil War (1860s) that cut off the northern U.S. from southern U.S. sugar and the Treaty of Reciprocity (1876), a free trade agreement between the U.S. and Hawaiian Kingdom that encouraged the growth of commercial sugar in the islands. Linked to the growth of commercial sugar was the need for industrial-scale irrigation capabilities (i.e., water storage, transport and distribution infrastructure), processing facilities (e.g., sugar mills) and transport (railways, dependable roads, functioning ports, etc.). Yucha et al. (ibid.:85-86) discuss early efforts in East Maui that paved the way for late nineteenth century development:

> With the ratification of the treaty of reciprocity with the United States in 1876, the future success of sugar in the Hawaiian Islands seemed assured. At that time, several small plantations in the districts east of Wailuku and Kahului and north of Makawao developed new plans to expand the growing of sugar. The Haiku Plantation, managed by Samuel T. Alexander, as well as the Paia Plantation of Henry P. Baldwin, and the Grove Ranch Plantation of T. H. Hobron all suffered from frequent drought. In 1867, S. T. Alexander proposed a massive construction project to bring mountain water from the streams of East Maui west to their plantations along the slopes of Haleakalā (Kuykendall 1967:64).
>
> The stockholders of the Haiku Plantation agreed to back the project. On 30 September 1876, the government of Hawaiʻi gave permission to the plantations of Maui to take water from the principal six streams of the region and convey the water by ditch to their fields, for an annual rental of $100. The grant for the water was to last for 20 years, with the stipulation that the ditch construction be completed within the next two years (Kuykendall 1967:64). The system by which mountain water was brought from East Maui to the Haiku Plantation fields in Haʻikū and further west onto the isthmus of Maui was the breakthrough that the sugar industry needed to flourish (Wilcox 1996:127).
>
> The "Hamakua Ditch Company" was organized on November 2, 1876, and specifically allotted the shares and costs and the divisions of water to the various plantations [ . . . ]
>
> When construction got under way, Sam Alexander and Henry Baldwin began to find out what a monumental job they had tackled. Torrential rains and landslides plagued the project. Workers had to hack their way through jungle and descend sheer cliffs by rope [ . . . ]

Yucha et al. (ibid.:87-88) cite newspaper articles from *The Hawaiian Star* in 1897 and 1898 describing the Hāna region as one of the last remote frontiers in the islands. This newspaper, which went through many changes in ownership and titles from its origins in 1870 (initially called the *Daily Marine Bulletin*) to its transformation to the *Honolulu Star-Bulletin* in 1912, was decidedly pro-U.S. annexation and supported the 1893 overthrow of the Hawaiian Kingdom by the U.S.[4] Hence, these comments reflected the prevailing interest in viewing Hawaiian places in terms of their economic potential above all else. "Hāna and the undeveloped slopes of East Maui described as one of the last natural environments remaining in the State [ . . . ]":

> The district of Hana is one of the least known to the general public of any districts on the Islands. Beyond the fact that there are three sugar plantations, viz: Hana, Reciprocity and Kipahulu, the average citizen of Honolulu knows very little about it. It is one of the districts that, like Kona and Puna, will one of these days awake out of sleep.
>
> The prospects of the Hana district are good. The sugar plantations lie on the belt of the undulating land at the extreme east of the Island. To the northwest of Hana Plantation there is an extent of country stretching for twelve or fourteen miles, which, at one time, supported a large population, but which at present time has only a scattered villages here and there.
>
> The energy to develop these lands must come from without, it can never come from within. Again, it is not only energy and capital that are required, but roads. The roads of the portion of the Hana district have hardly been touched since the days of Dr. Judd, who, so far as memory serves, had the present so-called road constructed. (*The Hawaiian Star* 1897:4)

And,

> The land sale which took place at Paia on Saturday afternoon, December 17th, was indeed a phenomenal one. There were three lots for sale, and each of them sold for a little over five times the appraised price.
>
> The lands in question are situated in Nahiku among the Palis of East Maui. A couple years ago it would have been hard to give the land away and no one wanted it, unless the chances of permanent government and therefore capital were assured. So the land lay a waste of guava scrub, ferns, ohia, kukui, lauhala and so forth. The thundering waterfalls crashed over the cliffs and the streams roared over their rocky beds to the ocean, with no tribute to the soil in the shape of irrigation. For miles there would be no habitation.
>
> Now all this is being changed. The district, one of the most fertile on the Islands, awakes out of its lethargy. The valleys which have only heard the roar of the cataract and the rush of the stream will wake to the sound of the steam whistle and the ax, and man will enter upon his kingdom. Cultivation and civilization will reign, but the wild beauty of the Koolau district will be gone. Again this is progress under annexation. (*The Hawaiian Star* 1898)

Regarding the current APE/project area, throughout this time, it remained beyond the outer limits of major development of any commercial kind other than road-side stands to supply travelers and early tourists to the region.

[4] See U.S. Library of Congress' *Chronicling America* website page at https://www.loc.gov/item/sn82015415/.

### 3.2.4 History of Hāna Belt Road and Bridges

Duensing (2001, 2005), MKE and Fung (2013), Yucha et al. (2018) and Blanchard et al. (2024) have provided historical summaries of the history of the development of the Hāna Belt Road, which includes 48 miles of roadway, and dozens of bridges, beginning at 0.2 miles west of Mile Marker 3 on State Route 360 (Hāna Highway) in the north down to Kālepa Gulch on County Route 31 (Pi‘ilani Highway) between Kīpahulu and Kaupō. Relevant information from these reports—as it pertains to understanding previously identified historic properties and their component features in and near the current APE/project area—is presented in Section 4.2 (below). Here, we include historical background on the twentieth century origins and construction of this road and bridge system, which was collectively listed on the National Register of Historic Places (NRHP) in 2001 (NR Reference Number 1000615, State Inventory of Historic Places [SIHP] # 50-50-vr-01638).[5]

Pre-Contact and early historic-period development of trails along and near portions of what came to be known as the Hāna Belt Road is covered in previous sections of the subject report (see Section 3.1.2 Traditional Trails to Hāna and Section 3.2.1 Early Historical Period).

MKE and Fung (2013:2-13) begin their discussion of the development of the historic Hāna Belt Road in the context of the development of commercial sugar cane in East Maui and the Hāna region, highlighting the importance of Hāna Bay as a shipping port, as early as the middle nineteenth century, a direct result of the purchase of large tracts of land by foreign speculators and developers during the Māhele. As early as 1849, a haole (white person) sea captain, George Wilfong, tried his hand at a small sugar cane plantation in Ka‘uiki in Hāna District. This and other interest in commercial ventures in East Maui stimulated the desire for a proper road through the region. These authors explain:

> All of the sugar was shipped from Hana Bay, and despite the booming business, there was still no substantial overland trading between the north and south parts of Maui. Prior to this enterprise Kipahulu and its adjoining districts of Hana and Kaupo had retained their traditional Hawaiian culture.
>
> In 1877 fifteen miles of unpaved road was constructed from central Maui to Kailua in order to build the Haiku Ditch, a remarkable engineering feat that watered new cane land on the central Maui plateau. In 1899 the Nahiku Rubber Company planted thousands of experimental rubber trees on the makai (toward the ocean) side of the old road. This enterprise pushed the unpaved road another fifteen miles to Nahiku. East Maui's potential tourism value gave the county a strong incentive to promote the idea of a belt highway to Hana. As early as 1900 the Maui News editorialized in favor of a good wagon road connecting Hana and central Maui. This prompted the building of the first stretch of improved roadway, which followed the old road from Keanae to Nahiku, in 1900. The ancient footpath was widened to sixteen feet, to accommodate horse-drawn wagons, and was surfaced with cinders. Because of the extreme difficulty of the terrain, however, its cost was prohibitive and the roads were inadequate for frequent

---

[5] The State Inventory of Historic Places (SIHP) numbering system includes a two-digit quadrangle designation; for historic properties that extend into multiple quadrangles, this value is typically entered as “vr”) denoting various quadrangles; thus, when referring to entire highway system as a whole, the SIHP # is 50-50-vr-01638.

> automobile traffic. The 1905 SPW report stated that "very rough country is encountered in these districts. On account of the great expenses of road construction, the road has been made as narrow as possible in order to construct, with the money available, the maximum length of road." (ibid.:2-13, 2-14)

From the early 1900s into the 1920s, different portions of the Hāna Belt Road and some of its bridges were planned and completed but owing to disagreements about costs, feasibility and need among the Territorial and County governments, as well as private interests, by no means was the entire system constructed in one integrated effort. MKE and Fung (2013:2-14) explain:

> Between 1905 and 1908 concrete bridges were built in the ditch country near Nahiku. Bridge building on Maui surged in 1911, when the Territorial Legislature established a Loan Fund Commission to oversee a special fund for belt roads. Out of the $1,270,000 appropriated by the Commission in 1911, Maui received $370,000. This made possible the building of twenty-one Maui bridges: four on the Hana Belt Road, four on the Piilani Highway south of Hana, six in the upcountry district, six in Central Maui and one in West Maui. Work on the belt road continued depending on the extent of funding. A narrow road with several bridges was built from Kailua to Keanae by 1912 with territorial funds. From Hana, contractors Wilson and McCandless had completed the Nahiku-Keanae section of road by 1915. This road did not link up with the Kailua extension, but instead dead-ended in the Koolau Forest Reserve. The lack of a continuous paved road prompted one Maui legislator to complain that "Maui is the only island on which you cannot traverse by road around it."
>
> In 1914, inspired by the dramatic expansion of the sugar industry at Hana, the County of Maui Board of Supervisors unanimously agreed to press the Territorial Legislature for funding to improve the rest of the old road at least as far as Kipahulu and entertained ambitions to eventually circle the entire island. The road to Hana became part of a grander vision, called the Belt Road. Unfortunately, Territorial Governor Lucius Pinkham was adamantly opposed to the project, and consequently it took until 1923 before belt road planning was resurrected and modifications to the ancient route were given serious consideration.
>
> Until this time, the journey to Hana was made partly over unpaved wagon roads and horse trails, often rendered impassable by damage from frequent rains. An alternative route through the island's south side took the traveler through the drier ranch country ending at Kipahulu. Since both land routes were arduous and slow, the most common means of travel to Hana was by steamer ship.

It is worth highlighting that the two bridges involved in the current proposed undertaking, South Wailua and Waikakoi, were both constructed during this early period of bridge building, even before the highway in the APE/project area was even paved or improved very much.

Yucha et al. (2018) explain the highway conception and development as follows:

> The Hāna Highway was first built with the intent to circumscribe East Maui with a levelled road surface in 1900, complete with gulch spanning bridges. The initial roadwork of the early twentieth century was piecemeal and incremental at best, sometimes making use of horse and foot trails connecting otherwise isolated

sections of road (Duensing 2005). Dawn E. Duensing in Hāna Belt Road HAER HI-75 (2005:29) describes the difficulty of working on the early road as follows:

> The work required in the Hana District was quite extensive due to the heavy rainstorms and freshets. At times flooding during the winter rainy season made it impossible to travel on the Hana Road…mail carriers were unable to complete their rounds, so the SPW [Superintendent of Public Works] ordered foot bridges built over deep gulches. Travelers were stuck with difficult overland travel on horseback or by steamers, which used what one resident called the "most impractical landings." (Duensing 2005:29)

A modest amount of Territorial funding to complete a paved road all the way to Hāna was appropriated in 1923, although it was widely understood to be inadequate to the logistically difficult task of dealing with extreme terrain and weather, periodic landslides and other hazards, and so on, encountered during previous efforts to build road sections in the northern parts of East Maui (i.e., areas of Ha‘ikū, Ke‘anae, Pā‘ia), which were not as challenging as the southern parts down to Hāna and beyond (e.g., Kīpahulu). Nonetheless, by the late 1920s, and in part due to the use of prison labor from a camp at Ke‘anae, Hāna was eventually reached by at least a cinder-paved road (ibid.:15).

Work to complete the Hāna Belt Road as a reliable, formally paved roadway continued in the 1930s with help from the Hana Coast Civilian Conservation Corps, one of President Franklin D. Roosevelt's depression-era job programs. By 1940, the roadway was substantially complete.

Still more improvements and work on the final (and current) version of the Hāna Belt Road took place in the 1960s, when the State legislature mandated that the Hawai‘i Department of Transportation (HDOT) assume responsibility for taking care of the roadway (ibid.:16):

> An unheard-of $2.2 million was allocated for widening, paving and restoring the highway from beginning to end. When the job was finished in 1964, the "highway" was at last negotiable by even the heaviest vehicles, at least in good weather. Since 1985, a well-planned maintenance program has preserved the road as one of Hawaii's most scenic and treasured drives. Residents have resisted a major upgrading of the roadway since improvements would "result in a tidal wave of visitors and would destroy the fragile balance between being fed by tourism and being consumed by it." (quoting Lueras and Youngblood 1983)

## 3.3 Selected Additional Historical Maps and Aerial Images

Figure 12, an 1885 Hawaiian Kingdom map by F.S. Dodge, depicts the APE/project area between (northeast and southwest of) two areas bordered in red, which depict commercial agricultural areas (i.e., sugar cane): Hāna Bay to the northeast and Kīpahulu to the southwest. The Hawaiʻi Statewide GIS Program maintains an on-line database of the extent of historic-period commercial sugar cane operations. [6] Reference to these data show in 1920 the area just northeast of Waikakoi Bridge, centered on the next two main stream systems (Alaalaula and Papahawahawa gulches) and Mūʻolea, was part of a commercial sugar cane plantation.

This 1885 map also shows the current alignment of the Hāna Belt Road had not been established at this time. The ala nui (main traditional coast or near-coastal trail) appears to have passed just inland (upslope) of the Waikakoi Bridge APE/project and makai (downslope) of the South Wailua Bridge APE/project area at this time.

Figure 13, a 1923 topographic map, shows the current alignment of the Hāna Belt Road was finalized by this time. There do not appear to be any house symbols in or near the South Wailua Bridge, which is clearly surrounded by steeper terrain compared with the Waikakoi Bridge, around and near which are numerous house-lot symbols. Upcountry at this time, a cross-slope "government pipeline" can be seen with an intake on the upper reaches of Wailua Stream.

Figure 14, a 1951 aerial photograph, appears to show much cleared land upslope of the two bridges. Some of this clearing to the northeast is likely associated with Hana Ranch and commercial pineapple agriculture, which was founded in the 1940s.

Figure 15, a 1957 topographic map, shows a "Historical Mon[ument]" and "Grave" downslope from the South Wailua Bridge. Honua staff attempted to hike down to investigate these features but the trail was treacherous and impassable. We are uncertain what these labels specifically refer to.

Figure 16, a 1965 aerial photograph, shows similar landscape clearing to the 1951 image (above).

[6] See https//:geoportal.hawaii.gov/datasets/HiStateGIS::historical-sugarcane-lands-1920/explore?location=20.680013%2C-156.035948%2C13.05


Figure 12. Portion of 1885 Hawaiian Kingdom map showing project area location (base map source: University of Hawai‘i-Mānoa’s digital maps, http://magis.manoa.hawaii.edu/maps/index.html)


Figure 13. Portion of 1923 topographic showing the project area (base map source: University of Hawai‘i-Mānoa’s digital maps, http://magis.manoa.hawaii.edu/ maps/index.html)

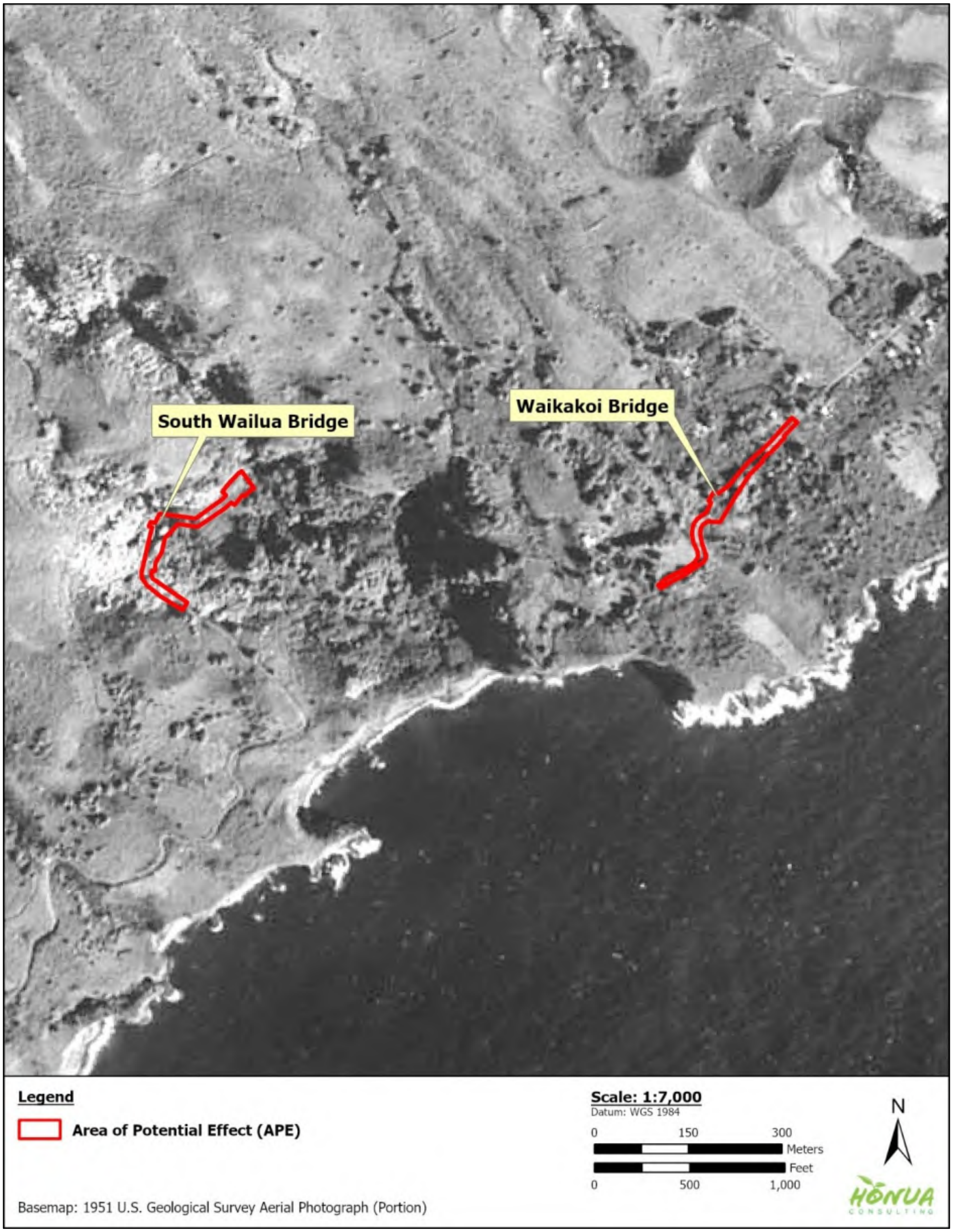


Figure 14. Portion of 1951 USGS aerial photograph showing project area (base image source: University of Hawai‘i-Mānoa’s digital maps, http://magis.manoa.hawaii.edu/maps/index.html)


Figure 15. Portion of 1957 topographic map showing the project area (base map source: University of Hawai'i-Mānoa's digital maps, http://magis.manoa.hawaii.edu/maps/index.html)

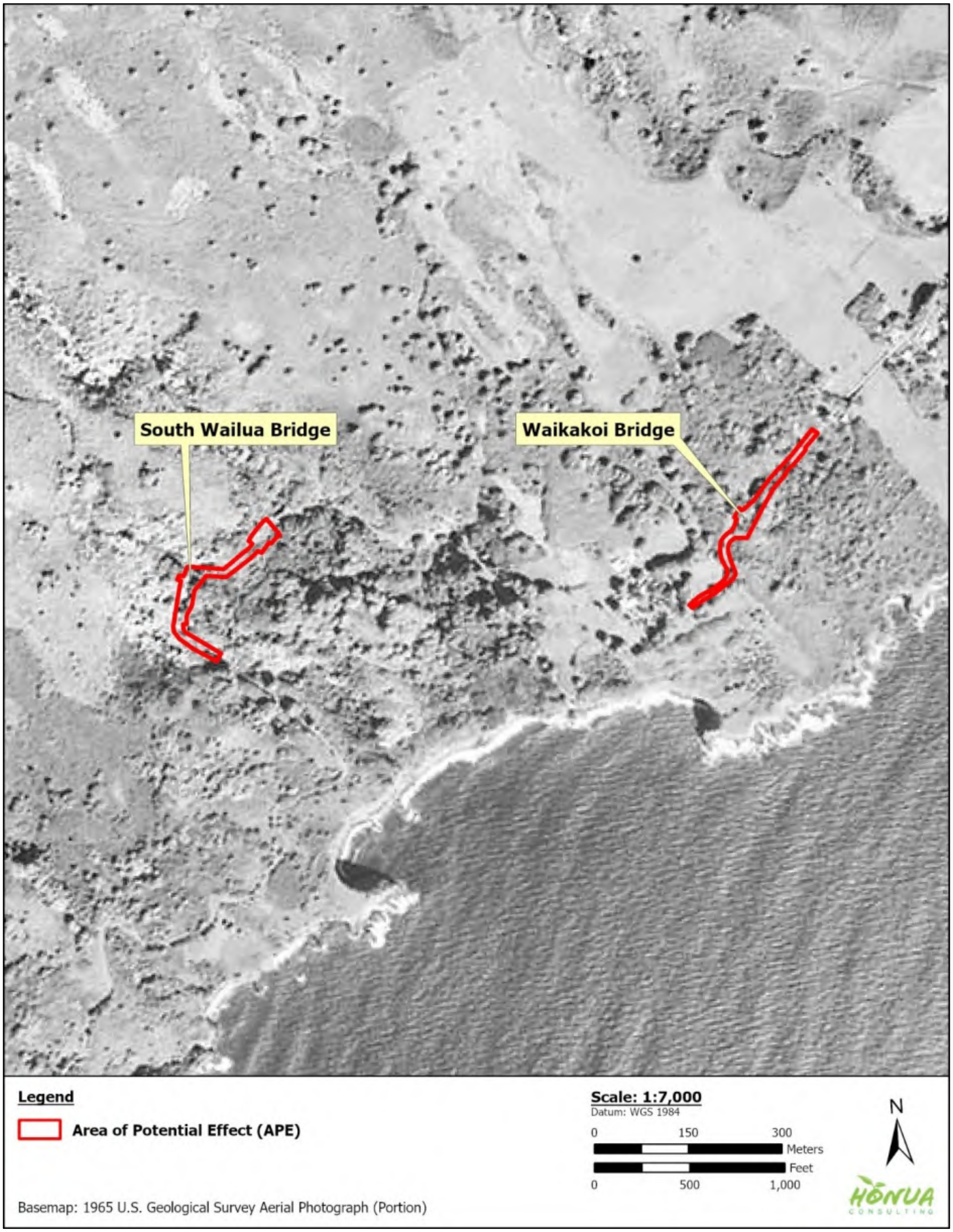


Figure 16. Portion of 1965 USGS aerial photograph showing project area (base image source: University of Hawai‘i-Mānoa’s digital maps, http://magis.manoa.hawaii.edu/maps/index.html)

# Section 4 Previous Historic Preservation Studies

In this section, we summarize previous archaeological and architectural studies to understand human use and modification of the land in and near the project area.[7] The main purpose of this section is to develop predictive data about the types and distribution of historic properties we expected to encounter; and to assist interpretation of any new findings.

Table 3, Figure 17 and Figure 18 summarize and depict the location and results of previous archaeological and architectural studies and results in and near the project area.

## 4.1 Previous Archaeological Studies

Prior to the advent of modern, professional archaeological research on Maui, several early studies that included compilations and surveys of heiau (traditional Hawaiian temples) and other prominent structures such as fishponds and settlement/cultivation areas were completed (e.g., Stokes 1916; Walker 1931; Thrum 1938). Starting in the 1970s, with the advent of Federal and State historic preservation laws, updated island-wide survey and compilation projects (i.e., Emory and Hommon 1972; Sterling 1998) were also completed. These studies, which focused on above-ground sites, identified one site, a heiau (traditional Hawaiian temple) known as Hale o Kāne (designated SIHP # 50-50-17-00129), within 0.5 miles of current project area. Walker (1931) described this site as "Haleokane Heiau. On a high bluff above Alaalaula Gulch at the mouth on the west. A heiau of the platform type walled at the back only … 40 x 55 feet…" This name, a reference to the "house" of one of the Hawaiian's principal gods of procreation, life and fertility, Kāne, is a fairly common heiau name in the archipelago.[8]

Other than these early studies, modern archaeological survey, assessment and mitigation work (O'Claray-Nu et al. 2016; Conte 2017; Tam Sing 2018, 2019, 2020), have been conducted adjacent to Waikakoi Bridge but no closer than approximately 500 ft. (152.4 m) from the South Wailua Bridge (see Figure 17). These previous archaeological studies are summarized below.

### 4.1.1 O'Claray-Nu et al. 2016

Archaeological Services Hawai'i (ASH) conducted an archaeological inventory survey (AIS) makai of Hāna Highway, just south of Waikakoi Bridge.[9] Three historic properties were identified, designated State Inventory of Historic Places (SIHP) #s 50-50-17-08013, 50-50-17-08014 and 50-50-17-08015. SIHP # 08013 is described as a historic-period cemetery that consists of a rectangular rock-wall enclosure with two mounds interpreted as "presumed burials." SIHP # 08014 is an extensive site complex with 12 component features of traditional Hawaiian habitation and agricultural features (including dry-stacked terraces, platforms and mounds) interpreted as dating from pre-Contact to early-historic times. SIHP # 08015 refers to five historic-period homestead features—two rock-wall planters, two rock mounds and an outhouse/trash dump—in the same area as SIHP # 08014.

[7] Historical architectural studies of the Hāna Belt Road and its bridges, although not strictly archaeological, are summarized here because this information is directly relevant to the subject AIS.
[8] For example, another Hale o Kāne, is at the famous Kaloko, Hawai'i Island, associated with Kamehameha I.
[9] Honua reached out to both the SHPD and Archaeological Services Hawai'i for a copy of this report, but, to date, the report has not been located or transmitted; efforts to obtain this report are ongoing.

### 4.1.2 Conte 2017

CRM Solutions (Conte 2017) conducted an AIS of 124.8 acres of private land (“Hana Koali Mesa Property”) at TMK (2) 1-5-008:006 (por.) and 013 mauka of Hāna Highway between ʻAlaʻalaʻula Gulch and Wailua Stream. A makai portion of this project area abuts the west end of the Waikakoi APE. Fifty-one sites (SIHP #s 50-50-17-07429 through 07480) comprised of 275 component features, including several extensive complexes, were identified. Most of the sites consist of traditional Hawaiian settlement and cultivation sites interpreted as dating from pre-Contact to early historic times with some exhibiting remodeling and use in the historic period.

### 4.1.3 Tam Sing 2018, 2019

Archaeo.Hawaiʻi completed an archaeological data recovery plan (Tam Sing 2018) and report (Tam Sing 2019) for site-features identified by Conte (2017). Data recovery focused on SIHP #s 50-50-17-07456, Feature G, and 50-50-17-07457, Feature H, because these sites were going to be impacted by proposed ground disturbance in the project area. The fundamental objectives of data recovery at these two site-features, as outlined in Tam Sing (2018), were chronological (i.e., focused on determining whether distinctions could be made in subsurface excavation as to the specific timing of construction and use of these sites [e.g., pre-Contact, early post-Contact, later historic period, etc.]). A 5.0-long trench was excavated at each of the two sites.

SIHP # 07456, Feature G is described as follows (Tam Sing 2019:18):

> Site 50-50-17-7456 was originally recorded by Conte (2017:153), who described it as a “large post-contact period agricultural complex with 15 terraces” situated on an undissected slope [ . . . ] In poor to fair condition, Site 7456 measures 106 meters in length by 40 meters in width overall, with heights ranging between 0.3 to 1.9 meters. Conte (2017) did not offer further descriptions of the 15 contiguous terraces (Features A-O) comprising Site 50-50-17-7456. Feature G a loi terrace specifically, measures 15 meters in length northeast to southwest by 11 meters in width northwest to southeast. The front face of the terrace is 6-8 courses high with a max height of 92cm. The rear portion of the terrace abuts the front face of 7456 Fe. H, and is 6-8 courses high with a max height of 80cm.

SIHP # 07457, Feature H is described as follows (Tam Sing 2019:24):

> Site 50-50-17-7457 was originally recorded by Conte (2017:154), who described it as “a pre- and post-contact period agricultural complex with 14 terraces, four enclosures, four mounds and an alignment” situated on an undissected slope (Figure 25). In poor to fair condition, Site 50-50-17-7457 and its 23 component features (Features A through W) measure 100 meters in length by 50 meters in width overall, with heights ranging between .1 to 1.5 meters. Feature H specifically, measures 25 meters in length east to west by 12 meters in width north to south. The front face of the terrace is composed of a soil embankment with small-large cobbles and small boulders it ranges from 33cm-40cm in height. There are also four very large mango trees which are set in a row along the front face of the terrace. The rear portion of the terrace abuts the front face of 7457 Fe. K, and is comprised of a soil embankment with small-large cobbles and small boulders being 1 course in height, with a max height of 40cm. There are also 5 large mango trees set along the front face of 7457 Fe. K.

Results of data recovery excavations were inconclusive as no cultural materials, subsurface features, datable charcoal or other materials were obtained.

### 4.1.4 Tam Sing 2020

Archaeo.Hawai‘i completed an archaeological preservation plan for SIHP #s 50-50-17-07456, Features A-F and H-O, 50-50-17-07457, Features A-G and I-W, 50-50-17-07459, 50-50-17-07460, 50-50-17-07463, 50-50-17-07465, and 50-50-17-07471.

## 4.2 Historical Architectural Studies

Previous studies of the Hāna Belt Road and its bridges are relevant to the subject AIS report.

### 4.2.1 Duensing 2001

On behalf of the Maui County Cultural Resources Commission, historian Dawn Duensing prepared a National Register of Historic Places (NRHP) nomination form (see Appendix C) that identified the entire Hāna Belt Road from “near Mile Marker 3 . . . near Huelo” to “the south end of Koukou‘ai Bridge near Kīpahulu” (Duensing 2001:6) as a historic district.[10] The district, designated (NR Reference Number 1000615, SIHP # 50-50-vr-01638), was formally listed in 2001. This historic property consists of 73 contributing resources, including its roadway, bridges and culverts. The two bridges in the current project area (South Wailua and Waikakoi) are included as contributing resources.

The Hāna Belt Road was determined to be historically significant under criterion A, recognizing its association “with events that have made a significant contribution to the broad patterns of our history”; and criterion C because it embodies distinctive engineering materials and methods reflective of its period of significance, which is circa 1900 to 1947.

### 4.2.2 MKE & Fung 2013; Blanchard et al. 2024

On behalf of the State of Hawai‘i Department of Transportation, Highways Division, MKE Associates & Funk Associates completed the *Hawaii State Historic Bridge Inventory and Evaluation,* including 707 historic bridges in the Hawaiian Islands (MKE and Fung 2013); a recent update of this inventory and evaluation was completed by WSP USA (Blanchard et al. 2024). The update included the original 707 bridges as well as another 196 historic bridges.

The update did not change the evaluations of the three historic bridges in the APE/project area.

Table 4 summarizes MKE and Fung’s (2013) findings and evaluations about South Wailua and Waikakoi Bridges, both of which were constructed in 1911, and Wailua Bridge, built in 1947. All three of these bridges have been evaluated as having a “high preservation value.”

To the best of our knowledge, neither of the three bridges have been assigned an SIHP number other than as component features of the Hāna Belt Road (SIHP # 01638).

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[10] There are numerous alternative names for the Hāna Belt Road including Belt Road, Hāna Road, Hāna Highway, Pi‘ilani Highway, as well as State Route 360 and County Route 31; all of these alternatives are listed in Duensing (2001).

Table 3. Previous Historic Preservation Studies and Results in and near Project Area

| Reference | Type of Study | Location | Results & Comments |
|---|---|---|---|
| Stokes 1916<br>Walker 1931<br>Thrum 1938<br>Sterling 1998 | Earliest surveys / compilations of heiau (temples), other sites and wahi pana (legendary places) | Maui Island-wide | These studies focused on above-ground sites and identified one historic property within 0.5 miles of the current project area: SIHP # 50-50-17-00129, a heiau named Hale o Kāne (Walker 1931) |
| Duensing 2001 | NRHP Nomination Form | Entire Hāna Belt Road | Formal nomination report for the Hāna Belt Road (SIHP # 50-50-vr-01638)* |
| MKE & Fung 2013 | State Historic Bridge Inventory and Evaluation | All islands including Maui | Evaluation of 707 historic bridges in Hawaiian Islands, including the South Wailua, Waikakoi and Wailua bridges |
| O'Claray-Nu et al. 2016 | AIS | Makai of Hāna Belt Road just south of Waikakoi Bridge | Identified 3 sites: SIHP # 08013, a historic-period rectangular rock-wall enclosure w. 2 mounds interpreted as "presumed burials"; SIHP # 08014, an extensive site complex w. 12 component features of traditional Hawaiian habitation and agricultural features interpreted as pre-Contact to early-historic age; SIHP # 08015 is 5 historic-period homestead features—in same area as SIHP # 08014. |
| Conte 2017 | AIS | Hana Koali Mesa Property TMK [2] 1-5-008:006 por. & 013 | Identified 51 sites (SIHP #s 50-50-17-07429 through 07480) comprised of 275 component features, including several extensive complexes; mostly traditional Hawaiian settlement and cultivation sites dating from pre-Contact to early historic times w. some exhibiting remodeling and use in the historic period |
| Tam Sing 2018 | DRP | | Plan for archaeological data recovery at SIHP #s 50-50-17-07456, Feature G; and 50-50-17-07457, Feature H |
| Tam Sing 2019 | DRR | | Report on archaeological data recovery of SIHP #s 50-50-17-07456, Feature G; and 50-50-17-07457, Feature H |
| Tam Sing 2020 | PP | | Archaeological preservation plan for SIHP #s 50-50-17-07456, Features A-F and H-O, 50-50-17-07457, Features A-G and I-W, 50-50-17-07459, 50-50-17-07460, 50-50-17-07463, 50-50-17-07465, and 50-50-17-07471 |
| Blanchard et al. 2024 | Update to State Historic Bridge Inventory and Evaluation | All islands including Maui | Update on evaluation of 707 historic bridges in Hawaiian Islands and evaluation of another 196 historic bridges |

* The State Inventory of Historic Places (SIHP) numbering system includes a two-digit quadrangle designation; for historic properties that extend into multiple quadrangles, this value is typically entered as "vr") denoting various quadrangles. In the case of the subject AIS, which is in the Kipahulu quadrangle, designated number 17, the section of documented Hāna Belt Road can be designated SIHP # 50-50-17-01638.

Abbreviations: AIS = archaeological inventory survey, DRP = archaeological data recovery plan, DRR = archaeological data recovery report, NRHP = National Register of Historic Places, PP = archaeological preservation plan, SIHP = State Inventory of Historic Places

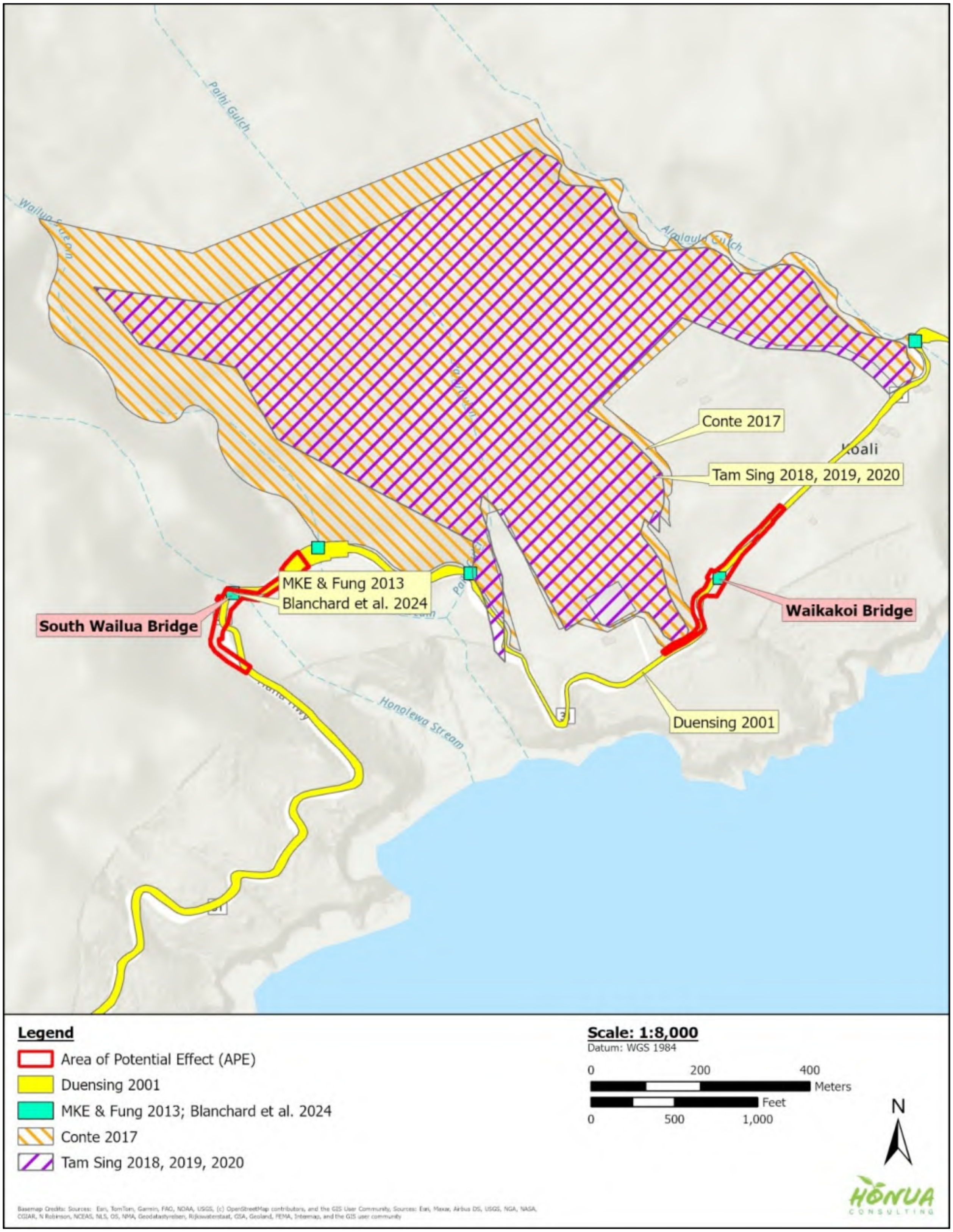


Figure 17. Previous archaeological and other historic preservation studies in and near the project area (see table and text above for details)

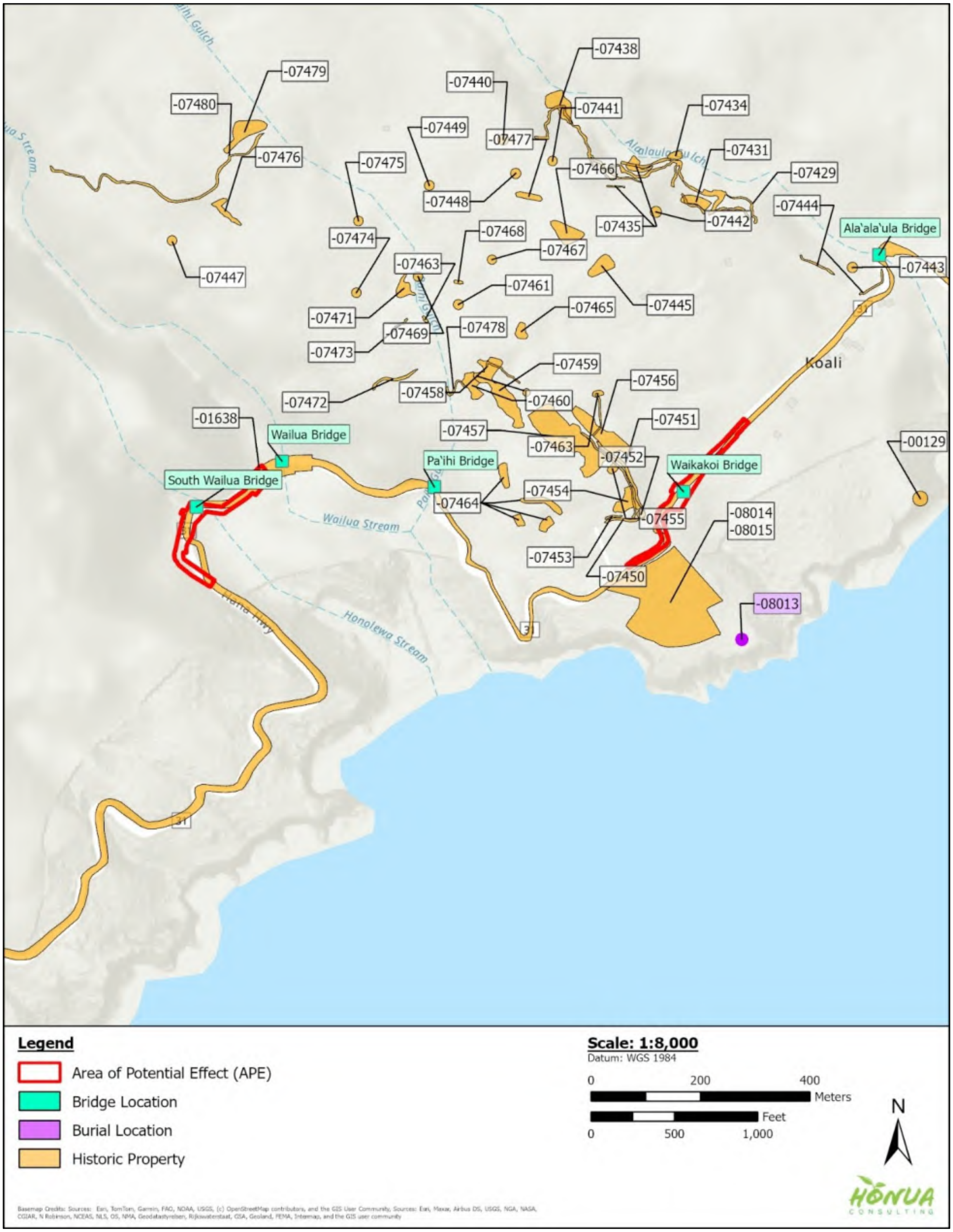


Figure 18. Documented historic properties in and near the project area (see table and text above for details)

Table 4. Summary of MKE and Fung's (2013) Findings and Evaluation of APE/Project Area Bridges

| Bridge | Bridge Name (#) | Stream Crossed | Feature Carried | Constr. Date | Bridge Type | Parapet/Railing Type | Listed on NRHP? | Eligibility Status[1] | Character Defining Feature (Significance) |
|---|---|---|---|---|---|---|---|---|---|
| 009003600904464 | South Wailua (No. 23) | Honolewa Stream | Hāna Hwy. | 1911 | Concrete Tee Beam | Concrete Solid with Cap | Yes | High Preservation Value | Contributes to Hāna Highway Historic Bridge District<br>Part of best remaining intact example of a belt road system in the state<br>20th century example of bridge engineering and construction<br>Significant for commerce and social history |
| 009003600904542 | Waikakoi (No. 26) | Waikakoi Stream | Hāna Hwy. | 1911 | Concrete Tee Beam | Concrete Solid with Cap | Yes | High Preservation Value | Contributes to Hāna Highway Historic Bridge District<br>Part of best remaining intact example of a belt road system in the state<br>20th century example of bridge engineering and construction<br>Significant for commerce and social history |
| 009003600904475 | Wailua (No. 24) | Wailua Stream | Hāna Hwy. | 1947 | Concrete Tee Beam | Concrete Open Horizontal | Yes | High Preservation Value | Contributes to Hana Highway Historic Bridge District<br>Part of best remaining intact example of a belt road system in the state<br>20th century example of bridge engineering and construction<br>Significant for commerce and social history<br>Post-War Public Works Project |

Abbreviations: Hwy. = Highway, NRHP = National Register of Historic Places.

[1] High Preservation Value: Has unique or exemplary characteristics of a bridge type and exhibits high degrees of historic integrity.

# Section 5 Results

This section begins with an overview of the results, then describes and documents the findings at each of the two bridge APE/project areas. Table 5, Figure 19 and Figure 20 summarize and depict the location of identified site-features in the APE.

## 5.1 Overview

Survey of the South Wailua Bridge APE identified (see Figure 19):

1. The bridge, itself, designated #009003600904464 in the *Hawaii State Historic Bridge Inventory and Evaluation* (MKE and Fung 2013) and three associated wing-wall features (Features 1-3) likely built at the same time as the bridge (1911);
2. A portion of Hāna Belt Road (SIHP # 50-50-17-01638) and three associated features (Features 1-3), only one of which (a retaining wall along the makai road shoulder) appears to date from its original construction (the other two are later additions);
3. A pair of informally constructed terraces (initially designated temporary field number Honua 1, Features 1 and 2) on the makai side of the parking area south of the bridge; these appear to be component features of a traditional Hawaiian cultivation (gardening) site dating from the pre-Contact to early historic-period;
4. Partially within the northern end of the limits of the APE, in an area that will not be impacted by project-related construction activities,[11] Wailua Bridge (#009003600904475 in the *Hawaii State Historic Bridge Inventory and Evaluation* [MKE and Fung 2013]) and associated features dating from as early as 1947.

Survey of the Waikakoi Bridge APE identified (see Figure 20):

1. The bridge, itself, designated #009003600904542 in MKE and Fung (2013) and seven associated features (Features 1-7), some of which were likely built at the same time as the bridge (1911) and others later (i.e., 1950s-1960s);
2. A portion of the Hāna Belt Road (SIHP # 01638) and three associated features: a retaining wall along the makai road shoulder south of the bridge (Feature 1), another retaining wall on the makai shoulder north of the bridge (Feature 2) and a small concrete drainage feature (Feature 3) built on top of Feature 2; Features 1 and 2 date from the original roadway construction; Feature 3 may be younger in age; Features 2 and 3 are in an area that will not be impacted by project-related construction activities (see footnote below);
3. A dry-stacked rock wall associated with the adjacent private land (TMK [2] 1-5-009:011, which is also a portion of LCA 5176-C to Liilii) along the mauka (inland or upslope) side of the road south of the bridge; this site, initially designated temporary field number Honua 2, was clearly constructed by the neighboring private landowner and is not associated the Hāna Belt Road.

No other site-features of historic (i.e., more than 50 years old) age were identified in the two bridge APE.

[11] This part of the APE will be used for temporary traffic control warning signage only with no project-related ground disturbance.

Table 5. Summary of Identified Site-Features in the APE/Project Areas

| Site Designation[1] | APE/project area | Other Resource #[1,2] | Formal Type | Feature/s | Functional Interpretation | Temporal Interpretation |
|---|---|---|---|---|---|---|
| S. Wailua Bridge Features | S. Wailua Bridge | 009003600904464 (Bridge No. 23) | Component features of bridge | 3 Wing Walls (Features 1, 2 & 3) | Structural to bridge | 1911 |
| Hāna Belt Road Features at S. Wailua Bridge | S. Wailua Bridge | SIHP # 01638 (Hāna Belt Road) | Component features of Hāna Belt Road | Fea. 1 = Retaining wall for highway | Structural to highway | Early 20th century |
| | | | | Fea. 2 = Wall along highway shoulder | Upslope soil retention | Middle 20th century |
| | | | | Fea. 3 = Discontinuous boulder alignment along highway shoulder | Road safety | Middle 20th century |
| SIHP Site | S. Wailua Bridge | Honua 1 | Dry-stacked terraces (n=2) | 2 dry-stacked terraces (Feas.1 & 2) | Cultivation (traditional) | Pre-Contact to early historic period |
| Wailua Bridge Features | S. Wailua Bridge | 009003600904475 (Bridge No. 24) | Component features of bridge | 4 buttresses (Features 1-4)<br>4 bollards/posts/guardrails (Feas. 1-4) | Structural to bridge<br>Road/bridge safety | 1947 |
| Waikakoi Bridge Features | Waikakoi Bridge | 009003600904542 (Bridge No. 26) | Component features of bridge | 4 buttresses (Features 1, 2, 3 & 4) | Structural to bridge | 1911 |
| | | | | 2 mortared rock guardrail anchors (Feas. 5 & 6) | Road/bridge safety | Early to middle 20th century |
| | | | | 1 water diversion feature (Fea. 7) | Water distribution | Early to middle 20th century |
| Hāna Belt Road Features at Waikakoi Bridge | Waikakoi Bridge | SIHP # 01638 (Hāna Belt Road) | Component features of Hāna Belt Road | Fea. 1 = Retaining wall for highway<br>Fea. 2 = Retaining wall for highway<br>Fea. 3 = Drainage for highway | Structural to highway | Early 20th century |
| SIHP Site | Waikakoi Bridge | Honua 2 | Dry-stacked retaining wall | Long dry-stacked retaining wall w. level soil area upslope | Cultivation (traditional) | Pre-Contact to early historic period |

[1] Complete, formal State Inventory of Historic Places (SIHP) # is preceded by "50-50-17-."
[2] Bridge reference #s from MKE and Fung (2013)

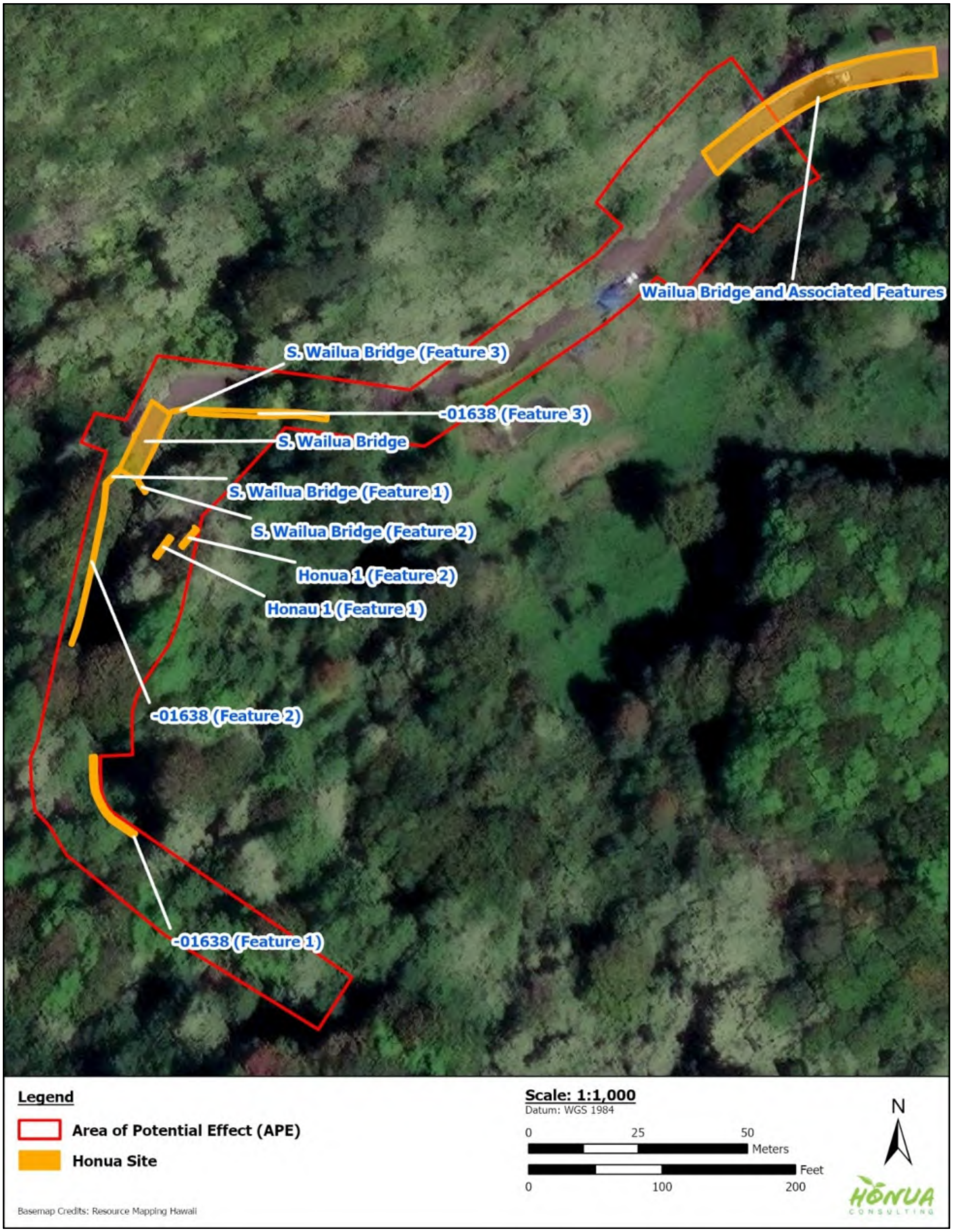


Figure 19. Site-features identified by Honua in the South Wailua Bridge APE

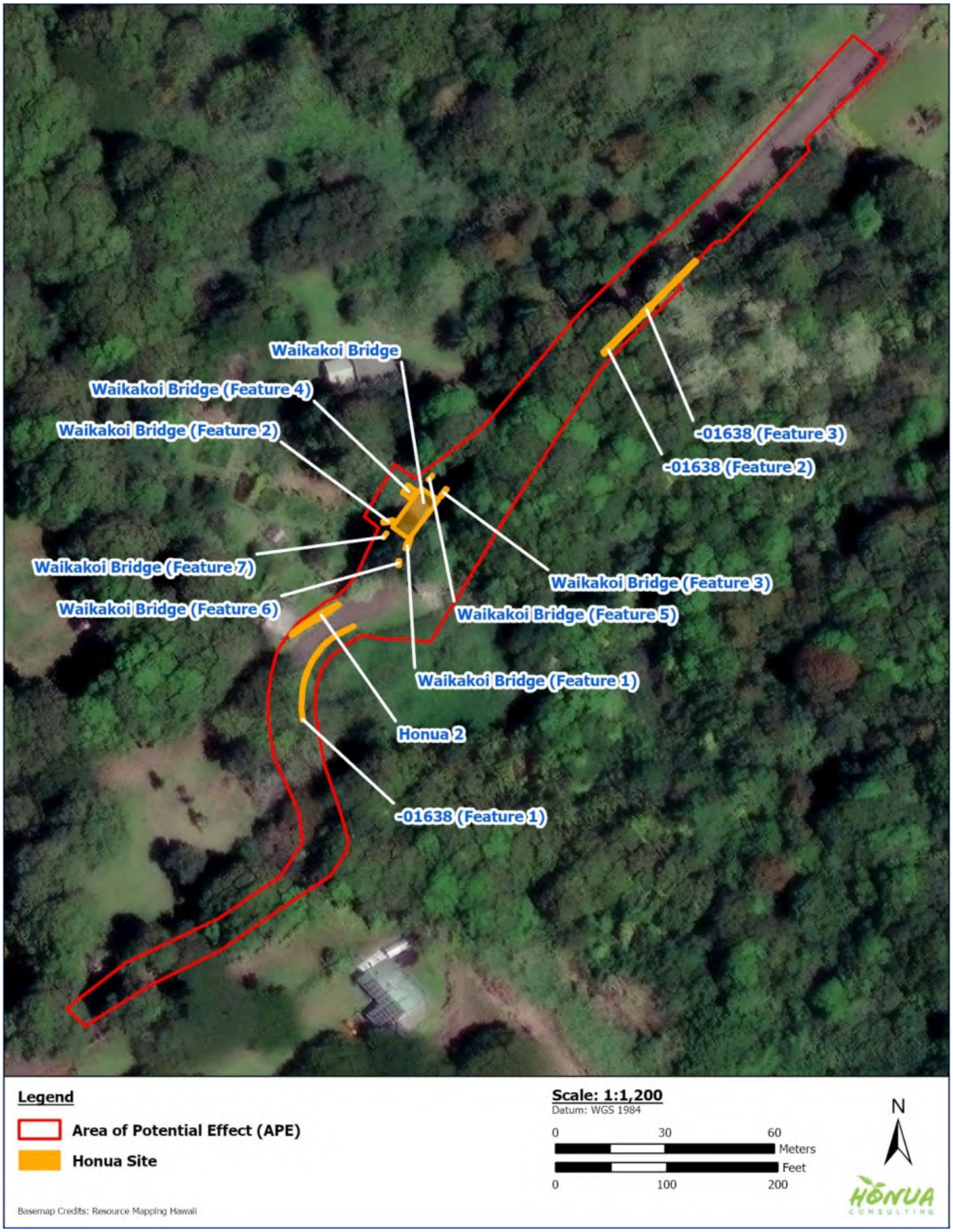


Figure 20. Site-features identified by Honua in the Waikakoi Bridge APE

## 5.2 South Wailua Bridge Features

| | |
|---|---|
| **FORMAL SITE TYPE:** | Wing walls attached to bridge |
| **NO. OF FEATURES:** | 3 |
| **DIMENSIONS:** | Variable (see below) |
| **MATERIAL:** | Mortared basalt |
| **CONDITION ABOVE GROUND:** | Variable (see below) |
| **FUNCTIONAL INTER.:** | Structural support for bridge |
| **AGE INTERPRETATION:** | Circa 1911 |

South Wailua Bridge (designated No. 23, Hāna Belt Road, State Historic Bridge Inventory # 009003600904464), built in 1911 across Honolewa Stream, is a concrete tee-beam bridge with a solid concrete cap. It has been assessed as having “high preservation value” for its contribution to the Hāna Highway Historic Bridge District as part of the best remaining intact example of a belt road system in the state (see last column in Table 4 for details on its historical significance). Honua identified three associated bridge features designated Features 1-3; all of these features are mortared basalt “wing walls” dating from the original time of construction of the bridge, extending from the ends of the main bridge structure, as described below.

South Wailua Bridge, Feature 1 is on the mauka side of the south end of the bridge at the top of a very steep slope into the stream drainage (Figure 21 to Figure 25). The mortared basalt wall has a top layer of mortar with a high pebble/gravel context. The function of the wing wall, as with the others at this bridge, is stabilization/reinforcement of the bridge-parapet ends. An approximately 1.0-m long section near the middle of the wall was damaged at some point in the past; a repair job was made consisting of a large basalt slab laid between the original mortared sections. The south end is built off a large boulder outcrop. The north end abuts the mauka (south end) bridge parapet. The wing wall is oriented roughly southwest to northeast. Maximum dimensions of this feature are 4.5 m (length) by 2.0 m (height on downslope side); maximum height on the upslope (road) side is 40-50 cm above the ground surface (cmas); width varies from 65-75 cm. Constituent materials are subangular to angular basalt cobbles and small boulders stacked 3-4 courses high (downslope side) to 1-2 courses high (upslope side). Other than the old, repaired section, the physical condition of this feature is good to fair.

South Wailua Bridge, Feature 2 is on the makai side of the south end of the bridge at the top of a very steep slope into the stream drainage (Figure 26 to Figure 28). The mortared basalt wall has a top layer of mortar with a high pebble/gravel content. The function of the wing wall is the same as Feature 1 (above). The north end abuts the makai (south end) bridge parapet. The wing wall is oriented roughly northwest to southeast. Maximum dimensions of this feature are 3.0 m (length) by 1.5 m (height on downslope side, which tapers down to 60 cm at the south end); maximum height on the upslope (road) side is 30-40 cmas; width varies from 60-70 cm. Constituent materials are primarily subangular to angular basalt cobbles and small boulders stacked 4-5 courses high (downslope side) to 2-3 courses high (upslope side). The physical condition of this feature is good.

South Wailua Bridge, Feature 3 is on the makai side of the north end of the bridge at the top of a very steep slope into the stream drainage (Figure 29 and Figure 30). The mortared basalt wall has a top layer of mortar with a high pebble/gravel content. The function of the wing wall is the same as Feature 1 (above). The north end abuts the makai (south end) bridge parapet. The wing wall is oriented roughly northwest to southeast. Maximum dimensions are 3.7 m (length) by 1.6 m (height on downslope side, which tapers down to 70 cm at the north end); maximum height on the upslope (road) side is 30-40 cmas; width varies from 60-70 cm. Constituent materials are subangular to angular basalt cobbles and small boulders stacked 4-5 courses high (downslope side) to 2-3 courses high (upslope side). The physical condition of this feature is poor with major structural fractures and breaks in the wall.

Figure 21. Overview of Feature 1, South Wailua Bridge; facing west

Figure 22. View of north end of Feature 1, South Wailua Bridge; facing east

Figure 23. Detail of mauka (upslope) side of north end of Feature 1, South Wailua Bridge' view southwest

Figure 24. Oblique view of Feature 1, South Wailua Bridge; facing north

Figure 25. Detail of basalt slab repair near middle of Feature 1, South Wailua Bridge; view west-northwest


Figure 26. Overview of Feature 2, South Wailua Bridge; view northeast

Figure 27. View of north side of Feature 2, South Wailua Bridge; view south

Figure 28. Overview of Feature 3, South Wailua Bridge; view southeast

Figure 29. Wider shot overview of Feature 3, South Wailua Bridge; view southeast

Figure 30. Detail of makai (downslope) side of Feature 3, South Wailua Bridge; view west-northwest

## 5.3 Hāna Belt Road Features at South Wailua Bridge

| | |
|---|---|
| **FORMAL SITE TYPE:** | Retaining walls & alignment along roadway |
| **NO. OF FEATURES:** | 3 |
| **DIMENSIONS:** | Variable (see below) |
| **MATERIAL:** | Dry-stacked & aligned basalt boulders |
| **CONDITION ABOVE GROUND:** | Variable (see below) |
| **FUNCTIONAL INTER.:** | Structural to roadway (Fea. 1), soil retention (Fea. 2) & road safety (Fea. 3) |
| **AGE INTERPRETATION:** | Early (Fea. 1) to middle (Feas. 2 & 3) 20th century |

Honua identified three retaining wall features along the shoulders of the Hāna Belt Road: two (Features 1 and 2) on the south side of the bridge, and one (Feature 3) on the north side. Only one of these (Feature 1) appears to date from the original road construction; the other two appear to be more recent, probably from the terminal historic period (i.e., not much older than 50 years ago). These features are described below.

Hāna Highway at South Wailua Bridge, Feature 1 is a formally constructed, dry-stacked retaining wall along the makai shoulder of the roadway (Figure 31 to Figure 35). This feature provides structural support for the roadbed. The natural terrain at this feature slopes down moderately to the east. The middle section of this feature is largely intact and well preserved; the south end and northern third are mostly collapsed.

Maximum dimensions of this feature are 22.0 m (length) by 1.75-1.4 m (maximum height on downslope side); the upper surface of this feature grades into the slope to the north at its north end (which is near the south edge of the parking area for the waterfall). On its upslope side, the feature is flush with the road surface; width varies from 40-50 cm. Constituent materials are primarily subangular to angular basalt cobbles and small boulders formally stacked up to 3-4 courses high in the northern section and up to 5-6 courses high in the middle. The middle section is formally faced and close to plumb. The feature follows the makai edge of the roadway in a north to south orientation. This feature exhibits a high degree of quality workmanship and care.

Hāna Highway at South Wailua Bridge, Feature 2 is an informally constructed, dry-stacked and -aligned low retaining wall along the mauka road shoulder south of the bridge (Figure 36 to Figure 40). The wall functions to formalize the road shoulder and retain soil upslope (on the west side) of the road. The feature is oriented parallel to the road and terminates at its north end at a large boulder outcrop (which separates this feature from Feature 1 of the South Wailua Bridge).

Maximum dimensions of this feature are 35.0 m (length) by 60-70 cm (maximum height of north end) to 20-30 cm (maximum height of south end); the upper surface of the feature grades into the slope at its south end; width varies from 40-50 cm. Constituent materials are primarily subangular to angular basalt cobbles and small boulders informally stacked up to 1-2 courses high. The southern third of the feature is discontinuous with a lower maximum height that transitions into an alignment. In some places, the feature consists entirely of large boulders in an alignment. The physical condition of this feature varies from fair to good. There is a memorial for a local man who passed away in 2019 near the north end of the feature (see Figure 40). There is also a small area of concrete on top of the rock work at the north end of the feature with some barely legible engraving (in the concrete) that reads “Wailua” and a date of either “89” (as in

1989) or “69” (as in 1969) (see Figure 39). This feature post-dates the original construction of the road at this location; and is consistent with a date at or around 1969.

Hāna Highway at South Wailua Bridge, Feature 3 is a discontinuous large boulder alignment along the makai (downslope) road shoulder north of the bridge, at the top of a very steep slope down to the east (Figure 41 and Figure 42). The alignment is clearly more recent than the original road or bridge construction; it probably dates from the terminal historic period. Some of the boulders exhibit damage from mechanical earth-moving equipment. The constituent material is large angular to subangular boulders. The feature is approximately 30.0 m long and oriented roughly east to west. The physical condition of this feature is good.

Figure 31. Overview of Feature 1, Hāna Belt Road south of South Wailua Bridge; view north

Figure 32. Overview of Feature 1, Hāna Belt Road south of South Wailua Bridge; view south

Figure 33. Overview of intact, middle portion of Feature 1, Hāna Belt Road south of South Wailua Bridge; view northwest

Figure 34. Another view of intact middle portion (center and right) of Feature 1, Hāna Belt Road south of South Wailua Bridge with collapsed south end (left); view northwest

Figure 35. Detail of best-preserved middle section of Feature 1, Hāna Belt Road south of South Wailua Bridge; facing west-northwest

Figure 36. Overview of Feature 2, Hāna Belt Road south of South Wailua Bridge; facing northwest

Figure 37. Overview of Feature 2, Hāna Belt Road south of South Wailua Bridge; facing south-southwest

Figure 38. Detail of intact portion of Feature 2, Hāna Belt Road south of South Wailua Bridge; facing west

Figure 39. Detail of incised concrete atop Feature 2, Hāna Belt Road south of South Wailua Bridge; circled portion reads “Wailua” and either “69” or “89” (see test for explanation)

Figure 40. Modern shrine on top of Feature 2, Hāna Belt Road south of South Wailua Bridge; facing northwest (see test for explanation)

Figure 41. Overview of Feature 3, Hāna Belt Road north of South Wailua Bridge; facing east

Figure 42. Overview of Feature 3, Hāna Belt Road north of South Wailua Bridge; facing west

## 5.4 Honua 1– Pair of Dry-stacked Terraces

| | |
|---|---|
| **FORMAL SITE TYPE:** | Dry-stacked terraces |
| **NO. OF FEATURES:** | 2 |
| **DIMENSIONS:** | 14 m (NW/SE) by 22 m (NE/SW) |
| **MATERIAL:** | Dry-stacked and piled basalt clasts |
| **CONDITION ABOVE GROUND:** | Fair to poor |
| **FUNCTIONAL INTER.:** | Traditional agriculture |
| **AGE INTERPRETATION:** | Pre-Contact to early historic period |

A pair of dry-stacked rock and soil terraces initially designated temporary field number Honua 1 is just downslope (makai) of the parking area for the waterfalls (Figure 43). These two terraces, which are defined as component features of SIHP Site, are interpreted as a traditional Hawaiian cultivation (gardening) site. The site occupies a total area of approximately 14 m (NW/SE) by 22 m (NE/SW).

Parts of the site have been severely damaged by large tree fall and growth on top of both features. Vegetation at the site includes multiple Polynesian-introduced varieties including kī (ti leaf, *Cordyline fruticosa*), ʻulu (breadfruit tree, *Artocarpus altilis*) and kukui (candlenut tree, *Aleutites moluccana*).[12] Mature mango trees (*Mangifera indica*) are also present at this site. All of these varieties are actively being choked out by invasive climbing vines.

Feature 1 is a dry-stacked rock terrace that retains a level soil area on its upslope (west) side (Figure 44 to Figure 47); the southern half has been severely impacted by sediment and debris pushed over the side of the adjacent parking lot. Tree fall and invasive (vines) vegetation have also negatively impacted the southern half of this feature. The most intact, well-preserved portion is its northern half. The constituent stacked and piled basalt rocks, which are mainly angular to subangular cobbles and small boulders with a few blocks and slabs, have a maximum length (N/S) of 11.8 m by a maximum width (E/W) of 3.3 m. There is a major collapsed area near the center of the feature. Maximum height of the rock work varies from 50 cmas (southern end) to 70 cmas (northern end). The northern half is stacked 1-2 courses high with some cobble fill on top. The rock work creates a level soil area measuring 4.5 m (N/S) by 4.5 m (E/W); the length (N/S) of this level soil area was probably twice as long before it was covered with overburden from the parking lot. Large mango and ʻulu trees are growing on top of this feature.

Feature 2 is another dry-stacked rock terrace that retains a level soil area on its upslope (west) side (Figure 48 to Figure 51); it is located several meters downslope from Feature 1, which is in somewhat better physical condition. The southern portion of Feature 2 has been severely impacted by tree falls and heavy vegetation cover. The most intact, well-preserved portion of the feature is its currently defined southern half, which is truncated to the south by a large fallen tree. The constituent stacked and piled basalt rocks, which are mainly angular to subangular cobbles and small boulders with a few blocks and slabs, have a maximum length (N/S) of 9.3 m by a maximum width (E/W) of 1.6 m. Most of the northern two-thirds of the rock work is mostly collapsed. Maximum height of the rock work varies from 70 cmas (southern end) to 40 cmas (northern end). The southern end exhibits stacking of 1-2 courses high with some cobble fill on

[12] Contemporary Hawaiians and cultural practitioners often refer to Polynesian-introduced plants as “canoe plants,” since they were transported to the islands in voyaging canoes in antiquity.

top. The rock work creates a level soil area measuring about 4.5 m (N/S) by 20.0 m (E/W); the northern end of the feature is constrained by a natural bedrock outcrop up to 65 cm high.

This site pre-dates the bulldozing associated with the construction of the parking area along the road shoulder upslope. It seems likely that this site, which exhibits traditional Hawaiian methods and materials, dates from pre-Contact times. As such, it is probably the remnants of a traditional, rain-fed (i.e., non-irrigated) cultivation (gardening) site. It has unfortunately been severely impacted and partially destroyed by early to middle-twentieth century development of the road and parking area.

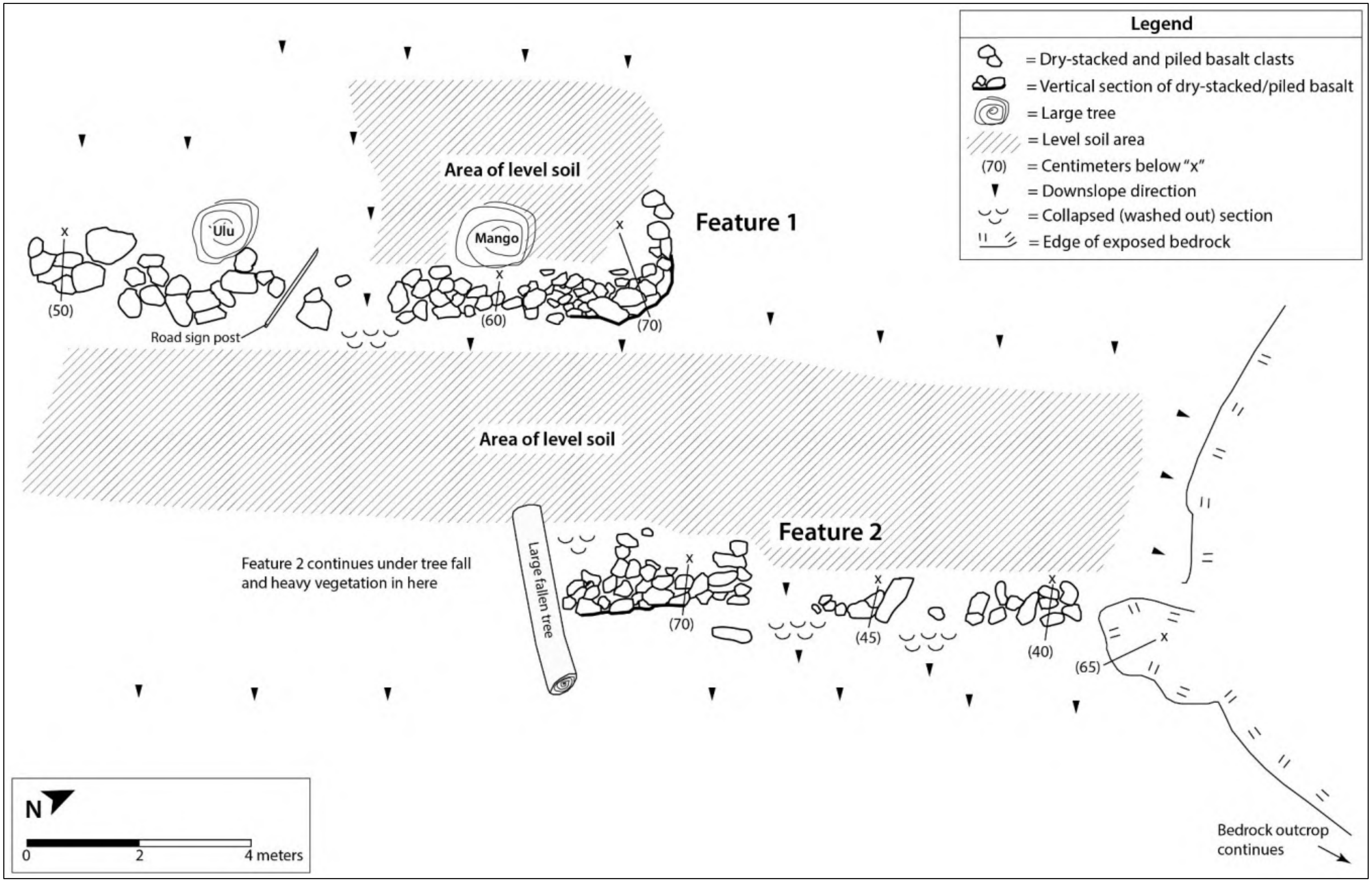


Figure 43. Plan view of Site (see text for discussion)

Figure 44. Northern end of Feature 1; view west

Figure 45. Another view of northern end of Feature 1; facing southwest

Figure 46. Overview of middle section of Feature 1; facing west

Figure 47. Southern end of Feature 1; view west-northwest

Figure 48. Best-preserved portion of Feature 2, its currently documented southern end; view west

Figure 49. Another view of best-preserved southern end of Feature 2

Figure 50. Overview of southern end of Feature 2 (foreground), northern end of Feature 1 (background) and tree fall across the rest of the Feature 2 (left); facing west

Figure 51. Detail of northern end of Feature 2, where it abuts bedrock outcrop; view west

## 5.5 Wailua Bridge Features

| | |
|---|---|
| **FORMAL SITE TYPE:** | Bridge buttresses & bollards/posts/guardrails |
| **NO. OF FEATURES:** | 8 |
| **DIMENSIONS:** | Variable (see below) |
| **MATERIAL:** | Concrete (buttresses), concrete/aggregate (bollards / posts) & non-ferrous metal (guardrails) |
| **CONDITION ABOVE GROUND:** | Good (buttresses) & poor (other features) |
| **FUNCTIONAL INTER.:** | Structural support for bridge (buttresses) & safety |
| **AGE INTERPRETATION:** | Circa 1947 |

The Wailua Bridge (No. 24, Hāna Belt Road, State Historic Bridge Inventory # 009003600904475), built in 1947 across Wailua Stream, is a concrete tee-beam bridge with a concrete open horizontal parapet/railing (MKE and Fung 2013). It has been assessed as having "high preservation value" for its contribution to the Hāna Highway Historic Bridge District as part of the best remaining intact example of a belt road system in the state and associations with the post-World War II period (see last column in Table 4 for more details on its historical significance).

Wailua Bridge and its associated features are partially within the northern end of the APE—a and partially outside of the APE to the northeast—in an area that will only be used for temporary traffic control warning signage but not for project-related ground disturbance. Eight features were identified:

- Features 1-4 are bridge buttresses at each of its corners where the bridge deck meets the upper slope of the drainage; in addition to providing structural support for the bridge, these buttresses also divert and deflect stream flow towards the main channel and downstream;
- Features 5-8 are sets of bollards/posts, some with intact guardrails (some without), at each of the four bridge corners along the road shoulder.

The proposed undertaking will have no effect on this bridge or its associated features, which are summarized below.

Wailua Bridge, Feature 1 is the southeast bridge abutment that is formed by two distinct sections (Figure 52 and Figure 53). The standing (level upper surface) portion of the wall measures 3.6 m long, 50 cm wide and 70 cm high. The maximum height on the stream side was 5.2 m. A sloping section of the wall, which dips down to the east, is the same width and measures 6.6 m long.

Wailua Bridge, Feature 2 is the southwest buttress formed by three distinct sections (Figure 54 and Figure 55). The first two sections are standing (level upper surface) portions; the third is a sloping section down to the west. The first section measures 1.1 m long, 50 cm wide and 1 m high. The second section measures 3.65 m long, 50 cm wide and 1.15 m high. It has a maximum height of 5.6 m on the stream side. The third section is the sloping portion of the wall, which measures 7.5 m long, 50 cm wide with a maximum height of 4.9 m.

Wailua Bridge, Feature 3 is the northeast buttress formed by three distinct sections (Figure 56 and Figure 57). The first two sections are standing (level upper surface) portions; the third is a sloping section down to the west. The first section measures 80 cm long, 45 cm wide and 85 cm high. The second section measures 2.6 m long, 45 cm wide and 95 cm high. It has a maximum height of 7.5 m on the stream side. The third section is the sloping portion of the wall, which measures 6.0 m long. Heavy vegetation growth obscures much of this feature.

Wailua Bridge, Feature 4 is the northwest buttress formed by two distinct sections (Figure 58 and Figure 59). The standing (level upper surface) portion of the wall measures 3.65 m long, 45 cm wide and 1.25 m high. The maximum height on the stream side was 6.6 m. A sloping section of the wall, which dips down to the east, is 6.0 m long, 45 cm wide with a maximum height of 5.9 m.

Figure 52. View of Feature 1, Wailua Bridge (southeast buttress); facing northeast

Figure 53. Another view of Feature 1, Wailua Bridge (southeast buttress); facing south-southwest

Figure 54. View of Feature 2, Wailua Bridge (southwest buttress); facing northeast

Figure 55. View across Wailua Stream to Feature 2 (southwest buttress); facing south

Figure 56. View of Feature 3, Wailua Bridge (northeast buttress); facing south

Figure 57. Detail of previous image

Figure 58. View of Feature 4, Wailua Bridge (northwest buttress); facing southwest

Figure 59. Detail of upper surface of top section of Feature 4; oblique view

Wailua Bridge, Feature 5 (Figure 60) is a set of five square, white-painted guardrail bollards/poles at the southeast corner of the bridge and its road shoulder. They are made of pre-cast with chipped-basalt aggregate. They measure 20 by 20 cm with a maximum height of 60 cm. The feature is 15.8 m long with approximately 5.0 m in between bollards/posts.

Wailua Bridge, Feature 6 (Figure 61) is a set of four square, white-painted guardrail bollards/poles at the southwest corner of the bridge and its road shoulder. They are made of pre-cast with chipped-basalt aggregate. They measure 20 by 20 cm with a maximum height of 80 cm. The feature is 17.0 m long with approximately 5.5 m in between bollards/posts.

Wailua Bridge, Feature 7 (Figure 62) is a set of three square, white-painted guardrail bollards/poles at the northeast corner of the bridge and its road shoulder. They are made of pre-cast with chipped-basalt aggregate. They measure 20 by 20 cm with a maximum height of 75 cm. The feature is 11.2 m long with approximately 5.5 m in between bollards/posts.

Wailua Bridge, Feature 8 (Figure 63) is a set of five square, white-painted guardrail bollards/poles at the northwest corner of the bridge and its road shoulder. They are made of pre-cast with chipped-basalt aggregate. They measure 20 by 20 cm with a maximum height of 75 cm. The feature is 11.75 m long with approximately 3.0 m in between bollards/posts

Figure 60. Feature 5, Wailua Bridge; facing north

Figure 61. Feature 6, Wailua Bridge; facing south

Figure 62. Feature 7, Wailua Bridge; facing southwest

Figure 63. Feature 8, Wailua Bridge; facing south

## 5.6 Waikakoi Bridge Features

| | |
|---|---|
| **FORMAL SITE TYPE:** | Bridge buttresses (Feas. 1-4), basalt guardrail anchors (Feas. 5 & 6), water diversion (Fea. 7) |
| **NO. OF FEATURES:** | 7 |
| **DIMENSIONS:** | Variable (see below) |
| **MATERIAL:** | Concrete, basalt, mortar (see below) |
| **CONDITION ABOVE GROUND:** | Variable (see below) |
| **FUNCTIONAL INTER.:** | Structural to bridge, road/bridge safety, water distribution |
| **AGE INTERPRETATION:** | 1911 to early/middle 20$^{th}$ century |

Waikakoi Bridge (designated No. 26 of the Hāna Belt Road, State Historic Bridge Inventory # 009003600904542), constructed in 1911 across Waikakoi Stream, is a concrete tee-beam bridge with a solid concrete cap (MKE and Fung 2013). It has been assessed as having "high preservation value" for its contribution to the Hāna Highway Historic Bridge District as part of the best remaining intact example of a belt road system in the state (see last column in Table 4 for more details on its historical significance).

Honua identified seven associated bridge features designated Features 1-7; these features are primarily bridge buttresses and structures associated with guardrails; some of these features date from the original time of bridge construction while others appear to be later (circa 1950s or 1960s) modifications, as described below.

<u>Waikakoi Bridge, Feature 1</u> is the southeast extension of a concrete, poured-in-place buttress at the south end of the bridge; the buttress is at the top of a very steep slope into the stream drainage (Figure 64 to Figure 66). This feature has a layer of boulders and soil on top of the main concrete structure. The south buttress, which dates to the original construction of the bridge, functions to stabilize/reinforce the bridge-parapet ends on the top of the drainage slope sides. The southeast buttress extension is 3.2 m long (NW/SE) and has a maximum height measured from the downslope (stream) side of 4.5 m; the top of the buttress is 1.15 m below the top of the main bridge "rail" and about 50 cm below the current top of the adjacent road/bridge surface.

A more recent addition to this feature, probably dating to the 1950s or 1960s, is a non-ferrous ("stainless") metal guardrail structure with several bollards/posts and the guardrail itself build atop part of Feature 1; the guardrail extends back to a mortared basalt feature (Feature 6, see below) that anchors the southeast end of the guardrail. The physical condition of Feature 1, including the guardrail, is good to fair.

<u>Waikakoi Bridge, Feature 2</u> is the southwest extension of a concrete, poured-in-place buttress at the south end of the bridge; the buttress is at the top of a very steep slope into the stream drainage (Figure 67 to Figure 69). The south buttress, which dates to the original construction of the bridge, functions to stabilize/reinforce the bridge-parapet ends on the top of the drainage slope sides. The southwest buttress extension is 2.2 m long (NE/SW) and has a maximum height measured from the downslope (stream) side of 3.25 m; the top of the buttress is 1.15 m below the top of the main bridge "rail" and about 50 cm below the current top of the adjacent road/bridge surface. The physical condition of this feature is good to fair. As described below, a short segment of mortared basalt wall with a (currently not in use section of) iron drainage pipe built into is on top of a portion of this southwest buttress.

Waikakoi Bridge, Feature 3 is the northeast extension of the buttress at the north end of the bridge (Figure 70 to Figure 72). The north buttress, which dates to the original construction of the bridge, functions to stabilize/reinforce the bridge-parapet ends on the top of the drainage slope sides. Unlike the south buttress (see Features 1 and 2 above), the north buttress is mostly constructed of large, dressed (i.e., shaped) basalt boulders and blocks with mortar atop a lowermost base layer of poured-in-place concrete. Feature 3 is structurally unsound and most of it has fallen into the stream. It is poor (i.e., failing) condition. Approximately 1.0 m (length) of intact, mortared boulders remain in place at the upper edge of the steep slope down to the stream. This feature is unsafe to measure or describe in further detail. A more recent addition to this feature, probably dating to the 1950s or 1960s, is a non-ferrous ("stainless") metal guardrail structure with several bollard/posts and the guardrail itself built from the northeast end of the bridge atop the feature to the northeast.

Waikakoi Bridge, Feature 4 is the northwest extension of the buttress at the north end of the bridge (Figure 73 to Figure 75). The north buttress, which dates to the original construction of the bridge, functions to stabilize/reinforce the bridge-parapet ends on the top of the drainage slope sides. Unlike the south buttress (see Features 1 and 2 above), the north buttress is mostly constructed of large, dressed (i.e., shaped) basalt boulders and blocks with mortar atop a lowermost base layer of poured-in-place concrete. The northwest buttress extension is 1.9 m long (NW/SE) and has a maximum height from the downslope (stream) side of 2.2 m; the top of the buttress is 1.2 m below the top of the main bridge "rail" and about 50 cm below the current top of the adjacent road/bridge surface. The physical condition of this feature is fair. A more recent addition to this feature, probably dating to the 1950s or 1960s, is a non-ferrous ("stainless") metal guardrail structure with several bollards/posts and the guardrail itself build atop part of Feature 4; the guardrail extends north to a mortared basalt feature (Feature 5, see below) that anchors the north end of the guardrail. The physical condition of Feature 4, including the guardrail, is good to fair.

Waikakoi Bridge, Feature 5 is a small mortared basalt structure measuring approximately 60 cm (length) by 60 cm (width) by 60 cm (height) that anchors the far north end of a guardrail connected to the northwest corner of the bridge (Figure 76 to Figure 79). This small feature, constructed of mortared angular basalt small boulders and a layer of mortar on top, likely dates from the 1950s or 1960s. It is in good physical condition.

Waikakoi Bridge, Feature 6 is a short section of mortared basalt wall anchoring the south end of a guardrail connected to the southeast corner of the bridge (Figure 80 to Figure 82). The section of rock wall measures about 1.4 m (length) by 90 cm (height) by 55 cm (width). Its constituent materials are mortared angular to subangular small boulders and cobbles with layer of mortar on top. The feature is in poor (i.e. failing) condition with major structural cracks. It is being destroyed by a large tree on its south side. This feature likely dates from the 1950s or 1960s.

Waikakoi Bridge, Feature 7 is a short section of non-functional (abandoned) mortared basalt encasing a now-abandoned ferrous-metal pipe (Figure 83 to Figure 85) built on top of the southwest buttress extension (Feature 2). Feature 7 is about 1.0 m (length) by 40 cm (width) by 60 cm (height). This feature seems to have been built by, and is related to, occupants of the adjacent parcel southwest of the south end of the bridge. The feature appears to have once been related to water siphoning or irrigation but is no longer functional. It is in fair physical condition.

Figure 64. View of Feature 1, Waikakoi Bridge showing southeast side; facing north-northeast

Figure 65. Overview of Feature 1, Waikakoi Bridge showing southeast side; view northwest

Figure 66. Detail of Feature 1, Waikakoi Bridge showing southeast side; view northwest

Figure 67. View of Feature 2, Waikakoi Bridge showing southwest side; facing east-northeast

Figure 68. Another view of Feature 2, Waikakoi Bridge showing southwest side; facing east

Figure 69. View of Feature 2, Waikakoi Bridge from north bank; facing south

Figure 70. View of Feature 3, Waikakoi Bridge showing northeast side; facing west-southwest

Figure 71. View of Feature 3, Waikakoi Bridge from south bank; facing northeast

Figure 72. Overview of Feature 3, Waikakoi Bridge showing northeast side; facing southwest

Figure 73. Overview of Feature 4, Waikakoi Bridge showing northwest corner; facing east

Figure 74. Another view of Feature 4, Waikakoi Bridge showing northwest corner; facing east

Figure 75. Overview of Feature 4, Waikakoi Bridge in wider context; facing southeast

Figure 76. Close view of Feature 5, Waikakoi Bridge; facing west


Figure 77. Feature 5, Waikakoi Bridge in wider context, showing guardrail; view west-southwest

Figure 78. Another view of Feature 5, Waikakoi Bridge; facing north-northeast

Figure 79. Overview of Feature 5, Waikakoi Bridge; facing north


Figure 80. Feature 6, Waikakoi Bridge; facing east

Figure 81. Another view of Feature 6, Waikakoi Bridge; facing west

Figure 82. Overview of Feature 6, Waikakoi Bridge built around and as an anchor to guardrail; view south

Figure 83. Overview of Feature 7, Waikakoi Bridge, built on top of Feature 2; view east-northeast

Figure 84. Oblique view of Feature 7, Waikakoi Bridge; facing northwest

Figure 85. Overview of Feature 7, Waikakoi Bridge, in context of neighboring property with abundant traditional Hawaiian site-features; view southwest

## 5.7 Hāna Belt Road Features at Waikakoi Bridge

| | |
|---|---|
| **FORMAL SITE TYPE:** | Retaining walls (Feas. 1 & 2) & drainage feature (Fea. 3) |
| **NO. OF FEATURES:** | 3 |
| **DIMENSIONS:** | Variable (see below) |
| **MATERIAL:** | Basalt, mortar, concrete (see below) |
| **CONDITION ABOVE GROUND:** | Good |
| **FUNCTIONAL INTER.:** | Structural to highway |
| **AGE INTERPRETATION:** | Early 20th century |

Honua identified three features along the makai road shoulder: Feature 1 is a long, curvilinear retaining wall supporting the Hāna Belt Road south of the bridge; Feature 2 is another long retaining wall supporting the Hāna Belt Road north of the bridge; Feature 3 is a small concrete drainage structure built on top of Feature 2 to drain the roadway of excess water. The retaining walls date from the original road construction; the concrete drainage feature may be a later addition.

Hāna Highway at Waikakoi Bridge, Feature 1 is a formally constructed, dry-stacked retaining wall along the makai shoulder of the roadway (Figure 86 to Figure 90). This feature provides structural support for the roadbed; it parallels the curvilinear roadway bend at this location. The natural terrain at this feature slopes moderately to steeply down to the east. Most of this feature is covered in extremely dense overgrowth.

Clearing portions of the retaining wall showed that it consists of at least two levels, or steps (see Figure 88 and Figure 90), and possibly a third (lowermost) level in dense vegetation that may be out of the APE/project area to the east (downslope). Vegetation at this feature consists of invasive California grass (*Urochloa mutica*) and vines as well as the historically introduced papaya (*Carica* sp.).[13]

The overall length of Feature 1 is approximately 30 m. The wall varies along its length in its main materials and methods; three sections—the south end, near the middle and the north end—are described below to illustrate this variation.

The south end consists of at least two levels with an overall height from the base of the first level to the top of the second of 1.55 m; the lower level measures 70 cm from its base to its top. Both the lower and upper levels consist of three courses of subangular to angular small boulders and large cobbles. All of the rock work in the upper level is mortared; only portions of the lower step are mortared.

The “near middle” section, which is just south of a prominent boulder on the road shoulder that seems to serve as a warning to drivers of the dangerous drop-off to the east, also consists of at least two levels with an overall height from the base of the first level to the top of the second of 1.85 m; the lower level measures 1.2 m from its base to its top. There may be a third (lowermost) level but it is covered in heavy vegetation and likely out of the project area/APE to the east. The lower level consists of five courses; the upper level is 2-3 courses. There is no

[13] We intentionally did not cut any papaya while clearing this feature since they are important fruit trees in the community.

mortar in either of the levels, except for a thin coat of mortar on the very top of the upper level. The lower level has near-vertical facing on its east side (i.e., it is built close to plumb).

The northern end consists of one level with a maximum height of 1.0 m; this level, which is 3-4 courses high, is mortared. The northernmost 5.7 m (linear length, parallel to the roadway) is a repair job that post-dates the rest of the feature. The repaired section has a near-vertical face that is nearly plumb (see Figure 87); the rest of this northern end section (i.e., the original construction) flares out somewhat to the east at its base. A possible second level at this location is covered with heavy vegetation.

<u>Hāna Highway at Waikakoi Bridge, Feature 2</u> is a formally constructed, dry-stacked retaining wall along the makai shoulder of the roadway (Figure 91 and Figure 92). This feature provides structural support for the roadbed; it parallels the curvilinear roadway bend at this location. The natural terrain at this feature slopes moderately to steeply down to the east. Most of this feature is covered in extremely dense overgrowth including invasive vines. Some banana (maiʻa) and ti leaf (kī) plants are located along its length; these were not cut or cleared since this feature is not going to be affected by the proposed project. The constituent materials of this retaining wall are mortared angular and subangular basalt cobbles and small boulders formally stacked up to 10 courses high. The wall is approximately 38 m long and averages 1.5 m high and 50 cm wide.

<u>Hāna Highway at Waikakoi Bridge, Feature 3</u> is a small concrete drainage channel built on top of the Feature 2 retaining wall (Figure 93 to Figure 96). Its function is to drain water off the roadway and over the retaining wall. Feature 3 is constructed of poured concrete over angular to subangular basalt cobbles with a hand-shaped channel down to the east. The feature measures 2.8 m (length parallel to the long axis of the Feature 2 retaining wall) with an 80-cm wide channel in the middle. The pouted concrete is about 10-15 cm thick.

The proposed undertaking will have no effect on either Feature 2 or Feature 3, which are both beyond the limits of proposed ground disturbance.

Figure 86. Overview from northeast end of Feature 1, Hāna Highway at Waikakoi Bridge; facing southwest

Figure 87. Detail of repaired portion of northern end of Feature 1, Hāna Highway at Waikakoi Bridge; original construction is to left of vertical rebar; facing west

Figure 88. Detail of two-level retaining wall construction at Feature 1, Hāna Highway at Waikakoi Bridge; view west

Figure 89. View of north end of Feature 1, Hāna Highway at Waikakoi Bridge; facing south

Figure 90. Another detail view of two-level retaining wall construction at Feature 1, Hāna Highway at Waikakoi Bridge; view west

Figure 91. View of south end of Feature 2, Hāna Highway at Waikakoi Bridge; view northwest

Figure 92. Overview of Feature 2, Hāna Highway at Waikakoi Bridge, covered in vegetation; view northeast

Figure 93. Overview of Feature 3, Hāna Highway at Waikakoi Bridge; facing east

Figure 94. Detail of Feature 3, Hāna Highway at Waikakoi Bridge, facing southeast

Figure 95. Another detail view of Feature 3, Hāna Highway at Waikakoi Bridge; oblique view

Figure 96. Detail of Feature 3, Hāna Highway at Waikakoi Bridge, from downslope (east) side; facing west

## 5.8 Honua 2 – Dry-stacked Rock Retaining Wall

| | |
|---|---|
| **FORMAL SITE TYPE:** | Dry-stacked retaining wall |
| **NO. OF FEATURES:** | 1 |
| **DIMENSIONS:** | 16.5 m (length) by 1.2-1.4 m (height) |
| **MATERIAL:** | Basalt clasts |
| **CONDITION ABOVE GROUND:** | Good |
| **FUNCTIONAL INTER.:** | Traditional agriculture |
| **AGE INTERPRETATION:** | Pre-Contact to early historic period |

A dry-stacked rock retaining wall (designated SIHP Site in the subject study) associated with an adjacent private parcel (TMK [2] 1-5-009:011, which is also a portion of LCA 5176-C to Liilii) was identified along the mauka (upslope) side of the road south of Waikakoi Bridge (Figure 97). This site, initially designated temporary field number Honua 2, has clearly been constructed by the neighboring private landowner—there are numerous traditional Hawaiian site-features in this adjacent parcel—and is not associated the Hāna Belt Road (Figure 98). This rock wall may be encroaching into the highway ROW. We are unaware of any previous archaeological study in TMK (2) 1-5-009:011 but there are clearly many site-features in parcel 011 that qualify as historic properties (federal language) or significant historic properties (state language).

The rock wall roughly parallels the roadway and functions to retain an elevated, level area of soil-sediment next to a residence (see Figure 97). A line of ornamental shrubs is planted in the level soil area on top of this feature. Several ti leaf (kī) plants are in front of the base of the retaining wall along the road shoulder.

The constituent materials are boulders with some smaller (cobble) basalt, mostly angular and subangular, formally stacked up to 5-6 courses high. The front facing is not plumb but flares out a bit at its base. Maximum dimensions of this retaining wall are 16.5 m (length) by 1.2-1.4 m (height) by 50 cm (width). The upper (level soil area) surface of this site was not inspected since it is clearly being treated as private property at this time; even without inspecting the top surface, it seems certain it consists of an extensive level area consistent with representing a typical, traditional Hawaiian cultivation (gardening) structure on an otherwise sloping ground surface. As illustrated in Figure 98, this site is clearly part of an extensive complex of features representing part of a traditional Hawaiian settlement and planting area.

Figure 97. Overview of Site, dry-stacked rock retaining wall along mauka shoulder south of Waikakoi Bridge (see text above for discussion); facing northwest

Figure 98. Overview of numerous traditional Hawaiian site-features in private parcel (TMK [2] 1-5-009:011, which is also a portion of LCA 5176-C to Liilii) adjacent to roadway south of Waikakoi Bridge (see text above for discussion); view southwest

# Section 6 Conclusion

This archaeological inventory survey (AIS) was completed on behalf of HDR, Inc. in support of a proposed bridge replacement project south of Hāna, Maui, on the National Register of Historic Places (NRHP) listed Hāna Belt Road (a.k.a., Hāna Highway). The South Wailua Bridge in Wailua and Puʻuhaoa Ahupuaʻa and Waikakoi Bridge in Kawaipapa (Koali) Ahupuaʻa are in Hāna District, Island of Maui, TMK (2) 1-5-008: portions of 001, 002 and 004 (South Wailua Bridge APE/project area) and (2) 1-5-009: portions of 009, 010, 011 and 012 (Waikakoi Bridge APE/project area). The Area of Potential Effects (APE)/project area is approximately 2.73 acres: 1.21 acres at and around Waikakoi Bridge and 1.52 acres at and around South Wailua Bridge. The APE includes permanent and temporary bridge construction, roadway approaches (including temporary traffic control warning signage) and anticipated staging areas. The scope of work for the proposed project is included in the Introduction as well as Appendix A.

The proposed undertaking is subject to review under Section 106 (36 CFR Part 800) of the National Historic Preservation Act of 1966, as amended. The project is also reviewable under Hawaiʻi Revised Statutes (HRS) Chapter 6E-8 and Hawaiʻi Administrative Rules (HAR) Chapter 13-275. The purpose of the AIS was to determine the land-use history of the project area, to identify and evaluate any archaeological historic properties, and to provide recommendations for review and acceptance by the State Historic Preservation Division (SHPD). The AIS was conducted in accordance with HAR Chapter 13-276.

Fieldwork was conducted by Christopher M. Monahan, Ph.D., who served as the principal investigator for the project, Nathan DiVito, M.A. (project director), Theo Ikaikakoa Monahan and Cassandra Pascua, B.A., on March 13–15 and May 15, 2025.

As summarized in Table 6, seven historic properties, including component features of previously identified historic properties, were identified. Detailed site-feature descriptions and documentation have been provided in Section 5 (Results).

## 6.1 Significance Assessments (Evaluations)

Because this project is reviewable under both State and Federal laws, both State and Federal significance criteria (evaluation) are included (see Table 6).

<u>In accordance with State administrative rules (HAR § 13-275-6)</u>, significance of a historic property is evaluated by first establishing that it possesses "integrity of location, design, setting, materials, workmanship, feeling, and association," and, second, that it meets one or more of the following criteria:

a. Be associated with events that have made an important contribution to the broad patterns of our history;
b. Be 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
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.

Under Federal standards, site significance is evaluated with regard to the criteria in the Code of Federal Regulations (CFR), Title 36, Part 60.4, as follows:

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
B. That are associated with the lives of persons significant in our past; or
C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. That has yielded or may be likely to yield information important in prehistory or history.

### 6.1.1 South Wailua Bridge Features

South Wailua Bridge (No. 23, Hāna Belt Road, State Historic Bridge Inventory # 009003600904464), built in 1911 across Honolewa Stream, is a concrete tee-beam bridge with a solid concrete cap. It has been assessed as having "high preservation value" for its contribution to the Hāna Highway Historic Bridge District as part of the best remaining intact example of a belt road system in the state. Honua identified three associated bridge features designated Features 1-3; these features are mortared basalt "wing walls" dating from the original time of construction of the bridge, extending from the ends of the main bridge structure.

The three associated features identified at South Wailua Bridge retain integrity of location, setting, feeling and association with the historic bridge. Feature 1 has been damaged and repaired in the past. Feature 3 is damaged/structurally unsound and in failing condition. Feature 2 also retains integrity of design, materials and workmanship.

These features are significant under criteria a (state) and A (federal) for their association with the construction of the Hāna Belt Road and Bridge system in the early twentieth century. They are also significant under criteria c (state) and C (federal) for their embodiment of a distinctive period in bridge construction in Hawai'i in the early twentieth century.

### 6.1.2 Hāna Belt Road Features at S. Wailua Bridge

Honua identified three rock wall features along the shoulders of the Hāna Belt Road: two (Features 1 and 2) south of the bridge, and one (Feature 3) on the north side. Only one of these (Feature 1) dates from the original road construction; the other two appear to be more recent, probably from the terminal historic period (i.e., not much older than 50 years ago).

The three rock wall features along the shoulders of the Hāna Belt Road on either side of South Wailua Bridge retain integrity location, setting, feeling and association with the historic road.

Feature 1 is part of the earliest road construction. The other two features appear to be late (i.e., middle twentieth century) constructions. Feature 1 also retains integrity of design, materials and workmanship.

These features are significant under criteria a (state) and A (federal) for their association with the construction of the Hāna Belt Road and Bridge system in the early twentieth century. They are also significant under criteria c (state) and C (federal) for their embodiment of a distinctive period in road and bridge construction in Hawaiʻi in the early twentieth century.

### 6.1.3 Honua 1 – Dry-Stacked Terraces

A pair of dry-stacked rock and soil terraces initially designated temporary field number Honua 1 is just downslope (makai) of the parking area for the waterfalls. These two terraces, which are defined as component features of site, are interpreted as a traditional Hawaiian cultivation (gardening) site.

This site retains integrity of location and design, creating small level soil areas on the naturally sloped terrain, which is a hallmark of traditional Hawaiian subsistence agriculture in the islands.

This site is fairly degraded and damaged by sediment and debris pushed over the side of the parking lot area as well as large tree fall and invasive (vines) vegetation. Nonetheless, it is significant under criterion d (state) and D (federal) for its contribution to our understanding of traditional subsistence agriculture in an area that has been otherwise modified by the construction of the bridge and road system.

### 6.1.4 Wailua Bridge Features

Wailua Bridge (No. 24, Hāna Belt Road, State Historic Bridge Inventory # 009003600904475), built in 1947 across Wailua Stream, is a concrete tee-beam bridge with a concrete open horizontal parapet/railing. It has been assessed as having "high preservation value" for its contribution to the Hāna Highway Historic Bridge District as part of the best remaining intact example of a belt road system in the state and associations with the post-World War II period. Honua identified eight features associated with the bridge: Features 1-4 are bridge buttresses at each of its corners; Features 5-8 are sets of bollards/posts, some with intact guardrails (some without), at each of the four bridge corners along the road shoulder. These features are in an area that will only be used for temporary traffic control warning signage but not for project-related ground disturbance; thus, the proposed undertaking will have no effect on this bridge or its associated features.

The bridge buttresses (Features 1-4) at Wailua Bridge all retain integrity of location, design, setting, materials, workmanship, feeling and association with the historic bridge. The sets of bollards/posts (Features 5-8) are generally in disrepair and poor state of preservation.

These bridge buttresses (Feature 1-4) are significant under criteria a (state) and A (federal) for their association with later (circa 1940s) alterations and improvements to the original construction of the Hāna Belt Road and Bridge system in the post-World War II era. They are also significant under criteria c (state) and C (federal) for their embodiment of a distinctive period in road and bridge improvements in Hawaiʻi in the middle twentieth century.

### 6.1.5 Waikakoi Bridge Features

Waikakoi Bridge (No. 26, Hāna Belt Road, State Historic Bridge Inventory # 009003600904542), constructed in 1911 across Waikakoi Stream, is a concrete tee-beam bridge with a solid concrete cap. It has been assessed as having “high preservation value” for its contribution to the Hāna Highway Historic Bridge District as part of the best remaining intact example of a belt road system in the state. Honua identified seven associated bridge features: four buttresses (Features 1-4), two mortared basalt guardrail anchors and guardrails (Features 5-6) and a non-functional (abandoned) mortared basalt water diversion structure (Feature 7). Some of these features date from the original time of bridge construction (Features 1-4) while the others appear to be later (circa 1950s or 1960s) modifications.

Most of the seven associated features identified at Waikakoi Bridge retain integrity of location, setting, feeling and association with the historic bridge, although Feature 1 and Feature 2 have been modified to some extent by the addition of rocks and soil on top of Feature 1 and a more recent feature (Feature 7) on top of Feature 2. Feature 3 and Feature 7 are damaged/structurally unsound and in failing condition.

Therefore, there is a wide variety of physical conditions and preservation of these seven features; nonetheless, at least some of these features are significant under criteria a (state) and A (federal) for their association with the construction of the Hāna Belt Road and Bridge system in the early twentieth century. They are also significant under criteria c (state) and C (federal) for their embodiment of a distinctive period in bridge construction in Hawaiʻi in the early twentieth century.

### 6.1.6 Hāna Belt Road Features at Waikakoi Bridge

Honua identified three features along the makai road shoulder: Feature 1 is a long, curvilinear retaining wall supporting the Hāna Belt Road south of the bridge. Feature 2 is another long retaining wall supporting the Hāna Belt Road north of the bridge. Feature 3 is a small concrete drainage structure built on top of Feature 2 to drain the roadway of excess water. The retaining walls date from the original road construction; the concrete drainage feature may be a later addition. The proposed undertaking will have no effect on either Feature 2 or Feature 3, which are both beyond the limits of proposed ground disturbance.

The three features along the shoulders of the Hāna Belt Road on either side of Waikakoi Bridge retain integrity of location, design, setting, materials, workmanship, feeling and association.

These features are significant under criteria a (state) and A (federal) for their association with the construction of the Hāna Belt Road and Bridge system in the early twentieth century. They are also significant under criteria c (state) and C (federal) for their embodiment of a distinctive period in road and bridge construction in Hawaiʻi in the early twentieth century.

### 6.1.7 Honua 2 – Dry-stacked Retaining Wall

A dry-stacked rock retaining wall (designated SIHP Site in the subject study) associated with an adjacent private parcel (TMK [2] 1-5-009:011, which is also a portion of LCA 5176-C to Liilii) was identified along the mauka side of the road south of Waikakoi Bridge. This site, initially designated temporary field number Honua 2, has clearly been constructed by the neighboring private landowner—there are numerous traditional Hawaiian site-features in this adjacent parcel—and is not associated the Hāna Belt Road. This rock wall may be encroaching into the highway ROW. We are unaware of any previous archaeological study in TMK (2) 1-5-009:011 but there are clearly many site-features in parcel 011 that qualify as historic properties (federal language) or significant historic properties (state language).

This site retains integrity of location, design, setting, materials, workmanship, feeling and association, creating a laterally extensive level soil area on the naturally sloped terrain, which is a hallmark of traditional Hawaiian subsistence agriculture in the islands; and, represents one feature of an extensive site complex of traditional Hawaiian settlement and cultivation structures in the adjoining private parcel.

This site is significant under criterion d (state) and D (federal) for its contribution to our understanding of traditional subsistence agriculture and settlement in an area that has been otherwise modified by the construction of the bridge and road system.

## 6.2 Project Effect and Mitigation Recommendations

Under HRS Chapter 6E, this AIS supports a project effect determination (HAR § 13-275-7) of "effect, with proposed mitigation commitments."

Under Section 106 (36 CFR Part 800.5), because the proposed undertaking involves historic properties listed on the NRHP, the effect determination is "adverse effect," and the next step regarding resolution is (36 CFR Part 800.6) consultation with the State Historic Preservation Division (SHPD) to complete a Memorandum of Agreement (MOA).

Recommended mitigation commitments, which can be used to satisfy both State and Federal regulatory processes, are as follows (and see Table 6):

1. South Wailua Bridge and Associated Features – Complete an Architectural-Historical Assessment
2. Hāna Belt Road Features at South Wailua Bridge – No further work required
3. Honua 1 – If resource can be avoided by the proposed undertaking / project, no further work required; if resource cannot be avoided by the proposed undertaking / project, archaeological data recovery to include archaeological excavation
4. Wailua Bridge and Associated Features – No further work required (resource will not be impacted by ground disturbance during the proposed undertaking / project
5. Waikakoi Bridge and Associated Features – Complete an Architectural-Historical Assessment
6. Hāna Belt Road Features at Waikakoi Bridge – No further work required
7. Honua 2 – Consultation with adjacent landowner at TMK (2) 1-5-009:011 to establish whether site is within the roadway or on private property

Table 6. Historic Properties in APE/Project Area, Significance Assessments and Recommended Mitigation

| Site Designation[1] | APE/project area | Other Resource #[1,2] | Formal Type | Feature/s | Functional Interpretation | Temporal Interpretation | Sign. Assess.[3] | Integrity[4] | Recomm. Mitig.[5] |
|---|---|---|---|---|---|---|---|---|---|
| S. Wailua Bridge Features | S. Wailua Bridge | 009003600904464 (Bridge No. 23) | Component features of bridge | 3 Wing Walls (Features 1, 2 & 3) | Structural to bridge | 1911 | a, c<br>A, C | l, s, f, a, plus<br>d, m, w (Fea. 2 only) | Architectural assessment |
| Hāna Belt Road Features at S. Wailua Bridge | S. Wailua Bridge | SIHP # 01638 (Hāna Belt Road) | Component features of Hāna Belt Road | Fea. 1 = Retaining wall for highway | Structural to highway | Early 20th century | a,c<br>A, C | l, s, f, a, plus<br>d, m, w (Fea. 1 only) | NFW |
| | | | | Fea. 2 = Wall along highway shoulder | Upslope soil retention | Middle 20th century | | | |
| | | | | Fea. 3 = Discontinuous boulder alignment along highway shoulder | Road safety | Middle 20th century | | | |
| SIHP Site | S. Wailua Bridge | Honua 1 | Dry-stacked terraces | Pair of dry-stacked terraces (Features 1 & 2) | Cultivation (traditional agriculture) | Pre-Contact to early historic period | d<br>D | l, d | DR |
| Wailua Bridge Features | S. Wailua Bridge | 009003600904475 (Bridge No. 24) | Component features of bridge | 4 buttresses (Features 1, 2, 3 & 4) | Structural to bridge | 1947 | a, c<br>A, C | l, d, s, m, w, f, a<br>(Feas. 1-4 only) | NFW |
| | | | | 4 bollards/posts/guardrails (Feas. 1, 2, 3 & 4) | Road/bridge safety | | | | |
| Waikakoi Bridge Features | Waikakoi Bridge | 009003600904542 (Bridge No. 26) | Component features of bridge | 4 buttresses (Features 1, 2, 3 & 4) | Structural to bridge | 1911 | a, c<br>A, C | l, s, f, a | Architectural assessment |
| | | | | 2 mortared rock guardrail anchors (Feas. 5 & 6) | Road/bridge safety | Early to middle 20th century | | | |
| | | | | 1 water diversion feature (Fea. 7) | Water distribution | Early to middle 20th century | | | |
| Hāna Belt Road Features at Waikakoi Bridge | Waikakoi Bridge | SIHP # 01638 (Hāna Belt Road) | Component features of Hāna Belt Road | Fea. 1 = Retaining wall for highway | Structural to highway | Early 20th century | a, c<br>A, C | l, d, s, m, w, f, a | NFW |
| | | | | Fea. 2 = Retaining wall for highway | | | | | |
| | | | | Fea. 3 = Drainage for highway | | | | | |
| SIHP Site | Waikakoi Bridge | Honua 2 | Dry-stacked retaining wall | Long dry-stacked retaining wall w. level soil area upslope | Cultivation (traditional agriculture) | Pre-Contact to early historic period | d<br>D | l, d, s, m, w, f, a | Consultation w. adjacent landowner |

[1] Complete, formal State Inventory of Historic Places (SIHP) # is preceded by "50-50-17-."
[2] Bridge reference #s from MKE and Fung (2013)
[3] Significance Assessments: lower case letters = State criteria; upper case letters = National criteria.
[4] Integrity criteria: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
[5] Recommended Mitigation: NFW = no further work

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# Appendix A Full Project Description

The County of Maui (County), Department of Public Works (DPW), in coordination with the Federal Highway Administration (FHWA) and the State of Hawaiʻi (State), Department of Transportation (HDOT), proposes to replace the two existing structurally deficient bridges, the Waikakoi Bridge and South Wailua Bridge, with new single-lane bridges to provide safe and functional stream crossings (Project). Waikakoi Bridge and South Wailua Bridge are located at mileposts 45.4 and 44.6, respectively, on Hāna Highway (HI-360) on the island of Maui. The Waikakoi Bridge carries Hāna Highway over Waikakoi Stream, while the South Wailua Bridge carries the highway over Honolewa Stream. The purpose of the Project is to address the existing structural deterioration and load capacity deficiencies by upgrading the structures to be consistent with current design standards and guidelines. To accommodate traffic during construction, it is anticipated that temporary bypass bridges would be installed *makai* of each bridge.

The Project area is approximately 2.73 acres comprised of 1.21 acres surrounding Waikakoi Bridge and 1.52 acres surrounding South Wailua Bridge. The area encompasses permanent and temporary bridge construction, roadway approaches, and anticipated staging areas. The Project consists of the following primary components:

1. Demolition and Removal of Existing Waikakoi and South Wailua Bridges: Work will include the demolition of both bridge decks, bridge abutments above the existing ground, bridge center piers above the stream bottom, existing pavement, guardrails, concrete retaining walls, and other associated infrastructure. Selected trees, signs, and other roadside elements within the Project areas may be removed or relocated where feasible.

2. Temporary Bypass Bridges: Temporary modular steel bypass bridges will be installed makai of each bridge to facilitate traffic flow and minimize disruption during construction. Each of the temporary bridges will accommodate a single lane of traffic and is anticipated to span approximately 100 feet long and have an out to out width of approximately 21.5 feet. The modular steel bridge structures will rest on reinforced concrete abutments with micropile foundations. Temporary gabion basket retaining walls will be installed at each bridge approach to mitigate potential erosion. Temporary signage, pavement markings, portable concrete barriers, and crash barrels will be placed at the bridge approaches to serve as safety and traffic control measures. The final design and mitigation measures will be determined as the design progresses.

   The bypass bridges will be constructed outside of the County Right-of-Way (ROW); therefore, temporary construction easements will be coordinated with adjacent landowners. Upon completion of the permanent bridges, the temporary bridge structures will be removed, and the surrounding areas will be restored to original conditions.

3. Replacement and Construction of New Waikakoi and South Wailua Bridges: The new Waikakoi and South Wailua Bridges will be constructed in their original locations. Each bridge will accommodate a single-lane configuration and will be designed to current structural and safety standards, providing load-bearing capacities to accommodate current and future traffic demands. The new Waikakoi Bridge is anticipated to span

approximately 54.5 feet long and have an out to out width of 18.0 feet, and the new South Wailua Bridge is anticipated to span approximately 63.0 feet long and have an out to out width of approximately 18.0 feet. Each bridge superstructure will be comprised of a reinforced concrete deck supported by reinforced concrete tee girders. The bridge decks will be surfaced with asphalt concrete pavement, extending beyond the bridge and tying into the existing roadway to provide a smooth transition. The new bridge barrier railings will be compliant with the Manual for Assessing Safety Hardware, Test Level 2 (MASH TL-2) in the similar style to the existing barriers. Concrete rubble masonry (CRM) barriers internally strengthened with steel-reinforced concrete will be connected to the barrier railings and extend off the bridge decks. The CRM barriers will be slightly realigned to reduce potential of being hit by vehicles. Design of the bridge railings and CRM barriers will match the historic character of the existing bridges and have been approved for use on bridge projects in Hawaiʻi by FHWA and HDOT (December 2021). The bridges will be supported on each end by reinforced concrete abutments with deep micropiles. CRM retaining walls will be installed at each end of the bridge decks for slope stability.

4. Both bridges will be constructed within the County ROW; as such, no permanent acquisition of adjacent properties is anticipated. Each bridge will be designed to accommodate existing hydrologic conditions, ensuring sufficient clearance above Waikakoi and Honolewa Streams to maintain natural flow patterns and minimize flood risks. During construction, Best Management Practices (BMPs) will be implemented to protect water quality and maintain stream flows. The final design and mitigation measures will be determined as the design progresses.

5. Roadway Improvements and Utility Relocation: Roadway approaches on either side of each bridge will be reconstructed with asphalt pavement to provide smooth transitions onto the new bridge structures. Utility lines, including electrical, telecommunications, and water may be temporarily or permanently relocated or reinforced to prevent service disruptions. Roadway grading and resurfacing will be conducted to enhance drainage and improve overall roadway safety. Additionally, appropriate signage and pavement markings will be installed.

6. Grading and Drainage Improvements: Grading will be required for installation of both temporary and permanent bridges. Additionally, roadway approaches may be regraded and resurfaced to provide a smooth transition onto the new bridge decks. Retaining walls and embankment protections will be installed where necessary to prevent erosion and provide slope stability. During construction, temporary erosion control measures such as compost filter socks, silt fences and stabilized construction entrances will be used during construction to protect against erosion and prevent construction from negatively impacting water quality in the adjacent streams. Construction activities will adhere with Federal, State and County standards.

# Appendix B Design and Construction Plans

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 001 | 084 |

# DEPARTMENT OF PUBLIC WORKS

## COUNTY OF MAUI, HAWAII
## WAILUKU, MAUI

**PLANS FOR**

# WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT

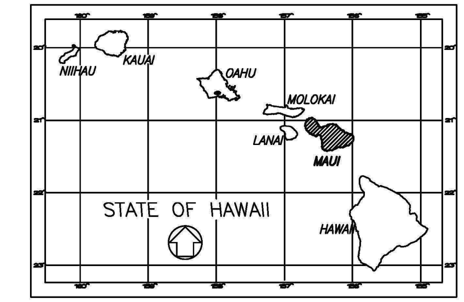
**WITHIN AND FRONTING TMK'S: (2) 1-5-008:001, (2) 1-5-008:002, (2) 1-5-008:004, (2) 1-5-009:009, (2) 1-5-009:010, (2) 1-5-009:011, (2) 1-5-009:012, (2) 1-5-009:013, (2) 1-5-010:008**

## FEDERAL-AID PROJECT NO. BR-0360(015)

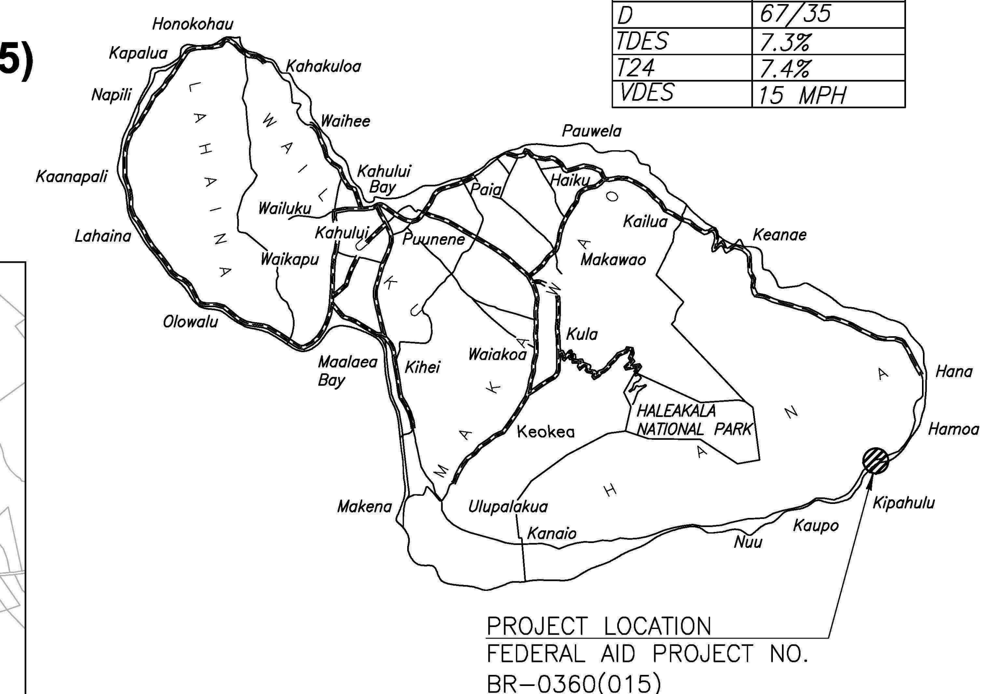
## DISTRICT OF HANA
## ISLAND OF MAUI

### INDEX OF DRAWINGS



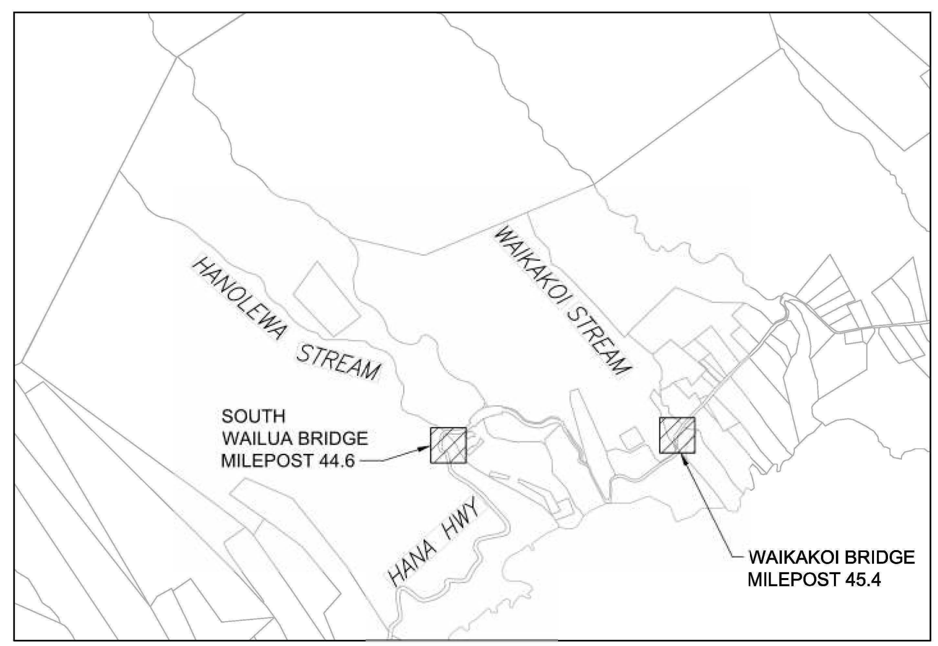



| DESIGN DESIGNATION | |
|---|---|
| ADT (2022) | 962 |
| ADT (2071) | 1,297 |
| DHV | 200 |
| KDES | 15.7% |
| D | 67/35 |
| TDES | 7.3% |
| T24 | 7.4% |
| VDES | 15 MPH |




## ISLAND OF MAUI

5 0 5 10
SCALE IN MILES




## LOCATION MAP

1000' 500' 0 1000' 2000'
SCALE: 1" = 1000'

*GROSS PROJECT LENGTH = 0.30 MILES*
*NET PROJECT LENGTH = 0.30 MILES*

*APPROVED:*

Director, Department Of Public Works, County Of Maui    Date

SHEET T-001 of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 5:58pm
CAD File Name: C:\pwworking\west01\d1900569\T-001 - Title Sheet.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 002 | 084 |

# STANDARD PLANS SUMMARY

| STD. 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 CAN DETAILS | 05/31/07 |
| B-12A | PRESTRESSED CONCRETE PILES, PILE & COMPRESSION SPLICE CAN DETAILS & NOTES | 05/31/07 |
| 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 |
| | | 08/16/06 |
| 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 |
| | | |

| STD. 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 FRAME AND GRATES | 05/31/07 |
| H-16 | TYPE 61614, 61614P, 61616, 61616P STEEL FRAME AND GRATES | 05/31/07 |
| 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 |

| STD. PLAN NO. | TITLE | DATE |
|---|---|---|
| TE-08 | MISCELLANEOUS INTERSECTION SIGNS | 07/11/08 |
| 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 GUIDE SIGNS | 07/11/08 |
| 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 | CENTILEVER SIGN FRAME DETAIL AND SECTION | 05/31/07 |
| TE-17C | CANTILEVER SIGN FRAME DETAIL | 05/31/07 |
| TE-17D | CENTILEVER SIGN FRAME SECTION | 05/31/07 |
| TE-17E | CENTILEVER 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 BREAKWAY 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 ACCESSORY DETAILS | 05/31/07 |
| 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 |

| STD. PLAN NO. | TITLE | DATE |
|---|---|---|
| TE-30 | PAVEMENT ALPHABETS, NUMBERS & SYMBOLS | 07/11/08 |
| TE-31 | PAVEMENT ALPHABETS, NUMBERS & SYMBOLS | 07/11/08 |
| 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 STANDARD PLAN NO. (FOR EXAMPLE: D-07●)

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

STANDARD PLANS SUMMARY

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

SHEET C-001
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:58pm
CAD File Name: C:\pwworking\west01\d1900569\C-001 – Standard Plans Summary.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 003 | 084 |

## GENERAL NOTES:

1. THE SCOPE OF WORK FOR THIS PROJECT INVOLVES THE REPLACEMENT OF THE WAIKAKOI BRIDGE AND THE SOUTH WAILUA BRIDGE; CONSTRUCTION OF TEMPORARY BYPASS ROADS WITH TEMPORARY BRIDGES; DEMOLITION AND REMOVAL OF THE EXISTING WAIKAKOI BRIDGE AND SOUTH WAILUA BRIDGE; CLEARING AND GRADING; CONSTRUCTION OF NEW BRIDGES, WALLS, ASPHALT PAVEMENTS; INSTALLATION, PAVEMENT MARKINGS AND SIGNS.

2. CONTACT THE FOLLOWING ENTITIES PRIOR TO CONSTRUCTION:

   a. SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE COUNTY OF MAUI-DEPARTMENT OF PUBLIC WORKS, ENGINEERING DIVISION AT LEAST FIVE (5) DAYS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

   b. ANY DEVIATIONS FROM THE TRAFFIC CONTROL PLANS PROVIDED IN THESE PLANS REQUIRING A DETOUR MUST BE APPROVED BY THE DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION'S TRAFFIC SECTION. PLANS MUST BE SUBMITTED 15 WORKING DAYS OR SOONER AND BE APPROVED PRIOR TO THE COMMENCEMENT OF WORK.

   c. NOTIFY THE COUNTY OF MAUI-DEPARTMENT OF WATER SUPPLY (DWS) INSPECTOR ONE (1) WEEK PRIOR TO COMMENCEMENT OF WORK.

   d. PRIOR TO ANY EXCAVATION OR DIGGING, THE CONTRACTOR SHALL NOTIFY "CALL BEFORE YOU DIG" AT 811 OR 1-866-423-7278 AND PROVIDE ANY NECESSARY PROJECT INFORMATION.

3. PRIOR TO PAVING 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.

4. THE CONTRACTOR SHALL REPLACE ALL TRAFFIC SIGNS, POSTS, PAVEMENT MARKINGS, UNDERGROUND UTILITIES, MANHOLES, MONUMENTS, STRUCTURES, AND LANDSCAPING DISTURBED BY THEIR ACTIVITIES. THE CONTRACTOR SHALL BE HELD LIABLE FOR ANY DAMAGES INCURRED TO THE EXISTING FACILITIES AND/OR IMPROVEMENTS AS A RESULT OF OPERATIONS.

5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR HAULING AND DISPOSING OF REMOVED A.C., CONCRETE, BASE COURSE, AND EXCESS EXCAVATED MATERIAL. THE COUNTY WILL NOT COORDINATE ANY DELIVERY, STORAGE, OR HAULING OF MATERIAL.

6. 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.

7. THE HOURS OF OPERATION SHALL BE FROM 8:30 A.M. TO 3:30 P.M. NO NIGHT WORK, WORK ON HOLIDAYS OR WEEKENDS WILL BE PERMITTED UNLESS APPROVED BY THE ENGINEER.

8. THE CONTRACTOR SHALL COMPLY WITH THE DIRECTIVES OF THE STATE OF HAWAII OCCUPATIONAL SAFETY AND HEALTH LAW (DOSH).

9. THE CONTRACTOR SHALL CONSIDER AS PART OF THE CONTRACT DOCUMENTS THE "HAWAII STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2005."

10. THE CONTRACTOR IS REMINDED OF THE REQUIREMENTS OF SUBSECTION 105.16 - SUBCONTRACTS, WHICH REQUIRES HIM 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.

11. THE CONTRACTOR'S ATTENTION IS DIRECTED TO SUBSECTION 107.06 - CONTRACTOR DUTY REGARDING PUBLIC CONVENIENCE, SUBSECTION 104.09 - MAINTENANCE OF TRAFFIC AND SECTION 645 - WORK ZONE TRAFFIC CONTROL, AND SUBSECTION 104.11 - UTILITIES AND SERVICES.

12. THE CONTRACTOR SHALL OBTAIN A PERMIT TO PERFORM WORK ON COUNTY HIGHWAYS FROM THE DEVELOPMENT SERVICES ADMINISTRATION TWO WEEKS PRIOR TO THE COMMENCEMENT OF WORK.

13. THE DIRECTOR OF PUBLIC WORKS AND/OR THE DIRECTOR OF THE DEPARTMENT OF WATER SUPPLY HAS THE RIGHT TO STOP CONSTRUCTION SHOULD ANY WORK BE FOUND CONTRARY TO THE APPROVED CONSTRUCTION PLAN OR DETRIMENTAL TO THE PUBLIC'S INTEREST.

14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING SITES AS MAY BE REQUIRED FOR STORAGE, STOCKPILING, FIELD OFFICE/LABORATORY, STAGING AREA, AND OTHER CONTRACTOR OPERATIONS. THE LOCATION OF THESE SITES MUST BE WITHIN THE DESIGNATED APE UNDER THE PROJECT'S SECTION 106.

15. THE CONTRACTOR SHALL MAKE THEIR OWN ARRANGEMENTS FOR UTILITIES SUCH AS ELECTRICITY, WATER, ETC. REQUIRED FOR THEIR OPERATIONS AND PAY FOR ALL COST THEREOF.

## GENERAL NOTES (CONTINUED):

16. EXISTING DRAINAGE SYSTEMS SHALL BE 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 VARIOUS CONTRACT ITEMS.

17. THE CONTRACTOR SHALL VERIFY AND CHECK ALL DIMENSIONS AND DETAILS ON THE DRAWINGS BEFORE PROCEEDING WITH THE WORK. ANY DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR CLARIFICATION OR TO MAKE REVISIONS WHICH WILL AVOID SUCH CONFLICTS. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR PRECISELY LAYING OUT THE VARIOUS IMPROVEMENTS SHOWN ON THE DRAWINGS.

18. INFORMATION ON ALL EXISTING IMPROVEMENTS, LANDSCAPING, IRRIGATION, UTILITIES, APPURTENANCES, AND GRADES ARE APPROXIMATE AND WERE BASED ON AVAILABLE RECORDS AND AS-BUILT DRAWINGS FROM PREVIOUS CONTRACTORS. ACCURACY IS NOT GUARANTEED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION AND INVERTS OF EXISTING UTILITIES AND SHALL BE RESPONSIBLE TO PROTECT SUCH UTILITIES AT ALL TIMES. DAMAGES TO EXISTING IMPROVEMENTS, INCLUDING DRIVEWAYS, WALLS, LANDSCAPING, IRRIGATION, UTILITIES, ETC., WHETHER OR NOT SHOWN ON THE PLANS, SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. PORTIONS OF EXISTING UTILITIES, ETC. THAT MUST BE REMOVED OR OTHERWISE DISTURBED TO ACCOMPLISH THE WORK CALLED FOR ON THE PLANS SHALL ALSO BE RECONSTRUCTED, REPLACED, OR RESTORED TO AN ORIGINAL OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE.

19. THE CONTRACTOR SHALL, AT THEIR OWN EXPENSE, KEEP THE PROJECT AREA AND SURROUNDING AREA FREE FROM DUST NUISANCE. THE WORK SHALL BE IN CONFORMANCE WITH AIR POLLUTION CONTROL STANDARDS AND REGULATIONS OF THE STATE DEPARTMENT OF HEALTH AND COUNTY GRADING ORDINANCE.

20. THE CONTRACTOR SHALL REMOVE ALL SILT AND DEBRIS RESULTING FROM THEIR WORK AND DEPOSITS IN DRAINAGE FACILITIES, ROADWAYS, AND OTHER AREAS. THE COST INCURRED FOR ANY NECESSARY REMEDIAL ACTION ORDERED BY THE DIRECTOR OF PUBLIC WORKS SHALL BE PAID BY THE CONTRACTOR.

21. CONSTRUCTION DEBRIS AND WASTES SHALL BE DEPOSITED AT A PROPERLY PERMITTED DEPARTMENT OF HEALTH DUMP SITE. THE CONTRACTOR SHALL INFORM THE DIRECTOR OF PUBLIC WORKS OF THE LOCATION OF THE DISPOSAL SITE(S). THE DISPOSAL SITE(S) MUST FULFILL THE REQUIREMENTS OF THE GRADING ORDINANCE.

22. THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE ADEQUATE, SAFE, NON-SKID BRIDGING MATERIAL OVER THE TRENCH, INCLUDING SHORING, WHEN TRENCHING IN PAVEMENT AREAS TO HANDLE ALL TYPES OF VEHICULAR TRAFFIC. STEEL PLATE WARNING SIGNS ARE REQUIRED FOR ALL STEEL PLATES IN THE RIGHT-OF-WAY.

23. THE CONTRACTOR SHALL PROVIDE ACCESS TO ADJACENT PROPERTIES DURING CONSTRUCTION.

24. ALL SAW CUTTING WORK SHALL BE CONSIDERED INCIDENTAL TO VARIOUS CONTRACT ITEMS IN SECTION 401-HOT MIX ASPHALT PAVEMENT, SECTION 610 - REINFORCED CONCRETE DRIVEWAYS, SECTION 634-PORTLAND CEMENT CONCRETE SIDEWALKS, SECTION 638-PORTLAND CEMENT CONCRETE CURB AND GUTTER, AND SECTION 650-CURB RAMPS.

25. EXISTING REUSABLE GUARDRAILS, SIGNS AND POSTS THAT WILL BE REMOVED AND/OR REPLACED SHALL BE DELIVERED TO THE COUNTY'S MAKAWAO BASEYARD. PAYMENT FOR REMOVAL, STORAGE, AND DELIVERY SHALL BE CONSIDERED INCIDENTAL TO VARIOUS CONTRACT ITEMS IN SECTION 606-GUARDRAIL, SECTION 630-TRAFFIC CONTROL GUIDE SIGNS, AND SECTION 631-TRAFFIC CONTROL REGULATORY, WARNING, AND MISCELLANEOUS SIGNS AND WILL NOT BE PAID FOR SEPARATELY.

26. PRIOR TO THE REMOVAL OR RECONSTRUCTION OF ANY MONUMENTS THE CONTRACTOR SHALL HIRE A SURVEYOR LICENSED IN THE STATE OF HAWAII TO LOCATE THE MONUMENTS IN THE FIELD SO THAT THE MONUMENTS CAN BE RE-ESTABLISHED TO THE SAME POSITION BY THE CONTRACTOR. PAYMENT FOR THIS WORK SHALL BE INCIDENTAL TO ITEM NO. 614.2000 RE-CONSTRUCTING STREET SURVEY MONUMENTS.

27. THE CONTRACTOR SHALL COORDINATE WITH THE COUNTY'S CONSTRUCTION SECTION TO HAVE THE EXISTING MONUMENTS WITHIN THE PROJECT REFERENCED BY THE COUNTY'S SURVEYOR PRIOR TO THE PROJECT CLOSEOUT. ANY NEW OR RECONSTRUCTED MONUMENTS THAT ARE NOT IN THE CORRECT LOCATION OR ELEVATION SHALL BE ADJUSTED OR REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST.

## GENERAL NOTES (CONTINUED):

28. WHEN EXCAVATION IS ADJACENT TO EXISTING STRUCTURES OR FACILITIES, THE CONTRACTOR IS RESPONSIBLE FOR PROPERLY SHEETING AND BRACING THE EXCAVATION AND STABILIZING THE EXISTING GROUND TO RENDER IT SAFE AND SECURE FROM POSSIBLE SLIDES, CAVE-INS, AND SETTLEMENT, SUPPORT FACILITIES WITH BEAMS, STRUTS, OR UNDERPINNING TO FULLY PROTECT IT FROM DAMAGE. WHEN EXCAVATION AND CONSTRUCTION CROSSES OR IS IN CLOSE PROXIMITY OF UNDERGROUND TELEPHONE AND SIGNAL CABLE FACILITIES, THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION AND MAINTAIN ADEQUATE CLEARANCE FOR THEIR EQUIPMENT WHILE WORKING CLOSE TO AND/OR UNDER OVERHEAD FACILITIES. DAMAGES TO THE EXISTING FACILITIES SHALL BE IMMEDIATELY REPORTED TO THE RESPECTIVE UTILITY COMPANIES, COUNTY, OR STATE AGENCY. THE REPAIR WORK SHALL BE DONE AT THE CONTRACTOR'S EXPENSE. ALL DAMAGED PORTIONS SHALL BE REPLACED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF THE AFFECTED UTILITY COMPANY.

29. WHEN EXCAVATING OVER AN EXISTING STRUCTURE, THE CONTRACTOR SHALL EXERCISE CARE NOT TO DAMAGE ANY PORTION OF THE STRUCTURE. DAMAGE RESULTING FROM THE CONTRACTOR'S WORK SHALL BE REPAIRED BY THE CONTRACTOR AT THEIR OWN EXPENSE. REPAIR WORK SHALL BE AS DIRECTED BY THE ENGINEER.

30. WHEN CONSTRUCTION IS IN CLOSE PROXIMITY TO PROPERTY LINES, THE CONTRACTOR SHALL LOCATE AND MARK PROPERTY PINS SO THAT THEY WILL NOT BE DISTURBED BY CONSTRUCTION ACTIVITIES.

31. SMOOTH RIDING CONNECTIONS SHALL BE CONSTRUCTED AT THE BEGINNING AND END OF THE PROJECT AND AT ALL CONNECTING APPROACHES, SIDE ROADS, AND DRIVEWAYS AS DIRECTED BY THE ENGINEER.

32. 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 ITEM NO. 401.1000 HMA PAVEMENT. SHOULDER AREAS WITHOUT GUARDRAILS SHALL BE DRESSED AT 6:1 SLOPE (MAX) UNLESS SHOWN ON THE PLANS OR DIRECTED BY THE ENGINEER.

33. ALL CONSTRUCTION SIGNS SHALL BE LEFT IN PLACE UNTIL ALL CONSTRUCTION ITEMS HAVE BEEN COMPLETED. THE CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FROM THE ENGINEER TO REMOVE CONSTRUCTION SIGNS. THIS WORK SHALL NOT BE PAID FOR SEPARATELY BUT SHALL BE CONSIDERED INCIDENTAL TO VARIOUS CONTRACT ITEMS.

## FEDERAL MITIGATION MEASURES:

SECTION 7 USFW PROGRAMMATIC AGREEMENT:

1. AS PART OF THE PROJECT'S CONSULTATION UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT, TO AVOID IMPACTS TO LISTED SPECIES AND PURSUANT TO THE PROGRAMMATIC CONSULTATION, THE FOLLOWING MEASURES MUST BE IMPLEMENTED:

   a. ALL WORK LIGHTS WILL BE SHIELDED SO THE BULB CAN ONLY BE SEEN FROM BELOW BULB HEIGHT AND ONLY USED WHEN CONSTRUCTION IS OCCURRING IN THE AREA ILLUMINATED BY THE LIGHT.

   b. NIGHTTIME CONSTRUCTION WILL NOT OCCUR DURING THE SEABIRD FLEDGLING PERIOD, SEPTEMBER 15TH THROUGH DECEMBER 15TH.

   c. ABOVE-GROUND UTILITIES WILL NOT BE MOVED OR REALIGNED.

   d. HIGHWAY LIGHTING WILL NOT BE INSTALLED OR REPLACED.

   e. WOODY PLANTS GREATER THAN 15 FEET TALL WILL NOT BE DISTURBED, REMOVED, OR TRIMMED DURING THE HAWAIIAN HOARY BAT BIRTHING AND PUP REARING SEASON, JUNE 1ST THROUGH SEPTEMBER 15TH.

   f. A BIOLOGICAL MONITOR (PROCURED BY THE CONTRACTOR) THAT IS FAMILIAR WITH THE SPECIES' BIOLOGY AND APPROVED BY THE FHWA WILL CONDUCT HAWAIIAN STILT (AE`O) NEST SURVEYS WHERE APPROPRIATE HABITAT OCCURS WITHIN THE PROPOSED MAINTENANCE SITE PRIOR TO CLEANING CULVERTS AND DRAINAGE STRUCTURES. SURVEY WILL TAKE PLACE WITHIN THREE (3) DAYS OF PROJECT INITIATION AND AFTER ANY SUBSEQUENT DELAY OF WORK OF THREE (3) OR MORE DAYS (DURING WHICH THE BIRDS MAY ATTEMPT TO NEST) IF A NEST IS ACTIVE OR A BROOD IS FOUND, THIS PA CANNOT BE USED.

   g. PROJECTS MUST BE RESTRICTED TO AREAS IMMEDIATELY ADJACENT TO PAVED SURFACES, IMPACTS TO THE BLACKBURN'S SPHINX MOTH FROM THE COVERED ACTIONS INCLUDING POTENTIAL VEGETATION REMOVAL WILL BE INSIGNIFICANT OR DISCOUNTABLE.

SECTION 106:

1. 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 ACCESS THE NATURE AND SIGNIFICANCE OF THE FIND.

## FEDERAL MITIGATION MEASURES (CONTINUED):

2. IF PREVIOUSLY UNIDENTIFIED NON-BURIAL HISTORIC PROPERTIES OR UNANTICIPATED EFFECTS ARE DISCOVERED, THE HDOT SHALL FOLLOW HAWAII ADMINISTRATIVE RULES (HAR) CHAPTER 13-280 "RULES GOVERNING GENERAL PROCEDURES FOR INADVERTENT DISCOVERIES OF HISTORIC PROPERTIES DURING A PROJECT COVERED BY THE HISTORIC PRESERVATION REVIEW PROCESS."

3. IF HUMAN REMAINS ARE DISCOVERED, HAR 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 HAR RULES TITLE 13, SUBTITLE 13, CHAPTER 300 SUBCHAPTER 4 "PROCEDURES FOR PROPERTY TREATMENT OF BURIAL SITES AND HUMAN SKELETAL REMAINS."

4. IN THE UNLIKELY EVENT THAT SUBSURFACE HISTORIC RESOURCES, INCLUDING HUMAN SKELETAL REMAINS, STRUCTURAL REMAINS, CULTURAL DEPOSITS, ARTIFACTS, NATIVE SAND DEPOSITS, OR SINKHOLES ARE IDENTIFIED DURING THE DEMOLITION AND/OR CONSTRUCTION WORK, CEASE WORK IN THE IMMEDIATE VICINITY OF THE FIND, PROTECT THE FIND FROM ADDITIONAL DISTURBANCE AND CONTACT THE STATE HISTORIC PRESERVATION DIVISION AT (808)652-1510.

**60% DESIGN**
***NOT FOR CONSTRUCTION***

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

GENERAL NOTES - 1

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET C-002 of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 5:58pm
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| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 004 | 084 |

## PUBLIC HEALTH, SAFETY & CONVENIENCE:

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. AS REQUIRED BY THE COUNTY, THE CONTRACTOR SHALL HIRE SPECIAL DUTY POLICE OFFICERS TO CONTROL THE FLOW OF TRAFFIC.

3. DURING NON-WORKING HOURS ALL LANES SHALL BE OPEN AND ALL EXCAVATIONS ON THE ROADWAY SHALL BE COVERED WITH A SAFE NON-SKID BRIDGING MATERIAL TO HANDLE ALL TYPES OF VEHICULAR TRAFFIC. DRIVEWAYS, SIDE ROADS, AND STREETS SHALL BE KEPT OPEN UNLESS THE OWNERS TO THE PROPERTY USING THESE RIGHT-OF-WAYS ARE OTHERWISE PROVIDED FOR SATISFACTORILY.

4. DURING WORKING HOURS, THE CONTRACTOR SHALL MAINTAIN A ROADWAY SUITABLE FOR ONE LANE OF TRAFFIC WITH FLAG MEN AT BOTH ENDS, ALTERNATING DIRECTION OF TRAFFIC FLOW. THE CONTRACTOR SHALL PROVIDE SAFE ACCESS TO AND FROM ALL EXISTING SIDE ROADS, DRIVEWAYS, AND STREETS.

5. 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.

6. THE CONTRACTOR SHALL PROVIDE, INSTALL AND MAINTAIN ALL NECESSARY SIGNS, LIGHTS, FLARES, BARRICADES AND OTHER PROTECTIVE DEVICES FOR THE PROTECTION, SAFETY AND CONVENIENCE OF THE PUBLIC, ACCORDING TO THE OR LATEST APPROVED EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS," AND TO THE LATEST RULES AND REGULATIONS GOVERNING THE USE OF TRAFFIC CONTROL DEVICES AT WORK.

7. SITES ON/OR ADJACENT TO PUBLIC STREETS AND HIGHWAYS ADOPTED BY THE HIGHWAY SAFETY COORDINATOR AND THE U.S. FEDERAL HIGHWAY ADMINISTRATION "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS".

## NPDES PERMIT REQUIREMENTS:

1. A NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR CONSTRUCTION ACTIVITIES IS ON FILE WITH THE STATE DEPARTMENT OF HEALTH CLEAN WATER BRANCH (DOH). A STORMWATER POLLUTION AND PREVENTION PLAN (SWPPP) HAS BEEN PREPARED AND IS AVAILABLE UPON REQUEST.

2. THE CONTRACTOR SHALL SUBMIT THEIR CONTACT INFORMATION AND A COPY OF THE APPROVED GRADING PERMIT, IF APPLICABLE, TO DOH NO LATER THAN 30 CALENDAR DAYS PRIOR TO THE START OF CONSTRUCTION.

3. THE CONTRACTOR SHALL ADHERE TO ALL THE CONDITIONS OF THE PROJECT'S NPDES PERMIT AND SWPPP. THE APPLICABLE TRAINING LOG, INSPECTION FORMS, AND CONSTRUCTION SCHEDULE DATES SHALL BE COMPLETED BY THE CONTRACTOR IN THE SWPPP. DEPENDING ON THE CONTRACTOR'S MEANS AND METHODS, THE CONTRACTOR MAY ELECT TO MODIFY THE SWPPP. AN UP-TO-DATE COPY OF THE SWPPP SHALL BE LOCATED AT THE JOBSITE AT ALL TIMES.

4. IF A NPDES PERMIT FOR CONSTRUCTION DEWATERING OR HYDROTESTING WATERS IS REQUIRED, THE CONTRACTOR SHALL BE RESPONSIBLE TO OBTAIN THE PERMIT(S) FROM THE STATE DEPARTMENT OF HEALTH CLEAN WATER BRANCH (DOH).

5. THE CONTRACTOR SHALL NOT DISCHARGE ANY TREATED EFFLUENT FROM ANY POINT SOURCES (SUCH AS DEWATERING OR HYDROTESTING EFFLUENT) INTO STATE WATER WITHOUT FIRST OBTAINING A PERMIT ISSUED BY THE DEPARTMENT OF HEALTH UNDER THE AUTHORIZATION OF THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM OF SECTION 402 OF THE CLEAN WATER ACT.

6. THE CONTRACTOR SHALL BE RESPONSIBLE TO PAY ALL CITATIONS ISSUED FOR NON-COMPLIANCE WITH THE REQUIREMENTS OF THE NPDES PERMIT(S) AND SHALL IMMEDIATELY CORRECT OR ADDRESS THE NON-CONFORMANCE AT THEIR EXPENSE.

7. THE ENGINEER WILL DEDUCT THE COST OF CITATIONS ISSUED FOR NON-COMPLIANCE FROM THE PROGRESS PAYMENT. THERE IS NO MAXIMUM LIMIT ON THE AMOUNT THAT CAN BE DEDUCTED.

## GRADING NOTES:

1. ALL GRADING WORK SHALL BE DONE IN ACCORDANCE WITH CHAPTER 20.08, AS RELATED TO SOIL EROSION AND SEDIMENT CONTROL, OF THE MAUI COUNTY CODE OF ORDINANCES, 2011, AS AMENDED.

2. EXISTING TOPOGRAPHIC INFORMATION SHOWN IS FROM A FEBRUARY 2021 SURVEY MAP PREPARED BY CONTROLPOINT SURVEYING, INC. DUE TO THE EXTENDED LENGTH OF TIME WHICH HAS LAPSED FROM THE DATE OF SURVEY, THE CONTRACTOR SHOULD EXAMINE THE SITE AND TAKE ANY MEASURES NECESSARY TO VERIFY CONDITIONS EXISTING IN THE FIELD.

3. 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.

4. ALL SLOPES AND EXPOSED AREAS SHALL BE SODDED OR PLANTED AS SOON AS FINAL GRADES HAVE BEEN ESTABLISHED. THE CONTRACTOR SHALL GRASS AND MAINTAIN ALL EXPOSED SLOPES SUCH THAT 60% COVERAGE WILL BE ACHIEVED WITHIN 30 DAYS AND 95% COVERAGE WILL BE ACHIEVED WITHIN 60 DAYS AFTER PLANTING.

5. ALL EXPOSED SLOPES SHALL BE PROTECTED WITH TEMPORARY DIVERSIONS, BERMS, AND SWALES AT THE TOP OF THE SLOPES.

6. 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 FULFILL ALL THE REQUIREMENTS OF THE GRADING ORDINANCE.

7. THE LIMITS OF THE AREA TO BE GRADED SHALL BE FLAGGED BEFORE THE COMMENCEMENT OF THE GRADING WORK.

8. 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, CHAPTER 11-55, "WATER POLLUTION CONTROL" AND CHAPTER 11-54, "WATER QUALITY STANDARDS".

9. THE CONTRACTOR SHALL REMOVE ALL SILT AND DEBRIS RESULTING FROM THEIR WORK AND DEPOSITED IN DRAINAGE FACILITIES, ROADWAYS, AND OTHER AREAS. THE COSTS INCURRED FOR ANY NECESSARY REMEDIAL ACTION BY THE CHIEF ENGINEER SHALL BE PAYABLE BY THE CONTRACTOR.

10. IF THE GRADING WORK INVOLVES CONTAMINATED SOIL, THEN ALL GRADING WORK SHALL BE DONE IN CONFORMANCE WITH APPLICABLE STATE AND FEDERAL REQUIREMENTS.

11. NON-COMPLIANCE TO ANY OF THE ABOVE REQUIREMENTS SHALL MEAN IMMEDIATE SUSPENSION OF ALL WORK, AND REMEDIAL WORK SHOULD COMMENCE IMMEDIATELY. ALL REMEDIAL WORK SHALL BE BILLED TO THE CONTRACTOR. ALL REMEDIAL WORK SHALL BE OF NO COST TO THE STATE. FURTHERMORE, VIOLATORS SHALL BE SUBJECTED TO ADMINISTRATIVE, CIVIL, AND/OR CRIMINAL PENALTIES.

## MECO NOTES:

1. LOCATION OF MECO FACILITIES:
   THE LOCATION OF MECO'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. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES TO MECO'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. CAUTION!!! ELECTRICAL HAZARD!!!
   EXISTING MECO OVERHEAD AND UNDERGROUND LINES ARE ENERGIZED AND WILL REMAIN ENERGIZED DURING CONSTRUCTION UNLESS PRIOR SPECIAL ARRANGEMENTS HAVE BEEN MADE WITH MECO. ONLY MECO 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 MECO FACILITIES, WHICH CAN RESULT IN ELECTROCUTION.

4. OVERHEAD LINES:
   STATE LAW REQUIRES THAT A WORKER AND THE LONGEST OBJECT THEY MAY CONTACT CANNOT COME CLOSER THAN A MINIMUM RADIAL CLEARANCE OF 10 FEET WHEN WORKING CLOSE TO OR UNDER ANY OVERHEAD LINES RATED 50KV AND BELOW. FOR EACH ADDITIONAL 1KV ABOVE 50KV, AN ADDITIONAL 0.4 INCH SHALL BE ADDED TO THE 10-FOOT
   CLEARANCE REQUIREMENT. THE PRECEDING INFORMATION ON LINE CLEARANCE REQUIREMENTS IS PROVIDED AS A CONVENIENCE AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE INFORMED OF AND COMPLY WITH ANY REVISIONS OR AMENDMENTS TO THE LAW.

   SHOULD THE CONTRACTOR ANTICIPATE THAT THEIR WORK WILL RESULT IN THE NEED TO ENCROACH WITHIN THE MINIMUM REQUIRED CLEARANCE AT ANY TIME, THE CONTRACTOR SHALL NOTIFY MECO AT LEAST FOUR (4) WEEKS PRIOR TO THE PLANNED ENCROACHMENT SO THAT, IF FEASIBLE, THE NECESSARY PROTECTIONS (E.G. RELOCATE, DE-ENERGIZE, OR BLANKET MECO LINES) CAN BE PUT IN PLACE. MECO'S COST OF SAFEGUARDING ITS LINES WILL BE CHARGED TO THE CONTRACTOR.

   CONTACT MECO'S ENGINEERING DEPARTMENT AT 871-2312 FOR ASSISTANCE IN IDENTIFYING AND SAFEGUARDING OVERHEAD POWER LINES.

5. POLE BRACING:
   A MINIMUM CLEARANCE OF 10 FEET MUST BE MAINTAINED WHEN EXCAVATING AROUND UTILITY POLES AND/OR THEIR ANCHOR SYSTEM TO PREVENT WEAKENING OR POLE SUPPORT FAILURE. SHOULD WORK REQUIRE EXCAVATING WITHIN 10 FEET OF A POLE AND/OR ITS ANCHOR SYSTEM, THE CONTRACTOR SHALL PROTECT, SUPPORT, SECURE, AND TAKE ALL OTHER PRECAUTIONS TO PREVENT DAMAGE TO OR LEANING OF THESE POLES. THE CONTRACTOR IS RESPONSIBLE FOR ALL ASSOCIATED COSTS TO BRACE, REPAIR, OR STRAIGHTEN POLES. ALL MEANS OF STRUCTURAL SUPPORT FOR THE POLE PROPOSED BY THE CONTRACTOR SHALL FIRST BE REVIEWED BY MECO BEFORE IMPLEMENTATION. FOR POLE BRACING INSTRUCTIONS, THE CONTRACTOR SHALL CALL THE MECO TRANSMISSION & DISTRIBUTION SUPERINTENDENT AT 871-2312 A MINIMUM OF TWO (2) WEEKS IN ADVANCE.

6. CALL HAWAII ONE CALL CENTER (1-866-423-7287) TO HAVE EXISTING UNDERGROUND LINES LOCATED BEFORE EXCAVATING.

7. CALL FOR A MECO STANDBY MAN BEFORE EXCAVATION IN THE AREA OF EXISTING UNDERGROUND ELECTRICAL CABLES. THREE (3) WORKING DAYS ADVANCE NOTICE IS REQUIRED (871-7777).

8. EXCAVATIONS:
   WHEN TRENCH EXCAVATION IS ADJACENT TO OR BENEATH MECO'S EXISTING STRUCTURES OR FACILITIES, THE CONTRACTOR IS RESPONSIBLE FOR:

   a. SHEETING AND BRACING THE EXCAVATION AND STABILIZING THE EXISTING GROUND TO RENDER IT SAFE AND SECURE AND TO PREVENT POSSIBLE SLIDES, CAVE-INS, AND SETTLEMENTS.

   b. PROPERLY SUPPORTING EXISTING STRUCTURES OR FACILITIES WITH BEAMS, STRUTS, OR UNDER-PINNINGS TO FULLY PROTECT IT FROM DAMAGE.

   c. BACKFILLING WITH PROPER BACKFILL MATERIAL INCLUDING SPECIAL THERMAL BACKFILL WHERE EXISTING (REFER TO ENGINEERING DEPARTMENT FOR THERMAL BACKFILL SPECIFICATIONS).

9. DAMAGE TO MECO FACILITIES:
   THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL MECO SURFACE AND SUBSURFACE UTILITIES AND SHALL BE RESPONSIBLE FOR ANY DAMAGES TO MECO'S FACILITIES AS A RESULT OF THEIR OPERATIONS. THE CONTRACTOR SHALL IMMEDIATELY REPORT SUCH DAMAGES TO MECO'S TROUBLE DISPATCHER AT 871-7777. REPAIR WORK SHALL BE DONE BY MECO OR BY THE CONTRACTOR UNDER MECO'S SUPERVISION. COSTS FOR DAMAGES TO MECO'S FACILITIES SHALL BE BORNE BY THE CONTRACTOR.

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

GENERAL NOTES - 2

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-003
of 084 Sheets

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| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 005 | 084 |

## ABBREVIATIONS:

| | |
|---|---|
| @ | AT |
| Δ | DELTA |
| Δ/2 | HALF DELTA |
| AASHTO | AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS |
| ABUT | ABUTMENT |
| AC | ASPHALT CONCRETE |
| ADA | AMERICANS WITH DISABILITIES ACT |
| ADAAG | AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES |
| ARV | AIR RELEASE VALVE |
| ASTM | AMERICAN SOCIETY FOR TESTING AND MATERIALS |
| AVE | AVENUE |
| AZ | AZIMUTH |
| BL | BASELINE |
| BC | BOTTOM CURB |
| BFP | BACK FLOW PREVENTER |
| BMP | BEST MANAGEMENT PRACTICES |
| BOT | BOTTOM |
| BRG | BEARING |
| BVC | BEGINNING OF VERTICAL CURVE |
| BW | BOTTOM WALL |
| CL | CENTERLINE |
| Ch | CHORD |
| CATV | CABLE TV |
| CB | CATCH BASIN |
| CC | CONCRETE CURB |
| CFS | CUBIC FEET PER SECOND |
| CLF | CHAIN LINK FENCE |
| CL | CLASS |
| CLR | CLEAR |
| cmu | EXISTING CONCRETE MASONRY UNIT |
| CMU | CONCRETE MASONRY UNIT |
| CMP | CORRUGATED METAL PIPE |
| CO | CLEANOUT |
| CONST | CONSTRUCTION |
| CONT | CONTINUOUS |
| COL | COLUMN |
| conc | EXISTING CONCRETE |
| CONC | CONCRETE |
| CONN | CONNECT OR CONNECTION |
| crm | EXISTING CONCRETE RUBBLE MASONRY |
| CRM | CONCRETE RUBBLE MASONRY |
| D | DRAIN |
| DET | DETAIL |
| DI | DRAIN INLET/ DUCTILE IRON |
| DIA | DIAMETER |
| DWG | DRAWINGS |
| DWS | DEPARTMENT OF WATER SUPPLY |
| DWY | DRIVEWAY |
| EA | EACH |
| elec | EXISTING ELECTRIC |
| ELEC/E | ELECTRIC OR ELECTRICAL |
| EF | EACH FACE |
| ELEV | ELEVATION |
| ep | EXISTING EDGE OF PAVEMENT |
| EP | EDGE OF PAVEMENT |
| EQ | EQUAL, EQUALLY |
| ES | EDGE OF SHOULDER |
| ESMT | EASEMENT |
| EXIST/exist | EXISTING |
| EVC | END OF VERTICAL CURVE |
| fh | EXISTING FIRE HYDRANT |
| FHWA | FEDERAL HIGHWAY ADMINISTRATION |
| FND | FOUND |
| FTG | FOOTING |
| G | GUTTER |
| GA | GAUGE |
| GALV | GALVANIZED |
| GDI | GRATED DRAIN INLET |
| GRD | GROUND |
| GP | GUARD POST/ GATE POST |
| GW | GUY WIRE |
| ID | INNER DIAMETER |
| H | HEIGHT |
| HB | HOSEBIB |
| HDOT | STATE OF HAWAII DEPARTMENT OF TRANSPORTATION |
| HDPE | HIGH DENSITY POLYETHYLENE |
| HMA | HOT MIX ASPHALT |
| HORIZ | HORIZONTAL |
| HP | HIGH POINT |
| HS | HIGH STRENGTH |
| HWY | HIGHWAY |
| IV | IRRIGATION VALVE |
| INV | INVERT |
| L | LENGTH |
| Lc | LENGTH OF CURVE |
| LF | LINEAR FOOT |
| LT | LEFT |
| MAG | MAGNETIC |
| MAX | MAXIMUM |
| MB | MAIL BOX |
| MECO | MAUI ELECTRIC COMPANY |
| MH | MANHOLE |
| MIN | MINIMUM |
| MISC | MISCELLANEOUS |
| MJ | MECHANICAL JOINT |
| ML | MATCH LINE |
| MON | MONUMENT |
| MUTCD | MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES |
| NIC | NOT IN CONTRACT |
| NO. | NUMBER |
| O/H | OVERHEAD |
| O/S | OFFSET |
| OC | ON CENTER |
| OD | OUTER DIAMETER |
| OM | OBJECT MARKER |
| OSHA | OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION |
| PL | PROPERTY LINE |
| P/T | POST-TENSIONING |
| PAVT | PAVEMENT |
| PBX | PANEL BOX/PULL BOX |
| PC | POINT OF CURVATURE |
| PCC | POINT OF COMPOUND CURVE |
| PGL | PROFILE GRADE LINE |
| PI | POINT OF INTERSECTION |
| PIVC | POINT OF INTERSECTION (VERTICAL CURVE) |
| PL | PLATE |
| POC | POINT ON CURVE |
| PPB | PEDESTRIAN PUSH BUTTON |
| PRVC | POINT OF REVERSING CURVE |
| PT | POINT OF TANGENCY |
| PVC | POLYVINYL CHLORIDE |
| PVI | POINT VERTICAL INTERSECTION |
| R | RADIUS |
| r/w | EXISTING RIGHT OF WAY |
| REF | REFLECTOR POST |
| REINF | REINFORCING STEEL |
| RF | REAR FACE |
| RM | REFLECTIVE MARKER |
| RPM | REFLECTIVE PAVEMENT MARKING |
| RT | RIGHT |
| S | SEWER/ SLOPE/ SOUTH/ SPREAD |
| S/W | SIDEWALK |
| SE | SLOPE EXISTING |
| SHT | SHEET |
| SHDR | SHOULDER |
| SDMH | STORM DRAIN MANHOLE |
| SF | SQUARE FEET |
| SL | STREET LIGHT |
| SPC | SPACING |
| SPCS | SPACES |
| ST | STREET |
| STA | STATION |
| STD | STANDARD |
| SYM | SYMMETRICAL |
| T | TANGENT |
| T&B | TOP & BOTTOM |
| TC | TOP CURB |
| tel. | EXISTING TELEPHONE |
| TEL | TELEPHONE |
| TEMP | TEMPORARY |
| THK | THICK |
| TMK | TAX MAP KEY |
| TP | TOP PIPE |
| TS | TOP STEM/ TOP SIDEWALK |
| TW | TOP WALL |
| TX | TEXAS |
| TYP | TYPICAL |
| VPI | VERTICAL POINT OF INTERSECTION |

## SYMBOLS

### EXISTING

- CONTROL POINT
- CONCRETE PAVEMENT/SLAB
- ROAD OR TRAIL
- BUILDING
- WM — WATER METER
- O/H — OVERHEAD ELECTRICAL LINE
- U.P. — ELECTRICAL/TELEPHONE POLE
- 10 — MAJOR CONTOUR LINE
- MINOR CONTOUR LINE
- 12.13 — SPOT ELEVATION
- POST
- TREE D= H= 40.06 — TREE WITH "D" TRUNK DIAMETER AND "H" HEIGHT
- H.B. — HOSE BIBB

### NEW

- CONCRETE
- CRM
- TO BE REMOVED
- AC PAVEMENT
- 190 — MAJOR CONTOUR
- 185 — MINOR CONTOUR

## CROSS REFERENCING SYSTEM

B1
C-040
SECTION IDENTIFICATION NUMBER
DRAWING NUMBER OF SHEET ON WHICH SECTION IS SHOWN

SYMBOL WHERE SECTION IS TAKEN

DETAIL TITLE
SCALE: 1" = 20'
C-020
B1
C-040
DRAWING IDENTIFICATION NUMBER
DRAWING NUMBER WHERE DETAIL IS SHOWN
DRAWING NUMBER OF WHERE DETAIL APPLIES

SUBTITLE FOR DETAIL DRAWING

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

LEGEND AND ABBREVIATIONS

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-004
of 084 Sheets

PROJ. NO.: 2020040
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| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR–0360(015) | 2026 | 006 | 084 |

## WATER POLLUTION & EROSION CONTROL:

A. GENERAL:

1. SEE SPECIAL PROVISION 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, "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 SOIL EROSION STANDARDS AND GUIDELINES" 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 DETER 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 21 CALENDAR DAYS OF DATE OF AWARD. 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.

## WATER POLLUTION & EROSION CONTROL (CONTINUED):

C. EROSION AND SEDIMENT CONTROL INSPECTION AND MAINTENANCE PRACTICES:

1. FOR PROJECTS WITH AN NPDES PERMIT FOR CONSTRUCTION ACTIVITIES, INSPECT AT THE FOLLOWING INTERVALS.

   a. 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.

   b. 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, 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.

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.

## WATER POLLUTION & EROSION CONTROL (CONTINUED):

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 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
      DETERGENTS
      PAINTS (ENAMEL AND LATEX)
      METAL STUDS
      TAR
      FERTILIZERS
      PETROLEUM BASED PRODUCT
      CLEANING SOLVENTS
      WOOD
      MASONRY BLOCK
      HERBICIDES AND PESTICIDES
      CURING COMPOUNDS
      ADHESIVES

   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. ALL MATERIALS STORED ONSITE SHALL BE KEPT 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 COMPLETELY UP 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 MANUFACTURER'S INSTRUCTIONS AND LOCAL AND STATE REGULATIONS.

## WATER POLLUTION & EROSION CONTROL (CONTINUED):

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 MANUFACTURER'S 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.

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

EROSION CONTROL NOTES - 1

Date:
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| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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| HAWAII | HAW. | BR–0360(015) | 2026 | 007 | 084 |

## WATER POLLUTION & EROSION CONTROL (CONTINUED):

4. SPILL CONTROL PLAN

   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.

E. PERMIT REQUIREMENTS:

1. A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR CONSTRUCTION ACTIVITIES OF ONE ACRE OR MORE OF DISTURBED AREA IS REQUIRED FOR THIS PROJECT. IF THE CONTRACTOR REQUIRES EXTRA LAND DISTURBANCE, INCLUDING STAGING AND STORAGE AREAS, THAT IS NOT COVERED BY THE NPDES PERMIT OBTAINED BY THE COUNTY, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THE REQUIRED NPDES CONSTRUCTION ACTIVITIES PERMIT TO COVER THIS ADDITIONAL DISTURBED AREA. SEE HAWAII ADMINISTRATIVE RULES CHAPTER 11-55, APPENDIX C FOR DEFINITION OF LAND DISTURBANCE. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE APPLICABLE NPDES PERMIT DOCUMENTS ON THE BID PACKAGE COMPACT DISC.

2. COMPLY WITH ALL APPLICABLE STATE AND FEDERAL PERMIT CONDITIONS. PERMITS MAY INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:

   a. NPDES PERMIT FOR CONSTRUCTION ACTIVITIES

   b. NPDES PERMIT FOR CONSTRUCTION DEWATERING

NPDES PERMIT FOR HYDROTESTING WATERS

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. SUPPLEMENTAL BMP SHEETS ARE LOCATED AT HTTP://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-6 EARTH DIKE, SWALES, AND DITCHES

## WATER POLLUTION & EROSION CONTROL (CONTINUED):

4. INCORPORATE APPLICABLE SITE MANAGEMENT BMP

   a. SM-1 EMPLOYEE TRAINING
   b. SM-2 MATERIAL STORAGE AND HANDLING
   c. SM-3 STOCKPILE MANAGEMENT
   d. SM-6 SOLID WASTE MANAGEMENT
   e. SM-7 SANITARY WASTE MANAGEMENT
   f. SM-9 HAZARDOUS MATERIALS AND 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. SM16 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 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

## BEST MANAGEMENT PRACTICES - NOTES:

1. BEST MANAGEMENT PRACTICES (BMP) PRESENTED ON THE EROSION CONTROL PLANS ARE FOR SUGGESTION ONLY. THE PURPOSE OF BMPs IS TO PREVENT THE DISCHARGE OF POLLUTANTS, RESULTING FROM SEDIMENT LADEN STORM WATER RUNOFF, INTO RECEIVING WATER. SOIL PARTICLES RESULTING FROM LAND DISTURBING ACTIVITIES, SHALL BE PREVENTED FROM ENTERING ANY WATER OF HAWAII. FOR THIS REASON THE CONTRACTOR SHALL DEVELOP A SITE-SPECIFIC BEST MANAGEMENT PRACTICES PLAN FOR THE PROJECT AND OBTAIN ITS APPROVAL BY THE ENGINEER OR THEIR REPRESENTATIVE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES. EROSION AND SEDIMENT CONTROL SHALL BE IN COMPLIANCE WITH ALL PROVISIONS DESCRIBED IN SECTION 209 - WATER POLLUTION AND EROSION CONTROL, AND THE CURRENT HDOT "CONSTRUCTION BEST MANAGEMENT PRACTICES FIELD MANUAL".

2. IF THE CONTRACTOR HAS A STAGING/STOCKPILE AREA LOCATED OUTSIDE OF THE PROJECT LIMITS, THE CONTRACTOR SHALL BE RESPONSIBLE TO OBTAIN AND PAY FOR ANY REQUIRED LAND USE AND/OR ENVIRONMENTAL PERMITS PRIOR TO THE USE OF THESE AREAS.

3. THE CONTRACTOR SHALL INSTALL SILT FENCES, DIVERSION BERMS, SAND BAGS, DRAIN INLET PROTECTION/CATCH BASIN FILTERS, STABILIZED CONSTRUCTION INGRESS/EGRESS FEATURES, AND OTHER METHODS AS REQUIRED AS SOON AS PRACTICABLE PRIOR TO COMMENCEMENT OF CONSTRUCTION WORK FOR SEDIMENT RUNOFF CONTROL. THE CONTRACTOR SHALL MAINTAIN THESE EROSION CONTROL MEASURES AS REQUIRED TO ENSURE THEIR EFFECTIVENESS.

4. STORM DRAIN INLET PROTECTION MUST BE USED THROUGHOUT THE JOBSITE AND AREAS OUTSIDE THE JOBSITE WHERE CONSTRUCTION ACTIVITY MAY TRACK SEDIMENT ONTO PAVED AREAS. STORM DRAIN INLET PROTECTION MUST BE PLACED AT STORM DRAINS, DROP INLETS, CURB INLETS, OR WHEREVER RUNOFF MAY OCCUR. AS THE PROJECT PROGRESSES, INLET PROTECTION MAY HAVE TO BE ADDED AS DETERMINED BY THE ENGINEER OR THEIR REPRESENTATIVE.

5. THE CONTRACTOR SHALL ADJUST DISTANCES AS NECESSARY TO ENSURE EFFECTIVENESS OF FILTER BARRIERS AND SILT FENCES.

6. THE CONTRACTOR SHALL PROVIDE SILT FENCE AND STABILIZED CONSTRUCTION ENTRANCE FOR EACH INGRESS/EGRESS POINT UNLESS AUTHORIZED OTHERWISE BY THE ENGINEER OR THEIR REPRESENTATIVE.

7. MEASURES TO CONTROL EROSION AND OTHER POLLUTANTS SHALL BE IN PLACE BEFORE ANY EARTHWORK OR DEMOLITION IS INITIATED.

## BEST MANAGEMENT PRACTICES - NOTES (CONTINUED):

8. SLOPES AND EXPOSED AREAS SHALL BE WATERED, MULCHED, SODDED, OR PLANTED AS SOON AS BACKFILL AND FINAL GRADING HAS BEEN ESTABLISHED IN ORDER TO CONTROL DUST, EROSION, AND SEDIMENTATION. PLANTING SHALL NOT BE DELAYED UNTIL ALL BACKFILLING AND FINAL GRADING HAS BEEN COMPLETED. BACKFILLING SHALL BE CONTINUOUS AND ANY AREA WITHIN WHICH WORK HAS BEEN INTERRUPTED OR DELAYED SHALL BE STABILIZED. UNLESS INDICATED OTHERWISE ON THE PLANS OR IN THE SPECIFICATIONS, PAYMENT FOR PLANTING OR GRASSING REQUIRED UNDER THIS ITEM (OTHER THAN SPECIFIED FOR LANDSCAPING) SHALL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED INCIDENTAL AND INCLUDED IN THE PRICE BID FOR EXCAVATION AND EMBANKMENT OR OTHER RELEVANT BID ITEM.

9. AT THE END OF THE EARTHWORK OPERATIONS, EXISTING INLETS AND MANHOLES SURROUNDING THE PROJECT SITE SHALL BE INSPECTED AND ANY ACCUMULATED SEDIMENT AND DEBRIS FOUND IN THE STRUCTURES SHALL BE REMOVED. FLUSHING INTO THE INLETS AND MANHOLES IS NOT PERMITTED.

10. TEMPORARY BMPs SHALL NOT BE REMOVED UNTIL ALL PERMANENT EROSION CONTROLS ARE IN PLACE AND ESTABLISHED.

11. ANY BACKFILLED OR EXPOSED AREAS WHICH WILL BE LEFT IDLE FOR FOURTEEN (14) CALENDAR DAYS OR MORE SHALL BE MULCHED OR STABILIZED.

12. WASHING DOWN OF CONSTRUCTION EQUIPMENT AND VEHICLES AND WASH OUT OF CONCRETE TRUCK DRUMS ON SITE IS PROHIBITED. WASH WATER FROM WASH DOWNS SHALL NOT BE DISCHARGED INTO DRAINAGE SYSTEMS NOR WATER COURSES.

13. THE CONTRACTOR SHALL PROVIDE REQUIRED INFORMATION TO THE ENGINEER OR THEIR REPRESENTATIVE AND DOH FOR DISCHARGES OF STORM WATER ASSOCIATED WITH CONSTRUCTION ACTIVITY WITHIN THIRTY (30) DAYS OF CONTRACT EXECUTION IN ACCORDANCE WITH SECTION 209.

14. THE CONTRACTOR SHALL USE THE APPROPRIATE BMPs, AS REQURIED OR SHOWN ON THE EROSION CONTROL PLAN SHEET AND DESCRIBED IN THE CONSTRUCTION BEST MANAGEMENT PRACTICES FIELD MANUAL FOR RUNOFF CONTROL, TO THE APPROVAL OF THE ENGINEER OR THEIR REPRESENTATIVE AND DOH.

15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY PRECAUTION FOR THE HEALTH AND SAFETY OF THEIR EMPLOYEES AT THE PROJECT WHERE CONTAMINATED WATER OR OTHER HAZARDOUS MATERIALS ARE PRESENT AT THE PROJECT SITE.

16. WITHIN THE EROSION AND SEDIMENT CONTROL PLAN, THE CONTRACTOR SHALL ESTABLISH AN APPROVED MONITORING PLAN TO VERIFY THIS REQUIREMENT. THE SITE-SPECIFIC BMP PLAN SHOULD BE REFERRED TO FREQUENTLY DURING PROJECT WORK AND REVISED WHEN SITE CONDITIONS OR INFORMATION CHANGES. SITE HOUSECLEANING TO PREVENT INDISCRIMINATE STORAGE OF CONSTRUCTION MATERIALS OR WASTE IS A REQUIREMENT TASKED OR CHARGED TO THE CONTRACTOR.

17. MECHANIZED EQUIPMENT AND CONSTRUCTION MATERIALS SHALL BE CLEAN, UNCONTAMINATED, AND FREE OF DELETERIOUS SUBSTANCES, INCLUDING TOXIC CHEMICALS AND CLAY-COATED MATERIAL.

18. WEEKLY SWEEPS SHALL BE CONDUCTED AT ALL CONSTRUCTION ENTRANCES AND EXITS. HOWEVER, IF SEDIMENT BUILD UP IS HEAVY, DAILY SWEEPS SHALL BE CONDUCTED. RESIDUAL ASPHALT OR CONCRETE PRODUCED DURING THE JOB SHALL BE IMMEDIATELY SWEPT, CONTAINED, AND MANAGED.

19. CONCRETE WASHOUTS SHALL BE GENERATED IN THE STAGING AREAS OR THE JOBSITE. WASHOUT AREAS SHALL BE LINED WITH GEOTEXTILE FABRIC OR PLASTIC SHEETING OR CONTAINED IN APPROVED WASHOUT BINS.

20. SAW CUTTING WASTE SHALL BE VACUUMED WITH A SHOP VACUUM.

21. WATER TRUCKS SHALL BE CIRCULATED THROUGHOUT THE JOBSITE.

22. FUELING TRUCKS SHALL BE USED TO REFUEL VEHICLES AND HEAVY EQUIPMENT AT THE PROJECT LOCATION. FUELING TRUCKS SHALL ALSO STORE AND DISPENSE OTHER REQUIRED LUBRICANTS AND FUELS. IN AN EVENT THE FUELING TRUCK REMAINS AT THE PROJECT SITE, THE TRUCK SHALL BE POSITIONED IN A SAFE ENVIRONMENT CLEAR FROM VEHICULAR AND OPERATIONAL TRAFFIC.

23. IF NECESSARY, ABSORBENT PADS AND DRIP PANS SHALL BE PLACED UNDER THE EQUIPMENT.

24. LITTER SHALL BE PICKED UP AND DISPOSED OF ON A DAILY BASIS.

25. PORTABLE TOILETS SHALL BE PLACED THROUGHOUT THE JOBSITE.

26. ALL POINTS OF EGRESS AND INGRESS TO A SITE SHALL BE PROTECTED WITH A STABILIZED CONSTRUCTION ENTRANCE.

## BEST MANAGEMENT PRACTICES - NOTES (CONTINUED):

27. STOCKPILES SHALL NOT BE LOCATED IN DRAINAGE WAYS OR OTHER AREAS OF CONCENTRATED FLOWS. DURING PERIODS OF WET WEATHER, SUCH AS THE RAINY SEASON, STOCKPILES SHALL BE STABILIZED. COVER STOCKPILES IN PLASTIC WHEN NOT IN USE.

28. DUST CONTROL SHOULD BE APPLIED TO REDUCE DUST EMISSIONS. CONTRACTOR TO SPRAY WATER AS NECESSARY.

29. DISTURBED AREAS WHICH ARE AT FINAL GRADE OR WILL NOT BE WORKED ON FOR LONGER THAN 14 DAYS SHALL BE STABILIZED.

30. SEDIMENT TRAPPING DEVICES SUCH AS FENCES, TRAPS, BASINS, OR BARRIERS SHALL BE USED DOWN SLOPE OF ALL DISTURBED AREAS AND AROUND THE BASE OF ALL MATERIAL STOCKPILES. COVER STOCKPILES WITH PLASTIC.

31. SURFACE FLOW FROM ABOVE AN EXPOSED SLOPE SHALL NOT BE ALLOWED TO FLOW OVER THE SLOPE WITHOUT PROTECTION. SLOPE PROTECTION SHALL BE USED ON AREAS WITH SLOPES GREATER THAN 50% AND ON AREAS OF MODERATE SLOPES THAT ARE PRONE TO EROSION. SLOPE PROTECTION SHALL ALSO BE USED ON GROUND SURFACES AND STOCKPILES EXPOSED DURING WET WEATHER. ANCHOR PLASTIC OVER RETAINING WALL EXCAVATION.

32. ALL STORM DRAIN INLETS ON SITE AND THOSE OFFSITE WHICH MAY RECEIVE RUNOFF FROM THE SITE SHALL USE AN INLET PROTECTION DEVICE.

33. ALL DISTURBED AREAS SHALL BE PERMANENTLY STABILIZED PRIOR TO REMOVING EROSION AND SEDIMENT MEASURES. ALL TEMPORARY EROSION AND SEDIMENT MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION OR AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED. TRAPPED SEDIMENT AND AREAS OF DISTURBED SOIL WHICH RESULT FROM THE REMOVAL OF THE TEMPORARY MEASURES SHALL BE IMMEDIATELY PERMANENTLY STABILIZED.

34. AREAS TO BE PERMANENTLY SEEDED/MULCHED WITHIN 14 DAYS OR UPON FINAL GRADE EXCEPT HOUSE AREAS WHICH WILL BE FORMED AND SLABBED WITHIN 14 DAYS.

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

EROSION CONTROL NOTES - 2

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET C–006
of 084 Sheets

PROJ. NO.: 2020040
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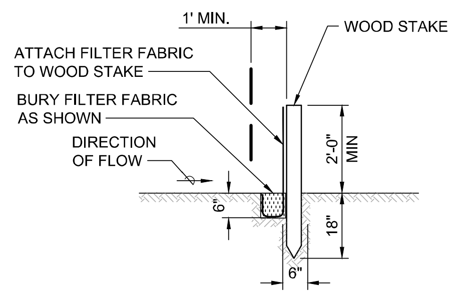
| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR–0360(015) | 2026 | 008 | 084 |




## SILT FENCE 1
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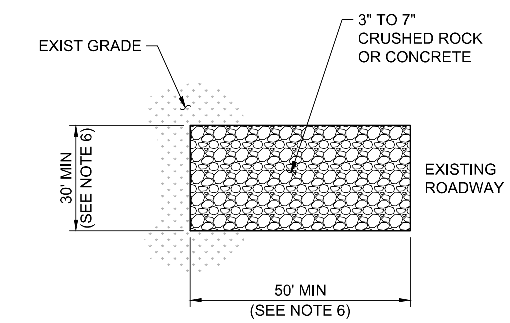
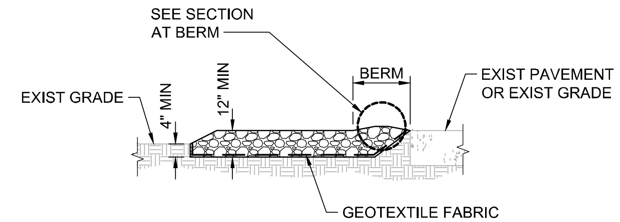



PLAN

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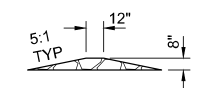
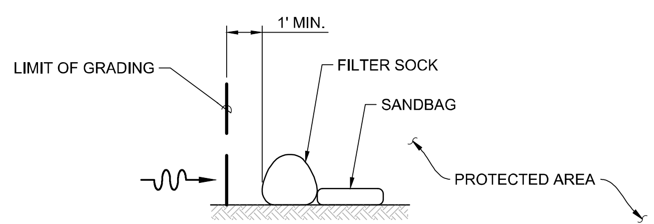



SECTION AT BERM

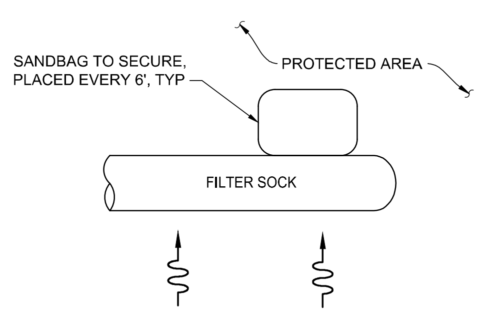
## STABILIZED CONSTRUCTION ENTRANCE 2
NOT TO SCALE

NOTES:

1. LOCATE THE STABILIZED CONSTRUCTION ENTRANCE AS NEEDED FOR CONSTRUCTION OPERATIONS AND REGULATORY COMPLIANCE.
2. USE DESIGNATED STABILIZED ENTRANCE(S) FOR ALL CONSTRUCTION TRAFFIC.
3. CLEAN SEDIMENT FROM VEHICLES PRIOR TO ENTRANCE ONTO A PUBLIC ROADWAY. WASH VEHICLES ON AN AREA STABILIZED WITH CRUSHED STONE OR AGGREGATE WITH DRAINAGE DIRECTED AWAY FROM BOTH THE STREET AND THE STABILIZED ENTRANCE. PREVENT ALL SEDIMENT FROM ENTERING ANY STORM DRAIN, DITCH OR WATER COURSE USING ADDITIONAL BMP'S AND APPROVED METHODS.
4. MAINTAIN THE ENTRANCE IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PAVED SURFACES. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR REPLACEMENT OF TOP SURFACING AS CONDITIONS DEMAND. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PAVED SURFACES MUST BE REMOVED IMMEDIATELY.
5. REMOVE THE ENTRANCE AT THE END OF THE CONSTRUCTION AND RESTORE AREA.
6. THE CONTRACTOR SHALL DEVELOP A SITE SPECIFIC BMP PLAN FOR THE VARIOUS PHASES OF CONSTRUCTION REQUIRED FOR THE PROJECT. THE CONTRACTOR SHALL PROVIDE THE MINIMUM DIMENSIONS FOR THE STABILIZED CONSTRUCTION ENTRANCE SHOWN IN THE DETAIL UNLESS SITE CONSTRAINTS DO NOT ALLOW THE MINIMUM DIMENSIONS TO BE PROVIDED. IN CIRCUMSTANCES WHERE THE MINIMUM DIMENSIONS CANNOT BE PROVIDED THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND PROVIDE THE MAXIMUM SIZE STABILIZED CONSTRUCTION ENTRANCE POSSIBLE.




SECTION

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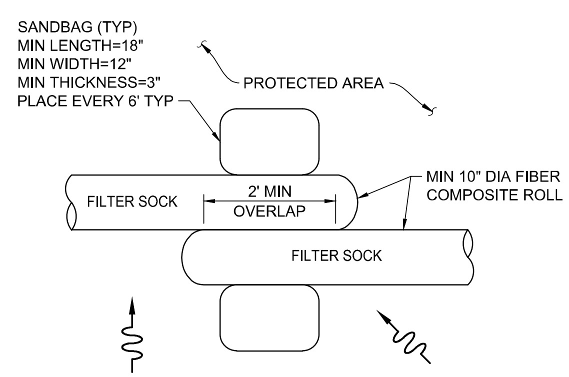


OVERLAP

## COMPOST FILTER SOCK 3
NOT TO SCALE

NOTES:

1. OVERLAP ENDS OF FIBER COMPOSITE ROLL A MINIMUM OF 2 FEET.
2. THE CONTRACTOR SHALL REMOVE ANY DEBRIS IN THE PATH OF THE FIBER COMPOSITE ROLL TO ENSURE CONTACT WITH THE GROUND.
3. REMOVE ACCUMULATED SEDIMENT WITH DEPTH REACHES 1/2 OF BARRIER HEIGHT.
4. AT COMPLETION OF THE PROJECT ALL FIBER COMPOSITE ROLLS INCLUDING THE COMPOST MATERIAL SHALL BE REMOVED FROM THE SITE AND DISPOSED OF PROPERLY.
5. FIBER COMPOSITE ROLL SHALL NOT CONTAIN ORGANIC OR COMPOST MATERIAL THAT COULD CONTRIBUTE NUTRIENTS IN CONCENTRATIONS THAT WOULD VIOLATE STATE WATER QUALITY STANDARDS.
6. THE CONTRACTOR SHALL NOT PLACE FIBER COMPOSITE ROLLS ON SLOPES GREATER THAN 2H:1V (HORIZONTAL TO VERTICAL).

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COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

EROSION CONTROL DETAILS

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C–007
of 084 Sheets

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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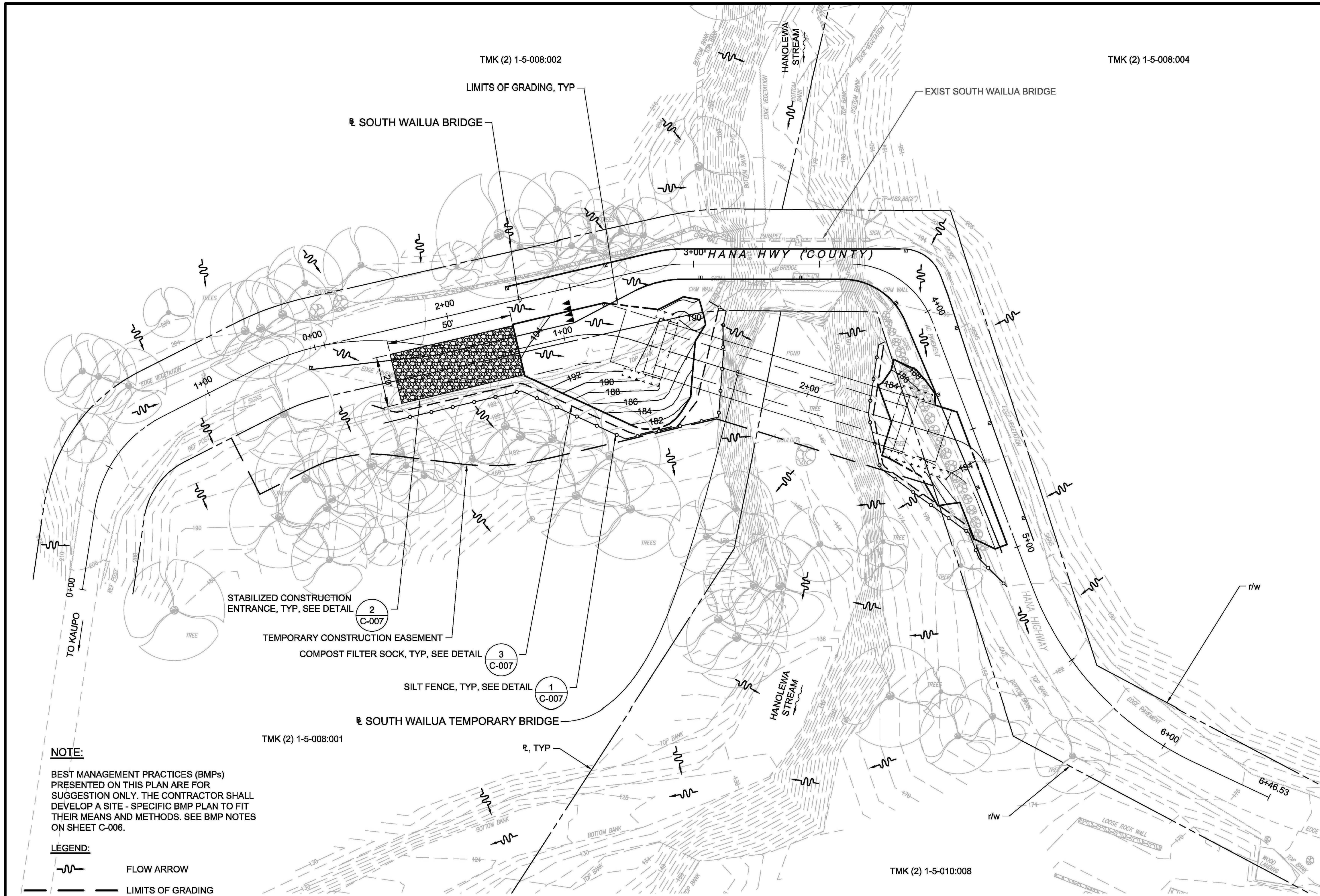


NOTE:

BEST MANAGEMENT PRACTICES (BMPs) PRESENTED ON THIS PLAN ARE FOR SUGGESTION ONLY. THE CONTRACTOR SHALL DEVELOP A SITE - SPECIFIC BMP PLAN TO FIT THEIR MEANS AND METHODS. SEE BMP NOTES ON SHEET C-006.

LEGEND:

- FLOW ARROW
- LIMITS OF GRADING
- SILT FENCE, SEE SHEET C-007
- COMPOST FILTER SOCK, SEE SHEET C-007
- 10 EXISTING MAJOR CONTOUR LINE
- EXISTING MINOR CONTOUR LINE
- 190 PROPOSED MAJOR CONTOUR LINE
- 185 PROPOSED MINOR CONTOUR LINE

## SOUTH WAILUA TEMPORARY BRIDGE EROSION CONTROL PLAN

NORTH

SCALE: 1" = 20'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY EROSION CONTROL PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-008
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 5:58pm
CAD File Name: C:\pwworking\west01\d1900569\C-009 - South Wailua Temporary Erosion Control Plan.dwg

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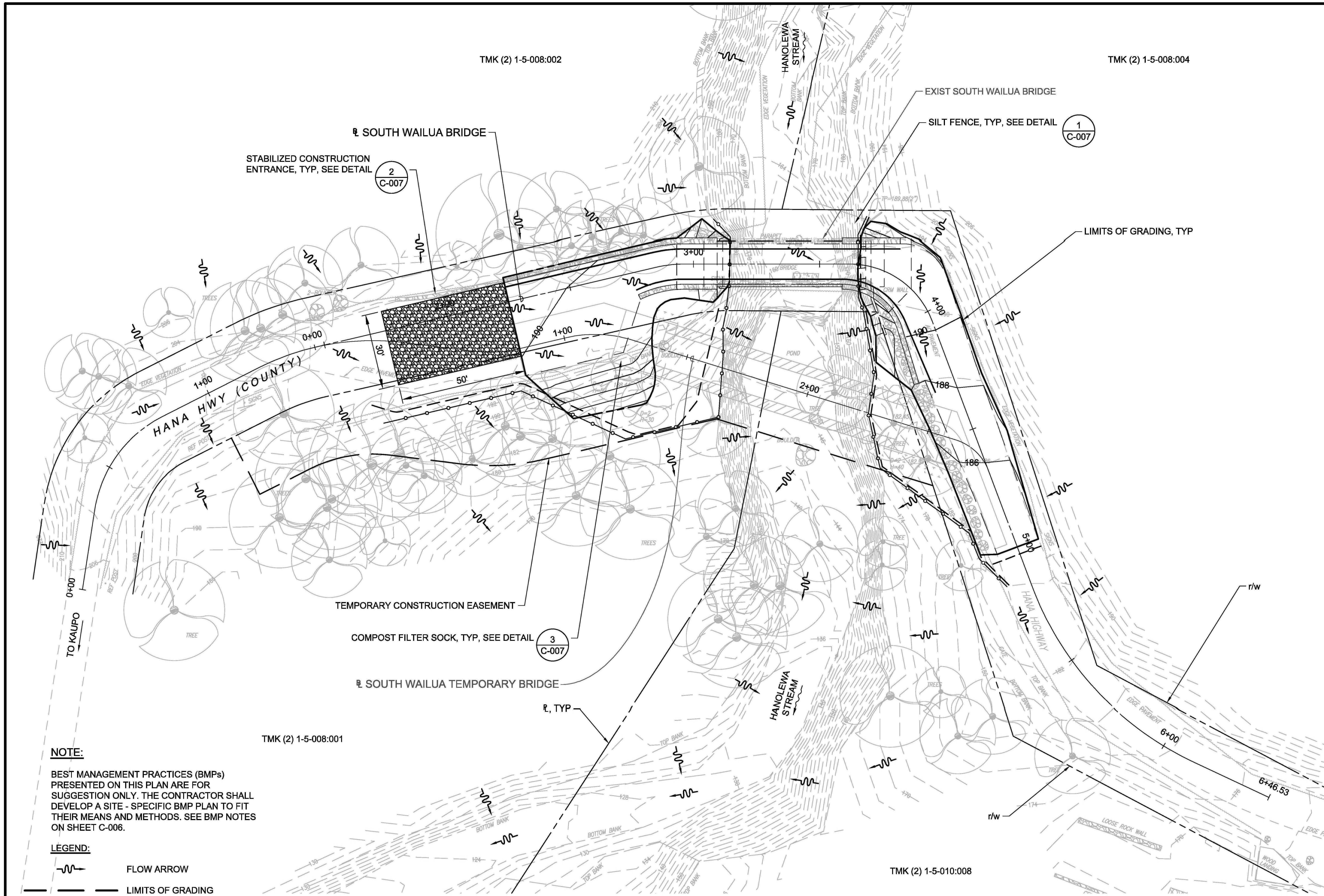


NOTE:

BEST MANAGEMENT PRACTICES (BMPs) PRESENTED ON THIS PLAN ARE FOR SUGGESTION ONLY. THE CONTRACTOR SHALL DEVELOP A SITE - SPECIFIC BMP PLAN TO FIT THEIR MEANS AND METHODS. SEE BMP NOTES ON SHEET C-006.

LEGEND:

- FLOW ARROW
- LIMITS OF GRADING
- SILT FENCE, SEE SHEET C-007
- COMPOST FILTER SOCK, SEE SHEET C-007
- 10 EXISTING MAJOR CONTOUR LINE
- EXISTING MINOR CONTOUR LINE
- 190 PROPOSED MAJOR CONTOUR LINE
- 185 PROPOSED MINOR CONTOUR LINE

# SOUTH WAILUA PERMANENT BRIDGE EROSION CONTROL PLAN

NORTH

SCALE: 1" = 20'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE EROSION CONTROL PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET C-009
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 5:59pm
CAD File Name: C:\pwworking\west01\d1900569\C-010 - South Wailua Permanent Erosion Control Plan.dwg

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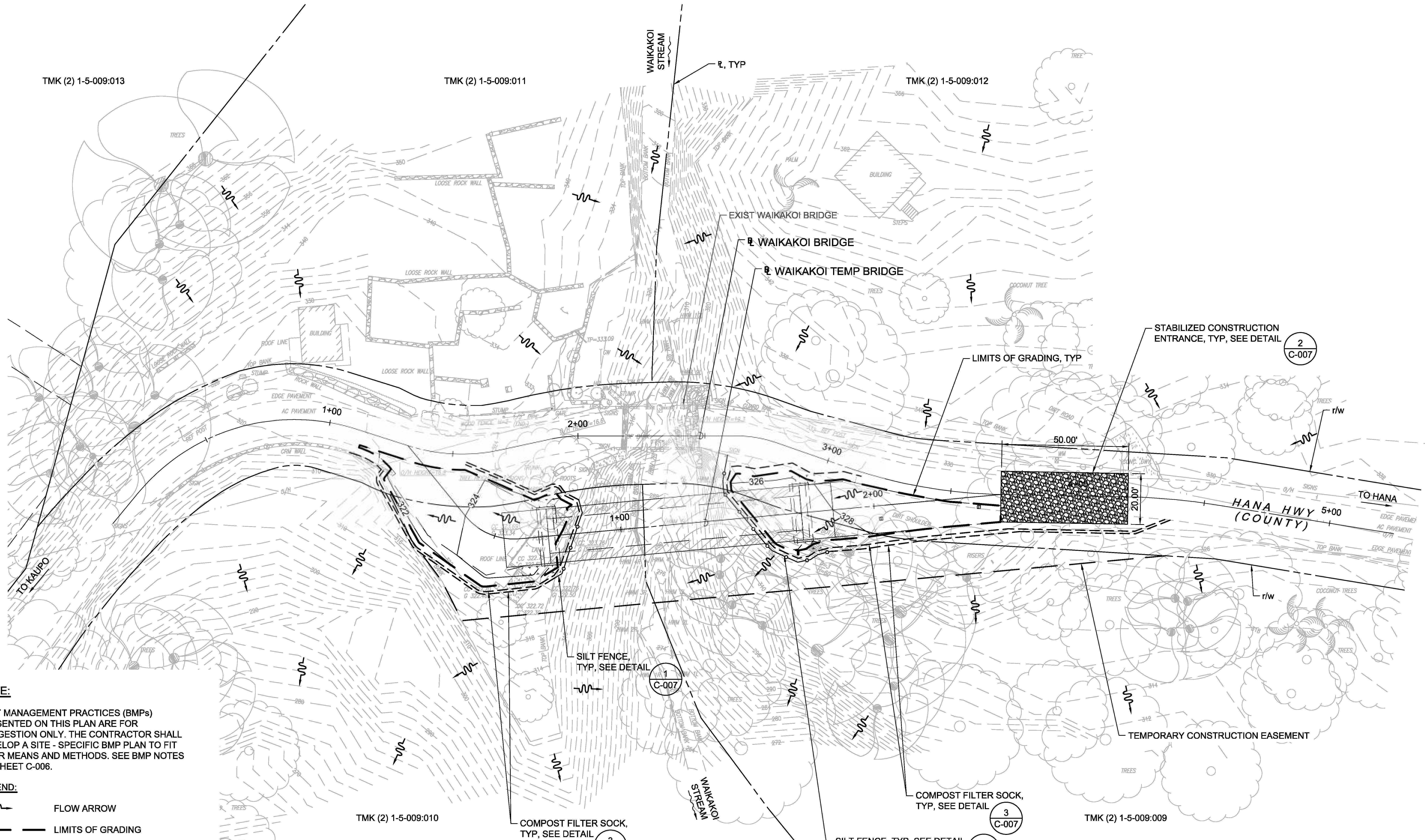


NOTE:

BEST MANAGEMENT PRACTICES (BMPs) PRESENTED ON THIS PLAN ARE FOR SUGGESTION ONLY. THE CONTRACTOR SHALL DEVELOP A SITE - SPECIFIC BMP PLAN TO FIT THEIR MEANS AND METHODS. SEE BMP NOTES ON SHEET C-006.

LEGEND:

- FLOW ARROW
- LIMITS OF GRADING
- SILT FENCE, SEE SHEET C-007
- COMPOST FILTER SOCK, SEE SHEET C-007
- EXISTING MAJOR CONTOUR LINE (10)
- EXISTING MINOR CONTOUR LINE
- PROPOSED MAJOR CONTOUR LINE (190)
- PROPOSED MINOR CONTOUR LINE (185)

## WAIKAKOI TEMPORARY BRIDGE EROSION CONTROL PLAN

SCALE: 1" = 20'

NORTH

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI TEMPORARY BRIDGE EROSION CONTROL PLAN

Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

SHEET C–010 of 084 Sheets

PROJ. NO.: 2020040
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CAD File Name: C:\pwworking\west01\d1900569\C-011 – Waikakoi Temporary Erosion Control Plan.dwg

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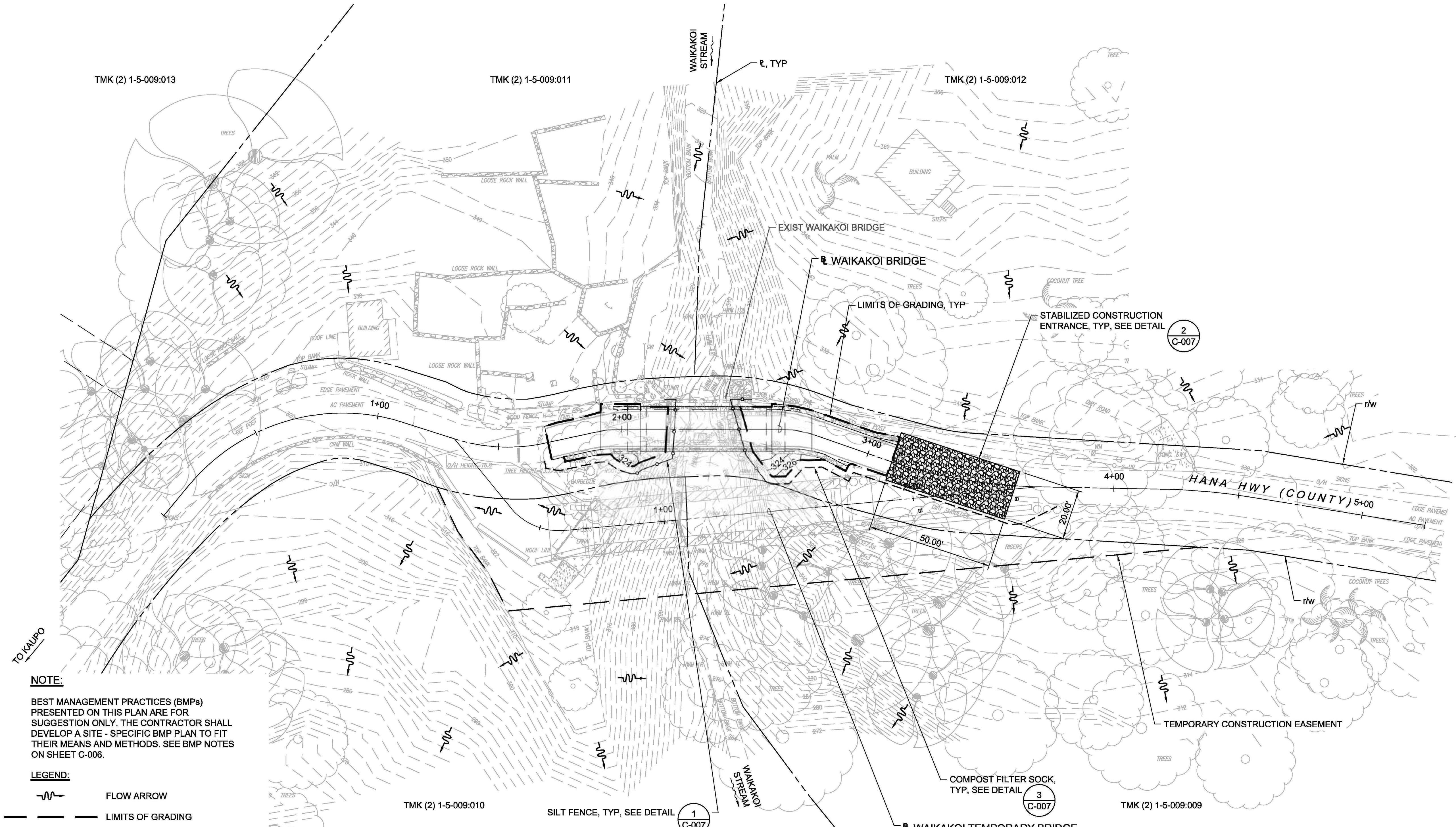


NOTE:

BEST MANAGEMENT PRACTICES (BMPs) PRESENTED ON THIS PLAN ARE FOR SUGGESTION ONLY. THE CONTRACTOR SHALL DEVELOP A SITE - SPECIFIC BMP PLAN TO FIT THEIR MEANS AND METHODS. SEE BMP NOTES ON SHEET C-006.

LEGEND:

| | |
|---|---|
| | FLOW ARROW |
| | LIMITS OF GRADING |
| | SILT FENCE, SEE SHEET C-007 |
| | COMPOST FILTER SOCK, SEE SHEET C-007 |
| 10 | EXISTING MAJOR CONTOUR LINE |
| | EXISTING MINOR CONTOUR LINE |
| 190 | PROPOSED MAJOR CONTOUR LINE |
| 185 | PROPOSED MINOR CONTOUR LINE |

## WAIKAKOI PERMANENT BRIDGE EROSION CONTROL PLAN

SCALE: 1" = 20'

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI PERMANENT BRIDGE EROSION CONTROL PLAN

Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

SHEET C–011 of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:56pm
CAD File Name: C:\pwworking\west01\d1900569\C–012 – Waikakoi Permanent Erosion Control Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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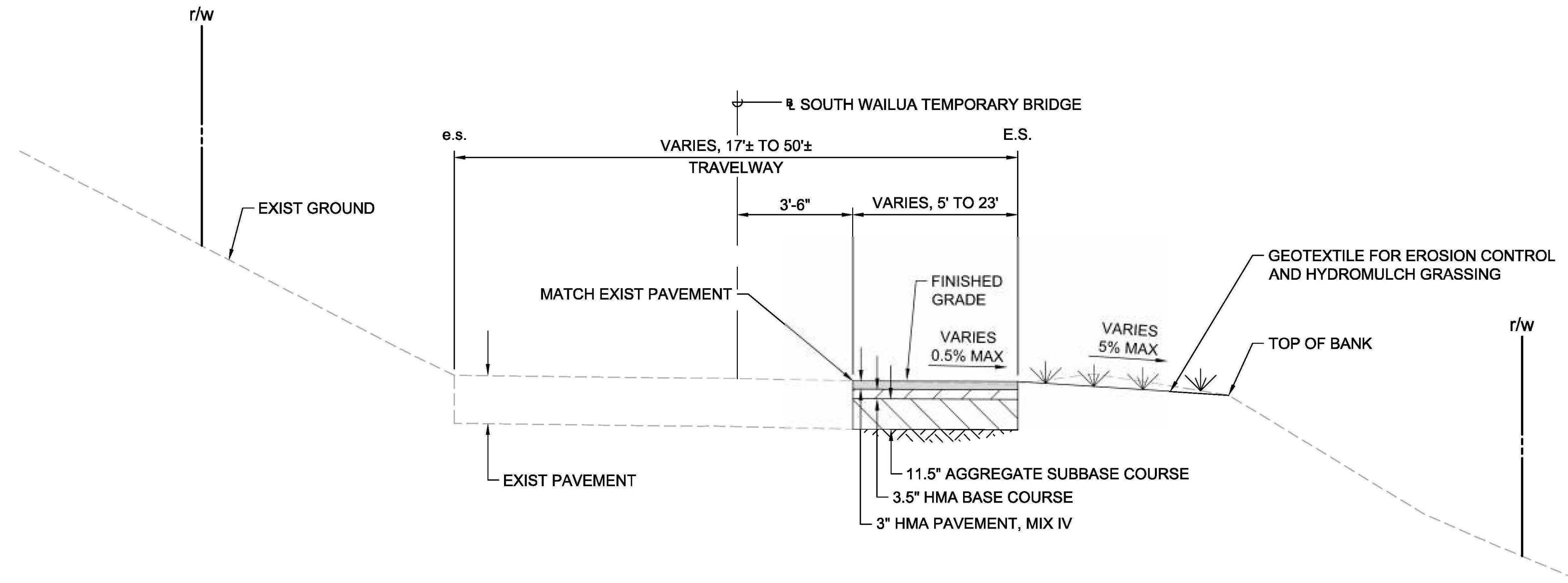
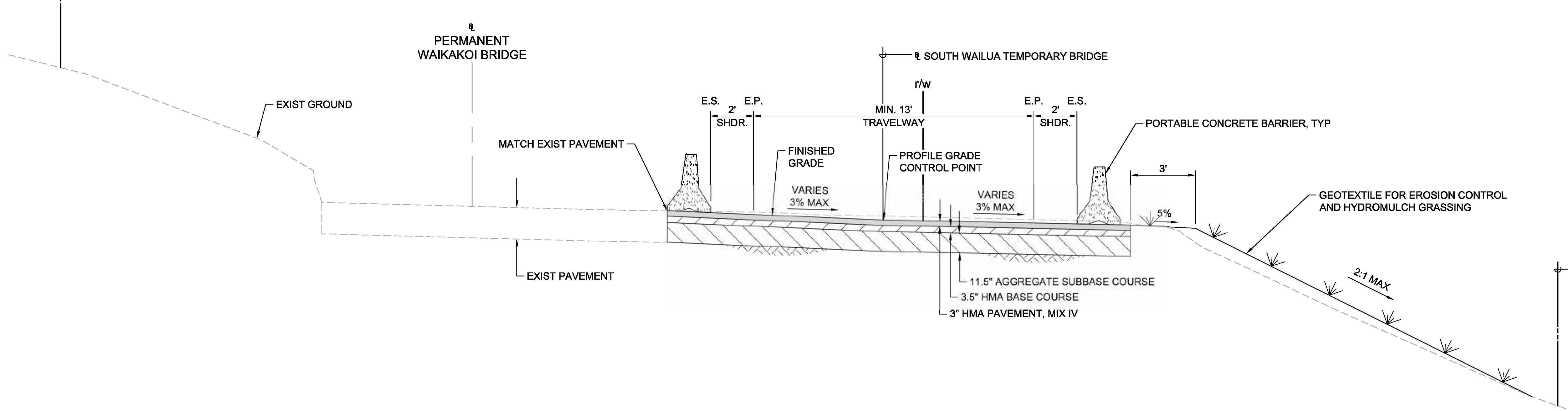



SOUTH WAILUA TEMPORARY BRIDGE TYPICAL SECTION STA 2+54 TO 3+10

SCALE: 3/8" = 1'-0"




SOUTH WAILUA TEMPORARY BRIDGE TYPICAL SECTION STA 0+81.27 TO 1+24

SCALE: 3/8" = 1'-0"

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE TYPICAL SECTIONS

Date:
Date: 8/30/24
Design By:
Drawn By:
SHEET
C-012
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 5:59pm
CAD File Name: C:\pwworking\west01\d1900569\C-013 - South Wailua Typical Sections.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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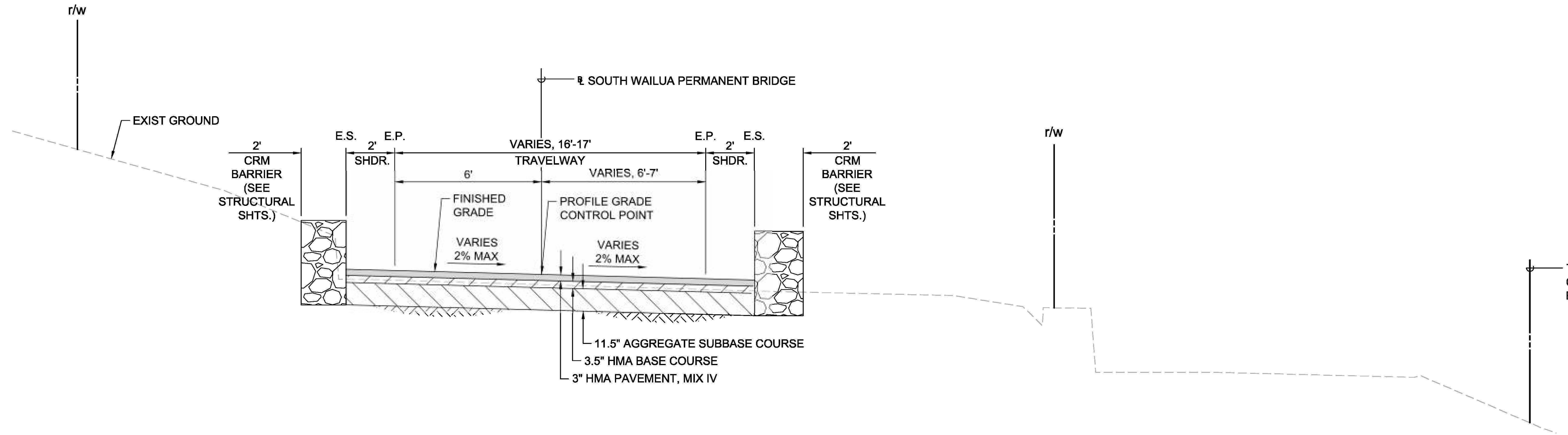
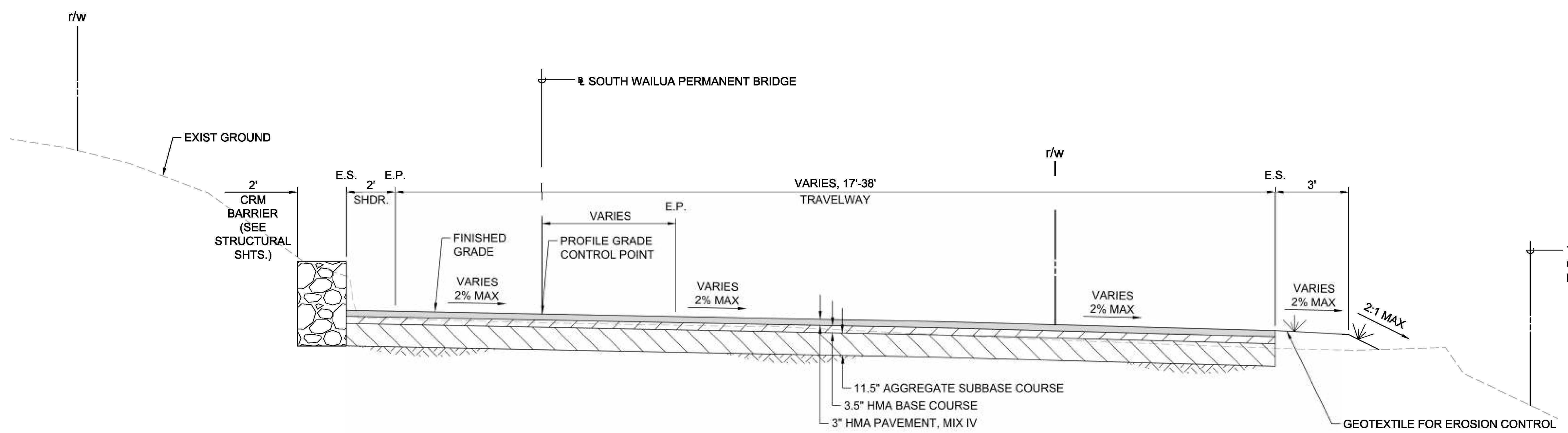



## SOUTH WAILUA PERMANENT BRIDGE TYPICAL SECTION STA 2+75.78 TO 2+93.36
SCALE: 3/8" = 1'-0"




## SOUTH WAILUA PERMANENT BRIDGE TYPICAL SECTION STA 2+25 TO 2+75.78
SCALE: 3/8" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

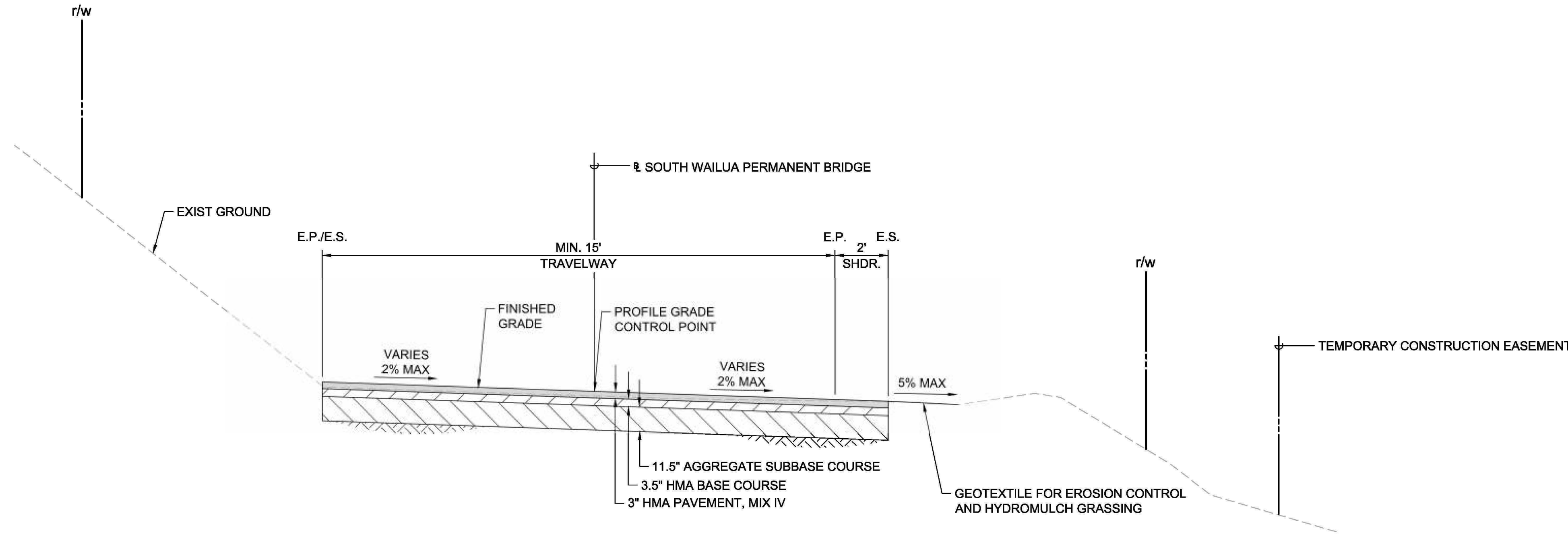
COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
TYPICAL SECTIONS - 1

Date:
Date: 8/30/24
Design By:
Drawn By:
SHEET
C-013
of 084 Sheets

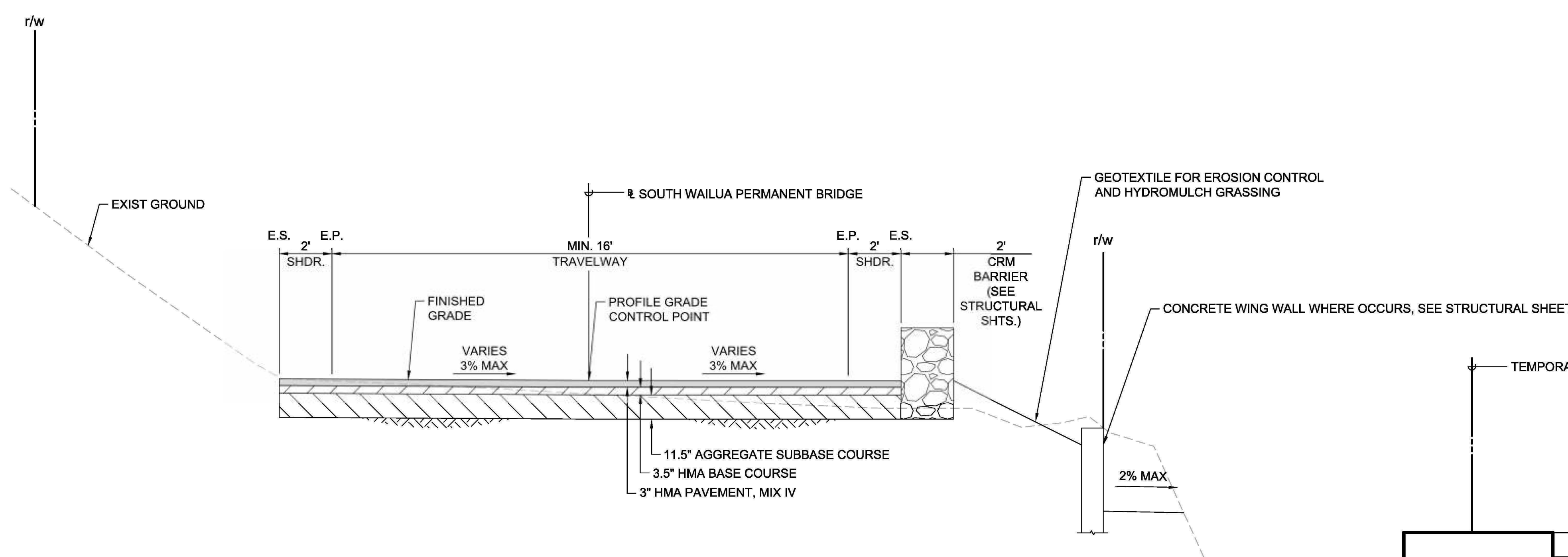
PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:59pm
CAD File Name: C:\pwworking\west01\d1900569\C-013 – South Wailua Typical Sections.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 015 | 084 |




SOUTH WAILUA PERMANENT BRIDGE TYPICAL SECTION STA 4+37.71 TO 5+00

SCALE: 3/8" = 1'-0"




SOUTH WAILUA PERMANENT BRIDGE TYPICAL SECTION STA 3+88.99 TO 4+31.71

SCALE: 3/8" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE TYPICAL SECTIONS - 2

Date:
Date: 8/30/24
Design By:
Drawn By:
SHEET
C-014
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 5:59pm
CAD File Name: C:\pwworking\west01\d1900569\C-013 - South Wailua Typical Sections.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
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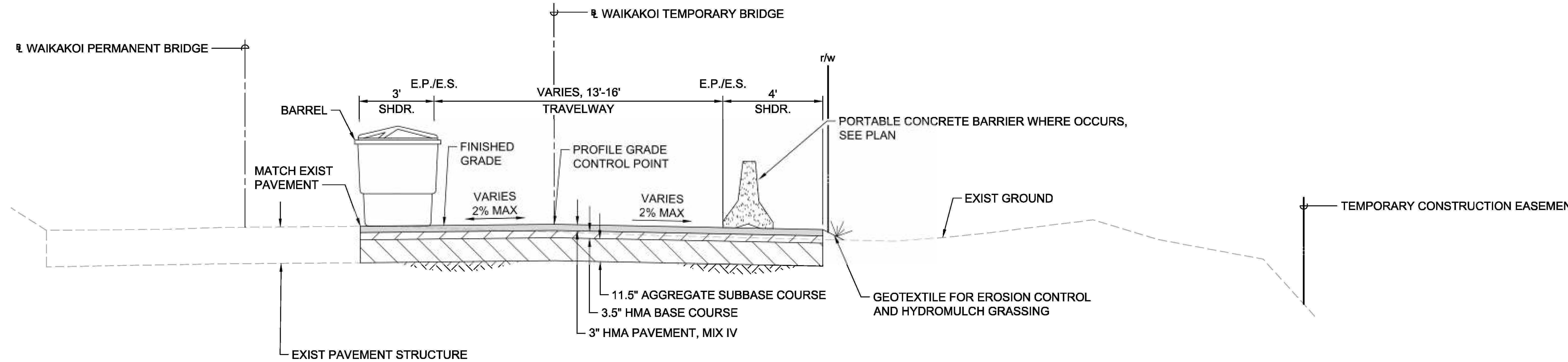
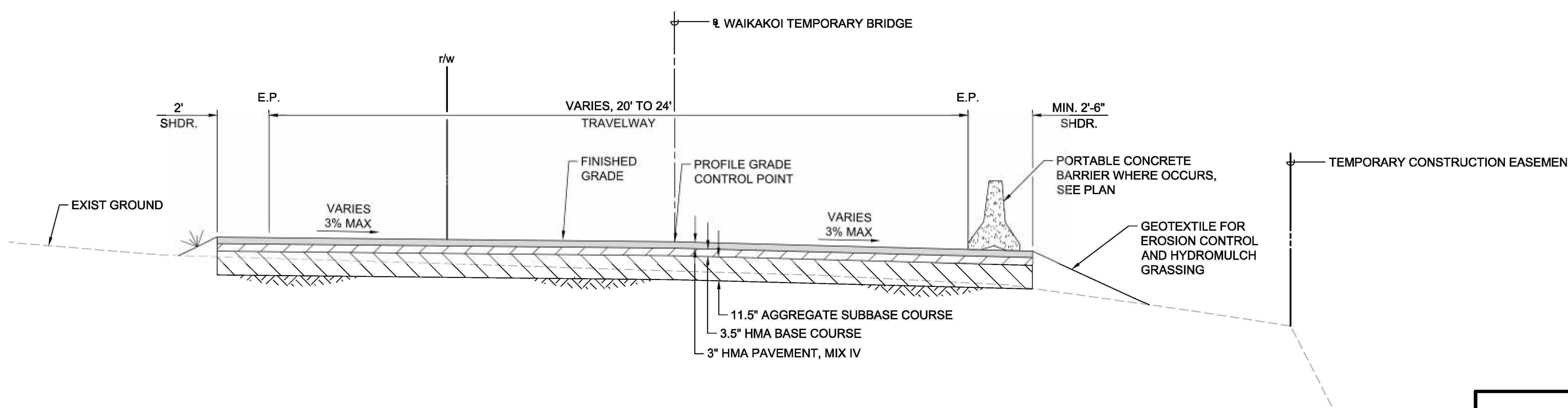



WAIKAKOI TEMPORARY BRIDGE TYPICAL SECTION STA 1+86.32 TO 2+26.14

SCALE: 3/8" = 1'-0"




WAIKAKOI TEMPORARY BRIDGE TYPICAL SECTION STA 0+10 TO 0+56.32

SCALE: 3/8" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE TYPICAL SECTIONS

Date:
Date: 8/30/24
Design By:
Drawn By:
SHEET
C-015
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 5:59pm
CAD File Name: C:\pwworking\west01\d1900569\C-014 - Waikakoi Typical Sections.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
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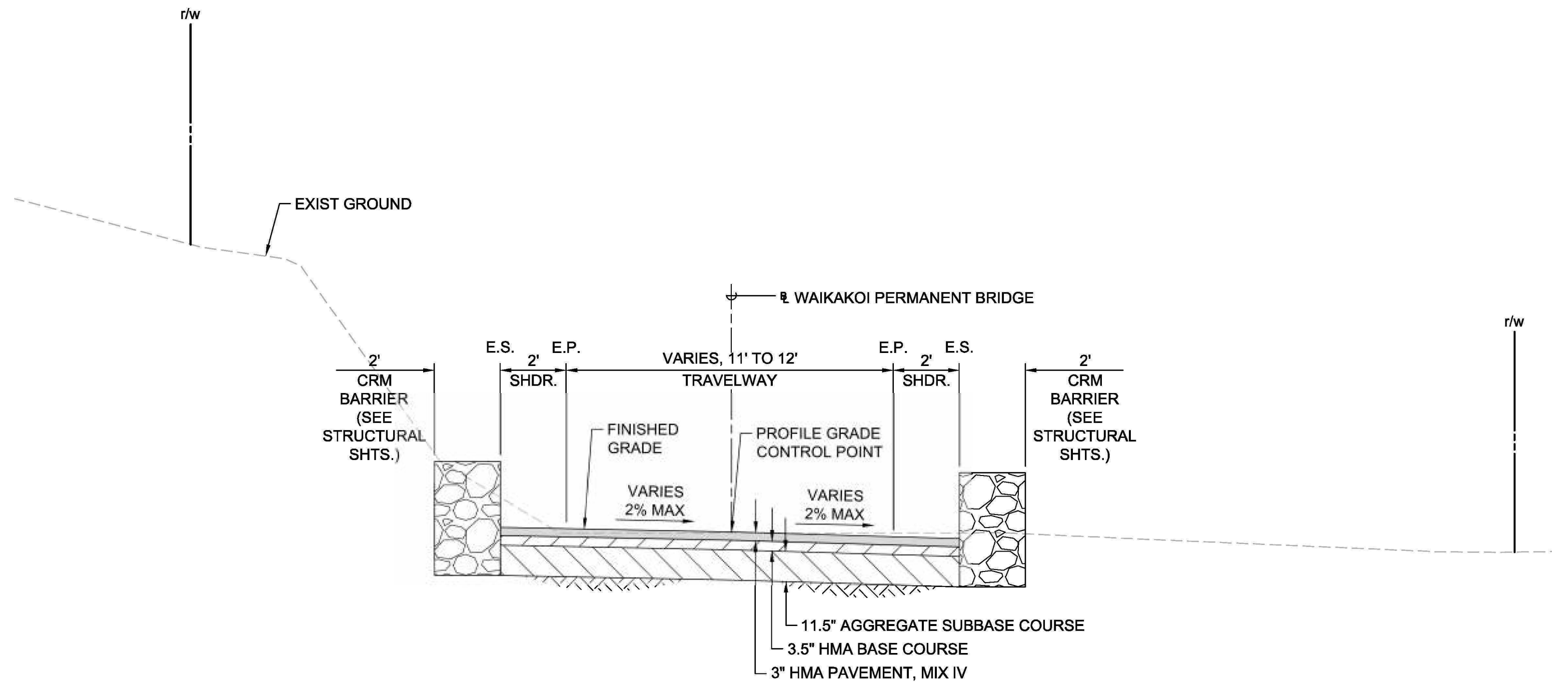
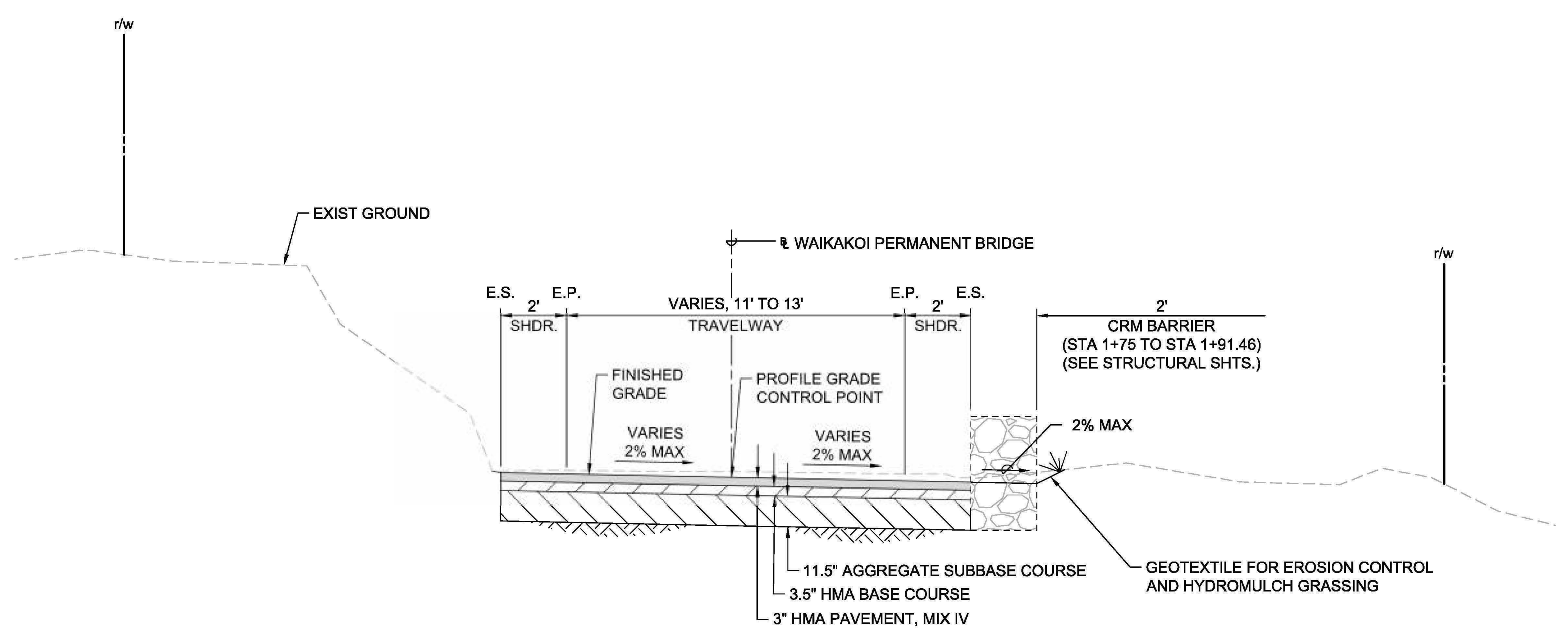



## WAIKAKOI PERMANENT BRIDGE TYPICAL SECTION STA 2+76.20 TO 3+10

SCALE: 3/8" = 1'-0"




## WAIKAKOI PERMANENT BRIDGE TYPICAL SECTION STA 1+70 TO 1+91.46

SCALE: 3/8" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

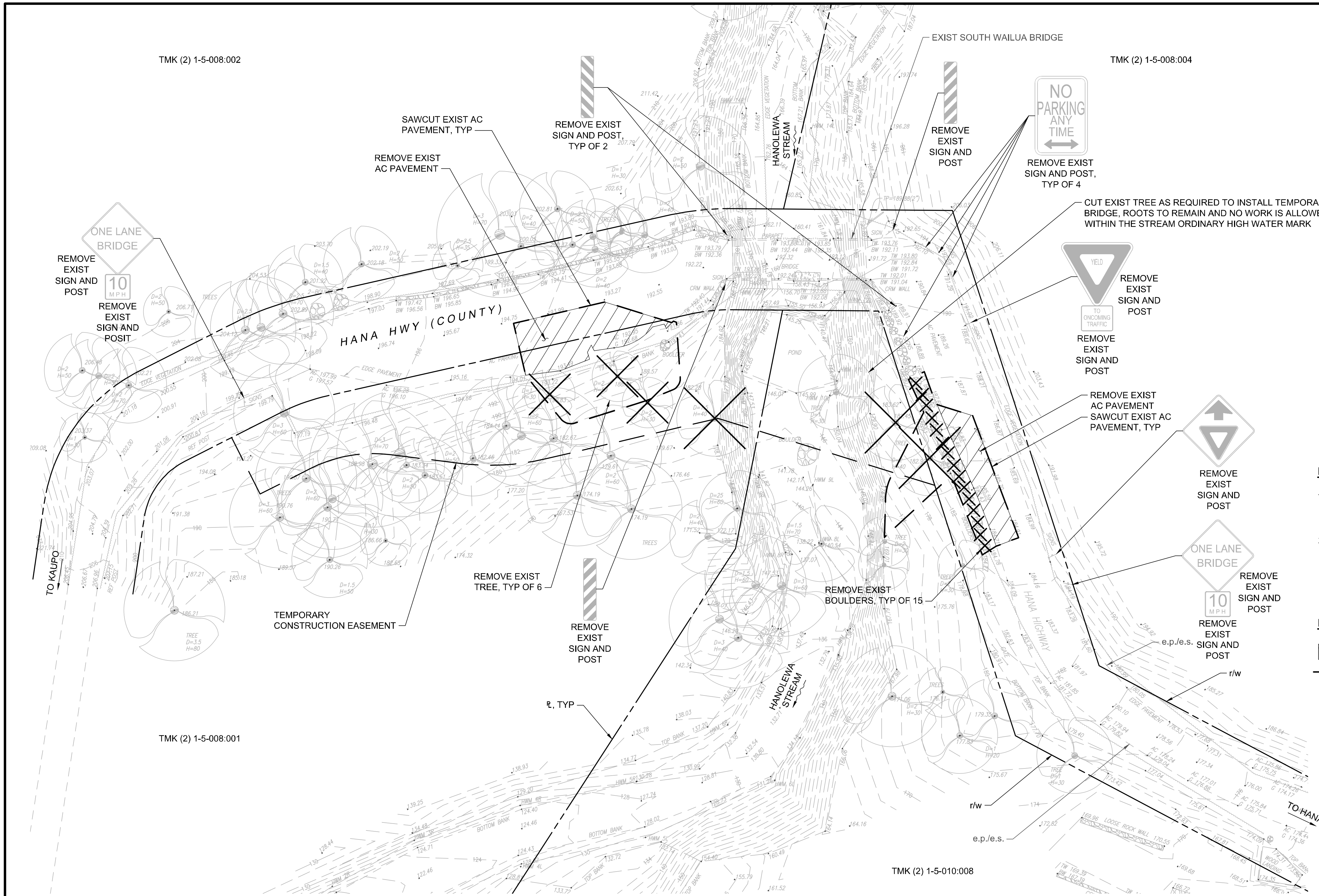
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI PERMANENT BRIDGE TYPICAL SECTIONS

Date:
Date: 8/30/24
Design By:
Drawn By:
SHEET
C-016
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 5:58pm
CAD File Name: C:\pwworking\west01\d1900569\C-014 - Waikakoi Typical Sections.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 018 | 084 |




NOTES:

1. ALL PAVEMENTS, WALLS, SIGNS, POSTS, BOULDERS, TREES, AND VEGETATION SHALL BE REMOVED WITHIN THE LIMIT OF DEMOLITION AND REMOVAL.
2. THE CONTRACTOR SHALL MAINTAIN SERVICE TO ALL ELECTRICAL, TELECOMMUNICATION, AND WATER UTILITIES AT ALL TIMES. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL WORK AFFECTING EXISTING UTILITIES WITH THE RESPECTIVE UTILITY COMPANY.

LEGEND:

- TO BE REMOVED
- LIMITS OF DEMOLITION AND REMOVAL

## S. WAILUA TEMPORARY BRIDGE EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

GRAPHIC SCALE: 20' 10' 0' 20' 40'

SCALE: 1" = 20'

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

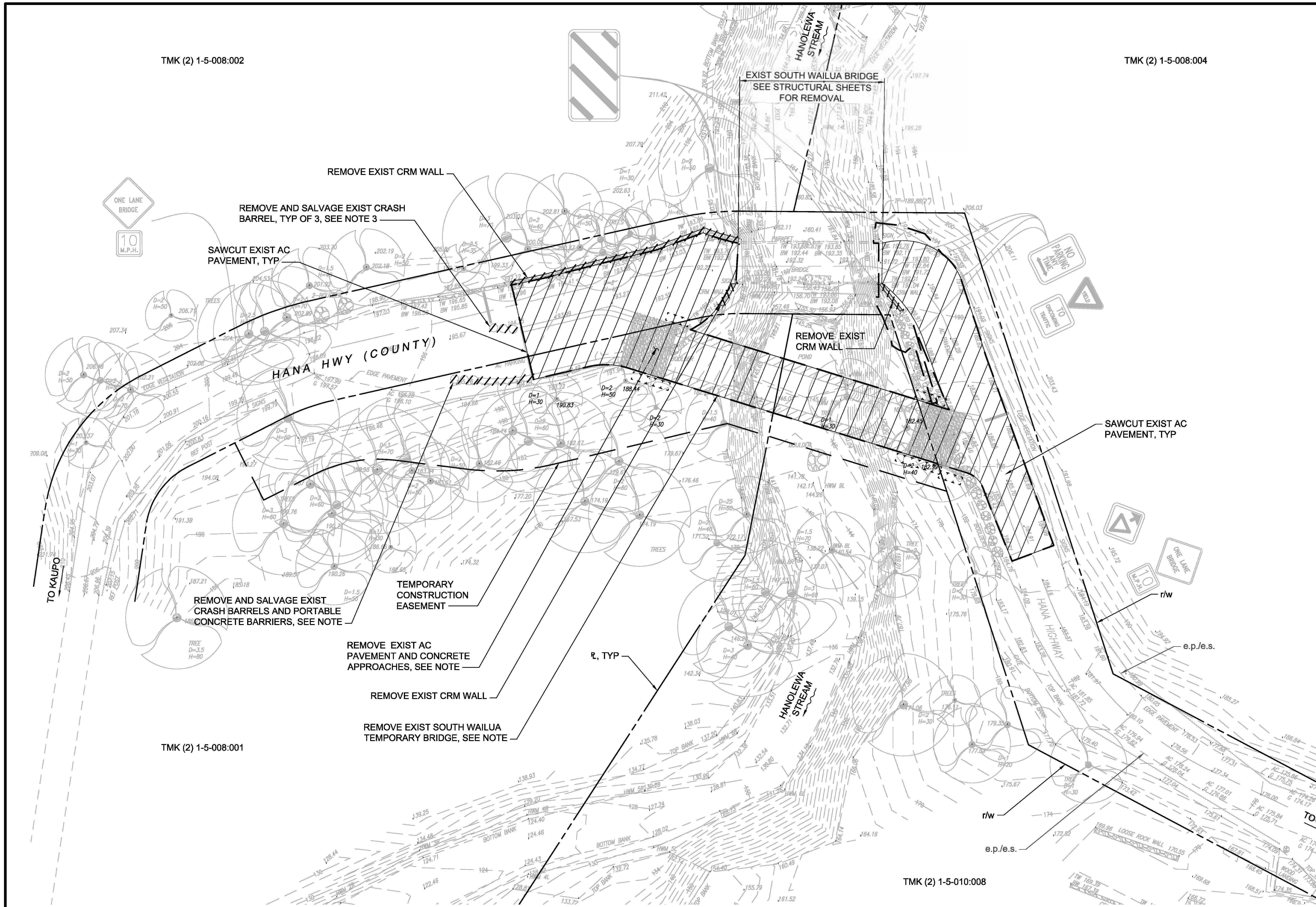
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE
EXISTING CONDITIONS AND DEMOLITION PLAN

Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET C-017
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:59pm
CAD File Name: C:\pwworking\west01\d1900569\C-020 – South Wailua Temporary Existing Conditions and Demolition Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 019 | 084 |




NOTES:

1. ALL PAVEMENTS, WALLS, SIGNS, POSTS, BOULDERS, TREES, AND VEGETATION SHALL BE REMOVED WITHIN THE LIMIT OF DEMOLITION AND REMOVAL.
2. THE CONTRACTOR SHALL MAINTAIN SERVICE TO ALL ELECTRICAL, TELECOMMUNICATION, AND WATER UTILITIES AT ALL TIMES. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL WORK AFFECTING EXISTING UTILITIES WITH THE RESPECTIVE UTILITY COMPANY.
3. TEMPORARY BRIDGE TO TO BE REMOVED AFTER PERMANENT BRIDGE IS CONSTRUCTED AND IN SERVICE.

LEGEND:

TO BE REMOVED
TO BE REMOVED
LIMITS OF DEMOLITION AND REMOVAL

NORTH

S. WAILUA PERMANENT BRIDGE EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'

60% DESIGN
NOT FOR CONSTRUCTION

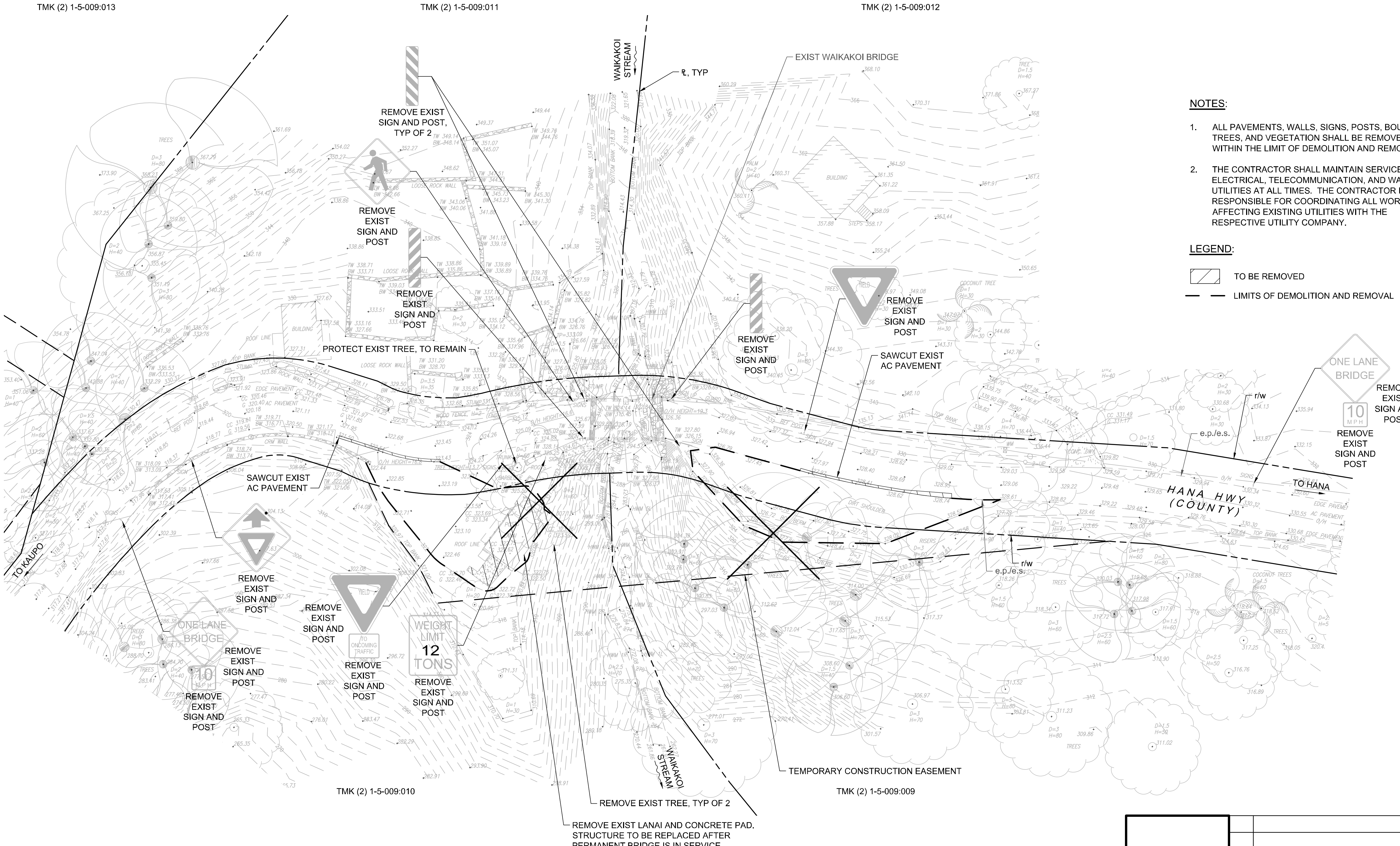
COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
EXISTING CONDITIONS AND DEMOLITION PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-018
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 5:59pm
CAD File Name: C:\pwworking\west01\d1900569\C-028 – South Wailua Permanent Existing Conditions and Demolition Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 020 | 084 |




NOTES:

1. ALL PAVEMENTS, WALLS, SIGNS, POSTS, BOULDERS, TREES, AND VEGETATION SHALL BE REMOVED WITHIN THE LIMIT OF DEMOLITION AND REMOVAL.
2. THE CONTRACTOR SHALL MAINTAIN SERVICE TO ALL ELECTRICAL, TELECOMMUNICATION, AND WATER UTILITIES AT ALL TIMES. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL WORK AFFECTING EXISTING UTILITIES WITH THE RESPECTIVE UTILITY COMPANY.

LEGEND:

TO BE REMOVED

LIMITS OF DEMOLITION AND REMOVAL

NORTH

## WAIKAKOI TEMPORARY BRIDGE EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:

20' 10' 0' 20' 40'

SCALE: 1" = 20'

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE
EXISTING CONDITIONS AND DEMOLITION PLAN

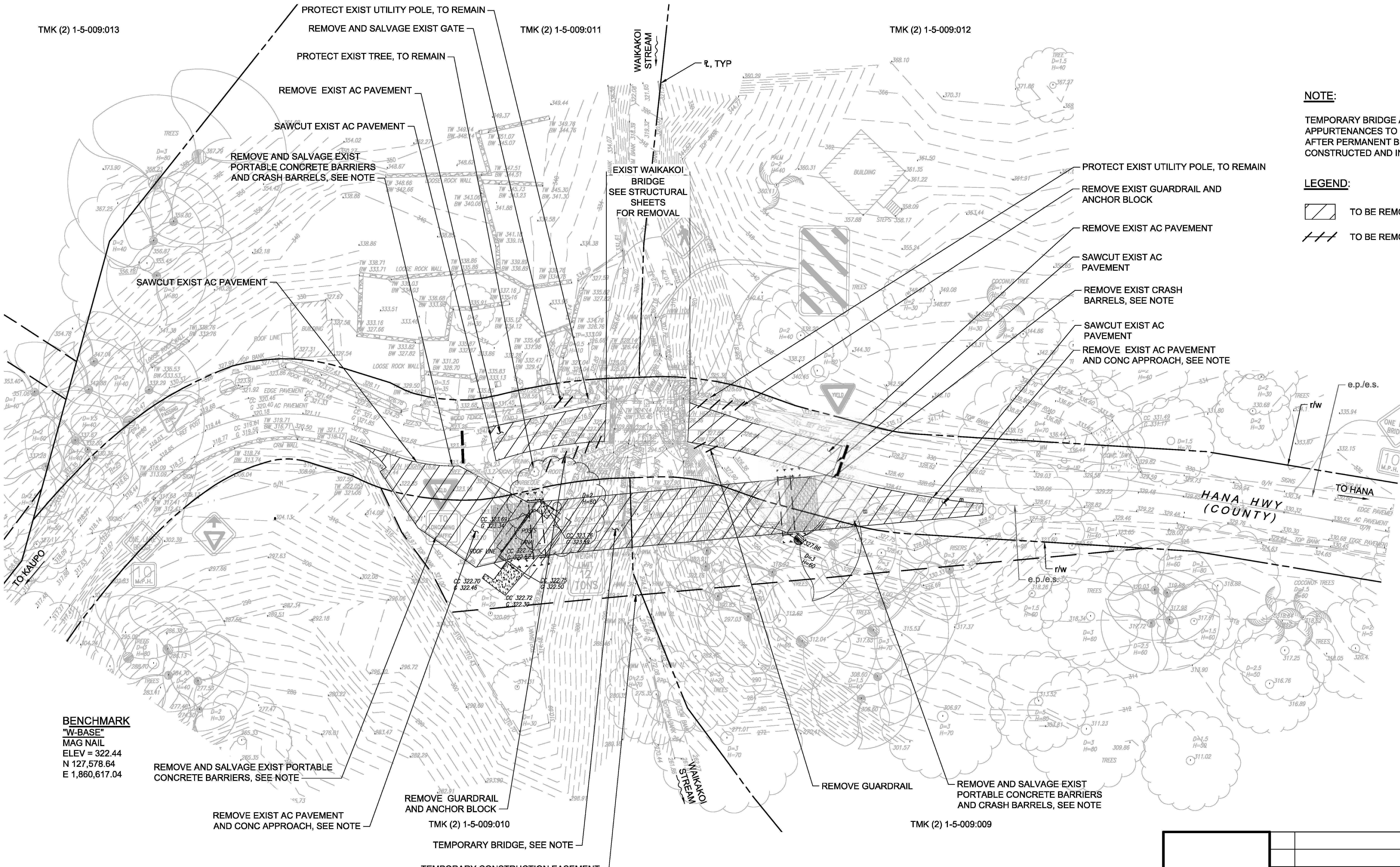
Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

SHEET C-019 of 084 Sheets

PROJ. NO.: 2020040

Date Saved: Fri, 30 Aug 2024 - 5:59pm
CAD File Name: C:\pwworking\west01\d1900569\C-035 - Waikakoi Temporary Existing Conditions and Demolition Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 021 | 084 |




NOTE:

TEMPORARY BRIDGE AND RELATED APPURTENANCES TO TO BE REMOVED AFTER PERMANENT BRIDGE IS CONSTRUCTED AND IN SERVICE.

LEGEND:

TO BE REMOVED

TO BE REMOVED

BENCHMARK
"W-BASE"
MAG NAIL
ELEV = 322.44
N 127,578.64
E 1,860,617.04

## WAIKAKOI PERMANENT BRIDGE EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI PERMANENT BRIDGE
EXISTING CONDITIONS AND DEMOLITION PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C–020
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-043 – Waikakoi Permanent Existing Conditions and Demolition Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
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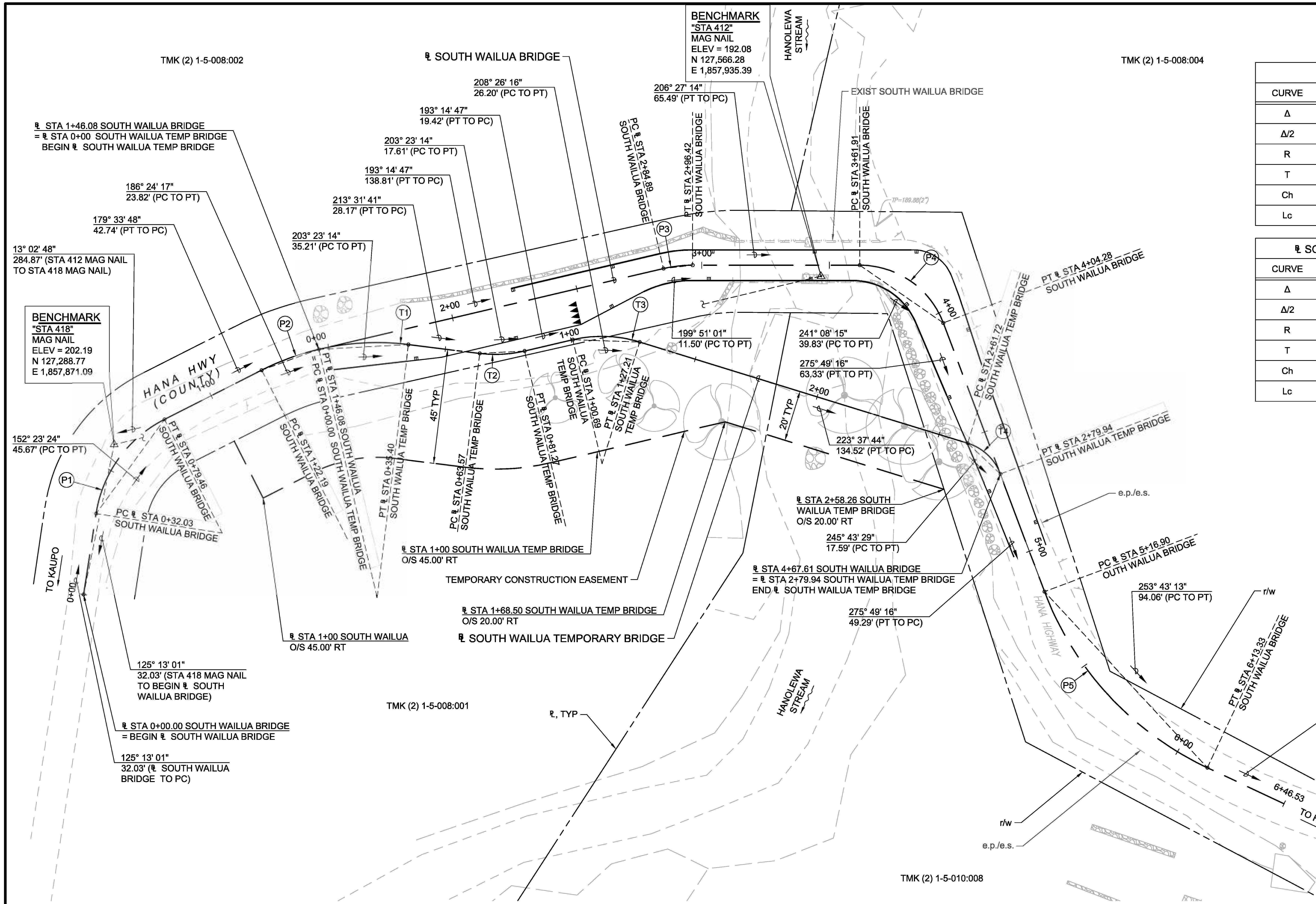



| ℄ SOUTH WAILUA CURVE DATA | | | | | |
|---|---|---|---|---|---|
| CURVE | P1 | P2 | P3 | P4 | P5 |
| Δ | 54° 20' 47" | 13° 40' 59" | 13° 12' 27" | 69° 22' 02" | 44° 12' 00" |
| Δ/2 | 27° 10' 24" | 6° 50' 30" | 6° 36' 14" | 34° 41' 01" | 22° 06' 00" |
| R | 50.00' | 100.00' | 50.00' | 35.00' | 125.00' |
| T | 25.67' | 12.00' | 5.79' | 24.22' | 50.76' |
| Ch | 45.67' | 23.82' | 11.50' | 39.83' | 94.06' |
| Lc | 47.43' | 23.88' | 11.53' | 42.37' | 96.43' |

| ℄ SOUTH WAILUA TEMP BRIDGE CURVE DATA | | | | |
|---|---|---|---|---|
| CURVE | T1 | T2 | T3 | T4 |
| Δ | 20° 16' 54" | 20° 16' 54" | 30° 22' 57" | 52° 11' 29" |
| Δ/2 | 10° 8' 27" | 10° 8' 27" | 15° 11' 29" | 26° 5' 45" |
| R | 100.00' | 50.00' | 50.00' | 20.00' |
| T | 17.89' | 8.94' | 13.58' | 9.80' |
| Ch | 35.21' | 17.61' | 26.20' | 17.59' |
| Lc | 35.40' | 17.70' | 26.51' | 18.22' |

## S. WAILUA BASELINE PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

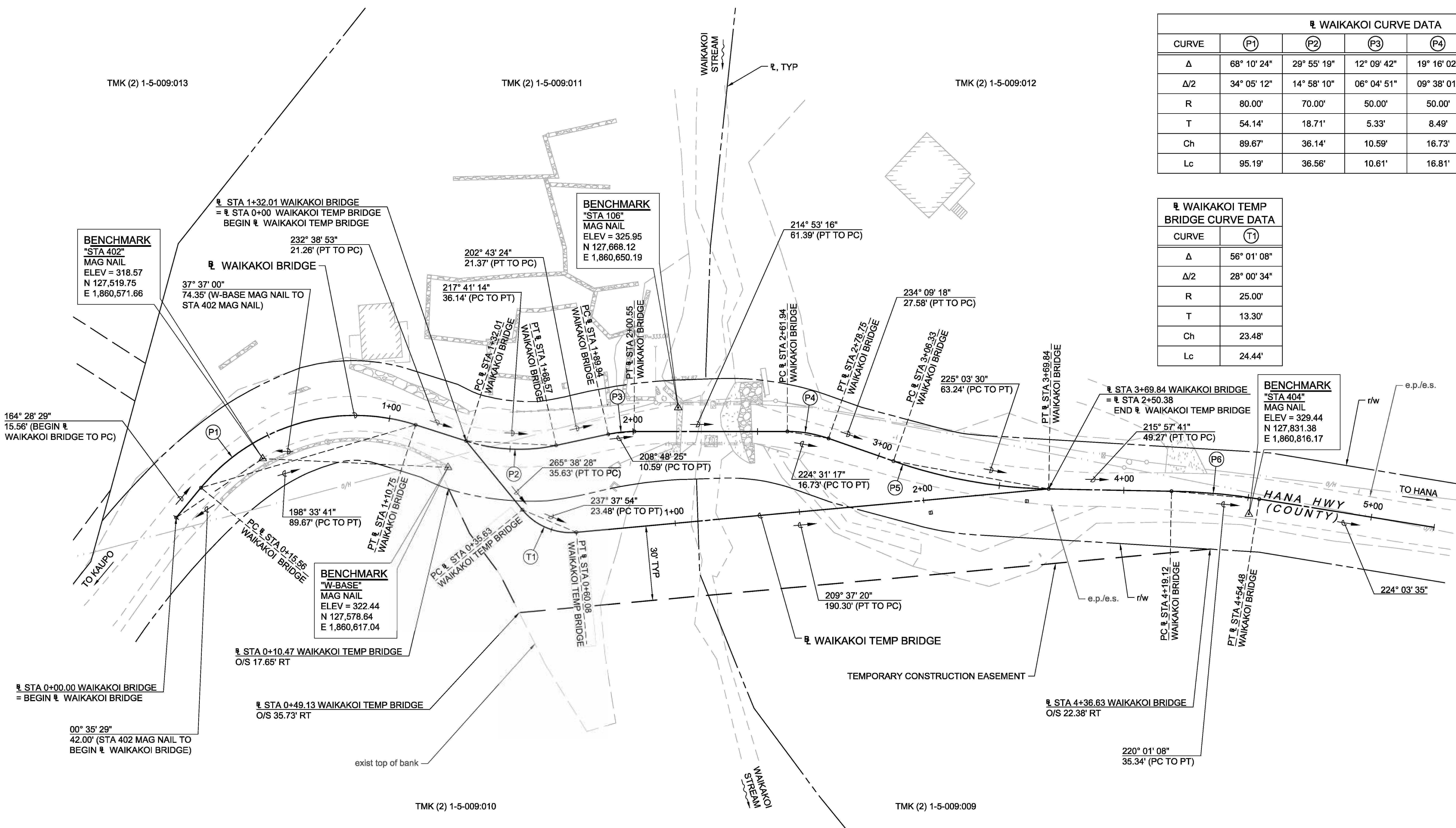
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA BASELINE PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-021
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-021 – South Wailua Baseline Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 023 | 084 |




℄ WAIKAKOI CURVE DATA

| CURVE | P1 | P2 | P3 | P4 | P5 | P6 |
|---|---|---|---|---|---|---|
| Δ | 68° 10' 24" | 29° 55' 19" | 12° 09' 42" | 19° 16' 02" | 18° 11' 37" | 08° 06' 19" |
| Δ/2 | 34° 05' 12" | 14° 58' 10" | 06° 04' 51" | 09° 38' 01" | 09° 05' 49" | 04° 03' 09" |
| R | 80.00' | 70.00' | 50.00' | 50.00' | 200.00' | 250.00' |
| T | 54.14' | 18.71' | 5.33' | 8.49' | 32.02' | 17.71' |
| Ch | 89.67' | 36.14' | 10.59' | 16.73' | 63.24' | 35.34' |
| Lc | 95.19' | 36.56' | 10.61' | 16.81' | 63.51' | 35.37' |

℄ WAIKAKOI TEMP BRIDGE CURVE DATA

| CURVE | T1 |
|---|---|
| Δ | 56° 01' 08" |
| Δ/2 | 28° 00' 34" |
| R | 25.00' |
| T | 13.30' |
| Ch | 23.48' |
| Lc | 24.44' |

## WAIKAKOI BASELINE PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

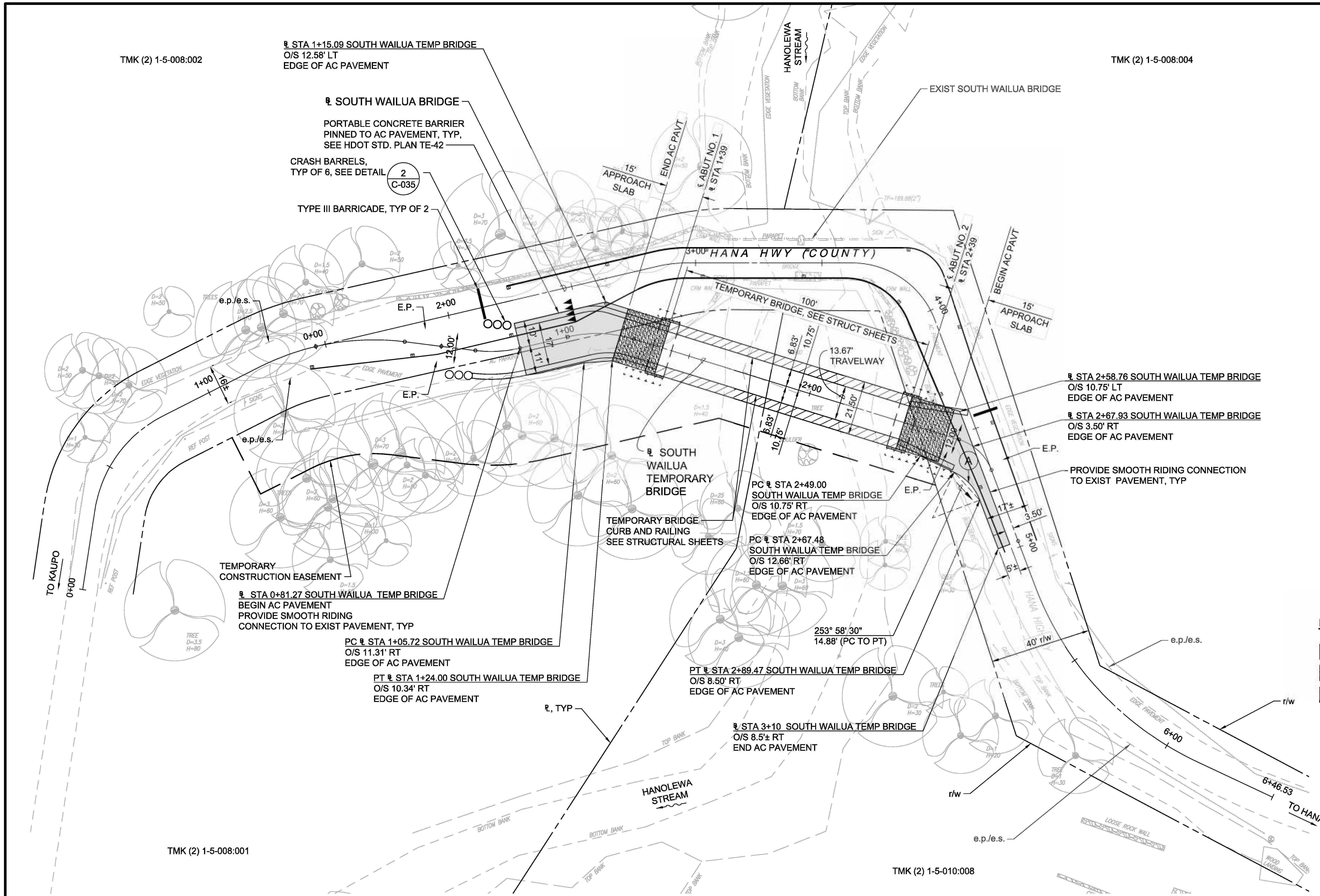
WAIKAKOI BASELINE PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-022
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-036 – Waikakoi Baseline Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 024 | 084 |

| ℄ SOUTH WAILUA TEMP BRIDGE CURVE RETURN DATA | |
|---|---|
| CURVE | A |
| Δ | 43° 41' 24" |
| Δ/2 | 21° 50' 42" |
| R | 20.00' |
| T | 8.02' |
| Ch | 14.88' |
| Lc | 15.25' |




## LEGEND:

- ASPHALT PAVEMENT
- CONCRETE APPROACH SLAB
- TEMPORARY BRIDGE RAILING

## S. WAILUA TEMPORARY BRIDGE SITE PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:

20' 10' 0' 20' 40'

SCALE: 1" = 20'

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

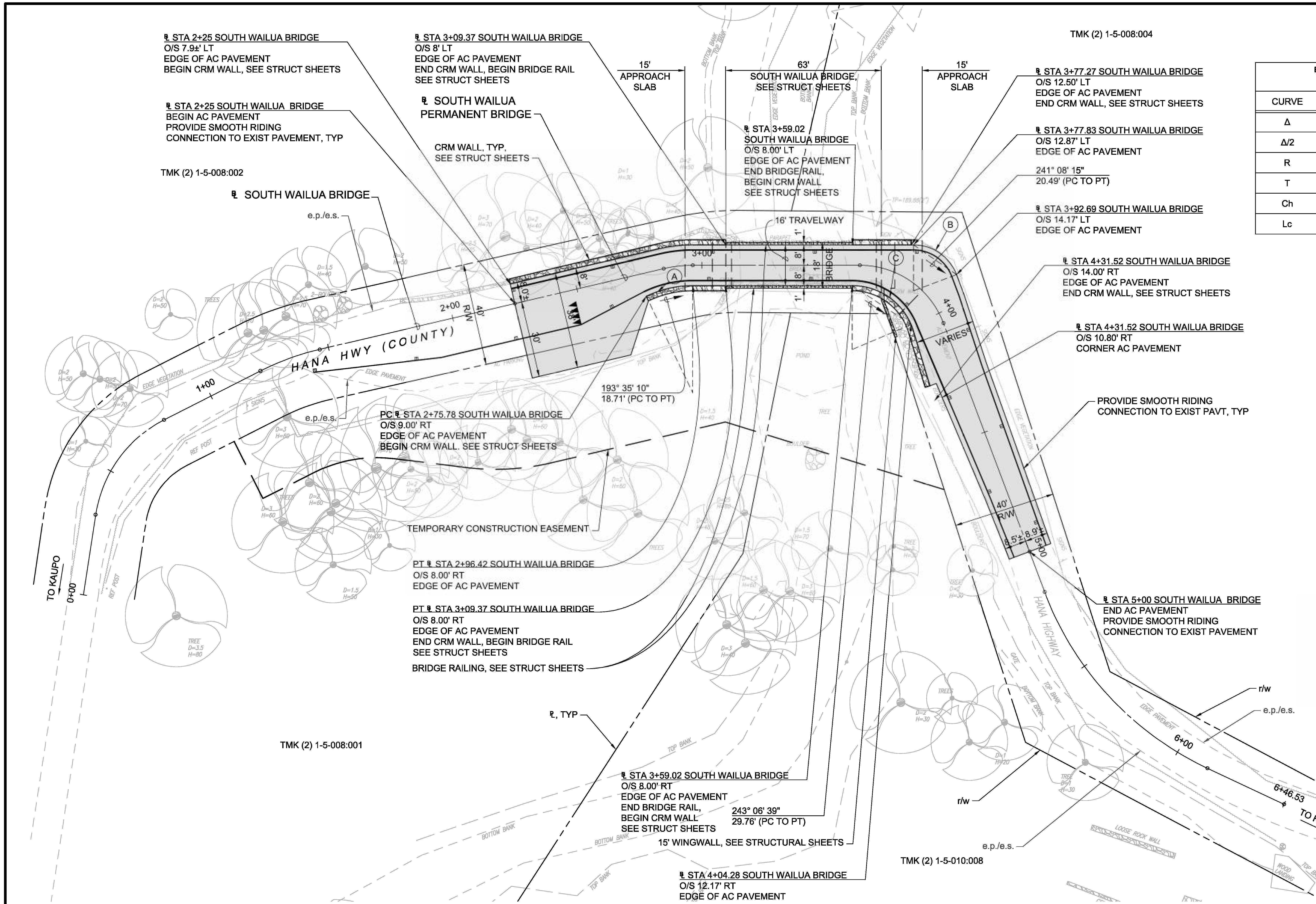
S. WAILUA TEMPORARY BRIDGE SITE PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C–023
of 084 Sheets

PROJ. NO.: 2020040

Date Saved: Fri, 30 Aug 2024 – 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-022 – South Wailua Temporary Bridge Site Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 025 | 084 |




### ℄ SOUTH WAILUA BRIDGE CURVE RETURN DATA

| CURVE | (A) | (B) | (C) |
|---|---|---|---|
| Δ | 25° 43' 14" | 69° 22' 02" | 66° 55' 12" |
| Δ/2 | 12° 51' 37" | 34° 41' 01" | 33° 27' 36" |
| R | 42.00' | 20.00' | 25.00' |
| T | 9.59' | 13.84' | 16.52' |
| Ch | 18.70' | 22.76' | 27.57' |
| Lc | 18.85' | 24.21' | 29.20' |

LEGEND:

- ASPHALT PAVEMENT
- CONCRETE
- CRM WALL

## S. WAILUA PERMANENT BRIDGE SITE PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE SITE PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-024
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-029 – South Wailua Permanent Bridge Site Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 026 | 084 |

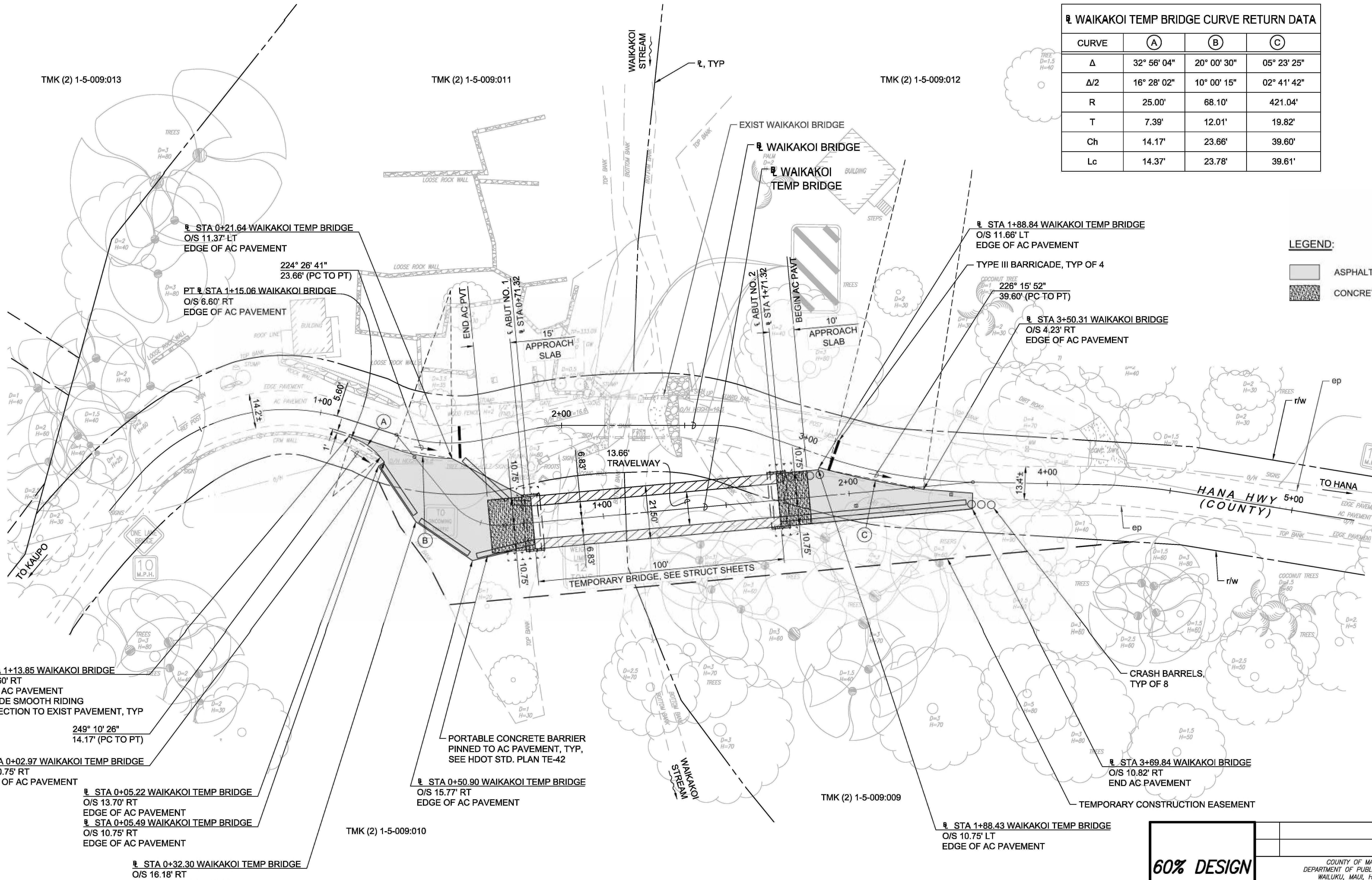
℄ WAIKAKOI TEMP BRIDGE CURVE RETURN DATA

| CURVE | (A) | (B) | (C) |
|---|---|---|---|
| Δ | 32° 56' 04" | 20° 00' 30" | 05° 23' 25" |
| Δ/2 | 16° 28' 02" | 10° 00' 15" | 02° 41' 42" |
| R | 25.00' | 68.10' | 421.04' |
| T | 7.39' | 12.01' | 19.82' |
| Ch | 14.17' | 23.66' | 39.60' |
| Lc | 14.37' | 23.78' | 39.61' |

LEGEND:

ASPHALT PAVEMENT

CONCRETE




## WAIKAKOI TEMPORARY BRIDGE SITE PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:

20' 10' 0' 20' 40'

SCALE: 1" = 20'

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE
SITE PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-025
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-037 – Waikakoi Temporary Bridge Site Plan_2024-08-29.dwg

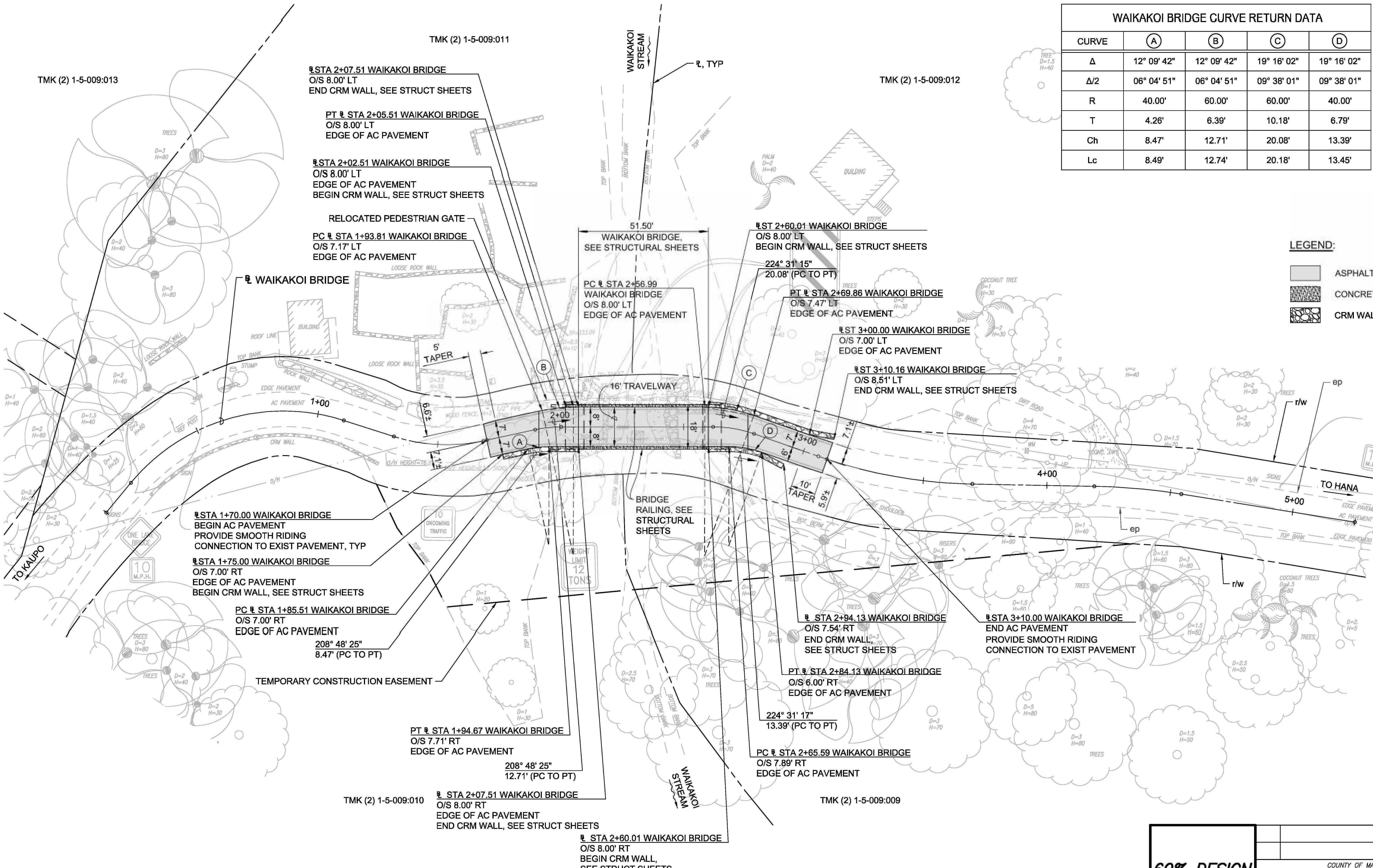
| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 027 | 084 |

WAIKAKOI BRIDGE CURVE RETURN DATA

| CURVE | A | B | C | D |
|---|---|---|---|---|
| Δ | 12° 09' 42" | 12° 09' 42" | 19° 16' 02" | 19° 16' 02" |
| Δ/2 | 06° 04' 51" | 06° 04' 51" | 09° 38' 01" | 09° 38' 01" |
| R | 40.00' | 60.00' | 60.00' | 40.00' |
| T | 4.26' | 6.39' | 10.18' | 6.79' |
| Ch | 8.47' | 12.71' | 20.08' | 13.39' |
| Lc | 8.49' | 12.74' | 20.18' | 13.45' |

LEGEND:

- ASPHALT PAVEMENT
- CONCRETE
- CRM WALL




## WAIKAKOI PERMANENT BRIDGE SITE PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:

20' 10' 0' 20' 40'

SCALE: 1" = 20'

**60% DESIGN NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

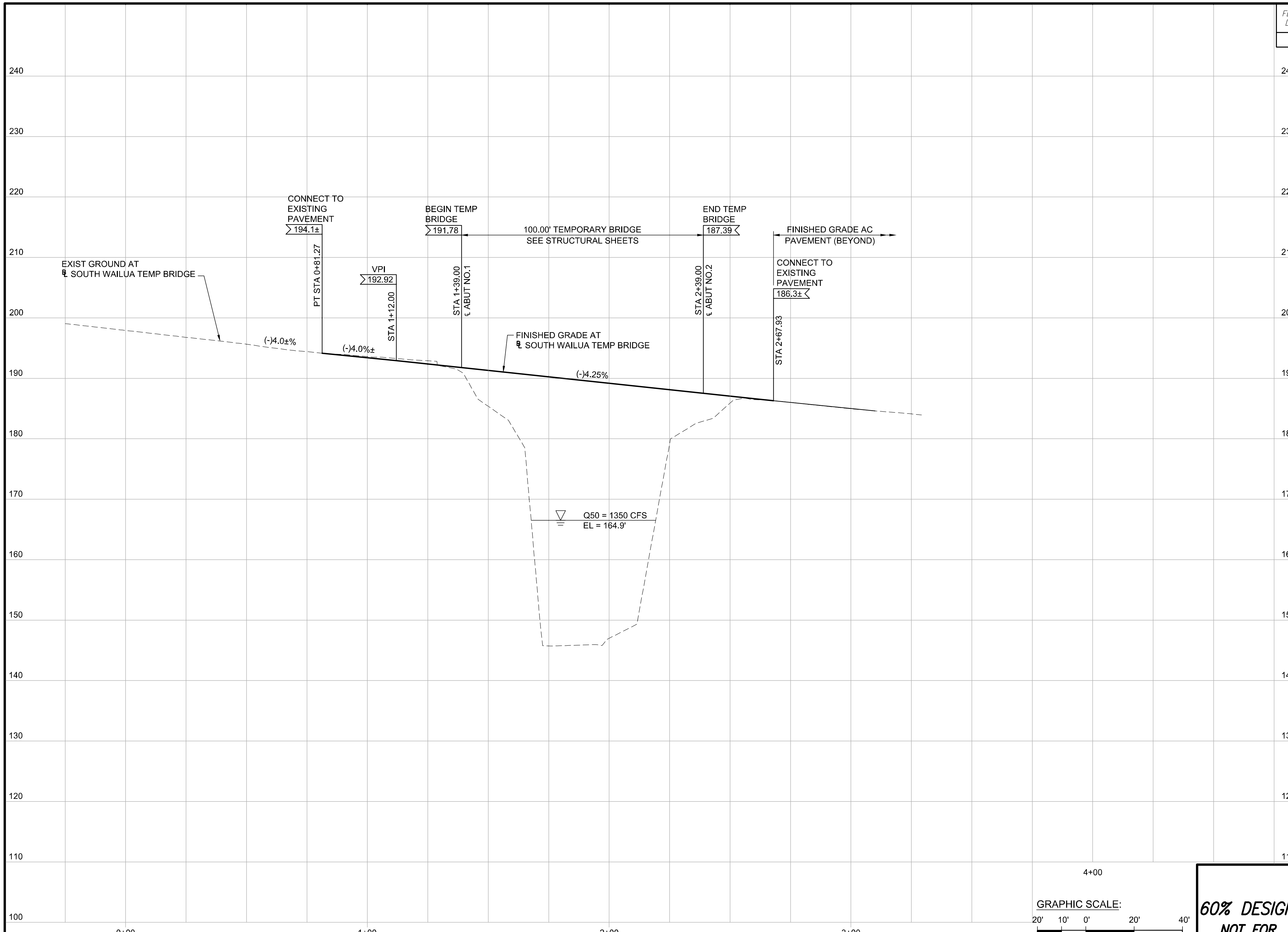
WAIKAKOI PERMANENT BRIDGE SITE PLAN

Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK

SHEET C-026 of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:00pm
CAD File Name: C:\pwworking\west01\d1900569\C-044 – Waikakoi Permanent Bridge Site Plan_2024-08-29.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 028 | 084 |




## SOUTH WAILUA TEMPORARY BRIDGE PROFILE

SCALE: HORIZ 1" = 20'
VERT 1" = 8'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'
8' 4' 0' 8' 16'
SCALE: 1" = 8'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

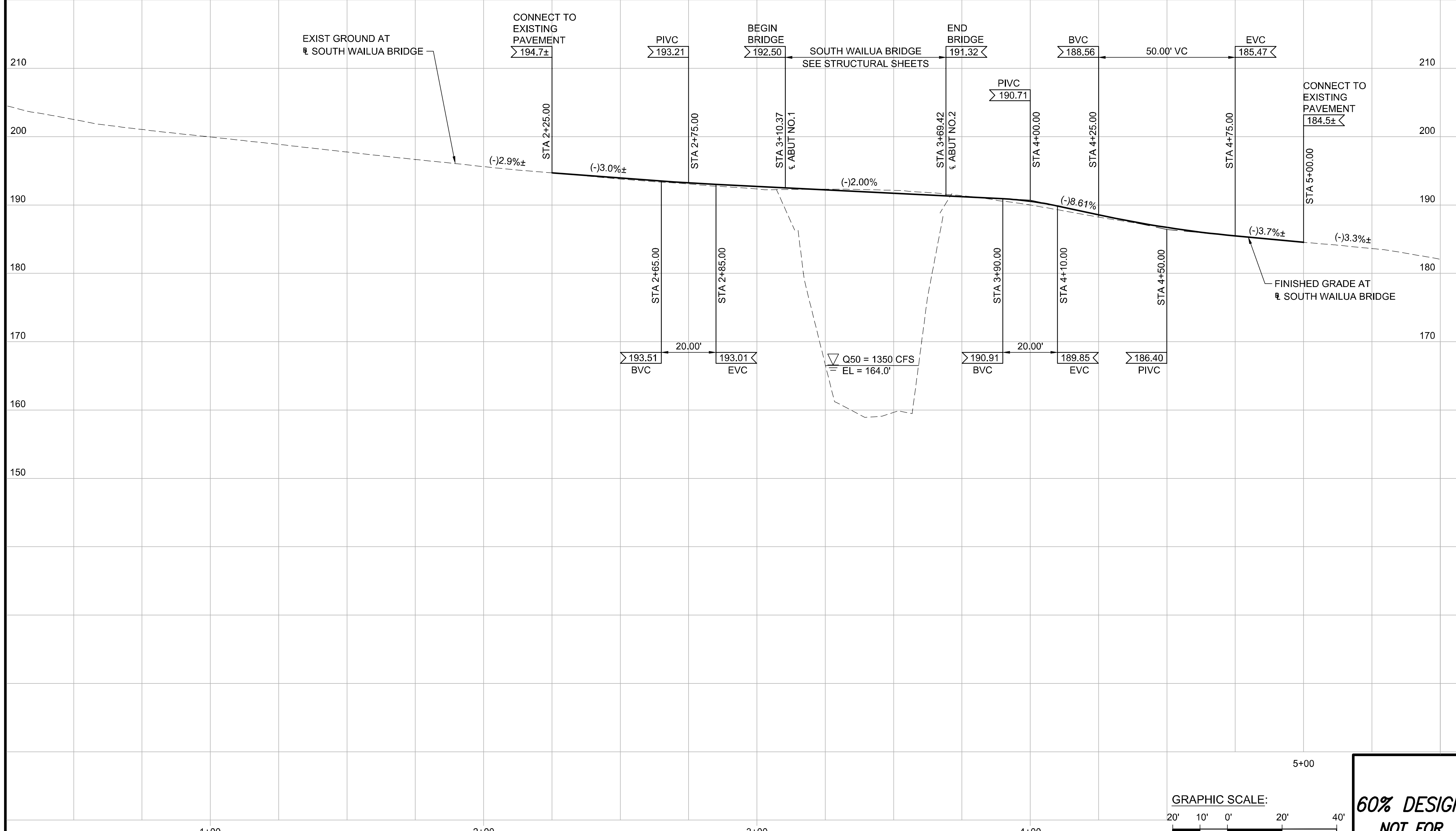
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE PROFILE

Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-027
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 6:01pm
CAD File Name: C:\pwworking\west01\d1900569\C-023 - South Wailua Temporary Bridge Profile.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 029 | 084 |




## S. WAILUA PERMANENT BRIDGE PROFILE

SCALE: HORIZ 1" = 20'
VERT 1" = 8'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'
8' 4' 0' 8' 16'
SCALE: 1" = 8'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

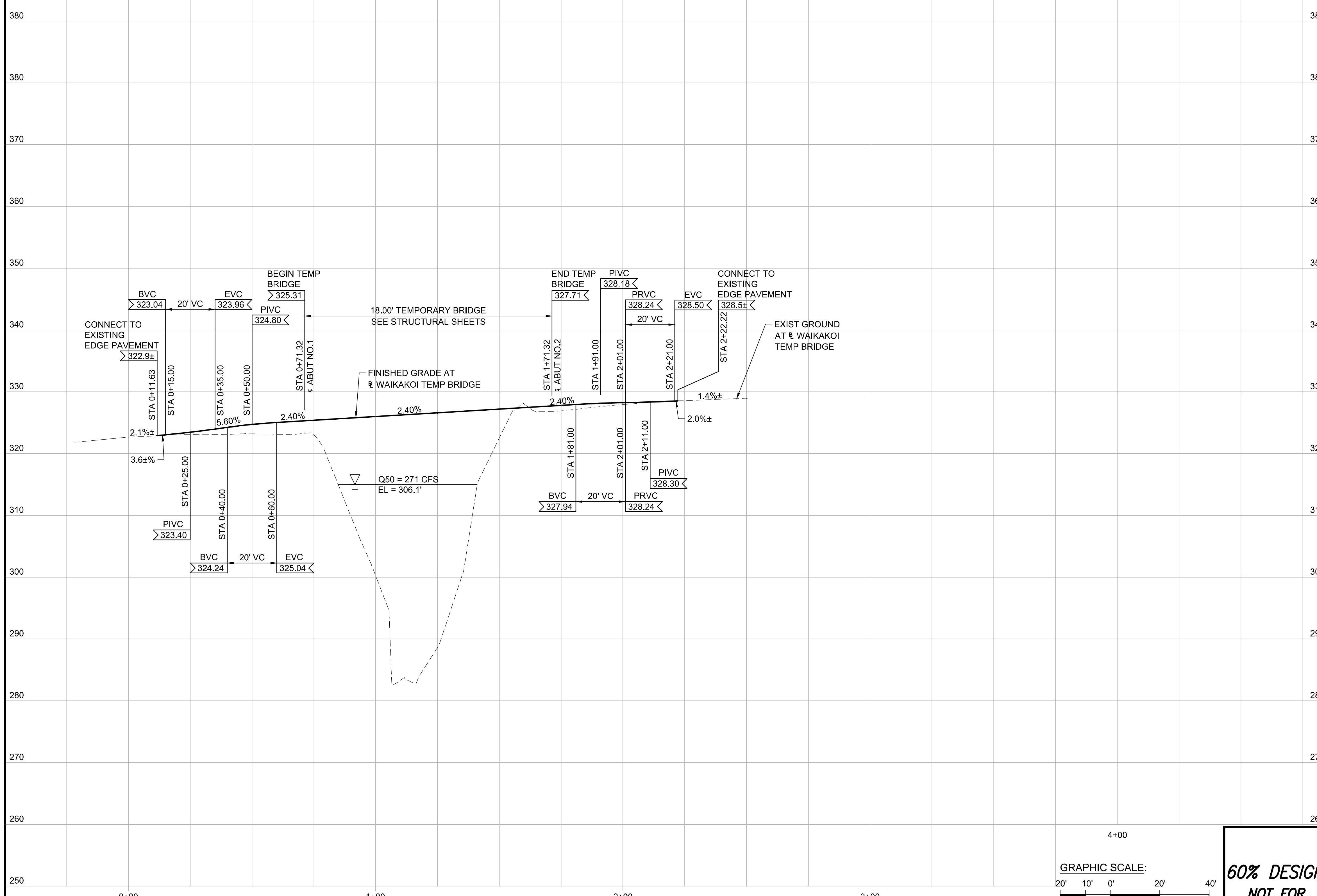
WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE PROFILE

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-028
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 6:01pm
CAD File Name: C:\pwworking\west01\d1900569\C-030 - South Wailua Permanent Bridge Profile.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 030 | 084 |




## WAIKAKOI TEMPORARY BRIDGE PROFILE

SCALE: HORIZ 1" = 20'
VERT 1" = 8'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'
8' 4' 0' 8' 16'
SCALE: 1" = 8'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI TEMPORARY
BRIDGE PROFILE

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C–029
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:01pm
CAD File Name: C:\pwworking\west01\d1900569\C-038 – Waikakoi Temp Bridge Profile.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
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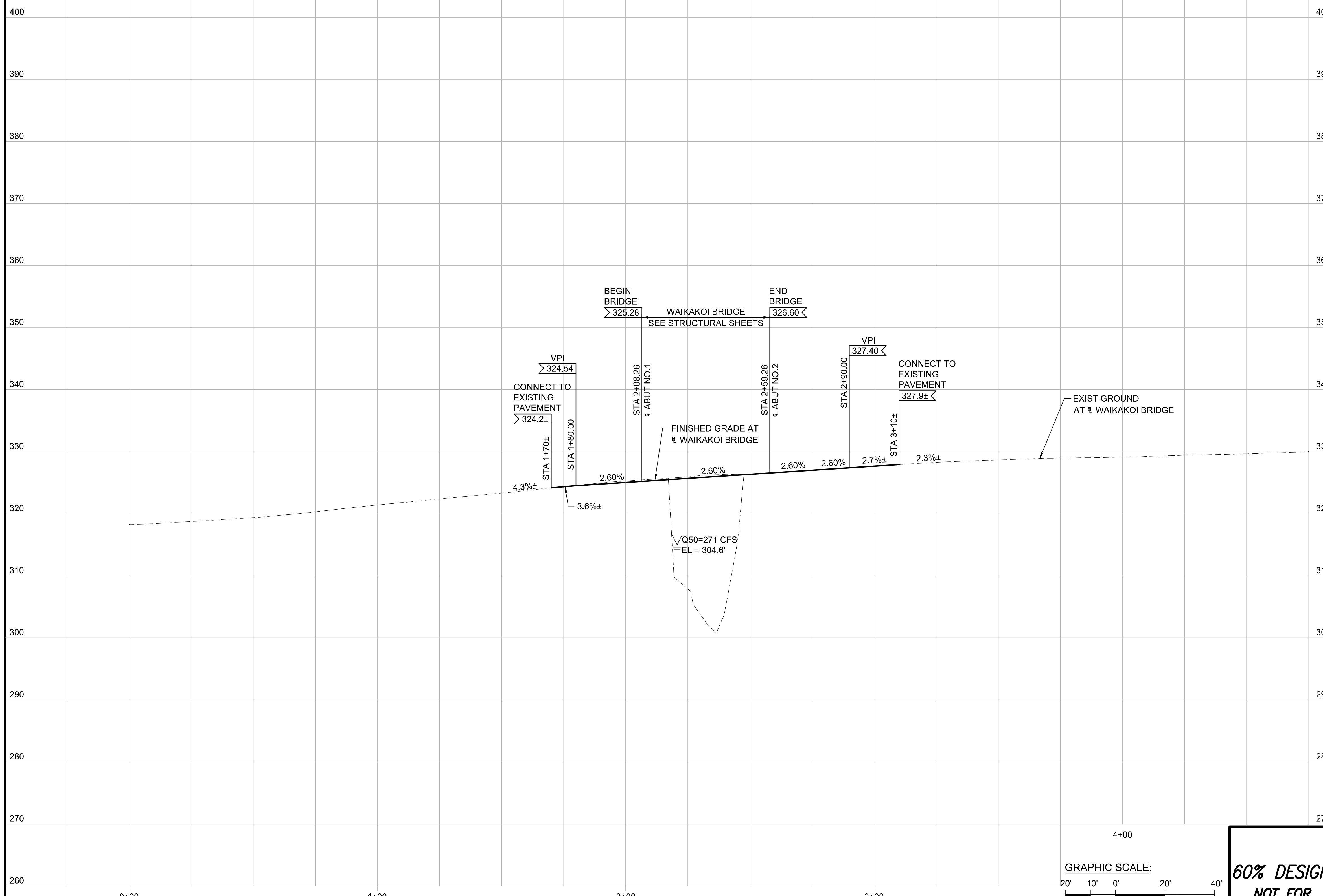



## WAIKAKOI PERMANENT BRIDGE PROFILE

SCALE: HORIZ 1" = 20'
VERT 1" = 8'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'
8' 4' 0' 8' 16'
SCALE: 1" = 8'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

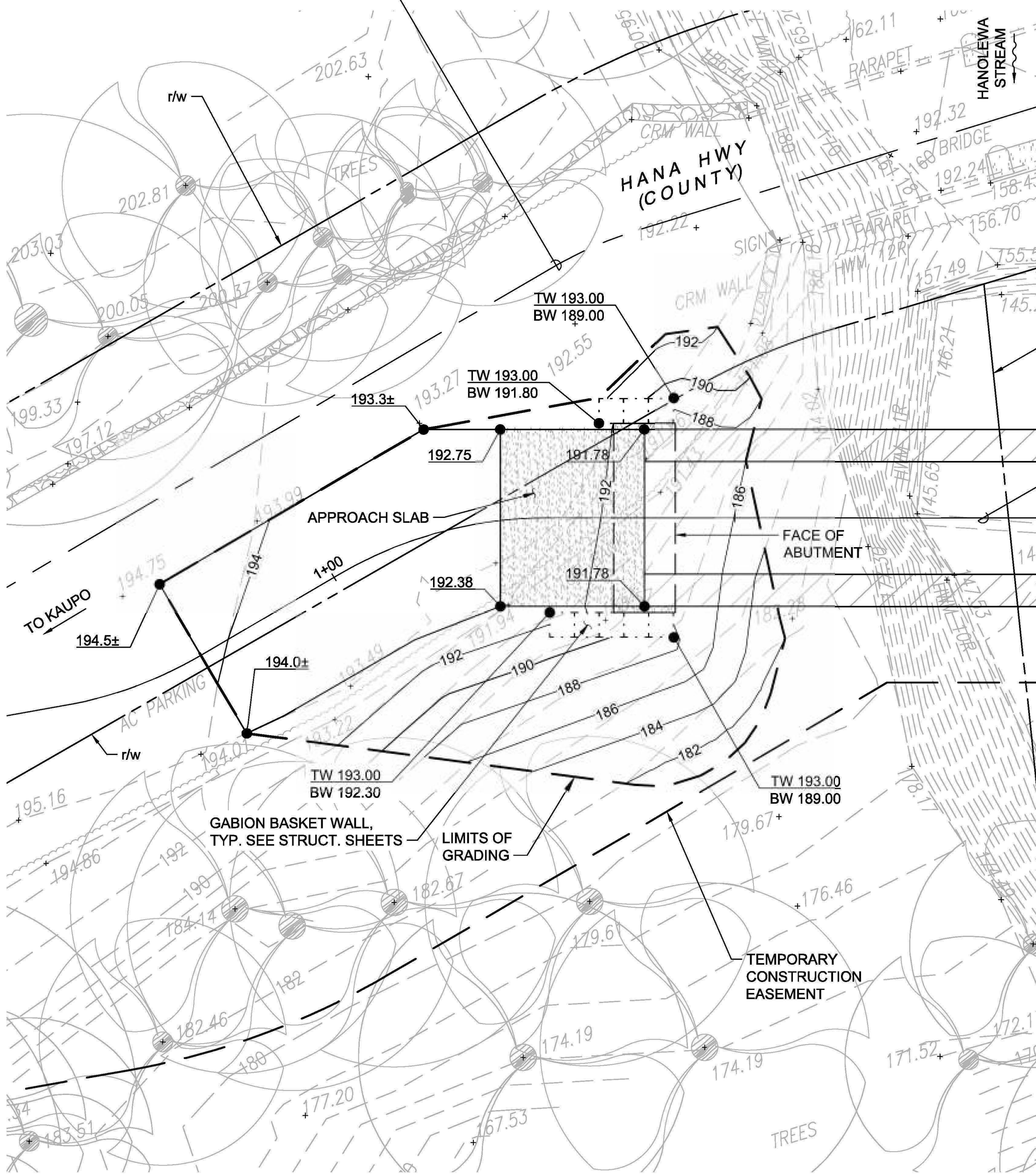
WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

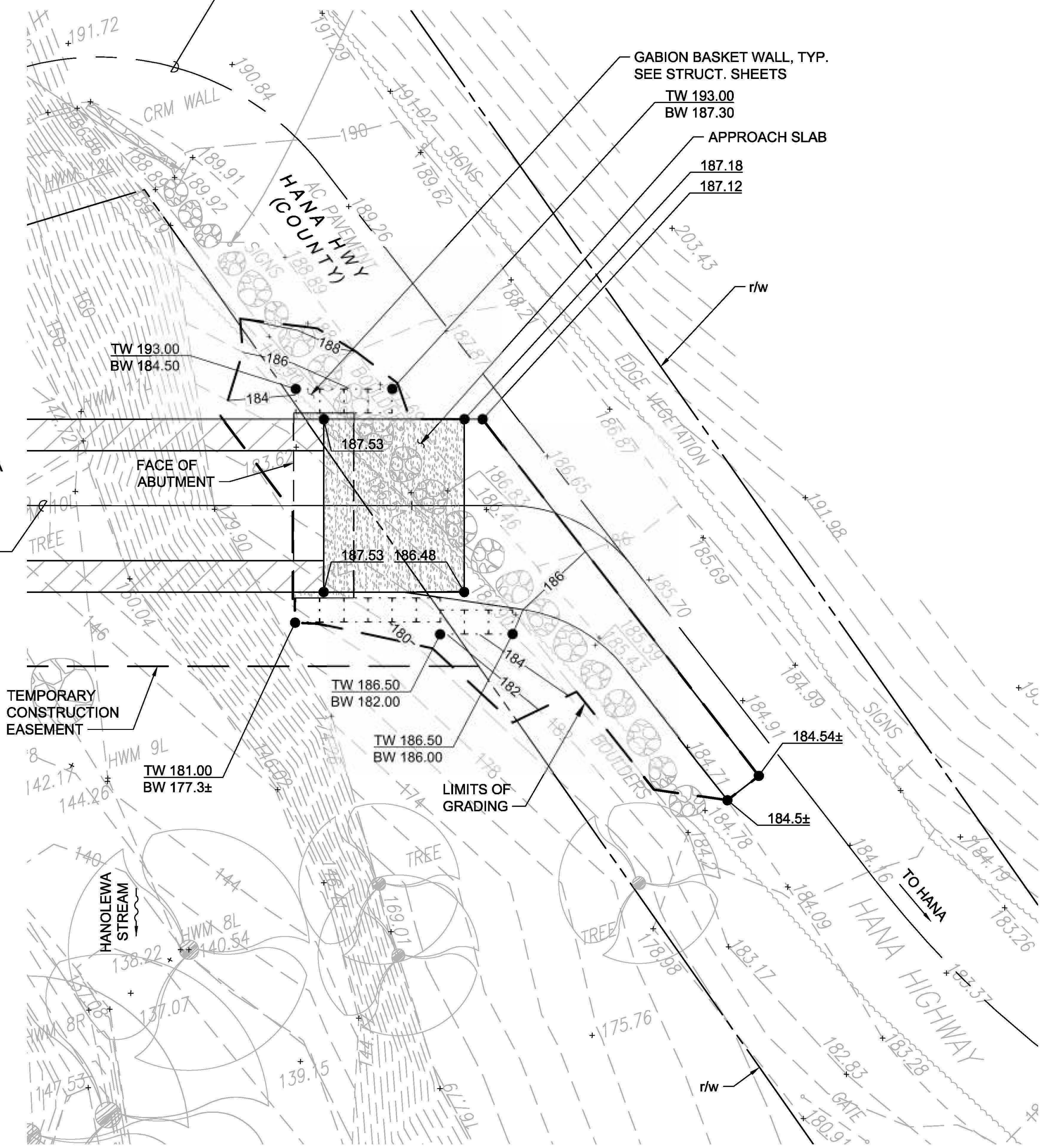
WAIKAKOI PERMANENT
BRIDGE PROFILE

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-030
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:01pm
CAD File Name: C:\pwworking\west01\d1900569\C-045 – Waikakoi Permanent Bridge Profile.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 032 | 084 |




## SOUTH WAILUA KAUPO APPROACH ENLARGED GRADING PLAN
SCALE: 1" = 10'

## SOUTH WAILUA HANA APPROACH ENLARGED GRADING PLAN
SCALE: 1" = 10'

**LEGEND:**

| | |
|---|---|
| 310 | EXISTING GRADE CONTOUR |
| 316 | FINISH GRADE CONTOUR |
| — — | LIMITS OF GRADING |
| 316.00 | FINISH GRADE ELEVATION |
| TW 316.00 BW 314.00 | TOP WALL AND BOTTOM WALL ELEVATION |

**NOTE:**

TEMPORARY BRIDGE AND ASSOCIATED WORK ITEMS NOT SHOWN FOR CLARITY.

GRAPHIC SCALE:
10' 5' 0' 10' 20'
SCALE: 1" = 10'

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

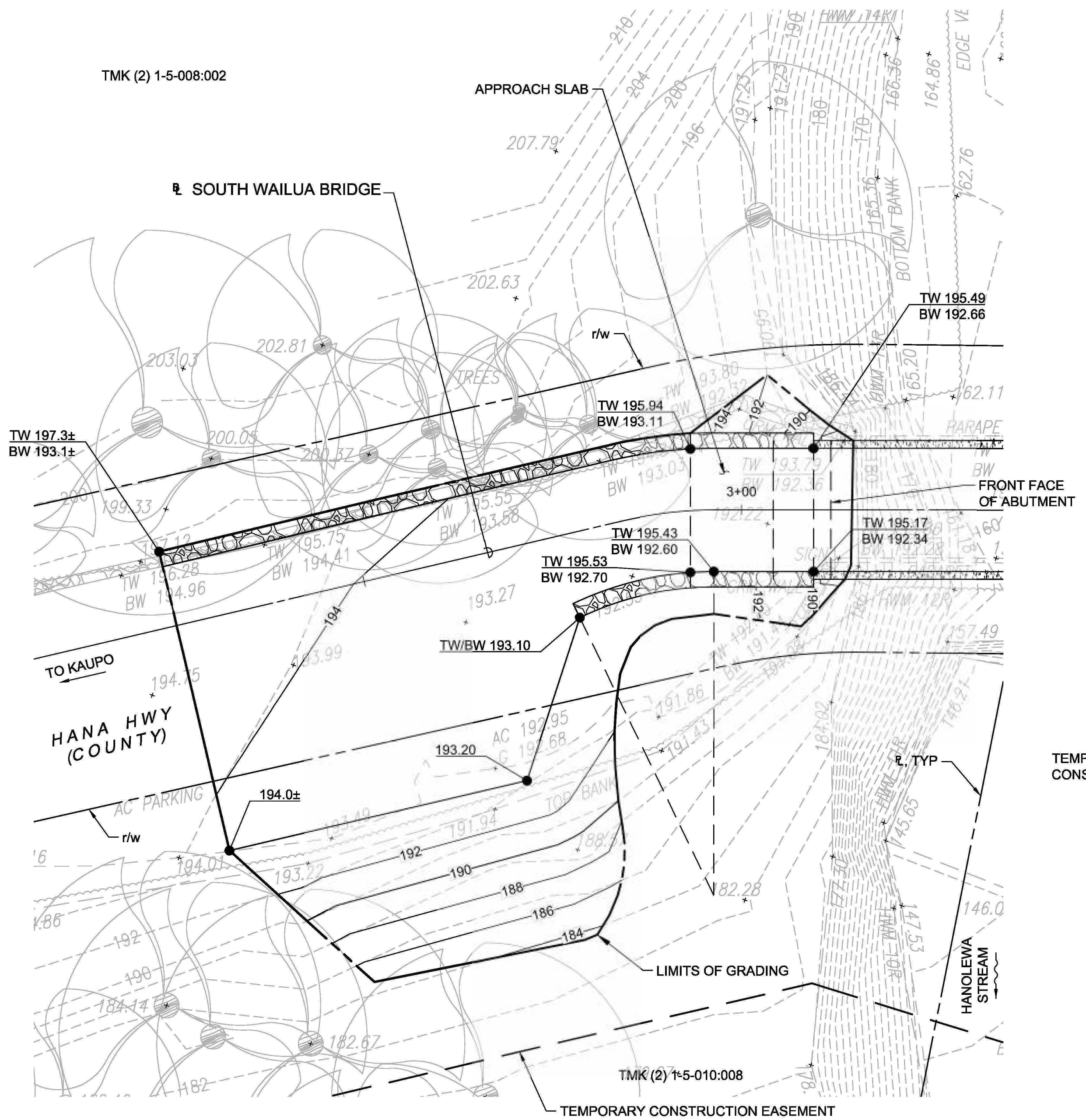
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE GRADING PLAN

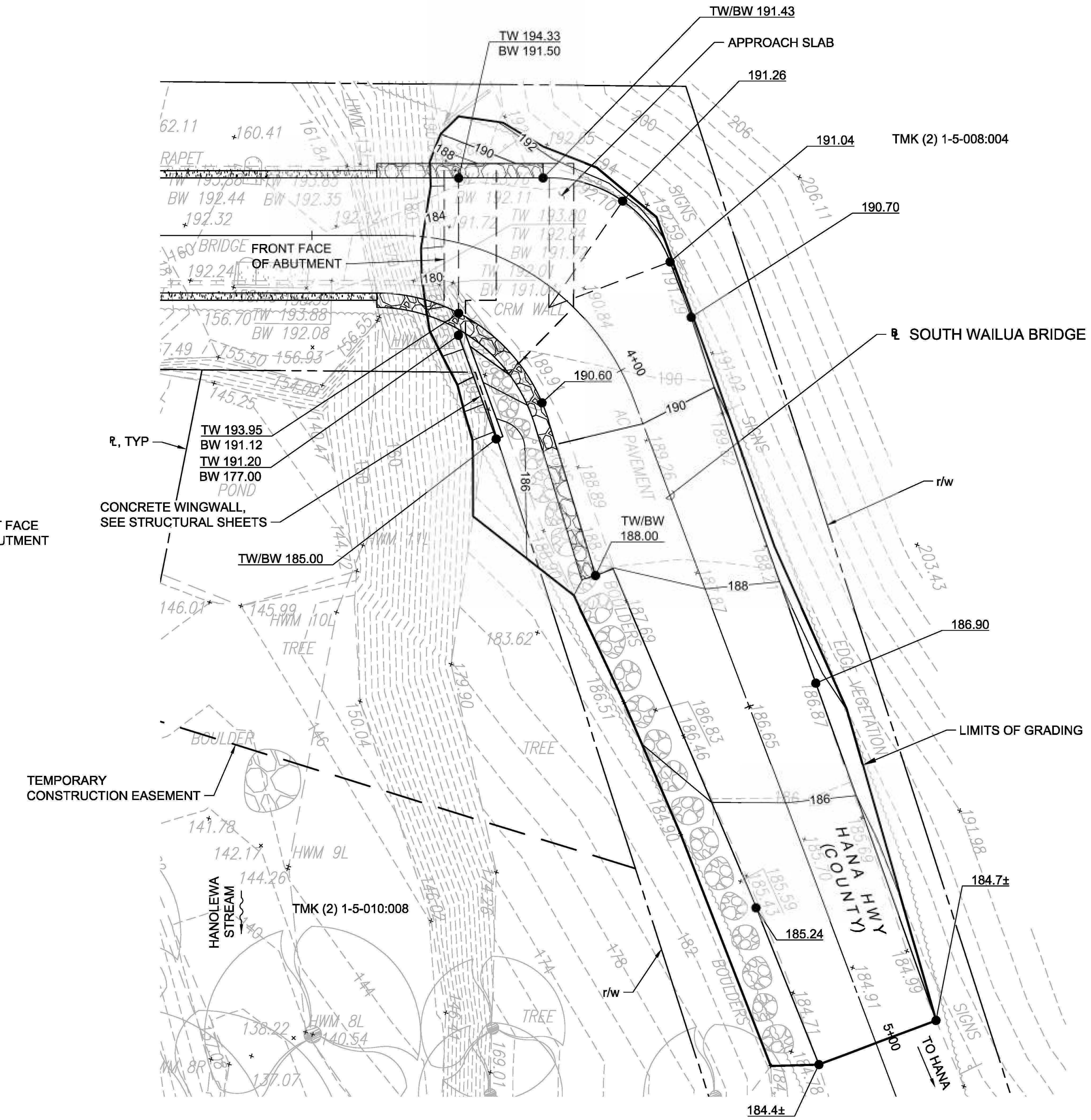
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET C-031
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:01pm
CAD File Name: C:\pwworking\west01\d1900569\C-024 – South Wailua Temporary Bridge Grading Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 033 | 084 |




## SOUTH WAILUA KAUPO APPROACH ENLARGED GRADING PLAN
SCALE: 1" = 10'




## SOUTH WAILUA HANA APPROACH ENLARGED GRADING PLAN
SCALE: 1" = 10'

LEGEND:

| | |
|---|---|
| 310 | EXISTING GRADE CONTOUR |
| 316 | FINISH GRADE CONTOUR |
| | LIMITS OF GRADING |
| 316.00 | FINISH GRADE ELEVATION |
| TW 316.00 BW 314.00 | TOP WALL AND BOTTOM WALL ELEVATION |

NOTE:

TEMPORARY BRIDGE AND ASSOCIATED WORK ITEMS NOT SHOWN FOR CLARITY.

GRAPHIC SCALE:
10' 5' 0' 10' 20'
SCALE: 1" = 10'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
GRADING PLAN

Date:
Date: 8/30/24
Design By: DK
Drawn By: DK
SHEET
C-032
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:01pm
CAD File Name: C:\pwworking\west01\d1900569\C-031 – South Wailua Permanent Bridge Grading Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
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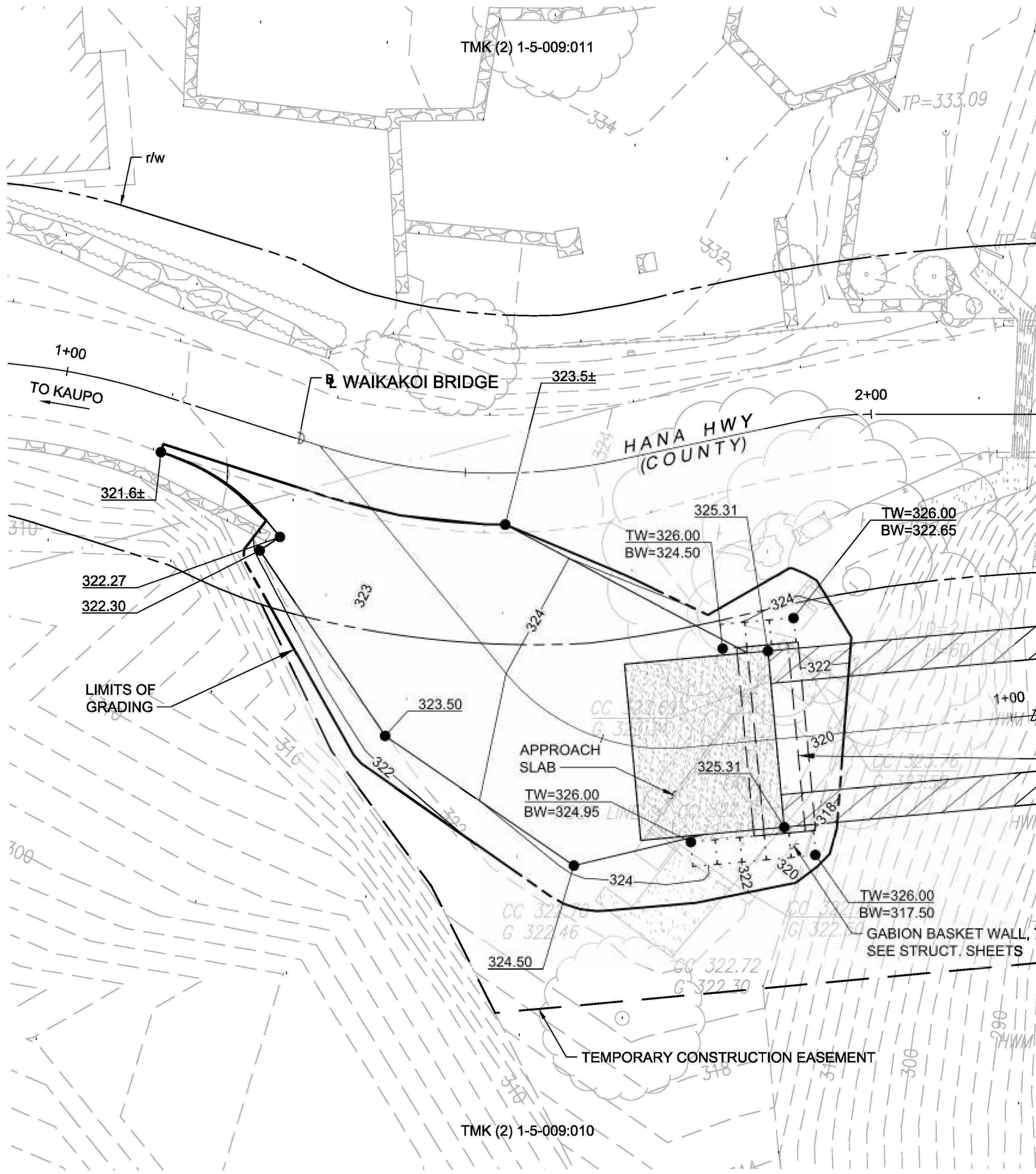



## WAIKOKOI KAUPO APPROACH ENLARGED GRADING PLAN

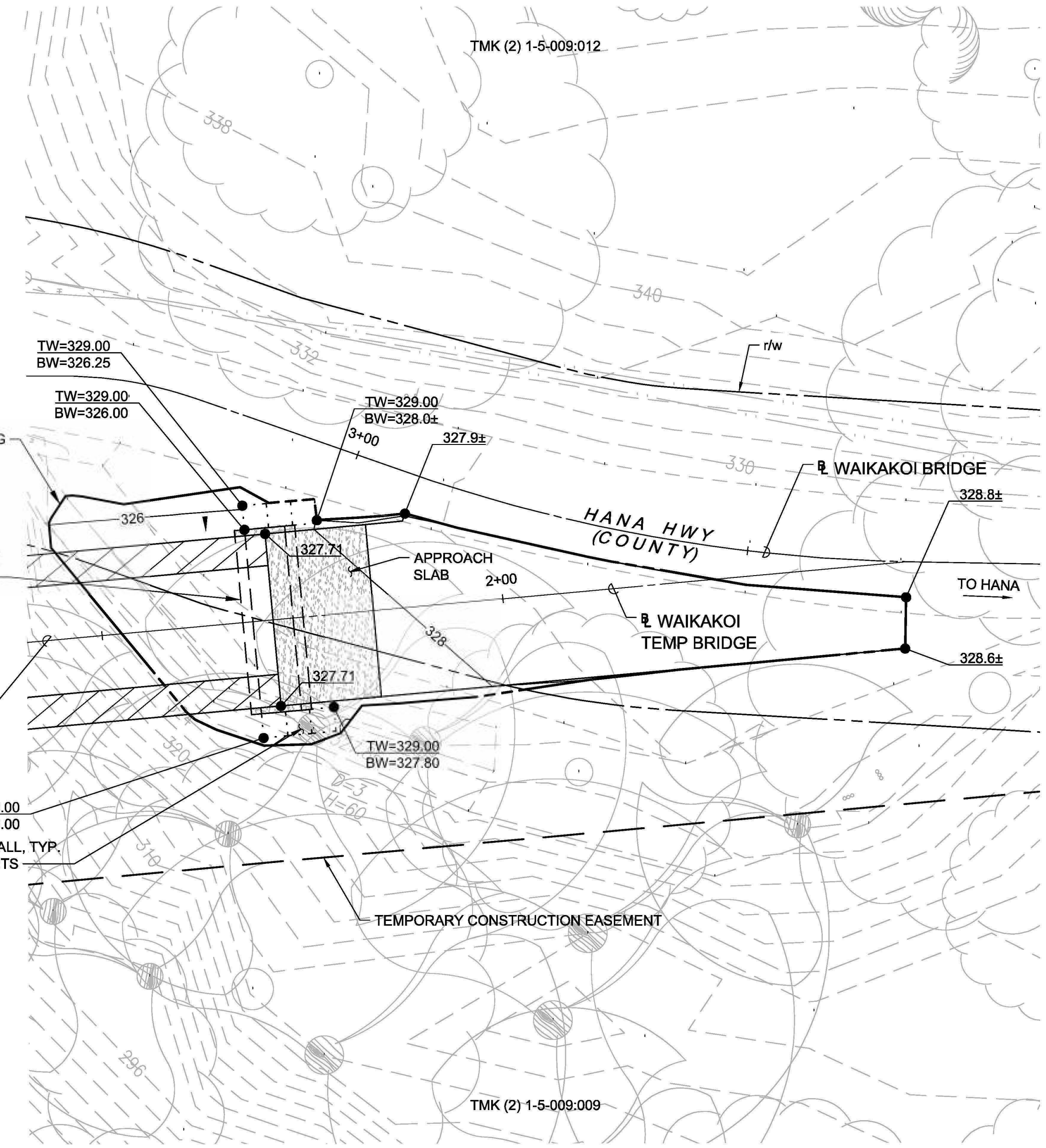
SCALE: 1" = 10'

℄ WAIKAKOI TEMP BRIDGE

℄ WAIKAKOI TEMP BRIDGE

FRONT FACE OF ABUTMENT

FRONT FACE OF ABUTMENT




## WAIKOKOI HANA APPROACH ENLARGED GRADING PLAN

SCALE: 1" = 10'

**LEGEND:**

- 310 — EXISTING GRADE CONTOUR
- 316 — FINISH GRADE CONTOUR
- — — LIMITS OF GRADING
- 316.00 — FINISH GRADE ELEVATION
- TW 316.00 / BW 314.00 — TOP WALL AND BOTTOM WALL ELEVATION

**NOTE:**

TEMPORARY BRIDGE AND ASSOCIATED WORK ITEMS NOT SHOWN FOR CLARITY.

GRAPHIC SCALE:
10' 5' 0' 10' 20'
SCALE: 1" = 10'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

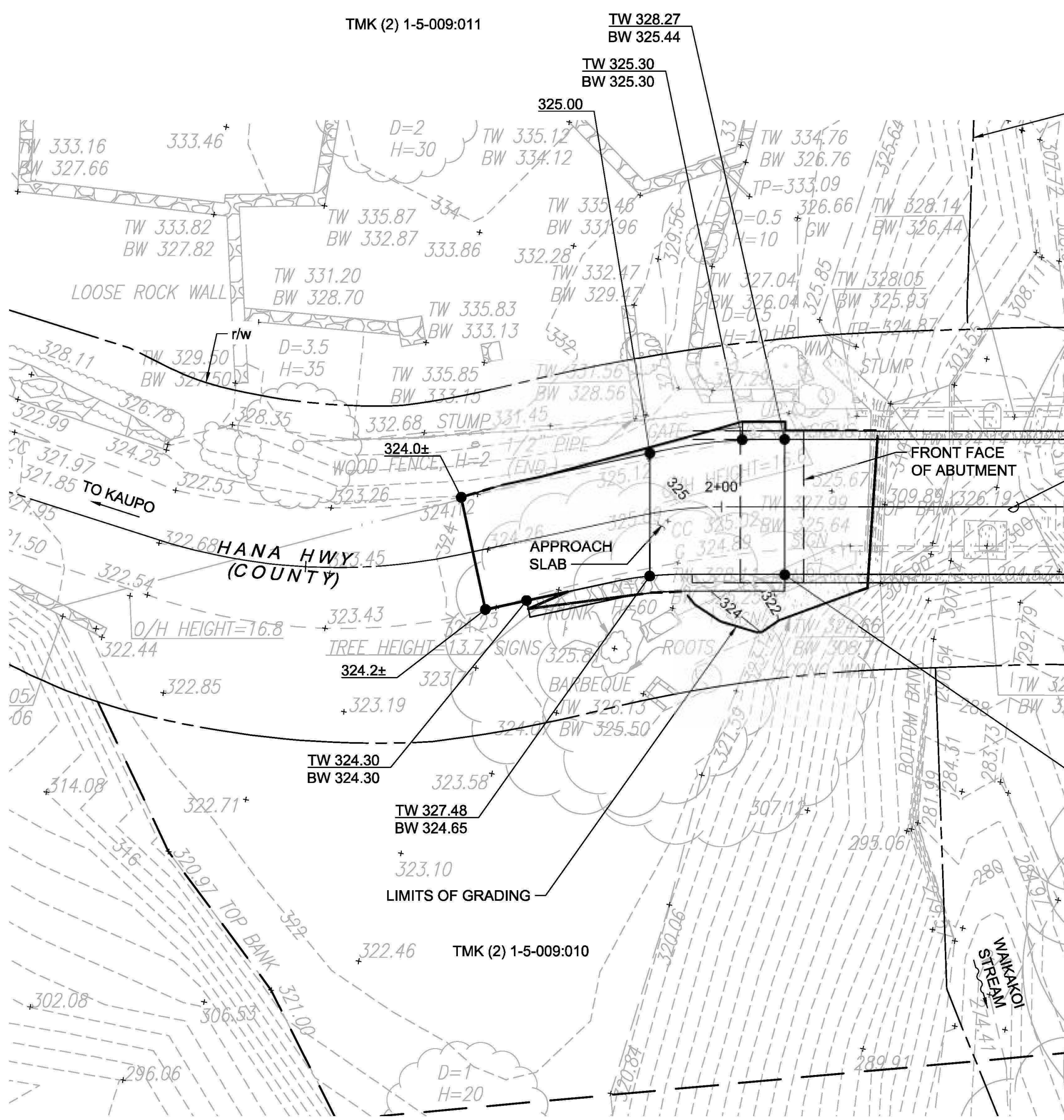
WAIKOKOI TEMPORARY BRIDGE GRADING PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET C-033
of 084 Sheets

PROJ. NO.: 2020040

Date Saved: Fri, 30 Aug 2024 – 6:02pm
CAD File Name: C:\pwworking\west01\d1900569\C-039 – Waikakoi Temporary Bridge Grading Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 035 | 084 |

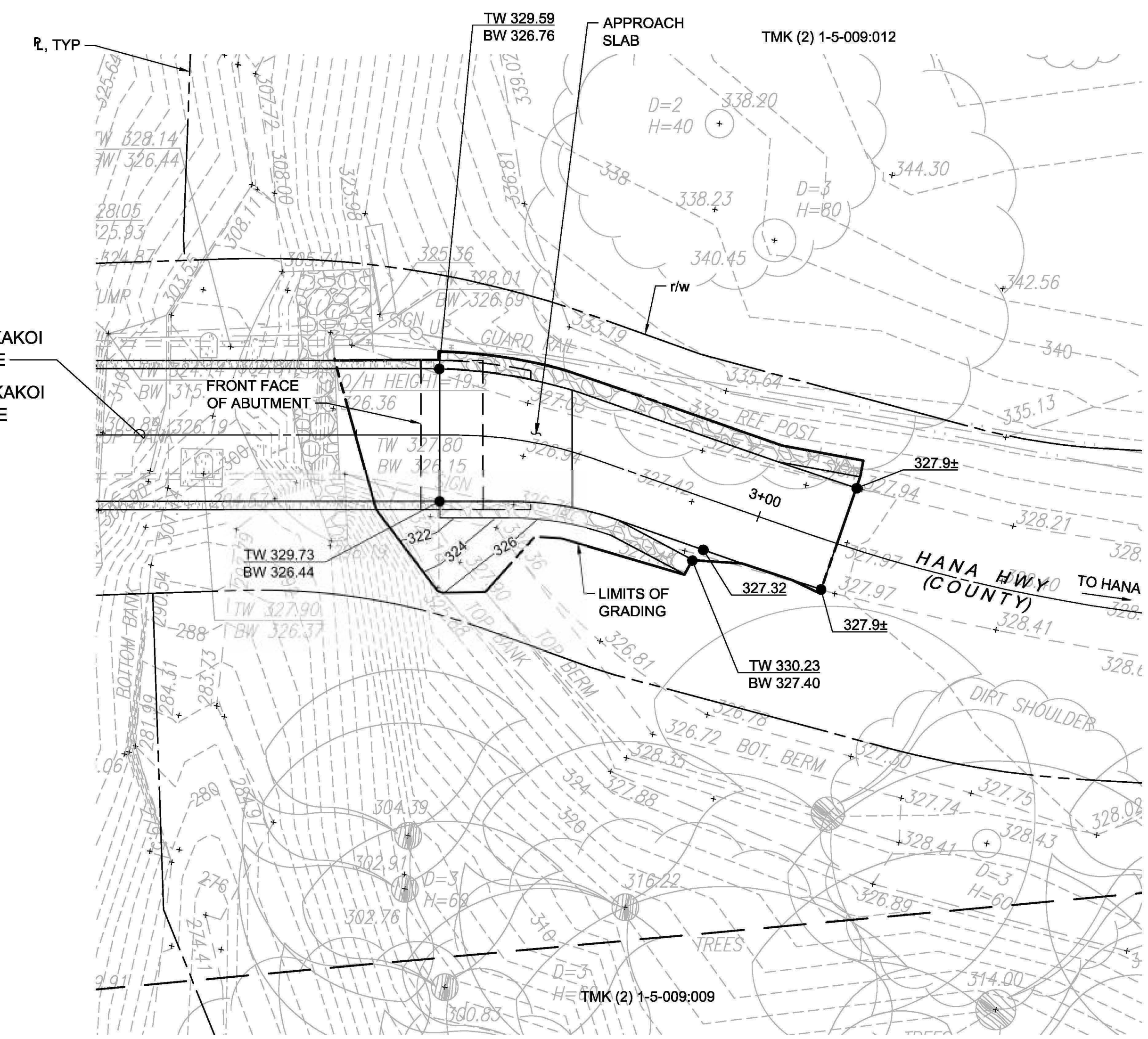



## WAIKOKOI KAUPO APPROACH ENLARGED GRADING PLAN

SCALE: 1" = 10'

℄ WAIKAKOI BRIDGE

℄ WAIKAKOI BRIDGE




## WAIKOKOI HANA APPROACH ENLARGED GRADING PLAN

SCALE: 1" = 10'

LEGEND:

| | |
|---|---|
| 310 | EXISTING GRADE CONTOUR |
| 316 | FINISH GRADE CONTOUR |
| | LIMITS OF GRADING |
| 316.00 | FINISH GRADE ELEVATION |
| TW 316.00 BW 314.00 | TOP WALL AND BOTTOM WALL ELEVATION |

NOTE:

TEMPORARY BRIDGE AND ASSOCIATED WORK ITEMS NOT SHOWN FOR CLARITY.

10' 5' 0' 10' 20'
SCALE: 1" = 10'

60% DESIGN
NOT FOR CONSTRUCTION

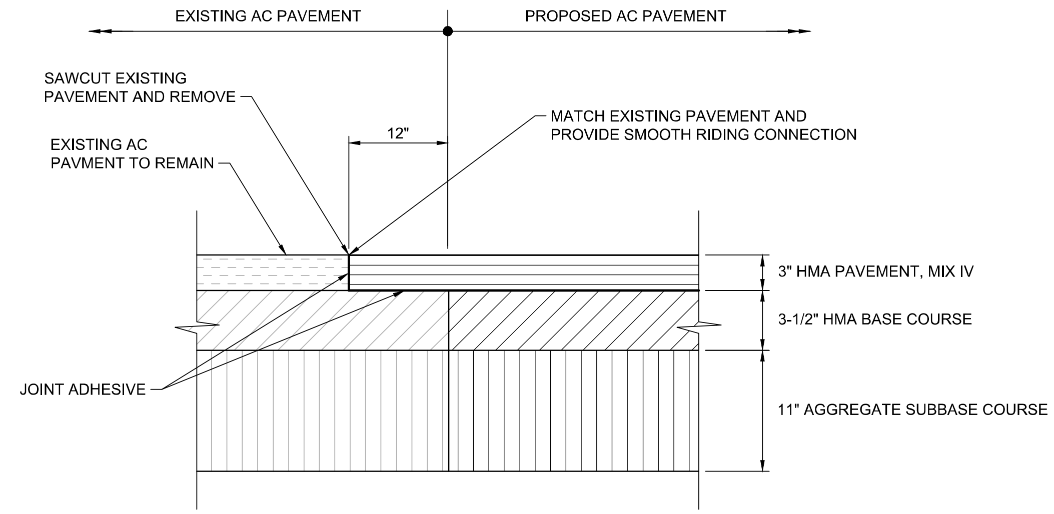
COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI PERMANENT BRIDGE GRADING PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-034
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:02pm
CAD File Name: C:\pwworking\west01\d1900569\C-046 – Waikakoi Permanent Bridge Grading Plan.dwg

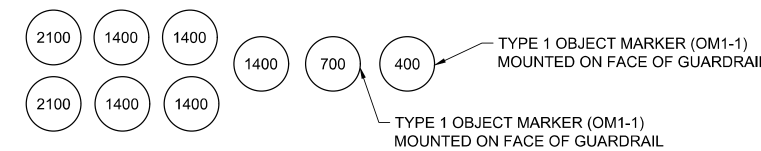


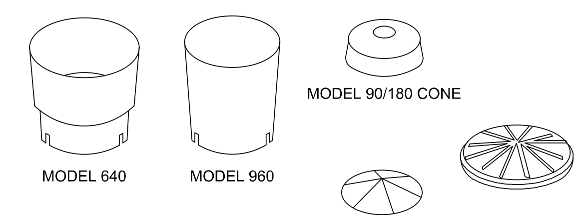

AC PAVEMENT TRANSITION DETAIL 1

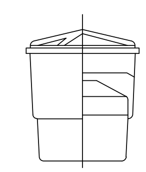
NOT TO SCALE

DESIGN VELOCITY 45 mph (72 km/h)

| | | 1800 lb vehicle | | | 4500 lb vehicle | | |
|---|---|---|---|---|---|---|---|
| ROW | SAND MASS (lbs) | EXIT VEL (mph) | AVE G'S FOR ROW | IMPULSE TIME (sec) | EXIT VEL (mph) | AVE G'S FOR ROW | IMPULSE TIME (sec) |
| 0 | | 45.0 | | | 45.0 | | |
| 1 | 400 | 36.8 | 7.5 | 0.05 | 41.3 | 3.5 | 0.05 |
| 2 | 700 | 26.5 | 7.3 | 0.06 | 35.8 | 4.8 | 0.05 |
| 3 | 1400 | 14.9 | 5.4 | 0.10 | 27.3 | 6.0 | 0.06 |
| 4 | 2800 | 5.8 | 2.1 | 0.20 | 16.8 | 5.1 | 0.09 |
| 5 | 2800 | 2.3 | .3 | 0.50 | 10.4 | 2.0 | 0.15 |
| 6 | 4200 | .7 | .1 | 1.38 | 5.4 | .9 | 0.26 |



TYPICAL ASSEMBLY (90kg)

| NOMINAL MASS kg | NOMINAL MASS lb | OUTER CONTAINER MODEL | CONE MODEL | LID |
|---|---|---|---|---|
| 90 | 200 | 640 | 90/180 | x |
| 180 | 400 | 640 | 90/180 | x |
| 320 | 700 | 640 | 320 | x |
| 640 | 1400 | 640 | - | x |
| 960 | 2100 | 960 | - | x |

SAND BARREL DETAIL 2

NOT TO SCALE

PROJ. NO.: 2020040

Date Saved: Fri, 30 Aug 2024 - 6:02pm
CAD File Name: C:\pwworking\west01\d1900569\C-048 - Miscellaneous Details.dwg

60% DESIGN
NOT FOR CONSTRUCTION

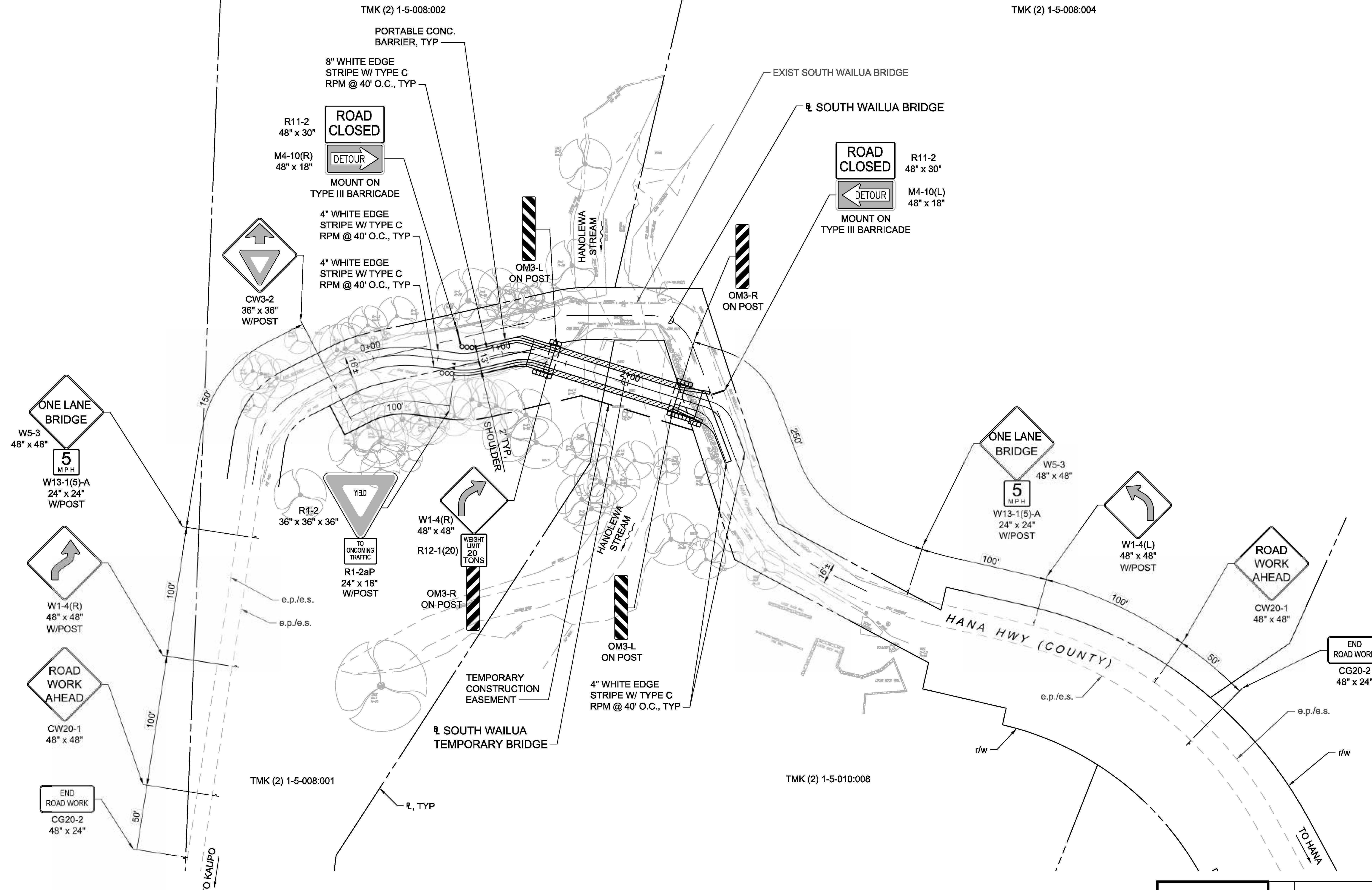
COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

MISCELLANEOUS DETAILS

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-035
of 084 Sheets

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR–0360(015) | 2026 | 037 | 084 |




NORTH

## S. WAILUA TEMPORARY BRIDGE SIGNAGE AND PAVEMENT MARKING PLAN

SCALE: 1" = 40'

GRAPHIC SCALE:

40' 20' 0' 40' 80'

SCALE: 1" = 40'

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

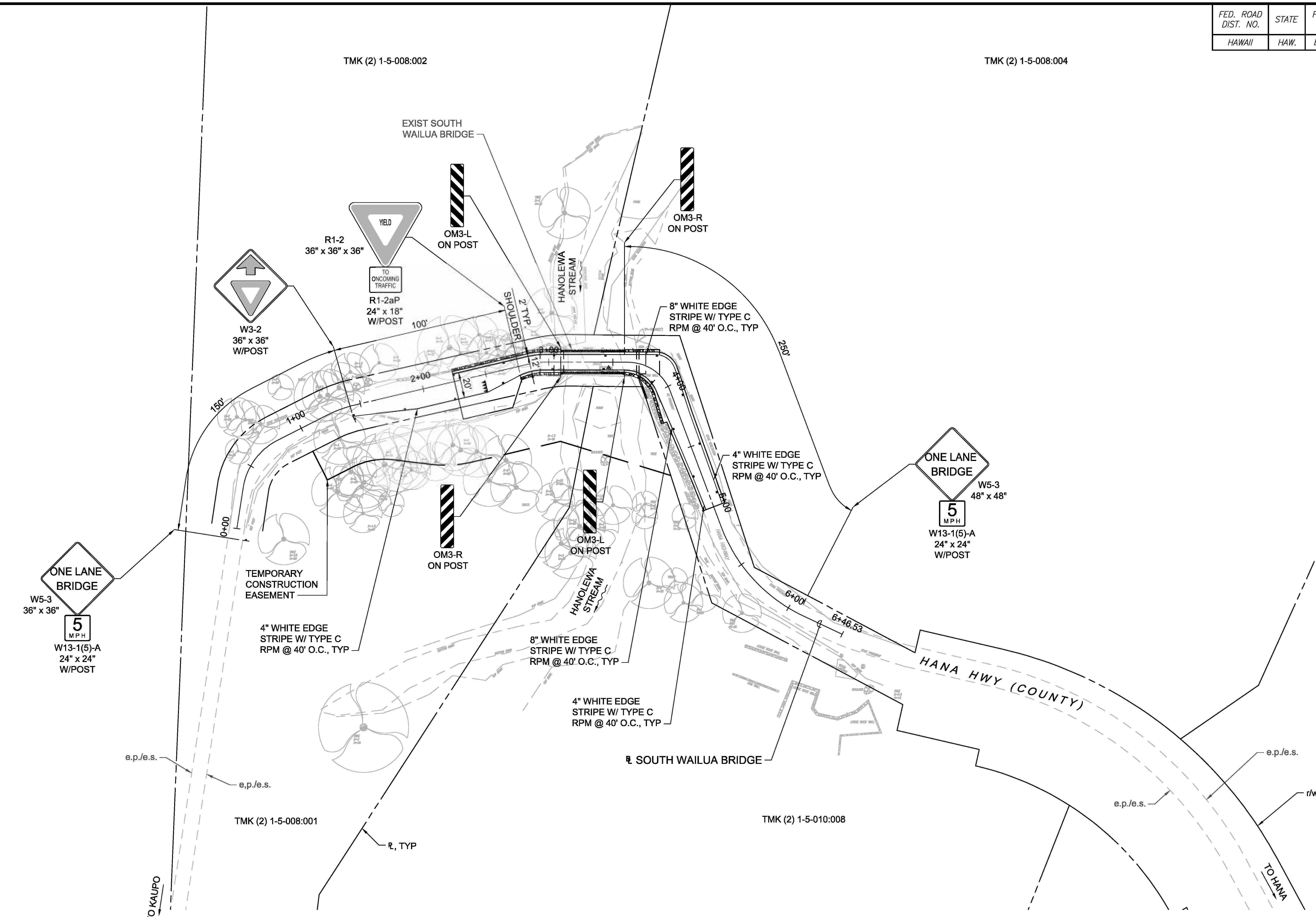
S. WAILUA TEMPORARY BRIDGE SIGNAGE AND PAVEMENT MARKING PLAN

Date:
Date: 8/30/24
Design By: DK
Drawn By: DK
SHEET
C–036
of 084 Sheets

PROJ. NO.: 2020040

Date Saved: Fri, 30 Aug 2024 – 6:02pm
CAD File Name: C:\pwworking\west01\d1900569\C-025 – South Wailua Temporary Bridge Signage and Pavement Marking Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 038 | 084 |




NORTH

## S. WAILUA PERMANENT BRIDGE SIGNAGE AND PAVEMENT MARKING PLAN

SCALE: 1" = 40'

GRAPHIC SCALE:
40' 20' 0' 40' 80'
SCALE: 1" = 40'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

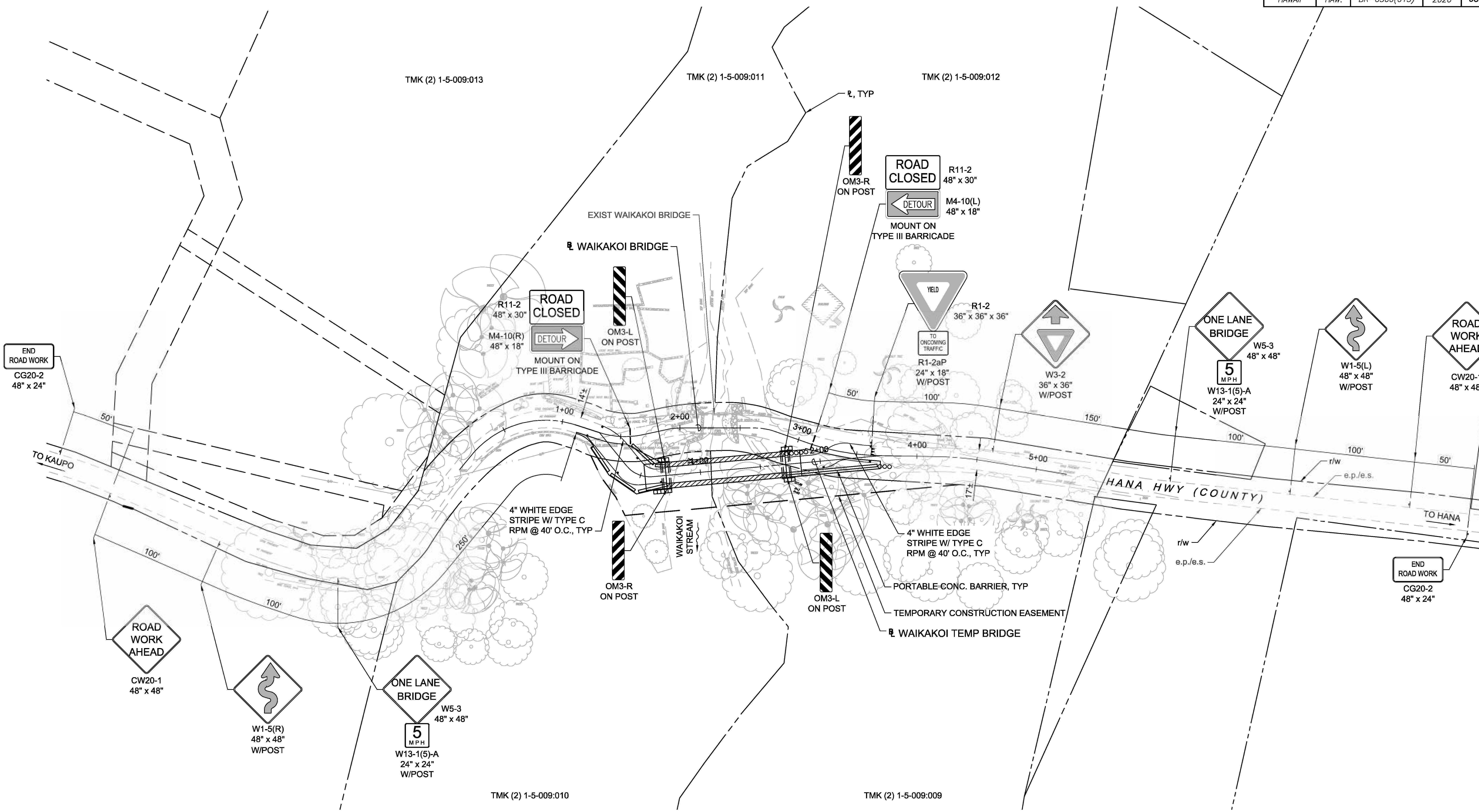
WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
SIGNAGE AND PAVEMENT MARKING PLAN

Date:
Date: 8/30/24
Design By: DK
Drawn By: DK
SHEET
C-037
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:02pm
CAD File Name: C:\pwworking\west01\d1900569\C-032 – South Wailua Perm Bridge Signage and Striping Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 039 | 084 |




NORTH

## WAIKAKOI TEMPORARY BRIDGE SIGNAGE AND PAVEMENT MARKING PLAN

SCALE: 1" = 40'

GRAPHIC SCALE:
40' 20' 0' 40' 80'
SCALE: 1" = 40'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

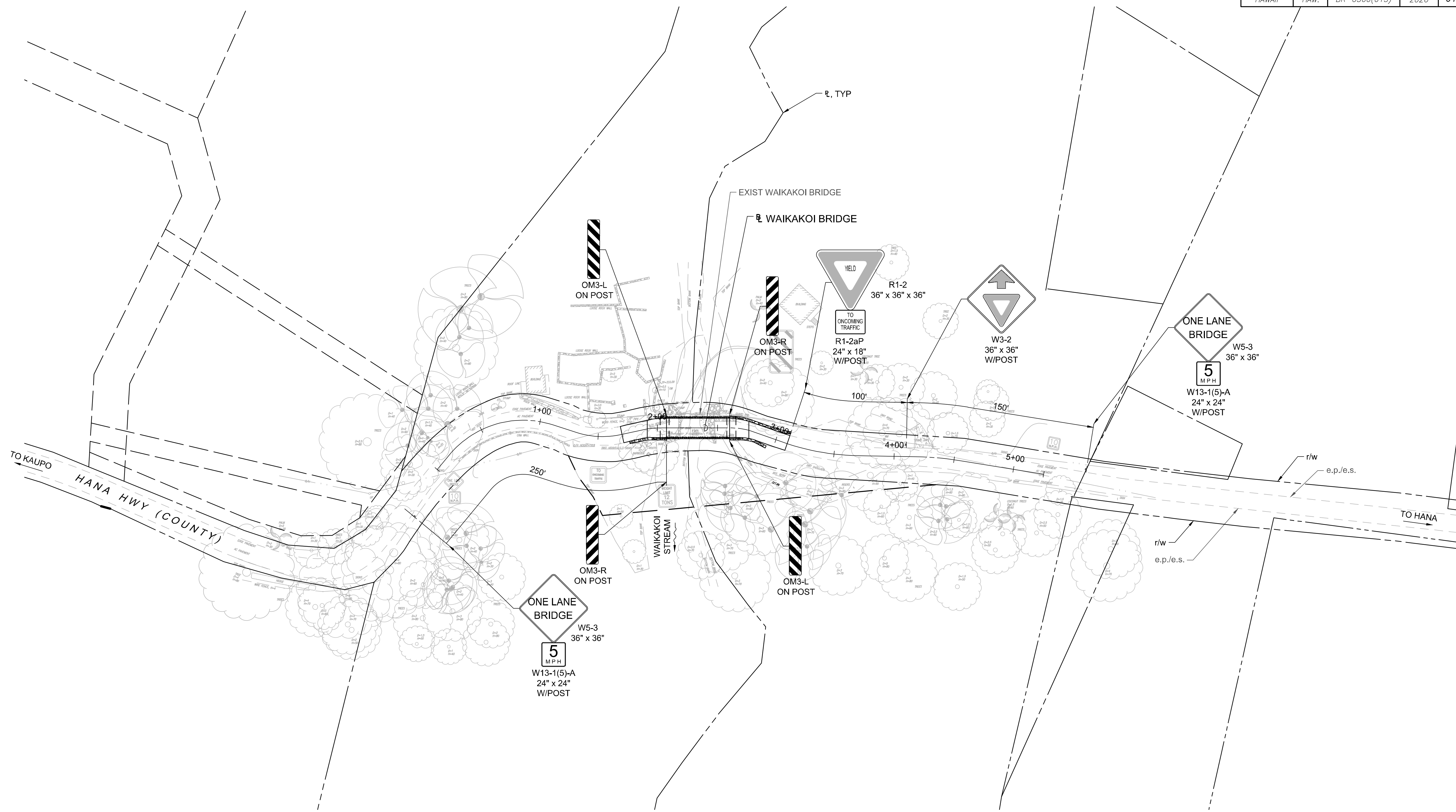
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE SIGNAGE AND PAVEMENT MARKING PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-038
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 6:02pm
CAD File Name: C:\pwworking\west01\d1900569\C-040 - Waikakoi Temporary Bridge Signage and Striping Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 040 | 084 |




NORTH

## WAIKAKOI PERMANENT BRIDGE SIGNAGE AND PAVEMENT MARKING PLAN

SCALE: 1" = 40'

GRAPHIC SCALE:
40' 20' 0' 40' 80'
SCALE: 1" = 40'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI PERMANENT BRIDGE
SIGNAGE AND PAVEMENT MARKING PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C–039
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:02pm
CAD File Name: C:\pwworking\west01\d1900569\C-047 – Waikakoi Perm Bridge Signage and Striping Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 041 | 084 |

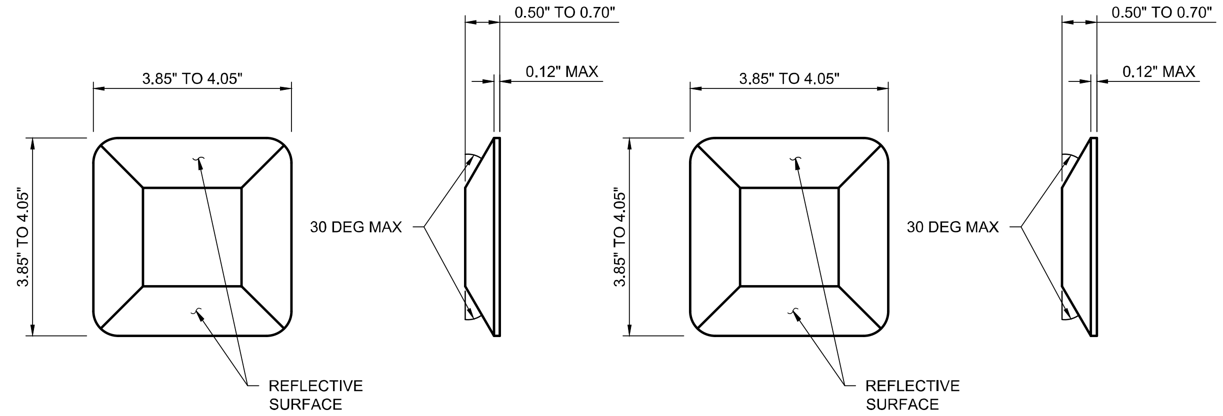
LEGEND:

4" WIDE DOUBLE SOLID YELLOW STRIPES WITH TYPE "D" RAISED PAVEMENT MARKERS @ 20' OC (THERMOPLASTIC EXTRUSION)

4" WIDE SOLID WHITE EDGE STRIPE WITH TYPE "C" RAISED PAVEMENT MARKERS @ 40' OC (THERMOPLASTIC EXTRUSION)

SIGNAGE AND MARKING NOTES:

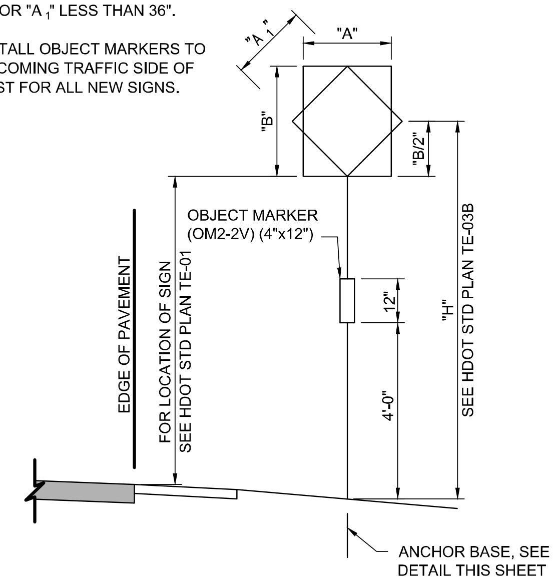
1. ALL TRAFFIC SIGNS AND PAVEMENT MARKING INSTALLATIONS SHALL BE DONE IN ACCORDANCE WITH THE LATEST "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS," AND THE 2005 "HAWAII STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION," DEPT. OF TRANSPORTATION, STATE OF HAWAII, AND AS SHOWN ON THE PLANS.
2. CONTRACTOR SHALL ALSO MAKE REFERENCE TO THE STATE OF HAWAII, DEPARTMENT OF TRANSPORTATION, HIGHWAY'S DIVISION STANDARD PLANS AND THE COUNTY OF MAUI'S STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION FOR DIMENSIONS AND OTHER DETAILS.
3. ALL PAVEMENT MARKINGS SHALL BE THERMOPLASTIC, UNLESS NOTED OTHERWISE.
4. SIGNS SHALL BE RETROREFLECTORIZED, UNLESS OTHERWISE SPECIFIED. ALL SIGNS PROPOSED FOR COUNTY OR STATE RIGHT-OF-WAY SHALL BE MADE OF TYPE IV RETROREFLECTIVE HIGH INTENSITY PRISMATIC SHEETING. BACK OF SIGNS SHALL ALSO BE STAMPED WITH INSTALLATION MONTH & YEAR. STICKERS MAY BE USED ALSO TO INDICATE THIS INFO (COUNTY TO REVIEW MATERIALS).
5. SIGNS SHALL BE ATTACHED TO POST WITH 5/16" ZINC PLATED STEEL BOLTS, NUTS AND WASHERS.
6. LAYOUT OF PAVEMENT MARKINGS AND SIGNS SHALL BE DONE BY THE CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO ANY INSTALLATION WORK.
7. CONTRACTOR SHALL REFERENCE, ALL EXISTING TRAFFIC SIGNS, POSTS AND PAVEMENT MARKINGS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, THE CONTRACTOR SHALL REPLACE OR REPAIR ALL TRAFFIC SIGNS, POSTS, AND PAVEMENT MARKINGS DISTURBED BY THEIR ACTIVITIES.
8. EXISTING PAVEMENT MARKINGS NOT INCORPORATED IN THE FINAL TRAFFIC PATTERN SHALL BE REMOVED AS DIRECTED BY THE ENGINEER. COSTS SHALL BE INCIDENTAL TO THE VARIOUS PAVEMENT MARKING ITEMS.
9. RAISED PAVEMENT MARKERS SHALL NOT BE INSTALLED WITHIN CROSSWALKS.
10. EXISTING SIGNS NOT SHOWN ON THESE PLANS SHALL REMAIN AS POSTED UNLESS OTHERWISE DIRECTED BY THE ENGINEER. REMOVAL AND DISPOSAL OF EXISTING SIGNS AND/OR POSTS AS DESIGNATED ON THESE PLANS SHALL BE INCIDENTAL TO THE VARIOUS SIGNING ITEMS.
11. ALL SIGNS NOT SHOWN IN DETAIL ON THIS PLAN OR THE STANDARD PLANS SHALL BE MADE TO MATCH EXISTING REGULATORY OR WARNING SIGNS.
12. INSTALL TYPE II OBJECT MARKER ON ALL UTILITY POLES, TREES, AND SIGN POST (NEW OR EXISTING) THAT ARE WITHIN THE RIGHT-OF-WAY AND WITHIN 30 FEET OF THE ROADWAY EDGE OF PAVEMENT OR AS DIRECTED BY THE ENGINEER.
13. ALL NEW SIGN POSTS SHALL BE SQUARE TUBE POSTS. SEE SIGNAGE DETAILS AND NOTES SHEET FOR ANCHOR.
14. CONTACT THE DEPARTMENT OF WATER SUPPLY INSPECTOR AT (808) 270-7340 TO ARRANGE FOR LOCATION OF EXISTING WATER LATERALS AND VALES PRIOR TO CONSTRUCTION.
15. CONTACT ANY OTHER APPLICABLE UTILITY COMPANIES FOR THE LOCATION OF UNDERGROUND LINES PRIOR TO INSTALLING SIGNS IN THE SHOULDER AREAS.



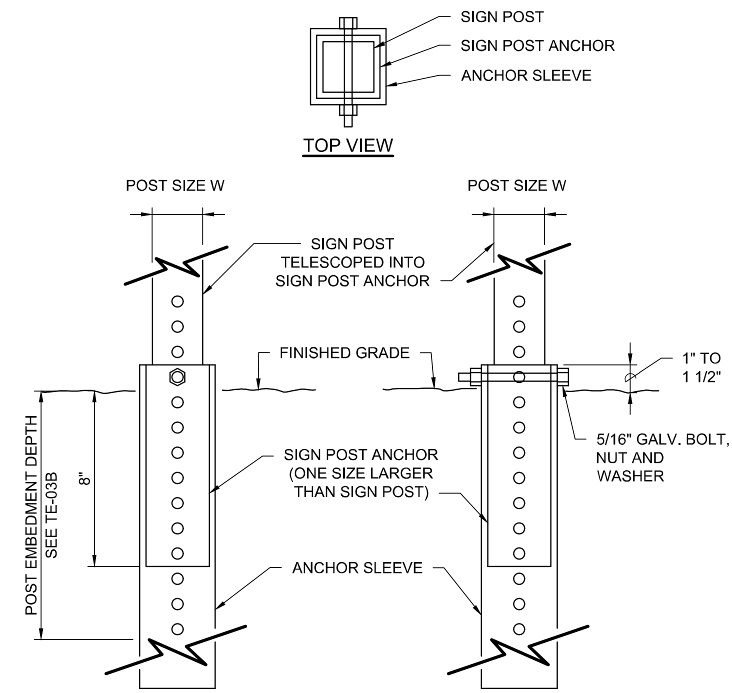

STANDARD RAISED PAVEMENT MARKER (1)
NOT TO SCALE

NOTES:

1. "A" OR "A$_1$" LESS THAN 36".
2. INSTALL OBJECT MARKERS TO ONCOMING TRAFFIC SIDE OF POST FOR ALL NEW SIGNS.




TYPICAL SIGN INSTALLATION (2)
NOT TO SCALE




TYPICAL SIGN INSTALLATION ANCHOR BASE (3)
NOT TO SCALE

SIGNAGE GENERAL NOTES:

1. DESIGN SPECIFICATIONS:
   A. DESIGN SHALL CONFORM WITH THE LATEST AASHTO STANDARD SPECIFICATIONS FOR THE STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES & TRAFFIC SIGNALS AND ITS INTERIM SUPPLEMENTS AND MODIFICATIONS BY THE HIGHWAYS DIVISION, DEPARTMENT OF TRANSPORTATION STATE OF HAWAII.
   B. LATEST HDOT MEMORANDUM WITH SUBJECT TITLE "DESIGN CRITERIA FOR BRIDGES AND STRUCTURES."
2. LOADS:
   A. BASIC WIND SPEED: 105 mph.
   B. RECURRENCE INTERVAL OF 10 YEARS.
3. MATERIALS:
   A. POST SHALL CONFORM TO THE STANDARD SPECIFICATIONS.
   B. ALL CONNECTION BOLTS SHALL BE AASHTO M164 BOLTS AND ANCHOR BOLTS SHALL BE ASSHTO M314-105 BOLT.
   C. LAP SPLICE NUTS AND BOLTS SHALL BE M180, WITH AN ULTIMATE TENSILE STRENGTH OF 180 ksi, MIN.
   D. ALUMINUM MEMBERS AND SURFACES IN CONTACT WITH STRUCTURAL STEEL SHALL BE ISOLATED WITH NEOPRENE MATERIAL AS APPROVED BY THE ENGINEER.
4. GENERAL:
   A. SEE GENERAL NOTES ON HDOT STD PLAN B-01, TE-01, AND TE-03B FOR ADDITIONAL INFORMATION.
   B. ALL POSTS SHALL BE 12 GAGE UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE PLANS.
   C. SQUARE TUBE POSTS SHALL BE PERFORATED WITH 7/16"~ HOLES, 1" OC, 4 SIDES, ALONG ENTIRE LENGTH OF POST.
   D. ALL ACCESSORIES, FITTINGS AND STIFFENER DETAILS (AS REQUIRED) SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL 20 DAYS PRIOR TO INSTALLATION.
   E. ALTERNATE DESIGNS IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SHALL USE THE SERVICE LOAD DESIGN METHOD AND SHALL BE STAMPED BY A REGISTERED STRUCTURAL ENGINEER OF THE STATE OF HAWAII AND SUBMITTED TO THE ENGINEER FOR APPROVAL.
   F. ALL SIGN SUPPORT POSTS SHALL BE OUTSIDE OF THE CLEAR ZONE OR SHIELDED BY AN APPROPRIATE TRAFFIC BARRIER SYSTEM. THE TRAFFIC BARRIER SYSTEM SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
   G. THE CONTRACTOR SHALL USE TEMPLATES WHILE INSTALLING THE ANCHOR BOLTS. ANCHOR BOLTS SHALL BE VERTICAL.
   H. EXCAVATION AND BACKFILL SHALL BE CONSIDERED INCIDENTAL TO THE COST OF THE SIGN FOUNDATION.

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

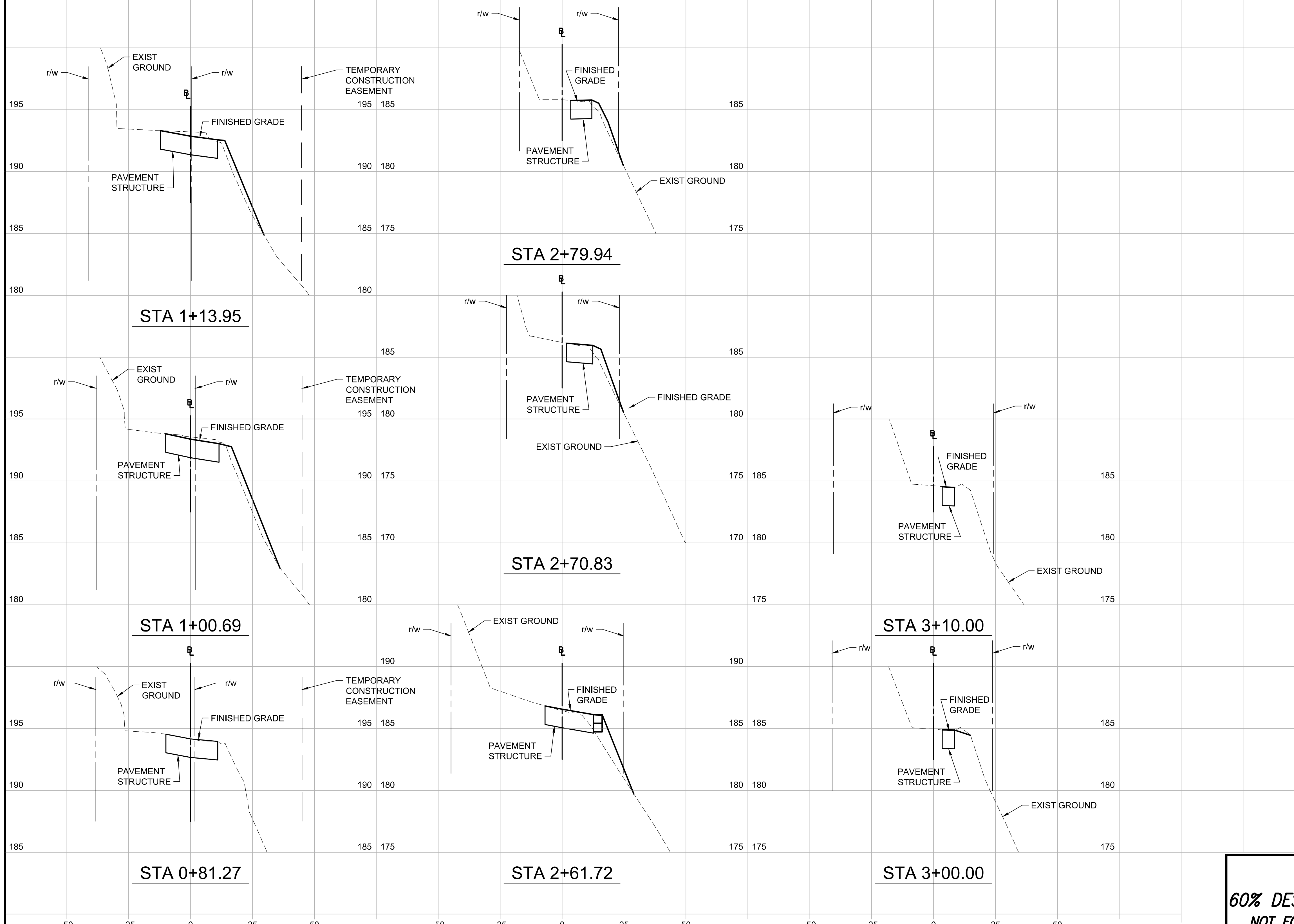
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

SIGNAGE AND PAVEMENT MARKING DETAILS

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-040
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 6:02pm
CAD File Name: C:\pwworking\west01\d1900569\C-049 - Signage and Pavement Marking Details and Notes.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 042 | 084 |




# SOUTH WAILUA TEMPORARY BRIDGE CROSS SECTIONS

SCALE: HORIZ 1" = 20'
VERT 1" = 4'

GRAPHIC SCALE:
SCALE: 1" = 20'
SCALE: 1" = 4'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE CROSS SECTIONS

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C-041
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 6:03pm
CAD File Name: C:\pwworking\west01\d1900569\C-024 - South Wailua Temporary Bridge Cross Sections.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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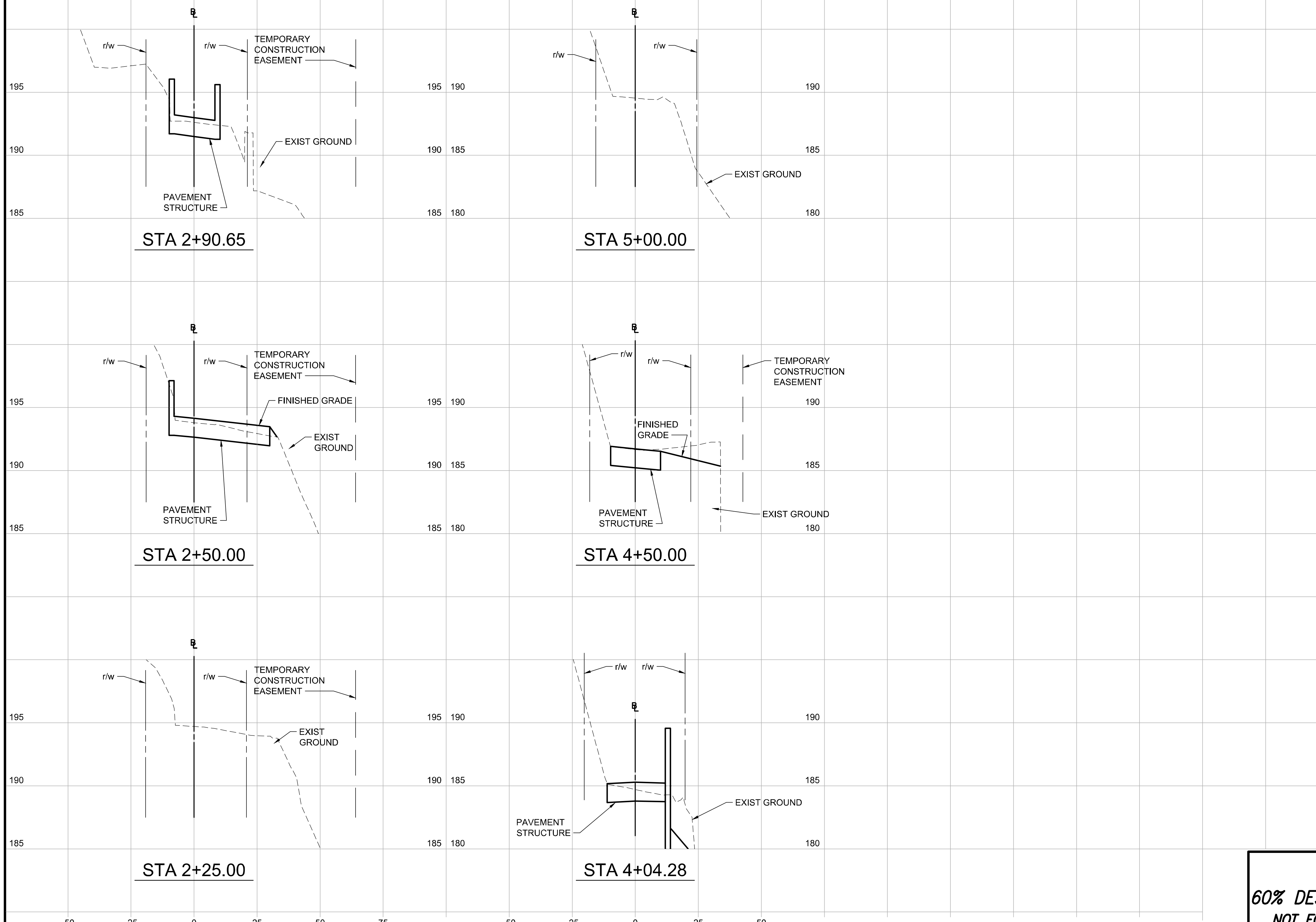


## SOUTH WAILUA PERMANENT BRIDGE CROSS SECTIONS

SCALE: HORIZ 1" = 20'
VERT 1" = 4'

GRAPHIC SCALE:

20' 10' 0' 20' 40'
SCALE: 1" = 20'

4' 2' 0' 4' 8'
SCALE: 1" = 4'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

S. WAILUA PERMANENT BRIDGE CROSS SECTIONS

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, EK
SHEET
C–042
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:03pm
CAD File Name: C:\pwworking\west01\d1900569\C-031 - South Wailua Permanent Bridge Cross Sections.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
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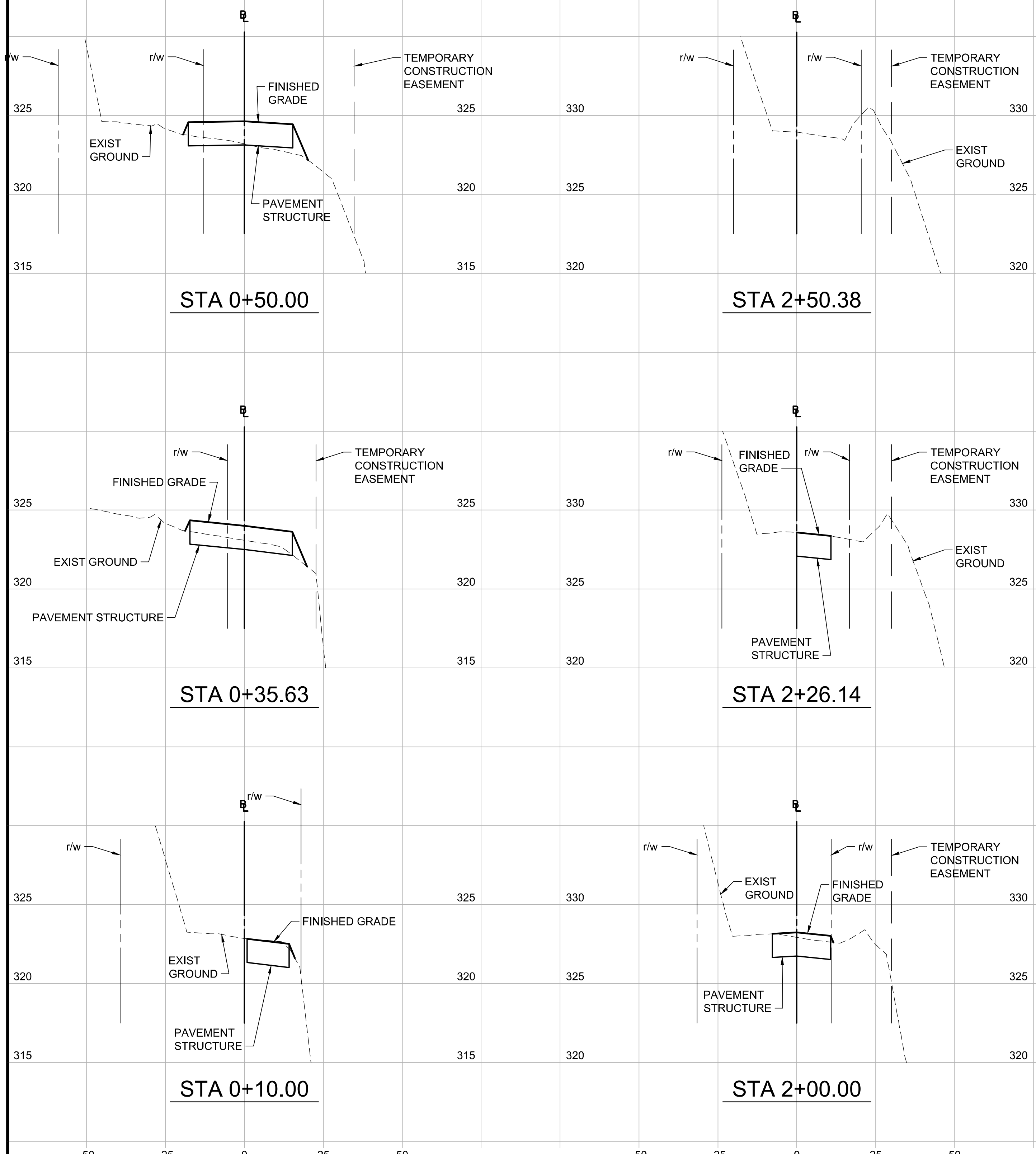


# WAIKAKOI TEMPORARY BRIDGE CROSS SECTIONS

SCALE: HORIZ 1" = 20'
VERT 1" = 4'

GRAPHIC SCALE:
20' 10' 0' 20' 40'
SCALE: 1" = 20'
4' 2' 0' 4' 8'
SCALE: 1" = 4'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI TEMPORARY BRIDGE
CROSS SECTIONS

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
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of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:03pm
CAD File Name: C:\pwworking\west01\d1900569\C-039 – Waikakoi Temporary Bridge Cross Sections.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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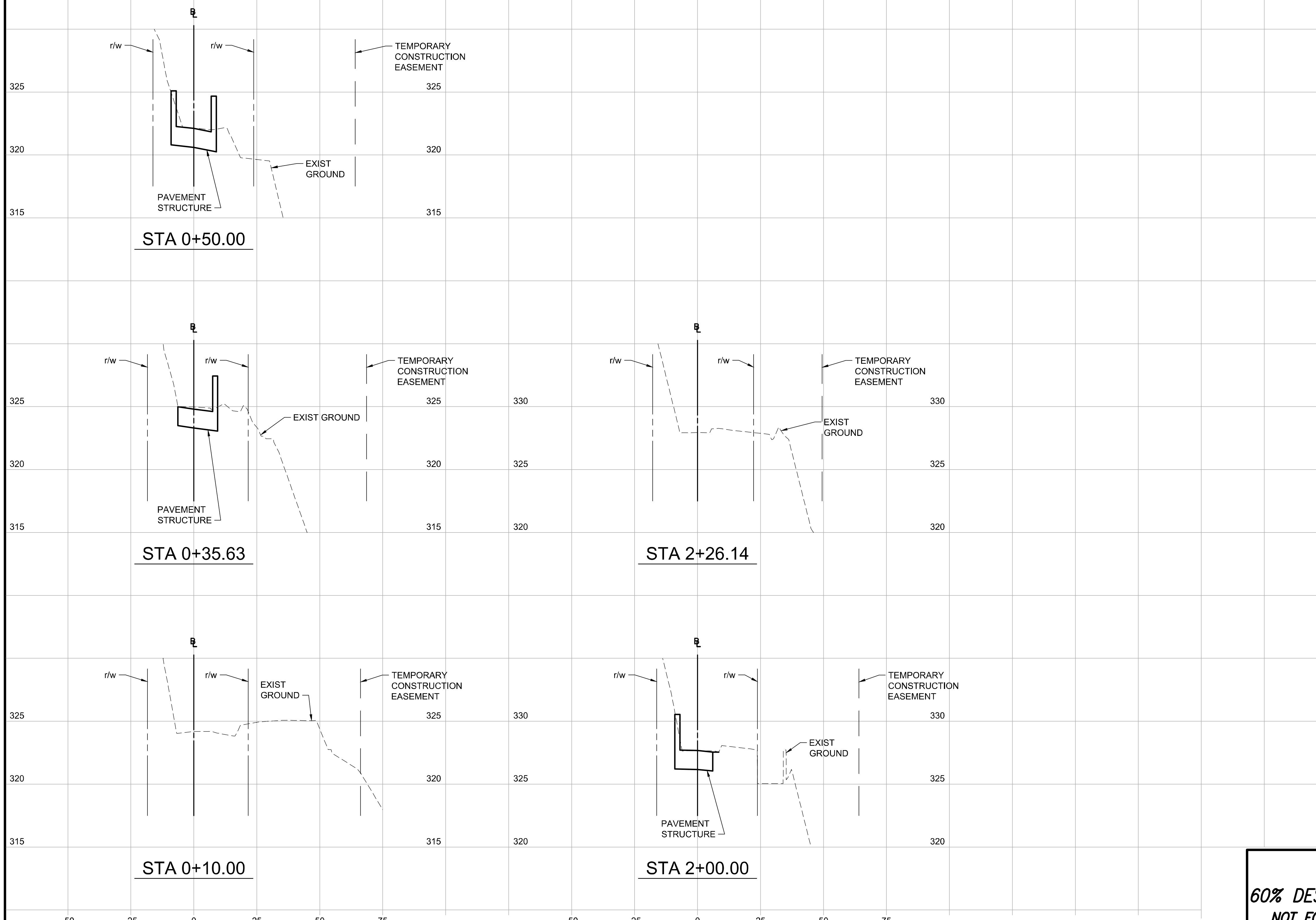


# WAIKAKOI PERMANENT BRIDGE CROSS SECTIONS

SCALE: HORIZ 1" = 20'
VERT 1" = 4'

GRAPHIC SCALE:

20' 10' 0' 20' 40'
SCALE: 1" = 20'

4' 2' 0' 4' 8'
SCALE: 1" = 4'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI PERMANENT BRIDGE CROSS SECTIONS

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
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of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 - 6:03pm
CAD File Name: C:\pwworking\west01\d1900569\C-045 - Waikakoi Permanent Bridge Cross Sections.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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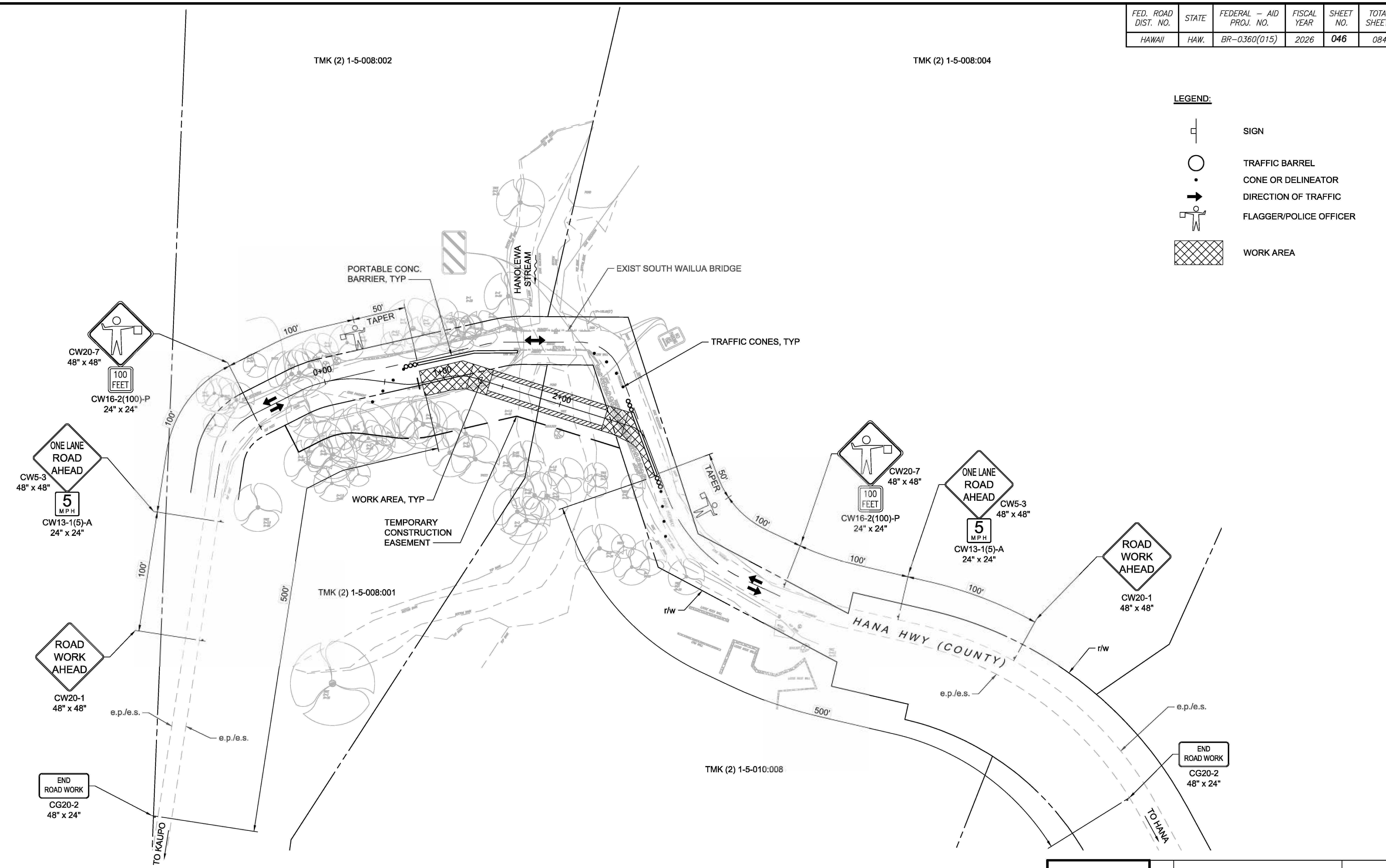



## S. WAILUA TEMPORARY BRIDGE TRAFFIC CONTROL PLAN

SCALE: 1" = 40'

GRAPHIC SCALE:
40' 20' 0' 40' 80'
SCALE: 1" = 40'

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

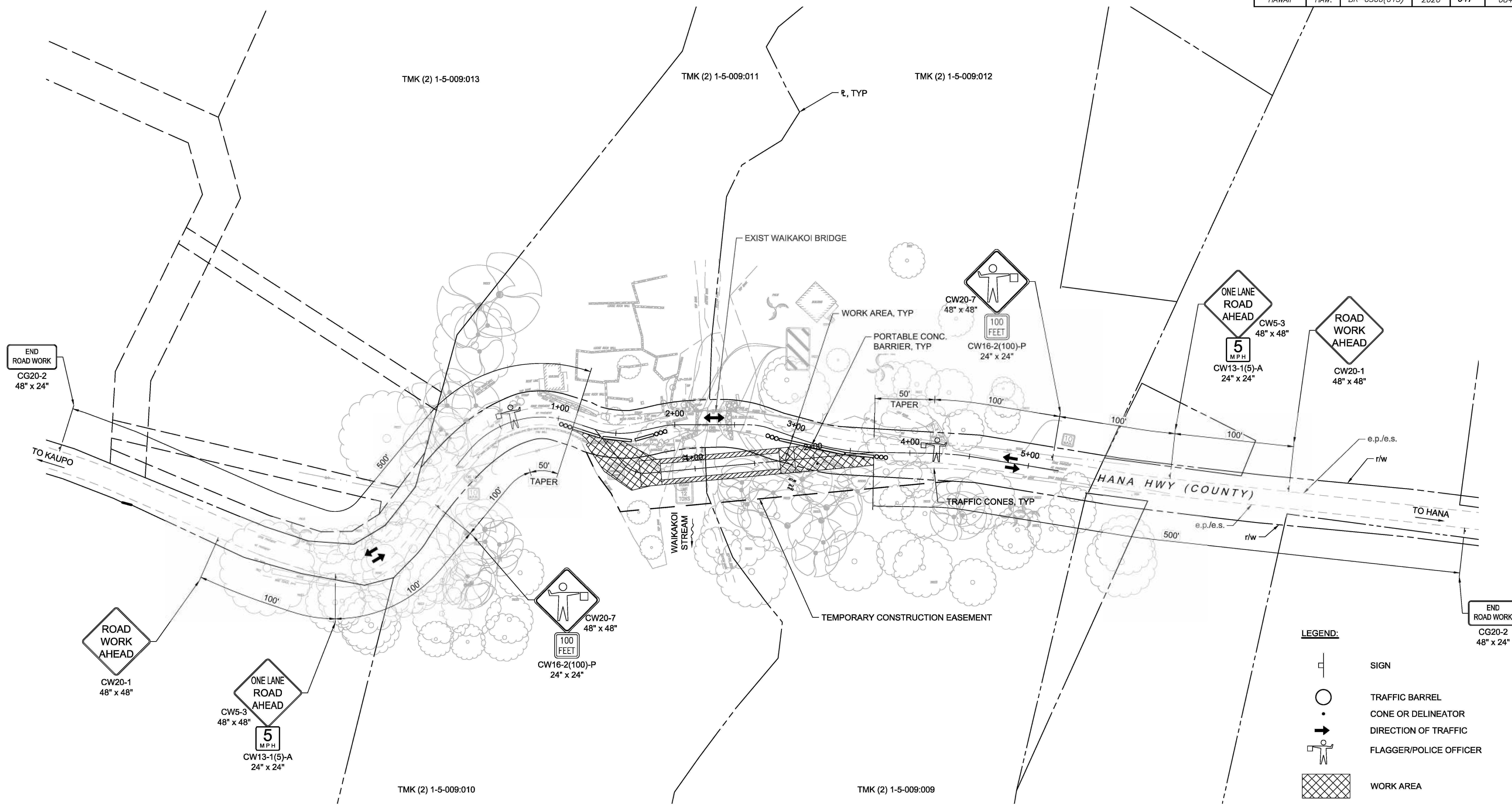
WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

S. WAILUA TEMPORARY BRIDGE
TRAFFIC CONTROL PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C–045
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:03pm
CAD File Name: C:\pwworking\west01\d1900569\C–025 – South Wailua Temporary Bridge Traffic Control Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR–0360(015) | 2026 | 047 | 084 |




## WAIKAKOI TEMPORARY BRIDGE TRAFFIC CONTROL PLAN

SCALE: 1" = 40'

GRAPHIC SCALE:

40' 20' 0' 40' 80'

SCALE: 1" = 40'

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI TEMPORARY BRIDGE
TRAFFIC CONTROL PLAN

Date:
Date: 8/30/24
Design By: CN, CT, DA, DK
Drawn By: CT, DA, EU, DK
SHEET
C–046
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Fri, 30 Aug 2024 – 6:04pm
CAD File Name: C:\pwworking\west01\d1900569\C-040 – Waikakoi Temporary Bridge Traffic Control Plan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 048 | 083 |

## GENERAL NOTES:

GENERAL:

A. GENERAL SPECIFICATIONS: HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND PUBLIC WORKS CONSTRUCTION, 2005, ISSUED BY THE STATE OF HAWAII, DEPARTMENT OF TRANSPORTATION, HIGHWAYS DIVISION, AND SPECIAL PROVISIONS PREPARED FOR THIS PROJECT.

B. DESIGN SPECIFICATIONS: AASHTO, LRFD STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES 9TH EDITION (2021) WITH CURRENT INTERIM REVISIONS.

C. THE CONTRACTOR SHALL TAKE FIELD MEASUREMENTS AND VERIFY FIELD CONDITIONS AND SHALL COMPARE SUCH FIELD MEASUREMENTS AND CONDITIONS WITH THE DRAWINGS BEFORE COMMENCING THE WORK. REPORT IN WRITING TO THE ENGINEER ALL ERRORS, INCONSISTENCIES OR OMISSIONS.

D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR METHODS OF CONSTRUCTION, WORKMANSHIP AND JOB SAFETY. THE CONTRACTOR SHALL PROVIDE TEMPORARY SHORING AND BRACING AS REQUIRED FOR STABILITY OF STRUCTURAL MEMBERS AND SYSTEMS.

E. CONSTRUCTION LOADING SHALL NOT EXCEED DESIGN LIVE LOAD UNLESS SPECIAL SHORING IS PROVIDED. ALLOWABLE LOADS SHALL BE REDUCED IN AREAS WHERE THE STRUCTURE HAS NOT ATTAINED ITS FULL DESIGN STRENGTH.

F. DETAILS NOTED AS TYPICAL ON STRUCTURAL DRAWINGS SHALL APPLY IN ALL CONDITIONS UNLESS SPECIFICALLY SHOWN OR NOTED OTHERWISE.

2. DESIGN CRITERIA:

A. SEISMIC LOAD: SITE CLASS D, SEISMIC ZONE 3
   a. PEAK GROUND ACCELERATION As = 0.374g
   b. IMPORTANCE CATEGORY = ESSENTIAL BRIDGE

B. DESIGN LIVE LOADS: HL-93 WITH HAWAII STANDARD SINGLE TRIP PERMIT VEHICLE

C. RAILING TEST LEVEL: MASH TL-3

3. FOUNDATION:

A. DESIGN IS BASED UPON PRELIMINARY GEOTECHNICAL RECOMMENDATIONS BY GEOLABS INC. IN A DOCUMENT TITLED "SOUTH WAILUA AND WAIKAKOI BRIDGES ADDITIONAL GEOTECHNICAL RECOMMENDATIONS", DATED JULY 25, 2024 THE DOCUMENT IS AVAILABLE FOR REVIEW AT THE OFFICE OF THE ENGINEER.

B. CONTRACTOR SHALL PROVIDE FOR DE-WATERING OF EXCAVATION FROM EITHER SURFACE WATER, GROUND WATER OR SEEPAGE AS REQUIRED.

C. CONTRACTOR SHALL PROVIDE FOR DESIGN AND INSTALLATION OF ALL CRIBBING, SHEETING, AND SHORING NECESSARY TO PRESERVE EXCAVATIONS AND EARTH BANKS, AND ADJACENT STRUCTURES AND PROPERTY FROM DAMAGE.

D. EXCAVATIONS FOR FOOTINGS, ETC., SHALL BE APPROVED BY THE ENGINEER PRIOR TO PLACING THE CONCRETE AND REINFORCING. CONTRACTOR SHALL NOTIFY THE ENGINEER WHEN EXCAVATION IS READY FOR INSPECTION.

E. EXCAVATIONS SHALL BE PROPERLY BACK FILLED. DO NOT PLACE BACKFILL BEHIND RETAINING WALLS BEFORE CONCRETE HAS ATTAINED FULL DESIGN STRENGTH. CONTRACTOR SHALL BRACE OR PROTECT ALL WALLS FROM LATERAL LOADS UNTIL BRIDGE SLAB IS COMPLETELY IN PLACE AND HAS ATTAINED FULL DESIGN STRENGTH.

F. BACKFILL SHALL BE IMPORTED GRANULAR MATERIAL SUCH AS SELECT BORROW OR BASE COURSE. BACKFILL SHALL BE COMPACTED TO BETWEEN 90 AND 95 PERCENT OF ITS MAXIMUM DENSITY. OVER-COMPACTING OF BACKFILL SHALL BE AVOIDED.

4. REINFORCING STEEL:

A. REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615, GRADE 60, UNLESS OTHERWISE NOTED.

B. CLEAR CONCRETE COVERAGE FOR REINFORCING BARS SHALL BE AS FOLLOWS, UNLESS OTHERWISE NOTED:
   a. CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH: 3".
   b. ABUTMENTS AND RETAINING WALLS: 2"
   c. BRIDGE DECK:
      1. TOP BARS: 2½"
      2. BOTTOM BARS 1½"

C. SPLICES:
   a. REINFORCING STEEL SHALL BE SPLICED ONLY WHERE INDICATED ON PLANS. PROVIDE LAP SPLICE LENGTH PER AASHTO STANDARDS, UNLESS NOTED OTHERWISE.
   b. MECHANICAL SPLICE CONNECTORS SHALL DEVELOP IN TENSION 125 PERCENT OF THE SPECIFIED MINIMUM YIELD STRENGTH OF REINFORCING BARS.
   c. BAR BENDS AND HOOK SHALL BE "STANDARD HOOKS" IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATION, 9TH EDITION (2021)

D. REINFORCING BARS SHALL BE DETAILED IN ACCORDANCE WITH A.C.I. MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE HIGHWAY STRUCTURES UNLESS OTHERWISE NOTED.

E. MINIMUM CLEAR SPACING BETWEEN PARALLEL BARS SHALL BE 1.5 TIMES THE DIAMETER OF BARS (FOR NON BUNDLED BARS). BUT IN NO CASE SHALL THE CLEAR DISTANCE BETWEEN THE BARS BE LESS THAN 1½ TIMES THE MAXIMUM SIZE OF THE COARSE AGGREGATE.

F. ALL DIMENSIONS RELATING TO REINFORCING BARS (E.G. SPACING OF BARS, ETC.) ARE TO CENTERS OF BARS, UNLESS OTHERWISE NOTED.

5. CONCRETE:

A. CAST IN PLACE CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4,000 PSI UNLESS OTHERWISE NOTED.

B. ALL INSERTS, ANCHOR BOLTS, PLATES, ETC. EMBEDDED IN CONCRETE SHALL BE HOT-DIPPED GALVANIZED UNLESS NOTED OTHERWISE.

C. EXPANSION JOINT MATERIAL SHALL BE ASTM D1752 CLOSED CELL POLYVINYL CHLORIDE FOAM, RESILIENCY RECOVERY OF 95 PERCENT IF NOT COMPRESSED MORE THAN 50 PERCENT OF ORIGINAL THICKNESS.

6. CONSTRUCTION NOTES:

A. SEE STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS.

B. EXCEPT AS OTHERWISE NOTED, ALL VERTICAL DIMENSIONS ARE MEASURED PLUMB.

C. FOR CONCRETE FINISH SEE STANDARD SPECIFICATIONS.

D. UNLESS OTHERWISE NOTED, EXPOSED CONCRETE EDGES SHALL BE CHAMFERED ¾" X ¾".

E. IN GENERAL, TOP OF CONCRETE DECK SLAB SHALL BE CONSTRUCTED TO FOLLOW THE ROADWAY VERTICAL AND HORIZONTAL CURVES.

F. THE CONTRACTOR SHALL VERIFY ALL EXISTING SITE CONDITIONS.

G. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UTILITY LINES AND NOTIFY THE RESPECTIVE OWNERS BEFORE COMMENCING WITH WORK.

## STRUCTURAL ABBREVIATION

| SYMBOL | DESCRIPTION |
|---|---|
| @ | AT |
| AASHTO | AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION |
| AB | ANCHOR BOLT |
| ABUT | ABUTMENT |
| AC | ASPHALTIC CONCRETE |
| ACI | AMERICAN CONCRETE INSTITUTE |
| ADJA | ADJACENT |
| ADD. | ADDITIONAL |
| ALT | ALTERNATE |
| APPROX | APPROXIMATE |
| ASTM | AMERICAN SOCIETY FOR TESTING AND MATERIALS |
| AZ | AZIMUTH |
| B, BOT | BOTTOM |
| BAL | BALANCE |
| BET., BTWN | BETWEEN |
| BL, BL | BASELINE |
| BLK | BLOCK |
| BLKG | BLOCKING |
| BOF | BOTTOM OF FOOTING |
| BRG | BEARING |
| BVC | BEGINNING OF VERTICAL CURVE |
| CIP | CAST IN PLACE |
| CJ | CONSTRUCTION JOINT |
| C, CL | CENTERLINE |
| CLR | CLEAR |
| CMU | CONCRETE MASONRY UNIT |
| COL | COLUMN |
| CONC | CONCRETE |
| CONN | CONNECTION |
| CONT | CONTINUOUS |
| CRM | CEMENT RUBBLE MASONRY |
| CY | CUBIC YARD |
| D | DEPTH OR DRAIN |
| DET | DETAIL |
| DIA, Ø | DIAMETER |
| DIAG | DIAGONAL |
| DWG | DRAWING |
| DWLS | DOWELS |
| EA | EACH |
| EF | EACH FACE |
| ES | EACH SIDE |
| EW | EACH WAY |
| ELEC | ELECTRICAL |
| EL, ELEV | ELEVATION |
| EQ | EQUAL |
| EXP | EXPANSION |
| EXT | EXTERIOR |
| EXIST, (E) | EXISTING |
| EVC | END OF VERTICAL CURVE |
| FA | FORCE ACCOUNT |
| FF | FRONT FACE |
| FOW | FACE OF WALL |
| FT | FEET |
| FIN. | FINISH |
| FLR, FL | FLOOR |
| FND | FOUNDATION |
| FTG | FOOTING |
| GA | GAUGE |
| GAL. | GALLON |
| GALV | GALVANIZED |
| GB | GRADE BEAM |
| GR | GRADE |
| H | HEIGHT |
| HD | HEAD |
| HDOT | STATE OF HAWAII DEPARTMENT OF TRANSPORTATION |
| HMA | HOT MIX ASPHALT |
| HORIZ | HORIZONTAL |
| HP | HIGH POINT |
| HS | HIGH STRENGTH |
| HWY | HIGHWAY |
| ID | INSIDE DIAMETER |
| INT | INTERIOR |
| INV | INVERT |
| JT | JOINT |
| K | KIP |
| KFT, KF | KIP FOOT |
| KLF | KIP PER LINEAR FOOT |
| KSI | KIPS PER SQUARE INCH |
| L | LENGTH |
| LB | POUND |
| LF | LINEAR FEET |
| LONGIT | LONGITUDINAL |
| LS | LUMP SUM |
| LT | LEFT |
| MAX | MAXIMUM |
| MB | MACHINE BOLT |
| MECH | MECHANICAL |
| MET. | METAL |
| MID. | MIDDLE |

| SYMBOL | DESCRIPTION |
|---|---|
| MIN | MINIMUM |
| MISC | MISCELLANEOUS |
| MPH | MILES PER HOUR |
| # | NUMBER, POUND |
| NIC | NOT IN CONTRACT |
| NTS | NOT TO SCALE |
| NO. | NUMBER |
| OC | ON CENTERS |
| OD | OUTSIDE DIAMETER |
| OPN'G | OPENING |
| OPP | OPPOSITE |
| P/T | POST-TENSIONING |
| PAV'T | PAVEMENT |
| PC | POINT OF CURVATURE |
| PCC | POINT OF COMPOUND CURVE |
| PGL | PROFILE GRADE LINE |
| PI | POINT OF INTERSECTION |
| PIVC | POINT OF INTERSECTION (VERTICAL CURVE) |
| PL | PLATE |
| POC | POINT ON CURVE |
| PRVC | POINT OF REVERSING CURVE |
| PSF | POUNDS PER SQUARE FOOT |
| PSI | POUNDS PER SQUARE INCH |
| PT | POINT, POINT OF TANGENCY |
| PVC | POLYVINYL CHLORIDE |
| PVI | POINT OF VERTICAL INTERSECTION |
| R | RADIUS |
| REINF | REINFORCED |
| REQ'D | REQUIRED |
| RT | RIGHT |
| SCH | SCHEDULE |
| SECT | SECTION |
| SF | SQUARE FEET |
| SHT | SHEET |
| SIM | SIMILAR |
| SPC | SPACING |
| SPCS | SPACE |
| SPECS | SPECIFICATIONS |
| SQ | SQUARE |
| SS | STAINLESS STEEL |
| ST | STREET |
| STA | STATION |
| STD | STANDARD |
| STIRR | STIRRUPS |
| STL | STEEL |
| STRUCT | STRUCTURE |
| SYM | SYMMETRICAL |
| T | TOP, TANGENT |
| T&B | TOP & BOTTOM |
| TEMP | TEMPORARY |
| THK | THICK, THICKNESS |
| TOF | TOP OF FOOTING |
| TW | TOP OF WALL |
| TRANSV. | TRANSVERSE |
| TX | TEXAS |
| TYP | TYPICAL |
| UBC | UNIFORM BUILDING CODE |
| UON | UNLESS OTHERWISE NOTED |
| V, VERT | VERTICAL |
| VAR | VARIES |
| VPI | VERTICAL POINT OF INTERSECTION |
| W | WIDTH |
| W/ | WITH |
| W/O | WITHOUT |
| WF | WALL FOOTING |
| WP | WORKING POINT |
| WW | WING WALL |
| WWF | WELDED WIRE FABRIC |
| WWM | WELDED WIRE MESH |

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

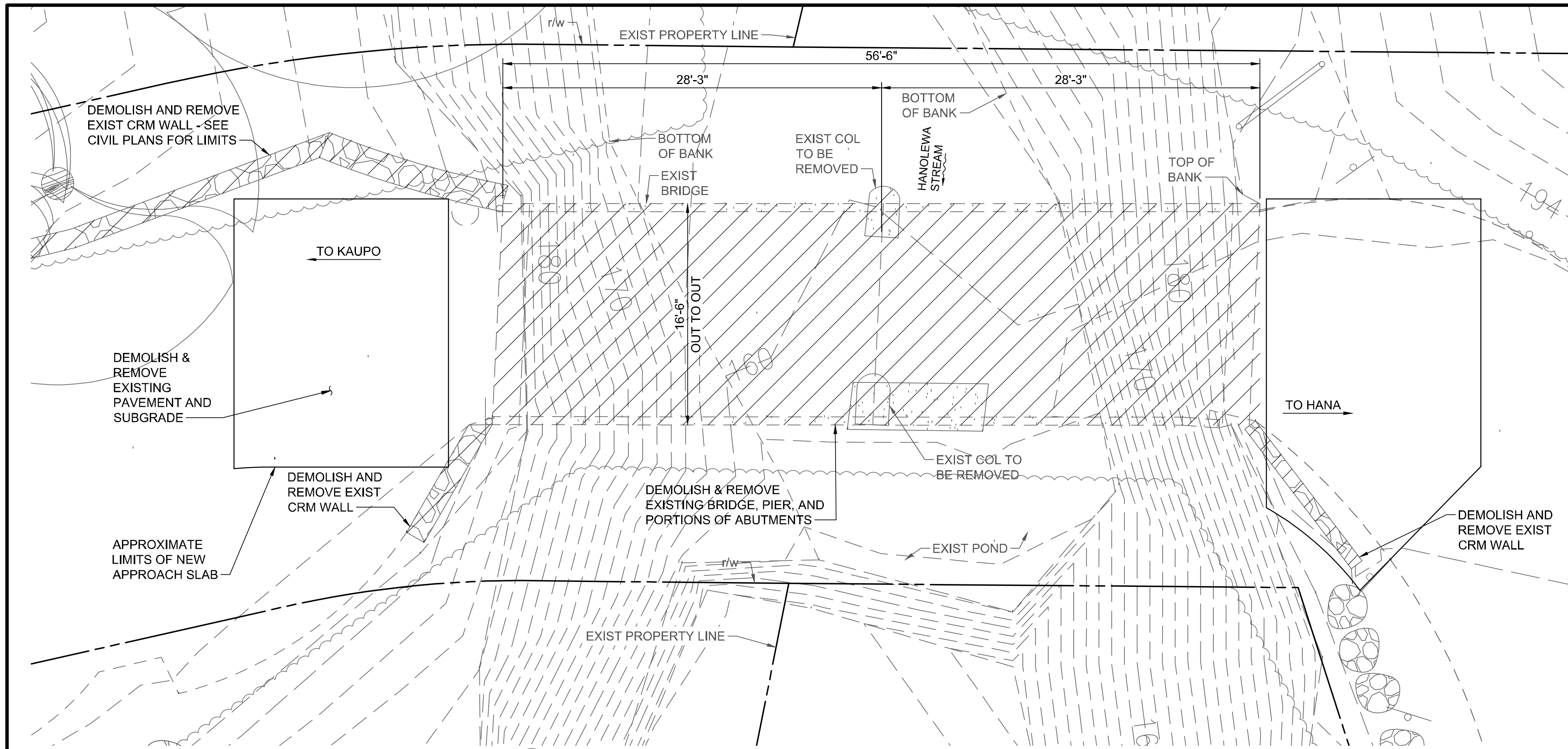
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA & WAIKAKOI
STRUCTURAL NOTES, ABBREVIATIONS & SUMMARY OF ESTIMATED QUANTITIES

Date:
Date: 8/30/24
Design By: ERS
Drawn By: ERS
SHEET
S-001
of 084 Sheets

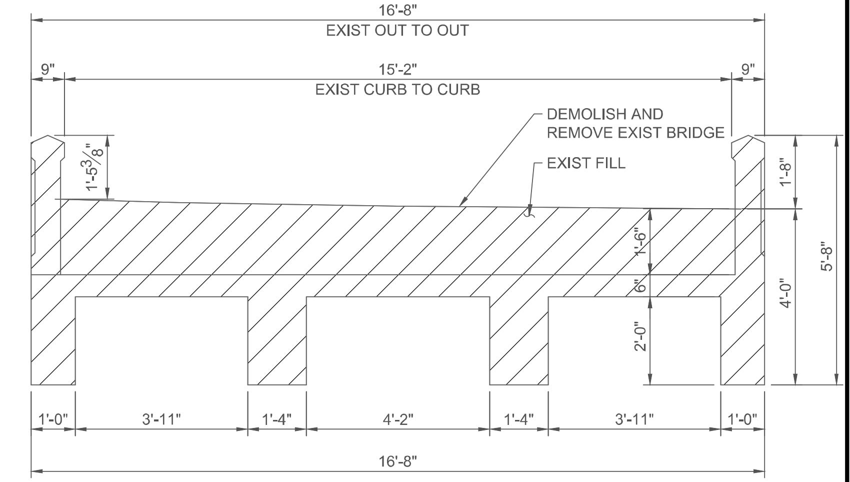
PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 – 2:22pm
CAD File Name: C:\pwworking\west01\d1900569\S-001 – S.Wailua_Waikakoi_Str.Notes_ Abbrev.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 049 | 083 |




## EXISTING S. WAILUA BRIDGE DEMOLITION PLAN

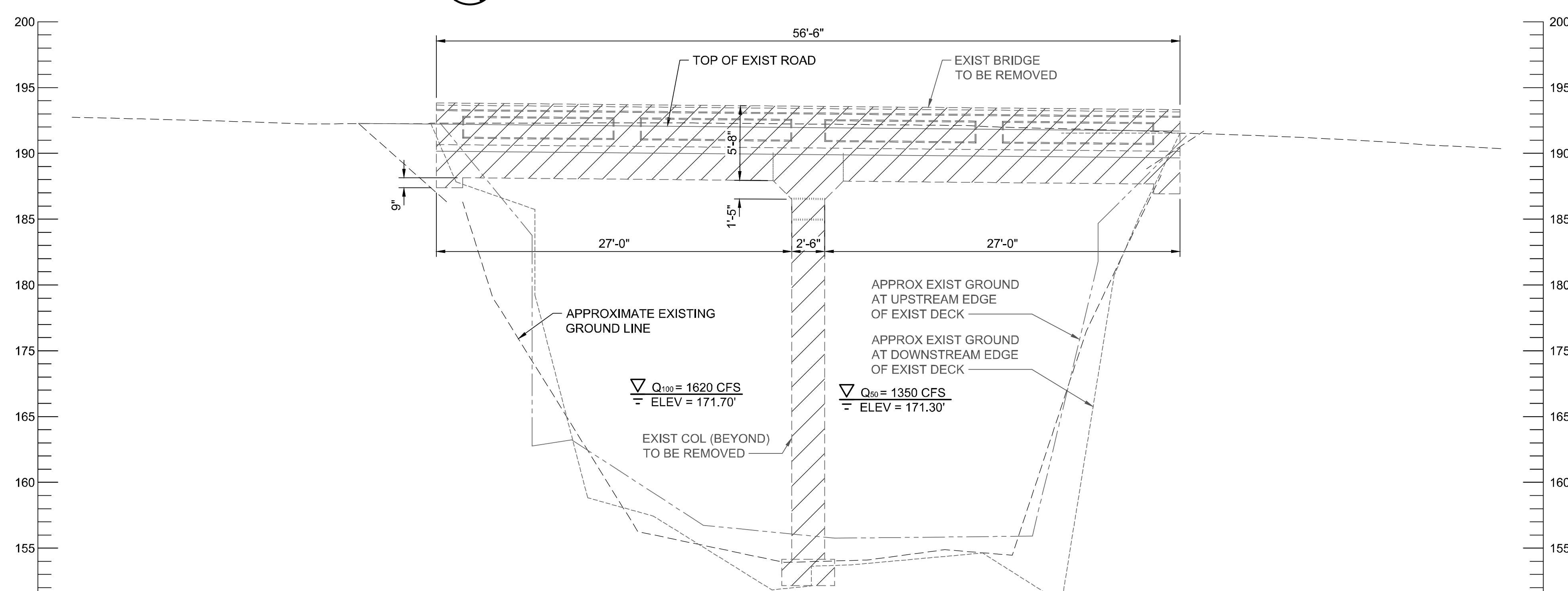
SCALE: 3/16" = 1'-0"




## EXISTING S. WAILUA TYPICAL SECTION

SCALE: 1/2" = 1'-0"

(LOOKING NORTH TOWARDS HANA)




## EXISTING S. WAILUA BRIDGE EAST ELEVATION

SCALE: HORIZ: 3/16"=1'-0"
VERT: 3/16"=1'-0"

### DEMOLITION NOTES:

1. ALL DIMENSIONS ARE APPROXIMATE.
2. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND CONDITIONS.
3. CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONDITIONS THAT ARE DIFFERENT FROM DEMOLITION DRAWINGS.
4. CONTRACTOR SHALL PERFORM THE WORK SO AS TO MITIGATE DEMOLITION DEBRIS FROM ENTERING THE STREAM CHANNEL BY USE OF A CATCHMENT SYSTEM.
5. THE TEMPORARY CATCHMENT SYSTEM SHALL BE ...
6. EMPTY CATCHEMENT SYSTEM DAILY AND DISPOSE DEBRIS OFFSITE.
7. PLACE SANDBAGS DOWNSTREAM OF BRIDGE TO CONTAIN DEBRIS.
8. REMOVE EXISTING ASPHALT PAVEMENT, RAILINGS, AND FILL OVER CONCRETE BRIDGE DECK. LOAD DEBRIS DIRECTLY ONTO TRUCKS FOR OFFSITE DISPOSAL.
9. CONTRACTOR TO TAKE ADEQUATE PRECAUTIONS TO PROTECT EXISTING ADJACENT STRUCTURES, FENCES, AND UTILITIES TO REMAIN. ITEMS TO REMAIN THAT ARE DAMAGED DURING THE WORK SHALL BE REPAIRED BY THE CONTRACTOR AT HIS OWN EXPENSE.

### LEGEND:

TO BE REMOVED

TO BE REMOVED

### GRAPHIC SCALE:

4' 2' 0' 4' 8' 12'
SCALE: 3/16" = 1'-0"

2' 1' 0' 2' 4'
SCALE: 1/2" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

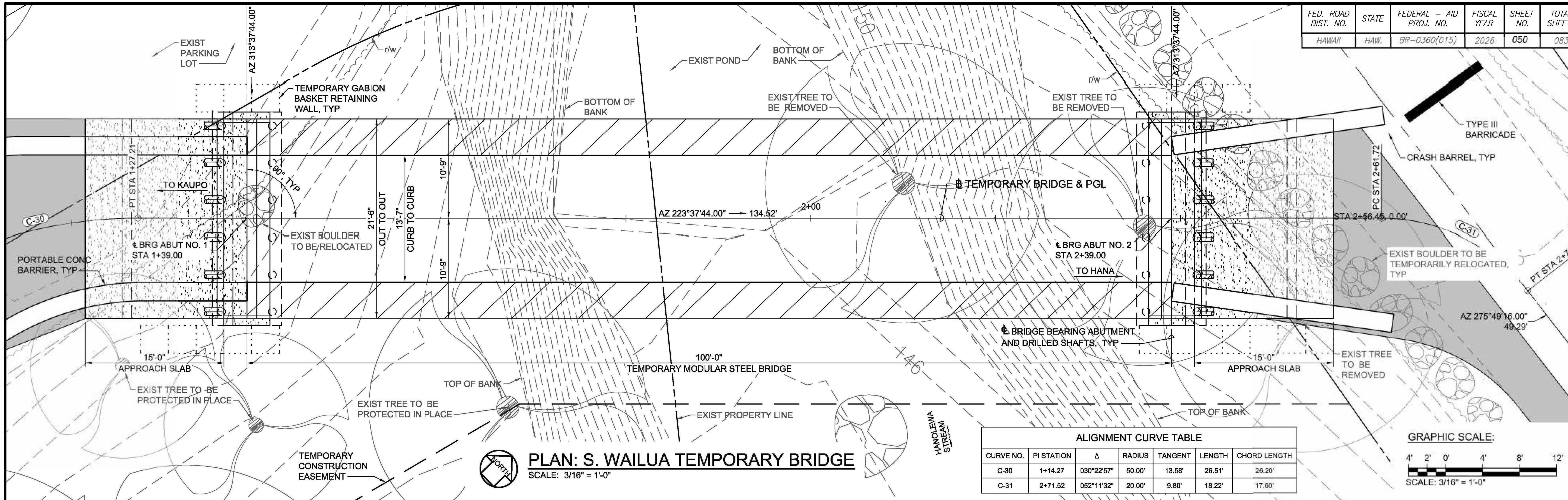
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

EXISTING S. WAILUA BRIDGE DEMOLITION PLAN AND SECTIONS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-002
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:22pm
CAD File Name: C:\pwworking\west01\d1900569\S-002 - S.Wailua Permanent Bridge DemoPlan_&_Sec.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 050 | 083 |

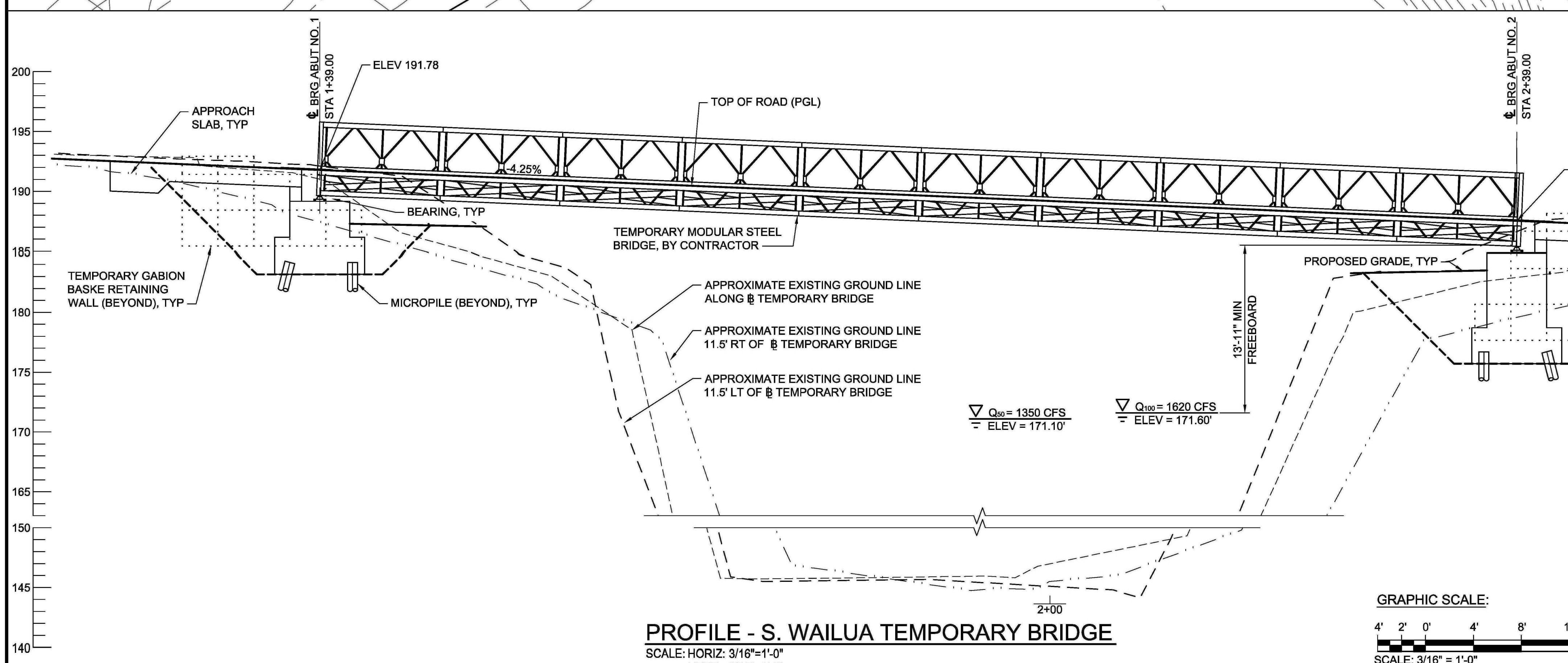



## PLAN: S. WAILUA TEMPORARY BRIDGE

SCALE: 3/16" = 1'-0"

**ALIGNMENT CURVE TABLE**

| CURVE NO. | PI STATION | Δ | RADIUS | TANGENT | LENGTH | CHORD LENGTH |
|---|---|---|---|---|---|---|
| C-30 | 1+14.27 | 030°22'57" | 50.00' | 13.58' | 26.51' | 26.20' |
| C-31 | 2+71.52 | 052°11'32" | 20.00' | 9.80' | 18.22' | 17.60' |




## PROFILE - S. WAILUA TEMPORARY BRIDGE

SCALE: HORIZ: 3/16"=1'-0"
VERT: 3/16"=1'-0"

GRAPHIC SCALE:
4' 2' 0' 4' 8' 12'
SCALE: 3/16" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

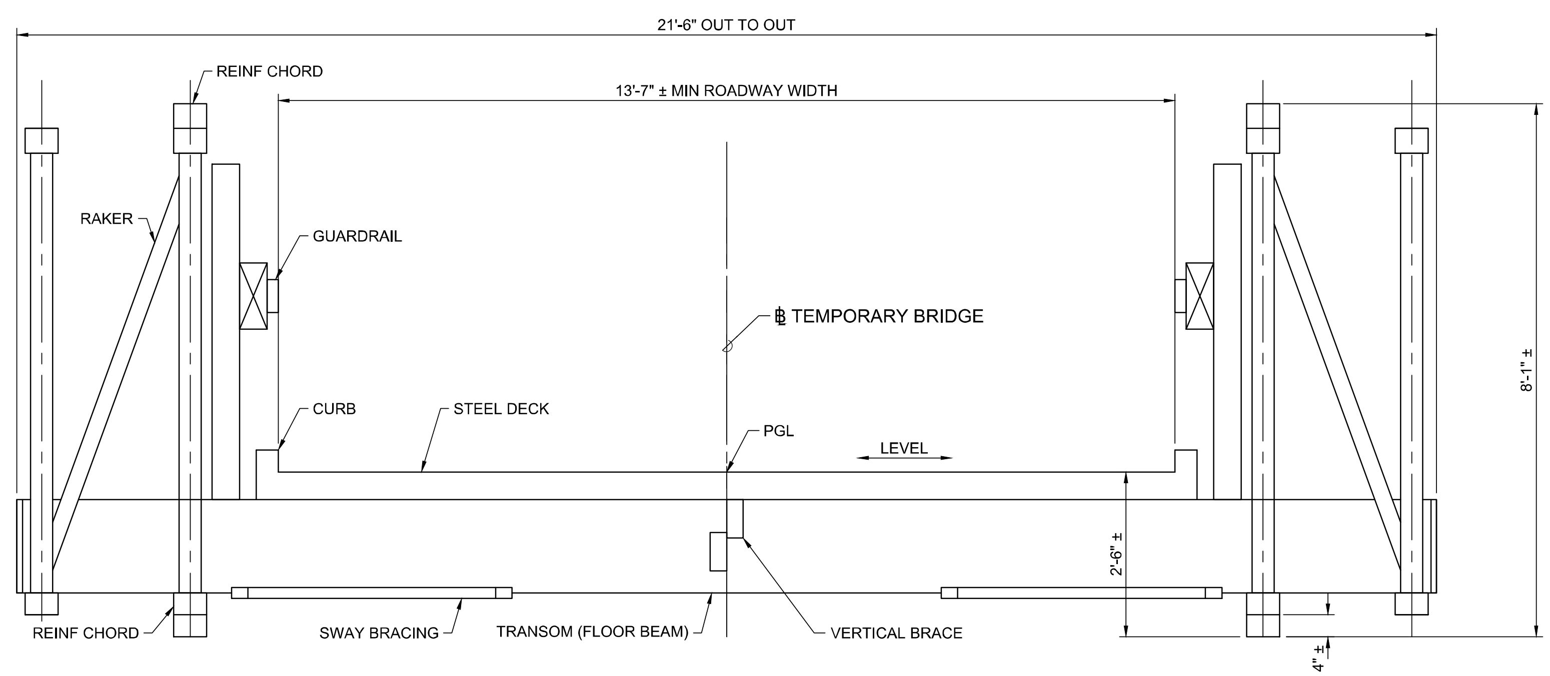
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE PLAN AND PROFILE

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-003
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:22pm
CAD File Name: C:\pwworking\west01\d1900569\S-003 - South Wailua Temp Bridge Plan & Profile.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 051 | 083 |




## TYPICAL SECTION - TEMPORARY BRIDGE

SCALE: 3/4" = 1'-0"

(LOOKING AHEAD STATION TOWARDS HANA)

### TEMPORARY BRIDGE NOTES:

1. TEMPORARY BRIDGE AND FOUNDATIONS SHOWN ARE SCHEMATIC AND SHOWN TO ASSIST BIDDING ONLY. CONTRACTOR IS RESPONSIBLE FOR THE COMPLETE DESIGN AND CONSTRUCTION OF THE TEMPORARY BRIDGE. BRIDGE IS CONSTRUCTED USING ACROW BRIDGE PANELS THAT ARE CURRENTLY OWNED BY MAUI COUNTY.
2. CONTRACTOR TO SUBMIT CALCULATIONS, DRAWINGS, AND ERECTION DETAILS FOR THE TEMPORARY BRIDGE SIGNED AND SEALED BY A STRUCTURAL ENGINEER LICENSED IN HAWAII. SEE PROJECT SPECIAL PROVISIONS FOR MORE INFORMATION.
3. COST FOR TEMPORARY STEEL BRIDGE SHALL INCLUDE THE DESIGN MANUFACTURE, SHOP DRAWINGS, SHIPPING, ERECTION, DISASSEMBLY AND TRANSPORTING THE BRIDGE TO THE LOCATION DESIGNATED BY THE ENGINEER, AND OTHER RELATED DETAILS. THE TEMPORARY BRIDGE SHALL BE DELIVERED TO MAUI COUNTY BASEYARD AFTER COMPLETION OF THE WORK, UNLESS NOTED OTHERWISE.
4. CAPACITY OF 10 INCH DIAMETER MICROPILE:

   COMPRESSIVE LOAD CAPACITY PER MICROPILE (KIPS)
   - UNFACTORED SINGLE PILE CAPACITY.....XXX
   - EXTREME EVENT LIMIT STATE.......................XXX
   - STRENGTH LIMIT STATE..................................XXX

   UPLIFT LOAD CAPACITY PER MICROPILE (KIPS)
   - EXTREME EVENT LIMIT STATE.......................XXX
   - STRENGTH LIMIT STATE................................XXX

   | LOADING CONDITION | LATERAL DEFLECTION (INCHES) | MAXIMUM MOMENT INDUCED (KIP-FEET) |
   |---|---|---|
   | STRENGTH | XX.XX | -XX |
   | EXTREME EVENT LIMIT STATE | XX.XX | -XXX |

5. DESIGN VEHICLE AASHTO HS20-44 TRUCK.
6. THE CONTRACTOR SHALL MAINTAIN ALL PORTIONS OF THE TEMPORARY STRUCTURE IN GOOD CONDITION WITH REGARD TO STRENGTH, SAFETY, AND RIDABILITY. MEMBERS DAMAGED DURING CONSTRUCTION SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST. SEE PROJECT SPECIFICATIONS FOR DETAILS REGARDING REMOVAL AND STORAGE OF BRIDGE UPON PROJECT COMPLETION.

GRAPHIC SCALE:

1' 0' 1' 2' 3'

SCALE: 3/4" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

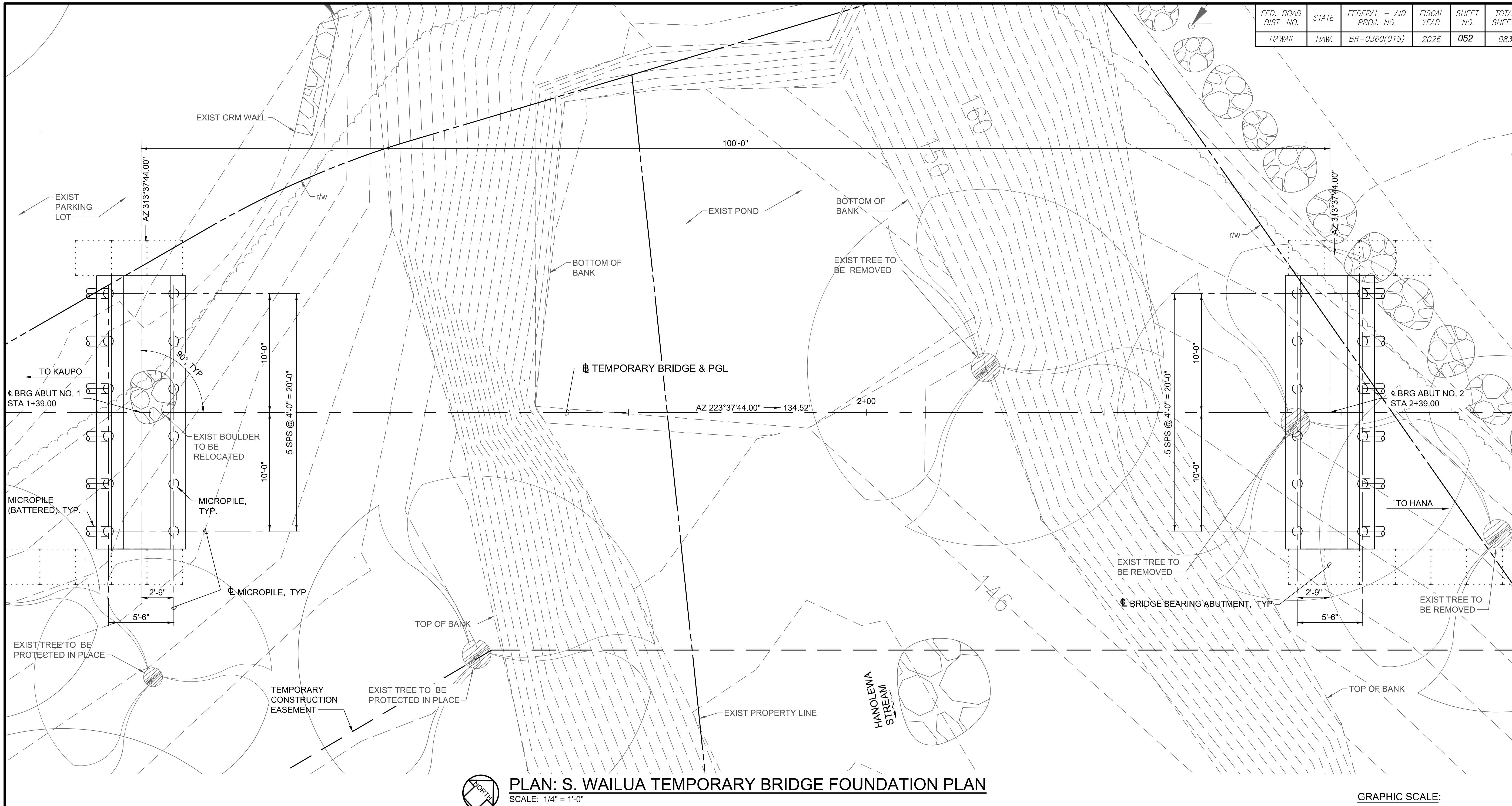
WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

S. WAILUA TEMPORARY BRIDGE
TYPICAL SECTION

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S–004
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 – 2:22pm
CAD File Name:C:\pwworking\west01\d1900569\S-003 – South Wailua Temp Bridge Plan & Profile.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 052 | 083 |




## PLAN: S. WAILUA TEMPORARY BRIDGE FOUNDATION PLAN

SCALE: 1/4" = 1'-0"

GRAPHIC SCALE:

4' 2' 0' 4' 8'

SCALE: 1/4" = 1'-0"

MICROPILE SUMMARY TABLE

| LOCATION | MICROPILE Ø | MAX FACTORED STRUCTURAL LOAD (TONS) | MAX FACTORED PILE STRUCTURAL CAPACITY (TONS) | RESISTANCE FACTOR | MAX FACTORED EE LOAD (TONS) | MAX FACTORED PILE EE CAPACITY (TONS) | RESISTANCE FACTOR | ESTIMATED TIP ELEVATION | MIN TIP ELEVATION |
|---|---|---|---|---|---|---|---|---|---|
| ABUTMENT NO 1 | 10" | | | | | | | | |
| ABUTMENT NO 2 | 10" | | | | | | | | |

NOTES:

1. FIELD VERIFY LOCATION OF EXISTING ROCK WALLS AND ALIGNMENT OF NEW CRM WALLS PRIOR TO CONSTRUCTION.
2. FOR ADDITIONAL INFORMATION, SEE GEOTECHNICAL ENGINEERING EXPLORATION REPORT FOR WAIKAKOI AND S. WAILUA BRIDGE REPLACEMENT, PREPARED BY GEOLABS INC., DATED JULY 25, 2024.
3. ONE SACRIFICIAL, PRE-PRODUCTION COMPRESSIVE LOAD TEST ON A SACRIFICIAL MICROPILE SHALL BE PERFORMED AT EACH ABUTMENT IN ACCORDANCE WITH ASTM D1143.
4. TWO INSTALLED MICROPILES AT EACH ABUTMENT (4 MICROPILES TOTAL) SHALL BE TESTED FOR PULLOUT.
5. FOR MICROPILE DETAILS, SEE SHEET S-XXX.

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

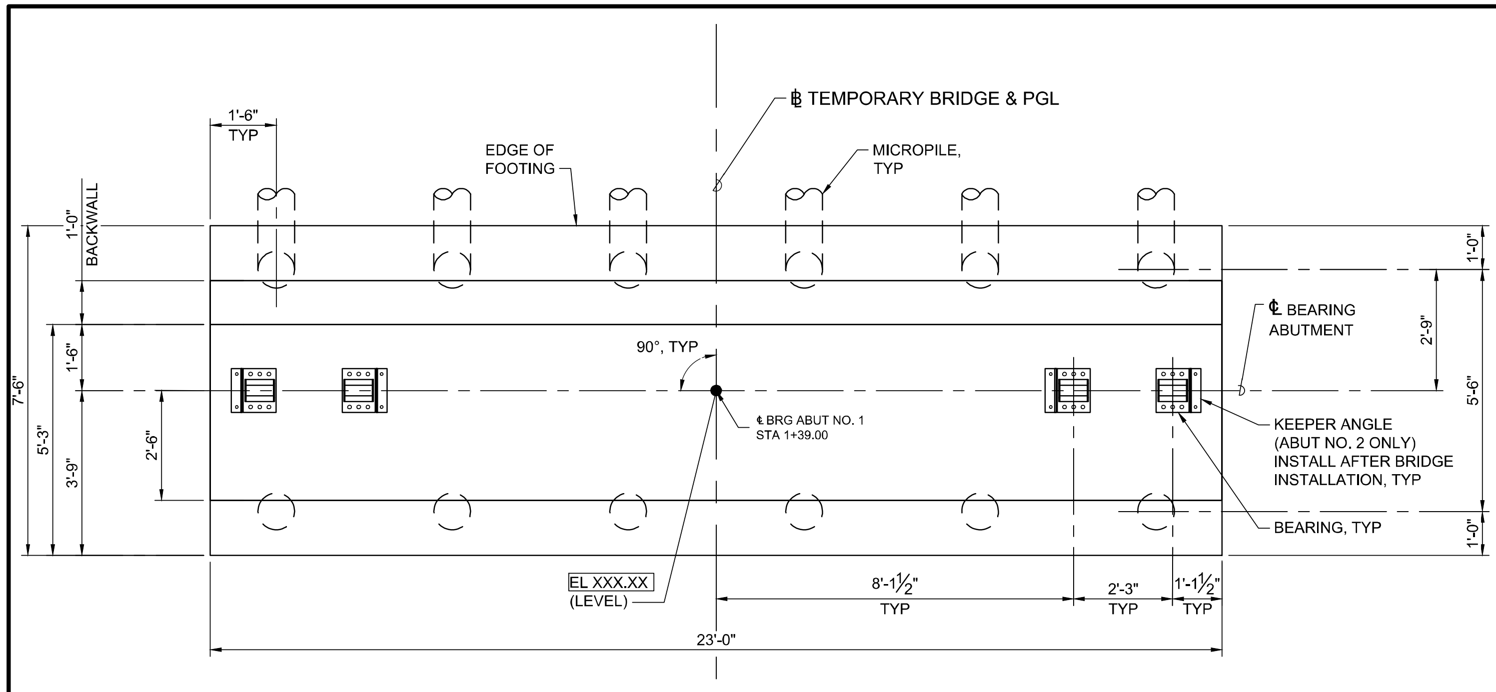
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE FOUNDATION PLAN

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET S-005
of 084 Sheets

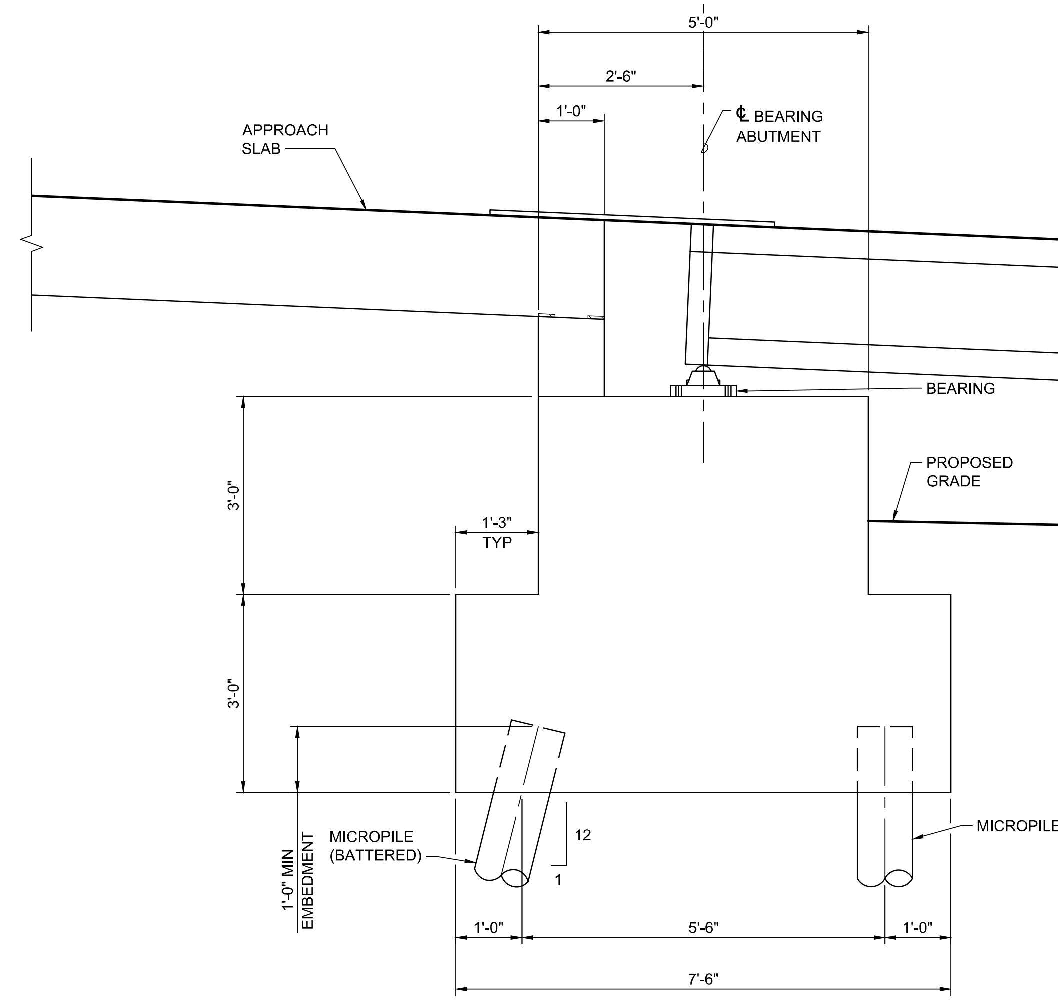
PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:22pm
CAD File Name: C:\pwworking\west01\d1900569\S-005 - South Wailua Temp Bridge FoundationPlan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 053 | 083 |



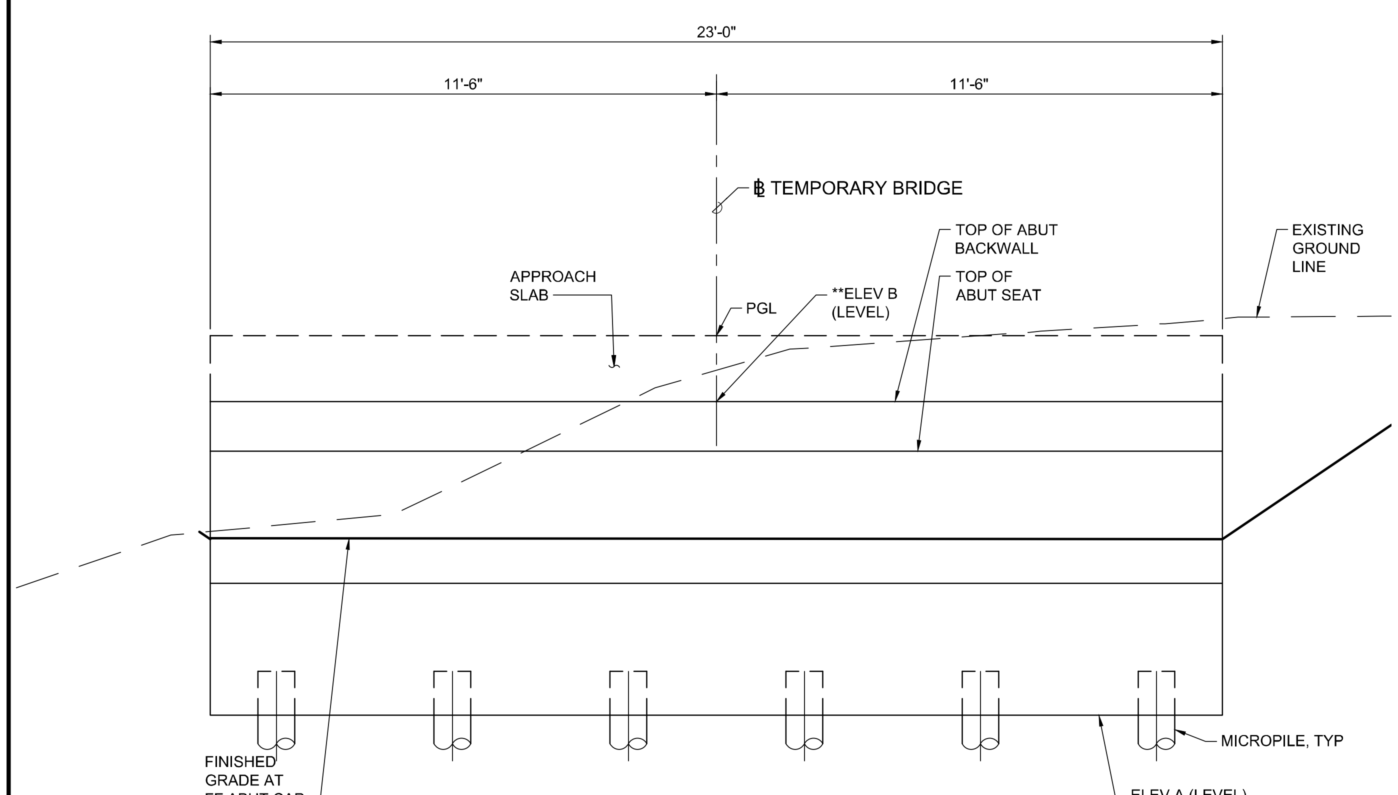

## ABUTMENT PLAN

SCALE: 1/2" = 1'-0"
(ABUTMENT NO. 1 SHOWN, ABUTMENT NO. 2 SIMILAR)




## TYPICAL SECTION

SCALE: 3/4" = 1'-0"




## ABUTMENT ELEVATION

SCALE: 1/2" = 1'-0"

LEGEND:

EL XXX.XX DENOTES ELEVATION AT BEARING SEAT

NOTES:

1. THE FOUNDATION SHALL BE SET BACK INTO THE SLOPE SO THAT THERE IS A MINIMUM 3-FOOT SETBACK FROM THE SLOPE FACE TO THE OUTSIDE BOTTOM EDGE OF THE ABUTMENT FOUNDATION.
2. THE FOUNDATION SHALL BE SITUATED ON A LEVEL BENCH CUT INTO THE EXISTING SLOPE WITH THE CONCRETE POURED IN DIRECT CONTACT WITH THE EXISTING GROUND. NO GRANULAR FILLS SHALL BE USED BENEATH THE ABUTMENT FOUNDATION.
3. THE BACKFILL OF THE ABUTMENT SHALL BE IMPORTED GRANULAR MATERIAL SUCH AS SELECTED BORROW OR BASE COURSE THAT CAN BE READILY COMPACTED AND THAT WILL MINIMIZE THE PRESSURES AGAINST THE ABUTMENT.
4. THE BACKFILL SHALL BE COMPACTED TO BETWEEN 90 AND 95 PERCENT OF ITS MAXIMUM DENSITY. OVERCOMPACTION OF THE BACKFILL SHALL BE AVOIDED.
5. IF VOLCANIC ASH IS ENCOUNTERED WITHIN THE ROADWAY SUBGRADE, REMOVE AND REPLACE IT WITH COMPACTED GRANULAR FILL. THE ROADWAY SUBGRADE AFTER COMPACTION SHALL BE TESTED TO CONFIRM THAT IT WILL PROVIDE A MINIMUM FIELD CBR OF 25. TWO LOCATIONS ON EACH SIDE OF THE BRIDGE SHALL BE TESTED TO VERIFY THE SUPPORT STRENGTH OF THE SUBGRADE.

GRAPHIC SCALE:

2' 1' 0' 2' 4'
SCALE: 1/2" = 1'-0"

1' 0' 1' 2' 3'
SCALE: 3/4" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

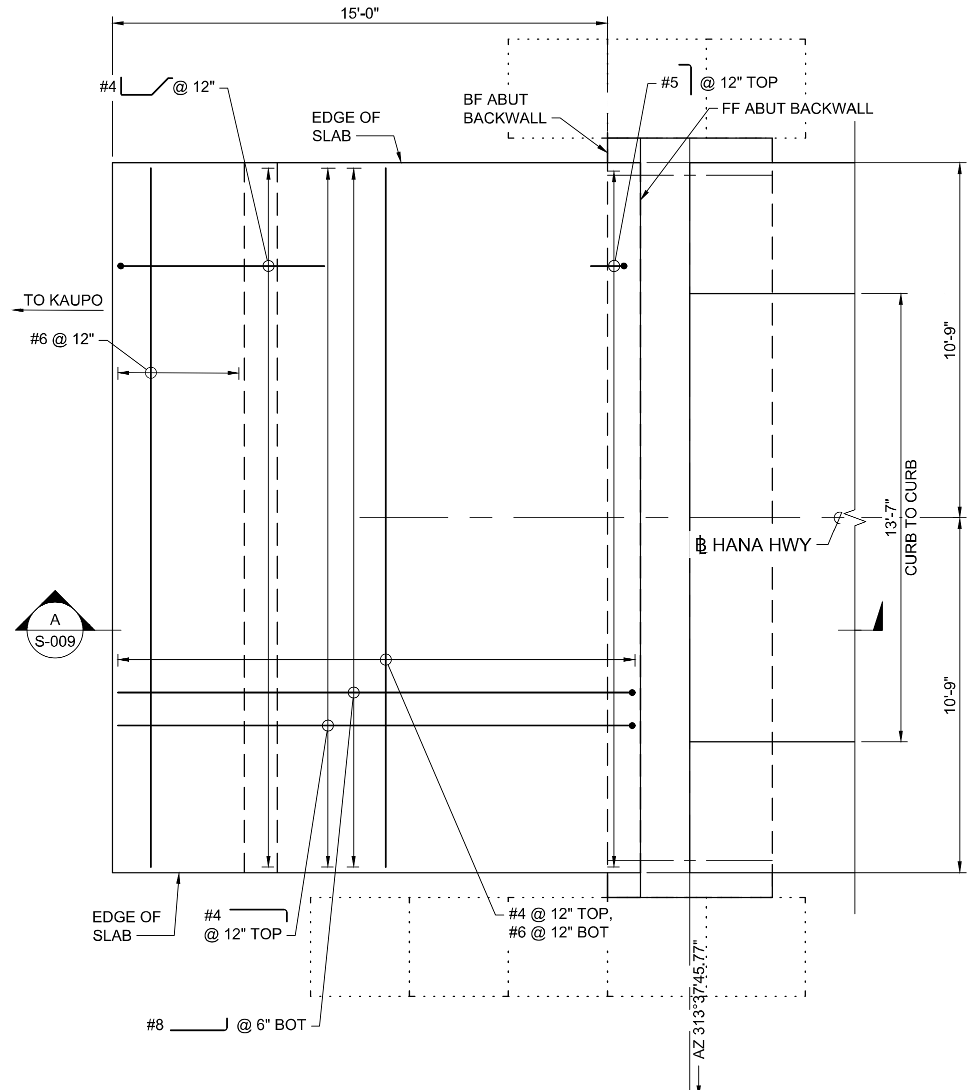
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE
ABUTMENT DETAILS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-006
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:22pm
CAD File Name: C:\pwworking\west01\d1900569\S-006 - South Wailua Temp Bridge_AbutmentDetails01.dwg

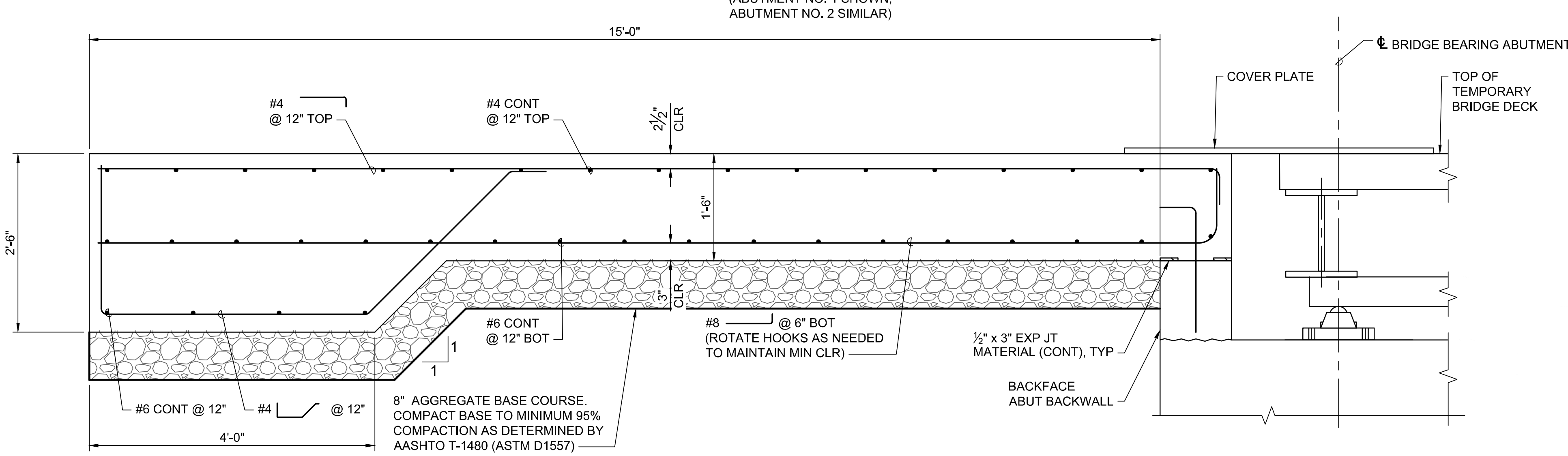
| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 054 | 083 |




APPROACH SLAB PLAN

SCALE: 3/8" = 1'-0"

(ABUTMENT NO. 1 SHOWN, ABUTMENT NO. 2 SIMILAR)




SECTION A
SCALE: 1" = 1'-0" SHT S-009

GRAPHIC SCALE:

2' 1' 0' 2' 4' 6'
SCALE: 3/8" = 1'-0"

1' 6" 0' 1' 2'
SCALE: 1" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE
APPROACH SLAB DETAILS

Date: 8/30/24
Design By: RLS
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SHEET S-009
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PROJ. NO.: 2020040
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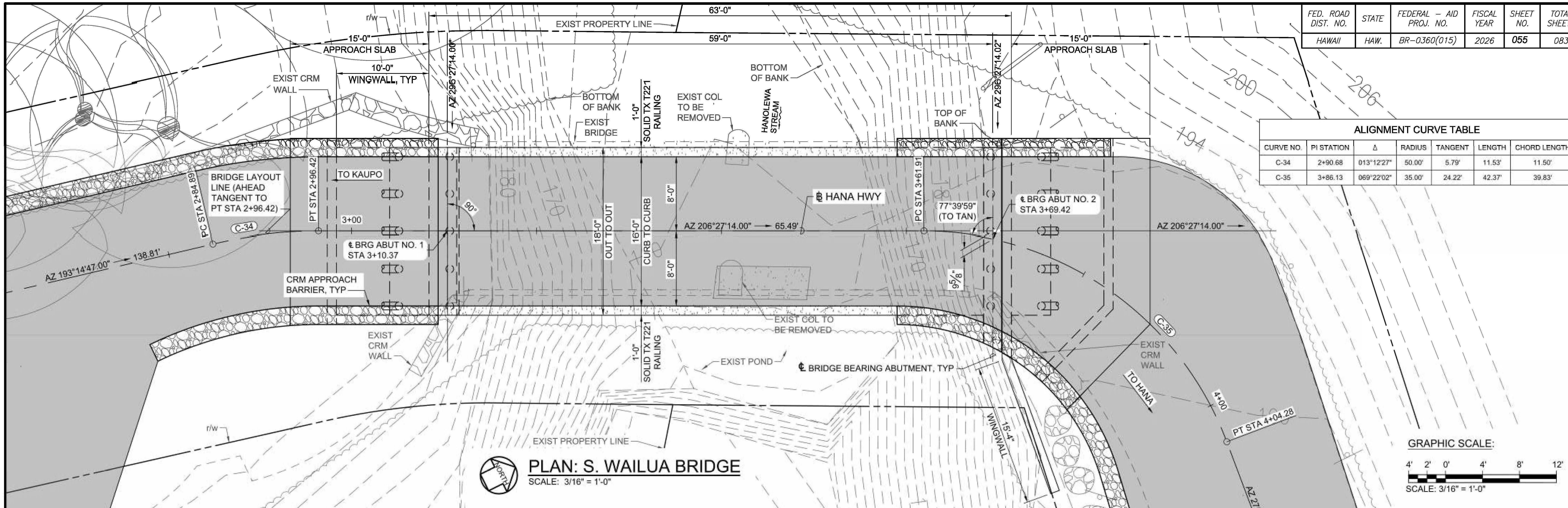
CAD File Name: C:\pwworking\west01\d1900569\S-009 - South Wailua Temp Bridge_AppSlabDet01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 055 | 083 |

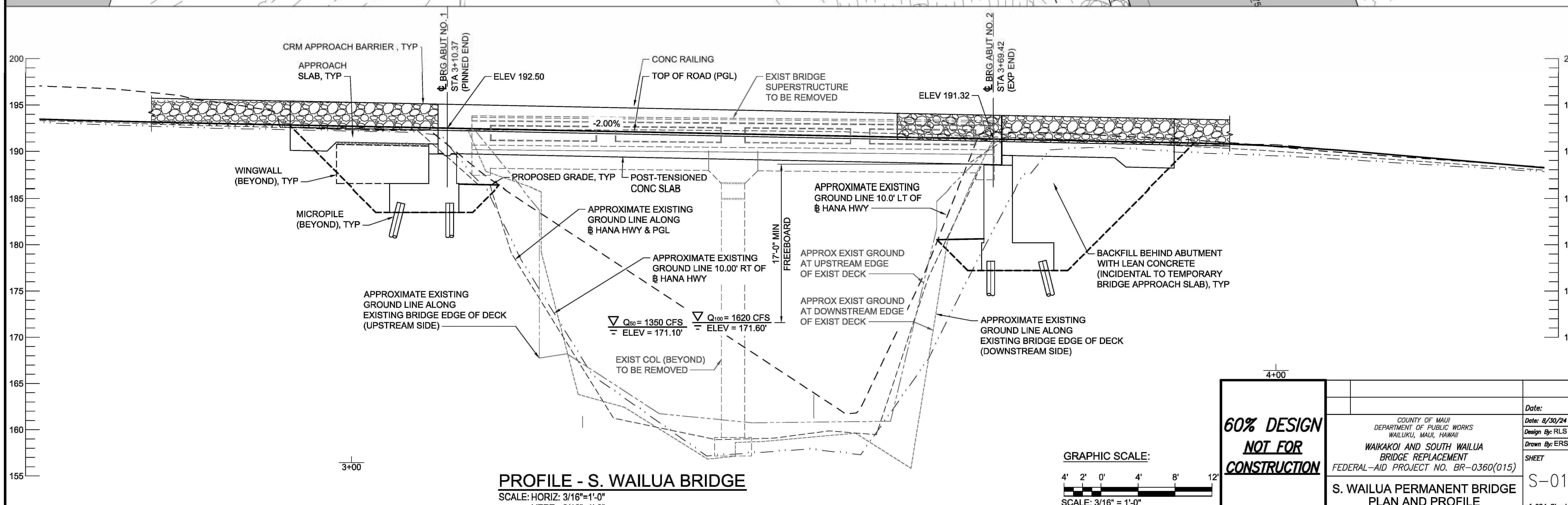



## PLAN: S. WAILUA BRIDGE

SCALE: 3/16" = 1'-0"

**ALIGNMENT CURVE TABLE**

| CURVE NO. | PI STATION | Δ | RADIUS | TANGENT | LENGTH | CHORD LENGTH |
|---|---|---|---|---|---|---|
| C-34 | 2+90.68 | 013°12'27" | 50.00' | 5.79' | 11.53' | 11.50' |
| C-35 | 3+86.13 | 069°22'02" | 35.00' | 24.22' | 42.37' | 39.83' |




## PROFILE - S. WAILUA BRIDGE

SCALE: HORIZ: 3/16"=1'-0"
VERT: 3/16"=1'-0"

GRAPHIC SCALE:
4' 2' 0' 4' 8' 12'
SCALE: 3/16" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE PLAN AND PROFILE

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-010
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 – 2:23pm
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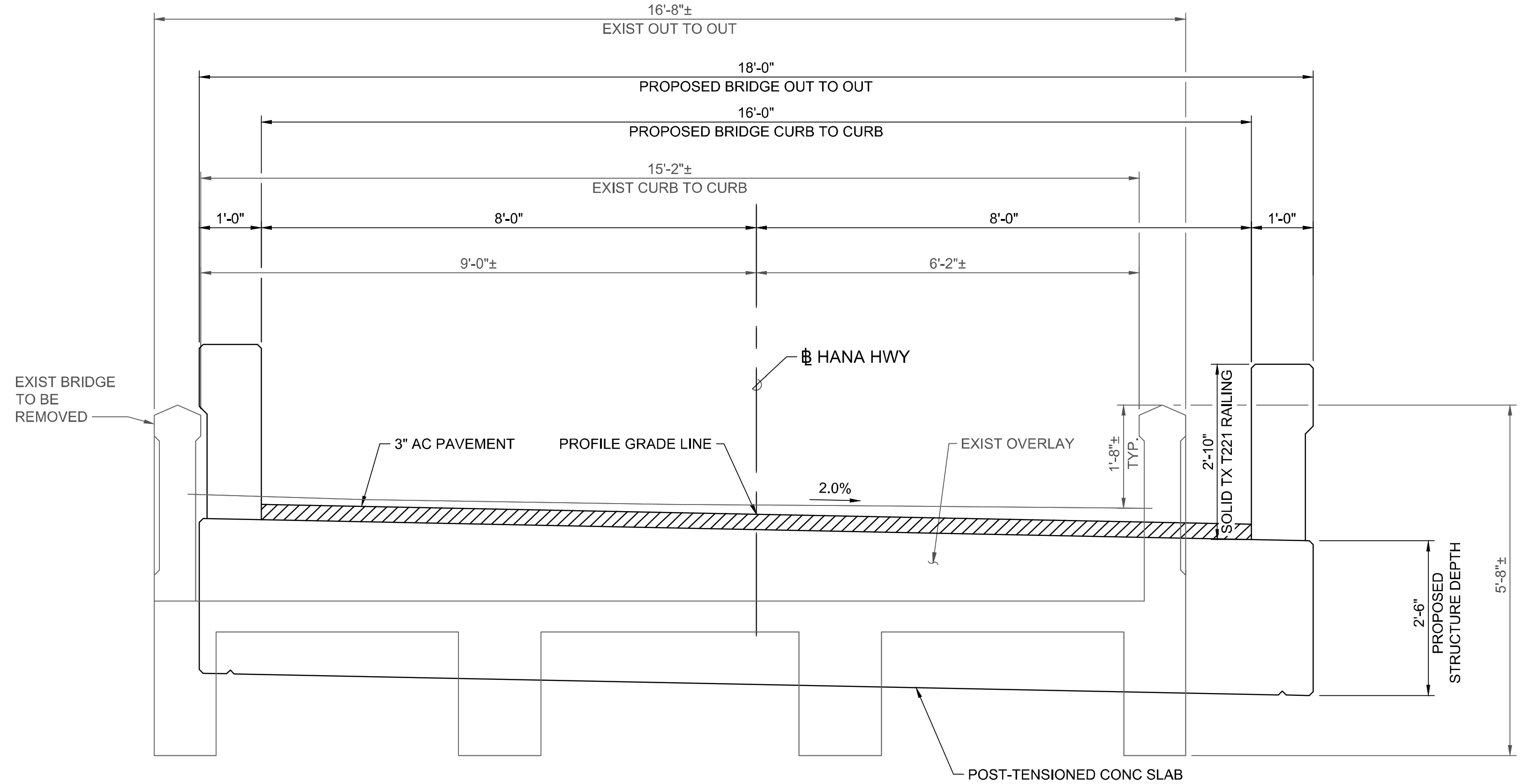
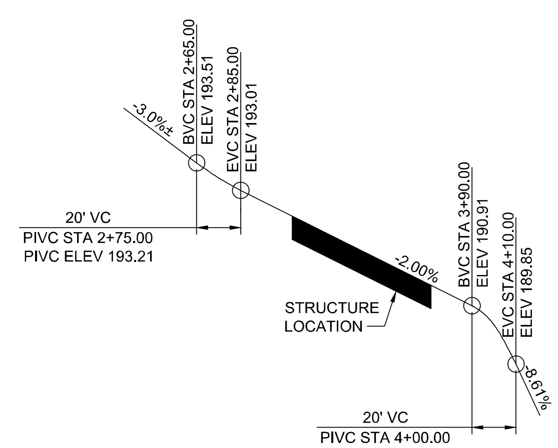
| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 056 | 083 |




## S. WAILUA TYPICAL SECTION - PROPOSED BRIDGE

SCALE: 3/4" = 1'-0"

(LOOKING AHEAD STATION TOWARDS HANA)




## PROFILE GRADE DIAGRAM

SCALE: NO SCALE

GRAPHIC SCALE:

1' 0' 1' 2' 3'

SCALE: 3/4" = 1'-0"

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
TYPICAL SECTION

Date:
Date: 8/30/24
Design By: RLS
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of 084 Sheets

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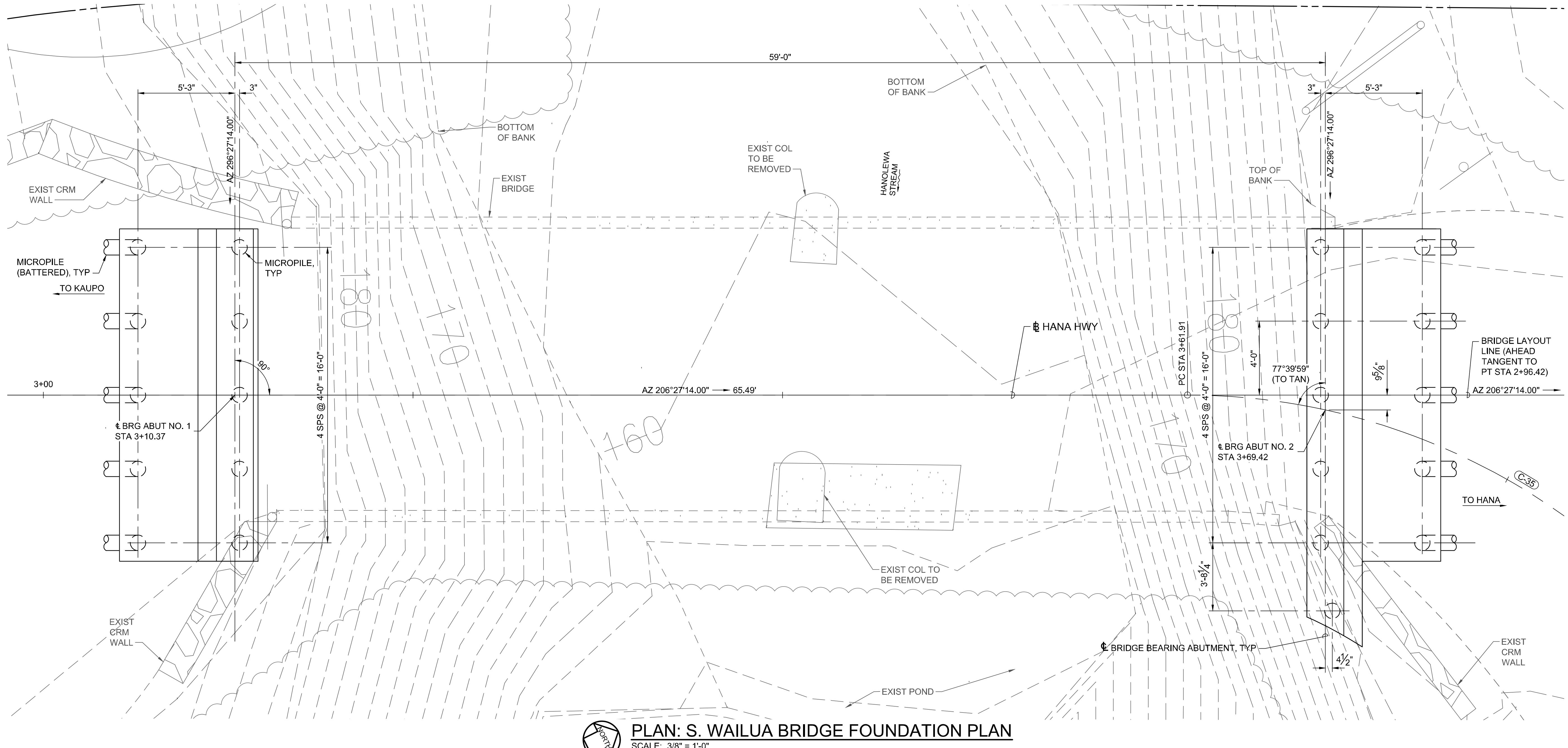
| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 057 | 083 |




## PLAN: S. WAILUA BRIDGE FOUNDATION PLAN

SCALE: 3/8" = 1'-0"

GRAPHIC SCALE:

2' 1' 0' 2' 4' 6'

SCALE: 3/8" = 1'-0"

NOTES:

1. FIELD VERIFY LOCATION OF EXISTING ROCK WALLS AND ALIGNMENT OF NEW CRM WALLS PRIOR TO CONSTRUCTION.
2. FOR ADDITIONAL INFORMATION, SEE GEOTECHNICAL ENGINEERING EXPLORATION REPORT FOR WAIKAKOI AND S. WAILUA BRIDGE REPLACEMENT, PREPARED BY GEOLABS INC., DATED JULY 25, 2024.
3. ONE SACRIFICIAL, PRE-PRODUCTION COMPRESSIVE LOAD TEST ON A SACRIFICIAL MICROPILE SHALL BE PERFORMED AT EACH ABUTMENT IN ACCORDANCE WITH ASTM D1143.
4. TWO INSTALLED MICROPILES AT EACH ABUTMENT (4 MICROPILES TOTAL) SHALL BE TESTED FOR PULLOUT.
5. FOR MICROPILE DETAILS, SEE SHEET S-XXX.

MICROPILE SUMMARY TABLE

| LOCATION | MICROPILE Ø | MAX FACTORED STRUCTURAL LOAD (TONS) | MAX FACTORED PILE STRUCTURAL CAPACITY (TONS) | RESISTANCE FACTOR | MAX FACTORED EE LOAD (TONS) | MAX FACTORED PILE EE CAPACITY (TONS) | RESISTANCE FACTOR | ESTIMATED TIP ELEVATION | MIN TIP ELEVATION |
|---|---|---|---|---|---|---|---|---|---|
| ABUTMENT NO 1 | 10" | | | | | | | | |
| ABUTMENT NO 2 | 10" | | | | | | | | |

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE FOUNDATION PLAN

Date:
Date: 8/30/24
Design By: RLS
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S-012
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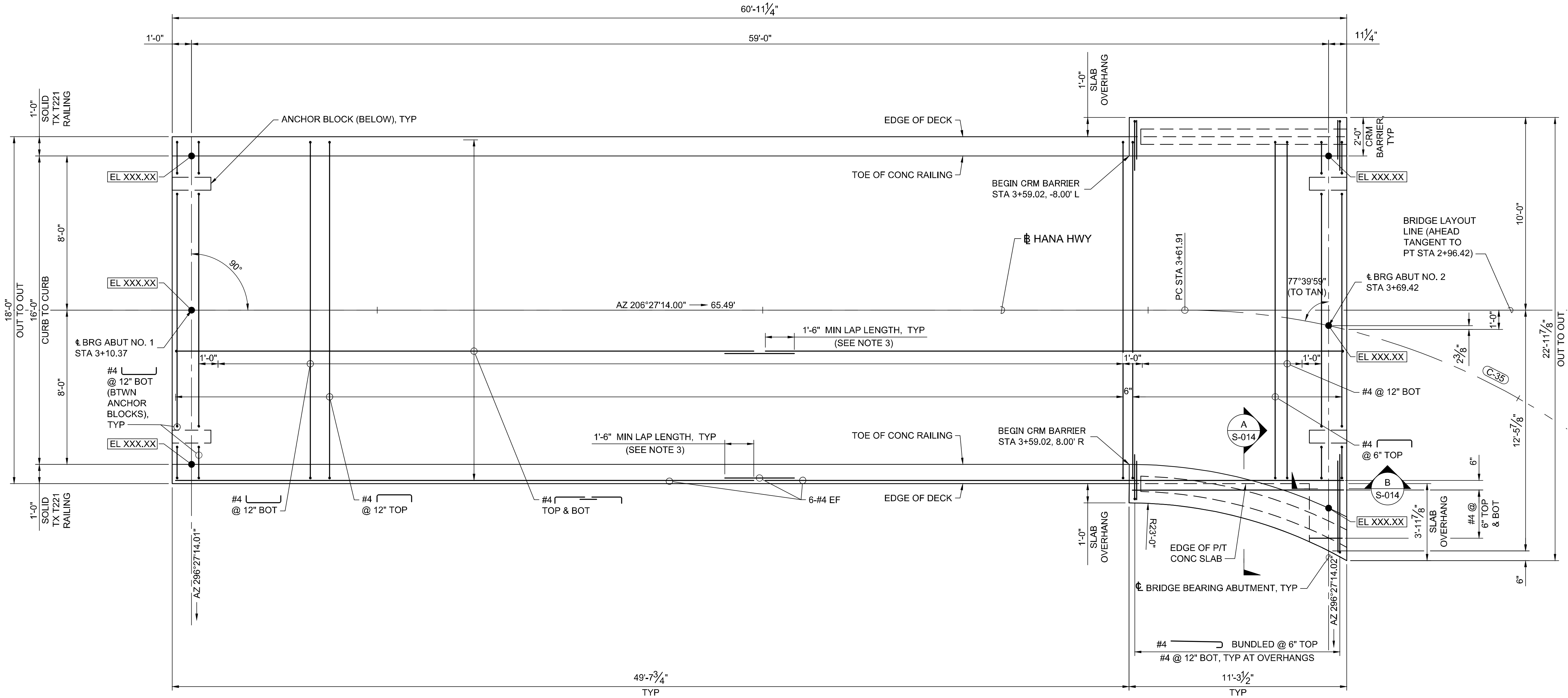
| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 058 | 083 |




NORTH

## DECK PLAN

SCALE: 3/8" = 1'-0"

(POST-TENSIONING NOT SHOWN)

GRAPHIC SCALE:

2' 1' 0' 2' 4' 6'

SCALE: 3/8" = 1'-0"

NOTES:

1. ELEVATIONS ON ROADWAY ARE TO TOP OF AC PAVEMENT.
2. IF THE BRIDGE DECK CANNOT BE PLACED IN ONE CONTINUOUS POUR, THE CONTRACTOR SHALL SUBMIT A DECK POUR SEQUENCE FOR APPROVAL AT LEAST TWO WEEKS PRIOR TO PLACEMENT OF BRIDGE DECK CONCRETE. THE SUBMITTAL SHALL INCLUDE THE PROPOSED CONSTRUCTION JOINT LOCATIONS.
3. LONGITUDINAL BARS SHALL BE A MAXIMUM OF 30 FEET IN LENGTH. LONGER BARS MAY BE USED AT THE CONTRACTOR'S OPTION AT NO ADDITIONAL EXPENSE TO THE PROJECT PROVIDED THE CONTRACTOR CAN DEMONSTRATE THAT THE LONGER BARS CAN BE SHIPPED TO THE SITE. LAP SPLICE LENGTHS SHALL BE AS SHOWN IN THE PLANS. ALL LAP SPLICES SHALL BE STAGGERED FROM ADJACENT LAP SPLICES.
4. FOR POST-TENSIONING DETAILS, SEE SHEETS S-015 AND S-016.
5. FOR BRIDGE RAIL DETAILS, SEE SHEET S-XXX.
6. FOR CRM BARRIER DETAILS, SEE SHEET S-XXX.

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

S. WAILUA PERMANENT BRIDGE
SLAB PLAN

Date:
Date: 8/30/24
Design By: RLS
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S–013
of 084 Sheets

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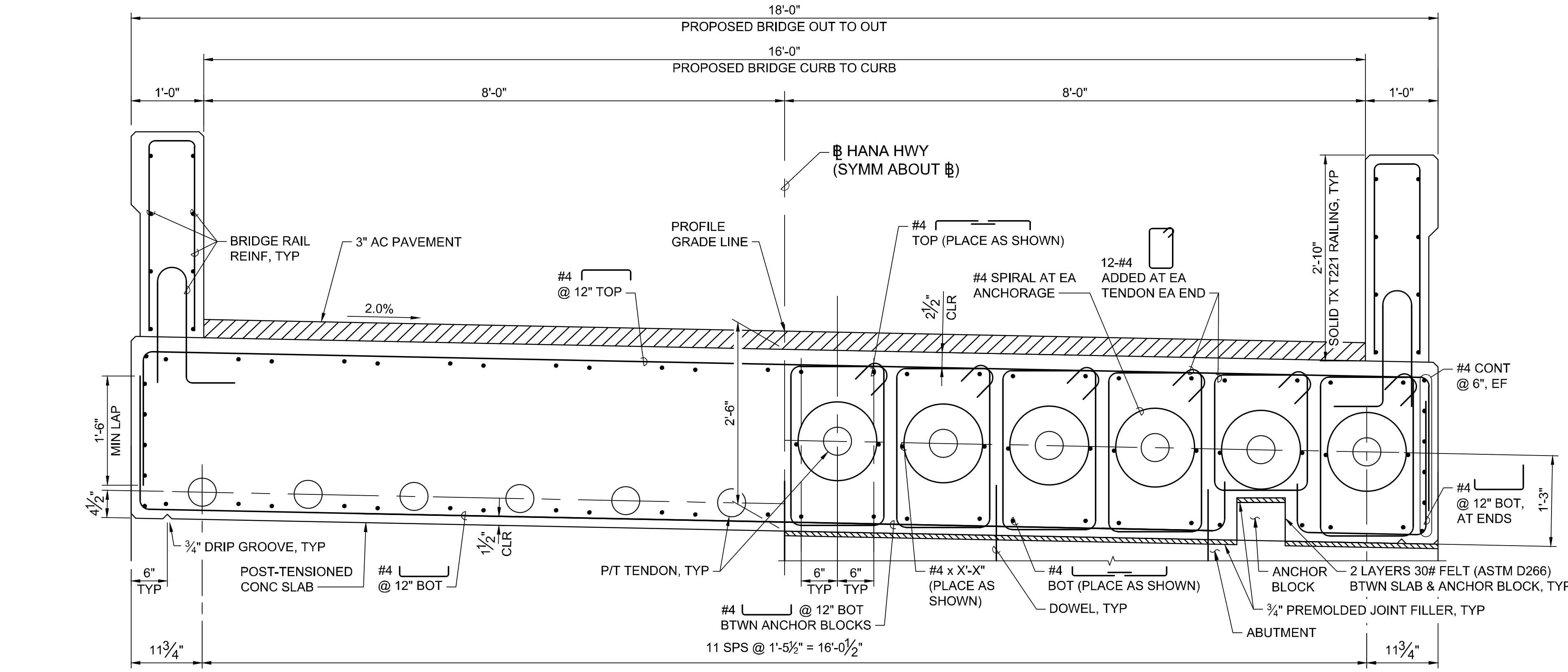
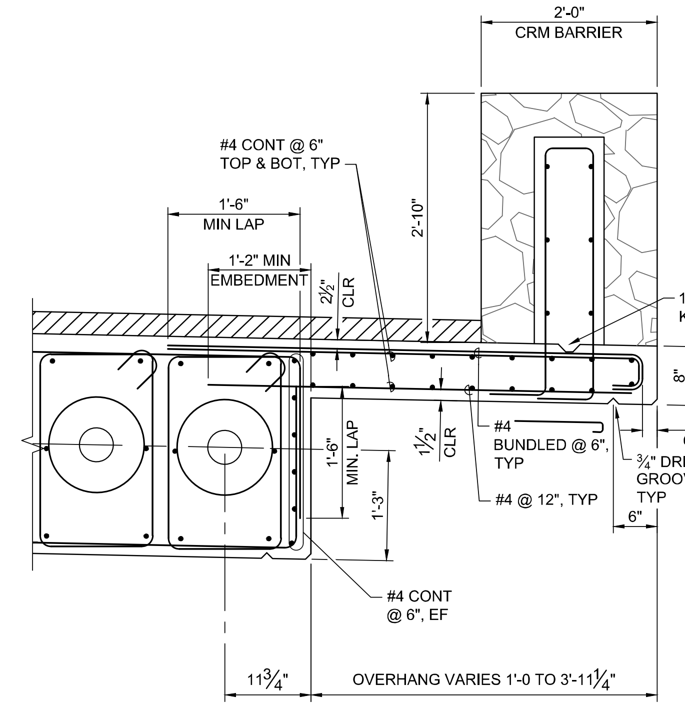
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 059 | 083 |




## TYPICAL SECTION

SCALE: 1" = 1'-0"

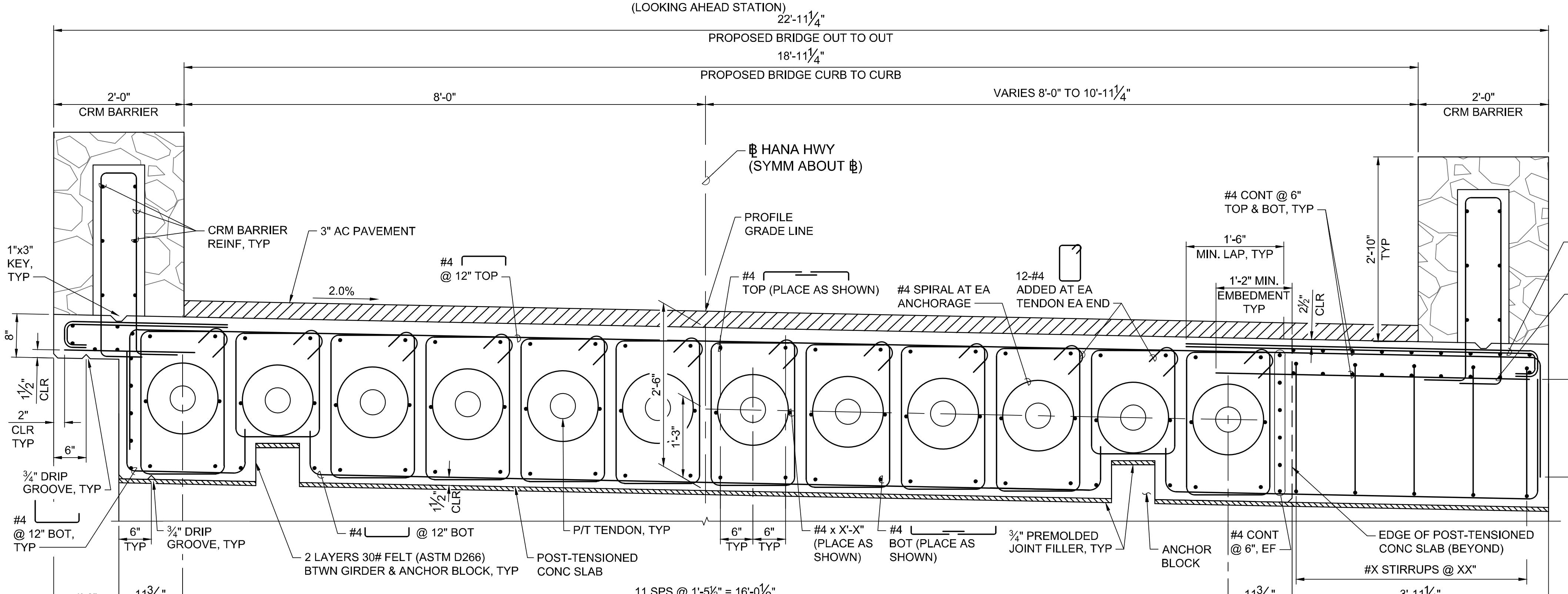
(LOOKING AHEAD STATION)




## SECTION (A / S-013)

SCALE: 1" = 1'-0" SHT

(FOR ADDITIONAL INFORMATION, SEE TYPICAL SECTIONS)




## TYPICAL SECTION

SCALE: 1" = 1'-0"

(LOOKING AHEAD STATION AT ABUTMENT NO. 2)

NOTES:

1. FOR BRIDGE RAIL AND CRM BARRIER DETAILS, SEE SHEET S-XXX.

GRAPHIC SCALE:

1' 6" 0' 1' 2'

SCALE: 1" = 1'-0"

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
SLAB SECTIONS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-014
of 084 Sheets

PROJ. NO.: 2020040

Date Saved: Thu, 29 Aug 2024 – 2:24pm
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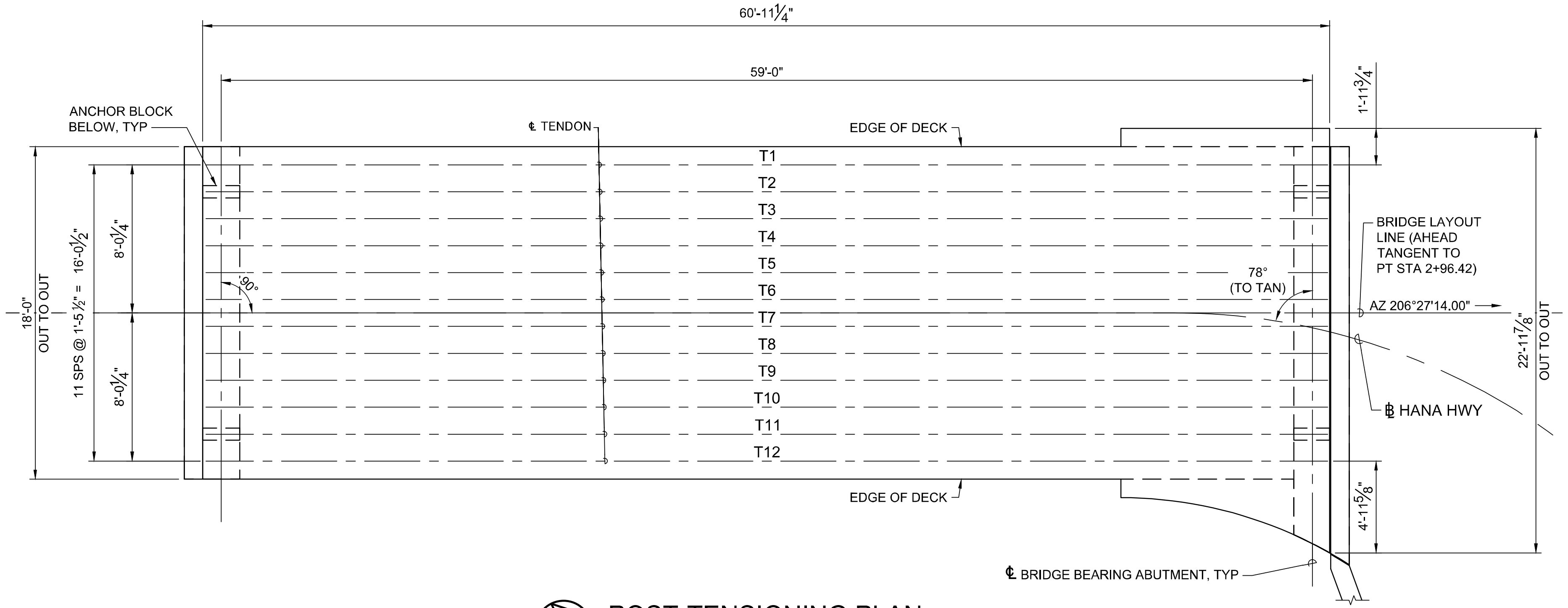
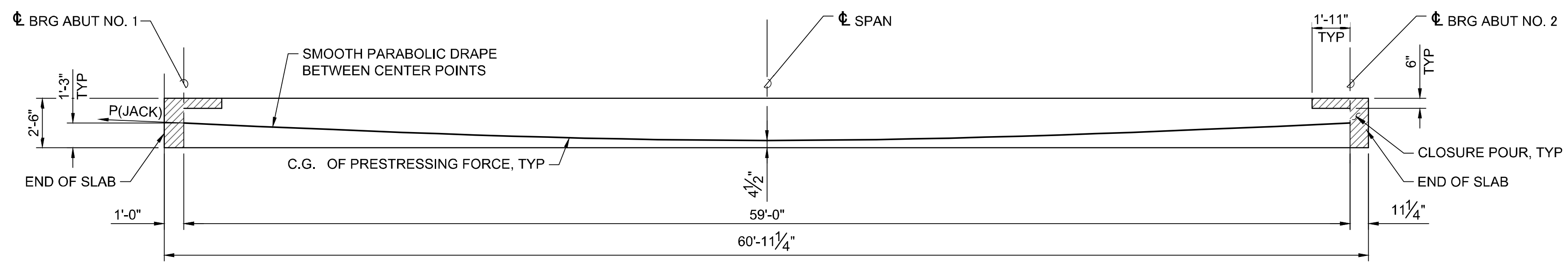
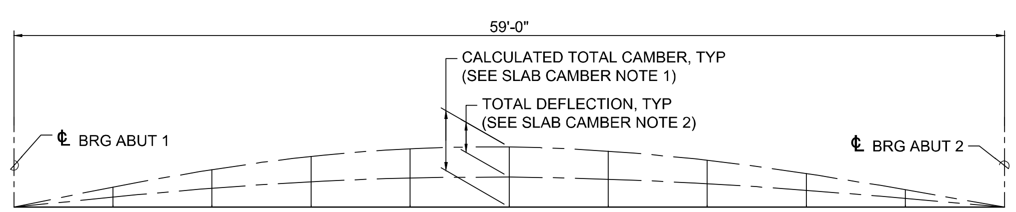
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 060 | 083 |




## POST-TENSIONING PLAN
SCALE: 1/4" = 1'-0"




## SLAB ELEVATION
SCALE: 1/4" = 1'-0"




## SLAB CAMBER DIAGRAM
SCALE: NTS

### SLAB CAMBER NOTES:

1. POSITIVE VALUES SHOWN FOR CALCULATED CAMBER INDICATE A NET UPWARD DEFLECTION AND NEGATIVE VALUES SHOWN FOR DEFLECTION INDICATE A NET DOWNWARD DEFLECTION.
2. INITIAL CAMBER IS THE CAMBER REMAINING AFTER THE FALSEWORK IS REMOVED.
3. LONG-TERM CAMBER IS THE LONG-TERM EXPECTED CAMBER DUE TO EFFECTS ASSOCIATED WITH CREEP, SHRINKAGE, AND RELAXATION.
4. CONTRACTOR SHALL CAMBER THE SLAB FALSEWORK AS REQUIRED BY THE CALCULATED ADDITIONAL FALSEWORK CAMBER.
5. ALL CAMBERS AND DEFLECTIONS ARE IN INCHES.

SLAB CAMBER SCHEDULE

| LOCATION - ℄ BRG ABUT 1 TO ℄ BRG ABUT 2 | GIRDER SELFWEIGHT DC1 DL DEFLECTION | COMPOSITE DC2 DL DEFLECTION | INITIAL PS CAMBER | INITIAL CAMBER | LONG-TERM CAMBER | ADDITIONAL FALSEWORK CAMBER |
|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.10 | -0.32 | -0.03 | 0.44 | 0.10 | 0.11 | 0.34 |
| 0.20 | -0.60 | -0.05 | 0.84 | 0.18 | 0.19 | 0.62 |
| 0.30 | -0.83 | -0.07 | 1.15 | 0.25 | 0.26 | 0.82 |
| 0.40 | -0.97 | -0.08 | 1.35 | 0.30 | 0.30 | 0.95 |
| 0.50 | -1.02 | -0.09 | 1.42 | 0.32 | 0.31 | 1.00 |
| 0.60 | -0.97 | -0.08 | 1.35 | 0.30 | 0.30 | 0.95 |
| 0.70 | -0.83 | -0.07 | 1.16 | 0.26 | 0.26 | 0.83 |
| 0.80 | -0.60 | -0.05 | 0.85 | 0.19 | 0.20 | 0.63 |
| 0.90 | -0.32 | -0.03 | 0.45 | 0.10 | 0.11 | 0.35 |
| 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

### GENERAL POST-TENSIONING NOTES:

1. ALL WORK SHALL CONFORM TO THE STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS. AFTER THE MINIMUM ULTIMATE 28 DAY COMPRESSIVE STRENGTH OF 4500 PSI IS ATTAINED, THE SLAB CAN BE POST-TENSIONED ON SITE. W/C RATIO SHALL NOT EXCEED 0.4. SLAB SHALL NOT BE HANDLED UNTIL POST-TENSIONING HAS TAKEN PLACE.
2. DUCTS SHALL BE PLACED SO AS TO ALIGN WITH THE CENTER OF GRAVITY OF THE PRESTRESSING STEEL AS SHOWN ON THE DRAWING.
3. ALL DUCTS SHALL BE SECURELY TIED AT A MAXIMUM OF 4 FT. ON CENTER TO PREVENT DISPLACEMENT DURING PLACEMENT OF CONCRETE. ALL DUCTS SHALL BE FREE OF OPENINGS AND ALL JOINTS ADEQUATELY SPLICED TO PREVENT THE INTRUSION OF CONCRETE.
4. ANCHORAGE BEARING PLATES SHALL BE PLACED TIGHT AGAINST THE FORMS. CENTERLINE OF THE TENDONS SHALL BE NORMAL TO THE PLATES. FORMS SHALL BE BRACED AND ANCHORED TO SUPPORT WEIGHT OF THE BEARING PLATES.
5. REINFORCING STEEL SHALL BE ADJUSTED OR RELOCATED DURING THE INSTALLATION OF POST-TENSIONING DUCTS AS REQUIRED TO PROVIDE INTENDED CLEARANCE FOR THE POST-TENSIONING TENDONS, ANCHORAGES, JACKS AND RELATED EQUIPMENT. REINFORCING STEEL INTERFERING WITH THE POST TENSION TENDON ALIGNMENT SHALL BE ADJUSTED AS DIRECTED BY THE ENGINEER.
6. STRANDS ARE TO BE PLACED IN SEMI-RIGID METAL DUCTS AFTER THE COMPLETION OF SLAB CONCRETE PLACEMENT. THE CONTRACTOR SHALL DEMONSTRATE TO THE SATISFACTION OF THE ENGINEER THAT THE DUCTS ARE FREE FROM FOREIGN MATERIAL AND OTHER OBSTRUCTIONS WHICH WOULD CREATE ADDED FRICTION LOSSES.
7. NO WELDING SHALL BE PERFORMED IN THE VICINITY OF HIGH TENSILE STEEL.
8. DURING STRESSING OPERATIONS, NO PERSON SHALL BE DIRECTLY BEHIND EITHER END OF THE TENDON.
9. SHOP DRAWINGS SHOWING COMPLETE DETAILS OF TENDON PROFILES, TENDON ANCHORAGES, LOCAL ZONE SPIRAL REINFORCING, AND DOCUMENTED FRICTION AND WOBBLE COEFFICIENTS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
10. CALCULATIONS INDICATING FINAL POST-TENSIONING FORCE OBTAINED, SPECIFIED LOSSES AND STRESSING SEQUENCE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. GROUT THE DUCTS WITHIN THREE (3) DAYS AFTER TENSIONING THE STEEL.
12. PROVISIONS TO VENT THE POST TENSIONING DUCTS WITHIN 3' OF THE HIGH POINT OF THE DUCT SHALL BE PROVIDED.
13. AFTER POST TENSIONING WORK IS COMPLETED, A CONCRETE CLOSURE POUR SHALL BE PLACED OVER THE POST TENSIONING ANCHORAGES. COAT ALL SURFACES, INCLUDING POST TENSIONING HARDWARE IN CONTACT WITH CONCRETE CAP , WITH A TWO COMPONENT EPOXY. JUST BEFORE NEW CONCRETE IS PLACED AGAINST POST TENSIONING ANCHOR PLATES, APPLY NEW COAT OF EPOXY TO INCREASE BOND WITH CONCRETE. THIS WORK SHALL BE INCIDENTAL TO POST TENSIONING OPERATIONS IN THE PROJECT.
14. NO TENSIONING OR GROUTING SHALL BE PERFORMED IN THE ABSENCE OF THE ENGINEER.
15. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE LATERAL AND VERTICAL STABILITY OF THE MEMBERS PRIOR TO INCORPORATING IN THE FINISHED STRUCTURE.
16. THE MECHANICAL CONNECTION SHALL MEET AASHTO REQUIREMENT OF DEVELOPING IN TENSION AND COMPRESSION. MECHANICAL COUPLER SHALL BE INCIDENTAL TO CONCRETE.

### POST-TENSIONING DESIGN NOTES:

1. DESIGN IS BASED ON K=.0002 AND M=0.25. P(JACK) AT THE JACKING END INCLUDES FRICTION, ANCHOR SET OF 0.375" AT THE JACKING END, ELASTIC SHORTENING, AND PROVISIONS FOR AN ADDITIONAL 10KSI LONG TERM LOSS IN STRESS.
2. DESIGN ASSUMES JACKING FROM ONE END.
3. PRESTRESSING STEEL SHALL BE GRADE 270, 0.6Ø, SEVEN WIRE, UNCOATED, LOW RELAXATION STRAND CONFORMING TO AASHTO M203.
4. P(JACK) = 6855.03 KIPS TOTAL AT JACKING END
   As(MIN) = 33.852 SQ.IN TOTAL STRAND AREA
   f's= 270 KSI
   f'c= 4500 PSI AT 28 DAYS FIELD COMPRESSIVE STRENGTH AT STRESSING
5. SUGGESTED STRESSING SEQUENCE:
   TENDONS SHALL BE STRESSED FROM ONE END.
   START AT T7, THEN T6, T8, T5, T9, T4, T10, T3, T11, T2, T12, AND T13.

GRAPHIC SCALE:
4' 2' 0' 4' 8'
SCALE: 1/4" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
SLAB PT DETAILS (1 OF 2)

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-015
of 084 Sheets

PROJ. NO.: 2020040
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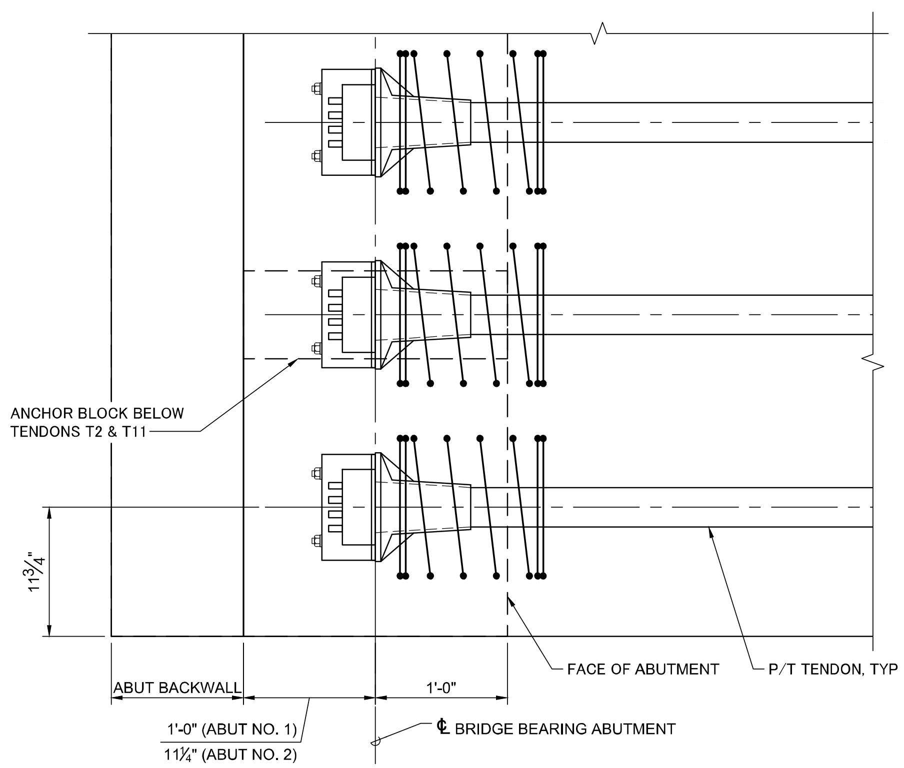
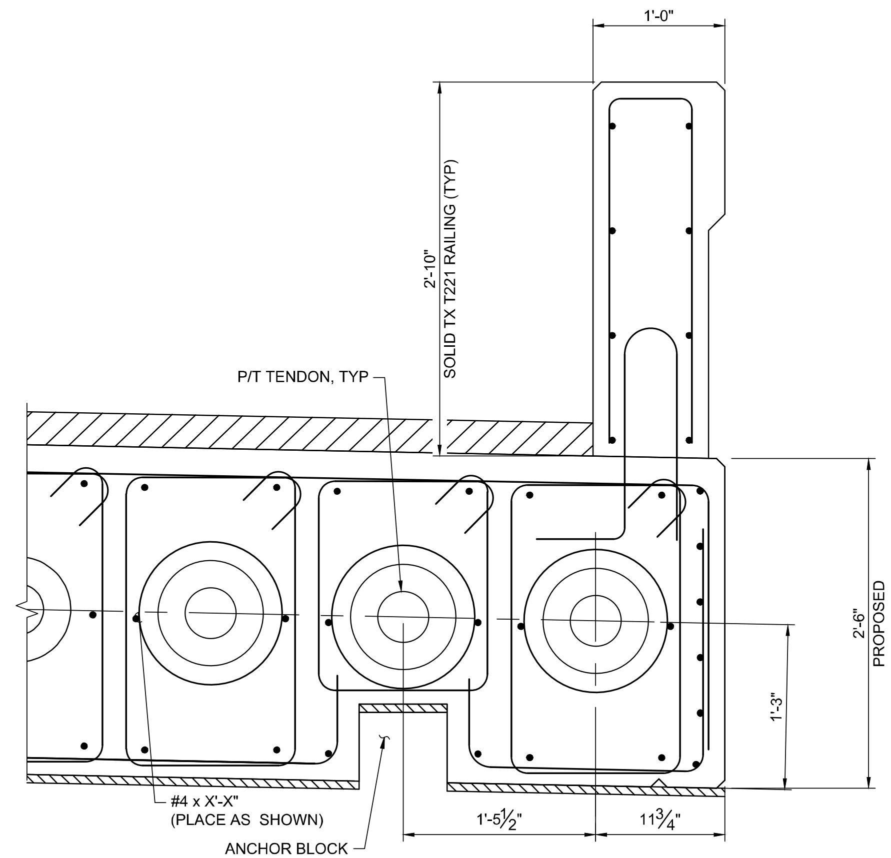
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 061 | 083 |




## PARTIAL POST-TENSIONING DETAIL PLAN

SCALE: 1 1/2" = 1'-0"

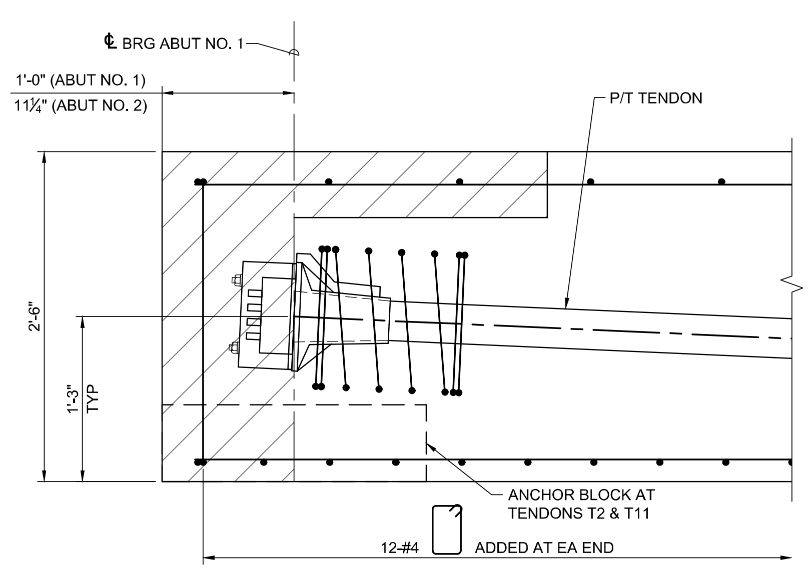
(POST-TENSIONING ANCHORAGE LAYOUT DETAIL, SLAB REINFORCING NOT SHOWN FOR CLARITY)




## SECTION AT END OF SLAB

SCALE: 1 1/2" = 1'-0"

(LOOKING AHEAD STATION AT ABUTMENT NO. 1)




## ELEVATION AT END OF SLAB

SCALE: 1 1/2" = 1'-0"

NOTES:

1. LOCAL ZONE SPIRAL REINFORCING AND ANCHORAGE SHOWN FOR SCHEMATIC PURPOSES ONLY. SEE NOTE 9 ON SLAB PT DETAILS (1 OF 2).
2. FOR SLAB REINFORCING, SEE SLAB SECTIONS SHEET.

GRAPHIC SCALE:

6" 3" 0' 6" 1' 1'-6"

SCALE: 1-1/2" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
SLAB PT DETAILS (2 OF 2)

Date:
Date: 8/30/24
Design By: RLS
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S-016
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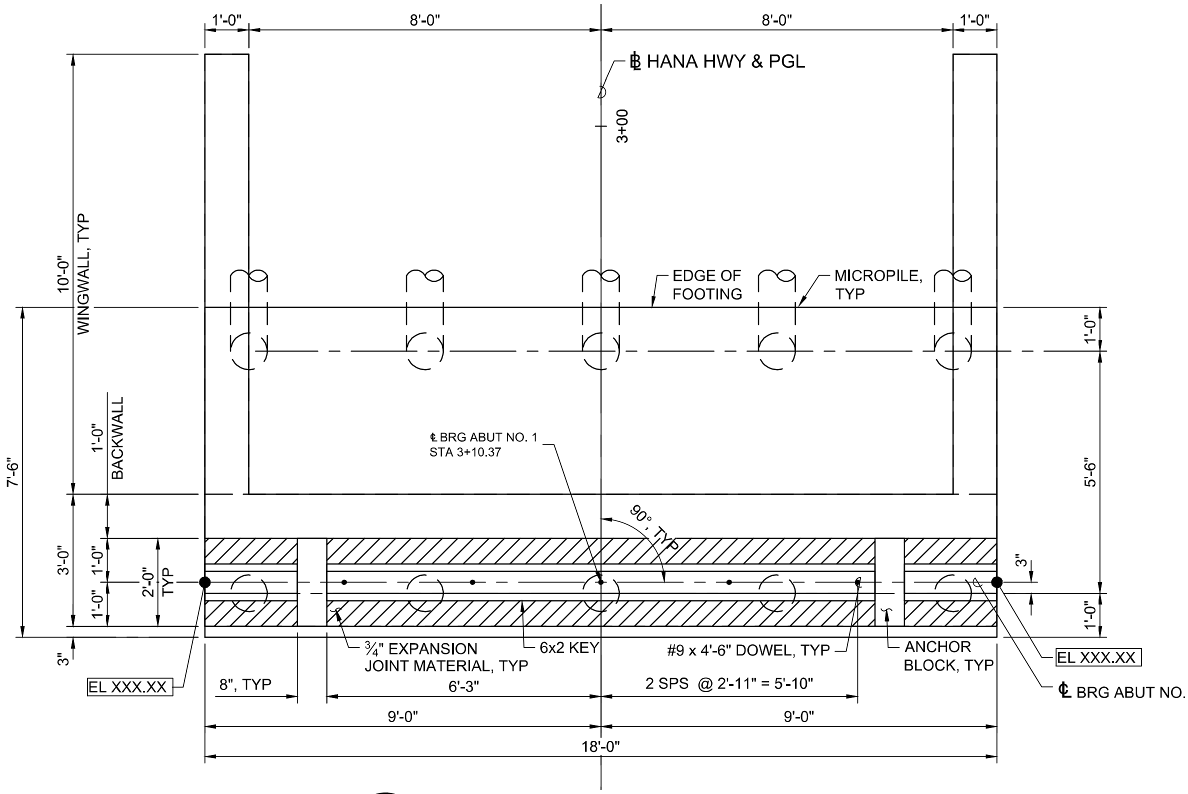
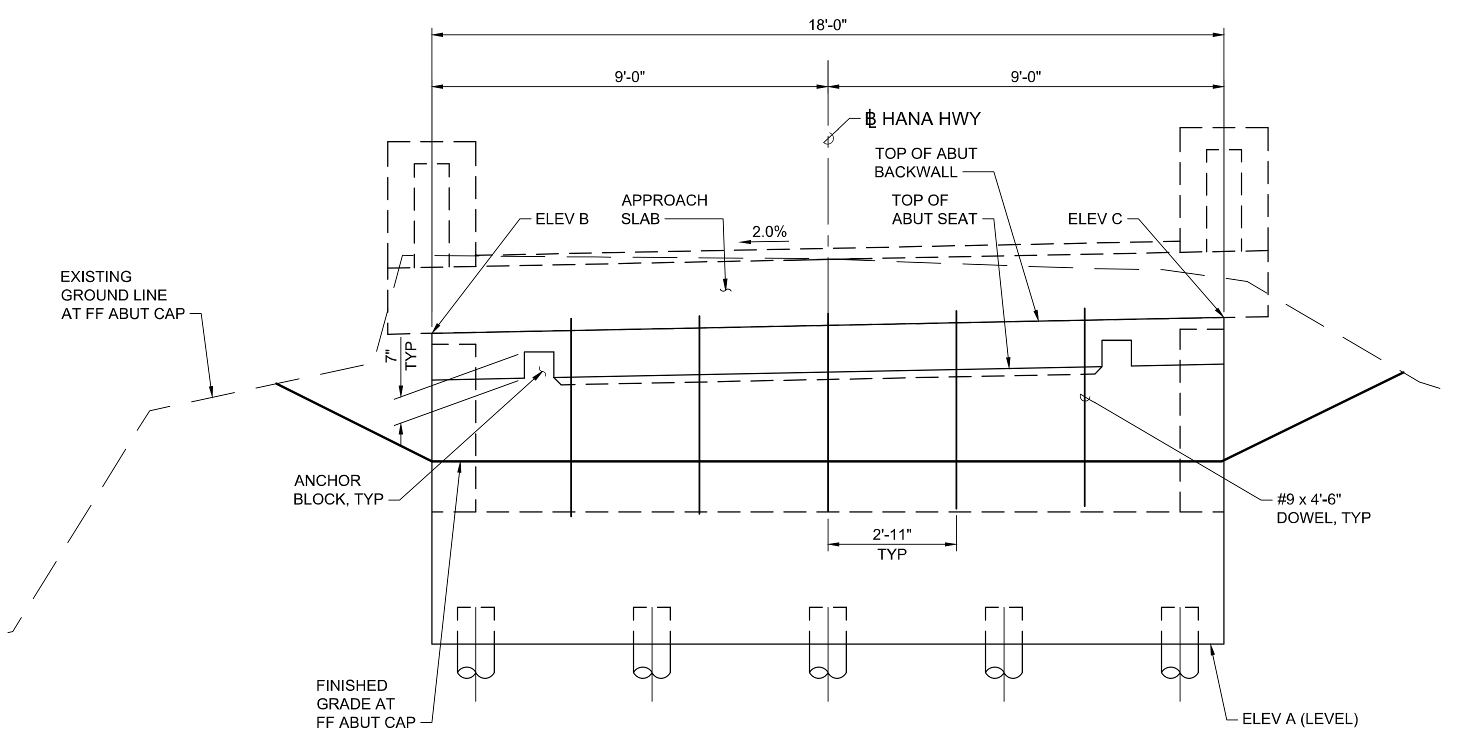
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 062 | 083 |




## ABUTMENT NO. 1 PLAN

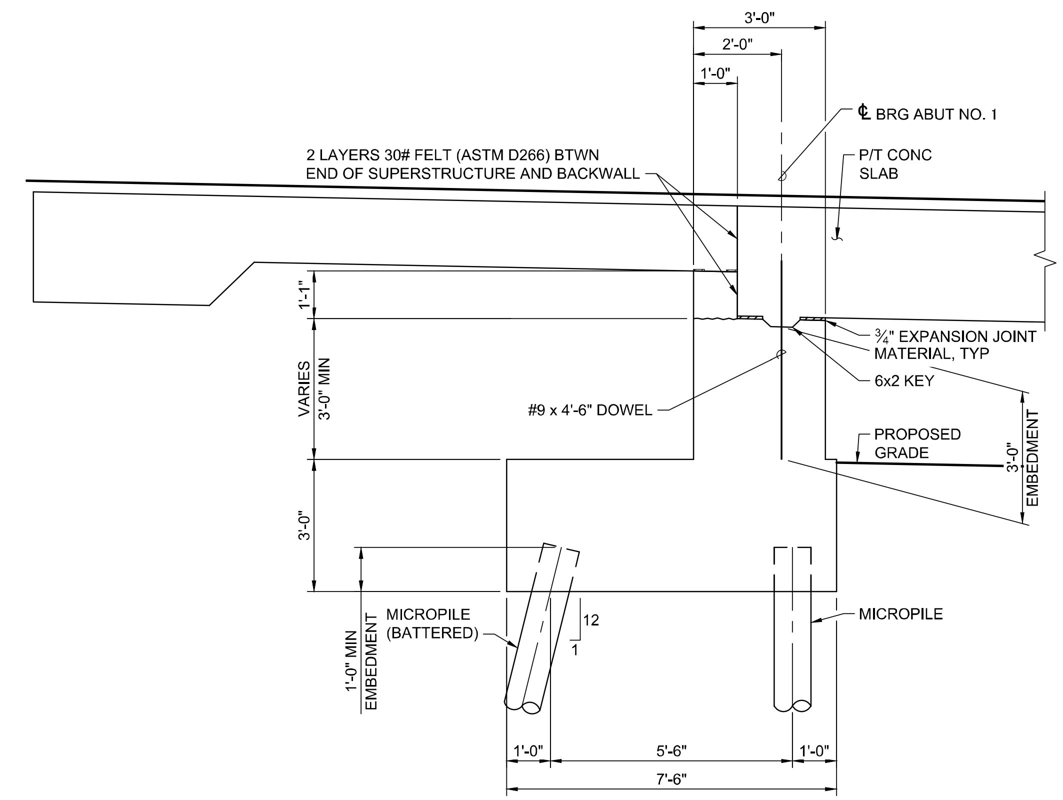
SCALE: 1/2" = 1'-0"




## ABUTMENT NO. 1 ELEVATION

SCALE: 1/2" = 1'-0"

(LOOKING BACK STATION)




## ABUTMENT TYPICAL SECTION

SCALE: 1/2" = 1'-0"

(ABUTMENT NO. 1 SHOWN, ABUTMENT NO. 2 SIMILAR)

LEGEND:

EL XXX.XX ● DENOTES ELEVATION AT BEARING SEAT

NOTES:

1. THE FOUNDATION SHALL BE SET BACK INTO THE SLOPE SO THAT THERE IS A MINIMUM 3-FOOT SETBACK FROM THE SLOPE FACE TO THE OUTSIDE BOTTOM EDGE OF THE ABUTMENT FOUNDATION.

2. THE FOUNDATION SHALL BE SITUATED ON A LEVEL BENCH CUT INTO THE EXISTING SLOPE WITH THE CONCRETE POURED IN DIRECT CONTACT WITH THE EXISTING GROUND. NO GRANULAR FILLS SHALL BE USED BENEATH THE ABUTMENT FOUNDATION.

3. THE BACKFILL OF THE ABUTMENT SHALL BE IMPORTED GRANULAR MATERIAL SUCH AS SELECTED BORROW OR BASE COURSE THAT CAN BE READILY COMPACTED AND THAT WILL MINIMIZE THE PRESSURES AGAINST THE ABUTMENT.

4. THE BACKFILL SHALL BE COMPACTED TO BETWEEN 90 AND 95 PERCENT OF ITS MAXIMUM DENSITY. OVERCOMPACTION OF THE BACKFILL SHALL BE AVOIDED.

5. IF VOLCANIC ASH IS ENCOUNTERED WITHIN THE ROADWAY SUBGRADE, REMOVE AND REPLACE IT WITH COMPACTED GRANULAR FILL. THE ROADWAY SUBGRADE AFTER COMPACTION SHALL BE TESTED TO CONFIRM THAT IT WILL PROVIDE A MINIMUM FIELD CBR OF 25. TWO LOCATIONS ON EACH SIDE OF THE BRIDGE SHALL BE TESTED TO VERIFY THE SUPPORT STRENGTH OF THE SUBGRADE.

GRAPHIC SCALE:

2' 1' 0' 2' 4'

SCALE: 1/2" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
ABUTMENT NO. 1 DETAILS

Date:
Date: 8/30/24
Design By: RLS
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SHEET
S-017
of 084 Sheets

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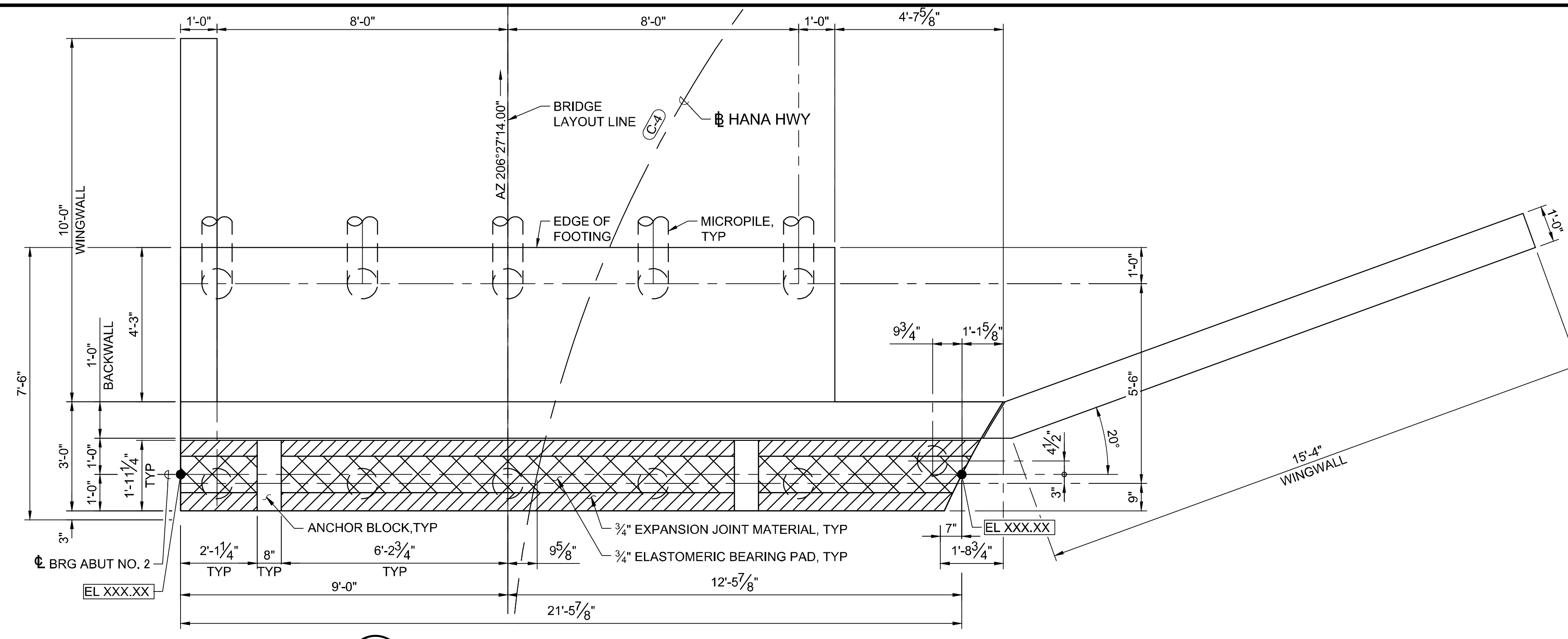
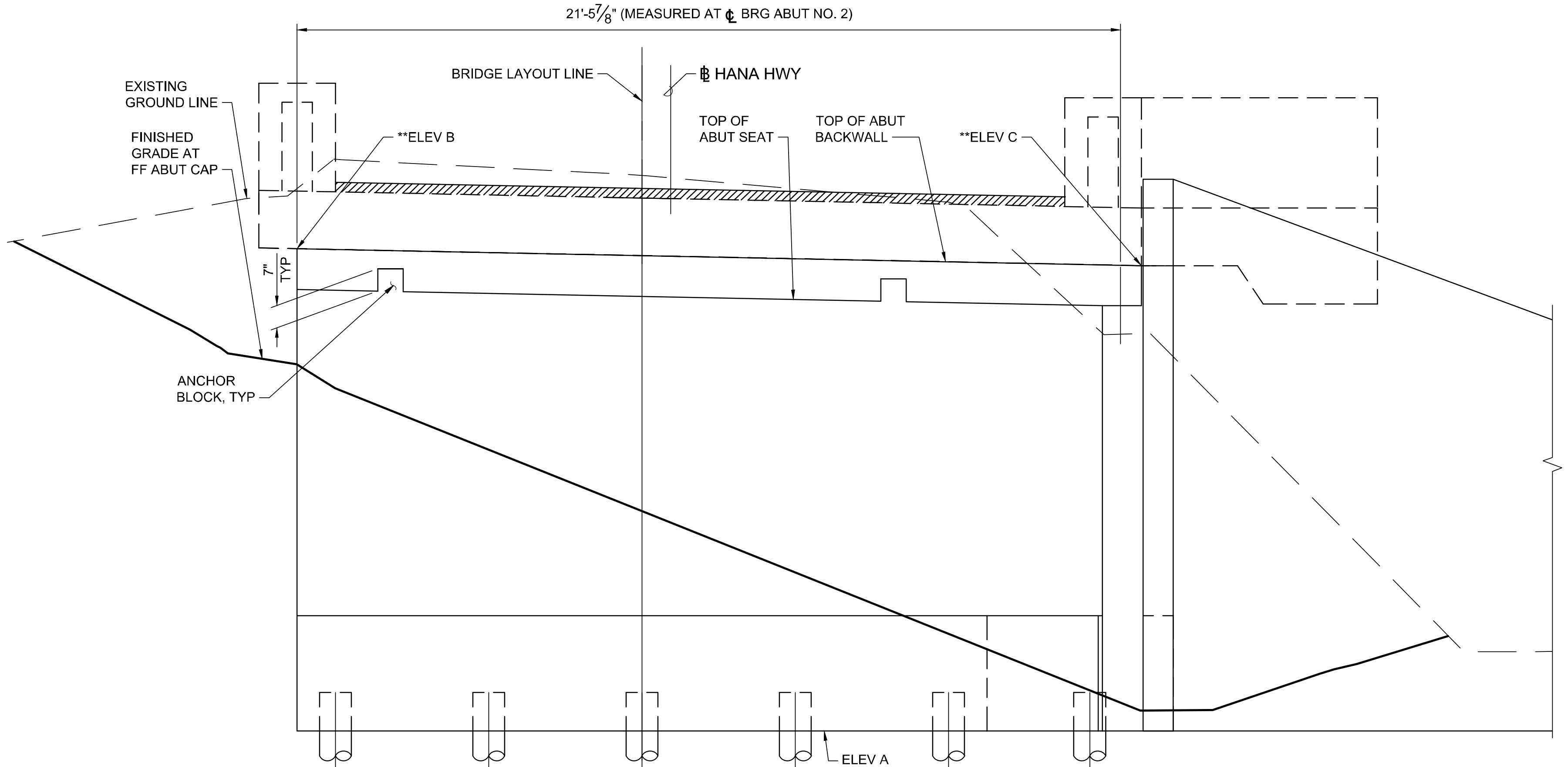
| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 063 | 083 |




## ABUTMENT NO. 2 PLAN

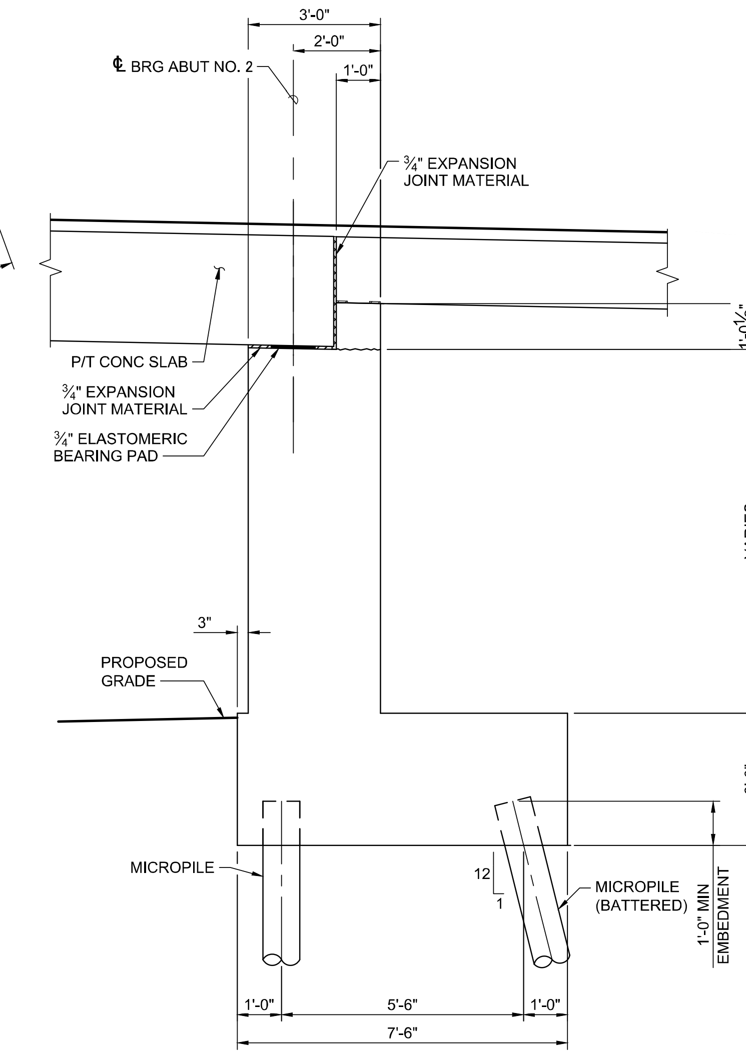
SCALE: 1/2" = 1'-0"




## ABUTMENT ELEVATION

SCALE: 1/2" = 1'-0"
(LOOKING AHEAD STATION)

** MEASURED AT FRONT FACE ABUTMENT BACKWALL




## ABUTMENT TYPICAL SECTION

SCALE: 1/2" = 1'-0"

LEGEND:

EL XXX.XX ● DENOTES ELEVATION AT BEARING SEAT

NOTES:

1. FOR NOTES, SEE SHEET S-017.

GRAPHIC SCALE:

2' 1' 0' 2' 4'

SCALE: 1/2" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

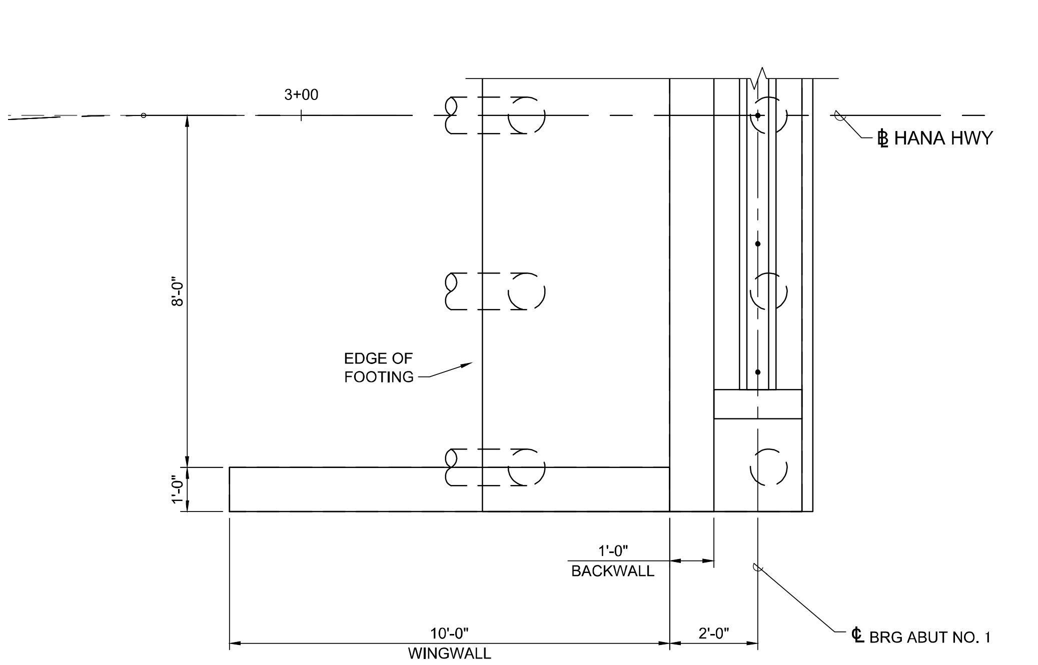
S. WAILUA PERMANENT BRIDGE
ABUTMENT NO. 2 DETAILS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-018
of 084 Sheets

PROJ. NO.: 2020040

Date Saved: Thu, 29 Aug 2024 - 2:24pm
CAD File Name: C:\pwworking\west01\d1900569\S-018 - South Wailua Permanent Bridge_Abut2_Details.dwg

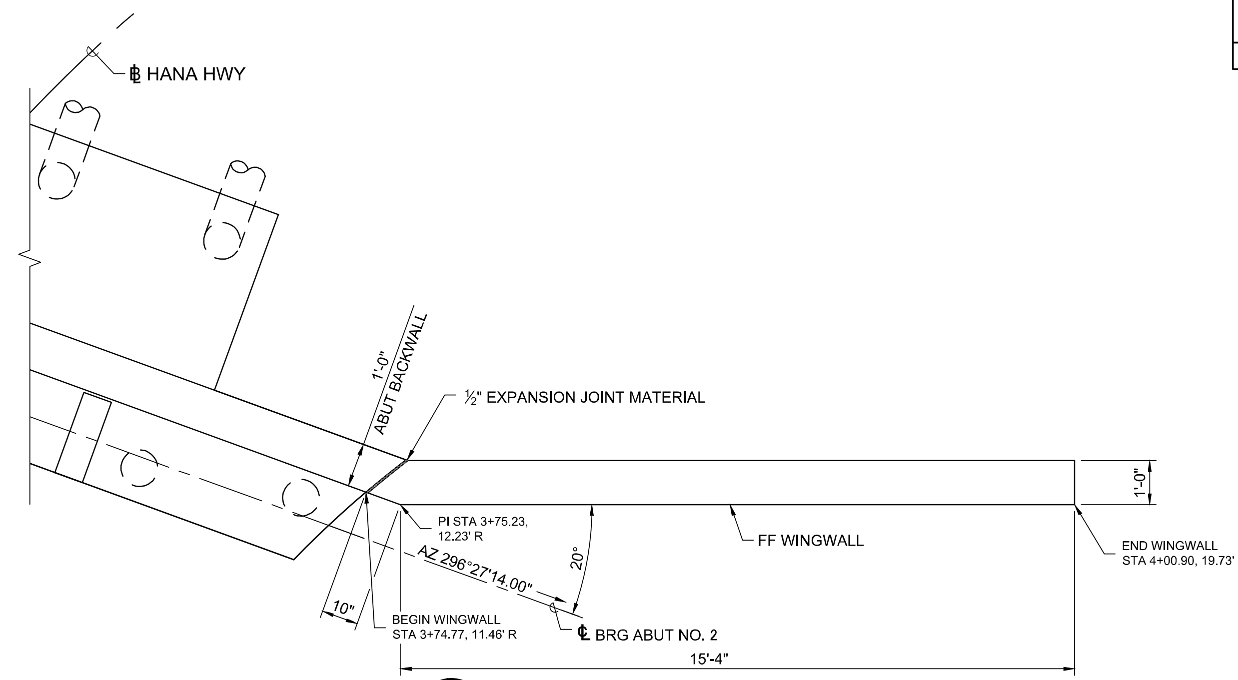
| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 064 | 083 |




## WINGWALL PLAN

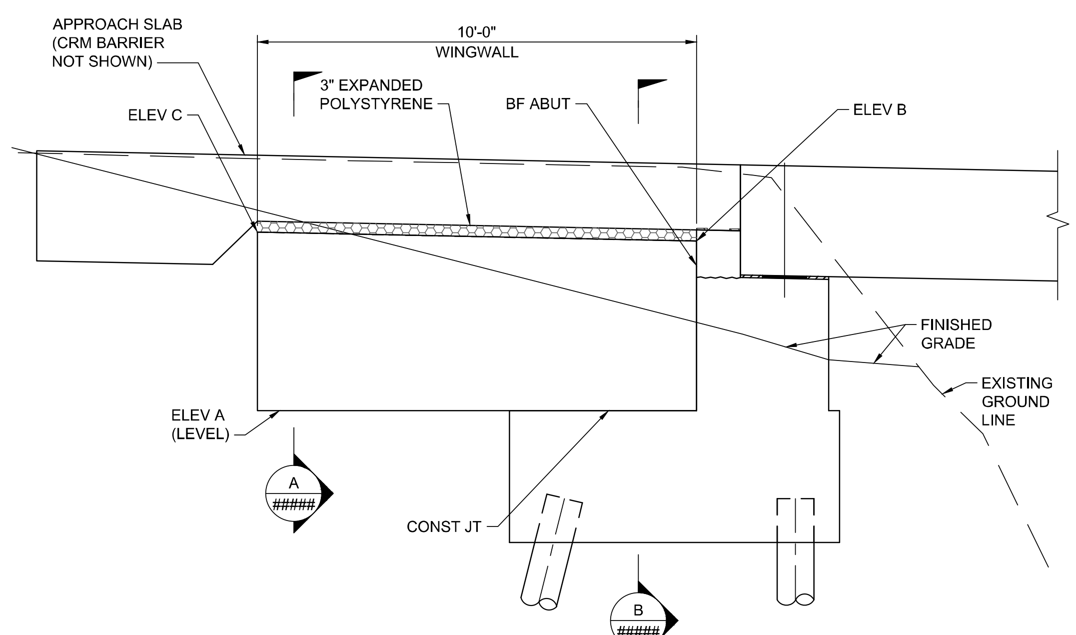
SCALE: 1/2" = 1'-0"

(SE WINGWALL SHOWN, SW AND NW WINGWALLS SIMILAR)




## NE WINGWALL PLAN

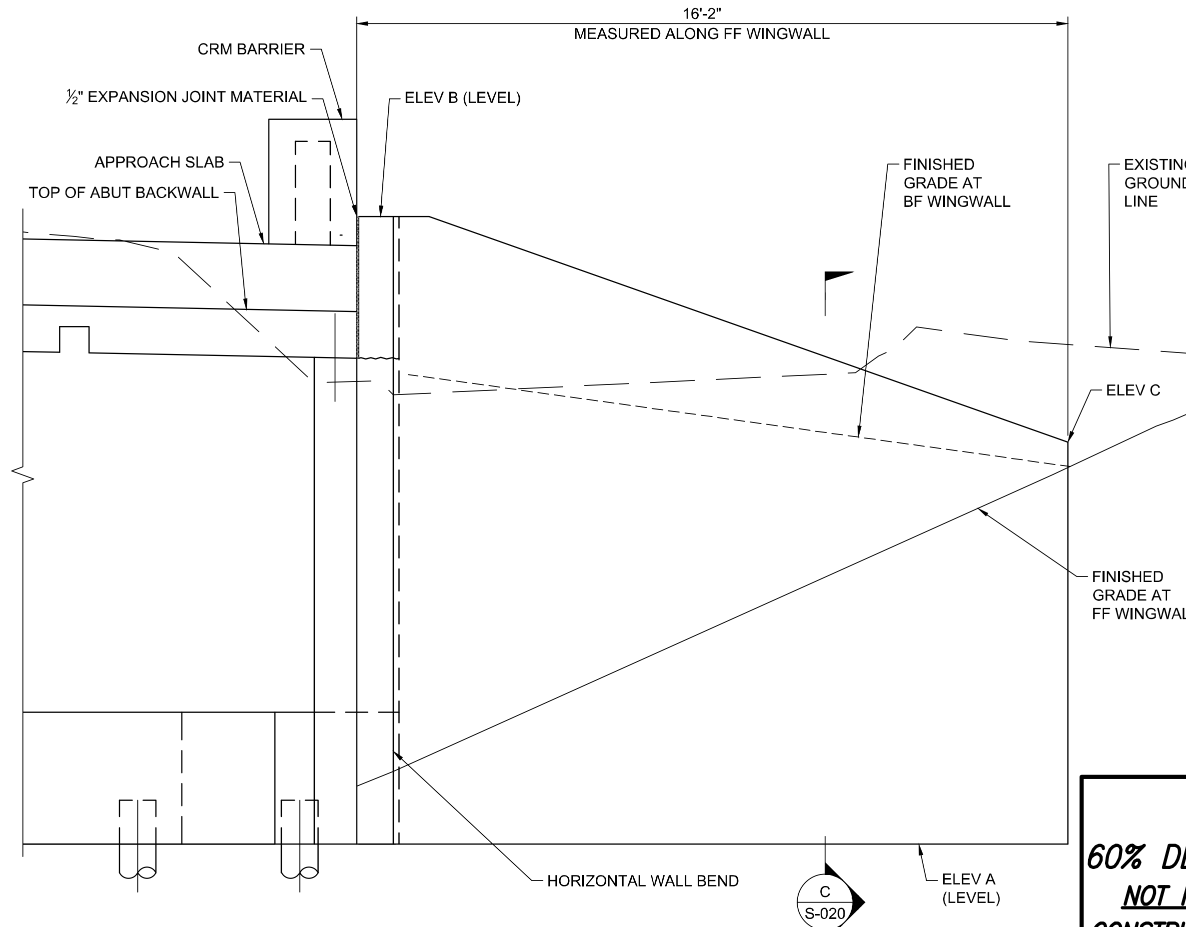
SCALE: 1/2" = 1'-0"




## WINGWALL ELEVATION

SCALE: 1/2" = 1'-0"

(SE WINGWALL SHOWN, SW AND NW WINGWALLS SIMILAR)




## NE WINGWALL ELEVATION

SCALE: 1/2" = 1'-0"

GRAPHIC SCALE:

2' 1' 0' 2' 4'

SCALE: 1/2" = 1'-0"

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

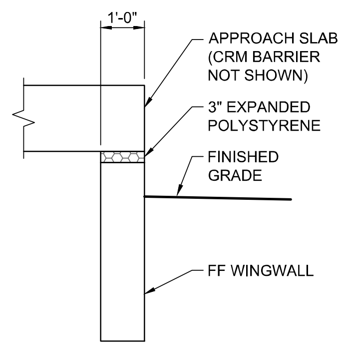
S. WAILUA PERMANENT BRIDGE
WINGWALL DETAILS (1 OF 2)

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-019
of 084 Sheets

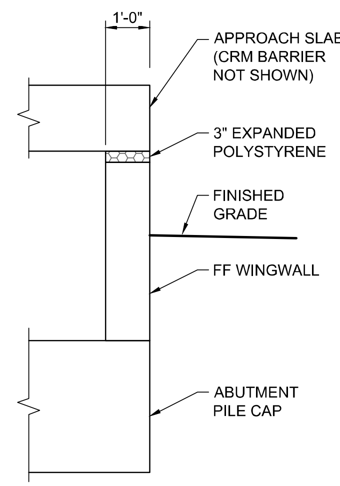
PROJ. NO.: 2020040

Date Saved: Thu, 29 Aug 2024 - 2:25pm
CAD File Name: C:\pwworking\west01\d1900569\S-019 - South Wailua Permanent Bridge_Wingwalls.dwg

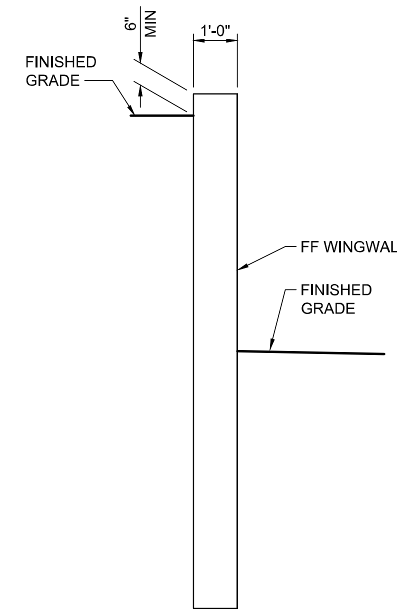
| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 065 | 083 |




SECTION A
SCALE: 1/2" = 1'-0" SHT S-019




SECTION B
SCALE: 1/2" = 1'-0" SHT S-019




SECTION C
SCALE: 1/2" = 1'-0" SHT S-019

GRAPHIC SCALE:
2' 1' 0' 2' 4'
SCALE: 1/2" = 1'-0"

60% DESIGN
NOT FOR CONSTRUCTION

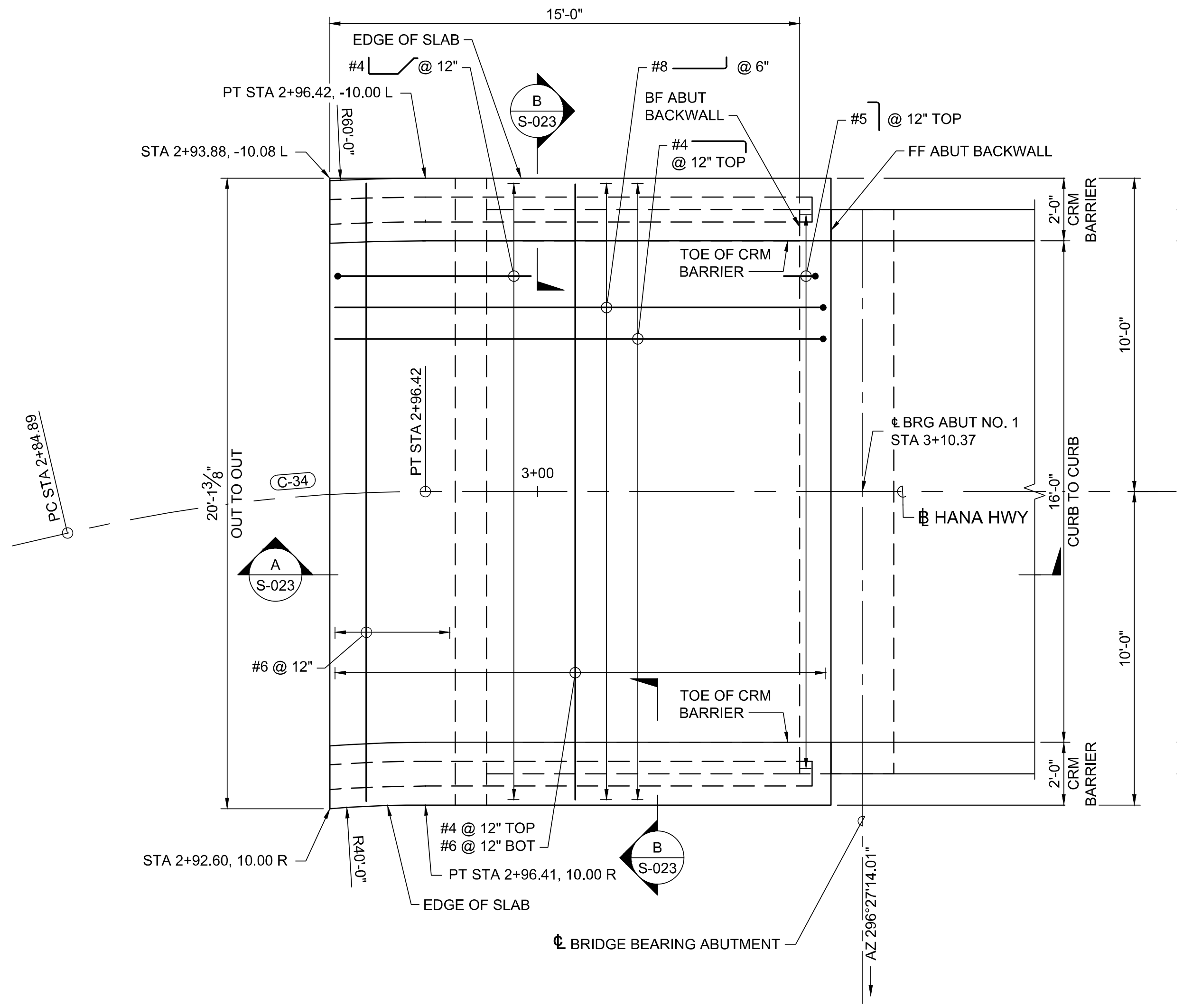
COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
WINGWALL DETAILS (2 OF 2)

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-020
of 084 Sheets

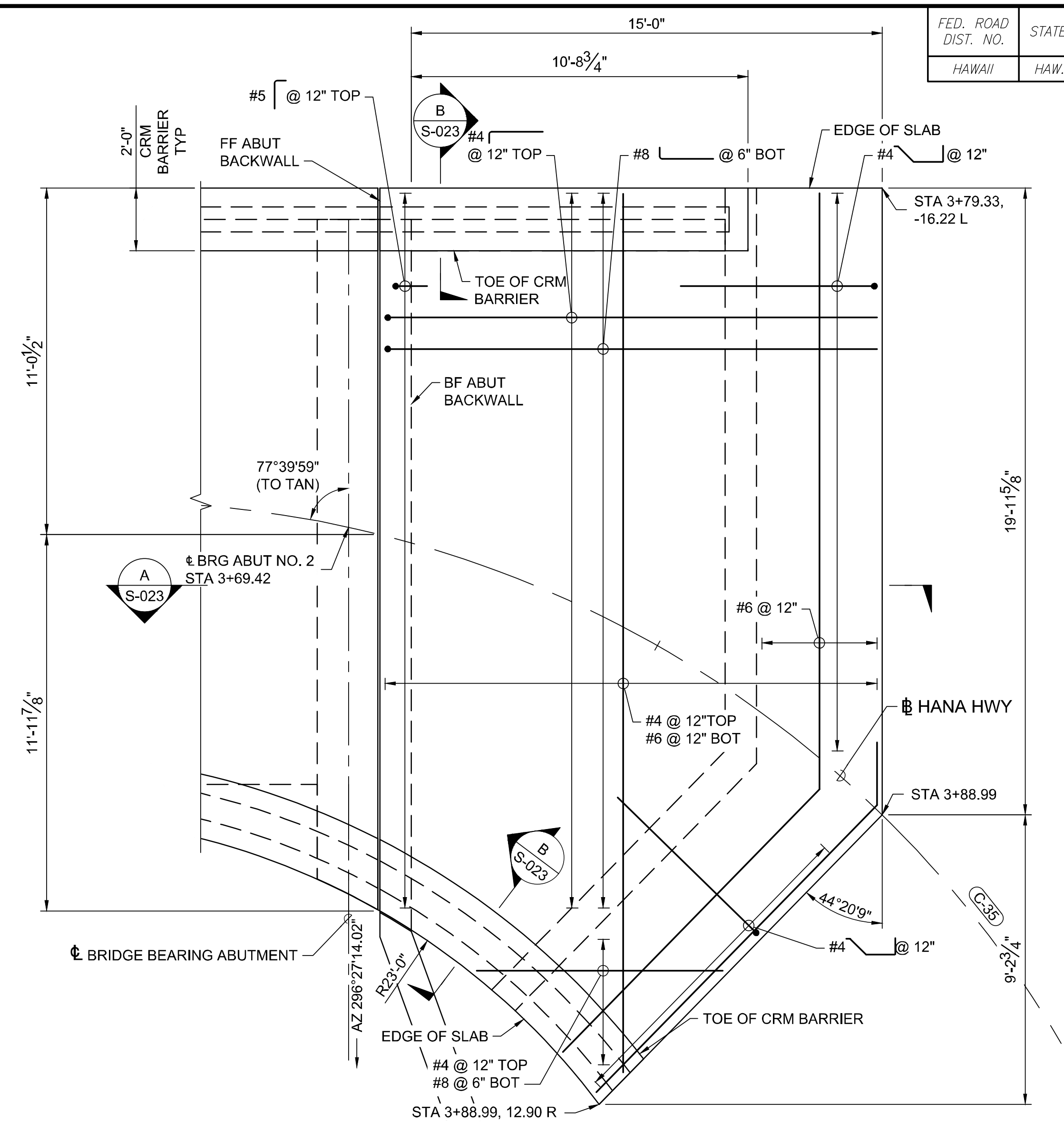
PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 – 2:25pm
CAD File Name: C:\pwworking\west01\d1900569\S-019 – South Wailua Permanent Bridge_Wingwalls.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 066 | 083 |




## APPROACH SLAB PLAN AT ABUTMENT NO. 1

SCALE: 3/8" = 1'-0"




## APPROACH SLAB PLAN AT ABUTMENT NO. 2

SCALE: 3/8" = 1'-0"

GRAPHIC SCALE:

2' 1' 0' 2' 4' 6'

SCALE: 3/8" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

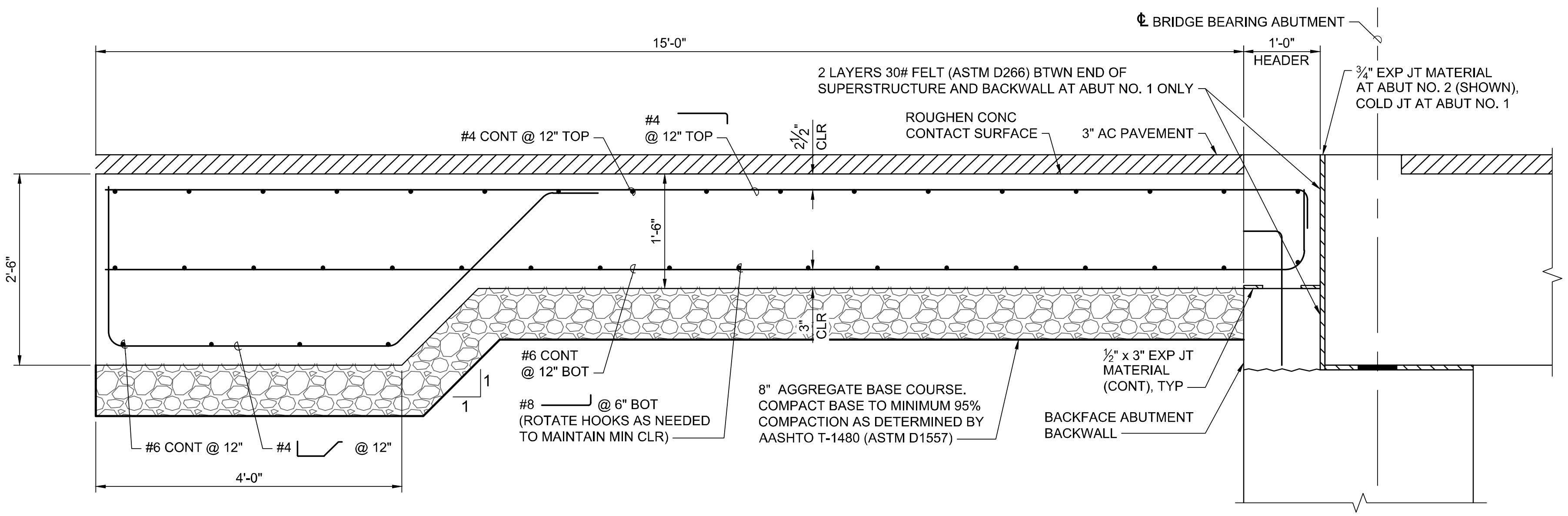
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
APPROACH SLAB PLANS

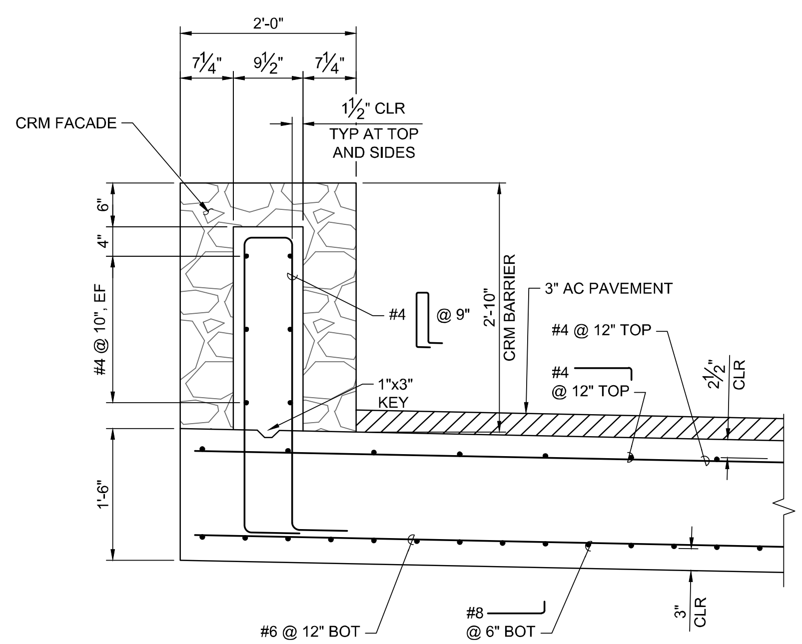
Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-022
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:25pm
CAD File Name: C:\pwworking\west01\d1900569\S-022 - South Wailua Permanent Bridge_ApprSlabDet01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 067 | 083 |




SECTION A
SCALE: 1" = 1'-0"
SHT S-022
(ABUTMENT NO. 2 SHOWN, ABUTMENT NO. 1 SIMILAR)




SECTION B
SCALE: 1" = 1'-0"
SHT S-022

GRAPHIC SCALE:
1' 6" 0' 1' 2'
SCALE: 1" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

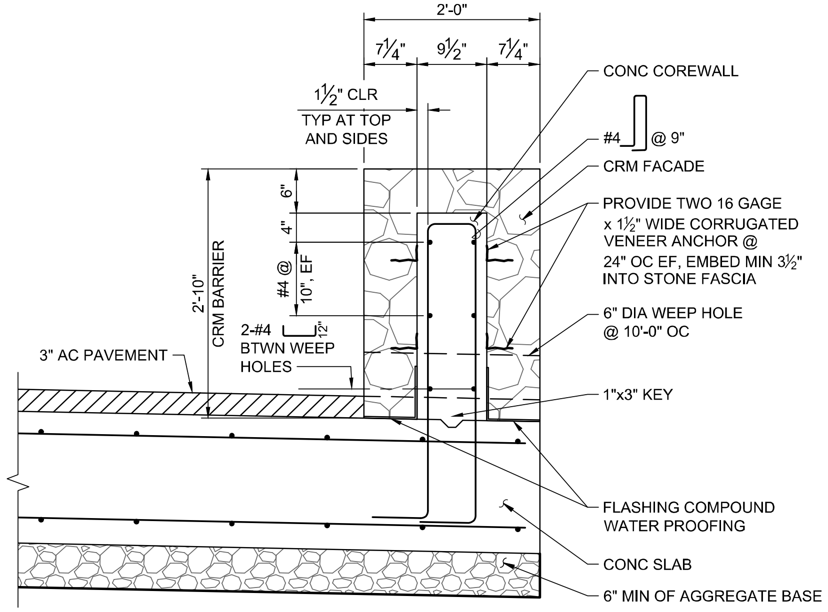
COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
APPROACH SLAB SECTIONS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-023
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 – 2:25pm
CAD File Name: C:\pwworking\west01\d1900569\S-022 – South Wailua Permanent Bridge_ApprSlabDet01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 068 | 083 |




## CRM BARRIER TYPICAL SECTION

SCALE: 1" = 1'-0"

NOTES:

1. FORM CONSTRUCTION JOINTS IN THE COREWALL AT 3'-0" INTERVALS OR AT THE OPTION OF THE CONTRACTOR, THE COREWALL MAY BE CONSTRUCTED IN PRECAST CONCRETE UNITS. COREWALL IS TO BE CAST-IN-PLACE WHEN RADIUS OF CURVED FACE IS LESS THAN 160 FEET.
2. THE DEPTH OF BASE MAY BE LESS THAN 6" AS DIRECTED BY THE ENGINEER, WHEN THE FOUNDATION IS ON EITHER ROCK FILL OR SOLID ROCK.
3. CORRUGATED VENEER ANCHOR SHALL BE A MINIMUM 16 GAGE THICK x 1½ " WIDE AND 3½ " MINIMUM EMBEDMENT INTO ROCK FASCIA, ALL ANCHOR HARDWARE SHALL BE HOT DIP GALVANIZED. EQUIVALENT ATTACHMENT SYSTEMS ARE ALLOWED WITH THE APPROVAL OF THE ENGINEER.

GRAPHIC SCALE:

1' 6" 0' 1' 2'

SCALE: 1" = 1'-0"

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

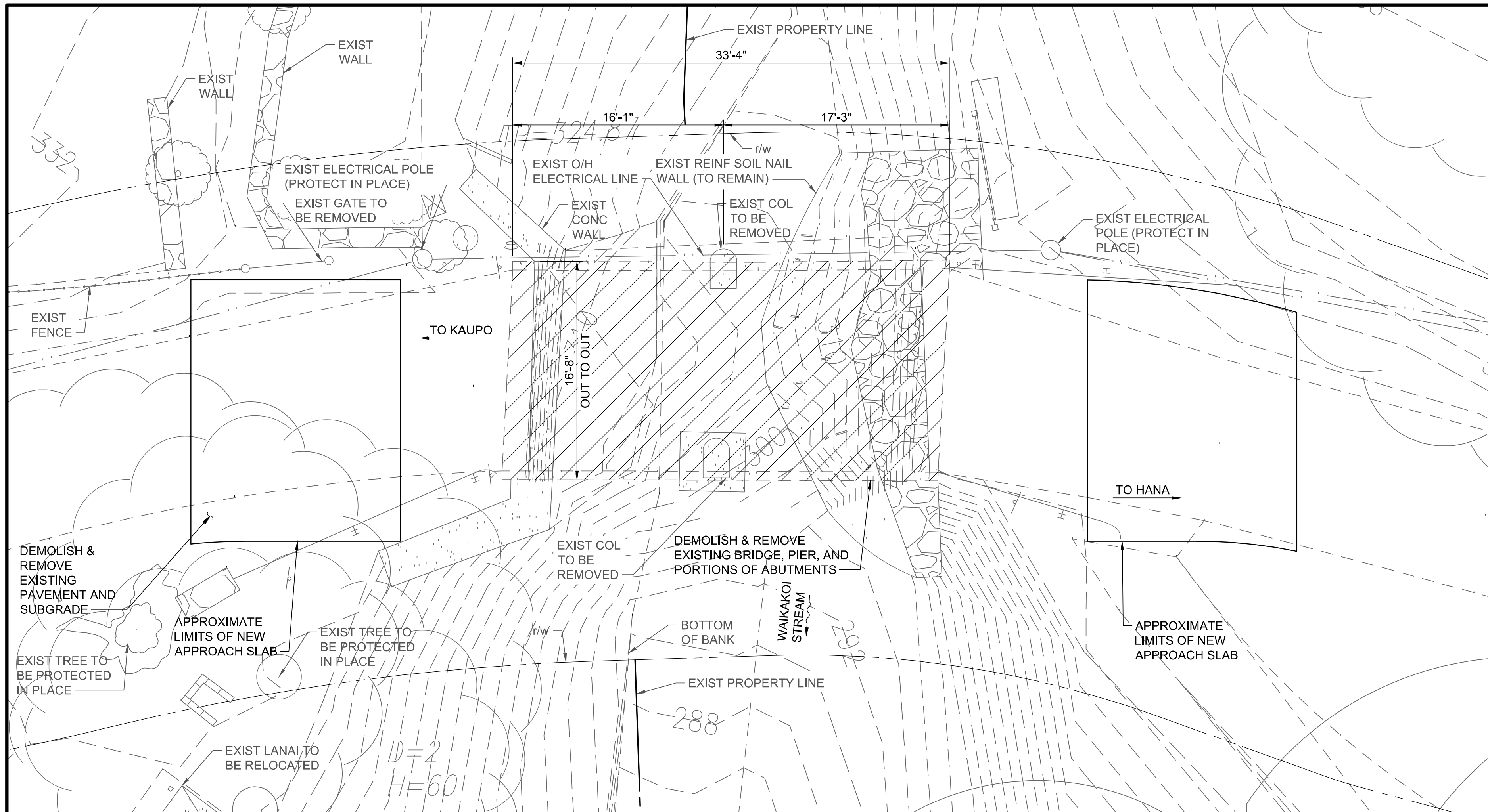
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
MISCELLANEOUS DETAILS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-024
of 084 Sheets

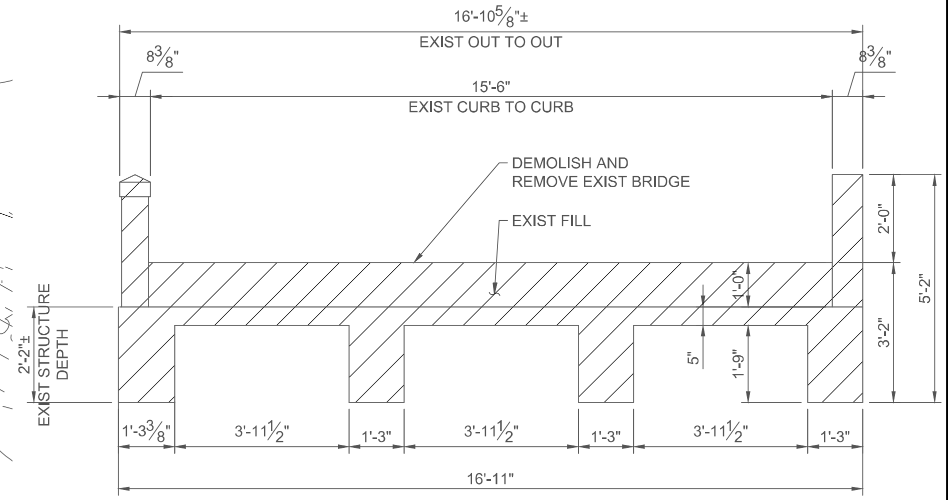
PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:25pm
CAD File Name: C:\pwworking\west01\d1900569\S-022 - South Wailua Permanent Bridge_ApprSlabDet01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 069 | 083 |




## EXISTING WAIKAKOI BRIDGE DEMOLITION PLAN

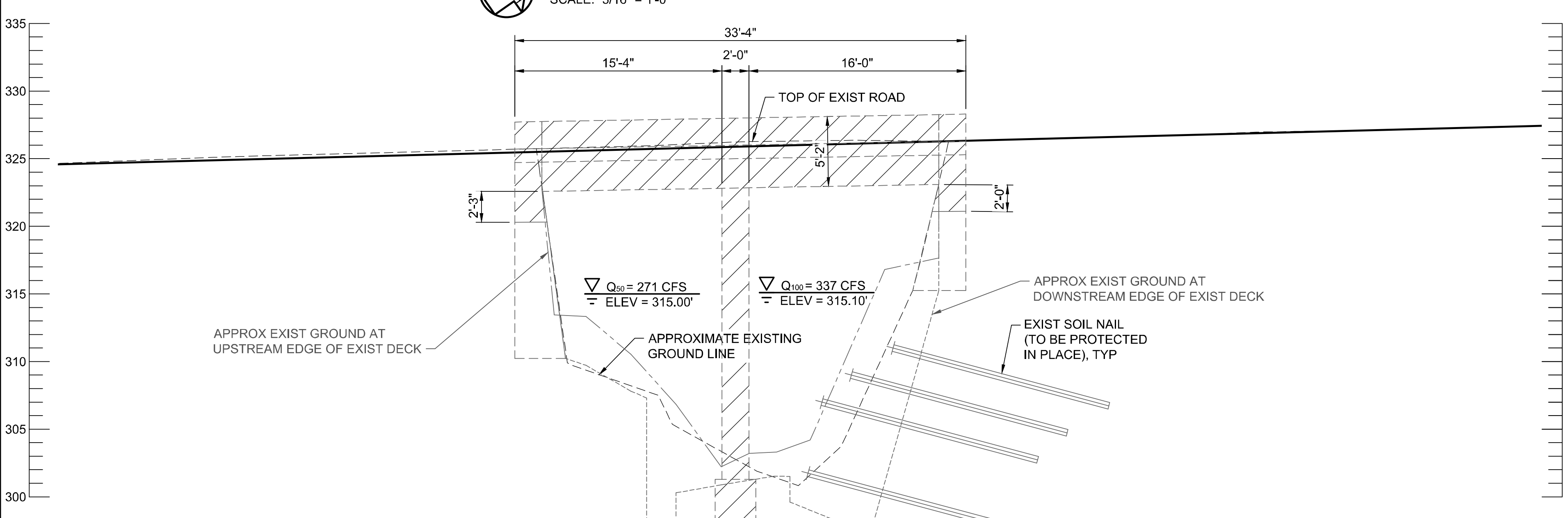
SCALE: 3/16" = 1'-0"




## EXISTING WAIKAKOI TYPICAL SECTION

SCALE: 1/2" = 1'-0"

(LOOKING NORTH TOWARDS HANA)




## EXISTING WAIKAKOI BRIDGE EAST ELEVATION

SCALE: HORIZ: 3/16"=1'0"
VERT: 3/16"=1'0"

### DEMOLITION NOTES:

1. ALL DIMENSIONS ARE APPROXIMATE.
2. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND CONDITIONS.
3. CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONDITIONS THAT ARE DIFFERENT FROM DEMOLITION DRAWINGS.
4. CONTRACTOR SHALL PERFORM THE WORK SO AS TO MITIGATE DEMOLITION DEBRIS FROM ENTERING THE STREAM CHANNEL BY USE OF A CATCHMENT SYSTEM.
5. THE TEMPORARY CATCHMENT SYSTEM SHALL BE ...
6. EMPTY CATCHEMENT SYSTEM DAILY AND DISPOSE DEBRIS OFFSITE.
7. PLACE SANDBAGS DOWNSTREAM OF BRIDGE TO CONTAIN DEBRIS.
8. REMOVE EXISTING ASPHALT PAVEMENT, RAILINGS, AND FILL OVER CONCRETE BRIDGE DECK. LOAD DEBRIS DIRECTLY ONTO TRUCKS FOR OFFSITE DISPOSAL.
9. CONTRACTOR TO TAKE ADEQUATE PRECAUTIONS TO PROTECT EXISTING ADJACENT STRUCTURES, FENCES, AND UTILITIES TO REMAIN. ITEMS TO REMAIN THAT ARE DAMAGED DURING THE WORK SHALL BE REPAIRED BY THE CONTRACTOR AT HIS OWN EXPENSE.

### LEGEND:

TO BE REMOVED

TO BE REMOVED

### GRAPHIC SCALE:

4' 2' 0' 4' 8' 12'
SCALE: 3/16" = 1'-0"

2' 1' 0' 2' 4'
SCALE: 1/2" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

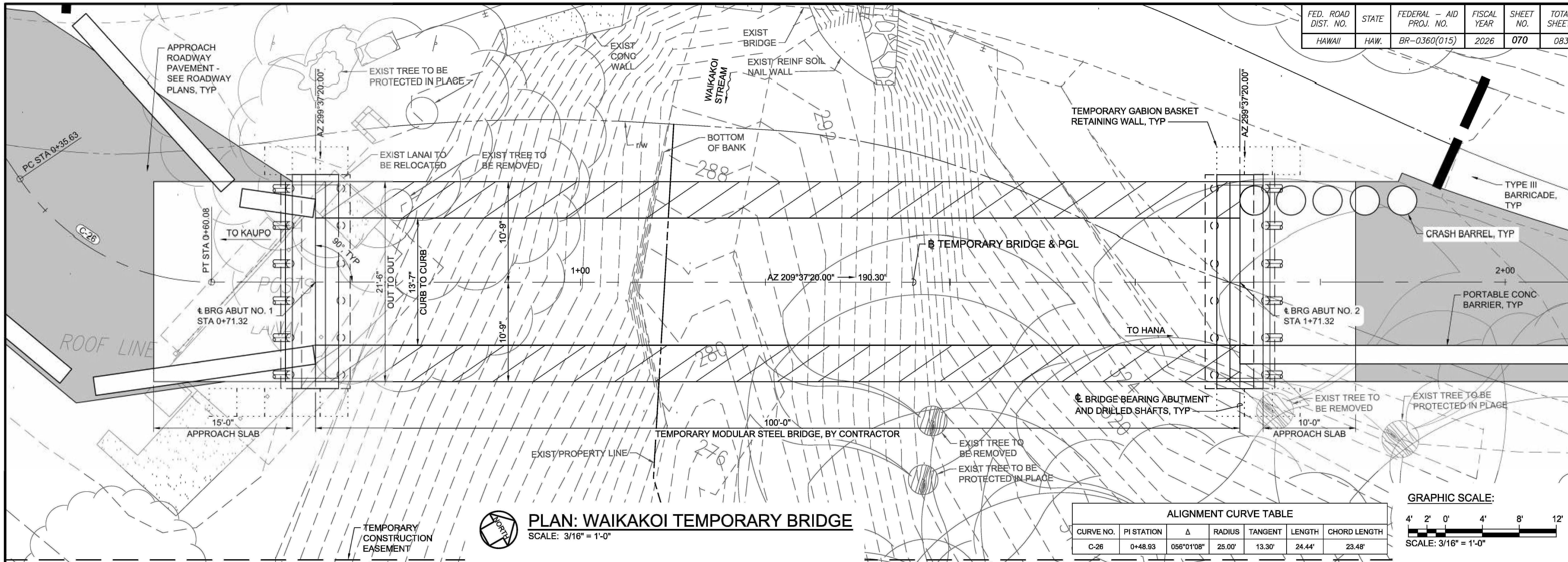
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

EXISTING WAIKAKOI BRIDGE DEMOLITION PLAN AND SECTIONS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET S-025
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 – 2:25pm
CAD File Name: C:\pwworking\west01\d1900569\S-025 – Waikakoi Perm Bridge DemoPlan_&_Sec.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
| --- | --- | --- | --- | --- | --- |
| HAWAII | HAW. | BR-0360(015) | 2026 | 070 | 083 |




## PLAN: WAIKAKOI TEMPORARY BRIDGE

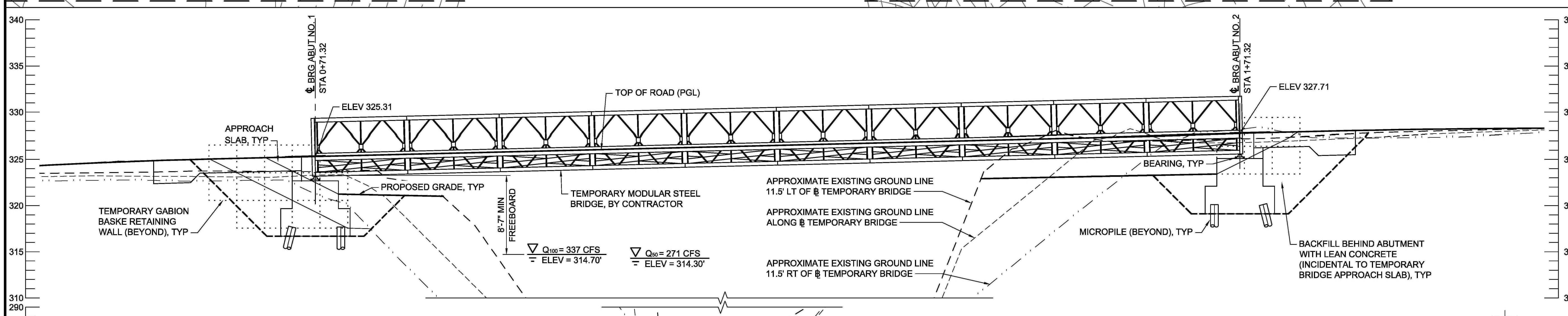
SCALE: 3/16" = 1'-0"

ALIGNMENT CURVE TABLE

| CURVE NO. | PI STATION | Δ | RADIUS | TANGENT | LENGTH | CHORD LENGTH |
| --- | --- | --- | --- | --- | --- | --- |
| C-26 | 0+48.93 | 056°01'08" | 25.00' | 13.30' | 24.44' | 23.48' |

GRAPHIC SCALE: 4' 2' 0' 4' 8' 12'

SCALE: 3/16" = 1'-0"




## PROFILE - WAIKAKOI TEMPORARY BRIDGE

SCALE: HORIZ: 3/16"=1'0"
VERT: 3/16"=1'0"

GRAPHIC SCALE: 4' 2' 0' 4' 8' 12'

SCALE: 3/16" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

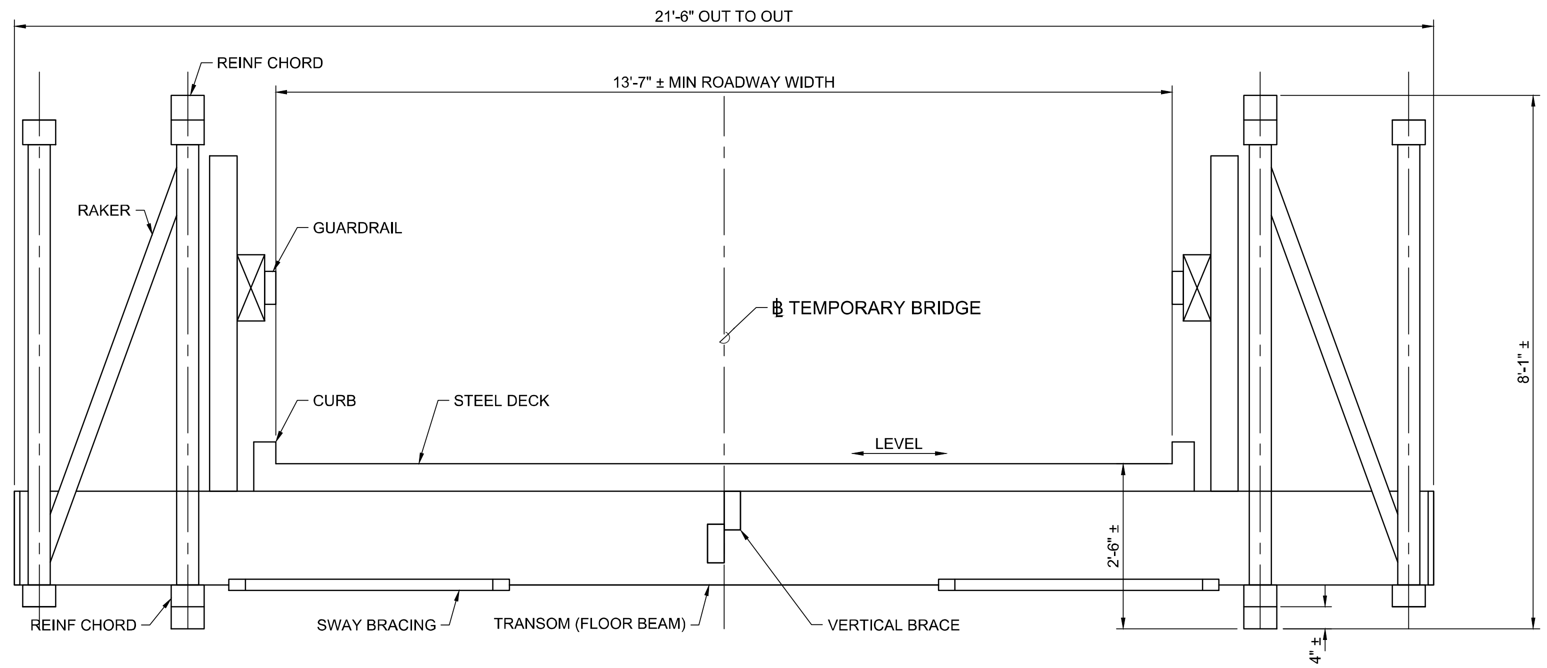
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE PLAN AND PROFILE

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-026
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:25pm
CAD File Name: C:\pwworking\west01\d1900569\S-026 - Waikakoi Temp Bridge Plan & Profile01.dwg

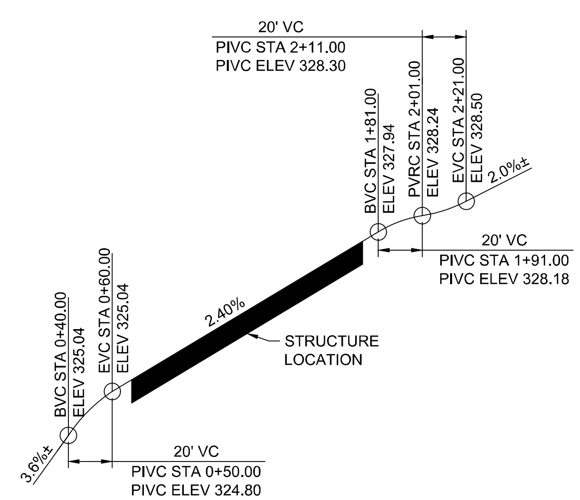
| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 071 | 083 |




## TYPICAL SECTION - TEMPORARY BRIDGE

SCALE: 3/4" = 1'-0"

(LOOKING AHEAD STATION TOWARDS HANA)




## PROFILE GRADE DIAGRAM

SCALE: NO SCALE

### TEMPORARY BRIDGE NOTES:

1. TEMPORARY BRIDGE AND FOUNDATIONS SHOWN ARE SCHEMATIC AND SHOWN TO ASSIST BIDDING ONLY. CONTRACTOR IS RESPONSIBLE FOR THE COMPLETE DESIGN AND CONSTRUCTION OF THE TEMPORARY BRIDGE. BRIDGE IS CONSTRUCTED USING ACROW BRIDGE PANELS THAT ARE CURRENTLY OWNED BY MAUI COUNTY.

2. CONTRACTOR TO SUBMIT CALCULATIONS, DRAWINGS, AND ERECTION DETAILS FOR THE TEMPORARY BRIDGE SIGNED AND SEALED BY A STRUCTURAL ENGINEER LICENSED IN HAWAII. SEE PROJECT SPECIAL PROVISIONS FOR MORE INFORMATION.

3. COST FOR TEMPORARY STEEL BRIDGE SHALL INCLUDE THE DESIGN MANUFACTURE, SHOP DRAWINGS, SHIPPING, ERECTION, DISASSEMBLY AND TRANSPORTING THE BRIDGE TO THE LOCATION DESIGNATED BY THE ENGINEER, AND OTHER RELATED DETAILS. THE TEMPORARY BRIDGE SHALL BE DELIVERED TO MAUI COUNTY BASEYARD AFTER COMPLETION OF THE WORK, UNLESS NOTED OTHERWISE.

4. CAPACITY OF 10 INCH DIAMETER MICROPILE:

   COMPRESSIVE LOAD CAPACITY PER MICROPILE (KIPS)
   - UNFACTORED SINGLE PILE CAPACITY.....XXX
   - EXTREME EVENT LIMIT STATE......................XXX
   - STRENGTH LIMIT STATE.................................XXX

   UPLIFT LOAD CAPACITY PER MICROPILE (KIPS)
   - EXTREME EVENT LIMIT STATE......................XXX
   - STRENGTH LIMIT STATE.................................XXX

   | LOADING CONDITION | LATERAL DEFLECTION (INCHES) | MAXIMUM MOMENT INDUCED (KIP-FEET) |
   |---|---|---|
   | STRENGTH | XX.XX | -XX |
   | EXTREME EVENT LIMIT STATE | XX.XX | -XXX |

5. DESIGN VEHICLE AASHTO HS20-44 TRUCK.

6. THE CONTRACTOR SHALL MAINTAIN ALL PORTIONS OF THE TEMPORARY STRUCTURE IN GOOD CONDITION WITH REGARD TO STRENGTH, SAFETY, AND RIDABILITY. MEMBERS DAMAGED DURING CONSTRUCTION SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST. SEE PROJECT SPECIFICATIONS FOR DETAILS REGARDING REMOVAL AND STORAGE OF BRIDGE UPON PROJECT COMPLETION.

GRAPHIC SCALE:

1' 0' 1' 2' 3'

SCALE: 3/4" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

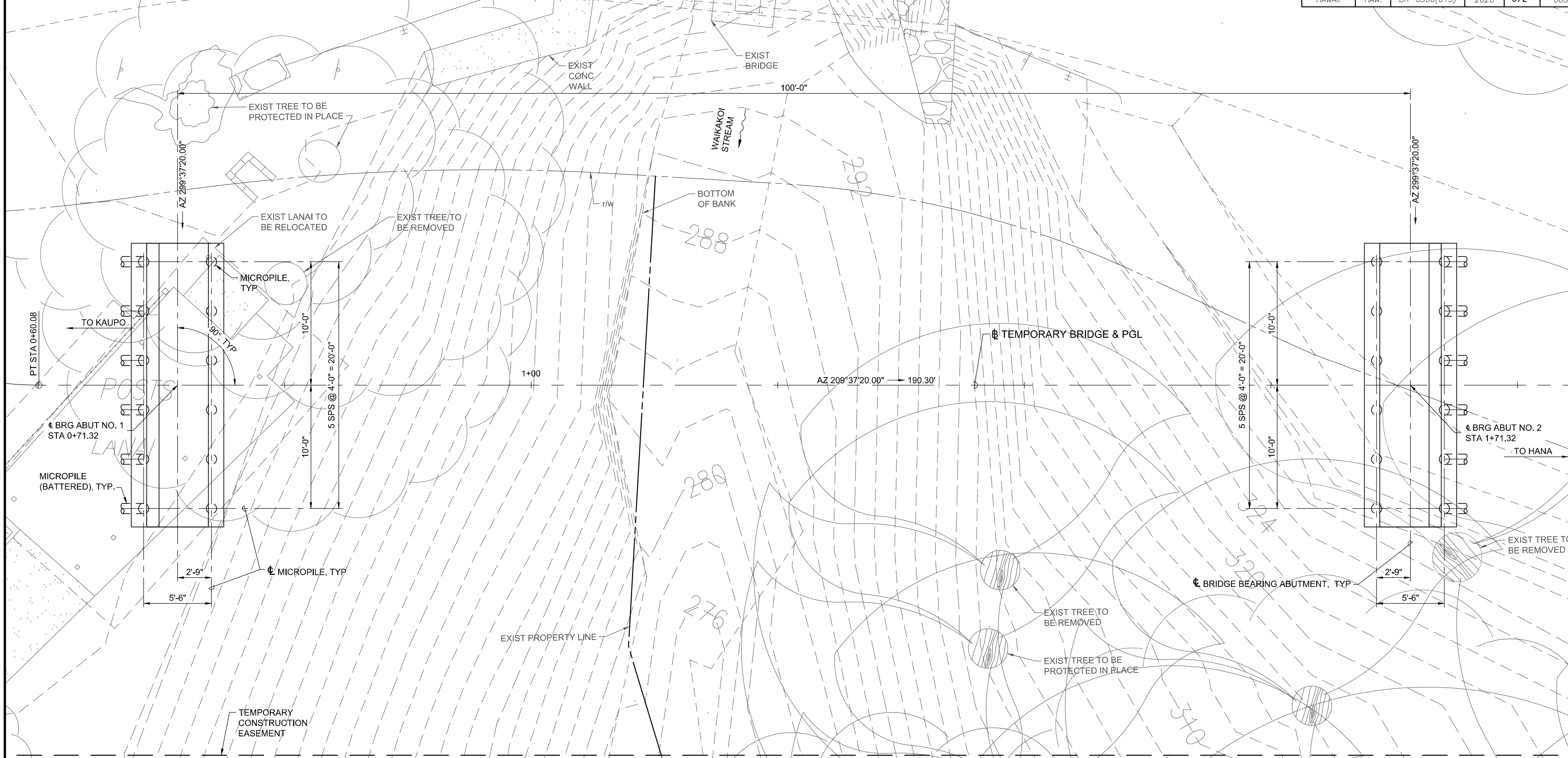
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE
TYPICAL SECTION

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-027
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 – 2:25pm
CAD File Name: C:\pwworking\west01\d1900569\S-026 – Waikakoi Temp Bridge Plan & Profile01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 072 | 083 |




NORTH

## PLAN: WAIKAKOI TEMPORARY BRIDGE FOUNDATION PLAN

SCALE: 1/4" = 1'-0"

GRAPHIC SCALE:

4' 2' 0' 4' 8'

SCALE: 1/4" = 1'-0"

MICROPILE SUMMARY TABLE

| LOCATION | MICROPILE Ø | MAX FACTORED STRUCTURAL LOAD (TONS) | MAX FACTORED PILE STRUCTURAL CAPACITY (TONS) | RESISTANCE FACTOR | MAX FACTORED EE LOAD (TONS) | MAX FACTORED PILE EE CAPACITY (TONS) | RESISTANCE FACTOR | ESTIMATED TIP ELEVATION | MIN TIP ELEVATION |
|---|---|---|---|---|---|---|---|---|---|
| ABUTMENT NO 1 | 10" | | | | | | | | |
| ABUTMENT NO 2 | 10" | | | | | | | | |

NOTES:

1. FIELD VERIFY LOCATION OF EXISTING ROCK WALLS AND ALIGNMENT OF NEW CRM WALLS PRIOR TO CONSTRUCTION.
2. FOR ADDITIONAL INFORMATION, SEE GEOTECHNICAL ENGINEERING EXPLORATION REPORT FOR WAIKAKOI AND S. WAILUA BRIDGE REPLACEMENT, PREPARED BY GEOLABS INC., DATED JULY 25, 2024.
3. ONE SACRIFICIAL, PRE-PRODUCTION COMPRESSIVE LOAD TEST ON A SACRIFICIAL MICROPILE SHALL BE PERFORMED AT EACH ABUTMENT IN ACCORDANCE WITH ASTM D1143.
4. TWO INSTALLED MICROPILES AT EACH ABUTMENT (4 MICROPILES TOTAL) SHALL BE TESTED FOR PULLOUT.
5. FOR MICROPILE DETAILS, SEE SHEET S-XXX.

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE FOUNDATION PLAN

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS

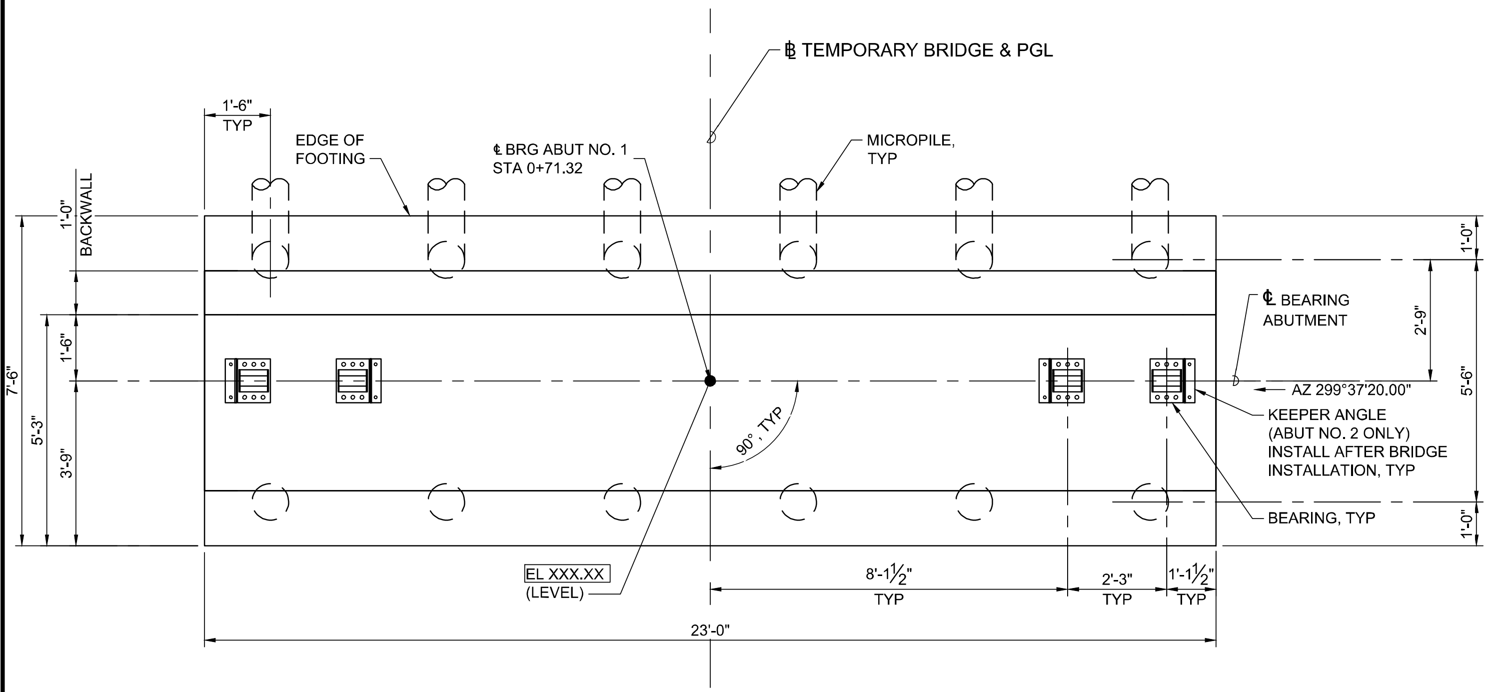
SHEET S-028

of 084 Sheets

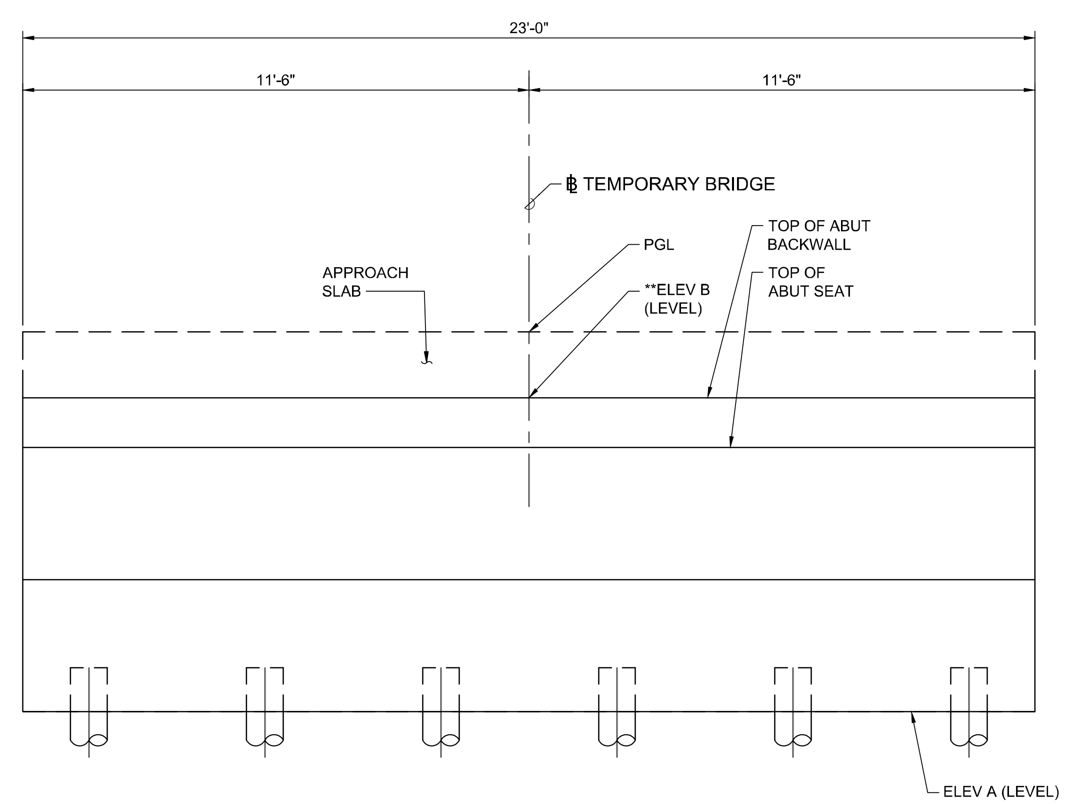
PROJ. NO.: 2020040

Date Saved: Thu, 29 Aug 2024 - 2:26pm
CAD File Name: C:\pwworking\west01\d1900569\S-028 - Waikakoi Temp Bridge_FoundationPlan.dwg

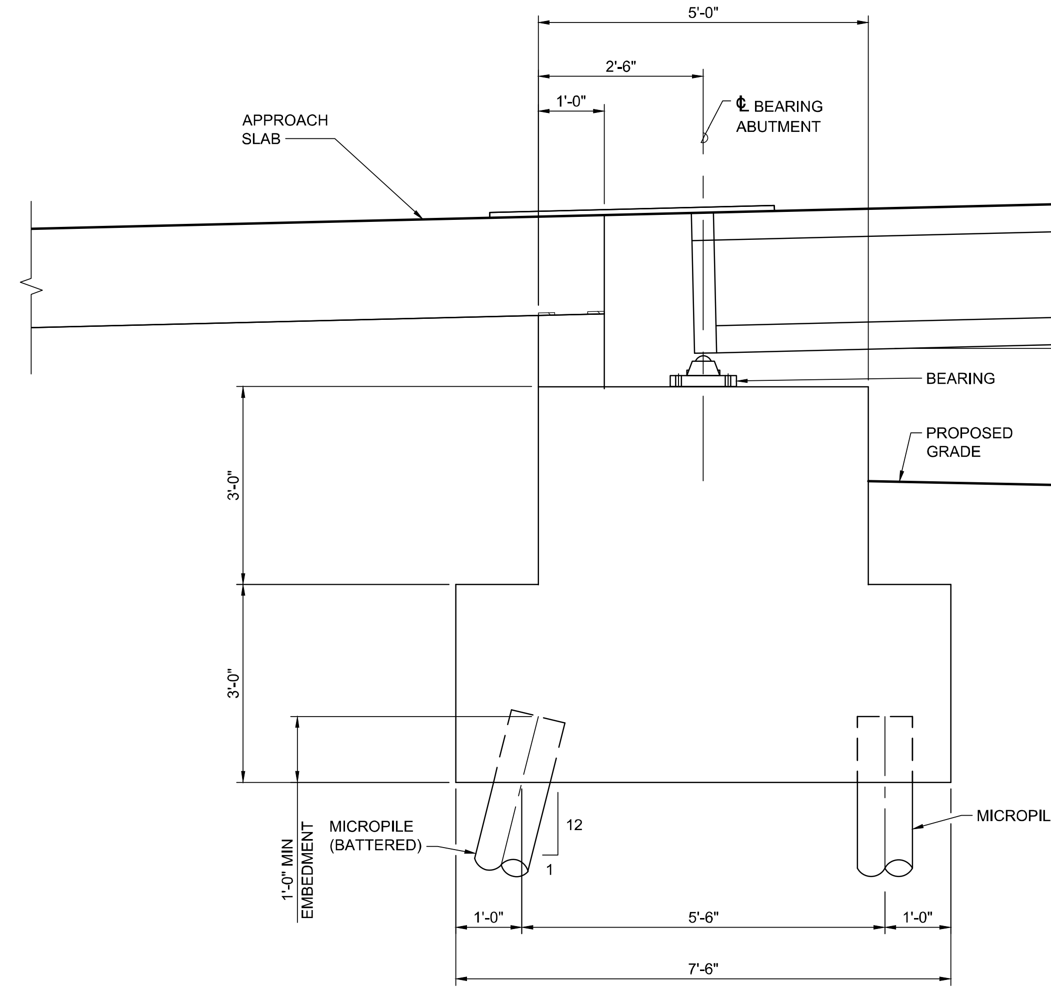
| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 073 | 083 |




## ABUTMENT PLAN
SCALE: 1/2" = 1'-0"
(ABUTMENT NO. 1 SHOWN, ABUTMENT NO. 2 SIMILAR)




## ABUTMENT ELEVATION
SCALE: 1/2" = 1'-0"




## TYPICAL SECTION
SCALE: 3/4" = 1'-0"

LEGEND:

EL XXX.XX DENOTES ELEVATION AT BEARING SEAT

NOTES:

1. THE FOUNDATION SHALL BE SET BACK INTO THE SLOPE SO THAT THERE IS A MINIMUM 3-FOOT SETBACK FROM THE SLOPE FACE TO THE OUTSIDE BOTTOM EDGE OF THE ABUTMENT FOUNDATION.
2. THE FOUNDATION SHALL BE SITUATED ON A LEVEL BENCH CUT INTO THE EXISTING SLOPE WITH THE CONCRETE POURED IN DIRECT CONTACT WITH THE EXISTING GROUND. NO GRANULAR FILLS SHALL BE USED BENEATH THE ABUTMENT FOUNDATION.
3. THE BACKFILL OF THE ABUTMENT SHALL BE IMPORTED GRANULAR MATERIAL SUCH AS SELECTED BORROW OR BASE COURSE THAT CAN BE READILY COMPACTED AND THAT WILL MINIMIZE THE PRESSURES AGAINST THE ABUTMENT.
4. THE BACKFILL SHALL BE COMPACTED TO BETWEEN 90 AND 95 PERCENT OF ITS MAXIMUM DENSITY. OVERCOMPACTION OF THE BACKFILL SHALL BE AVOIDED.
5. IF VOLCANIC ASH IS ENCOUNTERED WITHIN THE ROADWAY SUBGRADE, REMOVE AND REPLACE IT WITH COMPACTED GRANULAR FILL. THE ROADWAY SUBGRADE AFTER COMPACTION SHALL BE TESTED TO CONFIRM THAT IT WILL PROVIDE A MINIMUM FIELD CBR OF 25. TWO LOCATIONS ON EACH SIDE OF THE BRIDGE SHALL BE TESTED TO VERIFY THE SUPPORT STRENGTH OF THE SUBGRADE.

GRAPHIC SCALE:

2' 1' 0' 2' 4'
SCALE: 1/2" = 1'-0"

1' 0' 1' 2' 3'
SCALE: 3/4" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

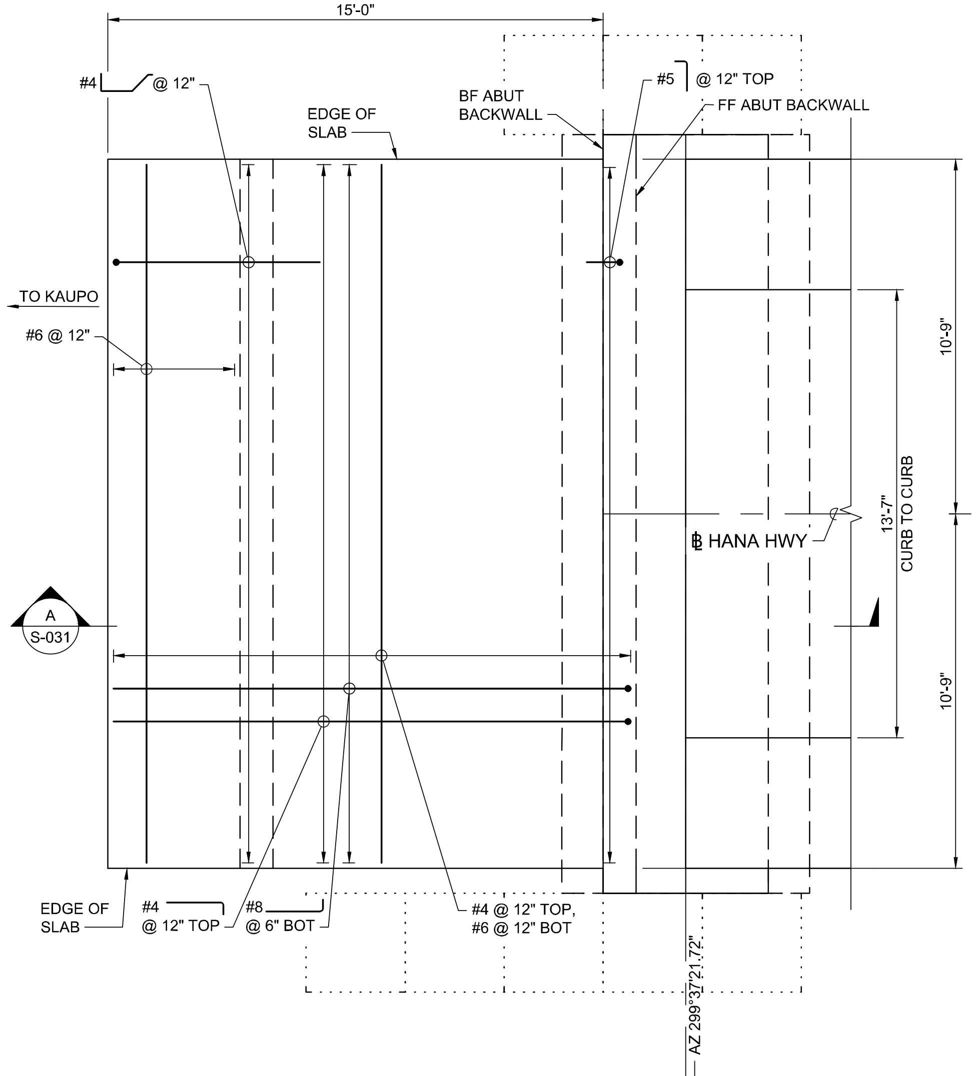
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE
ABUTMENT DETAILS

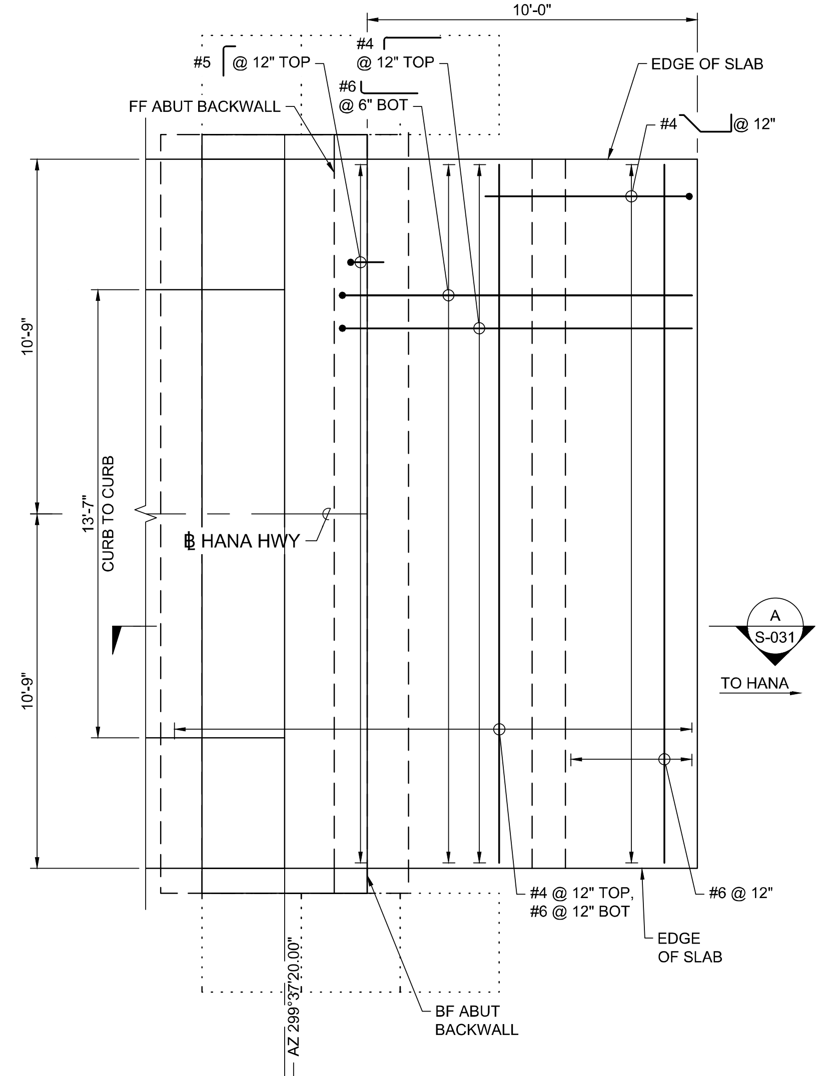
Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-029
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:26pm
CAD File Name: C:\pwworking\west01\d1900569\S-029 - Waikakoi Temp Bridge AbutmentDetails01.dwg

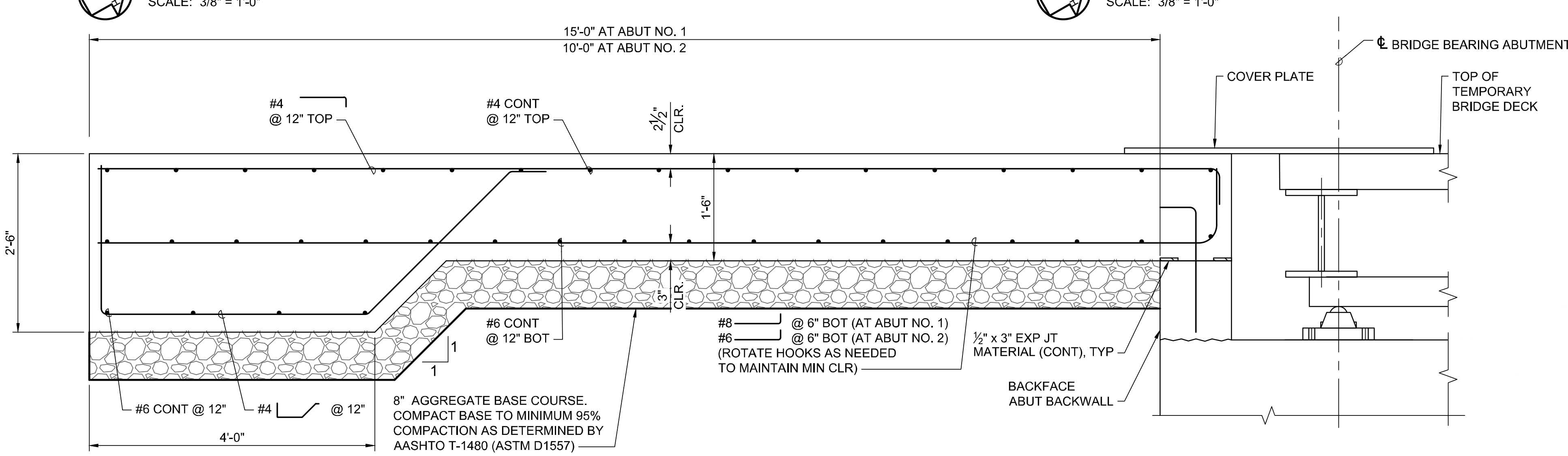
| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 074 | 083 |




## APPROACH SLAB PLAN AT ABUTMENT NO. 1
SCALE: 3/8" = 1'-0"

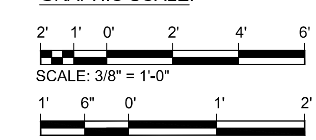



## APPROACH SLAB PLAN AT ABUTMENT NO. 2
SCALE: 3/8" = 1'-0"




## SECTION A
SCALE: 1" = 1'-0" SHT S-031

GRAPHIC SCALE:

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COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

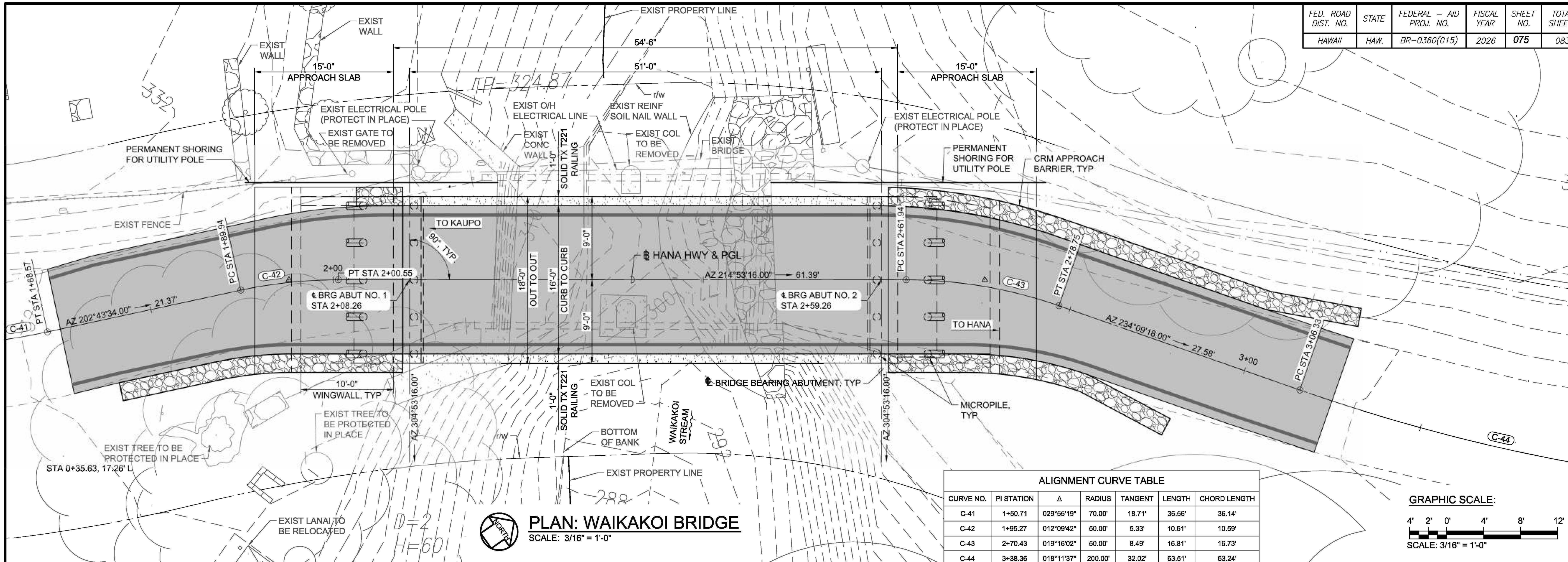
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI TEMPORARY BRIDGE
APPROACH SLAB DETAILS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET S-032
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:26pm
CAD File Name: C:\pwworking\west01\d1900569\S-032 - Waikakoi Temp Bridge_ApprSlabDet01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 075 | 083 |

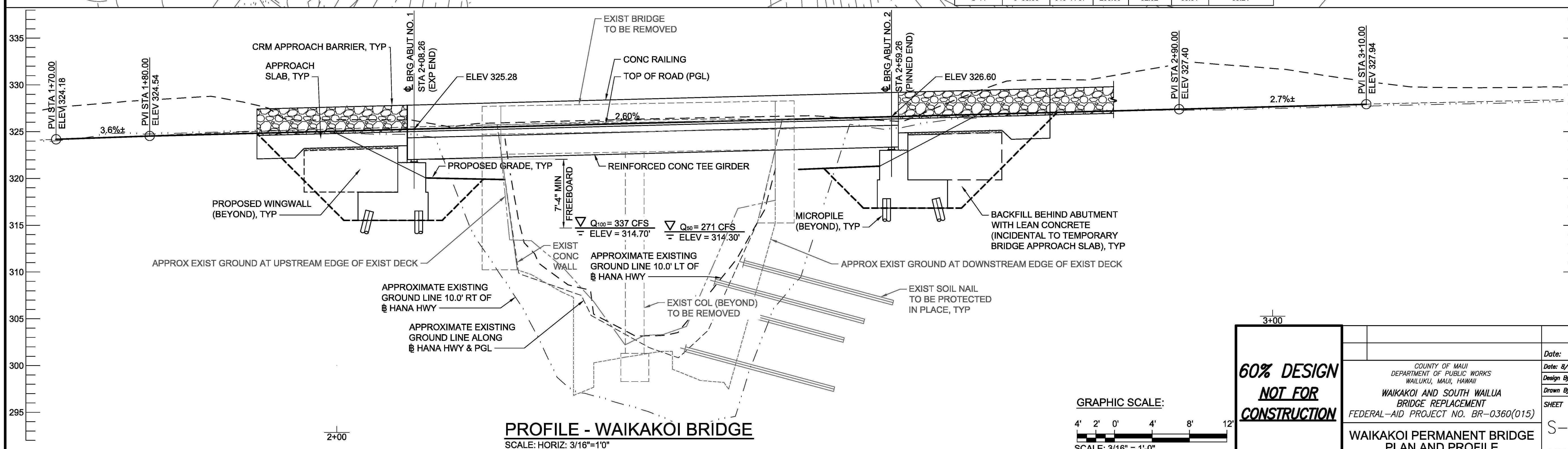



## PLAN: WAIKAKOI BRIDGE

SCALE: 3/16" = 1'-0"

| ALIGNMENT CURVE TABLE | | | | | | |
|---|---|---|---|---|---|---|
| CURVE NO. | PI STATION | Δ | RADIUS | TANGENT | LENGTH | CHORD LENGTH |
| C-41 | 1+50.71 | 029°55'19" | 70.00' | 18.71' | 36.56' | 36.14' |
| C-42 | 1+95.27 | 012°09'42" | 50.00' | 5.33' | 10.61' | 10.59' |
| C-43 | 2+70.43 | 019°16'02" | 50.00' | 8.49' | 16.81' | 16.73' |
| C-44 | 3+38.36 | 018°11'37" | 200.00' | 32.02' | 63.51' | 63.24' |

GRAPHIC SCALE:
4' 2' 0' 4' 8' 12'
SCALE: 3/16" = 1'-0"




## PROFILE - WAIKAKOI BRIDGE

SCALE: HORIZ: 3/16"=1'0"
VERT: 3/16"=1'0"

GRAPHIC SCALE:
4' 2' 0' 4' 8' 12'
SCALE: 3/16" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

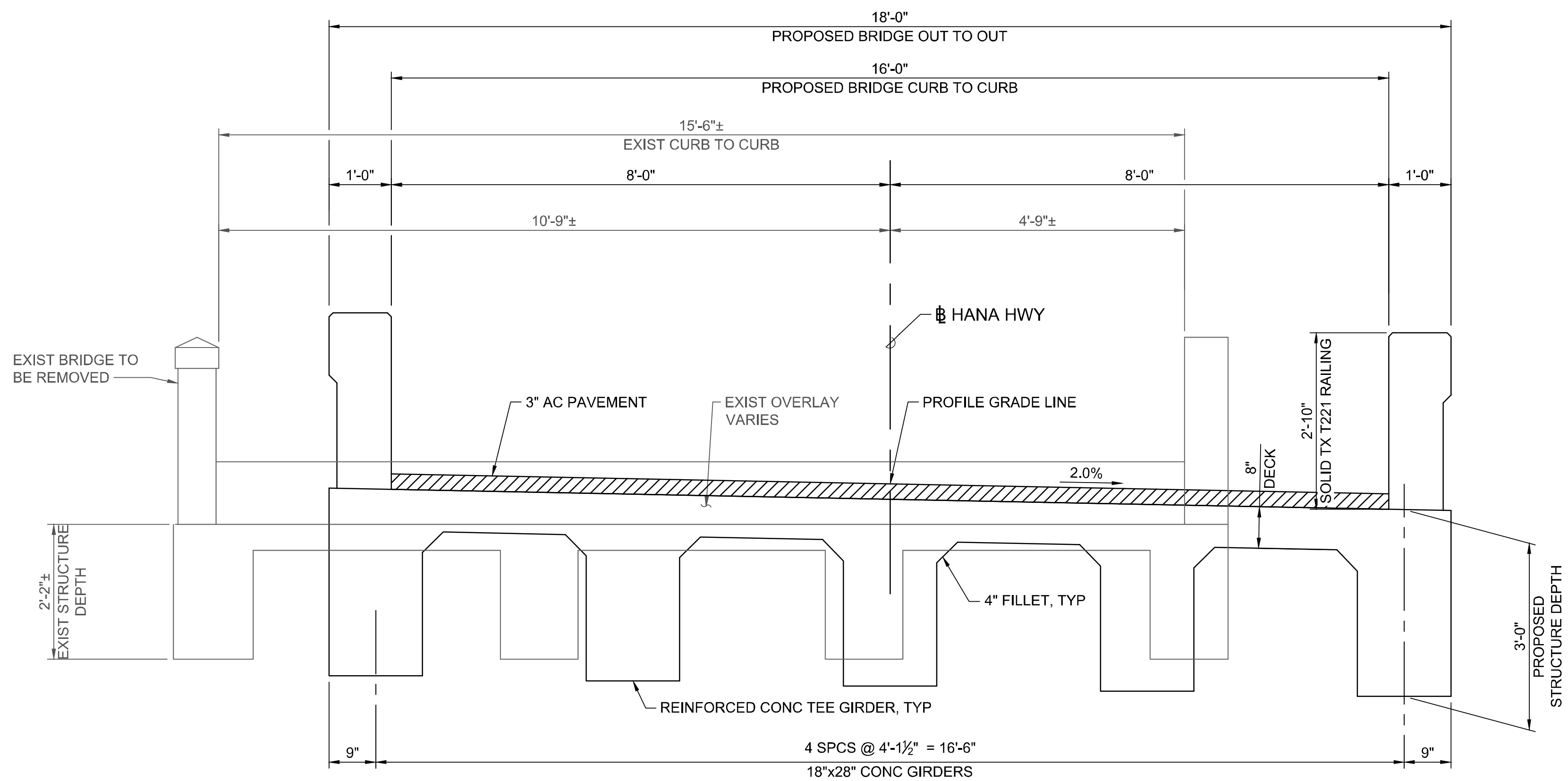
COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI PERMANENT BRIDGE PLAN AND PROFILE

Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET S–033 of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 – 2:28pm
CAD File Name: C:\pwworking\west01\d1900569\S-033 – Waikakoi Perm Bridge Plan & Profile01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 076 | 083 |




## TYPICAL SECTION - PROPOSED BRIDGE

SCALE: 3/4" = 1'-0"

(LOOKING AHEAD STATION TOWARDS HANA)

GRAPHIC SCALE:

1' 0' 1' 2' 3'

SCALE: 3/4" = 1'-0"

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

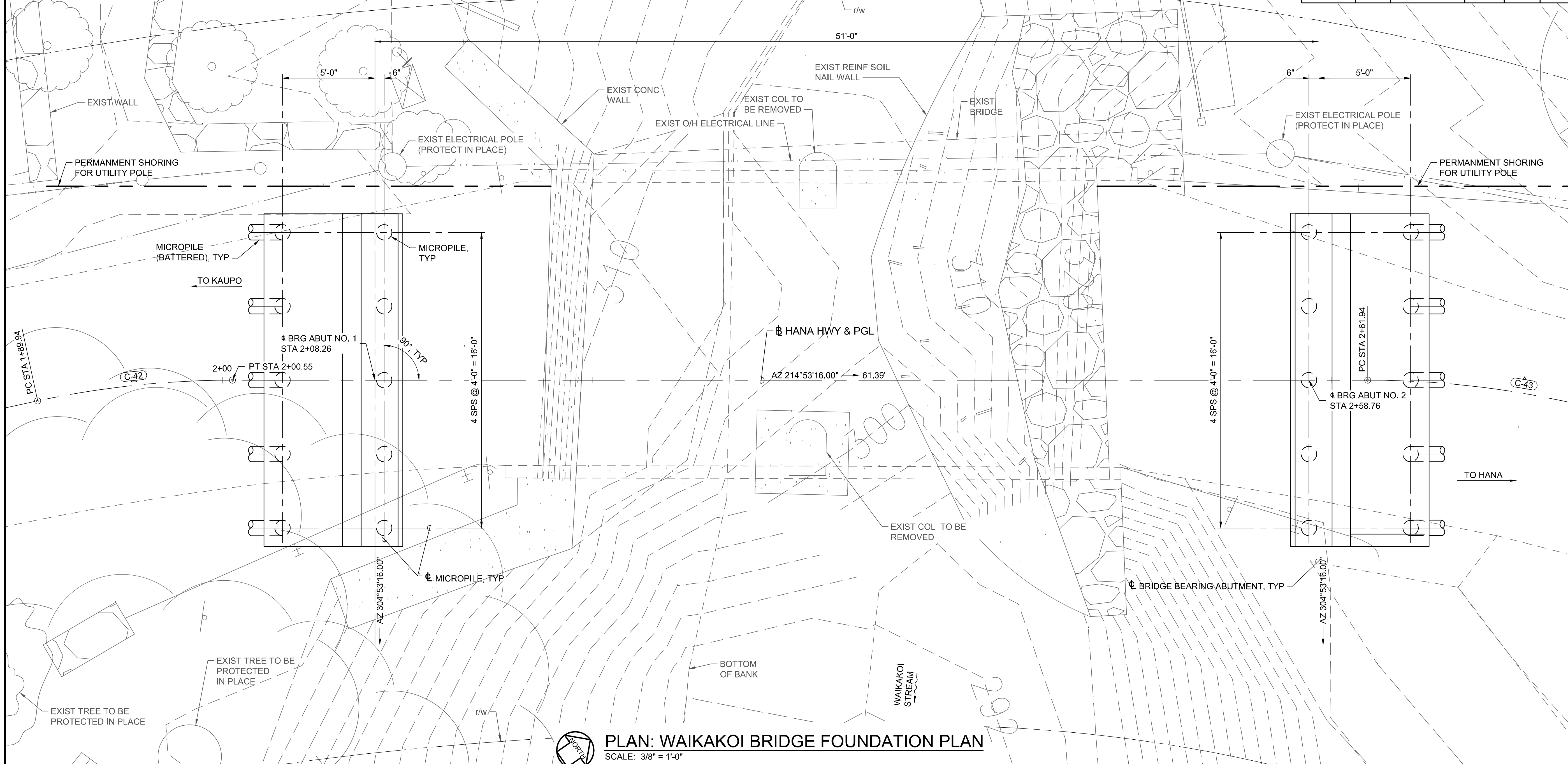
WAIKAKOI PERMANENT BRIDGE
TYPICAL SECTION

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-034
of 084 Sheets

PROJ. NO.: 2020040

Date Saved: Thu, 29 Aug 2024 - 2:26pm
CAD File Name: C:\pwworking\west01\d1900569\S-033 - Waikakoi Perm Bridge Plan & Profile01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 077 | 083 |




## PLAN: WAIKAKOI BRIDGE FOUNDATION PLAN

SCALE: 3/8" = 1'-0"

| MICROPILE SUMMARY TABLE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LOCATION | MICROPILE Ø | MAX FACTORED STRUCTURAL LOAD (TONS) | MAX FACTORED PILE STRUCTURAL CAPACITY (TONS) | RESISTANCE FACTOR | MAX FACTORED EE LOAD (TONS) | MAX FACTORED PILE EE CAPACITY (TONS) | RESISTANCE FACTOR | ESTIMATED TIP ELEVATION | MIN TIP ELEVATION |
| ABUTMENT NO 1 | 10" | | | | | | | | |
| ABUTMENT NO 2 | 10" | | | | | | | | |

NOTES:

1. FIELD VERIFY LOCATION OF EXISTING ROCK WALLS AND ALIGNMENT OF NEW CRM WALLS PRIOR TO CONSTRUCTION.
2. IF EXISTING SOIL NAILS ARE ENCOUNTERED DURING PLACEMENT OF MICROPILES, MICROPILES SHALL BE SHIFTED AS NEEDED TO CLEAR SOIL NAILS. ABANDONED HOLE SHALL BE FILLED WITH GROUT OR CONCRETE.
3. FOR ADDITIONAL INFORMATION, SEE GEOTECHNICAL ENGINEERING EXPLORATION REPORT FOR WAIKAKOI AND S. WAILUA BRIDGE REPLACEMENT, PREPARED BY GEOLABS INC., DATED JULY 25, 2024.
4. ONE SACRIFICIAL, PRE-PRODUCTION COMPRESSIVE LOAD TEST ON A SACRIFICIAL MICROPILE SHALL BE PERFORMED AT EACH ABUTMENT IN ACCORDANCE WITH ASTM D1143.
5. TWO INSTALLED MICROPILES AT EACH ABUTMENT (4 MICROPILES TOTAL) SHALL BE TESTED FOR PULLOUT.
6. FOR MICROPILE DETAILS, SEE SHEET S-XXX.

GRAPHIC SCALE:

2' 1' 0' 2' 4' 6'

SCALE: 3/8" = 1'-0"

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI PERMANENT BRIDGE
FOUNDATION PLAN

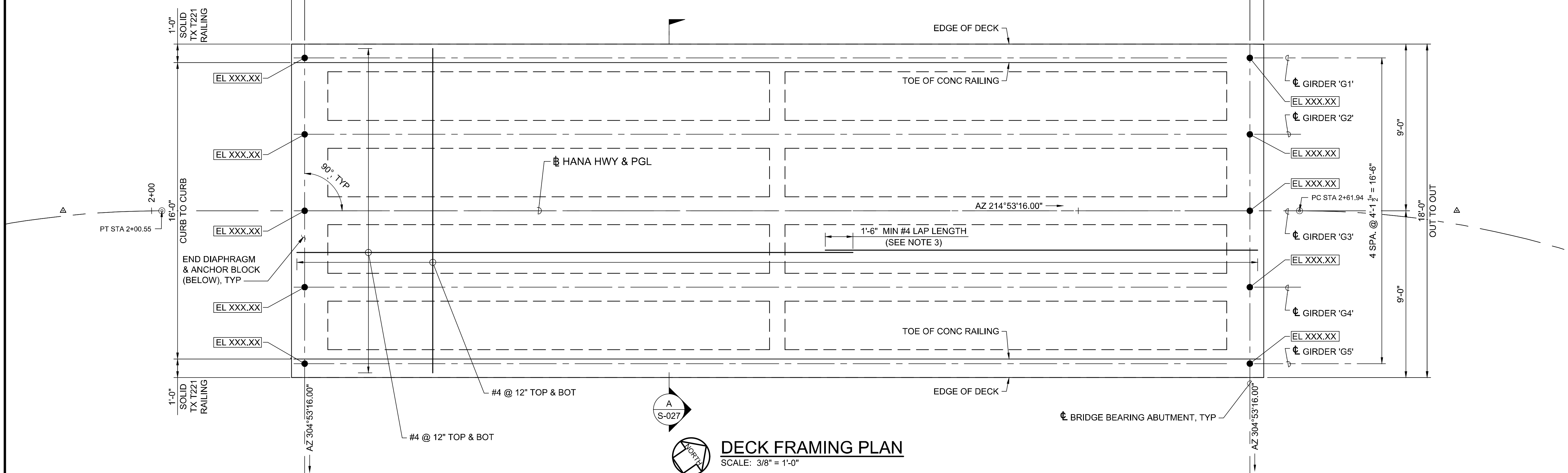
Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS

SHEET S-035 of 084 Sheets

PROJ. NO.: 2020040

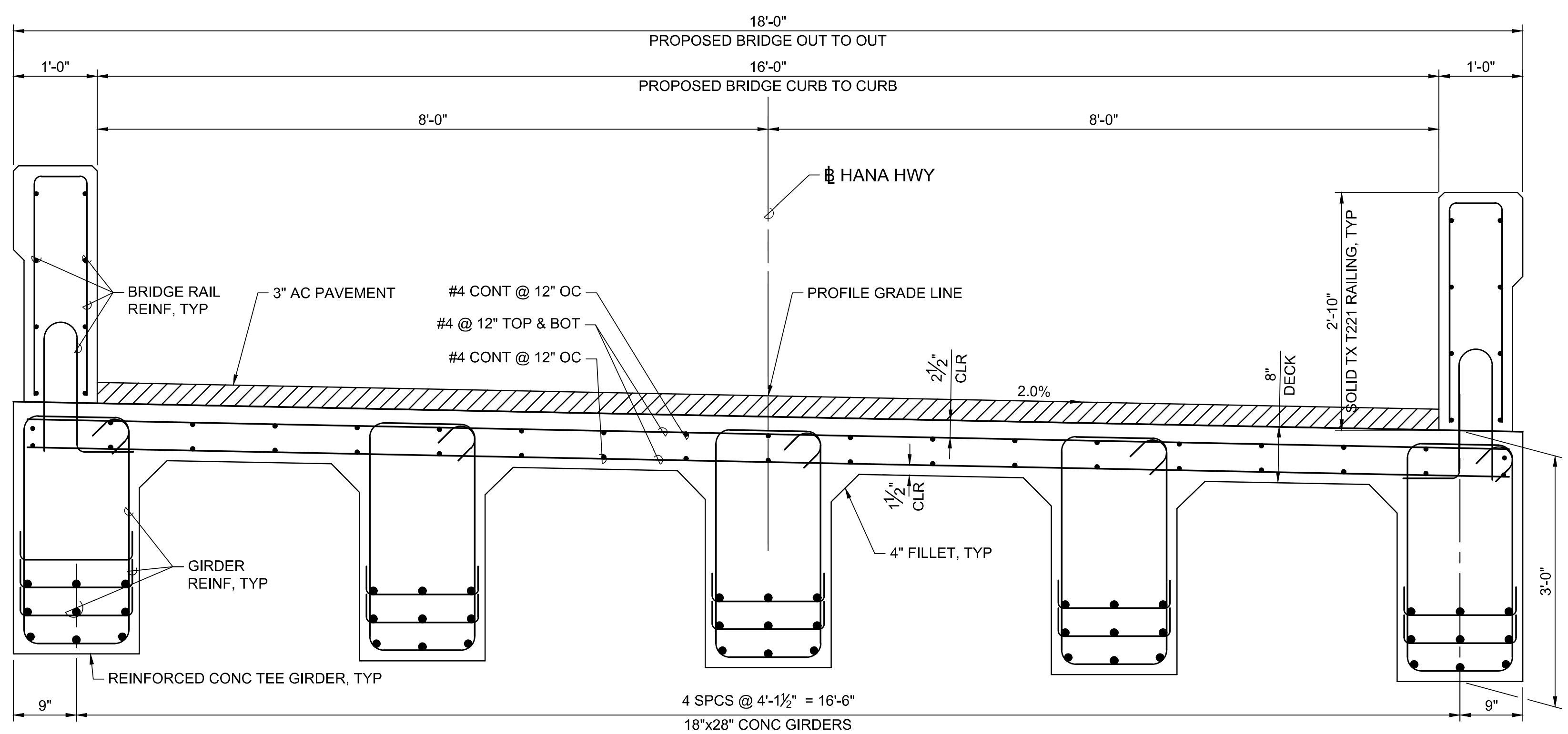
Date Saved: Thu, 29 Aug 2024 – 2:26pm
CAD File Name: C:\pwworking\west01\d1900569\S-035- Waikakoi Perm Bridge_FoundationPlan.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR–0360(015) | 2026 | 078 | 083 |




## DECK FRAMING PLAN

SCALE: 3/8" = 1'-0"




## TYPICAL SECTION

SCALE: 1" = 1'-0"

(LOOKING AHEAD STATION)

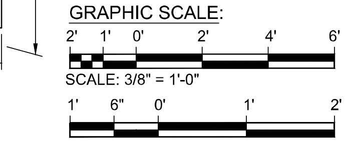
**LEGEND:**

EL XXX.XX — DENOTES ELEVATION AT TOP OF CONCRETE DECK

**NOTES:**

1. EDGE OF DECK AND GIRDERS SHALL BE PARALLEL TO ℄ HANA HWY.
2. IF THE BRIDGE DECK CANNOT BE PLACED IN ONE CONTINUOUS POUR, THE CONTRACTOR SHALL SUBMIT A DECK POUR SEQUENCE FOR APPROVAL AT LEAST TWO WEEKS PRIOR TO PLACEMENT OF BRIDGE DECK CONCRETE. THE SUBMITTAL SHALL INCLUDE THE PROPOSED CONSTRUCTION JOINT LOCATIONS.
3. LONGITUDINAL BARS SHALL BE A MAXIMUM OF 30 FEET IN LENGTH. LONGER BARS MAY BE USED AT THE CONTRACTOR'S OPTION AT NO ADDITIONAL EXPENSE TO THE PROJECT PROVIDED THE CONTRACTOR CAN DEMONSTRATE THAT THE LONGER BARS CAN BE SHIPPED TO THE SITE. LAP SPLICES SHALL BE STAGGERED IN ADJACENT LINES.
4. FOR END DIAPHRAGM AND ANCHOR BLOCK DETAILS, SEE SHEET S-XXX.
5. FOR GIRDER DETAILS, SEE SHEET S-031.
6. FOR BRIDGE RAIL DETAILS, SEE SHEET S-XXX.

GRAPHIC SCALE:




SCALE: 3/8" = 1'-0"

SCALE: 1" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI PERMANENT BRIDGE
DECK FRAMING PLAN AND SECTION

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET S–036
of 084 Sheets

PROJ. NO.: 2020040

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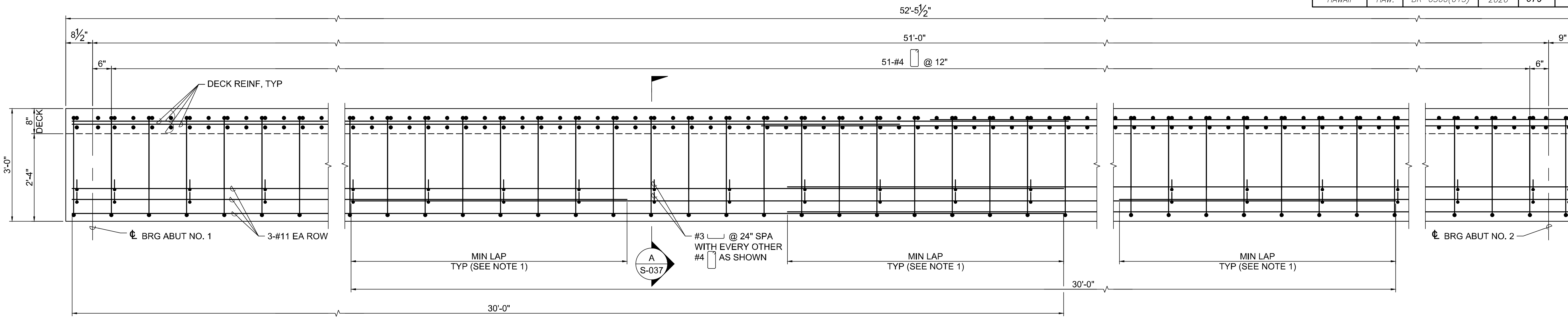
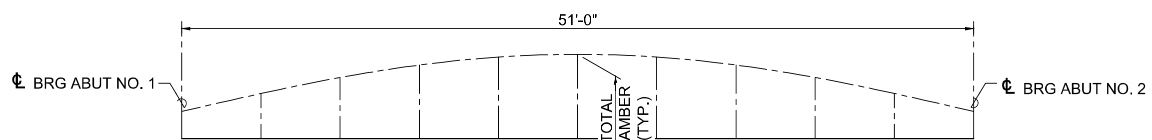
CAD File Name: C:\pwworking\west01\d1900569\S-036 – Waikakoi Perm Bridge_Deck_Plan_and_Long_Sec.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 079 | 083 |




## GIRDER ELEVATION

SCALE: 3/4" = 1'-0"



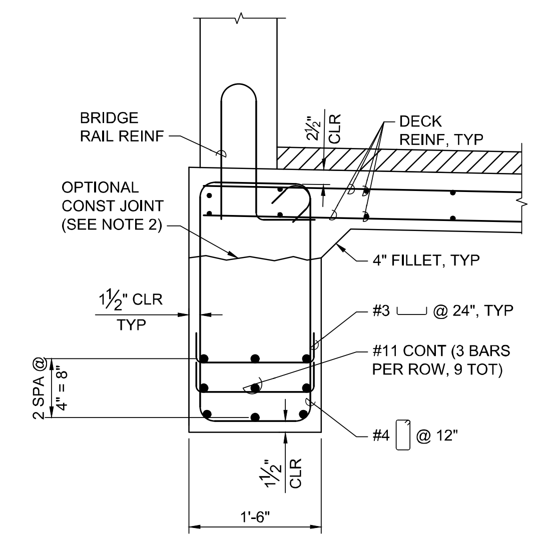

## GIRDER CAMBER DIAGRAM

SCALE: NTS

| GIRDER CAMBER SCHEDULE (INCHES) | | | |
|---|---|---|---|
| LOCATION - ℄ BRG ABUT 1 TO ℄ BRG ABUT 2 | GIRDER SELFWEIGHT DC1 DL DEFLECTION | COMPOSITE DC2 DL DEFLECTION | INITIAL FALSEWORK CAMBER |
| 0.00 | 0.00 | 0.00 | 0.00 |
| 0.10 | -0.12 | -0.04 | 0.34 |
| 0.20 | -0.23 | -0.07 | 0.62 |
| 0.30 | -0.31 | -0.09 | 0.83 |
| 0.40 | -0.36 | -0.11 | 0.96 |
| 0.50 | -0.38 | -0.12 | 1.00 |
| 0.60 | -0.36 | -0.11 | 0.96 |
| 0.70 | -0.31 | -0.09 | 0.83 |
| 0.80 | -0.23 | -0.07 | 0.62 |
| 0.90 | -0.12 | -0.04 | 0.34 |
| 1.00 | 0.00 | 0.00 | 0.00 |

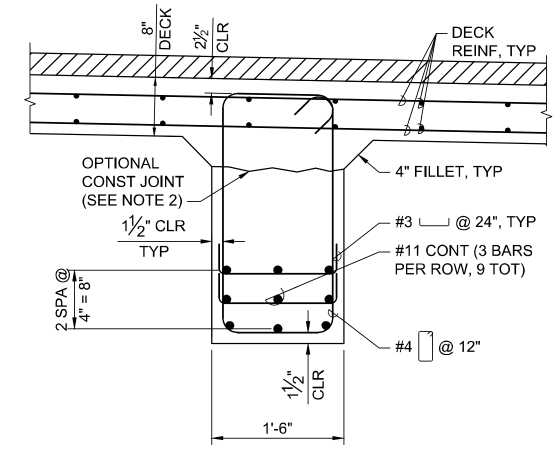
CAMBER NOTES:

1. POSITIVE VALUES SHOWN FOR CALCULATED CAMBER INDICATE A NET UPWARD DEFLECTION AND NEGATIVE VALUES SHOWN FOR DEFLECTION INDICATE A NET DOWNWARD DEFLECTION.
2. CONTRACTOR SHALL CAMBER THE GIRDER FALSEWORK AS REQUIRED BY THE CALCULATED FALSEWORK CAMBER.
3. ALL CAMBERS AND DEFLECTIONS ARE IN INCHES.




## SECTION AT EXTERIOR GIRDER

SCALE: 1"=1'-0" SHT A S-037



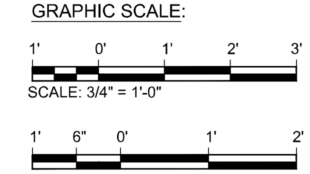

## SECTION AT INTERIOR GIRDER

SCALE: 1"=1'-0" SHT A S-037

NOTES:

1. MAINTAIN 1½" MINIMUM CLEAR DISTANCE AT ENDS OF GIRDERS. MINIMUM LAP SPLICE LENGTH SHALL BE 7'-4" FOR #11 BARS. STAGGER LAP SPLICES SUCH THAT LAP SPLICE LOCATIONS FOR ADJACENT LINES DO NOT COINCIDE IN EITHER DIRECTION.
2. CONSTRUCTION JOINTS SHALL BE ROUGHENED TO ¼" AMPLITUDE.
3. FOR DECK REINFORCING DETAILS, SEE SHEET S-XXX.
4. FOR BRIDGE RAIL DETAILS, SEE SHEET S-XXX.

GRAPHIC SCALE:




**60% DESIGN**
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COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI PERMANENT BRIDGE
CONCRETE GIRDER DETAILS (1 OF 2)

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-037
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 – 2:27pm
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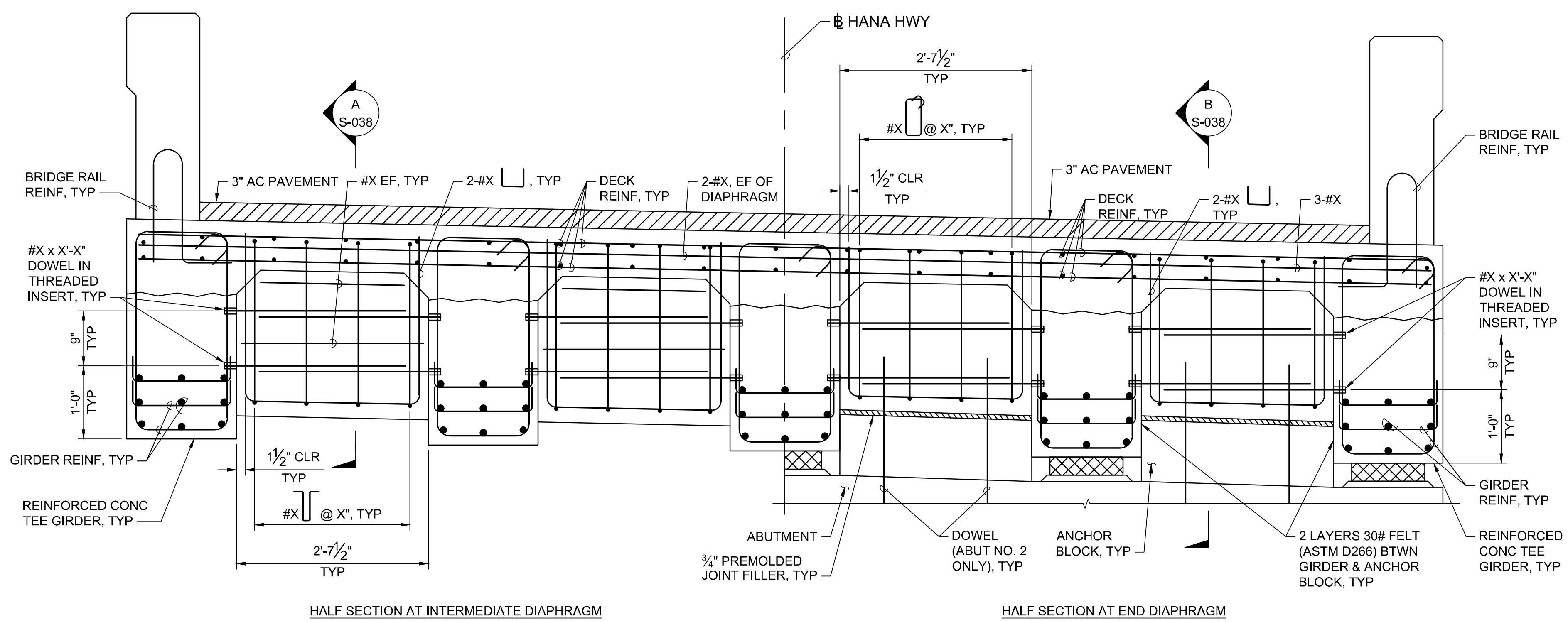
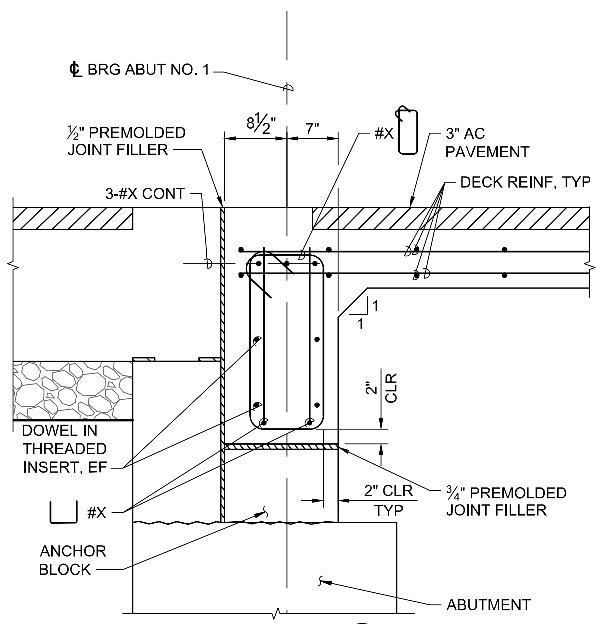
| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 080 | 083 |




## TYPICAL SECTION AT DIAPHRAGMS

SCALE: 1" = 1'-0"

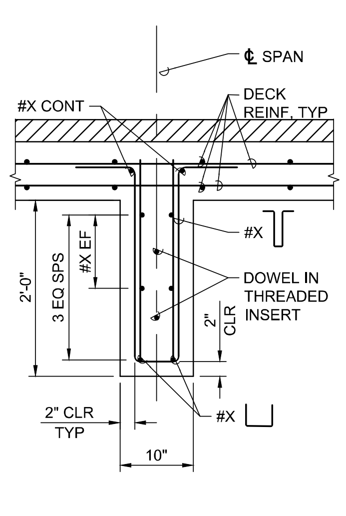
(LOOKING AHEAD STATION)




## SECTION B

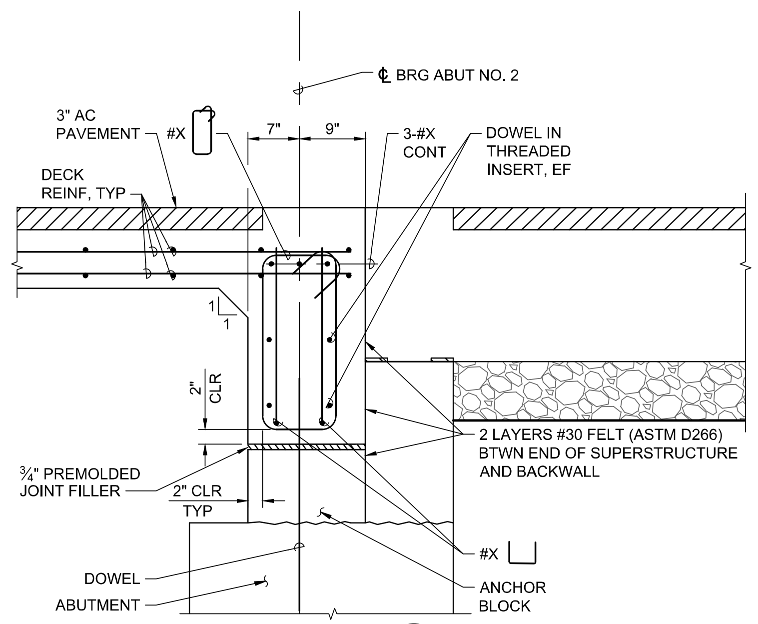
SCALE: 1"=1'-0" SHT S-038

(AT ABUT NO. 1)




## SECTION A

SCALE: 1"=1'-0" SHT S-038




## SECTION B

SCALE: 1"=1'-0" SHT S-038

(AT ABUT NO. 2)

GRAPHIC SCALE:

1' 6" 0' 1' 2'

SCALE: 1" = 1'-0"

NOTES:

1. THREADED INSERTS AT DIAPHRAGMS ARE INCIDENTAL TO REINFORCING STEEL IN GIRDER.

60% DESIGN

NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI PERMANENT BRIDGE
CONCRETE GIRDER DETAILS (2 OF 2)

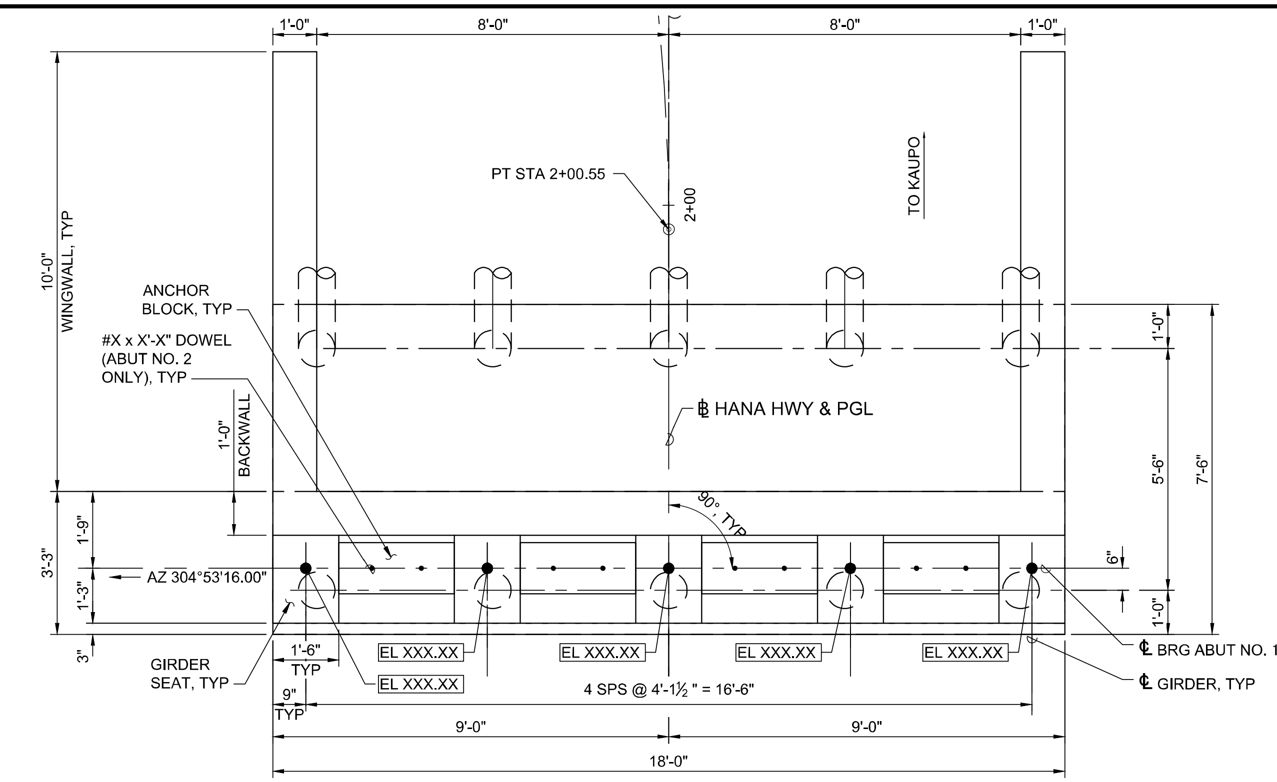
Date: 
Date: 8/30/24
Design By: RLS
Drawn By: ERS

SHEET S-038 of 084 Sheets

PROJ. NO.: 2020040

Date Saved: Thu, 29 Aug 2024 – 2:27pm
CAD File Name: C:\pwworking\west01\d1900569\S-037 – Waikakoi Perm Bridge_GirderDetails.dwg

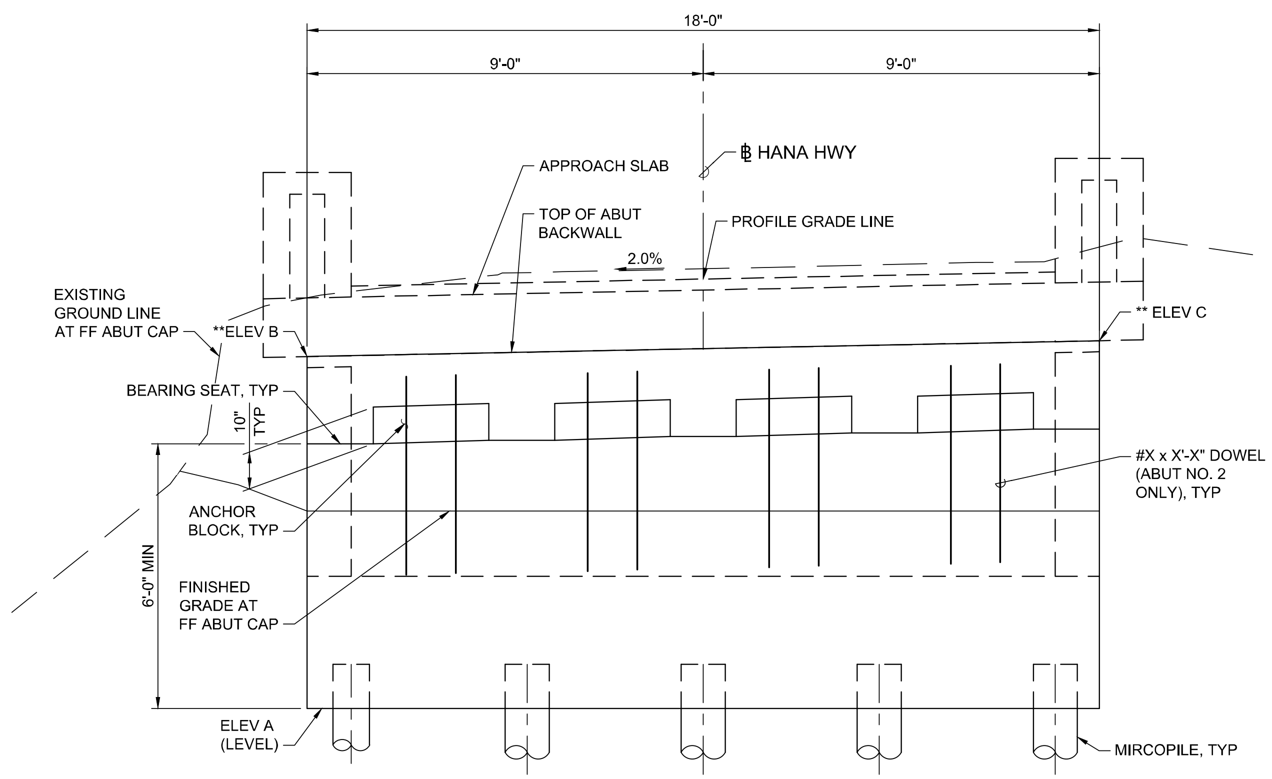
| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 081 | 083 |




## ABUTMENT PLAN

SCALE: 1/2" = 1'-0"

(ABUTMENT NO. 1 SHOWN, ABUTMENT NO. 2 SIMILAR)

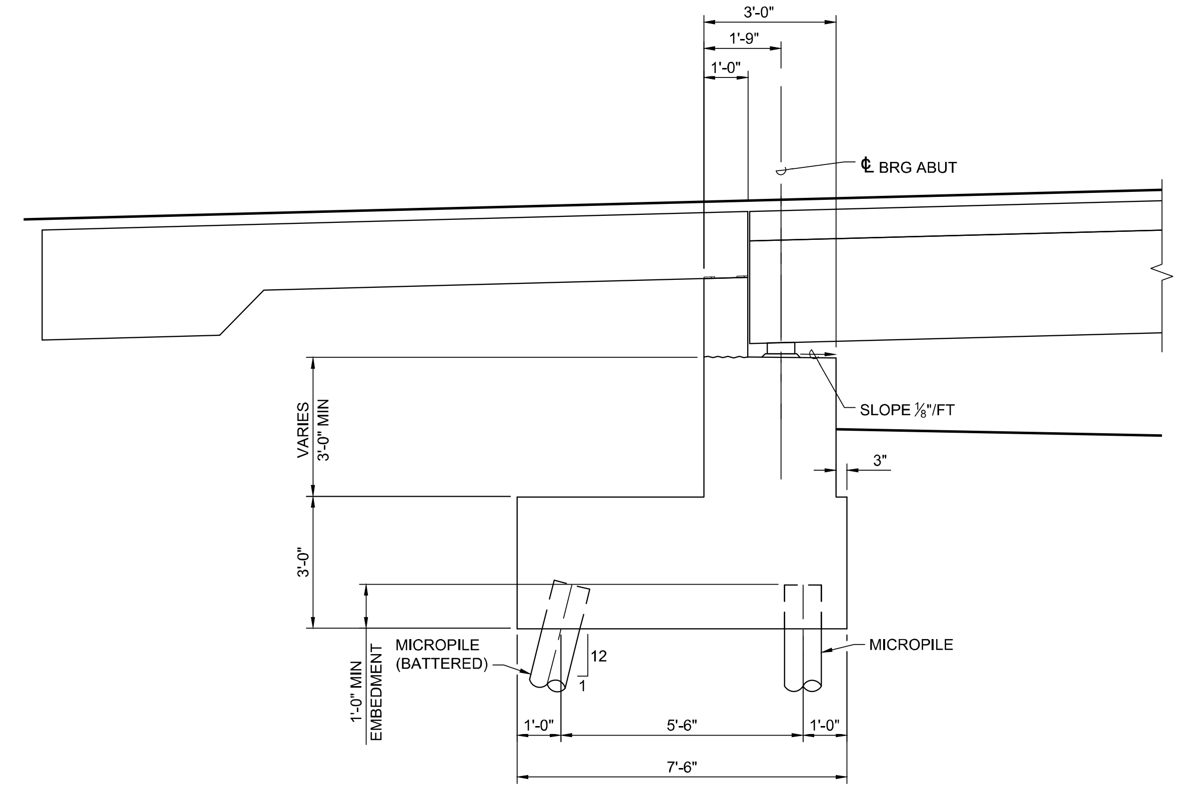



** MEASURED AT FRONT FACE ABUTMENT BACKWALL

## ABUTMENT ELEVATION

SCALE: 1/2" = 1'-0"

(LOOKING BACK STATION AT ABUTMENT NO. 1, ABUTMENT NO. 2 SIMILAR)




## ABUTMENT TYPICAL SECTION

SCALE: 1/2" = 1'-0"

(ABUTMENT NO. 1 SHOWN, ABUTMENT NO. 2 SIMILAR)

LEGEND:

EL XXX.XX ● DENOTES ELEVATION AT BEARING SEAT

NOTES:

1. THE FOUNDATION SHALL BE SET BACK INTO THE SLOPE SO THAT THERE IS A MINIMUM 3-FOOT SETBACK FROM THE SLOPE FACE TO THE OUTSIDE BOTTOM EDGE OF THE ABUTMENT FOUNDATION.
2. THE FOUNDATION SHALL BE SITUATED ON A LEVEL BENCH CUT INTO THE EXISTING SLOPE WITH THE CONCRETE POURED IN DIRECT CONTACT WITH THE EXISTING GROUND. NO GRANULAR FILLS SHALL BE USED BENEATH THE ABUTMENT FOUNDATION.
3. THE BACKFILL OF THE ABUTMENT SHALL BE IMPORTED GRANULAR MATERIAL SUCH AS SELECTED BORROW OR BASE COURSE THAT CAN BE READILY COMPACTED AND THAT WILL MINIMIZE THE PRESSURES AGAINST THE ABUTMENT.
4. THE BACKFILL SHALL BE COMPACTED TO BETWEEN 90 AND 95 PERCENT OF ITS MAXIMUM DENSITY. OVERCOMPACTION OF THE BACKFILL SHALL BE AVOIDED.
5. IF VOLCANIC ASH IS ENCOUNTERED WITHIN THE ROADWAY SUBGRADE, REMOVE AND REPLACE IT WITH COMPACTED GRANULAR FILL. THE ROADWAY SUBGRADE AFTER COMPACTION SHALL BE TESTED TO CONFIRM THAT IT WILL PROVIDE A MINIMUM FIELD CBR OF 25. TWO LOCATIONS ON EACH SIDE OF THE BRIDGE SHALL BE TESTED TO VERIFY THE SUPPORT STRENGTH OF THE SUBGRADE.

GRAPHIC SCALE:

2' 1' 0' 2' 4'

SCALE: 1/2" = 1'-0"

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

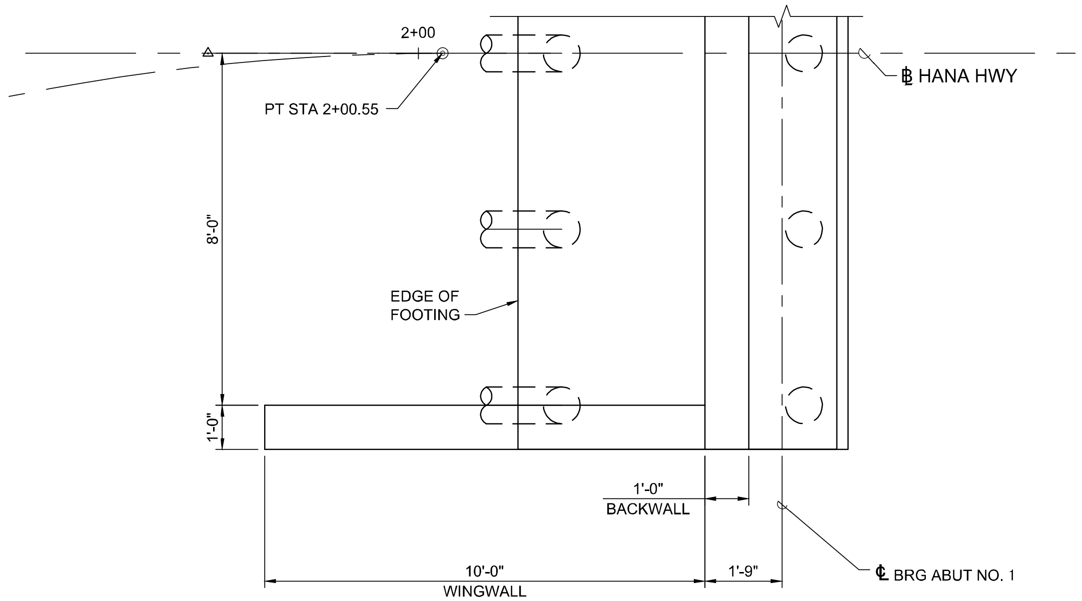
WAIKAKOI PERMANENT BRIDGE
ABUTMENT DETAILS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-039
of 084 Sheets

PROJ. NO.: 2020040

Date Saved: Thu, 29 Aug 2024 - 2:53pm
CAD File Name: C:\pwworking\west01\d1900569\S-039 - Waikakoi Perm Bridge_Abutment01.dwg

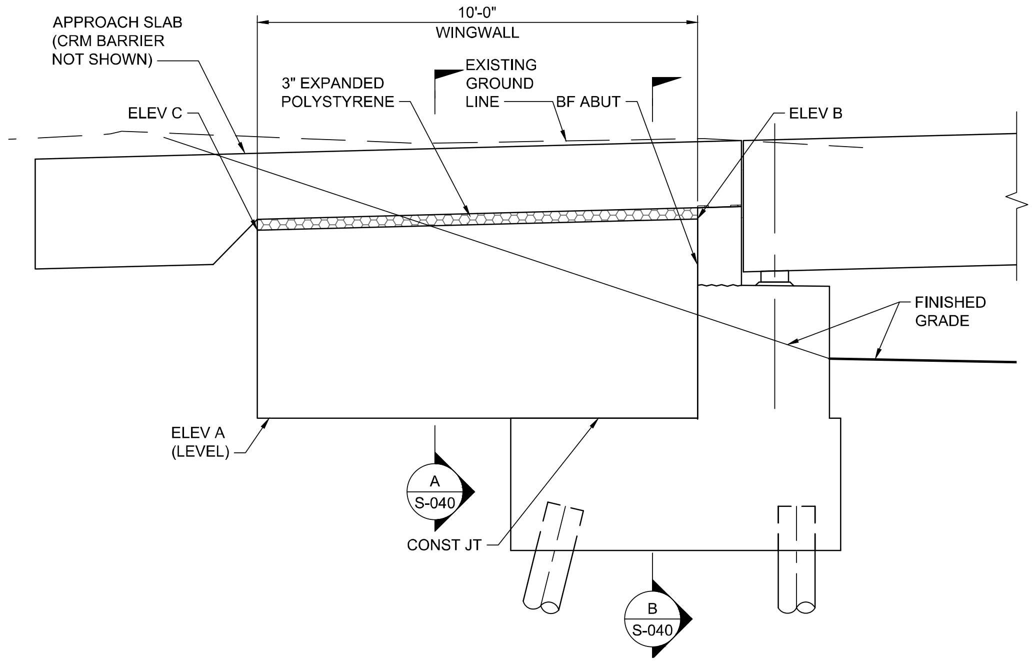
| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 082 | 083 |




## WINGWALL PLAN

SCALE: 1/2" = 1'-0"

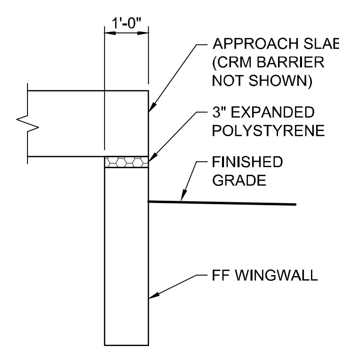
(SE WINGWALL SHOWN, ALL OTHER LOCATIONS SIMILAR)




## WINGWALL ELEVATION

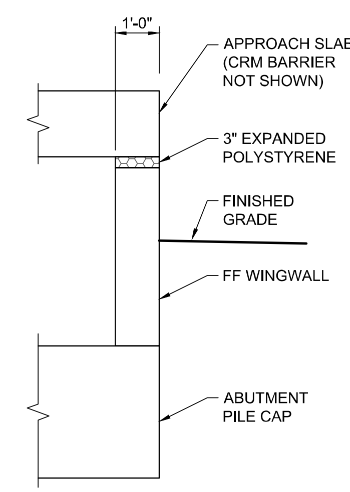
SCALE: 1/2" = 1'-0"

(SE WINGWALL SHOWN, SW AND NW WINGWALLS SIMILAR)




## SECTION A/S-040

SCALE: 1/2" = 1'-0" SHT S-040




## SECTION B/S-040

SCALE: 1/2" = 1'-0" SHT S-040

GRAPHIC SCALE:

2' 1' 0' 2' 4'

SCALE: 1/2" = 1'-0"

**60% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

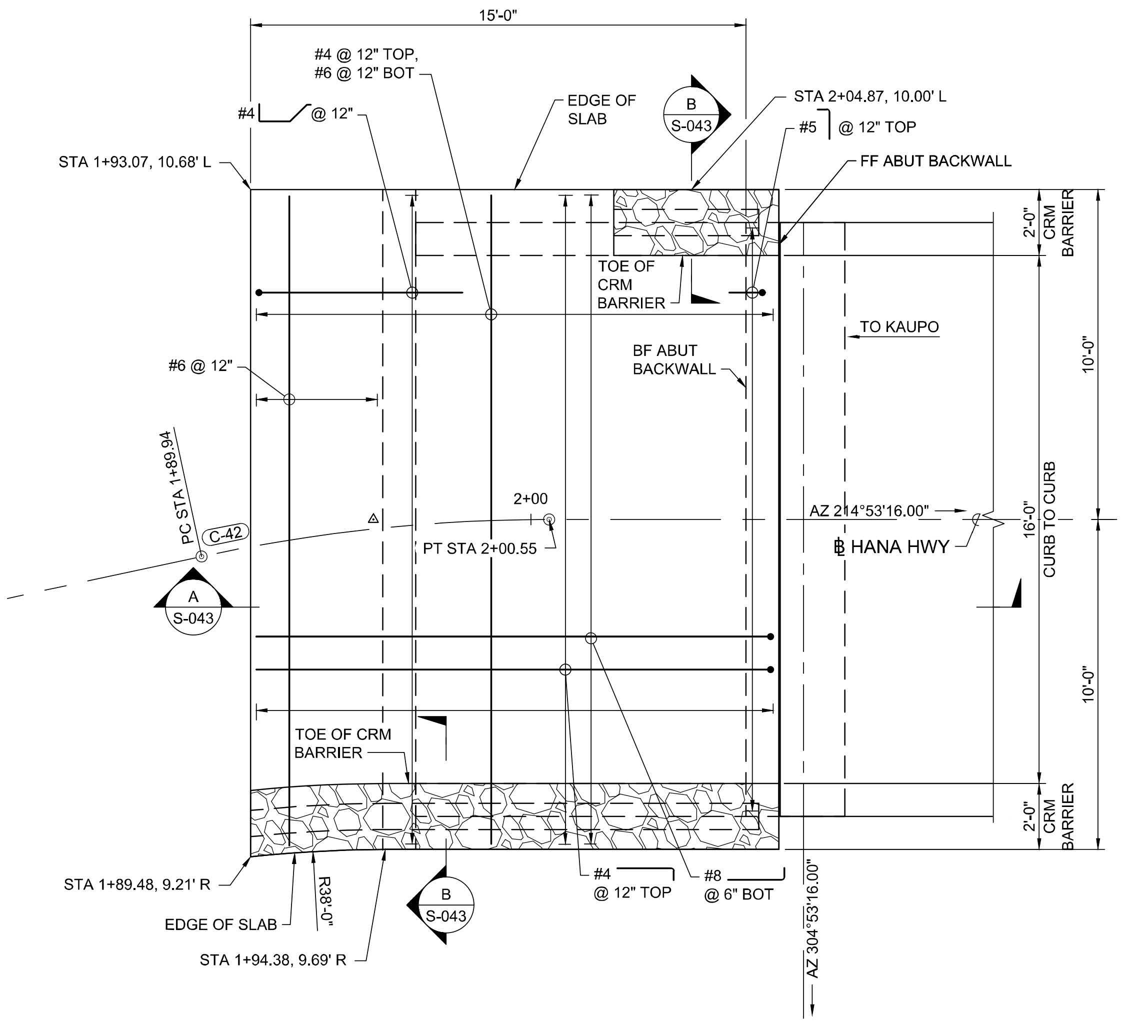
WAIKAKOI PERMANENT BRIDGE
WINGWALL DETAILS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET S-040
of 084 Sheets

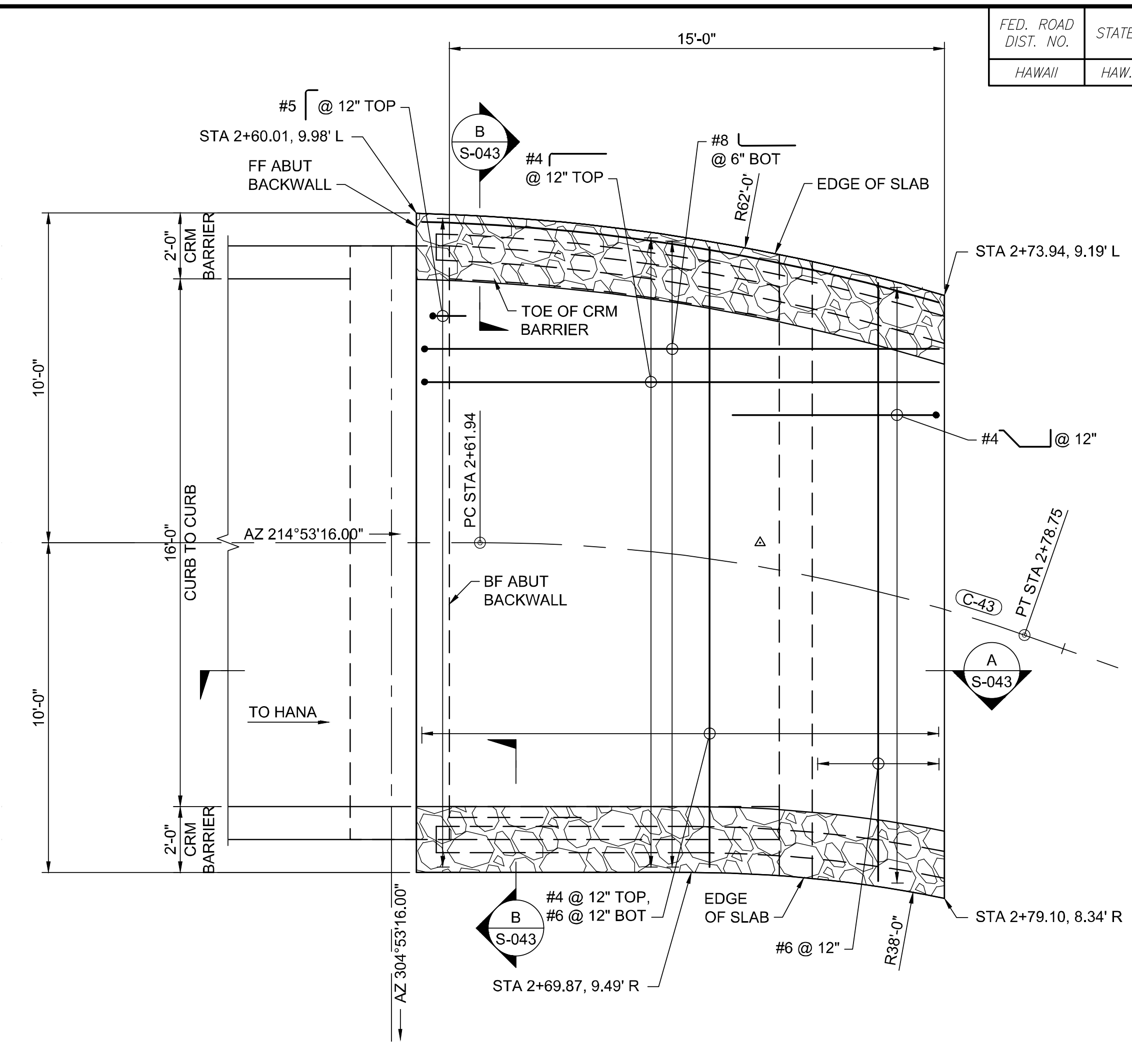
PROJ. NO.: 2020040

Date Saved: Thu, 29 Aug 2024 – 2:27pm
CAD File Name: C:\pwworking\west01\d1900569\S-040 – Waikakoi Perm Bridge_WingwallDet01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 083 | 083 |




## APPROACH SLAB PLAN AT ABUTMENT NO. 1
SCALE: 3/8" = 1'-0"




## APPROACH SLAB PLAN AT ABUTMENT NO. 2
SCALE: 3/8" = 1'-0"

GRAPHIC SCALE:
2' 1' 0' 2' 4' 6'
SCALE: 3/8" = 1'-0"

**60% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

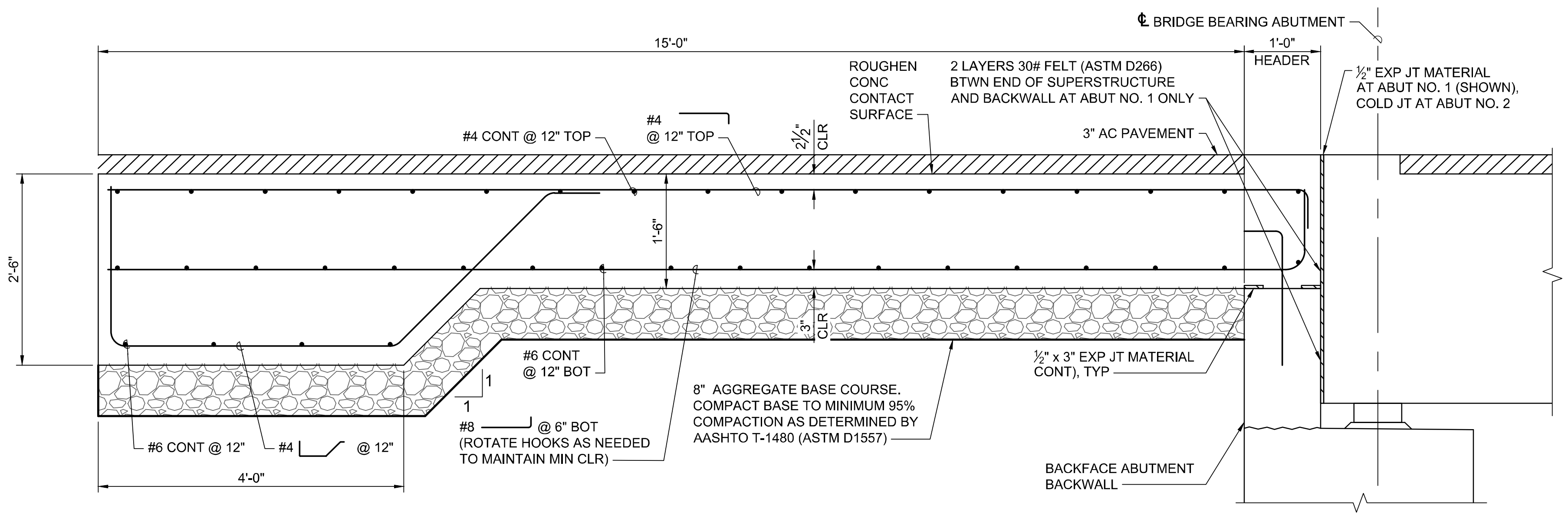
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI PERMANENT BRIDGE
APPROACH SLAB PLANS

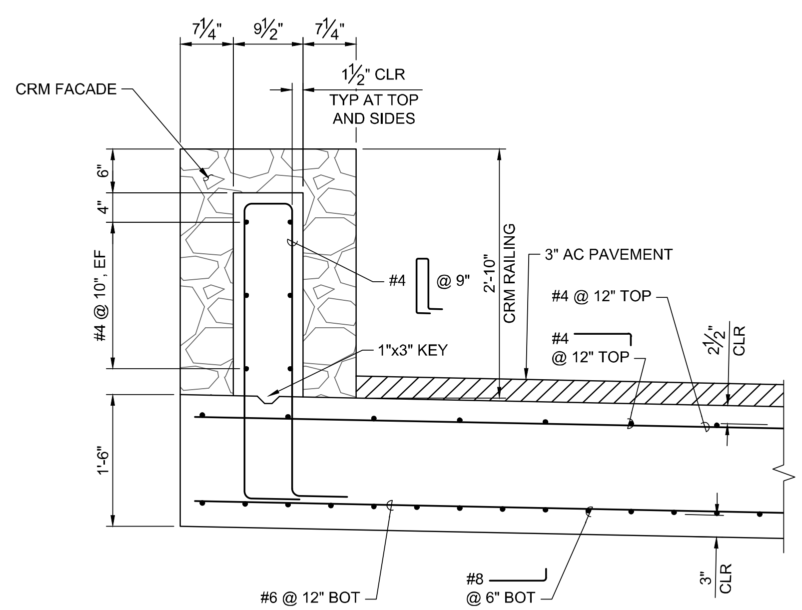
Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-042
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:27pm
CAD File Name: C:\pwworking\west01\d1900569\S-042 - Waikakoi Perm Bridge_ApprSlabDet01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | 084 | 083 |




SECTION A
SCALE: 1" = 1'-0" SHT S-042
(ABUTMENT NO. 1 SHOWN, ABUTMENT NO. 2 SIMILAR)




SECTION B
SCALE: 1" = 1'-0" SHT S-042

GRAPHIC SCALE:
1' 6" 0' 1' 2'
SCALE: 1" = 1'-0"

60% DESIGN
NOT FOR CONSTRUCTION

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

WAIKAKOI PERMANENT BRIDGE
APPROACH SLAB SECTIONS

Date:
Date: 8/30/24
Design By: RLS
Drawn By: ERS
SHEET
S-043
of 084 Sheets

PROJ. NO.: 2020040
Date Saved: Thu, 29 Aug 2024 - 2:27pm
CAD File Name: C:\pwworking\west01\d1900569\S-042 - Waikakoi Perm Bridge_ApprSlabDet01.dwg

# Appendix C NRHP Form – Hana Belt Road

NPS Form 10-900 OMB No. 1024-0018
(Rev. 10-90)

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
REGISTRATION FORM

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in How to Complete the National Register of Historic Places Registration Form (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name Hāna Belt Road
other names/site number Belt Road, Hāna Road, Hāna Highway, Pi'ilani Highway

2. Location
street & number Hāna Highway (State Rte. 360), Pi'ilani Highway (Rte. 31) not for publication ___
city or town Makawao District to Hāna District
vicinity Ha'ikū, Ke'anae, Nāhiku, Hāna, Kīpahulu
state Hawai'i code HI county Maui code 009 zip code ___

3. State/Federal Agency Certification
As the designated authority under the National Historic Preservation Act of 1986, as amended, I hereby certify that this ___ nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ✓ meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant ___ nationally ✓ statewide ___ locally. ( ___ See continuation sheet for additional comments.)

[signature] 4-20-01
Signature of certifying official Date

State or Federal agency and bureau

In my opinion, the property ___ meets ___ does not meet the National Register criteria.
( ___ See continuation sheet for additional comments.)

Signature of commenting or other official Date

State or Federal agency and bureau

4. National Park Service Certification

I, hereby certify that this property is: Signature of Keeper Date of Action

✓ entered in the National Register
✓ See continuation sheet. Sarah D. Pope 6/15/01

___ determined eligible for the National Register
__ See continuation sheet.

___ determined not eligible for the National Register

___ removed from the National Register

____ other (explain): ________________

5. Classification
Ownership of Property
(Check as many boxes as apply)

___ private

_x public-local

_x_ public-State

___ public-Federal

Category of Property
(Check only one box)

___ building(s)

_x_ district

___ site

___ structure

___ object

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of Resources within Property

| Contributing | Noncontributing | |
|---|---|---|
| ____ | _____ | buildings |
| ____ | _____ | sites |
| 73 | 1 | structures (bridges and culverts) |
| _____ | _____ | objects |
| 73 | 1 | Total |

Number of contributing resources previously listed in the

National Register N/A

6. Function or Use

Historic Functions (Enter categories from instructions)

Cat: Transportation Sub: road-related

Current Functions (Enter categories from instructions)

Cat: Transportation Sub: road-related

7. Description

Architectural Classification
(Enter categories from instructions)

Other: OTHER: roadways; bridges: reinforced concrete, girder, flat slab, masonry (basalt or lava rock)

Materials
(Enter categories from instructions)

foundation ______

roof ______

walls ______

other asphalt, concrete, masonry (lava rock)

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing)

__X__ A Property is associated with events that have made a significant contribution to the broad patterns of our history.

____ B Property is associated with the lives of persons significant in our past.

__X_ C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

____ D Property has yielded, or is likely to yield information important in prehistory or history.

Criteria Considerations

(Mark "X" in all the boxes that apply.)

Property is:

____ A owned by a religious institution or used for religious purposes.

____ B removed from its original location.

____ C a birthplace or a grave.

____ D a cemetery.

____ E a reconstructed building, object, or structure.

____ F a commemorative property.

____ G less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)

Engineering

Social History

Transportation

Commerce

Period of Significance

circa 1900 to 1947

Significant Dates

circa 1900 to 1947

Significant Person
(Complete if Criterion B is marked above)

Cultural Affiliation

Architect/Builder

County engineers, including Hugh Howell, Paul Low, and A. H. Wong; builders were county employees, prison labor, and private contractors. Private contractors included Wilson and McCandless, Hugh Howell Engineering Company, and Moses Akiona, Ltd. Designers also included William D'Esmond, architect; Joseph Matson, and D. Kapohakimohewa.

9. Major Bibliographical References Bibliography (Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS)

___ preliminary determination of individual listing (36 CFR 67) has been requested

___ previously listed in the National Register

___ previously determined eligible by the National Register

___ designated a National Historic Landmark

___ recorded by Historic American Buildings Survey

# ________

___ recorded by Historic American Engineering Record

# ________

Primary Location of Additional Data

___ State Historic Preservation Office

_X_ Other State agency

___ Federal agency

___ Local government

___ University

___ Other

Name of repository:

State of Hawai'i Department of Transportation

10. Geographical Data Acreage of Property _ __________

UTM References
(Place additional UTM references on a continuation sheet)

| | Zone | Easting | Northing | | Zone | Easting | Northing |
|---|---|---|---|---|---|---|---|
| 1 | 04 | 787810 | 2314160 | 3 | 04 | 789510 | 2312640 |
| 2 | 04 | 788850 | 2313440 | 4 | 04 | 789860 | 2312530 |

_X_ See continuation sheet.

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

The boundaries of the nominated district are delineated by the course of the Hāna Belt Road. The right-of-way is approximately 40′ wide and is variable along the entire length of the road. The historic district begins .2 miles west of Mile Marker 3 on the Hāna Highway, State Route 360, near Huelo, and ends on the south end of Koukou'ai Bridge near Kīpahulu on Route 31.

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

The boundaries are coterminus with the Hāna Belt Road's historic right-of-way. The beginning and end points were selected to encompass the portion of the Hāna Belt Road that retains the greatest historic integrity and character. This section of roadway is relatively unaltered and is the most spectacular portion of Maui's historic belt road system, both in its scenery and its historic character. The boundaries include the highest concentration of stylistically consistent historic bridges in the State of Hawai'i.

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section 10 Geographical Data Page 2

Name of property Hāna Belt Road
County and State Maui County, Hawai'i

UTMs continued:

| | zone/easting | northing | points 1-4: Ha'ikū, Hawai'i quad |
|---|---|---|---|
| 5 | 04/790890 | 2311540 | |
| 6 | 04/791260 | 2311740 | |
| 7 | 04/791400 | 2311610 | |
| 8 | 04/792250 | 2310930 | |
| 9 | 04/793400 | 2310360 | |
| 10 | 04/793620 | 2310280 | points 5-17: Ke'anae, Hawai'i quad |
| 11 | 04/794270 | 2309800 | |
| 12 | 04/794310 | 2309020 | |
| 13 | 04/795250 | 2309060 | |
| 14 | 04/796560 | 2309440 | |
| 15 | 04/796790 | 2309280 | |
| 16 | 04/797770 | 2308430 | |
| 17 | 04/797540 | 2306640 | |
| 18 | 04/797580 | 2305320 | |
| 19 | 04/797800 | 2305090 | |
| 20 | 04/798000 | 2304760 | |
| 21 | 04/798680 | 2304860 | |
| 22 | 04/798890 | 2304800 | |
| 23 | 04/799550 | 2304630 | points 18-32: Nāhiku, Hawai'i quad |
| 24 | 04/799760 | 2304420 | |
| 25 | 04/799920 | 2304330 | |
| 26 | 04/800000 | 2304410 | |
| 27 | 04/800520 | 2304260 | |
| 28 | 04/800880 | 2304190 | |
| 29 | 04/801930 | 2303950 | |
| 30 | 04/802190 | 23033830 | |
| 31 | 04/ | | |
| 32 | 04/ | 2303830 | |

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section 10 Geographical Data Page 3

Name of property Hāna Belt Road
County and State Maui County, Hawai'i

UTMs continued:

| | zone/easting | northing | |
|---|---|---|---|
| 33 | 04/803810 | 2303440 | |
| 34 | 04/803910 | 2303270 | |
| 35 | 04/804000 | 2303160 | |
| 36 | 04/804170 | 2303130 | |
| 37 | 04/804290 | 2303000 | |
| 38 | 04/804900 | 2303020 | points 33-47: Hāna, Hawai'i quad |
| 39 | 04/805350 | 2303020 | |
| 40 | 04/805650 | 2302900 | |
| 41 | 04/806060 | 2302760 | |
| 42 | 04/807160 | 2302510 | |
| 43 | 04/807630 | 2302290 | |
| 44 | 04/812440 | | |
| 45 | 04/812960 | 2295650 | |
| 46 | 04/812960 | 2293760 | |
| 47 | 04/812580 | 2292900 | |
| 48 | 04/811030 | 2290640 | |
| 49 | 04/810240 | 2290700 | |
| 50 | 04/809900 | 2290260 | |
| 51 | 04/809480 | 2290260 | |
| 52 | 04/809190 | 2290300 | |
| 53 | 04/809070 | 2290210 | points 48-60: Kīpahulu, Hawai'i quad |
| 54 | 04/808730 | 2289420 | |
| 55 | 04/808500 | 2289330 | |
| 56 | 04/808210 | 2289200 | |
| 57 | 04/808000 | 2289200 | |
| 58 | 04/807770 | 2288590 | |
| 59 | 04/807680 | 2288060 | |
| 60 | 04/805910 | 2286630 | |

11. Form Prepared By

name/title Dawn E. Duensing, historian
organization Maui County Cultural Resources Commission date 1/13/01
street & number P.O. Box 888 telephone (808)572-6583
city or town Makawao state HI zip code 96768

Additional Documentation. Submit the following items with the completed form:

Continuation Sheets

Maps

A USGS map (7.5 or 15 minute series) indicating the property's location.

A sketch map for historic districts and properties having large acreage or numerous resources.

Photographs

Representative black and white photographs of the property.

Additional items
(Check with the SHPO or FPO for any additional items)

Property Owner(Complete this item at the request of the SHPO or FPO.)

name State of Hawai'i, Department of Transportation
street & number 869 Punchbowl Street telephone (808)587-2150
city or town Honolulu state Hawai'i zip code 96813

name County of Maui, Department of Public Works & Waste Management
street & number 200 S. High Street telephone (808)270-7845
city or town Wailuku state Hawai'i zip code 96793

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section 7 Page 1

Name of property Hāna Belt Road
County and State Maui County, Hawai'i

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

The Hāna Belt Road is coterminous with its historic right-of-way. The Hāna Highway portion of the "belt road" traverses approximately fifty-one miles along Maui's north and east coast from Kahului in central Maui to the remote East Maui community of Hāna. After Hāna, the road continues as the Pi'ilani Highway and circles back around East Maui's south side, a distance of thirty-seven miles. Together, these East Maui roads were part of Maui's "belt" road system around the entire island. The proposed historic district includes approximately forty-two miles of road from .2 miles west of Mile Marker 3 on the Hāna Highway near Huelo to Koukou'ai Bridge on Pi'ilani Highway near the Kīpahulu section of Haleakalā National Park. The narrow road winds around more than 600 curves and over fifty-nine bridges. The Hāna Belt Road is famous for its one-lane bridges with sharp approaches and encompasses the highest concentration of unaltered and stylistically consistent historic bridges in Hawai'i. The Belt Road to Hāna is notable for its breathtaking scenery as it passes waterfalls, v-shaped valleys, and small villages, often hugging the precipitous sea cliffs on Maui's rugged coastline. The roadway width varies from less than 16' wide along the sea cliffs and other rugged terrain to approximately 22' wide through level topography and residential areas. Along most of the roadway, there is no shoulder or a very narrow shoulder. The road's alignment dates to its construction in the 1920s. The Belt Road is the only overland automobile route that connects East Maui communities with the rest of the island. The period of significance is circa 1900 when Mauians began calling for an improved road and a rudimentary wagon road was constructed near Nāhiku, to 1947 when the last bridge was built to service the Hāna Belt Road.

TOPOGRAPHY AND EARLY ROAD

The Hāna Belt Road traverses through some of Hawai'i's most rugged topography and rainiest climate. The island of Maui is comprised of two shield volcanoes joined by an isthmus, which constitutes east and west Maui. East Maui, where the Hāna Belt Road is located, is the immense Haleakalā, a dormant volcano more than 10,000' in elevation. In earlier times, lava flows poured into the ocean to create the jagged coastline along which the road is aligned. Centuries of stream erosion from the wet, tradewind climate on Haleakalā's windward (northeastern) slope cut a rugged terrain of great sea cliffs and v-shaped valleys. The wet climate allowed

Narrative Description (continued)

dense forests to grow over the rough terrain and helped make the Hāna District in East Maui one of Hawai'i's most isolated and inaccessible areas.

Prior to 1450 A.D., Maui was divided into two separate kingdoms, one with a court at Lahaina, the other with a court in Hāna. The East Maui coastal area was well populated in ancient times, but had little contact with the rest of Maui due to its isolated location. Traditionally, Hawaiians preferred to rely on their highly-developed navigational skills and traveled by canoe. As a result, Hāna was often politically tied to the more accessible communities across the channel on the island of Hawai'i. In the sixteenth century, Maui's King Pi'ilani conquered East Maui and pulled Hāna into his political sphere. Pi'ilani was notable for his public works projects, including the *Alaloa*, or main road, which began in West Maui.[1]

The predecessor trail to the Hāna Belt Road was built by Pi'ilani's son, Kihapi'ilani, in the sixteenth century. The trail was paved with hand-fitted basalt (lava) rocks. The 1848 account of Moses Manu noted, "This road was treacherous and difficult for the stranger, but when it was paved by Kihapi'ilani this road became a fine thing." When completed, the road was 4' to 6' wide, 138 miles long, and encircled the entire island. With the completion of Kihapi'ilani's East Maui trail, known as the King's Highway, Maui became the only island in the Hawaiian chain to have a "belt" road that completely encircled it.[2] In 1828, missionaries noted that the trail was "paved" and extended over thirty miles. They reported that it was a great help in ascending and descending the steep mountains and cliffs in the area. The early trail's switchbacks over the mountains near Honomanū were still visible in the 1940s.[3] Today, intact portions of the King's Highway remain, although most of the road has been obliterated by agriculture or paved over by modern roadways, including the Hāna Belt Road.

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[1] Gail Bartholomew, *Maui Remembers: A Local History.* (Honolulu: Mutual Publishing), 1994, 2.

[2] Bartholomew, *Maui Remembers,* 2; Trust for Public Land and Bay Pacific Consulting, *East Maui Resource Inventory,* Prepared for the Rivers, Trails, and Conservation Assistance Program, National Park Service, U.S. Department of the Interior (Honolulu: 1998), 9.

[3] E. E. Pleasant, "Maui 100 Years Ago: The Old Trail to Hāna." *The Maui News,* June 13, 1942.

Narrative Description (continued)

THE HĀNA BELT ROAD

The modern history of the Hāna Belt Road began in the 1870s when fifteen miles of unpaved road was built from central Maui into East Maui's rain forest to facilitate the construction of the Hāmākua Ditch, which was completed in 1878. The ditch was an extraordinary nineteenth century engineering marvel built to ensure the economic success of sugar by bringing water from rainy East Maui to central Maui's arid plantations. In 1900, Mauians began considering the necessity of extending a good wagon road through to Hāna, which would be part of the island's "belt" (around-the-island) road system. That year, a rudimentary road was built from Ke'anae to Nāhiku to service the Nāhiku Rubber Company. Construction through this country was difficult due to the terrain and climate. The road was surfaced with cinder, but was not adequate for automobile traffic. In 1905, the Superintendent of Public Works reported that the road in East Maui traversed through very rough country and as a result, was built "as narrow as possible in order to construct, with the money available, the maximum length of road."[4] Overland travel continued by horse and many travelers followed the trails along the irrigation ditches. Steamer remained the preferred mode of transportation for travel along the Hāna Coast.[5]

By the early 1900s, Maui leaders began planning for an improved route to Hāna. Beginning in 1908 and reaching a peak in 1911, numerous concrete bridges were built along the Hāna Coast in anticipation of road improvements.[6] In 1914, the Maui County Board of Supervisors lobbied the Territory of Hawai'i Legislature for funding to extend the road from Kailua to Ke'anae. Territorial Governor Pinkham was adamantly opposed to the Hāna Belt Road and blocked most of its funding. Despite the governor's opposition, money was appropriated and the Wilson and McCandless firm completed a "several-mile" section of road between Ke'anae and Nāhiku in

[4] Bartholomew, *Maui Remembers*, 161; Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, prepared for the State of Hawai'i, Department of Transportation, Highways Division. Draft. (Honolulu), 1996, IV 12.

[5] "Raymond Adds Ginger To Loan Fund Meeting," *The Maui News*, May 23, 1914.

[6] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, IV 12.

Narrative Description (continued)

1914. *The Maui News* reported that this "fine piece of road" was of "practically no benefit" since it ended in a forest reserve miles from any habitation. The newspaper noted that one section of road closely traversed along the mountainside a few thousand feet above sea level, with other sections following the Ko'olau Ditch. The road was praised for passing through some of the most spectacular scenery in the islands. Although money had been pledged to carry the road all the way into Ke'anae, Governor Pinkham refused to approve the appropriation and Maui was left with an inaccessible stretch of road.[7]

By 1920, the belt road from central Maui to Kailua was suitable for modern automobile traffic. Parts of the road were paved with macadam to ensure that it was passable during the rainy season. Keeping the road open was essential as it was the primary transportation route into Maui's pineapple country and muddy roads had periodically shut down pineapple operations. Maui County stretched funding as far as it could by using convict labor on the belt road projects.[8] Territorial funding to extend and complete the coastal highway to Hāna, however, continued to be a problem and was not resolved until Wallace Farrington became governor. Major sections of the Hāna Coast remained inaccessible to automobile traffic, namely the region between Kailua and Nāhiku, the area with the most challenging topography. With Governor Farrington's strong backing, the major portion of today's Hāna Highway was constructed in two separate construction projects between 1923 and 1926. The road between Kailua and Ke'anae was built from 1923 to 1925. Immediately thereafter, a road between Wailua and Nāhiku that connected with the route into Hāna was constructed and opened to the public in 1926.

[7] "Raymond Adds Ginger To Loan Fund Meeting," *The Maui News*, May 23, 1914; "Belt Road Or Nothing Says Board," *The Maui News*, June 20, 1914; "Let's Have The Belt Road Money," *The Maui News*, June 20, 1914; "No Ke'anae Highway Says Governor," *The Maui News*, July 18, 1914; "Road Pau on Nāhiku Part Belt Road," *The Maui News*, November 14, 1914.
[8] "No Money For Belt Road For Two Years," *The Maui News*, May 7, 1920; "Convict Labor to Work on Belt Road," *The Maui News*, September 17, 1920.

Narrative Description (continued)

Maui County Engineer Paul Low was credited with supervising "one of the most difficult and at the same time finest pieces of road engineering" on Maui.[9] In January 1923, Low presented his estimates to complete the Hāna road as two projects, the first of which was the roadway extension from Kailua to Ke'anae, a distance of 11.67 miles, which would require the excavation of 273,000 cubic yards of earth. The second phase of the project extended the road from Ke'anae to Wailuaiki near Nāhiku, a distance of 5.67 miles that called for almost 30,000 cubic yards of earth to be excavated. Low used earlier survey work done by engineers of the Maui Loan Fund Commission, which had been created by the Territorial Legislature to oversee special funds for Hawai'i's belt road systems. Low credited engineers Harvey and Howell with designing the original plans. (Hugh Howell also served as Maui County engineer between 1906 and 1914.) In addition to the earlier surveys, Low and a team of county surveyors scouted the route for the Hāna Belt Road, took field notes, and prepared plans and specifications. Low's 1923 estimates included engineering costs, excavation, fill, retaining walls, culverts, bridges, macadam pavement, and tunnels to relocate some ditches. The new road was to be built on a 16'-wide bench, with a pavement width of 12'-0".[10]

The Kailua to Ke'anae section of the belt road took two years to build. Crews worked from both ends of the project and met in May 1925. The road opened to the public on June 11, 1925. The new section of road was described as "serpentine" as it passed through a dozen gulches and wound around "mountain sides that dip into the ocean." Although the distance between the two communities was only four miles as the crow flies, the mileage needed to complete the road around the difficult topography was nearly twelve miles. In order to build the new road, workers were lowered by rope over the steep cliffs and gulches to dig a footing, set their drills, bore holes, and set the powder and fuses that would blast the new roadbed. The most spectacular piece of the road was also considered its most impressive engineering feat. This portion of road traversed down the mountainside (west) to the bottom of Honomanū Gulch,

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[9] "Steam Shovels Meet Next Week," *The Maui News*, July 31, 1926.

[10] "Itemized Costs Proposed Belt Road Presented," *The Maui News*, January 19, 1923; "Estimate Made Belt Road Cost By Way Kailua," *The Maui News*, January 13, 1923; "Magnificent Scenery Unfolds Before Eyes of Travelers On Motor Trip Over New Road Leading To Hāna," *The Maui News*, December 22, 1926.

Narrative Description (continued)

where it crossed a bridge and proceeded up the other mountainside (east side of the gulch) to a peak on the Ke'anae side. Motorists had impressive views from both sides of the gulch, including a view of the road on the other side. Governor Farrington described the scene as a "gorgeous spectacle [with] the blue sea in many places hundreds of feet below you, the white surf beating against the shore line and these wonderful green hills, the many gulches and every playing light, shade and color on the sides of beautiful and majestic Haleakalā." *The Maui News* noted that the road was still rough in many places, unsurfaced, and in need of widening so that cars could pass each other at any point. The article pointed out the road opened up "marvelously beautiful scenery" that most Maui residents had never seen. As a piece of engineering, the editor claimed that there was nothing in the Territory of Hawai'i or perhaps the world quite like the new road to Ke'anae. A Los Angeles-based writer admired the landscape features, including bamboo thickets, mountain apple, and native kukui trees.[11]

Work began immediately on the final link of the Hāna Belt Road project. In 1925, Maui's road program received a substantial boost when President Calvin Coolidge approved a bond issue for the Territory of Hawai'i that included $150,000 to continue construction of the Hāna Belt Road. County Engineer Low reported that finishing work was being done on the newly completed section to Ke'anae, including top-dressing the road, finishing culverts, and improving bridge approaches. Stone masons were building wing walls on the bridges and retaining walls in the valleys. Crews with forty men each had started to build the last link of the road from both the Hāna and Ke'anae sides, which was a length of 3.5 miles. This section was benched at 16'-0" wide, although plans called for the road to eventually be widened to 20'-0" after it had settled. Several bridges near Wailua were also built during this phase, including the Waikani Bridge and the bridge at West Wailuanui. Construction of the last link of road was difficult as

[11] "First Car Runs Over Belt Road Kailua-Ke'anae," *The Maui News*, May 23, 1925; "Dream Of Thirty Years Ago About To Be Realized," *The Maui News*, June 6, 1925; "Hundreds Motor to Ke'anae: Maui Turns Out To See Opening Of Scenic Road," *The Maui News*, June 13, 1925; "Magnificent Scenery Unfolds Before Eyes of Travelers On Motor Trip Over New Road Leading To Hāna," *The Maui News*, December 22, 1926; "Maui's New Road," editorial, *The Maui News*, June 17, 1925; "Wonder And Charm Of Maui Scenery To Be Pictured And Told Hundreds Of Thousands Readers On Mainland," *The Maui News*, August 15, 1925.

Narrative Description (continued)

much of the work consisted of blasting the solid rock in the area. Shovels on both sides of the project failed due to the stresses of working on solid rock cuts and the necessity of removing hundreds of tons of rock along the right-of-way. At times, the steam shovels could not do the work without considerable blasting and hand work. Heavy rains disrupted the project as well, causing floods and undermining embankments. In November 1926, a flood in the Wailuanui Valley caused a landslide over the road, washed out the scaffolding on the Waikani Bridge, and carried away 600 bags of cement to be used on the bridge.[12]

The Hāna Belt Road was opened to the public on December 18, 1926. *Honiron*, a publication of Honolulu Iron Works, described the road as "spectacularly chiseled out of abrupt cliffs and precipitous valleys." It noted that miles of the roadway were nothing more than a 16'-wide shelf cut into the mountainside, with towering masses of rock above and sheer drops measuring hundreds of feet to the ocean below. When asked how the scenery of the new section of road compared to the Kailua-Ke'anae section, Low commented that there was no comparison. He admired the section of road above the Wailua Valley that traveled along a narrow ledge for about a mile and provided a lovely panorama of *taro* patches and rice fields in the quaint village of Wailua below. *The Maui News* noted that the newly completed Hāna Belt Road was the "great road making achievement in the Islands, fraught with tremendous difficulties in engineering and construction work" and completed by "dare-devil exploits." The paper claimed the road was the most scenic driveway in the world, with vistas of lofty mountains, the Pacific Ocean, wild canyons, cataracts, waterfalls, and luxurious tropical vegetation. Signs marked "bad turn" and "go slow" were installed to mark dangerous curves and other points in the road. The average speed for driving the Hāna Belt Road was 20 m.p.h. Although Low's

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[12] "Coolidge Approves Proposed $2,590,000 Hawai'i Bond Issue," *The Maui News*, August 22, 1925; "Kailua-Kōpili'ula Road Work Making Headway, Says Low," *The Maui News*, March 13, 1926; "Workers Blast Tons Of Rock On Belt Road," *The Maui News*, May 15, 1926; "Builders Progress In Construction Of Belt Road Project," *The Maui News*, April 17, 1926; "Flood Threatens Belt Road Bridge," *The Maui News*, November 17, 1926.

Narrative Description (continued)

1923 estimates to complete the road to Hāna included pavement, the road was not paved when it was opened in 1926.[13]

Approximately six miles west of Hāna, near Upper Nāhiku, the Hāna Belt Road enters a coastal plain, which permits the alignment to run in a relatively straight path. The road passes over some minor gulches via a number of culverts and several bridges. Approximately four miles south of Hāna, the coastal plain ends and the road again passes through East Maui's challenging terrain. South of Ala'ala'ula Bridge, the road traverses through a series of rugged gulches similar to those near Ke'anae. South of Waikakoi Bridge, the road is benched into the high cliffs, around steep mountains and into the deep valley of Wailua Cove, before climbing back out of the valley. This portion of road is similar to the road near Honomanū Gulch near Ke'anae. Near Kīpahulu, the Hāna Belt Road passes through the scenic 'Ohe'o Gulch and Koukou'ai Gulch, which were spanned by concrete arch bridges in 1916 and 1911 respectively. It is uncertain when the belt road between Hāna and Kīpahulu was built, although it was being used for automobile traffic by the time the belt road was completed between Kailua and Hāna in 1926.[14]

## BRIDGES and CULVERTS

The Hāna Belt Road includes fifty-nine bridges and numerous culverts constructed between 1908 and 1947. Sixteen of these bridges are located on the Hāna Belt Road south of Hāna (Pi'ilani Highway, Route 31) and forty-three on the Hāna Belt Road between Hāna and Huelo

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[13] "Magnificent Scenery Unfolds Before Eyes of Travelers On Motor Trip Over New Road Leading To Hāna," *The Maui News*, December 22, 1926; "Honiron Tells Of Maui Road To Hāna," *The Maui News*, March 5, 1927; "Linking Up Maui," *The Maui News*, editorial, December 18, 1926; "Celebration Typical Of Maui," editorial, *The Maui News*, December 22, 1926.

[14] "Magnificent Scenery Unfolds Before Eyes of Travelers On Motor Trip Over New Road Leading To Hāna," *The Maui News*, December 22, 1926; "Maui Belt Road Circled," *The Maui News*, January 15, 1927.

Narrative Description (continued)

(Hāna Highway, Route 360). The narrowest bridges are approximately 12'-6" wide and the widest bridge is approximately 20'-6". More than half of the bridges are single span.

The majority of bridges in the district were constructed of reinforced cast-in-place concrete. County and territorial engineers utilized structural systems typical for the early twentieth century, including concrete arch, flat slab, girder, and simple tee-beam spans. Eighty percent of the concrete bridges were constructed between 1908 and 1929. Two unique bridges in the proposed historic district are rare surviving examples of masonry arch construction with basalt (lava rock). Many of the bridges have wingwalls, abutments, and piers constructed of concrete rubble masonry with basalt.

The majority of bridges featured two styles of parapet construction. Twenty-four bridges built between 1908 and 1915 had a solid-paneled, reinforced-concrete parapet with a peaked concrete rail cap. From 1916 to 1929, thirty-one bridges were built with a reinforced-concrete parapet of simple vertical concrete balusters and a square concrete rail cap.[15] The Pu'uhaoa Bridge, built in 1910, and the Waiokamilo Bridge, built in 1921, featured a more ornate open-rail parapet. Two bridges constructed in 1947, Kawaipapa and Wailua, are unique along the corridor, with concrete post-and-beam railings. Some of the bridges have construction dates inscribed on the parapets.

Masonry Arch Bridges

Two masonry arch bridges are located on the Hāna Belt Road south of Hāna, the Hāhālawe Bridge and Wai'ele Bridge. Constructed in 1910, both bridges utilized cut basalt blocks to build the abutments and arch rings. The bridges feature solid reinforced-concrete parapets with rail caps. "A.D. 1910" is inscribed on the outer parapet of each bridge. The bridge walls and rock abutments may date to different construction periods, with the concrete parapets being from a later date. The bridges retain their historic integrity, and feature fine craftsmanship and uncommon materials.[16]

[15] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, VI 191.
[16] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, VI 192.

Narrative Description (continued)

Concrete Arch Bridges

After 1904, concrete arch bridges were built in Hawai'i, often using standardized plans. Two types of concrete arch bridges were constructed in Hawai'i, solid and open spandrel. The solid-spandrel bridges were generally arch-deck bridges in which the traffic deck rested upon the arch. Between 1916 and 1926, several bridges of this type were built on Maui, including three bridges built along the Hāna Coast: 'Ohe'o Bridge, Hanawī Bridge, and Kūhiwa Bridge. The 'Ohe'o Bridge spans the scenic 'Ohe'o Gulch in Haleakalā National Park.

The open-spandrel concrete arch bridges demonstrated sophisticated engineering for their day and marked the evolution of concrete technology toward lighter, yet larger structures. Koukou'ai Bridge was the first open-spandrel arch bridge on Maui and is an excellent example of early twentieth century bridge construction in the Hawaiian Islands. Built in 1911, it spans a deep gorge just south of Haleakalā National Park. The other open-spandrel concrete arch bridge on the Hāna Coast is the Waikani Bridge, built in 1926 by the Akiona Contracting Company and designed by local architect William D'Esmond. The bridge dramatically crosses a deep gorge at the end of a long valley and is perhaps the most aesthetically pleasing bridge along the Hāna Belt Road.[17]

Concrete Deck Girder and Flat Slab Bridges

Concrete deck girder, including tee-beam spans and simple deck girder, were the most common types of bridge built along the Hāna Belt Road. Territorial and county engineers realized that these structures were both economical and strong over short spans. As a result, the government began using concrete deck bridges rather than arch or timber bridges after 1911. The majority of these bridges were built between 1911 and 1928. The 1912 Waikamoi Bridge is one of the earliest remaining examples of a concrete slab bridge in Hawai'i. Concrete slab bridges were cast on site using formwork built by local carpenters. The earlier bridges featured a solid-

[17] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, VI 192-194.

paneled reinforced-concrete parapet, with the later bridges utilizing simple vertical concrete balusters and a square concrete rail cap.[18] Three bridges date to the 1930s and two were built in 1947. The bridges constructed in 1947 utilized a post-and-beam design that is unique in the Hāna Belt Road corridor.

Culverts

Honolulu Iron Work's publication *Honiron* reported that numerous culverts along the Hāna Belt Road were necessary due to the to the demanding topography. During the 1920s, Calco Corrugated Culverts manufactured from Armco Ingot Iron were used in road construction.[19] Today, there are also culverts constructed of basalt, which are visible from the road. Many of the culverts are topped by lava rock walls on the road. Numerous culverts are not visible from the road and are covered by dense vegetation, which makes it difficult to establish an accurate count of culverts, both contributing and non contributing, along the Hāna Belt Road.

Many culverts along the Hāna Belt Road were built using concrete abutments, concrete slabs, and small concrete parapets. Example of this type of structure include: Culvert #1 between Nā'ili'ilihā'ele Bridge and 'O'opuola Bridge; Culverts #2, #3, and #4 near Ke'anae between Palauhulu Bridge and Waiokamilo Bridge; Culverts #9 and #10 located in the town of Hāna, south of Kawaipapa Bridge near the Hāna Fire Station; and Kalena Culvert north of Koukou'ai Bridge.

Four distinctive culverts (Culverts #5, #6, #7, and #8) constructed of concrete abutments, concrete slabs, and open parapets with simple vertical concrete balusters and concrete rail caps are located west of Hāna and east of Honomā'ele Bridge. These structures vary in span length from 5'-5" to 14'-7". Another distinctive culvert is located adjacent to (east of) Waiokamilo Bridge and spans the Hāna Highway at the "Y" intersection with Wailua Road. Its parapets were built to match those of the Waiokamilo Bridge. Two culverts with concrete abutments,

[18] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, VI 195-198.

[19] "Honiron Tells Of Maui Road To Hāna," *The Maui News*, March 5, 1927.

Narrative Description (continued)

concrete slabs, and solid parapets are Mo'omonui Culvert and Maluhiana'iwi Culvert. The construction dates are inscribed on each of these culverts.

To most observers, many of these culverts would be regarded as bridges, even though they are considered to be culverts by the State Department of Transportation. The State of Hawai'i Department of Transportation (DOT) considers a culvert to have a span of less than 10'-0" in accordance with Federal Highway Administration guidelines. Some of these structures measured longer than 10'.

VISTAS and VIEWS

There is hardly a place along the Hāna Belt Road where motorists are not rewarded with a variety of scenic views, including the ocean, mountains, sea cliffs, waterfalls, small villages, native and exotic vegetation, and traditional landscapes.

Although it is sometimes difficult to find pullouts along the narrow road, viewpoints are scattered throughout the Hāna Belt Road corridor. At most of the bridges, motorists can park on either side to view waterfalls and valleys. The most impressive waterfalls are located at the Waikani Bridge, 'Ohe'o Bridge, and Wailua Bridge. The Kīpahulu District of Haleakalā National Park includes the picturesque 'Ohe'o Gulch; its pools are a popular swimming spot. Elements of the East Maui Irrigation Company ditchworks can be seen at numerous bridges along the road, including the Kōpili'ula Bridge. Just after the Kōpili'ula Bridge, the Hāna Belt Road runs parallel to the irrigation ditch for a short distance. Scenic views are provided at Kaumahina State Wayside near Ke'anae and Wailua Valley Lookout Park above the village of Wailua. Pua'a Ka'a State Park is directly adjacent to the road near Nāhiku. Traditional cultural landscapes of taro patches are viewed in the villages of Ke'anae and Wailua. Native vegetation along the Hāna Belt Road includes hapu'u fern, ko'a, kukui, and pandanus forests. Most of the vegetation along the road, however, is exotic, with species such as bamboo and ginger impacting the landscape. On the coastal plain near the town of Hāna are large ranching areas that were formerly used for sugar cane cultivation.

Narrative Description (continued)

ALTERATIONS

Maintaining the Hāna Belt Road over the years has been no easy task. Since the earliest days, highway crews have struggled to keep up with damage caused by landslides, rocks, vegetation, downed trees, and floods. A journalist driving the road in 1940 referred to it as a "paved trail following the line of the ditch through the wild jungle."[20] The road was not completely paved until 1962. Over the years, lava-rock retaining walls and guardwalls were constructed in various locations along the road. These walls complement the historic character of the Hāna Belt Road.

In 1969, the State of Hawai'i transferred jurisdiction over the portion of the Hāna Belt Road between Hāna and Kīpahulu, which is now known as the Pi'ilani Highway, to the County of Maui. The Hāna Belt Road between Huelo and Hāna remained under the jurisdiction of the State of Hawai'i. The manner in which the road is maintained and preserved is significantly different between the two government agencies.

Although the state's portion of the Hāna Belt Road (Hāna Highway) between Huelo and Hāna retains its historic character and integrity, there have been alterations along the roadway. The most noticeable change to the state section of the Hāna Belt Road is the addition of w-beam and thrie-beam steel guardrails. It is unknown when the first guardrails were installed along the Hāna Belt Road. Concrete posts from earlier guardrails are still present along the roadside in some areas. Another change over the years has been road widening. There are still many segments of the road that are close to the original 16' width (especially on the cliffs near Ke'anae) and too narrow for cars to pass each other without yielding. The road, however, has been widened in most areas. In a few places where there is a more level topography, as through villages and near the beginning of the road near Huelo, the pavement is up to 22'-0" wide. In several locations, the Department of Transportation has used the new layers of asphalt during

[20] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, IV 14.

Narrative Description (continued)

repaving projects to super-elevate curves, particularly in the area east of Wailua. On many bridges, added layers of asphalt have significantly shortened the height of the bridge parapets and asphalt often fills part of the openings between bridge railings. Other changes along the road include painting some bridges and lava rock walls white to increase nighttime visibility, installation of numerous cautionary signs ("one-lane bridge," "narrow road"), reflector signs, and reflectors in the pavement. There have been a few jersey barriers added to the road, usually in places where the roadbed is being undermined alongside a steep cliff.

In the mid 1990s, the road west of Ke'anae that traverses the steep mountainside on the east side of Honomanū Gulch was widened. Work included blasting and removing a large section of the mountain near the road's summit to relocate the damaged road (which was collapsing into the ocean) away from the cliff. A rock wall which does not match the character of the typical basalt parapets seen along the Hāna Belt Road was built between the mountain and the road to catch falling rocks. Concrete gutters were installed and wide shoulders were added. The state Department of Transportation has installed concrete gutters and new culverts in other locations along the road, especially in the area between Wailua and Nāhiku.

The bridges along the Hāna Belt Road retain their historic character. One notable exception is Kawaipapa Bridge. Constructed in 1947, the bridge was altered in 1991 when a new bridge was added to the to the west end of the original structure. The 1991 bridge expansion was modeled on the original bridge, with replications of the post-and-beam bridge walls. The consequence of the expanded bridge was that the original bridge lost its historic integrity and is a non-contributing structure.

The County of Maui section of the Hāna Belt Road, now called the Pi'ilani Highway, has been subjected to fewer changes than the state-maintained portion of the belt road. The county has widened the road in a few locations, but for the most part, the pavement is no widr than 18'-0" and often averages 15' to 16' wide. Some guardrails have been added, but not to the same extent as the state-maintained section of the Hāna Belt Road.

Narrative Description (continued)

Although the Hāna Belt Road has been improved over the years, many of the bridges along the road have suffered from a lack of maintenance. Many of the bridge walls originally averaged 34" high. The walls are now shorter due to repeated layers of asphalt. In many cases, the additional asphalt is approximately 12" deep. The majority of the bridges in the Hāna corridor have weeds and vegetation growing in the concrete joints. A few bridge walls have been damaged by accidents. Many of the damaged walls were repaired to match the original design, although in a few cases, damage was not repaired neatly or was repaired with a non-matching element. An example of repaired bridge wall is the Waikani Bridge balustrades, which were severely damaged on the west end. Rather than restoring the end of the bridge wall, the repair consisted of building a rock wall in place of the balustrades. Another example of a bridge alteration that does not match the original structure is Nua'ailua Bridge. Altered in 1940, the *mauka* (mountain side) parapet was replaced with a non-matching concrete wall, most likely as a result of road widening.

The Hāna Belt Road retains its historic character and integrity. For the most part, the road is relatively unaltered. The road's alignment has not been changed since it was completed in 1926, although sections of the road on sea cliffs have collapsed into the ocean and necessitated reconstruction. The road retains its historic character and integrity in its rural location and narrow lanes. The bridges retain historic integrity with sharp and narrow approaches, original materials, and original design. Although a majority of the bridges are quite simple in appearance, several bridges are more elaborate and were designed and built by masters. The bridge designs and materials survive intact, with a few minor exceptions.

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section 7 Page 16

Name of property Hāna Belt Road
County and State Maui County, Hawai'i

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

Inventory of Contributing Bridges & Significant Culverts

Listed in geographical order east from Huelo:

Hōlua Bridge: constructed 1929; concrete tee-beam; one span, 48'-0"; total length 49'-0"; bridge width 16'-7"; approximate height above stream 28'-0".

Kailua Bridge: constructed 1929; concrete tee-beam; one span, 39'-0"; total length 40'-0"; bridge width 20'-6"; approximate height above stream 18'-0".

Nā'ili'ilihā'ele Bridge: constructed 1930; concrete tee-beam; three spans, 21'-6"; total length 64'-0"; bridge width 20'-3"; approximate height above stream 20'-6". Designer: County Engineer Office.

Culvert #1: concrete, one span, approximate length 9'-0".

'O'opuola Bridge: constructed 1925, altered 1931; concrete tee-beam; one span, 29'-0"; total length 30'-0"; bridge width 19'-8"; approximate height above stream 18'-6". Designer: County Engineer Office.

Makanali Bridge: constructed 1928; concrete slab; one span, 18'-0"; total length 18'-0"; bridge width 16'-6". Designer/builder: Department of Public Works.

Ka'aiea Bridge: constructed 1928; concrete tee-beam; one span, 20'-0"; total length 22'-0"; bridge width 16'-6"; approximate height above stream 15'-0". Designer/Builder: Department of Public Works.

Waikamoi Bridge: constructed 1912; concrete slab; two spans, 19'-0"; total length 41'-0"; bridge width 12'-9"; approximate height above stream 17'-0". Designer/Builder: Hugh Howell, Senior Engineer.

Narrative Description (continued)

Puohokamoa Bridge: constructed 1912; concrete tee-beam; two spans, 25'-0"; total length 56'-4"; bridge width 15'-3", approximate height above stream 13'-0".

Haipua'ena Bridge: constructed 1912; concrete slab; two spans, 16'-0"; total length 34'-6"; bridge width 12'-9"; approximate height above stream 11'-0". Designer/Builder: Hugh Howell, Senior Engineer.

Kōlea (Punala) Bridge: constructed 1911; concrete tee-beam; one span, 30'-0"; total length 34'-0"; bridge width 12'-8"; approximate height above stream 13'-0". Designer/Builder: Hugh Howell, Senior Engineer.

Honomanū Bridge: constructed 1911; concrete tee-beam; two spans, 23'-0"; total length 48'-0"; bridge width 12'-8"; approximate height above stream 15'-0". Designer/Builder: Hugh Howell, Senior Engineer.

Nua'ailua Bridge: constructed 1911/altered 1940; concrete tee-beam; one span, 22'-0"; total length 35'-0"; bridge width 24'-0"; approximate height above stream 13'-0". Designer/Builder: Joseph Matson, Senior Engineer.

Pi'ina'au Bridge: constructed 1916; concrete tee-beam; one span, 27'-0"; total length 28'-5"; bridge width 19'-0"; approximate height above stream 19'-0".

Palauhulu Bridge: constructed 1916; concrete tee-beam; one span, 30'-0"; total length 31'-0"; bridge width 19'-10"; approximate height above stream 20'-6".

Culvert #2: concrete, one span, approximate length 10'-0".

Culvert #3: concrete, one span, approximate length 15'-0".

Culvert #4: concrete, one span, approximate length 13'-0".

Narrative Description (continued)

Waiokamilo Bridge: constructed 1921, altered 1937; concrete tee-beam; one span, 20'-0"; total length 24'-0"; bridge width 22'-1"; approximate height above stream 11'-0". Designer: D. K. Kapohakimohewa.

Waiokamilo Culvert: concrete, one span, approximate length 10'-3".

Waikani Bridge: constructed 1926; concrete arch, open spandrel; one span, 82'-6"; total length 108'-0"; bridge width 17'-7"; approximate height above stream 32'-0". Designer: William D'Esmond. Builder: Moses Akiona.

West Wailuaiki Bridge: constructed 1926, altered 1937; concrete tee-beam; three spans, 24'-6"; total length 62'-6"; bridge width 19'-7"; approximate height above stream 15'-0". Designer: A. H. Wong.

East Wailuaiki Bridge: constructed 1926; concrete tee-beam; one span, 31'-0"; total length 34'-5"; bridge width 18'-4"; approximate height above stream 16'-0". Designer/builder: A. P. Low, County Engineer.

Kōpili'ula Bridge: constructed 1926; concrete tee-beam; two spans, 34'-2"; total length 76'-7"; bridge width 14'-4"; approximate height above stream 6'-0".

Pua'aka'a (Waiohue) Bridge: constructed 1926; concrete tee-beam; one span, 19'-6"; total length 20'-2"; bridge width 22'-0"; approximate height above stream 7'-8".

Waiohue Bridge: constructed 1926, altered 1937; concrete tee-beam; two spans, 16'-7"; total length 40'-0"; bridge width 13'-2"; approximate height above stream 10'-0".

Waiohuolua Bridge: constructed 1920, altered 1970; concrete tee-beam; one span, 15'-0"; total length 19'-0"; bridge width 12'-9"; approximate height above stream 8'-0". One bridge wall was replaced by w-beam guardrail; the original bridge wall is in the stream below.

Narrative Description (continued)

Bridge #2: constructed 1920; concrete tee-beam; one span, 16'-7"; total length 20'-0"; bridge width 12'-6"; approximate height above stream 8'-0".

Pa'akea Bridge: constructed 1920, altered 1937; concrete tee-beam; two spans, 16'-0"; total length 40'-0"; bridge width 12'-9"; approximate height above stream 8'-0".

Kapā'ula Bridge: constructed 1926; concrete tee-beam; two spans, 21'-0"; total length 49'-0"; bridge width 16'-0"; approximate height above stream 51'-0".

Hanawī Bridge: constructed 1926; concrete arch, solid spandrel; one span, 36'-0"; total length 61'-0"; bridge width 20'-4"; approximate height above stream 19'-0".

East Hanawī Bridge: constructed 1926; concrete tee-beam; one span, 18'-5"; total length 22'-10"; bridge width 15'-11"; approximate height above stream 15'-0".

East Hanawī Culvert: concrete, one span, approximate length 11'-8".

Makapipi Bridge: constructed 1926; concrete tee-beam; two spans, 22'-5"; total length 39'-10"; bridge width 16'-0"; approximate height above stream 12'-0".

Kūhiwa Bridge: constructed 1926; concrete arch, solid spandrel; one span, 36'-6"; total length 60'-0"; bridge width 16'-4"; approximate height above stream 35'-0". Builder: County Engineer's Office.

Kupukoi Bridge: constructed 1926; concrete tee-beam; one span, 21'-5"; total length 24'-7"; bridge width 16'-0"; approximate height above stream 15'-0".

Kahalaowaka Bridge: constructed 1926; concrete tee-beam; one span, 22'-4"; total length 24'-5"; bridge width 15'-0"; approximate height above stream 9'-0".

Narrative Description (continued)

Pupape-Manawaikeae Bridge: constructed 1926; concrete tee-beam; one span, 20'-8"; total length 24'-4"; bridge width 16'-2"; approximate height above stream 16'-0".

Kahawaihapapa Bridge: constructed 1922; concrete tee-beam; three spans, 17'-0"; total length 60'-0"; bridge width 16'-0"; approximate height above stream 15'-0". Builder: County Engineer's Office.

Kea'ā'iki Bridge: constructed 1921; concrete tee-beam; one span, 20'-10"; total length 22'-10"; bridge width 16'-1"; approximate height above stream 27'-0". Builder: County Engineer's Office.

West Waioni Bridge: constructed 1920; concrete tee-beam; one span, 24'-5"; total length 29'-5"; bridge width 16'-6"; approximate height above stream 15'-0".

Waioni Bridge: constructed 1920; concrete tee-beam; one span, 20'-7"; total length 24'-5"; bridge width 15'-11"; approximate height above stream 10'-0".

Lanikele Bridge: constructed 1917; concrete tee-beam; two spans, 22'-4"; total length 51'-6"; bridge width 16'-0"; approximate height above stream 13'-0".

Helele'ike'ōhā Bridge: constructed 1917; concrete tee-beam; one span, 23'-7"; total length 28'-6"; bridge width 16'-1"; approximate height above stream 12'-0".

'Ula'ino Bridge: constructed 1914; concrete tee-beam; two spans, 18'-10"; total length 39'-7"; bridge width 16'-0"; approximate height above stream 12'-0".

Mokulehua Bridge: constructed 1908; concrete tee-beam; three spans, 14'-0"; total length 48'-7"; bridge width 13'-11"; approximate height above stream 21'-0".

Oilowai Bridge: constructed 1914; concrete tee-beam; one span, 20'-7"; total length 22'-10"; bridge width 16'-2"; approximate height above stream 22'-0". Builders: Wilson & McCandless.

Narrative Description (continued)

Honomā'ele Bridge: constructed 1924; concrete tee-beam; two spans, 20'-4"; total length 38'-10"; bridge width 16'-1"; approximate height above stream 14'-0". Builders: County Engineer's Office.

Culvert #5: concrete, one span, approximate length 17'-6".

Culvert #6: concrete, one span, approximate length 12'-0".

Culvert #7: concrete, one span, approximate length 5'5".

Culvert #8: concrete, one span, approximate length 13'-0".

Culvert #9: concrete, one span, approximate length 14'-7".

Culvert #10: concrete, one span, approximate length 14'-0".

Mo'omonui Culvert: constructed 1911, concrete, one span approximate length 8'-3".

Haneo'o (Kaholopo) Bridge: constructed 1900, altered 1917; concrete slab; two spans, 10'-0"; total length 22'-6"; bridge width 15'-1".

Kapi'a (Kahawaiokapia) Bridge: constructed 1915, altered 1931; concrete slab; three spans, 17'-6"; total length 58'-4"; bridge width 14'-4"; approximate height above stream 17'-0". Designer/Builder: Wilson and McCandless.

Waiohonu Bridge: constructed 1915; concrete tee-beam; five spans, 18'-6"; total length 97'-6"; bridge width 15'-0"; approximate height above stream 14'-0". Designer/Builder: Wilson and McCandless.

Narrative Description (continued)

Papa'ahawahawa Bridge: constructed 1913; concrete tee-beam and concrete slab; two spans, 22'-0"; total length 40'-4"; bridge width 14'-5"; approximate height above stream 9'-0". Designer/Builder: County Engineer's Office.

Ala'ala'ula Bridge: constructed 1915; concrete slab; one span, 30'-0"; total length 54'-0"; bridge width 12'-6"; approximate height above stream 22'-0".

Waikakoi Bridge: constructed 1911; concrete slab; two spans, 14'-0"; total length 33'-6"; bridge width 15'-4"; approximate height above stream 18'-0".

Pa'ihi Bridge: constructed 1911; concrete slab; one span, 36'-6"; total length 42'-4"; bridge width 13'-9"; approximate height above stream 10'-0".

Wailua Bridge: constructed 1947; concrete tee-beam; one span, 60'-0"; total length 66'-1"; bridge width 14'-0"; approximate height above stream 17'-0".

South Wailua (Honolewa) Bridge: constructed 1911; concrete slab; two spans, 25'-0"; total length 57'-0"; bridge width 15'-2"; approximate height above stream 26'-0".

Pu'uhoao Bridge: constructed 1910; concrete tee-beam; one span, 20'-0"; total length 23'-2"; bridge width 12'-9"; approximate height above stream 13'-0".

Waiele (Paehala) Bridge: constructed 1910; masonry arch; one span, 20'-0"; total length 25'-0"; bridge width 12'-6"; approximate height above stream 7'-0".

Kakiweka (Mahalawa) Bridge: constructed 1910; concrete slab; one span, 28'-6"; total length 30'-10"; bridge width 13'-10"; approximate height above stream 16'-0".

Hāhālawe Bridge: constructed 1910; masonry arch; one span, 22'-0"; total length 25'-0"; bridge width 14'-9"; approximate height above stream 10'-0".

Narrative Description (continued)

Maluhiana'iwi Culvert: constructed 1910; concrete, one span, approximately 13'-9".

Pua'alu'u Bridge: constructed 1910; concrete slab; two spans, 15'-0"; total length 32'-10"; bridge width 14'-5"; approximate height above stream 10'-0".

'Ohe'o Bridge: constructed 1916; concrete arch, solid spandrel; one span, 58'-0"; total length 77'-0"; bridge width 14'-5"; approximate height above stream 44'-0".

Kalena Culvert: concrete, one span, approximate length 13'-5".

Koukou'ai (Kaukau'ai) Bridge: constructed 1911; concrete arch, open spandrel; one span, 31'-10"; total length 58'-0"; bridge width 15'-2"; approximate height above stream 34'-0".[21]

[21] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation,* prepared for the State of Hawai'i, Department of Transportation, Highways Division. Draft. (Honolulu), 1996, VI 196-198. All bridge widths and culvert span lengths were measured by Dawn Duensing as part of field work in December 2000.

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Section 8 Page 1

Name of property Hāna Belt Road
County and State Maui County, Hawai'i

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

The Hāna Belt Road achieves state and local significance in the areas of engineering, transportation, commerce, and social history under criteria A and C. The construction of bridges and a road to Hāna between 1900 and 1947 was a major engineering achievement, as the County of Maui and private contractors benched a road into precipitous mountainsides and through the wilderness of East Maui. Fifty-nine of the bridges built between 1908 and 1947 remain along the route as an example of bridge engineering and construction in Hawai'i during the early twentieth century. The completion of an automobile route to Hāna in 1926 ended that community's isolation from the rest of Maui. The road opened East Maui to settlement, agricultural enterprises, and tourism. The Hāna Belt Road is the best remaining intact example of the old belt road system in Hawai'i. The Hāna Belt Road retains historic integrity in its original road alignment, narrow lanes, bridges, and spectacular setting along Maui's northeast coast.

## Engineering

A 1905 Superintendent of Public Works report noted that road construction in the Hāna District was through "very rough country."[22] The plan for a belt road around East Maui was popular with Maui officials and businessmen, but took decades to complete due to high costs and construction difficulties. Building the Hāna Belt Road was an expensive and difficult proposition due to the challenging topography. Miles of road were blasted out of the mountainsides and numerous bridges were required to carry the road across streams and gulches. Construction was complicated by heavy vegetation, torrential rains, and landslides.

The majority of bridges in the Hāna District were built using construction methods and materials typical in Hawai'i during the early twentieth century. Most of the Hāna District bridges (eighty percent) were constructed prior to 1930. County and territorial engineers utilized common structural systems, including concrete arch, flat slab, girder, and simple tee-beam spans. The majority of bridges along the Hāna Belt Road were simple but functional, constructed with tee-beam spans and simple deck girders. The 1912 Waikamoi Bridge is one of

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[22] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation,* IV 12.

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Name of property Hāna Belt Road
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Narrative Statement of Significance (continued)

the earliest remaining examples of a concrete slab bridge in Hawai'i. Reinforced concrete was the most prevalent construction material due to the corrosive nature of the Pacific Ocean's salt air and the presence of wood-boring insects that made the use of steel and timber bridges less practical in Hawai'i than in the mainland United States. The Loan Fund Commission, established in 1911 to oversee belt road projects, decided that concrete would be used on Hawai'i's bridges rather than steel. The Commission observed that the concrete was more expensive in the beginning, but realized that the increased cost was justified due to concrete's durability as well as lower maintenance and repair costs. The use of reinforced concrete was an indication of the commitment of the Territory of Hawai'i and Maui County governments to building permanent public works improvements.[23]

Five concrete arch bridges on the Hāna Belt Road remain as excellent examples of early twentieth century bridge construction in the Hawaiian Islands. These bridges used the most modern engineering technology of their day. Today, the bridges make a significant statement regarding Maui's civic pride during the early twentieth century. The open-spandrel concrete arch bridges demonstrated sophisticated engineering and marked the evolution of concrete technology toward lighter yet larger structures. These bridges were constructed for their strength and permanence, although only a few remain in Hawai'i. Koukou'ai Bridge near Kīpahulu was the first open-spandrel arch bridge on Maui and one of the earliest to be built in Hawai'i. The 'Ohe'o Bridge, a solid spandrel concrete arch, spans the scenic 'Ohe'o Gulch in Haleakalā National Park and was declared eligible for the National Register of Historic Places in 1977 as part of the Kīpahulu Historic District (50-17-299). The open-spandrel Waikani Bridge was designed by Maui architect William D'Esmond and built by a well-known contractor, Moses Akiona.[24] D'Esmond designed Maui's County Office Building, built in 1927;

[23] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, VI 191, 195; V 10-12.

[24] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, VI 192-194.

Narrative Statement of Significance (continued)

Pā'ia School, 1926; St. Anthony's School, 1925; and numerous residences on Maui.[25]

Two unique bridges on the Hāna Belt Road are rare surviving examples of masonry arch construction with basalt, Hāhālawe Bridge and Wai'ele Bridge. Fewer than ten masonry arch bridges remain in the state of Hawai'i. Constructed in 1910, both bridges utilized cut basalt blocks for the abutments and arch rings. Basalt arch construction was common in Hawai'i prior to 1898. The bridge walls and rock abutments may date to different construction periods, with the concrete parapets being from a later date. The bridges retain their historic integrity, with each featuring fine craftsmanship and uncommon materials.[26]

The bridges along the Hāna Belt Road present a visual record and timeline of bridge construction technology and innovation on Maui and in Hawai'i. Many bridges are unique due to the use of vernacular materials (basalt). In addition to the masonry arch bridges, a number of bridges used basalt for the construction of abutments, piers and wingwalls. The majority of bridges, however, were built with the latest in construction technology, reinforced concrete. The bridges were built during a period when formal engineering expertise in bridge building was first introduced in Hawai'i and are good examples of the Territory of Hawai'i's progressive highway system. Each county in the territory had a County Engineer's Office, within which was a bridge design office. Many of the bridges on the Belt Road were designed by the County Engineer's Office and the engineers proved themselves to be not only technologically skilled, but also sensitive to aesthetics. In many cases, the bridges also demonstrate the work of skilled builders. The masonry arch and concrete arch bridges show a high degree of detailing and workmanship. Together, the bridges played a integral role in the development of belt roads on

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[25] *The Maui News*, December 4, 1926, section 8; "Drawings and Floor Plans of Proposed St. Anthony School Building," *The Maui News*, March 28, 1925; Dawn E. Duensing, *Historic Architectural Survey of Wailuku, Maui, Hawai'i*, prepared for the County of Maui Department of Planning, 1993, 20.
[26] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, VI 192.

Narrative Statement of Significance (continued)

Maui as well as on other Hawaiian Islands. Today, the Hāna Belt Road bridges remain as the highest concentration of unaltered and stylistically consistent historic bridges in Hawai'i.[27]

Talented local engineers were responsible for the design and construction of the Hāna Belt Road. A substantial portion of the road and bridge design as well as the majority of engineering work was completed by County Engineer's Office. Hugh Howell, who was appointed Maui County engineer in 1906 and again in 1914, had served as an engineer with the Loan Fund Commission and participated in the early survey work for the Hāna Belt Road. He also designed several bridges on the Hāna Belt Road while serving as a county engineer. The Hugh Howell Engineering Company worked on Hāna Belt Road contracts once construction began. Paul Low was Maui County Engineer from 1918 until 1928 and was responsible for supervising the two major phases of Hāna Belt Road construction between 1923 and 1926. He and his county crews used Howell's earlier survey work as the basis for their road design and built the most spectacular sections of road between Kailua and Nahikū. During his tenure as county engineer, Low also supervised a number of Maui's other public works projects, including the County Office Building in 1924. A. H. Wong, who designed the West Wailuaiki Bridge, was appointed county engineer in 1928 to replace Low. After his service with the county, he worked on the construction of Haleakalā Highway and became an engineering supervisor with the Works Progress Administration project building Maui Airport.[28]

Notable local contractors built portions of the Hāna Belt Road and several bridges. The Honolulu firm Wilson and McCandless built the 1914 section of road near Nahikū and Oilowai Bridge. Another important local builder, Moses Akiona, was born in Ke'anae and established his contracting firm, Moses Akiona, Ltd., in 1920. In addition to Waikani bridge, Akiona's firm worked on other Maui projects, including Malulani Hospital, Kula Sanitarium, and the Lahaina

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[27] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, IV 7-9.

[28] Howell noted in *The Maui News*, January 10, 1914; January 9, 1915; and February 4, 1916. Low noted in *The Maui News*, February 15, 1918; October 3, 1928; in Duensing, *Historic Architectural Survey*, 35. Wong noted in *The Maui News*, October 17, 1928.

Narrative Statement of Significance (continued)

Courthouse. His business eventually grew to become one of the largest contracting firms in the territory. In the 1960s, Akiona and his sons built a section of the H-1 freeway on O'ahu.[29]

Transportation & Commerce

Belt road projects are a significant element in the transportation history of Maui. This road-building program was concurrent with the strategy of all the major Hawaiian Islands to develop belt road systems. By 1900, Mauians were concentrating on the Hāna section of the belt road, calling for a good wagon road to connect central Maui and Hāna. "What the Central Pacific was to California, and what the Panama Canal would be to the Islands," *The Maui News* emphasized in 1903, was "relatively what a good road all the way from Pā'ia to Hāna would mean to Maui." A road to Hāna was believed necessary for the economic development of East Maui and its success in sugar, minor industries, and small-scale farming.[30] Prior to the completion of a road from central Maui to Hāna, travel to East Maui villages was by steamship or an unpaved wagon and horse trail. The route along the Hāna Coast was often impassable due to heavy rain. Various sections of the coastal road were built by 1914, but the lack of a continuous road to Hāna was considered a nuisance. One Maui legislator complained that Maui was "the only island on which you cannot traverse by road around it."[31]

The improved transportation provided by the Hāna Belt Road was considered essential for Maui's commercial development. *Maui News* editorials noted that East Maui had plenty of fertile land and emphasized that a road to Hāna would open the area to settlement. Mauians predicted that a road through East Maui to Hāna would make homestead lands available and would also facilitate trade between East Maui and the rest of the island. Benefits to be obtained from improved transportation to Hāna included increased tax revenues, population, and

[29] Spencer Mason Architects, *State of Hawai'i Historic Bridge Inventory and Evaluation*, VI 191, V 14.

[30] *The Maui News*, editorial, April 25, 1903.

[31] "Roads First Need View of Fassoth," *The Maui News*, February 11, 1921.

Narrative Statement of Significance (continued)

production. Roads connecting the various parts of the island, including Hāna, were viewed as essential to Maui as arteries were to the human body. Some Mauians believed that the Hāna Belt Road project was the most needed road in the territory and noted that Maui was ten years behind the other islands in its belt road construction.[32]

The opening of the Hāna Belt Road in 1926 was a major transportation milestone for Maui. *The Maui News* labeled it "the greatest road making achievement in the Island, one fraught with tremendous difficulties in engineering and construction work." The new road eliminated Hāna's reliance on the weekly steamer for its transportation and communication needs to the outside world. With the new road, the trip to Hāna could now be made overland on one's own timetable rather than by the schedule of a steamer or horse trip. Instead of a round-trip journey of a week, the trip was shortened to 3.5 hours each way.[33]

Another significant commercial aspect of the Hāna Belt Road was tourism. By the 1920s, Maui's businessmen and civic leaders recognized the importance of scenic roads and considered them to be commercial enterprises, without which Maui could not develop its tourism industry. As early as 1912, the Hāna Belt Road, as well as a proposed route to the summit of Haleakalā, were planned as the centerpieces of Maui's road-building projects. Mauians realized that building a road to Hāna would open up some of the finest scenery in the Hawaiian Islands and put Maui "on the tourist map." One civic group claimed that a magnificent scenic highway could be one of Maui's greatest assets. Local businessmen argued that tourism would not thrive on Maui unless the island had good roads to accommodate its visitors. One Mauian claimed that the mere mention of the term "horseback ride" scared tourists from visiting Maui. A businessman pointed out that tourists expected to travel comfortably by automobile and were not always willing to climb into the saddle to go sightseeing. Mauians realized that more tourists visited

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32 *The Maui News*, editorials, June 28, 1902; November 15, 1902; December 27, 1902; March 7, 1903; July 4, 1903; "Advocates Belt Road: Maui is Ten Years Behind in Road Matters," *The Maui News*, November 6, 1909.

33 "Linking Up Maui," *The Maui News*, editorial, December 18, 1926; "Maui Takes Day Off for Road Opening," *The Maui News*, December 22, 1926.

Narrative Statement of Significance (continued)

the Big Island of Hawai'i because that island's attractions, especially Kilauea Volcano, were accessible by automobile, while Maui's attractions remained almost inaccessible. The Hāna Belt Road was a significant piece of a road-building program that aimed to make Maui's scenic attractions easily available. Maui's plans to develop a tourist industry received a tremendous boost with the completion of the Hāna Belt Road in 1926 and the Haleakalā Highway in 1935.[34] These two roads were Maui's crowning achievements in transportation public works projects during the twentieth century. Both highways were important commercial enterprises and remain the island's most popular scenic drives today. The Hāna Belt Road has become an attraction in itself, with tourists driving the route to experience the narrow road and its historic bridges, not just the scenery. Motorists appreciate this unique route that is relatively unchanged from the 1920s and provides an opportunity to visit a rural area that is uniquely Hawaiian.

Social History

The immediate impact of opening the Hāna Belt Road was to end East Maui's centuries of isolation from the rest of Maui. Prior to the belt road's construction, many on Maui maintained that Hāna might as well be on another island.[35] Indeed, in ancient times, Hāna was more connected to communities on the island of Hawai'i that were more easily accessible by canoe. Until the Hāna Belt Road was completed, many Mauians had never seen the 'other side' of Maui, whether they lived in West Maui or East Maui.

The completion of the Hāna Belt Road is a testament to civic pride on Maui during the early twentieth century. The County Act in 1905 authorized the establishment of local governments

[34] "No Ke'anae Highway Says Governor," *The Maui News*, July 18, 1914; "The Key to Progress," *The Maui News*, May 16, 1914; "Road to Ke'anae Now Maui's Best Bet To Draw Tourist Travel, *The Maui News*, October 7, 1925; Connect Maui Up," *The Maui News*, February 11, 1921; Duensing, Dawn E., *Haleakalā Highway, HAER No. HI-52.* [Washington D.C.], National Park Service, Historic American Engineering Record, 1999.

[35] "New Comer Doesn't Like Our Road Policy," *The Maui News*, August 14, 1915; "Connect Maui Up," *The Maui News*, February 11, 1921.

Narrative Statement of Significance (continued)

on Hawai'i's four major islands. On Maui, numerous public works projects during the next thirty years demonstrated residents' keen sense of civic awareness. Substantial public buildings were constructed in the county seat of Wailuku, including the Wailuku Courthouse (built in 1907), County Office Building (1924), Wailuku Library (1928), and Territorial Building (1931). In the Lahaina District, the courthouse was renovated and the Pali Highway was improved in 1925. Prominent schools were built, including the Wailuku Public School in 1905 and Maui High School in 1921, both designed by well-known architect C. W. Dickey. Many of the structures built during this intense period of civil works projects were designed by prominent architects, including Dickey, H. L. Kerr, and William D'Esmond.[36]

The Hāna Belt Road was part of this great, early twentieth century public works movement. First suggested in 1895, the Maui Board of Supervisors sought funding for the road as early as 1900. Although numerous bridges were constructed on the Hāna Belt Road starting in 1908, little money was available for road construction or improvement. Mauians lobbied Hawai'i's governors and legislators for decades before receiving funding to build the dream of an automobile road to Hāna. A 1923 estimate of $692,000 to complete the road was a substantial undertaking for an island with limited resources and a population of approximately 38,000, most of whom were agricultural laborers. Maui's leaders found ways to finance the Hāna Belt Road through the sale of territorial bonds and the savings gained from the use of public employees and prison labor rather than private contractors. In early 1923, the county government demonstrated its determination to go ahead with the project by purchasing a steam shovel and drill and assigning a gang of twenty men to begin work on the new road, even though the territorial legislature had not yet approved the sale of bonds for the project. The county established a prison camp in Kailua to house the fifty convicts expected to work on the road. Within months, leaders purchased another steam shovel and drill so that work could proceed from both ends of the road. Funding eventually was secured from the territorial and federal governments.[37]

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[36] Duensing, *Historic Architectural Survey*, 5-12, 19-20.

[37] "Belt Road Plans Further Advanced," *The Maui News*, February 10, 1923; "Belt Road Funds Knotty Problem Chamber Finds," *The Maui News*, March 9, 1923; "Belt Road Work Will Be

Narrative Statement of Significance (continued)

A number of bridges on the Hāna Belt Road were significant civic statements for Maui. Altogether, the concrete bridges along the road demonstrated the county's commitment to permanent and modern improvements. Several bridges were visually prominent both in style and location, and also demonstrated fine workmanship. Bridges such as Waikani, Koukou'ai, and 'Ohe'o indicated both the technical and aesthetic sophistication of the community in which they were built. Many of the bridges are examples of exceptional work by important local builders, including Johnny Wilson of Honolulu (in partnership with McCandless) and Moses Akiona. Waikani Bridge is one of the most aesthetically pleasing bridges along the road and was a collaboration of Akiona and D'Esmond. Many other bridges were not quite so grand, but also made pleasing visual statements, including Hanawī Bridge, Kūhiwa Bridge, Waiokamilo Bridge, and Pu'uhaoa Bridge.

The extent of economic development predicted by *Maui News* writers never happened, although many homes and small farms were built along the Hāna Belt Road corridor over the years as land became available and accessible. Census statistics indicate that the Hāna District was home to 3,100 residents in 1920 before the road opened. In 1930, population in the district declined to 2,436. Agriculture remained the dominant activity, with the communities of Ke'anae and Wailua noted for their production of *taro* and rice. Despite the improvements in transportation and the possibilities for more development, the Hāna District's population dwindled to 1,495 by 1950.[38]

The lack of road improvements over the past seventy years has not only preserved the historic character of the Hāna Belt Road, but has also helped to maintain the historic rural character of the Hāna District itself. The absence of an easily-traveled, high-speed traffic artery has served to impede substantial development, which has subsequently allowed Hāna and other communities in East Maui to remain rural. There are no fast food chains, chain stores, strip malls or

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Started By Maui County," *The Maui News*, March 10, 1923; "Belt Road Project Is To Go Forward At Once," *The Maui News*, May 26, 1923, Robert C. Schmitt, *Historical Statistics of Hawai'i*, Honolulu: The University Press of Hawai'i, 1977, 13.

[38] Robert C. Schmitt, *Historical Statistics of Hawai'i*, 13-14.

Narrative Statement of Significance (continued)

sprawling subdivisions along the Hāna Belt Road. Travelers along the Hāna Coast are served by the occasional roadside stand and must drive all the way to Hāna for conveniences such as groceries, gas, and restaurants. With a sizable population of residents of Hawaiian ancestry, Hāna is often cited as Maui's "most Hawaiian community." The Hāna community has worked together to "Keep Hāna Hawaiian," as a bumper sticker urges, and preserve its rural lifestyle and values. In the 1990s, residents rallied against the approval of major developments such as a golf course and an adjacent residential community. Many Hāna residents believe that the narrow, winding, and slow Hāna Belt Road is a means to "Keep Hāna Hawaiian."

Today, a trip along the Hāna Belt Road allows a motorist to see much of what would have been viewed in 1926 when the road opened: a spectacular thoroughfare chiseled out of cliffs, passing through huge gullies and past waterfalls, while always presenting stunning views of the Pacific Ocean and East Maui's natural features. Ke'anae still practices traditional ways, with *taro* being farmed and a Hawaiian lifestyle. A three-room rural school is still in operation in Ke'anae. The section of road above the Wailua Valley, which was admired by Engineer Paul Low, still travels along a narrow ledge for a mile, providing a panoramic view of *taro* patches in the quaint village of Wailua below. Along the way motorists view the historic irrigation ditches, weirs, and intakes still used for Maui's sugar industry. The journey to Hāna provides an opportunity to experience a rural way of life that is uniquely Hawaiian and also a way of life that is becoming more rare in the Hawaiian Islands.

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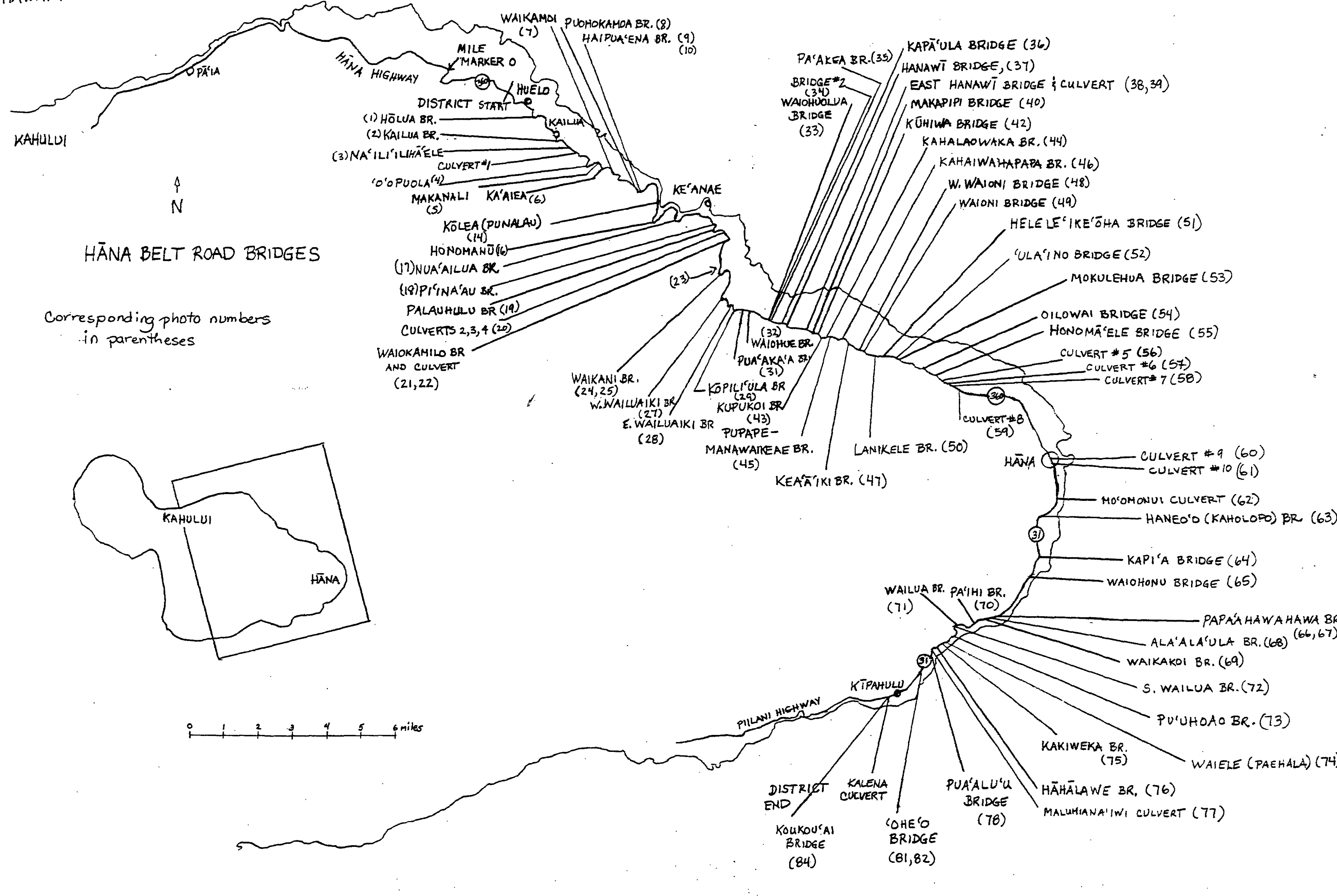
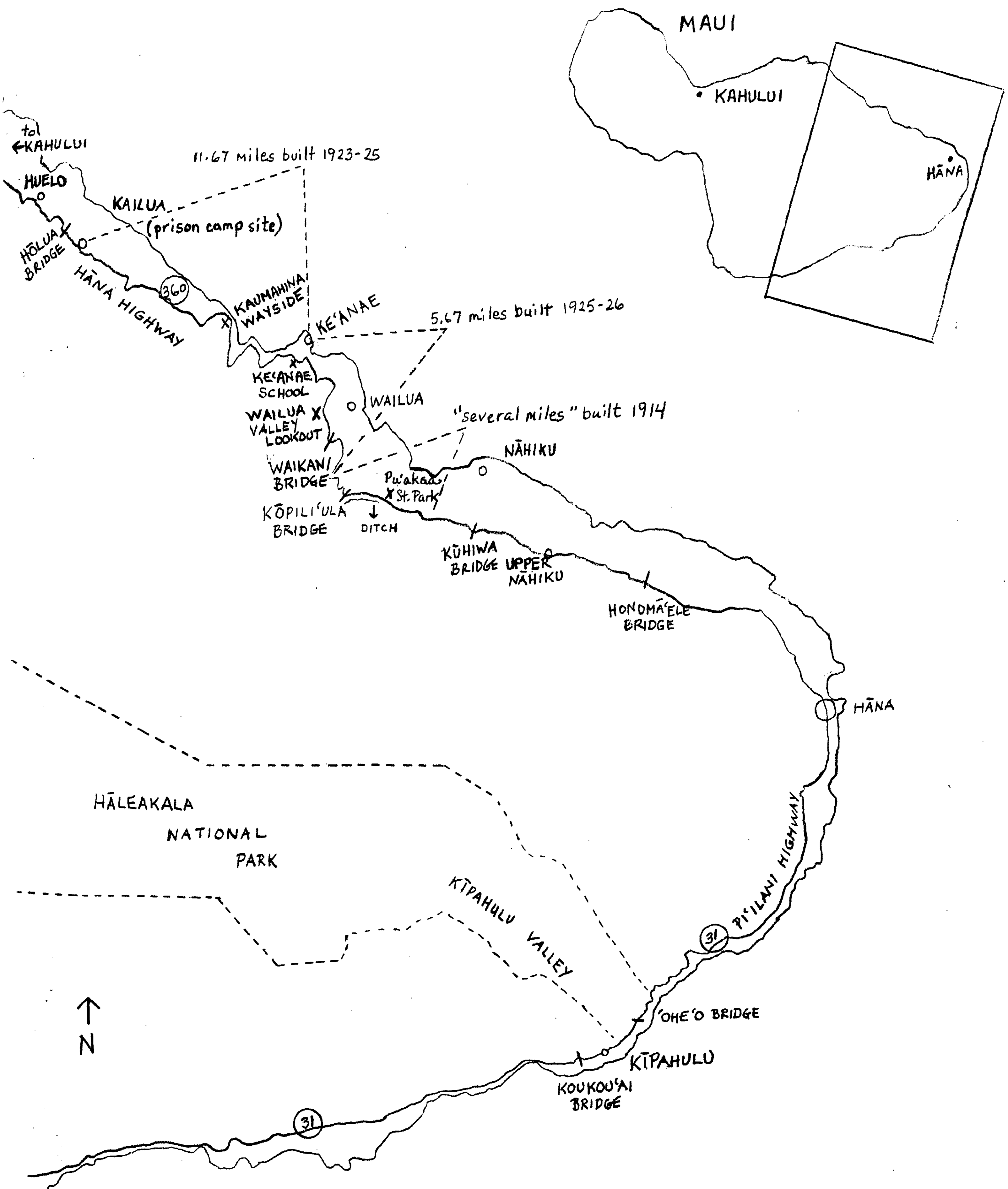
*The Maui News,* 1900-1950.

MAUI COUNTY, HAWAI'I



Hāna Belt Road
Maui County, Hawai'i



## SUPPLEMENTARY LISTING RECORD

**NRIS Reference Number: 01000615** **Date Listed: 06/15/01**

**Property Name:** **Hana Belt Road** **County: Maui** **State: HI**

**Multiple Name: N/A**

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This property is listed in the National Register of Historic Places in accordance with the attached nomination documentation subject to the following exceptions, exclusions, or amendments, notwithstanding the National Park Service certification included in the nomination documentation.

Sarah D Pope 6/15/01
(for) **Signature of the Keeper** **Date of Action**

---

**Amended Items in Nomination:**
The following amendments are hereby made to the documentation and confirmed with the HI SHPO:

Section 5. Classification
The road itself, not just the bridges and culverts, should be counted as a contributing structure. Therefore, the total number of contributing structures is changed to 74. The one (1) non-contributing structure remains the same.

Section 10. Geographical Data
The acreage of the property was not provided. The correct acreage of the district is 153 acres.

**DISTRIBUTION:National Register property file;Nominating Authority**

United States Department of the Interior
National Park Service

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Name of property Hāna Belt Road
County and State Maui County, Hawai'i

All photographs, with the exception of photograph #84 (Koukou'ai Bridge), were taken by Dawn E. Duensing. Dawn E. Duensing has all negatives except for that for #84, which is located at the State of Hawai'i Department of Transportation.

1. Hāna Belt Road
2. Maui County, Hawai'i
3. Dawn E. Duensing
4. November 19, 2000
5. Dawn E. Duensing
6. Hōlua Bridge, view looking east
7. Photograph #1

4. November 19, 2000
6. Kailua Bridge, view looking east
7. Photograph #2

4. November 19, 2000
6. Nā'ili'ilihā'ele Bridge, view looking west
7. Photograph #3

4. November 19, 2000
6. 'O'opuola Bridge, view looking west
7. Photograph #4

4. November 19, 2000
6. Makanali Bridge, view looking west
7. Photograph #5

4. November 19, 2000
6. Ka'aiea Bridge, view looking west, with ditchworks in the background
7. Photograph #6

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7. Photograph #7

4. November 19, 2000
6. Puohokamoa Bridge, view looking *makai* (towards the ocean)
7. Photograph #8

4. November 19, 2000
6. Haipua'ena Bridge, view looking *mauka* (toward the mountain or inland)
7. Photograph #9

4. November 19, 2000
6. Haipua'ena Bridge, view looking east
7. Photograph #10

4. November 19, 2000
6. View from road looking east, just east of Kaumahina State Wayside
7. Photograph #11

4. December 2, 2000
6. Aerial view of road on west side of Honomanū Valley.
7. Photograph #12

4. November 26, 2000
6. West side of Honomanū Valley portion of road as viewed from the road on Honomanū Valley's east side
7. Photograph #13

4. December 2, 2000
6. Kōlea (Punala) Bridge, looking *mauka*
7. Photograph #14

4. November 26, 2000
6. Hāna Belt Road through Honomanū Gulch, between Kōlea Bridge and Honomanū Bridge, looking east
7. Photograph #15

4. November 26, 2000
6. Honomanū Bridge, looking *mauka*
7. Photograph #16

4. November 26, 2000
6. Nua'ailua Bridge, looking east
7. Photograph #17

4. November 26, 2000
6. Pi'ina'au Bridge, looking west
7. Photograph #18

4. November 26, 2000
6. Palauhulu Bridge, looking *mauka*
7. Photograph #19

4. November 26, 2000
6. Culverts #2 & #3, looking west, culvert #4 is of similar construction.
7. Photograph #20

4. November 26, 2000
6. Waiokamilo Bridge, looking west
7. Photograph #21

4. December 2, 2000
6. Waiokamilo Bridge, *makai* wall. Waiokamilo Culvert, adjacent to bridge, has identical walls.
7. Photograph #22

4. November 26, 2000
6. View of road on cliff's edge above Wailua Village, after Wailua Valley lookout, looking west
7. Photograph #23

4. December 3, 2000
6. Waikani Bridge, looking *mauka* from west side of bridge
7. Photograph #24

4. November 26, 2000
6. Road view of Waikani Bridge, looking west
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6. View from road on east side of Wailuanui Valley, east of Waikani Bridge; overlooking Wailua Village, with Hāna Belt Road above Wailua visible on left
7. Photograph #26

4. November 26, 2000
6. West Wailuaiki Bridge, looking *mauka* from east side of bridge
7. Photograph #27

4. November 26, 2000
6. East Wailuaiki Bridge, looking east
7. Photograph #28

4. November 26, 2000
6. Kōpili'ula Bridge, looking east
7. Photograph #29

4. November 26, 2000
6. Ditch running alongside Hāna Belt Road after Kōpili'ula Bridge
7. Photograph #30

4. November 26, 2000
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7. Photograph #31

4. November 26,2000
6. Waiohue Bridge, looking east/ *makai*
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4. November 26, 2000
6. Bridge #2, looking east, Pa'akea Bridge is in background
7. Photograph #34

4. January 27, 2001
6. Pa'akea Bridge, with Bridge #2 in background, looking west
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4. December 2, 2000
6. Hanawī Bridge, from west side of bridge looking *mauka*
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4. December 2, 2000
6. East Hanawī Culvert, looking east/ *mauka*
7. Photograph #39

4. December 2, 2000
6. Makapipi Bridge, looking *mauka*
7. Photograph #40

4. December 2, 2000
6. View of Hāna Belt Road east of Makapipi Bridge, looking east
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4. December 2, 2000
6. Kūhiwa Bridge, looking east
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4. December 2, 2000
6. Kupukoi Bridge, looking east
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4. December 2, 2000
6. Kahalaowaka Bridge, view looking *mauka*
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4. December 2, 2000
6. Pupape-Manawaikeae Bridge, view looking east
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4. December 2, 2000
6. Kahawaihapapa Bridge, looking east
7. Photograph #46

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6. Kea'ā'iki Bridge, looking east
7. Photograph #47

4. December 2, 2000
6. West Waioni Bridge, looking east
7. Photograph #48

4. December 2, 2000
6. Waioni Bridge, looking east
7. Photograph #49

4. December 2, 2000
6. Lanikele Bridge, looking west
7. Photograph #50

4. December 2, 2000
6. Helele'ike'ōhā Bridge, looking east
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4. December 2, 2000
6. 'Ula'ino Bridge, looking west
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4. December 3, 2000
6. Mokulehua Bridge, looking east
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6. Oilowai Bridge, looking east
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6. Honomā'ele Bridge, looking west
7. Photograph #55

4. December 3, 2000
6. Culvert #5, looking west
7. Photograph #56

4. December 3, 2000
6. Culvert #6, looking *makai*
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Name of property Hāna Belt Road
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6. Haneo'o (Kaholopo) Bridge, looking *mauka*
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4. December 3, 2000
6. Kapi'a (Kahawaiokapia) Bridge, looking north
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6. Waiohonu Bridge, looking south
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7. Photograph #66

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6. Papa'ahawahawa Bridge, road view looking north
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4. December 3, 2000
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7. Photograph #69

4. December 3, 2000
6. Pa'ihi Bridge, looking *mauka*
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4. December 3, 2000
6. Wailua Bridge, looking north
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4. December 3, 2000
6. South Wailua (Honolewa) Bridge, looking *mauka*
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4. December 3, 2000
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6. Waiele (Paehala) Bridge, looking north
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6. Maluhiana'iwi Culvert, looking *mauka*
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4. December 3, 2000
6. Pua'alu'u Bridge, looking *mauka*
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Name of property Hāna Belt Road
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4. December 3, 2000
6. Roadscape south of Pua'alu'u Bridge, looking north
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6. 'Ohe'o Bridge, looking *makai*
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6. 'Ohe'o Bridge, looking *mauka*
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4. December 3, 2000
6. Roadscape south of 'Ohe'o Bridge in Haleakalā National Park, looking north
7. Photograph #83

3. August Riccio, Hawai'i Heritage Center
4. 1990
5. State of Hawai'i Department of Transportation
6. Koukou'ai (Kaukau'ai) Bridge, looking *mauka*
7. Photograph #84

# Appendix C. Cultural Impact Assessment for the Proposed Improvements of the Waikakoi and South Wailua Bridges. Honua Consulting. May 2025.

**Cultural Impact Assessment Report for the Proposed Improvements of the Waikakoi and South Wailua Bridges**

Wailua Ahupuaʻa, District of Hāna, Island of Maui

(2) 1-5-009:009, (2) 1-5-009:010, (2) 1-5-009:011, (2) 1-5-009:012, (2) 1-5-008:001, (2) 1-5-008:002, (2) 1-5-008:004, (2) 1-5-010:008, and Hana Highway Right-Of-Way

Prepared for

HDR

Prepared by

Honua Consulting

May 2025

## Author and Lead Researchers

Trisha Kehaulani Watson, J.D., Ph.D.

## Assistant Researchers and Authors

Torie Hoʻopiʻi

## Note on Hawaiian language usage

In keeping with other Hawaiian scholars, we do not italicize Hawaiian words. Hawaiian is both the native language of the pae ʻāina of Hawaiʻi and an official language of the State of Hawaiʻi. Some authors will leave Hawaiian words italicized if part of a quote; we do not. In the narrative, we use diacritical markings to assist our readers, except in direct quotes, in which we keep the markings used in the original text. We provide translations contextually when appropriate.

## Front Cover Credit

County of Maui
    1887    Registered Map 1763. State of Hawaii.

## Executive Summary

The County of Maui, Department of Public Works proposes to replace two structurally deficient historic bridges along the Hana Highway in the District of Hāna, Island of Maui. The Waikakoi and South Wailua Bridge Replacement Project (Federal Aid Project No. Br-0360(015)) involves the complete replacement of two existing single-lane bridges with new structures constructed in their current locations.

The project involves complete removal and replacement of both existing bridges while maintaining their single-lane design and 16-foot width between railings. Temporary bypass bridges will be constructed makai (seaward) of each existing structure to maintain traffic flow during construction. Ground disturbance will include removal of center piers from both bridges and installation of new foundation systems.

The replacement bridges will incorporate context-sensitive design elements to maintain visual compatibility with the historic district, including MASH-compliant aesthetic concrete railings similar to the original design, Hawaii Cement Rubble Masonry approach barriers, and commemorative inscriptions marking the construction date on downstream parapets. The project will adversely impact the historic bridges. That impact will be mitigated through consultation with the State Historic Preservation Division.

Research in preparation of this report involved a thorough search of Hawaiian language documents including, but not limited to, the Bishop Museum mele index and Bishop Museum archival documents, such as the Hawaiian language archival cache. All Hawaiian language documents were reviewed by Hawaiian language experts for relevant information that could be included in the report. Documents considered relevant to this analysis are included herein and translations are provided when appropriate to the discussion. Summaries of interviews and information on other oral testimonies are also provided. An impact analysis and *Ka Paʻakai* analysis are both included in this CIA.

Based on the extensive identification effort and thorough analysis undertaken for this assessment, which included interviews with cultural experts and area practitioners, there is a negligible potential for the project to have a direct, adverse impact on valued cultural, historical, or natural resources in the project area or larger geographic extent. Additionally, there is a negligible potential for the project to have a direct, adverse impact on traditional or customary Native Hawaiian rights in the project area or in the larger geographic extent.

Any potential for an adverse indirect or cumulative impact in the larger geographic extent can be minimized through the conditions and best management practices (BMPs)

recommended herein. These conditions and BMPs constitute feasible action that may be reasonably taken to protect Native Hawaiian rights and cultural rights in the larger geographic extent.

The project as currently conceptualized would not adversely impact traditional or customary practices. There are wahi pana (storied places) within the overall property in which the project area is located. Still, it does not appear that traditional or customary Native Hawaiian rights are currently exercised within the parcels that make up the project area. Still, it is important to note that traditional and customary practices are actively and widely exercised in the larger Hāna moku.

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## Abbreviations and Acronyms

AIS: Archaeological Inventory Survey
AMSL: Above Mean Sea Level
APE: Area of Potential Effect
BMP: Best Management Practice
CIA: Cultural Impact Assessment
DLNR: Department of Land and Natural Resources
EIS: Environmental Impact Statement
HAR: Hawaii Administrative Rules
HC&S: Hawaiian Commercial & Sugar Company
HDOT: Hawaii Department of Transportation
HRS: Hawaii Revised Statutes
ICH: Intangible Cultural Heritage
ILK: Indigenous Local Knowledge
LCA: Land Commission Award
MAGIS: Maps Aerial Photographs and GIS
MDWS: Maui Department of Water Supply
MGD: Million Gallons Per Day
NARA: U.S. National Archives and Records Administration
NRHP: National Register of Historic Places
NCSS: National Cooperative Soil Series
PD: Planned Development
ROI: Range of Influence
SHPD: State Historic Preservation Division
SIHP: State Inventory of Historic Places
SOI: U.S. Secretary of the Interior
TEK: Traditional Ecological Knowledge
TMK: Tax Map Key
UNESCO: The United Nations Educational, Scientific and Cultural Organization
USACE: U.S. Army Corps of Engineers
USGS: The United States Geological Survey

## 1.0 Project Description

The County of Maui, Department of Public Works proposes to replace two structurally deficient historic bridges along the Hana Highway in the District of Hāna, Island of Maui. The Waikakoi and South Wailua Bridge Replacement Project (Federal Aid Project No. Br-0360(015)) involves the complete replacement of two existing single-lane bridges with new structures constructed in their current locations.

The project involves complete removal and replacement of both existing bridges while maintaining their single-lane design and 16-foot width between railings. Temporary bypass bridges will be constructed makai (seaward) of each existing structure to maintain traffic flow during construction. Ground disturbance will include removal of center piers from both bridges and installation of new foundation systems.

The replacement bridges will incorporate context-sensitive design elements to maintain visual compatibility with the historic district, including MASH-compliant aesthetic concrete railings similar to the original design, Hawaii Cement Rubble Masonry approach barriers, and commemorative inscriptions marking the construction date on downstream parapets.

### 1.1 Description of the Project Area

The project is situated within the culturally significant Hana Highway corridor, a roadway that has served as a vital connection for Native Hawaiian communities for generations. The Waikakoi Stream Bridge (No. 26) is located near milepost 45.44, approximately 3.51 miles south of Haneoo Road, while the South Wailua Stream Bridge (No. 23) is positioned near milepost 44.63, approximately 4.29 miles south of Haneoo Road. The project encompasses Tax Map Keys (2) 1-5-009:009 through 012, (2) 1-5-008:001, 002, and 004, (2) 1-5-010:008, and portions of the Hana Highway Right-of-Way.

The Area of Potential Effect (APE) covers approximately 2.73 acres total, with 1.21 acres surrounding Waikakoi Bridge and 1.52 acres surrounding South Wailua Bridge. This area includes permanent and temporary bridge construction zones, roadway approaches, and construction staging areas.

Both bridges are recognized as significant historic properties under the Hawaiʻi State Historic Bridge Inventory and Evaluation (MKE Associates, 2013) and serve as contributing elements within the Hana Highway Historic Bridge District. The bridges meet significance criteria under HAR §13-276 for their historical importance (Criterion "a") and architectural significance (Criterion "c"). The Hana Highway itself represents a critical transportation corridor that has facilitated cultural exchange, subsistence practices, and community connections for Native Hawaiian families throughout East Maui for over a century.

The streams crossed by these bridges—Waikakoi and South Wailua—hold particular cultural importance as freshwater sources that have sustained Native Hawaiian communities and continue to support traditional cultural practices including gathering of native plants, fishing, and spiritual ceremonies.

The Wailua ahupuaʻa is a relatively small land division located within the Hāna District. It lies between the ahupuaʻa of Muʻolea to the north and Puʻuhaoa to the south, along the southeastern coastline of East Maui. Due to its limited size and less intensive historical use compared to neighboring ahupuaʻa, Wailua (Hāna) has received less attention in archival records, land commission documents, and ethnographic studies.

Unlike the lush, rain-fed valleys of Koʻolau's northern Wailua, which supported extensive wetland taro cultivation, the southern Wailua is part of a more rugged, volcanic terrain shaped by recent lava flows. The landscape here is generally drier, with fewer perennial water sources and limited lowland agricultural areas. Historical land use in this region was likely centered on small-scale subsistence farming, dryland agriculture, and coastal resource gathering rather than intensive loʻi systems. Its modest geographic footprint and lack of major historic developments have contributed to the relative scarcity of detailed documentation.

Despite this, Wailua (Hāna) remains culturally significant. It is part of a continuous ancestral landscape where Native Hawaiian families maintained coastal settlements, practiced traditional resource management, and perpetuated cultural practices tied to land and sea. Though less studied, this ahupuaʻa still holds value as a link in the cultural and ecological chain of Hāna’s storied coastline.

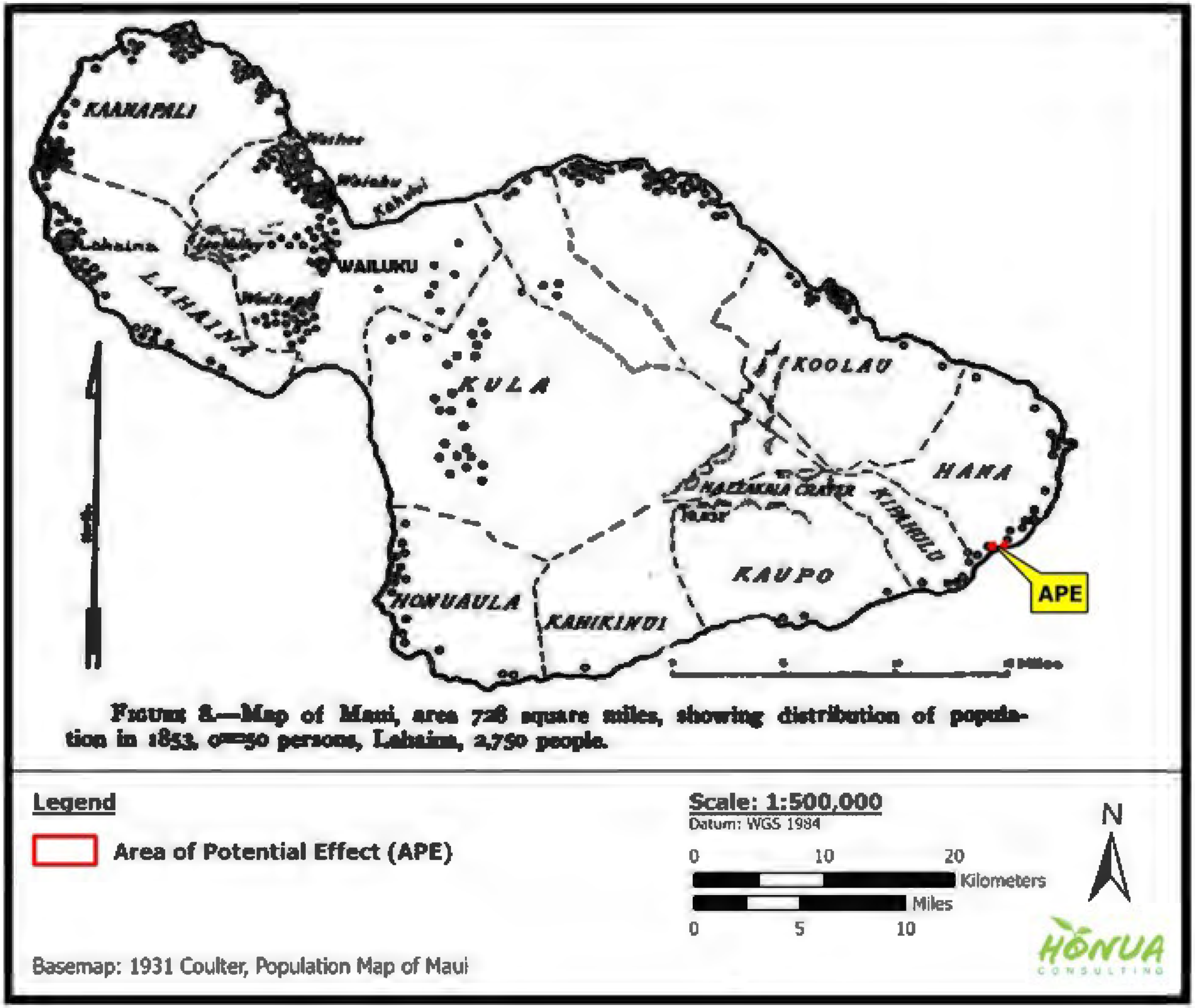


Figure 1. Regional Location Map

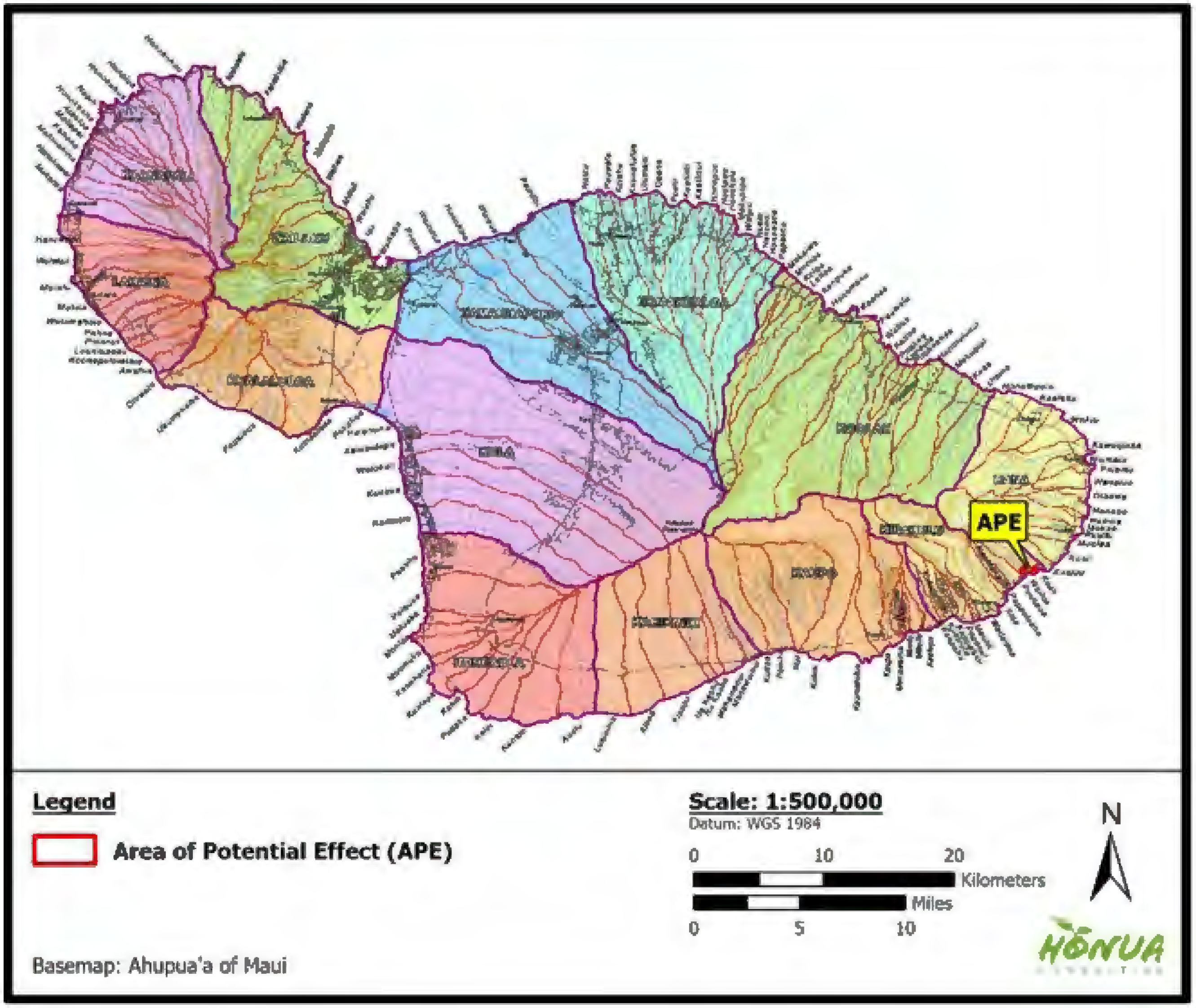


Figure 2. Location Map

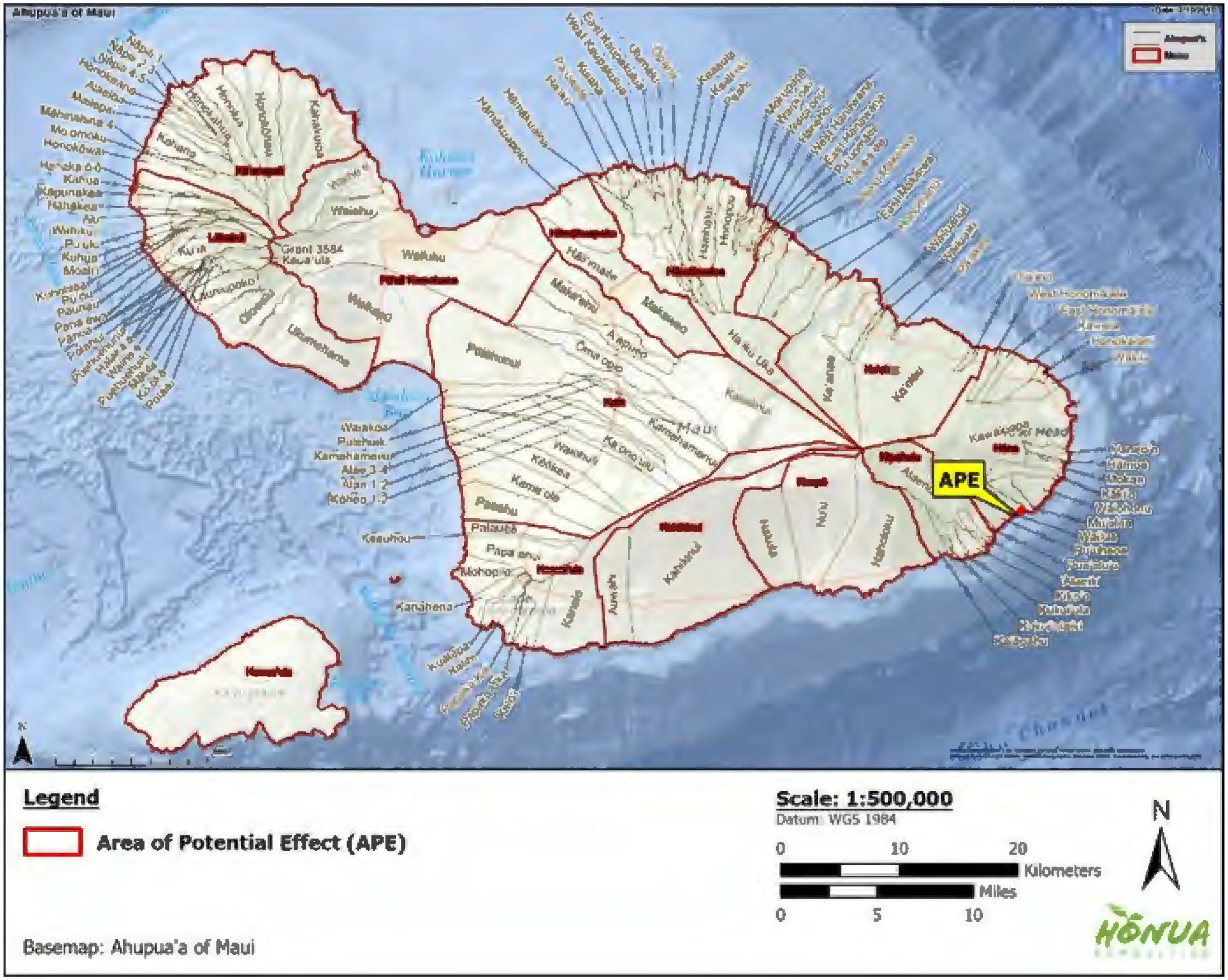


*Figure 3. Tax Map Keys showing project area*


*Figure 4. USGS Topography Map showing project area*

## 1.2 Background

The State and its agencies have an affirmative obligation to preserve and protect Native Hawaiians' customarily and traditionally exercised rights to the extent feasible.[1] State law further recognizes that the cultural landscapes provide living and valuable cultural resources where Native Hawaiians have and continue to exercise traditional and customary practices, including hunting, fishing, gathering, and religious practices. In *Ka Pa'akai*, the Hawai'i Supreme Court provided government agencies an analytical framework to ensure the protection and preservation of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development interests. This is accomplished through:

1) The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area;
2) The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
3) The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

The appropriate information concerning the project area has been collected, focusing on areas near or adjacent to the project area. A thorough analysis of this project and potential impacts to cultural resources, historical resources, and archaeological sites is included in this survey.

This ethnographic survey provides an overview of cultural and historic resources in the project area using thorough literature review, community and cultural practitioner consultation, and high-level, project-specific surveys. This survey focuses on identifying areas in which disturbance should be avoided or minimized to reduce impacts to historic properties or culturally important features. The paramount goal is to minimize impact through avoidance of sensitive areas and mitigation if avoidance is not feasible.

## 1.3 Geographic Extent

The geographic extent for impacts to cultural resources and historic properties includes the project area and localized surroundings. This CIA also reviews some of the resources

[1] Article XII, Section 7 of the Hawai'i State Constitution, *Ka Pa'akai O Ka 'Āina v. Land Use Commission*, 94 Haw. 31 [2000] (Ka Pa'akai), Act 50 SLH 2000.

primarily covered by the regulatory review. It primarily researches and reviews the range of biocultural resources identified through historical documents, traditional knowledge, information found in the Hawaiian language historical cache, and oral histories and knowledge collected from cultural practitioners and experts.

The best practice for ethnographic surveys is to define a geographic extent beyond the identified or typical boundaries of the geographic project area. The recommended area is typically the size of the traditional land area (ahupuaʻa) or region (moku), but this can be larger or smaller depending on what best helps to identify the resources appropriately.

The geographic extent of the survey is based on the position that the "Project Area" is part of an existing or former cultural landscape or cultural landscapes, and that therefore it is most appropriate to set and study the proposed alternatives within that cultural context. This approach is not to imply that an eligible cultural landscape currently exists in the region.

### 1.4 Goal of Ethnographic Survey

This survey, along with the archaeological work being conducted by Honua Consulting, looks to fulfill the requirement of taking into account the Project's potential impacts on historic and cultural resources and, at a minimum, describe: a) any valued cultural, historic, or natural resources in the area in question, including the extent to which traditional and customary native Hawaiian rights are exercised in the area, b) the extent to which those resources – including traditional and customary native Hawaiians rights – will be affected or impaired by the Project; and c) the feasible action, if any, to be taken to reasonably protect native Hawaiian rights if they are found to exist.

### 1.5 Nomenclature Challenges with Wailua, Hāna, Maui

It is not unusual to encounter challenges in researching place names in Hawaiʻi due to the recurrence of names across the islands. Wailua poses a unique challenge. While there is a well-known Wailua on Kauaʻi, ahupuaʻa named Wailua exists in two distinct areas on the island of Maui—one located on the north coast near Keʻanae, and another farther south. The north Wailua is often referred to in historic text as Wailua (Koʻolau) for its location within the Koʻolau moku. The southern ahupuaʻa is sometimes referred to as Wailua, Hāna, because of its location within the Hāna ahupuaa. Although these two places share a name, they represent remarkably different ecological, cultural, and historical landscapes shaped by their geography and natural resources.

#### 1.5.1 Wailua (Koʻolau)

This Wailua is situated in the Koʻolau District of East Maui, nestled along the verdant, windward side of the island. It lies just beyond the well-known taro-growing region of Keʻanae and is part of a series of deeply incised valleys nourished by abundant rainfall from the northeast tradewinds. Lush forests, perennial streams, waterfalls, and an enduring tradition of wetland agriculture characterize the region. According to ethnographic records and firsthand documentation by Handy and Handy (1972), Wailua and its neighboring ahupuaʻa such as Wailuanui were historically significant for the cultivation of *kalo* (taro) in irrigated loʻi. These communities exemplified the ingenuity of Hawaiian land and water management systems, using intricate ditch systems to direct stream water through terraced fields.

Wailua near Keʻanae was not only agriculturally productive but culturally rich. Oral histories recorded in *Wai o ke Ola* (Maly & Maly 2001) describe the continued occupancy and cultivation of the area well into the 20th century, with families maintaining close connections to the land and stream-fed farming practices. The presence of Catholic missionaries and churches in the 19th century supported this continuity of settlement and helped protect the community from displacement, as happened in other parts of the island.

### 1.5.2 Wailua (Hāna)

In contrast, Wailua on the southern slopes of Haleakalā belongs to a drier and more arid region. Located within the larger Hāna District, this Wailua is closer to Kaupō and Kahikinui, districts known for their rugged and relatively dry climate. Unlike its northern counterpart, this area does not benefit from the same level of orographic rainfall. As a result, its historical agricultural practices centered on dryland farming rather than irrigated loʻi systems. Crops such as ʻuala (sweet potato), maiʻa (banana), and kō (sugarcane) were grown using methods adapted to intermittent rain and nutrient-poor soils.

This southern Wailua lacks major taro systems. Instead, it was historically part of an economy based more on mobility and seasonal use, including temporary shelters for gathering upland and coastal resources. Its people adapted to a harsher climate by practicing rotational planting and maintaining wide networks of exchange across the region. While deeply rooted in cultural traditions, this landscape functioned differently, reflecting the diversity of ahupuaʻa systems across Maui.

Though both places bear the name "Wailua," they are ecologically and culturally distinct. Wailua near Keʻanae is a quintessential example of Hawaiʻi's wetland taro agriculture and permanent settlement patterns, while Wailua (Hāna) to the south reflects the adaptive strategies of Hawaiian dryland resource use. These differences illustrate the diversity of traditional Hawaiian land management and highlight how place names alone cannot capture the full depth of a region's historical and cultural identity.

*Figure 5. Registered Map 880 (Hawaii State Archives)*

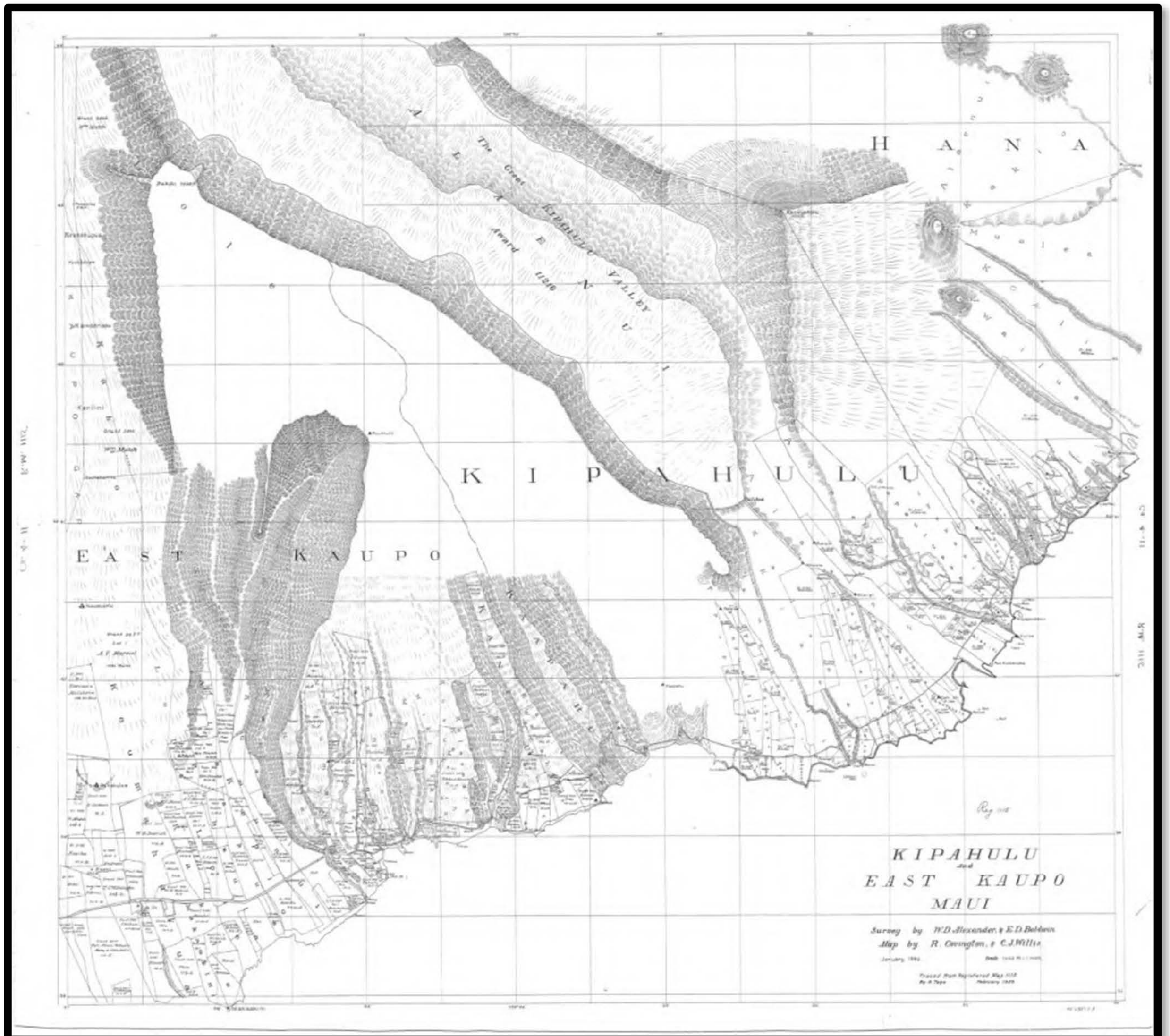


*Figure 6. Registered Map 1115 (Hawaii State Archives)*

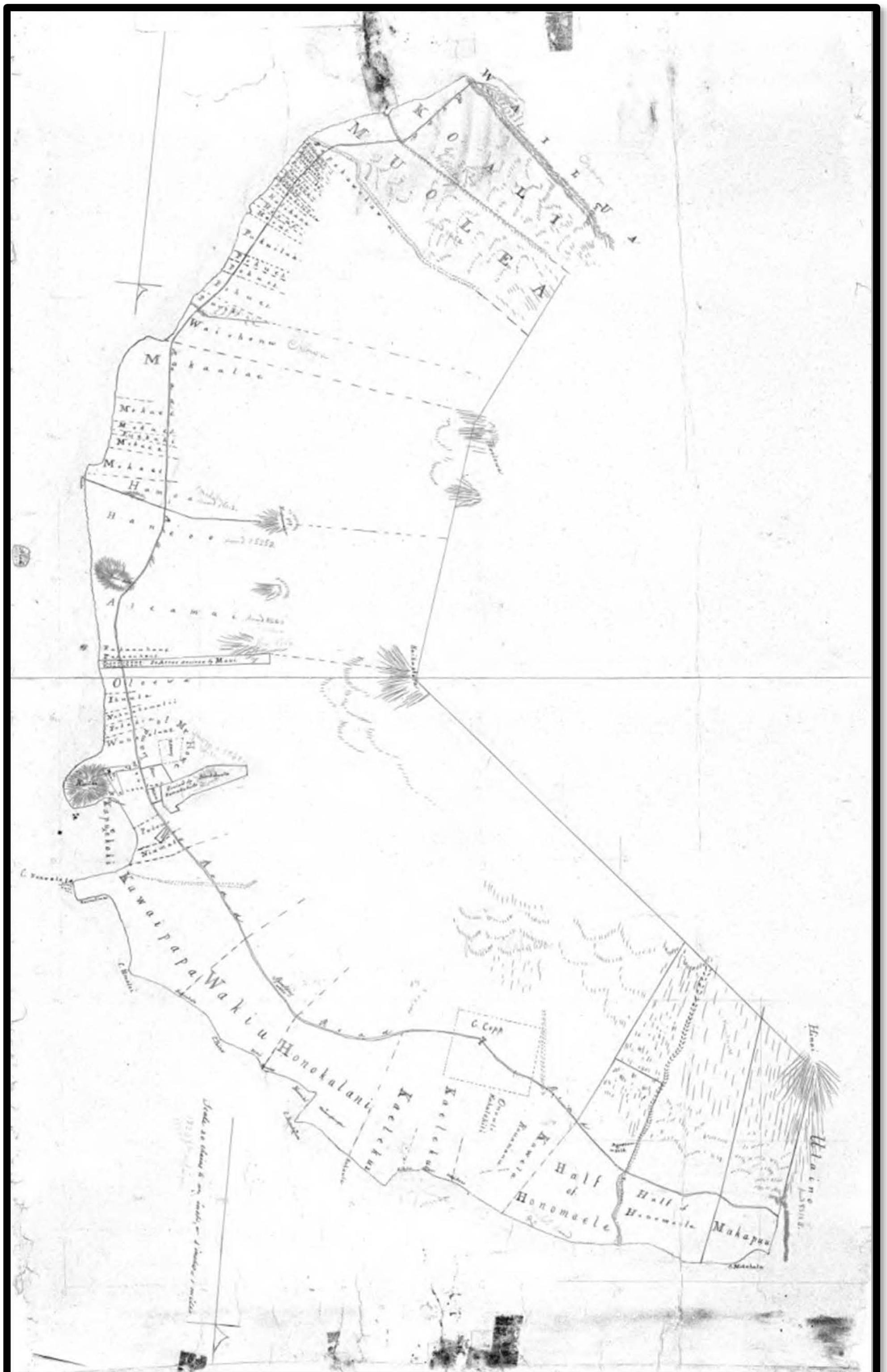

*Figure 7. Registered Map 1053 (Hawaii State Archives)*

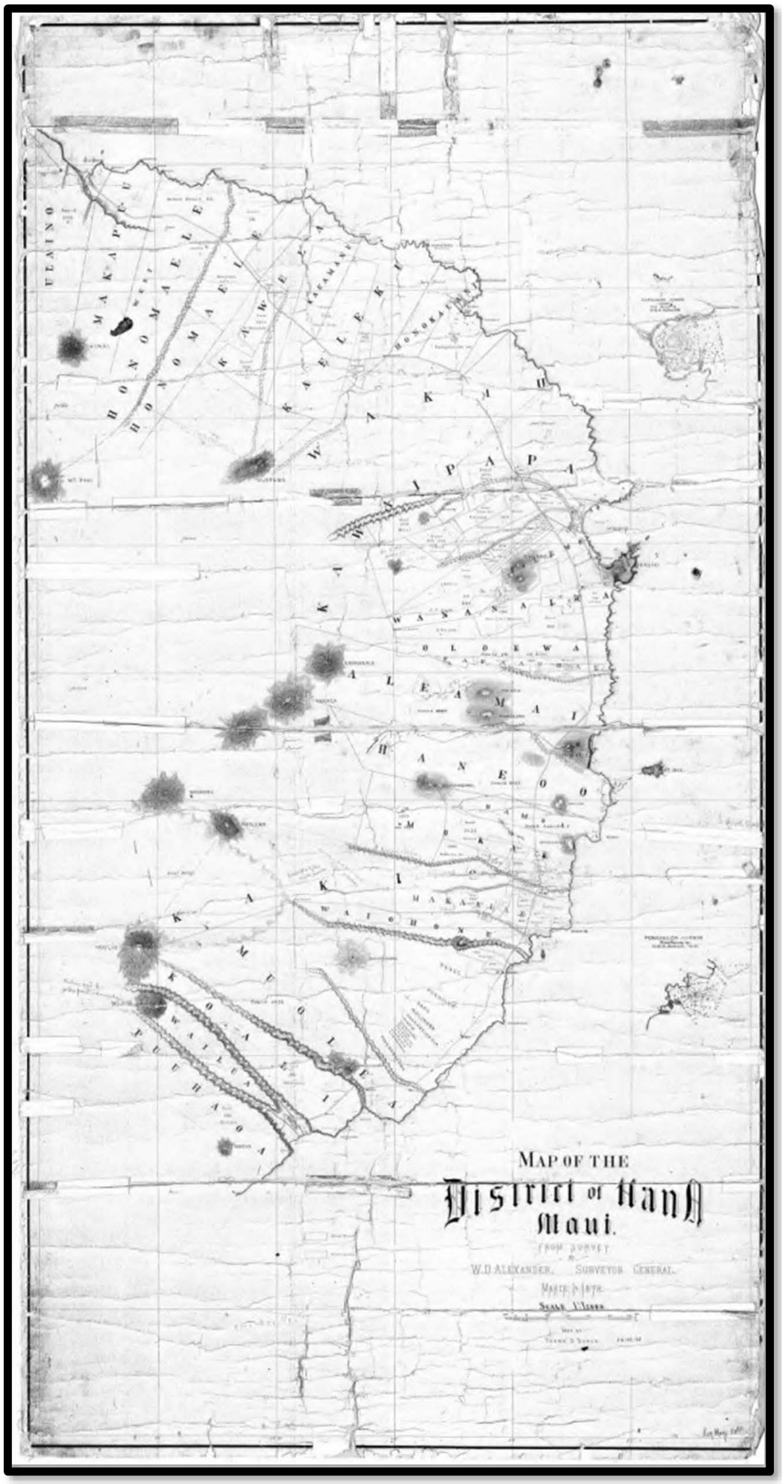


*Figure 8. Registered Map 1290 (Hawaii State Archives)*

## 2.0 Methodology

The approach to developing the ethnographic survey is as follows:

1) Gather Best Information Available
   a) Gather historic cultural information from stories and other oral histories about the affected area to provide cultural foundation for the report;
   b) Inventory as much information as can be identified about as many known cultural, historic, and natural resources, including previous archaeological inventory surveys, CIAs, etc. that may have been completed for the possible range of areas; and
   c) Update the information with interviews with cultural or lineal descendants or other knowledgeable cultural practitioners.
2) Identify Potential Impacts to Cultural Resources
3) Develop Reasonable Mitigation Measures to Reduce Potential Impacts
   a) Involve the community and cultural experts in developing culturally appropriate mitigation measures; and
   b) Develop specific Best Management Practices (BMPs), if any are required, for conducting the project in a culturally appropriate and/or sensitive manner as to mitigation and/or reduce any impacts to cultural practices and/or resources.

While numerous studies have been conducted on this area, very few have effectively utilized Hawaiian language resources and Hawaiian knowledge. This appears to have impacted modern understanding of this location, as many of the relevant documents are native testimonies given by Kanaka Hawaiʻi (Hawaiians) who lived on this land.

While hundreds of place names and primary source historical accounts (from both Hawaiian and English language narratives) are cited on the following pages, it is impossible to tell the whole story of these lands in any given manuscript. A range of history, spanning the generations, has been covered. Importantly, the resources herein are a means of connecting people with the history of their communities—that they are part of that history. Knowledge of place will, in turn, promote appreciation for place and encourage acts of stewardship for the valued resources that we pass on to the future.

Background research for the literature review was conducted using materials obtained from the State Historic Preservation Division (SHPD) library in Kapolei and the Honua Consulting, LLC report library. On-line materials consulted included the Ulukau Electronic Hawaiian Database (www.ulukau.com), Papakilo Database (www.papakilodatabase.com), the State Library on-line (http://www.librarieshawaii.org/Serials/databases.html), and Waihona ʻĀina Māhele database (http://www.waihona.com). Hawaiian terms and place names were translated using the on-line Hawaiian dictionaries (Nā Puke Wehewehe ʻŌlelo Hawaiʻi) (www.wehewehe.com), *Place Names of Hawaiʻi* (Pukui et al. 1974), and *Hawaiʻi Place Names* (Clark 2002). Historic maps were obtained from the State Archives, State of Hawaiʻi Land Survey Division website (http://ags.hawaii.gov/survey/map-search/), UH-Mānoa Maps, Aerial Photographs, and GIS (MAGIS) website (http://guides.library.manoa.hawaii.edu/magis). Maps were geo-referenced for this report using ArcGIS 10.3. GIS is not 100% precise and historic maps were created with inherent flaws; therefore, geo-referenced maps should be understood to have some built-in inaccuracies.

While conducting the research, primary references included, but were not limited to: land use records, including the Hawaiian L.C.A. records from the Māhele ʻĀina (Land Division) of 1848; the Boundary Commission Testimonies and Survey records of the Kingdom and Territory of Hawaiʻi; and historical texts authored or compiled by: David Malo (1987); Samuel M. Kamakau (1964, 1991, 1992); records of the American Board of Commissioners of Foreign Missions (A.B.C.F.M.) (1820–1860); Charles Wilkes (1845); Alexander & Preston (1892–1894); Abraham Fornander (1916–1919); and many other native and foreign writers. The study also includes several native accounts from Hawaiian language newspapers (primarily compiled and translated from Hawaiian to English by K. Maly), and historical records authored by nineteenth century visitors, and residents of the region.

Historical and archival resources were located in the collections of the Hawaiʻi State Archives, Survey Division, Land Management Division, Survey Division, and Bureau of Conveyances; the Bishop Museum Library and Archives; the Hawaiian Historical Society and the Hawaiian Mission Childrenʻs Society Library; University of Hawaiʻi-Hilo Moʻokini Library; the National Archives and Records Administration (NARA), Maryland; the Library of Congress, Washington D.C.; the National Oceanic and Atmospheric Administration National Library, Maryland; the Smithsonian Institution Natural History and National Anthropological Archives libraries, Washington, D.C.; the Houghton Library at Harvard; the United States Geological Survey (USGS) Library, Denver; the Paniolo Preservation Society and Parker Ranch collections; private family collections; and in the collection of Kumu Pono Associates LLC. This information is generally cited in categories by chronological order of the period depicted in the narratives.

M. P. Nogelmeier (2010) discusses the adverse impacts of methodology that fails to properly research and consider Hawaiian language resources. He strongly cautions against a mono-rhetorical approach that marginalizes important native voices and evidence from consideration, specifically in the field of archaeology. For this reason, Honua Consulting consciously employs a poly-rhetorical approach, whereby all data, regardless of language, is researched and considered. To fail to access these millions of pages of information within the Hawaiian language cache would fundamentally fail to gather the best information available, especially considering the voluminous amounts of historical accounts available for native tenants in the Hawaiian language.

Hawaiian culture views natural and cultural resources as largely being one and the same: without the resources provided by nature, cultural resources could and would not be procured. From a Hawaiian perspective, all natural and cultural resources are interrelated, and all natural and cultural resources are culturally significant. Kepā Maly (2001), ethnographer and Hawaiian language scholar, points out, "In any culturally sensitive discussion on land use in Hawaiʻi, one must understand that Hawaiian culture evolved in close partnership with its natural environment. Thus, Hawaiian culture does not have a clear dividing line of where culture ends and nature begins" (Maly 2001:1). As a leading researcher and scholars on Hawaiian culture, Maly, along with his wife, Onaona, have conducted numerous ground-breaking studies on cultural histories throughout Hawaiʻi. A substantial part of the archival research utilized in this study was previously compiled and published by Kepā and Onaona Maly, who have granted their permission to use this important work and are identified properly as associated authors and researchers to this study.

This study also specifically looks to identify intangible resources. Tangible and intangible heritage are inextricably linked (Bouchenaki 2003). Intangible cultural resources, also identified as intangible cultural heritage (ICH), are critical to the perpetuation of cultures globally. International and human rights law professor Federico Lenzerini notes that, "At present, we are aware on a daily basis of the definitive loss—throughout the world—of language, knowledge, knowhow, customs, and ideas, leading to the progressive impoverishment of human society" (Lenzerini 2011:12). He goes on to warn that:

> the rich cultural variety of humanity is progressively and dangerously tending towards uniformity. In cultural terms, uniformity means not only loss of cultural heritage—conceived as the totality of perceptible manifestations of the different human groups and communities that are exteriorized and put at the others' disposal—but also standardization of the different peoples of the world and of their social and cultural identity into a few stereotyped ways of life, of thinking, and of perceiving the world. Diversity of cultures reflects diversity of peoples; this is particularly linked to ICH, because such a heritage represents the living expression

> of the idiosyncratic traits of the different communities. Preservation of cultural diversity, as emphasized by Article 1 of the UNESCO Universal Declaration on Cultural Diversity, 'is embodied in the uniqueness and plurality of the identities of the groups and societies making up humankind'. Being a 'source of exchange, innovation and creativity', cultural diversity is vital to humanity and is inextricably linked to the safeguarding of ICH. Mutual recognition and respect for cultural diversity—and, *a fortiori*, appropriate safeguarding of the ICH of the diverse peoples making up the world—is essential for promoting harmony in intercultural relations, through fostering better appreciation and understanding of the differences between human communities. (Lenzarini 2011:103)

Therefore, tradition and practice, as elements of Hawaiian ICH, are essential to the protection of Hawaiian rights and the perpetuation of the Hawaiian culture.

## 2.1 Identifying Traditional or Customary Practices

It is within this context that traditional or customary practices are studied. The concept of traditional or customary practices can often be a challenging one for people to grasp. Traditional or customary practices can be defined as follows:

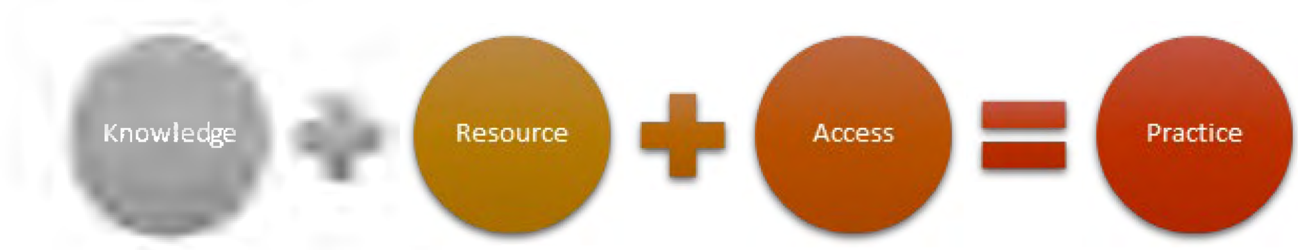


Figure 9. Diagram of elements that contribute to traditional or customary practices (Honua Consulting)

The first element is knowledge. This has been referred to as traditional ecological knowledge (TEK), Indigenous local knowledge (ILK), or ethnoscience. In the context of this study, it is the information, data, knowledge, or expertise Native Hawaiians or local communities possessed or possess about an area's environment. In a traditional context, this would have included information Hawaiians possessed in order to have the skills to utilize the area's resources for a range of purposes, including, but not limited to, travel, food, worship or habitation. This element is largely intangible.

The second element are the resources themselves. These are primarily tangible resources, either archaeological resources (i.e., habitation structures, walls, etc.) or natural resources (i.e., plants, animals, etc.). These can also be places, such as sacred or culturally important sites or wahi pana. Sometimes these wahi pana are general locations; this does not diminish their importance or value. Nonetheless, it is important to recognize that potential eligibility as a “historic site” on the National Register of Historic Places (NRHP) would require identifiable boundaries of a site.

The third element is access. The first two elements alone are not enough to allow for traditional or customary practices to take place. The practitioners must have access to the resource in order to be able to practice their traditional customs. Access does not just mean the ability to physically access a location, but it also means access to resources. For example, if a particular plant is used for medicinal purposes, there needs to be a sufficient amount of that plant available to practitioners to use. Therefore, an action that would adversely impact the population of a particular plant with cultural properties would impact practitioners’ ability to access that plant. By extension, it would adversely impact the traditional or customary practice.

Traditional or customary practices are, therefore, the combination of knowledge(s), resource(s) and access. Each of these individual elements should be researched and identified in assessing any potential practices or impacts to said practices.

## 2.2 Traditional Knowledge, or Ethnoscience, and the Identification of Cultural Resources

The concept of ethnoscience was first established in the 1960s and has been defined “the field of inquiry concerned with the identification of the conceptual schemata that indigenous peoples use to organize their experience of the environment” (Roth 2019). Ethnoscience includes a wide range of subfields, includes, but is not limited to, ethnoecology, ethnobotany, ethnozoology, ethnoclimatology, ethnomedicine and ethnopedology. All of these fields are important to properly identify traditional knowledge within a certain area.

Traditional Native Hawaiian practitioners were scientists and expert natural resource managers by necessity. Without modern technological conveniences to rely on, Hawaiians developed and maintained prosperous and symbiotic relationships with their natural environment for thousands of years. Their environments were their families, their homes, and their laboratories. They knew the names of every wind and every rain. The elements taught and inspired. The ability of Indigenous people to combine spirituality and science led to the formation of unique land-based methodologies that spurred unsurpassed innovation. Therefore, identifying significant places requires a baseline understanding of what made places significant for Hawaiians.

Hawaiians were both settlers and explorers. In *Plants in Hawaiian Culture,* B. Krauss explains: “Exploration of the forests revealed trees, the timber of which was valuable for building houses and making canoes. The forests also yielded plants that could be used for making and dying tapa, for medicine, and for a variety of other artifacts” (Krauss 1993). Analysis of native plants and resource management practices reveals the depth to which Hawaiians excelled in their environmental science practices:

> [Hawaiians] demonstrated great ability in systematic differentiation, identification, and naming of the plants they cultivated and gathered for use. Their knowledge of the gross morphology of plants, their habits of growth, and the requirements for greatest yields is not excelled by expert agriculturists of more complicated cultures. They worked out the procedures of cultivation for every locality, for all altitudes, for different weather conditions and exposures, and for soils of all types. In their close observations of the plants they grew, they noted and selected mutants (spores) and natural hybrids, and so created varieties of the plants they already had. Thus over the years after their arrival in the Islands, the Hawaiians added hundreds of named varieties of taro, sweet potatoes, sugarcane, and other cultivated plants to those they had brought with them from the central Pacific (Krauss 1993).

Thus, Native Hawaiians reinforced the biodiversity that continues to exist in Hawaiʻi today through their customary traditional natural resource management practices.

The present analyses of archival documents, oral traditions (oli or chants, mele or songs, and/or hula dances and haʻi moʻolelo or storytelling performances), and Hawaiian language sources including books, manuscripts, and newspaper articles, are focused on identifying recorded cultural resources present on the landscape, including: Hawaiian and non-Hawaiian place names; landscape features (ridges, gulches, cinder cones); archaeological features (kuleana parcel walls, house platforms, shrines, heiau [places of worship], etc.); culturally significant areas (viewsheds, unmodified areas where gathering practices and/or rituals were performed); and significant biological, physiological, or natural resources. This research also looks to document the wide range of Hawaiian science that existed within the project area and its neighboring mauka (mountain) and makai (seaward) areas.

### 2.3 Moʻolelo ʻĀina: Native Traditions of the Land

Among the most significant sources of native moʻolelo are the Hawaiian language newspapers which were printed between 1838 and 1948, and the early writings of foreign visitors and residents. Most of the accounts that were submitted to the papers were penned by native residents of areas being described and noted native historians. Over the last 30 years, Kepā Maly has reviewed and compiled an extensive index of articles published in the Hawaiian language newspapers, with particular emphasis on those narratives pertaining to lands, customs, and traditions. Many traditions naming places around Hawaiʻi are found in these early writings. Many of these accounts describe native practices, the nature of land use at specific locations, and native moʻolelo (history, narrative, story). Thus, we are given a means of understanding how people related to their environment and sustained themselves on the land.

### 2.4 Historic Maps

There are also numerous, informative historic maps for the region. Surveyors of the eighteenth and nineteenth centuries were skilled in traversing land areas and capturing important features and resources throughout Hawaiʻi's rich islands. Historic maps were carefully studied, and the features detailed therein were aggregated and categorized to help identify specific places, names, features, and resources throughout the study area. From these, among other documents, new maps were created that more thoroughly capture the range of resources in the area.

Historic maps and archival resources depict the ahupuaʻa and ʻili of South Hāna with notable inconsistencies. For example, 19th-century land commission award (LCA) records, Boundary Commission testimonies, and missionary-era maps sometimes identify ahupuaʻa boundaries differently than later Territorial and State maps. Some resources combine or omit smaller ahupuaʻa, such as Wailua, Puʻuhaoa, and Kaʻeleku, while others show them distinctly. Similarly, the labeling and extent of certain ʻili — particularly coastal sections — can vary, with some maps reflecting agricultural usage while others follow natural features like streams or cliffs.

These discrepancies may be attributed to several factors. First, traditional Hawaiian land divisions were grounded in ecological function and localized stewardship, and boundaries could be fluid or known only to resident konohiki and kamaʻāina. Second, early Western cartographers may have misunderstood or misrecorded these systems, leading to inaccuracies. Third, different maps were created for different purposes — taxation, resource extraction, transportation planning — and thus prioritized different kinds of information. Lastly, as population centers shifted and land use changed over time, certain names and boundaries may have fallen out of common use or been redefined. These variations underscore the importance of cross-referencing multiple sources when interpreting historical land divisions in Hāna.

### 2.5 Archaeological and Biological Studies

An archaeological inventory survey was conducted by Honua Consulting.

A biological field study was completed by AECOS, Inc. The findings are discussed in **Section 4.2.**

### 2.6 Ethnographic Methodology

Information from lineal and cultural descendants is instrumental in procuring information about the project area's transformation over time and its changing uses. The present analyses of archival documents, oral traditions (including oli or chants, mele or songs, and/or hula dance), and Hawaiian language sources including books, manuscripts, and newspaper articles, are focused on identifying recorded cultural and archaeological resources present on the landscape, including: Hawaiian and non-Hawaiian place names; landscape features (ridges, gulches, cinder cones); archaeological features (kuleana parcel walls, house platforms, shrines, heiau or places of worship, etc.); culturally significant areas (viewsheds, unmodified areas where gathering practices and/or rituals were performed); and significant biocultural resources. The information gathered through research helped to focus interview questions on specific features and elements within the project area. Descendants and cultural practitioners from the area were contacted and interviewed for this CIA.

## 3.0 Historic Background

Maui has a unique geography; it is considered to be two islands, joined together by an isthmus. Land divisions on Maui are unlike those on other islands (Sterling 1998). Ancient names for Maui include Ihikapalaumaewa and Kulua (Sterling 1998: 2).

> The division into district of the islands of the Maui group has not simplicity observed in the other islands. The configuration of the island of Maui, which is really a double island made up of two distinct mountain masses joined by a low flat isthmus, is probably the explanation for the group number of districts on that island, namely Kaanapali and Lahaina in West Maui, and the districts of Hamakua Poko, Hamakua Loa, Koolau, Hana, Kipahulu, Kaupo, Kahikinui, Honuaʻula and Kula in East Maui. The *ahupuaa* of Kahakuloa in Kaanapali and the *ahupuaas* [2] [sic] of Olowalu and Ukumehame in Lahaina were at times termed *kalanas* [sic]. The *ahupuaas* [sic] of Waihee and Waiehu were independent of any *moku* and are listed in the *Book of the Mahele* as being in "Puali Komohana," i.e., West Isthmus. The large *ahupuaas* [sic] of Wailuku of Waikapu, which appropriated almost the whole of the isthmus, belonged to no district and in the *Mahele* were said to be in Na Poko, Na Poko in this case meaning a smaller division of the island. C. J. Lyons says "with reference to the ahupuaas [sic] of Waihee, Waiehu, Wailuku and Waikapu, on the map it was necessary to form a new district and call it Wailuku, Nawaieha, 'the four waters,' being too cumbersome and ill understood'' (Sterling 1998: 3).

In Hawaiian culture, natural and cultural resources are one and the same. Native traditions describe the formation (literally the birth) of the Hawaiian Islands and the presence of life on and around them, in the context of genealogical accounts. All forms of the natural environment—from the heavens and mountain peaks to the valleys, *kula* (flat sloping lands) and lava plains, and to the shoreline and ocean depths; as well as the winds, rains, clouds, stars in the heavens, and all forms of life—animate and inanimate—were believed to be embodiments of Hawaiian gods and deities. One Hawaiian genealogical account records that Wākea (the expanse of the sky–the father) and Papa-

[2] In the Hawaiian language, the plural form of words is not created by adding an "s" to the end of the word, hence "[sic]" has been added where "s" was added to Hawaiian words. Words are instead made plural through the use of the kahakō and/or the plural definite article, for example, the plural form of the word he haumana (a student, singular) is nā haumāna (the students, plural).

hānau-moku (Papa, who gave birth to the islands–the mother), also called Haumea-nui-hānau-wā-wā (Great Haumea-born time and time again), and various gods and creative forces of nature, gave birth to the islands.

Maui, the second largest of the islands, was the second-born of these island children. As the Hawaiian genealogical account continues, we find that these same god-beings or creative forces of nature (parents of the islands), were also the parents of Hā-loa-naka-lau-kapalili (long stalk, quaking and trembling leaf). This Hāloa was born as a "shapeless mass" and buried outside the door of his parents' house (cf. Pukui and Elbert, 1981:382), and from his grave grew the *kalo* (taro). The next child born to these god-parents, was also called Hāloa (the long stalk or breath of life), and he is credited as being the progenitor of the Hawaiian race (David Malo 1951:3, 242-243; Beckwith 1970; Pukui and Korn 1973). It was in this context of kinship, that the ancient Hawaiians addressed their environment, and it is the basis of the Hawaiian system of land use.

### 3.1 Inoa ʻĀina

Honua Consulting developed a list of place names, which includes, but is not limited to, the following places and terms to help guide research and analyses. It is important to note that this is an extensive listing of known place names within the ahupuaʻa, but inclusion of the place name on this list does not indicate that the place is within the project area.

It should also be noted that the known place names for these regions are comparably less than other ahupuaʻa on Maui. This is likely explained by the natural lack of water in this region, compared to other regions.

Table 1. Place Names Associated with Project Area and Region

| Place Name | Type | Moʻolelo / Cultural Significance |
|---|---|---|
| **Wailua** | ʻĀina (Land area / Ahupuaʻa) | Traditional ahupuaʻa with rich moʻolelo, long-term habitation, and agricultural practices. |
| **Waikakoi** | Stream / Gulch | Stream and gulch area forming natural boundary; known for flood dynamics and vegetation. |
| **Koali** | ʻĀina / Settlement | Coastal settlement area with historic usage in farming and habitation. |

| | | |
|---|---|---|
| **Mu‘olea** | ‘Āina / Ahupua‘a | Adjacent land division to Wailua; retains cultural and coastal significance. |
| **Makali‘ihānau** | Upland Feature | Upland area, possibly associated with water catchment or former farming areas. |
| **Kauakiu Point** | Coastal Point | Prominent coastal feature; no specific mo‘olelo documented. |
| **Pāiloa Point** | Coastal Point | Noted coastal feature near Wailua Cove. |
| **Wai‘a‘ama Bay** | Bay | Fishing grounds and coastal access; likely used for marine resource gathering. |
| **Kīpahulu** | Moku / Larger District | Historic district with extensive mo‘olelo and habitation records. |
| **Pū‘uhaoa** | ‘Āina / Ahupua‘a | Small ahupua‘a along the Hāna coast. |
| **Makaiakūlani** | Historic Land Area | Appears on older maps; traditional land area name. |
| **Kanahualii Falls** | Waterfall | Upland waterfall possibly tied to traditional fresh water use. |
| **Wailua Falls** | Waterfall | Well-known waterfall; referenced in mele and mo‘olelo of East Maui. |
| **Nāhiku** | ‘Āina / Ahupua‘a | Larger ahupua‘a to the north of the project area; active in subsistence history. |
| **Waikakoi Gulch** | Gulch | Natural gulch forming drainage basin from uplands to coast. |
| **Wailua Stream** | Stream | Principal stream running through Wailua; vital for agriculture and lo‘i. |
| **Pua‘alu‘u Stream** | Stream | Smaller stream intersecting gulch areas; supports native vegetation and runoff. |

(This area intentionally left blank.)

## 3.2 Traditional Period

The district of Hāna, nestled on the eastern coast of Maui, stands as one of the most storied and culturally rich regions in all of Hawaiʻi. Known for its natural abundance, spiritual sites, and strategic military importance, Hāna has long held a central place in the narratives of Native Hawaiian history. Among its many significant places, Wailua—a verdant upland coastal area north of Hāna town—emerges as a particularly sacred and well-resourced landscape, recognized for its contributions to subsistence, resistance, and cultural continuity.

The expression "Hāna of the low sky" (Hāna i ka ua liʻiliʻi) evokes the region's misty rains and intimate atmosphere. Thomas Maunupau (Maunupau 1922) described Hāna in the 1920s as "rather a nice village and the land is green with sugar canes. The mists and fine rains covered the uplands"—a poetic account explaining the origin of the place's name. These climatic patterns contributed to Hāna's agricultural richness and sustained generations of kānaka who practiced sophisticated systems of land management and food production.

Wailua is referenced in Hawaiian oral history and newspaper archives as one of the "Three War Lands," along with Wananalua and Honomaʻele. These ahupuaʻa were of strategic importance for the defense of Hāna and its sacred fortress of Kauiki Hill (Manu 1884). Kauiki, overlooking Hāna Bay, was a fortified refuge with commanding views of the coastline and ocean routes. Protecting Wailua meant safeguarding essential natural resources and cultural strongholds that anchored the region's aliʻi leadership.

According to Moses Manu and S.M. Kamakau, Wailua was renowned for its dense ʻala stones—perfect for warfare, particularly sling stones used in battles such as the War of Kapalipilo (Manu 1899; Kamakau 1992). These stones were gathered from the upland ridges and riverbeds in Wailua and surrounding areas such as Kawaipapa, Waikaʻahiki, and Kaʻeleku. In oral accounts, Hoolae-makua, a warrior of great repute, is said to have held the line of defense using these stones to devastating effect (Ka Moolelo o Umi-a-Liloa 1909).

Ethnographic research conducted by E.S.C. Handy (Handy 1940) emphasized that Hāna and Wailua contained both dryland and irrigated agricultural systems. North of Hāna, dry taro (kalo māla) was cultivated along rugged slopes and lava fields. In Wailua, historical records and archaeological surveys confirm the presence of stone-walled loʻi terraces—some still visible today. These systems were constructed with remarkable engineering skill, using stone alignments, ʻauwai (irrigation channels), and embankments to control and direct water flow. The forested upper slopes also provided ʻuala (sweet potatoes), maiʻa (bananas), ʻulu (breadfruit), and wauke (paper mulberry).

Sweet potatoes were particularly successful in the coastal areas near Wailua. As Handy observed, although the inland regions of Hāna were generally too wet for ʻuala, the Wailua coastline offered drier microclimates suitable for their growth. Above Koali, Haou, and Muʻolea, Hawaiian homesteaders continued growing ʻuala well into the 20th century (Handy 1940). These crops were typically interplanted in rotating cycles with other food sources, demonstrating a complex, sustainable food system long before the introduction of commercial agriculture.

Religious and ceremonial structures were essential to life in Wailua. Archaeological surveys by W.M. Walker (Walker 1931) identify several heiau near Wailua, including Kuawalu and Honuaula—both described as war heiau constructed by King Hua-a-Pohukaina. Kuawalu, said to have measured 70 by 120 feet, was built upon Hua's victorious return from a raid on Hawaiʻi Island. Though now largely destroyed, these heiau once served as central places of spiritual preparation and political coordination.

The shoreline shrine Kaiapuni, located near Waikaʻakihi, was traditionally used as a burial site and potentially a fishing koʻa (Thrum 1917). The site also served as the resting place of J.U. Kawainui's father, a key figure in the Hawaiian political revival of the late 19th century. Such dual-function sites highlight the Hawaiian practice of integrating multiple aspects of spiritual, genealogical, and subsistence life into a single place.

Place names across the area—Waikoloa, Nanualele, Kawaipapa—are imbued with layers of meaning, from natural characteristics to historical events and famous battles. At Kawaipapa, for instance, oral accounts describe its opihi beds and rich uhu grounds, and at Waikaʻahiki, elders recalled its stone tools and sling traditions (Kamakau 1992; Sterling 1969).

Legends of Hāna are filled with moʻolelo of chiefs, warriors, and sacred places. The story of Popoalaea, for instance, is tied to the sea caves of Papaloa near Wailua, where the aliʻi wahine fled from her jealous husband and sought refuge in a lava tube that opened to the sea. Her hiding place was discovered only by the reflection of her kahili in the water (Kalaniʻopuʻu 1925). These types of legends serve to encode topographical knowledge into stories that instruct, warn, and inspire.

Puʻuhāhā, a spring-covered hill between Wailua and Wananalua, is said to be where the goddess Puuhele settled, according to traditions recorded in the early 20th century

(Sterling 1969). The placement of such stories within the landscape speaks to a world where geography and narrative are fused, forming the sacred geography of Hāna.

The Wailua coast has served as a battlefield for generations. As described in *Ka Moolelo o Umi-a-Liloa* (1909), warriors from Hawaiʻi arrived in canoes that landed at Wailuaiki and marched inland to ʻUlaʻino. They were met with fierce resistance at Makaʻolehua, Pihele, Honokalani, and eventually Wakiu. These engagements were fought by skilled Maui warriors using stones gathered from the local terrain, whose accuracy with the sling was so renowned that "they never missed even a grass blossom."

During the War of Kapalipilo, Kamehameha-nui sought to retake Hāna from the invader Kalaniʻōpuʻu. The fortress of Kauiki withstood siege after siege, in part due to the resource flow and manpower from Wailua and surrounding lands (Fornander 1916). Ka-makau-kiʻi and Kaʻohele, notable warriors, are said to have pursued one another through the ahupuaʻa of Honomaʻele, Kawaipapa, and Kaʻeleku before ending in combat near Pihehe (Kamakau 1992).

The coastline near Wailua is marked by sophisticated aquaculture features. W.M. Walker documented one of the largest loko iʻa (fishponds) on Maui located just south of Haneoʻo, with sea walls constructed from beach stones and basalt boulders measuring hundreds of yards across (Walker 1931). These ponds used ocean currents and tidal gates to trap fish and allowed families to cultivate species such as awa, moi, and akule year-round.

Near Kaʻuiki, the fishing shrine Makakiloia was used by generations of expert fishers as a koʻa to call in schooling fish. In interviews from the 1960s, Matthew Kalalau recounted how he and his family used this same koʻa for decades and remembered hand signals once used before radios became standard (Sterling 1969).

Despite waves of colonization, missionization, and the rise and fall of the plantation economy, the spiritual and cultural integrity of Wailua has endured. Families continue to pass down knowledge of trails, planting techniques, surf spots, and stories. Many of the wahi pana in this region remain deeply meaningful, even as some are hidden by forest or paved over by roads.

Today, Wailua remains a living archive of Hawaiian cultural knowledge. It is a landscape layered with memory, survival, and resurgence. As efforts to protect ancestral lands and restore loʻi and loko iʻa continue, Wailua offers a model of cultural resilience. It is not only a window into the past but a foundation for the future of Native Hawaiian identity, sovereignty, and stewardship.

### 3.2.1 Ka Hoʻonoho Moku–Hawaiian Settlement of the Islands

Archaeologists and historians describe the inhabiting of these islands in the context of settlement which resulted from voyages taken in canoes, across the open ocean. Archaeologists have proposed that early Polynesian settlement voyages between Kahiki (the ancestral homelands of the Hawaiian gods and people) and Hawaiʻi were underway by ca. 400 A.D., with long distance voyages occurring fairly regularly through at least the thirteenth century (cf. Cordy 2000). It has been generally reported that the island homes of the early Hawaiian population—the Hawaiian "Kahiki"—were the Marquesas and Society Islands (Emory in Tatar 1982:16-18). Indeed, Kahikinui, the district neighboring Honuaʻula to the south, is named because from afar on the ocean, it resembled a larger form of Kahiki, the ancestral home land.[3]

For several generations following initial settlement, communities were clustered along the watered, "*koʻolau*" (windward) shores of the Hawaiian Islands. Along the *koʻolau* slopes, streams flowed and rainfall was abundant, and agricultural production became established. The *koʻolau* region also offered sheltered bays from which deep sea fisheries could be easily accessed, and near shore fisheries, enriched by nutrients carried in the fresh water, could be maintained in fishponds and coastal fisheries. It was around these bays that clusters of houses where families lived could be found, and in these early times, the residents generally engaged in subsistence practices in the forms of agriculture and fishing (Handy, Handy and Pukui, 1972:287).

With the passing of time (ca. A.D. 800 to 1000), the *koʻolau* region became more populated and perhaps crowded, and the Hawaiians began expanding out to, and settling more remote areas, which had not been the first choices for settlement—based primarily on access to water.

### 3.2.2 Mokupuni to Ahupuaʻa – Hawaiian Land Use and Management Practices

Over the period of several generations following settlement, the Hawaiians began to develop a sophisticated system of land- and resource-management practices, that were integrated into natural cycles of the environment around them. By ca. 1500, in the time of Kākaʻe and Kakaʻalaneo, the island (moku-puni) of Maui was divided into some eleven or twelve major districts or moku-o-loko, and smaller subdivisions, which were handed down through time (cf. Malo, 1951:16; Fornander, 1919 Vol. VI-2:313; Beckwith, 1970:383; and

3 "*Kaao Hooniua Puuwai no Ka-Miki*" (The Heart Stirring Story of Ka-Miki), published in the Hawaiian language newspaper *Ka Hoku o Hawaii* from 1914 to 1917

King 1942). These (moku-o-loko or moku) included Honuaʻula, Kula, Lāhaina, Kāʻanapali, Nāpoko or Wailuku, Hāmākua Poko, Hāmākua Loa, Koʻolau, Hāna, Kīpahulu, Kaupō, and Kahikinui. Some of these large districts were subdivided into smaller ʻokana or kālana (regions of land smaller than the moku-o-loko) yet comprising a number of smaller units of land (see Lyons, 1875; and Coulter, 1935).

The large districts (moku-o-loko) and sub-regions (ʻokana and kālana) were further divided into manageable units of land, and were tended to by the makaʻāinana (people of the land). Of all the land divisions, perhaps the most significant management unit was the ahupuaʻa. Ahupuaʻa are subdivisions of land that were usually marked by an altar with an image or representation of a pig placed upon it (thus the name ahu-puaʻa or pig-altar). In their configuration, the ahupuaʻa may generally be compared to wedge-shaped pieces of land that radiate out from the center of the island, extending to the ocean fisheries fronting the land unit. Their boundaries are defined by topographic or geological features such as puʻu (hills), ridges, gullies, valleys, craters, or areas of a particular vegetation growth (see Malo, 1951:16-18; and Lyons, 1875).

The ahupuaʻa were also divided into smaller, manageable arable parcels of land (such as the ʻili, kula, kōʻele, māla, kīhāpai, moʻo and paukū etc.). Generally small land units that ran in a mauka-makai orientation, and that were often marked by stone wall alignments. In these smaller parcels, the native tenants tended fields and cultivated crops necessary to sustain their immediate families and the chiefly communities they were associated with. As long as sufficient tribute was offered, and kapu (restrictions) were observed, the common people, who lived in a given ahupuaʻa had access to most of the resources from mountain slopes to the ocean. These access rights were almost uniformly tied to residency on a particular land, and earned as a result of taking responsibility for stewardship of the natural environment, and supplying the needs of ones' aliʻi (see Malo, 1951:63-67; and Kamakau, 1961:372-377).

Entire ahupuaʻa, or portions of the land were generally under the jurisdiction of appointed konohiki or lesser chief-landlords, who answered to an aliʻi-ʻai-ahupuaʻa (chief who controlled the ahupuaʻa resources). The aliʻi-ʻai-ahupuaʻa in turn, answered to an aliʻi ʻai moku (chief who claimed the abundance of the entire district). Thus, ahupuaʻa resources supported not only the makaʻāinana and ʻohana who lived on the land, but also contributed to the support of the royal community of regional and/or island kingdoms. This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resources management planning. In this system, the land provided fruits and vegetables, and some meat in the diet, and the ocean provided a wealth of protein resources. Also, in communities with long-term royal residents, divisions of labor (with specialists in various occupations on land and in procurement of marine resources) came to be strictly adhered to (Malo 1951:63-67).

### 3.2.3 Governance during the Traditional Period

It seems best to begin a genealogy of Maui's chiefs with Moʻoinanea. Moʻoinanea appears in numerous moʻolelo throughout Hawaiian history. She is considered "the matriarch of all moʻo [(lizard)] gods and goddesses" (Pukui and Elbert 1971: 394). Accounts detail her arrival from Kahiki "with the Kū and Hina family of gods" and that she was "the ancestor of the ʻUlu / Hemo linage of Maui" (Klieger 1998: 8). It is explained:

> One of [Moʻoinanea's] descendants was Kelea (Keleanuinohoʻanaʻapiʻapi), a Maui chief and famous surfer of married Kalamakua, a prominent chief on Oʻahu. Maui was not yet a unified kingdom at the time, but soon the moʻo would be evoked for the unification of the island, and then the entire archipelago. Kelea was the daughter of Kahekili I, the alii nui of the kingdom of West Maui, and his wife Haukanuimakamaka. The moʻo lineage was most likely introduced through Kelea's mother. Kelea's paternal grandfather and great uncle were Kakaʻe and Kalaʻalaneo, alii nui of the Wailuku line who ruled West Maui and Lanai from Lele/Lahaina in the sixteenth century (Klieger 1998: 8).

After Kahekili I passed, Kelea's brother, Kawaokaohele, gained control over his kingdom. Kawaokaohele was a popular aliʻi (chief) and the reign is known for its prosperity. Most importantly, it was during the reign of Kawaokaohele that East Maui (i.e., Hana) recognized the Wailuku aliʻi as being mōʻī (King) of Maui (Klieger 1998: 8-9).

Kawaokaohele's son, Piʻilani, is widely acknowledged to this day to be the greatest aliʻi in Maui's history. He ruled all of Maui from Lahaina, which would eventually become the political center of the island and later the unified Hawaiian Kingdom. Piʻilani is known for creating a trail that circumnavigated the entire island (Klieger 1998: 9). Piʻilani married his first cousin, Laieloheloheikawai, daughter of Kelea. Piʻilani and Laieloheloheikawai had at least four children: daughter Kihawahine Mokuhinia Kalamaula Kalaaiheana, daughter Piʻikea, son Lono-a-Piʻilani[4] and son Kiha-a-Piʻilani. These children, being the result of a

[4] Children often bore the name of an ancestor, so names such as Lono-a-Piʻilani mean "Lono of Piʻilani." Whenever historical figures' names have this element, the name has been broken up with dashes in this report to help the reader follow genealogies and familial relationships.

piʻo union (marriage between two close relatives, sometimes a brother and sister), had a very strong lineage.

Historians estimate that Piʻilani ruled in the 16th century. It is important to note that Hawaiian chiefs demonstrated considerable savvy in politics. Chiefs commonly intermarried for political reasons. Piʻikea-a-Piʻilani, daughter of Piʻilani, married Umi-a-Liloa, the King of Hawaiʻi Island. When Piʻilani died, the Maui Kingdom went to his oldest son Lono-a-Piʻilani. For many years, Lono-a-Piʻilani and his younger brother Kiha-a-Piʻilani (brothers to Piʻikea) co-existed peacefully. Eventually, Lono-a-Piʻilani and Kiha-a-Piʻilani had a falling out and the latter feared his brother, the King, would try to kill him, so Kiha-a-Piʻilani fled and lived on Lānaʻi. He eventually returned and stayed in the southern parts of Maui, as to not be found by his brother. His identity was eventually discovered, and he traveled to Hawaiʻi Island to stay with his sister, Piʻikea-a-Piʻilani and her husband, ʻUmi-a-Liloa (Kamakau 1992: 23-27). Kiha-a-Piʻilani joined with ʻUmi-a-Liloa, and together they planned to invade Maui. Lono-a-Piʻilani resided in Wailuku during this time.

Kiha-a-Piʻilani and ʻUmi-a-Liloa successfully invaded and conquered East Maui. Before they could reach Lono-a-Piʻilani in Wailuku, Lono-a-Piʻilani died. A prophet told Kiha-a-Piʻilani that the body of Lono-a-Piʻilani was "in Wailuku in a land called Paʻuniu" (Kamakau 1992: 31). Despite a wide search throughout Wailuku, the bones of Lono-a-Piʻilani were never found by Kiha-a-Piʻilani.

Kiha-a-Piʻilani ruled Maui in the 17th century. During ʻUmi-a-Liloa's reign of Hawaiʻi Island, the two kingdoms remained close and peaceful thanks to the intermarrying of the chiefly families. It would be this history of strategically intermarrying that would help to engender the eventual unification of the islands. Kiha-a-Piʻilani's descendant, Kekaulike, would become the King of Maui in the 18th century.

As Kekaulike ruled on Maui, Keawe ruled on Hawaiʻi Island. Keawe was a famed ruler of Hawaiʻi Island (Kamakau 1992: 64). Keawe's half-sister was Ka-lani-kau-lele-ia-iwi, whose husband was Ka-uaua-nui-a-Mahi and to them was born Alapaʻi-nui-a-Kauaua (Alapaʻi) (Kamakau 1992: 64). Kamakau (1992) notes that Keawe enjoyed travel and would travel to the other islands, including Maui. When Keawe died, he left Kohala and Kona to his son Keʻeaumoku and Kaʻu to his son Kalaninuiʻiamamao (Kamakau 1992: 64-65).

Alapaʻi also lived on Maui during this time, moving there after Hilo chiefs killed his father, Ka-uaua-nui-a-Mahi. Alapaʻi's half-sister Kekuʻiapoiwanui-a-Kalaninuikauleleiaiwi (Kekuʻiapoiwanui) was the wife of Kekaulike (Kamakau 1992: 65). After Keawe's death, Alapaʻi returned to Hawaiʻi Island. He first waged war against Keʻeaumoku and gained control of Kohala and Kona. Kekaulike did not approve of this and took his own warriors to fight with Alapaʻi on Hawaiʻi Island. Kekaulike was unsuccessful in this battle, and he slaughtered numerous commoners during his campaign in Kohala (Kamakau 1992: 65-66). Alapaʻi then unsuccessfully launched a campaign against Kekaulike on Maui.

Kekaulike had four biological children with his wife Kekuʻiapoiwanui: Kalola (wahine (female)), Kamehamehanui (kāne (male)), Kahekili II (kāne), and Kahuʻaimokuakama (wahine). Kalola bore children with three different men: Kalanikauōkikilokalaniakua (wahine) with her brother Kamehamehanui, Kīwalaʻo (kāne) through her union with Kalaniʻopuʻu, and Kekuʻaipoiwa Liliha (wahine) from her union with Keōua. Kalanikauōkikilokalaniakua had many kapu on her due to her being the result of a nīʻau piʻo union between siblings, which Hawaiians believed gave a child a sacred status. Kalaniʻopuʻu and Keōua are two sons of Keawe, both of which Alapaʻi brought up as leaders in his government.

Keōua had many wives. In addition to Kalola, he also married Kekuʻaipoiwa, daughter of Kekela and Haʻae (not to be confused with Kekuʻaipoiwa Liliha, daughter of Kalola, or Kekuʻaipoiwanui, wife of Kekaulike). Keōua and Kekuʻaipoiwa would become the parents of Kamehameha I (kāne), who was born as Alapaʻi launched his attack against Kekaulike on Maui.

As Kekaulike ruled Maui, Alapaʻi ruled over Hawaiʻi Island. Alapaʻi was a peaceful and prosperous chief and additional war between the two kingdoms was avoided for a period of time. On Maui, Wailuku had been the central location of power since the time of Piʻilani. Kekaulike moved it to Kaupō, likely in preparation of attacks on Hawaiʻi Island. Kekaulike fell ill and never returned to Hawaiʻi Island. Kekaulike turned over Maui to his son, Kamehamehanui (not to be confused with Kamehameha I).

In anticipation of an attack from Alapai's forces, the weakened Kekaulike directed his family and governing officials to return to Wailuku, to Halekiʻi, "the royal residence of the Maui ruling line near Wailuku" (Kirch 2012: 240). There Kekaulike died and after his death, "fearing the arrival of Alapaʻi bent on war, the chiefs cut the flesh from the bones of Ke-kau-like in order to lighten the load in carrying the body to ʻIao" (Kamakau 1992: 69).

Alapaʻi arrived on Maui as anticipated. Yet, when Alapaʻi heard of Kekaulike's death and of Kamehamehanui's rule, he relinquished his planned attack on the island and rather opted for peace between the kingdoms.

Kahekili II, the second son of Kekaulike, would become one of Maui’s most famed ali‘i. He was known to be a ferocious warrior and a staunch follower of the Hawaiian religious beliefs and protocols. He kept individuals for sacrifice at a place called Pua‘anui, near the site of the Wailuku mill (Thrum 1917: 60). It was during Kahekili II’s reign that the great battle at Kakanilua occurred.

Joseph Mokuohai Poepoe wrote of this great battle in Hawaiian language newspapers in 1905:

> As the Alapa[5] and Piipii proceeded to the plain of Kamaomao [from Kihei-puko‘a] they met with no hindrance until they reached the southeastern side of a place called Kalua, close to the village of Wailuku.
>
> When the Alapa arrived there, the warriors of Kahekili concentrated upon them from many points, like sandcrabs running over the sand.
>
> A bitter fight was fought by the Alapa and Piipii armies of Kalaniopuu against the well trained warriors of Maui and those of Oahu under Kahahana…
>
> Kalaniopuu received the news on the evening of the day of the terrible battle. This battle in which the Alapa and Piipii were destroyed was called Ahulau ka Piipii i Kakanilua (completely slaughtered were the Piipii at Kakanilua) (Sterling 1998: 88, citing Poepoe 1905).

Keku‘aipoiwa Liliha (daughter of Keōua and Kalola) and her half-brother Kīwala‘ō married and this nī‘au pi‘o union resulted in the birth of Keōpuōlani (wahine). Due to the half-sibling relationship between her parents and her royal lineage, Keōpuōlani was a chiefess of substantial status and rank. While Kamehameha I would eventually take many wives, none held as high a sacred status as Keōpuōlani and she would become known as Kamehameha’s sacred wife. It is through their children, Liholiho (kāne), Kauikeaouli (kāne), and Nahi‘ena‘ena (wahine), that the Kamehameha Dynasty was established.

### 3.2.4 Chiefly Residents of Hana

The Hāna District of East Maui is not only a place of immense natural beauty and cultural abundance, but also the ancestral homeland of some of Hawai‘i’s most powerful and

[5] “Alapa” in this case references the famed warrior company of Kalani‘opu‘u. The spelling of the term with diacriticals is ‘ālapa.

storied aliʻi (chiefs). For centuries, Hāna was an important center of chiefly power, with its fertile lands, abundant fisheries, and defensible geography attracting elite lineages. The famed fortress of Kaʻuiki Hill, which towers above Hāna Bay, served not only as a stronghold but also as a seat of political and spiritual authority. Many of Hawaiʻi's most significant leaders—men and women alike—can trace part of their genealogy or historical influence to Hāna. Among them are Queen Kaʻahumanu, High Chief Piʻilani, Chiefess Kalola, and Kamehameha-nui, each of whom played pivotal roles in shaping Hawaiian society.

#### 3.2.4.1 Piʻilani and the Unification of Maui

One of the most significant figures in the history of Maui—and indeed all of Hawaiʻi—was High Chief Piʻilani. Born in Hāna during the 16th century, Piʻilani was the first chief to unify all of the island of Maui under a single rule. He was renowned for his diplomatic skill and military prowess, and he used marriage alliances as a way to solidify his rule across the island's various districts. His lineage is one of the most revered in Hawaiian history, and many later kings—including Kamehameha I—would seek to connect themselves to his genealogy to legitimize their power.

Piʻilani's legacy in Hāna includes the famed Piʻilani Heiau in Hāna and the road that would later bear his name. The coastal road from Hāna toward the western regions of the island—the Hāna Highway—follows the rough alignment of a route initiated during Piʻilani's rule, a symbol of his attempt to link and centralize the entire island of Maui. His children, including Kiha-a-Piʻilani, continued his rule and spread his lineage, establishing a political dynasty that extended from Maui to the other islands through intermarriage and conquest.

#### 3.2.4.2 Kaʻahumanu: Born of Hāna, Architect of Change

Perhaps the most famous aliʻi associated with Hāna is Queen Kaʻahumanu, one of the most influential women in Hawaiian history. Born in the uplands of Hāna, possibly near Kauiki Hill or within the ahupuaʻa of Honomaʻele, Kaʻahumanu was of chiefly descent on both sides. Her mother, Namahana of the Maui royal family, and her father, Keʻeaumoku Pāpaʻiahiahi of Hawaiʻi Island, ensured her a place of high status within both island kingdoms.

Kaʻahumanu became the favorite wife of Kamehameha I and played a key role in his rise to power. After Kamehameha's death in 1819, she proclaimed herself Kuhina Nui, or co-ruler of the kingdom, in a role roughly equivalent to a modern-day prime minister. Her authority was unprecedented for a woman in Hawaiian political history, and she used it to make sweeping changes that would alter Hawaiian society forever.

Perhaps her most transformative act was her role in the breaking of the kapu system. Alongside Keōpūolani and other high-ranking women, Kaʻahumanu publicly defied religious taboos by eating with men—a symbolic act that signaled the collapse of the ancient religious order. She then helped oversee the transition to Christianity and pushed for the establishment of written laws. Though controversial, Kaʻahumanu's leadership helped steer Hawaiʻi into a new political and cultural era, and her roots in Hāna remained a source of pride for the district.

### 3.2.4.3 Kalola: A Woman of Lineage and Diplomacy

Another prominent chiefess tied to Hāna was Kalola, a high-ranking aliʻi wahine of the 18th century. Kalola was a descendant of Piʻilani and the sister of King Kamehameha-nui of Maui. Known for her wisdom, poise, and strategic alliances, Kalola married several important chiefs during her lifetime, including Kalaniʻōpuʻu of Hawaiʻi Island. Through these alliances, she helped to link the royal families of Maui and Hawaiʻi.

Kalola was the grandmother of Kaʻahumanu and played a critical role in raising and educating her granddaughter in the customs, expectations, and responsibilities of chiefly women. Kalola's influence extended through her children and grandchildren, whose political power was often rooted in their maternal lines. She was present at key political events of the late 18th century and was one of the last great chiefesses to fully embrace the traditional kapu system, even as it began to wane during her later years.

### 3.2.4.4 Kamehameha-nui: Defender of Maui

Kamehameha-nui, not to be confused with Kamehameha I of Hawaiʻi Island, was a Maui king who defended Hāna and its fortresses from external invasions. His leadership is particularly associated with the legendary War of Kapalipilo, during which the district of Hāna was invaded by Kalaniʻōpuʻu of Hawaiʻi. Though Kalaniʻōpuʻu initially succeeded in occupying parts of East Maui, Kamehameha-nui eventually retook portions of the land and fought a series of fierce battles throughout Hāna, particularly near Kauiki and Wailua.

Kamehameha-nui is remembered for his tactical brilliance and fierce resistance against the encroachment of Hawaiʻi Island forces. He restored the independence of Maui, at least temporarily, and inspired many of the warrior traditions and place-based legends that continue to define Hāna's moʻolelo today. His death, which occurred at Kawaipapa near Wailua, marked the end of a significant chapter in Maui’s independent rulership before the rise of Kamehameha I.

#### 3.2.4.5 Piʻilaniwahine and Keeaumoku

Other aliʻi connected to Hāna include Piʻilaniwahine, a chiefess known for her wisdom and often associated with the upland taro terraces of Hāna. Her role as a political and spiritual advisor is recalled in mele and genealogy chants. Keʻeaumoku, father of Kaʻahumanu, was another important figure who united Hawaiʻi Island’s and Maui’s chiefly lines through his marriage into the Maui royal family. His support of Kamehameha I’s military campaigns helped solidify the unification of the islands.

Hāna’s importance in Hawaiian history cannot be overstated. It is not just a scenic and secluded district on Maui’s windward coast, but a crucible of Hawaiian leadership. The aliʻi of Hāna—Piʻilani, Kaʻahumanu, Kalola, Kamehameha-nui, and others—helped shape the political, cultural, and spiritual fabric of Hawaiʻi. Their stories are embedded in the land, echoed in the stone walls of ancient heiau, and remembered in the chants and genealogies of their descendants. As a place of chiefly origin and cultural continuity, Hāna remains a symbol of enduring Hawaiian strength and sovereignty.

### 3.3 The Māhele ʻÃina and Kuleana Claims: Land Use, Native Tenant Displacement and Title to Land

This section covers several categories of land use, rights and evolution of land tenure. The various categories are cited chronologically by subject matter. While quite detailed, the review is not exhaustive, but it gives us a context for understanding the landscape as it exists today.

In Hawaiian culture, the honua ola (living environment or natural and cultural resources) are one and the same. Native traditions describe the formation of the Hawaiian Islands and the presence of life on and around them, in the context of genealogical accounts—the islands were born as children to the gods and creative forces of nature. All forms of the honua ola, from the heavens and mountain peaks, the barren lava flows to the watered valleys and plains, the shoreline and ocean depths are the embodiments of Hawaiian gods and goddesses and deities. One Hawaiian genealogical account reveals that Wākea (the expanse of the sky, the father) and Papa-hānau-moku (Strata-earth who gave birth to the islands, the mother[6]) and various gods and creative forces of nature, gave birth to

6 Also called Haumea-nui-hānau-wā-wā (Great Haumea—Woman-earth born time and time again).

each of the islands. Hawaiʻi, the largest of the islands, was the first-born of these island children. As the Hawaiian genealogical account continues, we find that these same god-beings, or creative forces of nature who gave birth to the islands, stretching from Hawaiʻi to the Moku Papapa,[7] were also the parents of the first man (Hāloa), and from this ancestor, all Hawaiian people are descended.[8]

Settlement and residency in Hawaiʻi was determined by the nature of the landscape and the availability of resources necessary to sustain the population. Over time, a sophisticated system of land and resource management practices evolved. The environment was not only physical, but also spiritual. The development of the moku, kālana, ahupuaʻa, ʻili and smaller land units reflected the nature of the landscape, providing access for both aliʻi and hoaʻāina (native tenants) to all resources necessary to sustain the native population.

### 3.3.1 ʻĀina – Land, That Which Sustains the People (The Māhele ʻĀina and Establishing Private Property Rights)

Ancient Hawaiians developed a sophisticated system of land stewardship practices as a means of sustaining the population. In pre-western contact Hawaiʻi, all land and natural resources were held in trust by the high chiefs (Aliʻi ʻai ahupuaʻa, Aliʻi ʻai moku or Mōʻī). The use of lands and resources were given to the hoaʻāina (native tenants) at the prerogative of the aliʻi and their representatives or land agents (konohiki), who were generally lesser chiefs as well. While at first glance, it might seem that the hoaʻāina had no meaningful rights on the land, the religious belief system did have a series of checks and balances. The rulers bore kuleana (responsibility) for the health of the natural environment (bio-cultural landscape), and for the well-being of the people. Failure to adhere to these kuleana were manifest in many ways, among which were famine and drought and destructive natural phenomena such as severe storms, floods, earthquakes and tidal waves (tsunami).

### 3.3.2 1848-1855: Ka Māhele ʻĀina (The Land Division)

In pre-western contact Hawaiʻi, all land and natural resources were held in trust by the high chiefs (Aliʻi ʻai ahupuaʻa, Aliʻi ʻai moku or Mōʻī). The use of lands and resources were given to the hoaʻāina (native tenants) at the prerogative of the aliʻi and their representatives or land agents (konohiki), who were generally lesser chiefs as well.

7 The distant atolls and pinnacle-islets of the Northwestern Hawaiian Island Chain.
8 See David Malo 1951:3; Beckwith 1970; Pukui and Korn 1973.

By 1845, the Hawaiian system of land tenure was undergoing radical changes, and the foundation for implementing the Māhele ʻĀina (Land Division) of 1848, was set in place. This change in land tenure was promoted by the missionaries, a growing western population, and business interests in the island kingdom. On one hand, individuals were hesitant to enter into business deals on lease-hold land, and on the other, it was a "moral right" of natives to own their ʻāina.

On December 10, 1845, the Mōʻī, Kauikeaouli, Kamehameha III signed into law, a joint resolution establishing and outlining the responsibilities of the Board of Commissioners to Quiet Land Titles. The actions called for, and laws to be implemented, were as follows:

> Article IV. – Of The Board Of Commissioners To Quiet Land Titles.
> Section I. His Majesty shall appoint through the minister of the interior, and upon consultation with the privy council, five commissioners, one of whom shall be the attorney general of this kingdom, to be a board for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property acquired anterior to the passage of this act; the awards of which board, unless appealed from as hereinafter allowed, shall be binding upon the minister of the interior and upon the applicant.
>
> Section II. Said commissioners shall, before acting, take and subscribe an oath to be administered to them by the minister of the interior in the following form:
>
> We and each of us do solemnly swear that we will carefully and impartially investigate all claims to land submitted by private parties against the government of the Hawaiian Islands; and that we will equitably adjudge upon the title, tenure, duration and quantity thereof, according to the terms of article four of the seventh chapter of the first part of an act entitled "An act to organize the executive departments of the Hawaiian Island," passed at Honolulu, —— day of ——, 18—.
>
> Subscribed and sworn to, this —— day of ——, 18—.
> Before me, ——— Minister of the Interior.
>
> Which oath, having been sworn to, shall remain on file in the interior department.
>
> Section III. It shall be the duty of said board of commissioners to select one of their number as president…

Section IV. The president of said board shall, at least once in each month, from the date of their first convention, report their proceedings to the minister of the interior—the number of claims then pending before them—the number to that date confirmed or rejected, and the reasons for confirmation and rejection of any particular claim to land, with all the evidence adduced to and reduced before them.

Section V. It shall be the special duty of board to advertise in *The Polynesian* newspaper, during the continuance of their sessions the following public notice, viz.:

To All Claimants Of Land In The Hawaiian Islands.—The undersigned have been appointed by His Majesty the King, a board of commissioners to investigate and confirm or reject all claims to land arising previously to the __ day of__, 18__ [Dec. 10, 1845].

Patents in fee simple, or leases for terms of years, will be issued to those entitled to the same, upon the report of which we are authorized make, by testimony to be presented to us.

The board holds its stated meetings weekly at ——, in Honolulu, island of Oahu, to hear the parties or their counsel, in defense of their claims; and is prepared, every day to receive in writing, the claims and evidence of title which parties may have to offer, at the ——, in Honolulu between the hours of 9 o'clock A.M. and 3 o'clock P.M.

All persons are required to file with the board specifications of their claims to land, and to adduce the evidence upon which they claim title to any land in the Hawaiian Islands, before the expiration of two years from this date, or in default of doing so, they will after that time be forever barred of all right to recover same, in the courts of justice.

Section VI. The said board shall be in existence for the quieting of land titles during the two years from the first publication of the notice above required, and shall have the power to subpoena and compel the attendance of witnesses by discretionary fine; in like manner, when in session for the hearing of arguments, to punish for contempt; and they shall have the power to administer oaths to witnesses, and to perpetuate testimony in any case depending before them, which, when so perpetuated, shall be valid evidence in any court of justice created by the act to organize the judiciary.

Section VII. The decisions of said board shall be in accordance with the principles established by the civil code of this kingdom in regard to prescription, occupancy, fixtures, native usages in regard to landed tenures, water privileges and rights of piscary, the rights of women, the rights of absentees, tenancy and subtenancy, — primogeniture and rights of adoption; which decisions being of a majority in number of said board, shall be only subject to appeal to the supreme court, and when such appeal shall not have been taken, they shall be final.

Section VIII. All claims to land, as against the Hawaiian government, which are not presented to said board within the time, at the place and in the manner prescribed in the notice required to be given in the fifth section of this article, shall be deemed to be invalid, and shall be forever barred in law, unless the claimant be absent from this kingdom, and have no representative therein.

Section IX. The minister of the interior shall issue patents or leases to the claimants of lands pursuant to the terms in which the said board shall have confirmed their respective claims, upon being paid the fees of patenting or of leasing (as the case may be) prescribed in the third part of this act, unless the party entitled to a lease shall prefer to compound with the said minister in the succeeding section allowed.

Section X. The minister of the interior shall have power in concurrence with the privy council, and under the sanction of His Majesty, to issue to any lessee or tenant for life of lands so confirmed, being an Hawaiian subject, a patent in fee simple for the same, upon payment of a commutation to be agreed upon by his Majesty in privy council.

Section XI. The patents and lease issued in accordance with the award of said commissioners, shall be recorded at the expense of the patentee or lessee, as prescribed in the third part of this act, in a book to be kept for that purpose by the minister of the interior.

Section XII. The said board shall not have power to entertain any claims to lands set up by any private person or persons until the claimant shall have deposited with the minister of finance a bond conditioned to defray the costs and expenses incident to the proposed investigation, according to the rates of charge prescribed in the third part of this act; which costs and expenses, shall, after award rendered, be taxed by the president of said board, and a certificate thereof shall be given to the claimant who shall exhibit the same to the minister of finance, whose certificate of full payment, together with the award of the commissioners, shall authorize the delivery of the awarded patent or lease to such confirmed claimant, by the minister of the interior, and not without.

> Section XIII. The titles of all lands claimed of the Hawaiian government anterior to the passage of this act, upon being confirmed as aforesaid, in whole or in part by the board of commissioners, shall be deemed to be forever settled, as awarded by said board, unless appeal be taken to the Supreme Court, as already prescribed. And all claims rejected by said board, unless appeal be taken as aforesaid, shall be deemed to be forever barred and foreclosed, from the expiration of the time allowed for such appeal. [*The Polynesian*; January 3, 1846:140]

As the Māhele evolved, it defined the land interests of the Mōʻī (Kamehameha III), some 252 high-ranking Aliʻi, Konohiki, and the Aupuni (Kingdom Government). Also included in the Māhele were a number of foreign residents who had served Kamehameha I and his immediate heirs, and representatives of the American Board of Foreign Christian Missions. As a result of the Māhele, all land in the Kingdom of Hawaiʻi came to be placed in one of three categories: (1) Crown Lands, for the occupant of the throne; (2); Konohiki Lands for notable chiefs and those who provided service to the Kingdom; and (3) Government Lands, to be used in support of public initiatives and as a means of providing land to those who did not acquire land in the Māhele.

The Māhele between the King, the Konohiki and Aupuni was recorded in the "*Buke Kakau Paa no ka Mahele Aina i hooholo ia iwaena o Kamehameha 3 a me na Lii a me na Konohiki ana. Hale Alii Honolulu*. Ianuari 1848" (Buke Māhele). *Table 1* is excerpted from the "Buke Mahele" (1848), and is the record of settlement of original title for all a majority of the ahupuaʻa across the Hawaiian Islands. Pursuant to law, and as a part of the proceedings, the King, in-turn. granted a large number of lands across the islands to the ʻĀina Aupuni (Kingdom-Government Land) inventory, as a means of supporting government operations and the granting of lands in leasehold or fee-simple interest to qualified individuals.

### 3.3.3 The "Kuleana Act"

On December 21, 1849, the "Enabling" or "Kuleana Act" of the Māhele further defined the framework by which hoaʻāina (native tenants) could apply for and be granted fee-simple interest in "Kuleana" lands.[9] The Kuleana Act also reconfirmed the rights of hoaʻāina to access subsistence and collection of resources necessary to their life upon the land in their given ahupuaʻa. The Kuleana Act, which remains the foundation of laws pertaining to native tenant rights in the present-day sets forth the following conditions:

9 See Kamakau in *Ke Au Okoa* Iulai 8 & 15, 1869; 1961:403-403.

August 6, 1850

An Act confirming certain resolutions of the King and Privy Council passed on the 21st day of December 1849, granting to the common people allodial titles for their own lands and house lots, and certain other privileges. Be it enacted by the Nobles and Representatives of the People of the Hawaiian Islands in Legislative Council assembled;

That the following sections which were passed by the King in Privy Council on the 21st day of December A.D. 1849 when the Legislature was not in session, be, and are hereby confirmed, and that certain other provisions be inserted, as follows:

Section 1. Resolved. That fee simple titles, free of commutation, be and are hereby granted to all native tenants, who occupy and improve any portion of any Government land, for the land they so occupy and improve, and whose claims to said lands shall be recognized as genuine by the Land Commission; Provided, however, that the Resolution shall not extend to Konohikis or other persons having the care of Government lands or to the house lots and other lands, in which the Government have an interest, in the Districts of Honolulu, Lahaina and Hilo.

Section 2. By and with the consent of the King and Chiefs in Privy Council assembled, it is hereby resolved, that fee simple titles free of commutation, be and are hereby granted to all native tenants who occupy and improve any lands other than those mentioned in the preceding Resolution, held by the King or any chief or Konohiki for the land they so occupy and improve. Provided however, this Resolution shall not extend to house lots or other lands situated in the Districts of Honolulu, Lahaina and Hilo.

Section 3. Resolved that the Board of Commissioners to quiet Land titles be, and is hereby empowered to award fee simple titles in accordance with the foregoing Resolutions; to define and separate the portions belonging to different individuals; and to provide for an equitable exchange of such different portions where it can be done, so that each man’s land may be by itself.

Section 4. Resolved that a certain portion of the Government lands in each Island shall be set apart and placed in the hands of special agents to be disposed of in lots of from one to fifty acres in fee simple to such natives as may not be otherwise furnished with sufficient lands at a minimum price of fifty cents per acre.

> Section 5. In granting to the People, their House lots in fee simple, such as are separate and distinct from their cultivated lands, the amount of land in each of said House lots shall not exceed one quarter of an acre.
>
> Section 6. In granting to the people their cultivated grounds, or Kalo lands, they shall only be entitled to what they have really cultivated, and which lie in the form of cultivated lands; and not such as the people may have cultivated in different spots, with the seeming intention of enlarging their lots; nor shall they be entitled to the wastelands.
>
> Section 7. When the Landlords have taken allodial titles to their lands the people on each of their lands shall not be deprived of the right to take firewood, aho cord, thatch, or ti leaf from the land on which they live, for their own private use, should they need them, but they shall not have a right to take such articles to sell for profit. They shall also inform the Landlord or his agent, and proceed with his consent. The people shall also have a right to drinking water, and running water, and the right of way. The springs of water, and running water, and roads shall be free to all should they need them, on all lands granted in fee simple. Provided, that this shall not be applicable to wells and water courses which individuals have made for their own use. Done and passed at the Council House, Honolulu this 6th day of August 1850.[10]

Typically, one of the most important sources of documentation that describes native Hawaiian residency, customs and land use practices—identifying specific residents, resource collections, types of land use, crops cultivated, and features on the landscape—is found in the records of the Māhele ʻĀina. While the Act gave the hoaʻāina an opportunity to acquire fee-simple property interest (kuleana) on land which they lived and actively cultivated, the process required them to provide personal testimonies regarding their residency, right to claim, and land-use practices. As a result, Kuleana documents present readers with first-hand accounts from native tenants generally spanning the period from just after western contact in 1778 to 1855.

The lands awarded to the hoaʻāina became known as "Kuleana Lands." All of the claims and awards (the Land Commission Awards or L.C.A.) were given a Helu (Number), and some Helu were repeated, so they were further qualified by adding an alphabet(s) to the Helu. The L.C.A. designations remain in use today to identify the original owners, metes

10 Copied from original handwritten "Enabling Act," HSA, DLNR 2-4. See also "Kanawai Hoopai Karaima no ko Hawaii Pae Aina" (Penal Code) 1850.

and bounds of lands in Hawai‘i. The work of the Land Commission was brought to a close on March 31, 1855. The program, directed by principles adopted on August 20, 1846, met with mixed results. In its statement to the King, the Commissioners to Quiet Land Titles (George M. Robertson, March 31, 1855) summarized events that had transpired during the life of the Commission:

> …The first award made by the Commission was that of John Voss on the 31st of March 1847.
>
> The time originally granted to the Board for the hearing and settlement of all the land claims in the kingdom was two years, ending the fourteenth day of February 1848.
>
> Before the expiration of that term it became evident that a longer time would be required to perform a work… Accordingly, the Legislature on the 26th day of August 1847, passed an Act to extend the duration of the Board to the 14th of February, 1849, adding one year to the term first prescribed, not however, for the purpose of admitting fresh claims, but for the purposes of hearing, adjudicating and surveying those claims that should be presented by the 14th of February, 1848. It became apparent to the Legislature of 1848 that the labors of the Land Commission had never been fully understood, nor the magnitude of the work assigned to them properly appreciated, and that it was necessary again to extend the duration of the Board. An act was accordingly passed, wisely extending the powers of the Commissioners “for such a period of time from the 14th day of February 1849, as shall be necessary for the full and faithful examination, settlement and award upon all such claims as may have been presented to said Board.” …[T]he Board appointed a number of Sub-Commissioners in various parts of the kingdom, chiefly gentlemen connected with the American Mission, who from their intelligence, knowledge of the Hawaiian language, and well-known desire to forward any work which they believed to be for the good of the people, were better calculated than any other class of men on the islands to be useful auxiliaries to the Board at Honolulu…
>
> …During the ten months that elapsed between the constitution of the Board and the end of the year 1846, only 371 claims were received at the office; during the year 1847 only 2,460, while 8,478 came in after the first day of January 1848. To these are to be added 2,100 claims, bearing supplementary numbers, chiefly consisting of claims which had been forwarded to the Board, but lost or destroyed on the way. In the year 1851, 105 new claims were admitted, for Kuleanas in the Fort Lands of Honolulu, by order of the Legislature. The total number of claims, therefore, amounts to 13,514, of which 209 belonged to foreigners and their descendants. The original papers, as they

> were received at the office, were numbered and copied into the Registers of the Commission, a highly necessary part of the work, which entailed no small amount of labor…
>
> …The whole number of Awards perfected by the Board up to its dissolution is 9,337, leaving an apparent balance of claims not awarded of say 4,200. Of these, at least 1,500 may be ranked as duplicates, and of the remaining 2,700 perhaps 1,500 have been rejected as bad, while of the balance some have not been prosecuted by the parties interested; many have been relinquished and given up to the Konohikis, even after surveys were procured by the Board, and hundreds of claimants have died, leaving no legal representatives. It is probable also that on account of the dilatoriness of some claimants in prosecuting their rights before the Commission, there are even now, after the great length of time which has been afforded, some perfectly good claims on the Registers of the Board, the owners of which have never taken the trouble to prove them. If there are any such, they deserve no commiseration, for every pains has been taken by the Commissioners and their agents, by means of oft repeated public notices and renewed visits to the different districts of the Islands, to afford all and every of the claimants an opportunity of securing their rights…[11]

By the time of its closure, the total land area in the Hawaiian Islands awarded to hoaʻāina only came to approximately 28,658 acres.[12]

Documenting the Māhele in 1848-1855[13] was a monumental task for the Land Commission and its agents. While we are fortunate to have the records of the Māhele and Kuleana, it will be seen that there were many problems at the time of recordation. These problems present us with some questions that will never be answered and require us to make educated assumptions—based on standard practices of residency and land use, and requirements of the Māhele-Kuleana application process at the time—to better understand what the records tell us.

### 3.3.4 A History of Land Tenure in Wailua

The transformation of land tenure in Hāna, Maui reflects a broader trajectory of dispossession experienced throughout Hawaiʻi following the Māhele of 1848. Prior to

11 Minister of Interior Report, 1856:10-17.
12 See Indices of Awards, 1929, and Kameʻeleihiwa, 1992:295.
13 In October 2000, Kumu Pono Associates LLC digitized the entire collection of records of the Register, Testimony, Mahele Award Books, and Royal Patents in the collection of the Hawaii State Archives.

Western contact, land in Hāna was managed through a sophisticated system of stewardship that recognized the ahupuaʻa as foundational to social and ecological balance. Land was not a commodity, but a relative, born from the genealogical union of Papa and Wākea and sustained through reciprocal responsibility (Kameʻeleihiwa 1992; Handy, Handy, and Pukui 1972).

The social structure of Hāna's land use was rooted in a communal system in which aliʻi oversaw large tracts of land on behalf of the population, with konohiki managing day-to-day resource allocations. Families cultivated loʻi kalo, gathered forest materials, and fished in designated shoreline areas, upholding practices that were deeply embedded in both spiritual law and environmental stewardship (Silva 2004).

The arrival of missionaries and foreign advisors catalyzed a dramatic shift in this traditional system. The Māhele ʻĀina, enacted in 1848 by Kamehameha III, attempted to codify Hawaiian land tenure into a Western legal framework. Lands were divided into Crown, Government, and Konohiki holdings. While the intent was to provide Native tenants with an opportunity to secure kuleana lands, the system was fraught with barriers. Filing a claim required a written petition, a land survey, and travel to Honolulu—a challenge for rural residents in isolated districts like Hāna (Osorio 2002). Only a fraction of Native tenants ultimately received awards under the Kuleana Act of 1850, leaving vast areas of East Maui, including Hāna, in the hands of the government or converted to fee simple by non-Hawaiian interests.

Throughout the early 20th century, notices published in local newspapers reveal a systematic and calculated disposition of East Maui lands through lease, auction, and private sale. These transactions were facilitated by the territorial government's interpretation of Government Land as freely available for commercial or settler acquisition. In 1906 and 1908, multiple public notices from the *Honolulu Star-Bulletin* and *The Hawaiian Gazette* advertised the lease and auction of Crown and Government Lands in Hāna and its neighboring ahupuaʻa, often citing their suitability for homesteading or ranching (Honolulu Star-Bulletin 1906a, 1906b; The Hawaiian Gazette 1908). By reclassifying traditionally stewarded lands as commercial assets, the state positioned itself as a broker in the conversion of Hawaiian resources into economic property.

The Maui News documented additional transfers and lease announcements in 1908 and 1916, including the opening of parcels for public bidding (The Maui News 1908; 1916). While these opportunities were nominally available to all citizens, Native Hawaiians remained systematically disadvantaged due to lack of access to capital, surveys, and legal counsel. In practice, these processes favored immigrant settlers and corporations, including large ranching interests that began to dominate East Maui's landscape by mid-century.

Newspaper records from the 1920s further illuminate this trend. On October 14, 1926, two separate notices in the *Honolulu Star-Bulletin* outlined the auction of East Maui land, including detailed lot descriptions, minimum bids, and lease terms (Honolulu Star-Bulletin 1926a; 1926b). The bureaucratization of land into numeric lots and revenue projections starkly contrasted with earlier Hawaiian conceptions of land as ancestral and communal. The use of sealed bids, minimum appraisal values, and distant auction locations further entrenched the barriers faced by Native descendants.

By the 1960s, the effects of land alienation were deeply entrenched. Development schemes promoted ranching, tourism, and subdivision in remote areas of Hāna. Articles and notices in the *Honolulu Star-Bulletin* and *Honolulu Star-Advertiser* in 1965, 1966, and 1967 document ongoing land transactions involving East Maui lands. Advertisements sought buyers for lots with "ocean views" and emphasized agricultural potential, often aimed at off-island investors (Honolulu Star-Bulletin 1965; Honolulu Star-Advertiser 1966a, 1966b; 1967). These parcels were increasingly disconnected from the families who had historically maintained them, both legally and physically.

Probate records and legal announcements from the 1960s through the early 1990s reveal further fragmentation of land holdings due to generational title issues. In many cases, parcels in Hāna remained in Native families but lacked clear title due to the failure of earlier generations to formalize inheritance through Western legal mechanisms. Notices from 1968 and 1993 detail court-mandated auctions, quiet title actions, and disputes among descendants (Honolulu Star-Advertiser 1968a; 1968b; 1993a; 1993b; 1993c). The cumulative effect was a continued erosion of Native land control.

### 3.4 Modern History in the Region of the Waikakoi and South Wailua Bridges

The Waikakoi and South Wailua Bridges form two modest but historically significant crossings along the Hāna Highway, a scenic coastal route renowned for its natural beauty, cultural depth, and architectural legacy. These two bridges, located near mile markers 45.4 (Waikakoi) and 44.6 (South Wailua), have stood for over a century, serving as critical arteries for residents, farmers, and travelers. Constructed during a pivotal era of Maui's infrastructural development, these bridges embody the intersection of early 20th-century engineering, plantation-era economic imperatives, and evolving cultural landscapes in Hāna, one of Hawaiʻi's most isolated and storied districts.

Before the construction of formal roadways, travel to and within Hāna was arduous, often reliant on treacherous footpaths, rough trails, or long canoe voyages around the rugged coastlines. The geographic isolation of East Maui shaped the cultural and economic development of Hāna, enabling the preservation of traditional Hawaiian practices well into the 20th century. However, this isolation also hindered economic growth and access to centralized government services. Thus, the development of the Hāna Belt Road, later formalized as the Hāna Highway, became a critical infrastructure project in the early 1900s.


Figure 10. Project area shown on an 1885 survey map

The March 13, 1908, edition of *The Hawaiian Gazette* provides a vivid glimpse into life and development in Hāna, Maui at the start of the 20th century, particularly highlighting the abundant natural resources and economic activity in the Wailua region of Hāna (Logan 1908).

The road construction was spearheaded by the Territorial Government of Hawaiʻi beginning in the 1910s, aiming to connect Hāna with Wailuku and Kahului. Between 1910 and 1926, a series of masonry and concrete bridges were constructed along the winding route. Among them were the Waikakoi and Wailua Bridges—both completed in the early 1910s—emerging as essential components of this new transportation network.

Both the Waikakoi and South Wailua Bridges were designed as single-span reinforced concrete bridges, reflecting the engineering innovations of their time. At Waikakoi Stream, the bridge (Bridge No. 26, DOT #009003600904542) spans a rugged gulch with steep walls covered in dense vegetation. It was designed with aesthetic concrete railings and parapets typical of the early Hāna Highway bridges. At South Wailua Stream, Bridge No. 23 (DOT #009003600904464) crosses a narrower but equally dramatic valley carved by flowing waters from mauka rainforests into the sea.

Each bridge was built using cast-in-place concrete with cement rubble masonry (CRM) wing walls and abutments—a method aligned with the Territorial Department of Public Works standards of the time. These bridges were engineered to support light vehicular loads, fitting for a region with low traffic volume but demanding environmental conditions, including heavy rains, flash floods, and frequent landslides.

In addition to structural functionality, the bridges were inscribed with "AD 19XX" to mark their construction year—a common practice of the era and a nod to their civic importance.

### *3.4.1 The Plantation Era and Road Expansion*

The push to modernize Hāna's roadways was partly driven by the demands of the sugarcane industry. By the early 20th century, large plantations in East Maui—including the Kaʻelekū Sugar Company—required more efficient transportation for workers and goods. Roads like the Hāna Belt Road and bridges like Waikakoi and Wailua enabled trucks to transport cane from remote fields to mill sites and harbors. The bridges' construction coincided with a dramatic transformation in Hāna's socioeconomic landscape, from subsistence farming and fishing to wage labor on plantations.

Nonetheless, the pace and scale of this transformation were tempered by Hāna's continued remoteness and resistance to total industrial domination. As plantation operations waned in the late 20th century, the bridges outlasted their economic imperatives and began to take on new roles—as conduits for tourism, cultural resurgence, and rural resilience.

Recognizing the uniqueness of these bridges, the State of Hawaiʻi undertook a comprehensive review in 2013 known as the *Hawaiʻi State Historic Bridge Inventory and Evaluation*. Both the Waikakoi and South Wailua Bridges were found eligible for listing as significant historic properties under Hawaiʻi Administrative Rules (HAR) §13-276. They were determined to contribute to the overall significance of the Hāna Highway Historic Bridge District, under Criterion "a" (association with historical events) and Criterion "c" (architectural and engineering merit).

In this context, the bridges serve as representative examples of early 20th-century transportation infrastructure in rural Hawaiʻi. Their narrow, one-lane design and low-profile silhouette reflect both the engineering limitations and landscape-sensitive aesthetics of their era.

By the early 21st century, both bridges were declared structurally deficient due to age, weathering, and evolving safety standards. In 2021, the County of Maui initiated evaluations to assess the feasibility of their replacement. Acknowledging their historic value, the proposed project emphasized context-sensitive solutions, such as preserving single-lane dimensions, using aesthetic concrete railings that mirror the original parapets, and documenting the original structures through Historic American Engineering Record (HAER) methods.

According to the most recent mitigation proposals:

- Both bridges will be reconstructed with new one-lane spans in their current footprints.
- Temporary bypass bridges will be installed makai (toward the sea) during construction.
- Original abutments and wing walls will be retained where feasible.
- "AD 20XX" inscriptions will be recreated in the same locations as the originals.
- Crash-tested Hawaii Department of Transportation railings and cement rubble masonry barriers will be used to preserve visual continuity with historic structures.

These mitigation measures aim to balance public safety with the preservation of cultural and visual character. In accordance with HAR §13-275-7, the County of Maui has acknowledged that the proposed project will adversely affect the historic properties but has committed to minimizing this impact through careful design, documentation, and community engagement.

As infrastructure modernization proceeds, the Waikakoi and Wailua Bridges remind us of the profound responsibility to uphold cultural integrity while addressing safety and accessibility. In a place like Hāna, where ancestral knowledge, oral tradition, and connection to land remain strong, even concrete can carry memory.

The bridges are witnesses to a century of change—of people walking barefoot from one ahupuaʻa to another, of Model Ts and sugar trucks winding narrow curves, of surfers heading to Hamoa and families returning home from town. They are symbols of both movement and mooring, reminding travelers of the care it takes to enter a place like Hāna with respect and intention.

**4.0 Cultural Resources**

The following research and analyses appropriately study the history and cultural resources of the project area, focusing on the project area and the surrounding environment.

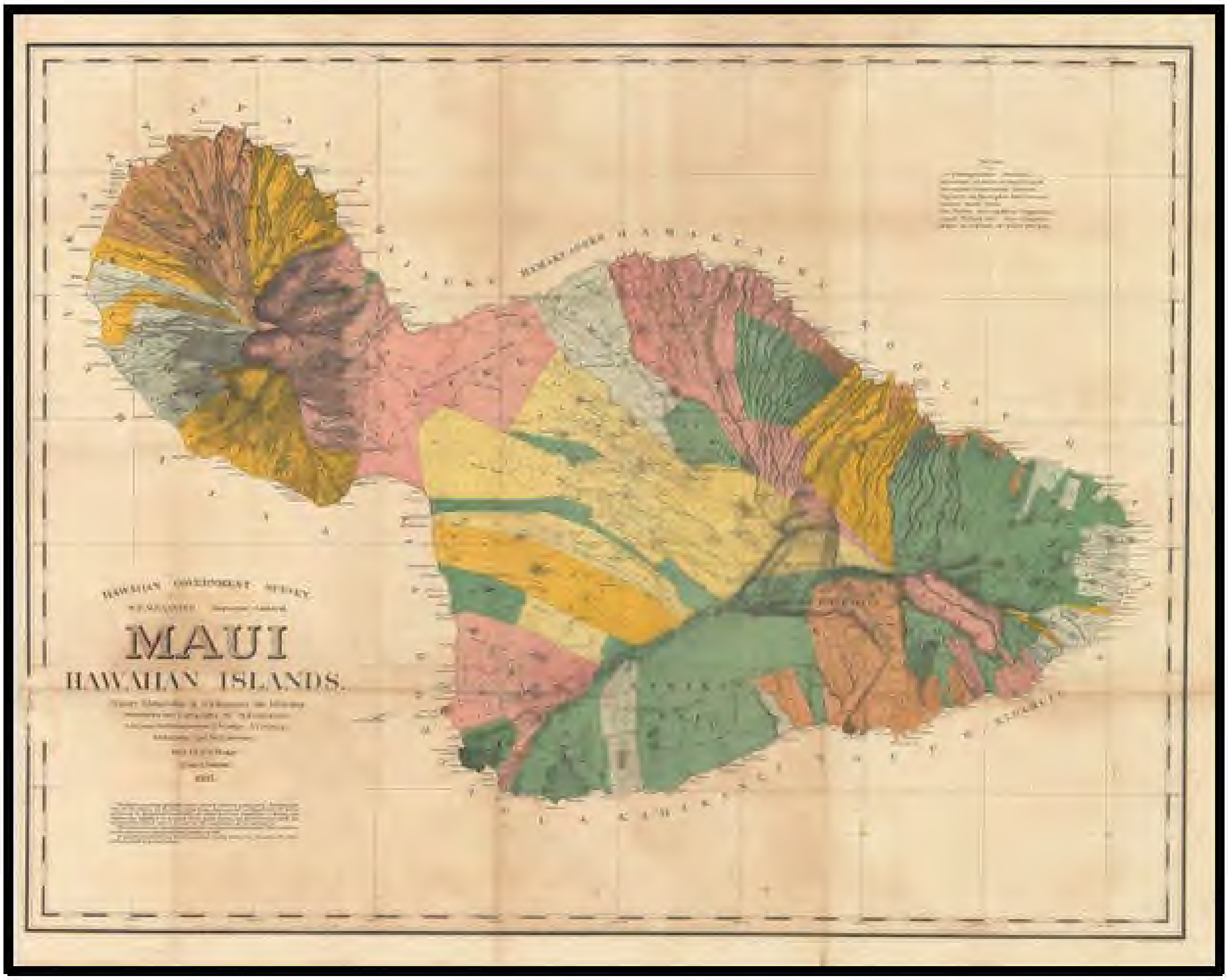


Figure 11. Map of Maui by W.D. Alexander and F.S. Dodge (1885)


*Figure 12. Soil map*

## 4.1 Historic Properties and Cultural Sites

Honua Consulting is conducting a study that complies with Hawaiʻi Revised Statutes (HRS) Chapter 6E.

## 4.2 Natural Resources with Cultural Significance

To employ the Hawaiian landscape perspective and emphasize the symbiosis of natural and cultural resources, Honua Consulting uses the term 'biocultural' to refer to natural and cultural resources, with additional sub-classifications by attributes.

A brief further discussion of environmental zones and traditional Hawaiian land management practices is necessary to understand the tangible and intangible aspects of the Hawaiian landscape. Additionally, it is important to point out once again that in the Hawaiian landscape, all natural and cultural resources are interrelated and culturally significant. Natural unaltered landscape features such as rocky outcrops, cinder cones, intermittent streams, or an open plain can carry as much significance as a planted grove of wauke (*Broussonetia papyrifera*) or a boulder-lined ʻauwai (canal).

Maly presents a narrative of traditional Hawaiian land management strategies and the different environmental zones recorded in *Ka Hoku o Hawaii* (September 21, 1916):

> Hawaiian customs and practices demonstrate the belief that all portions of the land and environment are related, like members of an extended family, each environmental zone was named, and their individual attributes were known. Acknowledging the relationship of one environmental zone (wao) to another, is rooted in traditional land management practices and values. Just as place names tell us that areas are of cultural importance, the occurrence of a Hawaiian nomenclature for environmental zones also tells us that there was an intimate relationship between Hawaiians and their environment.
>
> The native tradition of Ka-Miki provides readers with a detailed account of Hawaiian land divisions and environmental zones. While competing in a riddling contest at the court of the chief, Palikū-a-Kīkoʻokoʻo, the hero, Ka-Miki sparred with Pīnaʻau, the foremost riddler of the district of Hilo Palikū (northern Hilo). The riddles covered topics describing regions from the mountain tips to the depths of the ocean, and descriptions of kalo (taro growth), the ala loa (trail systems), and nā mea lawaiʻa (fishing practices). As the contest unfolded, it was seen that each of the competitors were well

> matched. In one of the riddles, Ka-Miki described the various regions of the island of Hawaii, extending from the mountain to the sea. Ka-Miki then told his opponent, that if he could rise to the challenge of answering the riddle, his knowledge could be compared to one who has ascended to the summit of the “mauna o Paliahu” (mountain of Poliʻahu, or Mauna Kea) (in *Ka Hoku o Hawaii*, September 21, 1916).
>
> Through one of the riddles [the] reader learn[s] about the traditional wao or regions of land, districts, and land divisions of the administrators who kept peace upon the land. The environmental zones include:
>
> 1 – Ke kuahiwi; 2 – Ke kualono; 3 – Ke kaumauna; 4 – Ke ku(a)hea; 5 – Ke kaolo; 6 – Ka wao; 7 – Ka wau maʻu kele; 8 – Ka wao kele; 9 – Ka wao akua; 10 – Ka wao lāʻau; 11 – Ka wao kānaka; 12 – Ka ʻamaʻu; 13 – Ka ʻāpaʻa; 14 – Ka paheʻe; 15 – Ke kula; 16 – Ka ʻilima; 17 – Ka puʻeone; 18 – Ka poʻina nalu; 19 – Ke kai kohola; 20 – Ke kai ʻele; 21 – Ke kai uli; 22 – Ke kai pualena; 23 – Kai Pōpolohua-a-Kāne-i-Tahiti.
>
> 1 – The mountain; 2 – The region near the mountain top; 3 – The mountain top; 4 – The misty ridge; 5 – The trail ways; 6 – The inland regions; 7 and 8 – The rain belt regions; 9 – The distant area inhabited by gods; 10 – The forested region; 11 – The region of people below; 12 – The place of ʻamaʻu (fern upland agricultural zone); 13 – The arid plains; 14 – The place of wet land planting; 15 – The plain or open country; 16 – The place of ʻilima growth (a seaward, and generally arid section of the kula; 17 – The dunes; 18 – The place covered by waves (shoreline); 19 – The shallow sea (shoreline reef flats); 20 – The dark sea; 21 – The deep blue-green sea; 22 – The yellow (sun-reflecting sea on the horizon); and 23 – The deep purplish black sea of Kāne at Tahiti (Maly 2001: 3).

This section discusses the natural resources within the project area, specifically those natural resources that may have cultural significance or use. These natural resources were identified through the biological assessment prepared for the project and through primary research into historic resources.

### 4.2.1 Flora

The *2025 Natural Resources Assessment* for the Wailua and Waikākoʻi bridge replacement project in Kīpahulu, East Maui was conducted by AECOS Inc. on behalf of

HDR Inc. The report documents flora, fauna, and aquatic resources observed during field surveys in August 2022. The survey recorded 110 plant species, including two endemic (kikawaiō and ni‘ani‘au) and four indigenous species, as well as nine culturally significant Polynesian-introduced plants such as kalo, ‘ulu, and kukui. The assessment found no threatened or endangered species but highlighted the presence of native stream fauna and culturally valuable plants.

The survey identified six native species (two endemic and four indigenous) and nine Polynesian-introduced species (canoe plants), many of which have traditional uses or associations in Native Hawaiian culture.

**Endemic Species**

(*Native to Hawai‘i and found nowhere else*)

1. **Kikawaiō** (*Christella cyatheoides*) – Endemic fern found at Waikāko‘i.
    - Culturally, ferns are often used in lei-making, hula adornments, and traditional medicine.
2. **Ni‘ani‘au** (*Nephrolepis exaltata hawaiiensis*) – Endemic fern found at Wailua.
    - Considered a native variety of the commonly used sword fern, associated with hula adornment and landscaping.

**Indigenous Species**

(*Native to Hawai‘i but found naturally elsewhere*)

1. **Kā‘ape‘ape** (*Cyrtomium caryotideum*) – Fern observed at Wailua.
2. **Moa** (*Psilotum nudum*) – Ancient fern ally reported at Waikāko‘i.
    - Traditionally used medicinally and in rituals, especially for cleansing.
3. **Pōpolo** (*Solanum americanum*) – Nightshade species recorded at Waikāko‘i.
    - Historically used in lā‘au lapa‘au (Hawaiian herbal medicine) for ailments like sore throat or stomachache.
4. **Kā‘e‘e / Sea Bean** (*Mucuna gigantea*) – A large vine documented at Wailua.
    - Known for strong fibers used in cordage; seeds also featured in lei.

**Polynesian Introductions (Canoe Plants)**

These species were brought to Hawai‘i by early Polynesian settlers and hold continued cultural importance:

1. **Kalo (Taro)** (*Colocasia esculenta*)
   - Staple food crop with deep cultural and genealogical significance (symbolically linked to Hāloa, the first-born ancestor of the Hawaiian people).
2. **Ki (Ti Plant)** (*Cordyline fruticosa*)
   - Used for food, lei, lāʻau lapaʻau, and ritual protection. Common at both sites.
3. **Coconut (Niu)** (*Cocos nucifera*)
   - Used for food, water, building materials, and ceremonial purposes.
4. **Kukui** (*Aleurites moluccana*)
   - Known for its oil (used in lamps), medicinal uses, and as a symbol of enlightenment.
5. **ʻUlu (Breadfruit)** (*Artocarpus altilis*)
   - Important food crop and part of oral traditions and planting lore.
6. **ʻOlena (Turmeric)** (*Curcuma longa*)
   - Used in medicine, dyes, and ceremonial cleansing.
7. **Noni** (*Morinda citrifolia*)
   - Extensively used in Hawaiian medicine for internal and external treatments.
8. **Dioscorea bulbifera (Hoi)**
   - Though not a staple food, known and used in traditional contexts.
9. **Mountain Apple (ʻŌhiʻa ʻai)** (*Syzygium malaccense*)
   - Used for food and ceremonial offerings.

### 4.2.2 Fauna

The same AECOS, Inc. report surveyed for fauna and identified the following species of potential cultural value. These species are either endemic or indigenous to Hawaiʻi and hold ecological and cultural importance, particularly in traditional Hawaiian fishing, storytelling, and spirituality.

#### Native Freshwater Fish (Iʻa Kahawai)

These species are endemic, meaning they are found only in Hawaiʻi, and are significant in traditional subsistence and ecological knowledge.

- **ʻOʻopu nākea** (*Awaous stamineus*) – Found in Wailua Stream
  - A commonly known freshwater goby, important in local fishing traditions and often mentioned in moʻolelo.

- **ʻOʻopu naniha** (*Stenogobius hawaiiensis*) – Observed in Wailua Stream
  - Another native goby known to travel between mountain streams and the ocean; part of traditional fishing practices.
- **ʻOʻopu alamoʻo** (*Lentipes concolor*) – Reported in DAR surveys
  - Culturally recognized as agile climbers of waterfalls; feature in stories that teach about perseverance and strength.
- **ʻOʻopu nōpili** (*Sicyopterus stimpsoni*) – Reported in DAR surveys
  - Known for their distinctive appearance and importance in stream ecosystems.

**Native Freshwater Snail**

- **Hihiwai** (*Neritina granosa*) – Observed in Wailua Stream
  - A native freshwater snail traditionally gathered as food. Hihiwai are referenced in songs and stories, symbolizing both nourishment and place-based identity.

**Native Insects (Hawaiian Dragonfly)**

- **Pinao** (*Anax strenuus*) – Native Hawaiian dragonfly seen near Wailua Falls
  - The largest dragonfly in Hawaiʻi and endemic to the islands, associated with upland streams and clean freshwater. Culturally, pinao are linked to warriors and swift movement in traditional narratives.

**Hawaiian Hoary Bat (ʻŌpeʻapeʻa)**

- *Lasiurus cinereus semotus* – Not directly observed, but identified as potentially present
  - The only native terrestrial mammal of Hawaiʻi. The bat is significant in traditional beliefs, sometimes considered an ʻaumakua (family guardian spirit). Cultural protocols often emphasize its protection, especially during the pupping season.

**Additional Notes**

- **Damselflies (Megalagrion spp.)**, including endangered species such as *M. pacificum* and *M. nesiotes*, are known from the region but were not observed during this survey. These native damselflies are culturally significant as indicators of stream health and symbols of freshwater vitality.

### 4.2.3 Water Resources

Fresh water (wai) is of tremendous significance to Native Hawaiians. It is closely associated with a variety of Hawaiian gods. According to traditional accounts, Kāne and Kanaloa were the “water finders:” “Ka-ne and Kanaloa were the water-finders, opening springs and pools over all the islands, each pool known now as Ka-Wai-a-ke-Akua (The water provided by a god)” (Westervelt 1915: 38). Kāne is widely known to be closely associated with all forms of water, as outlined in the mele “He Mele No Kane.”

There was no element more important or precious than water. There was no god more powerful than Kāne. Pua Kanahele recounts the oli “‘O Kāne, ‘o wai ia ali‘i o Hawai‘i?” and notes of the oli: “The chant begins with Kāne and focuses on this deity as the connective force of all the po‘e akua, or god family. All the entities mentioned in each paukū, or verse, are a manifestation of Kāne” (2011: 24). The association between water and Kāne is logical considering certain interpretations of Hawaiian mythology identify Kāne as the most powerful of all the Hawaiian gods.

Further investigation into the relationship between Kāne and Pele would be appropriate and helpful. Some interpretations identify Kāne as Pele’s father (Westervelt 1915). A full analysis of the different perspectives on Pele and Kāne would be helpful to refining an approach in developing community education programs for geothermal energy and culture. A brief analysis is provided below.

He Mele No Kane asks:

| | |
|---|---|
| E ui aku ana au ia oe, | One question I ask of you: |
| Aia i hea ka Wai a Kane? | Where flows the water of Kane? |
| Aia i lalo, i ka honua, i ka Wai hu, spring, | Deep in the ground, in the gushing |
| I ka wai kau a Kane me Kanaloa- | In the ducts of Kane and Kanaloa, |
| He waipuna, he wai e inu, | A well spring of water, to quaff, |
| He wai e mana, he wai e ola, | A water of magic power- The water of life! |
| E ola no, ea! | Life! O give us this life! |

This mele and other mo’olelo are clear: Kāne is water. It is deeply valued among the Hawaiian people. The only exceptions may be mist, known to be associated with Lilinoa, and snow, associated with Poliahu. There is an extensive body of traditional knowledge about the expeditions of Kāne and Kanaloa during which Kāne drove his ‘ō‘ō (digging stick) into the earth in search of water.

There is heightened sensitivity regarding water in South Maui, where the project is located. Contemporaneous protections around water as a “public trust resource” extend back to the Kingdom, where the concept of owning water contradicted Hawaiian cultural values and traditions. Under the monarchy, control of water was reserved for use by the people who lived on and worked the land. The use of surface water was strictly controlled through the kapu system to ensure that all land tenants enjoyed an abundant availability of water. Farming, particularly kalo or taro, occurred regularly, especially in places with notably fertile lands like those found in the watersheds of East Maui. As early as 1839, the public use of water was codified by Kauikeaouli, Kamehameha III. His “Respecting Water for Irrigation” law stated: “In all places which are watered by irrigation, those farms which have not formally received a division of water, shall, when this new regulation respecting lands is circulated, be supplied in accordance with this law, the design of which is to correct in full all those abuses which men have introduced. All those farms which were formally denied a division of water shall receive their equal proportion. Those bounties which God has provided for the several places should be equally distributed, in order that there may be an equal distribution of happiness among all those who labor in those places” (Cited in *Reppun v. Board of Water Supply*, 656 P.2d 57 1982). This public right eventually found its way into existing law, where the Hawaii Water Code continues to recognize and protect traditional farming and mahi ‘ai (farmers).

It is critical for this CIA to consider impacts to cultural practices, even when the practices may take place outside the project area if project activities within the project area have the potential to impact traditional practices and customs. In this particular case, it is appropriate to carefully consider the impact water usage may have on farmers and other practitioners within the watershed(s) from which the water for this project will be drawn. If the water usage potentially results in an allocation of water that diverts these resources from cultural and/or traditional uses, that potential impact should be considered. The project should remain mindful of its water consumption and ensure that its usage does not exceed the sustainable yield for any of the aquifers from which it draws water.

In addition to its cultural and spiritual significance, water in the Hāna region—specifically within the Wailua watershed—is also important from ecological and regulatory perspectives. The area surrounding the South Wailua and Waikākoʻi bridges includes several perennial streams, including Honolewa Stream and Waikākoʻi Stream, which ultimately flow into the Pacific Ocean. According to a 2023 report prepared by AECOS Inc., both streams are considered jurisdictional “Waters of the United States” under the Clean Water Act due to their continuous surface connection to the ocean (AECOS 2023).

Honolewa Stream passes beneath Bridge No. 23 and is characterized by natural streambanks, a series of pools and runs, and the presence of notable features such as Wailua Falls. Field observations identified consistent indicators of the ordinary high-water mark (OHWM), suggesting relatively stable flow conditions. Similarly, Waikākoʻi Stream, though smaller in scale, flows through a steep ravine beneath Bridge No. 26 and supports aquatic life. Both stream corridors are densely vegetated and largely natural in character.

#### 4.2.4 Rains

Akana and Gonzalez in *Hānau Ka Ua: Hawaiian Rain Names* explain the significance of the wind and rain in Native Hawaiian culture:

> In the mind…of our Hawaiian kūpuna [(ancestors)], every being and every thing in the universe was born. Our kūpuna respected nature because we, as kānaka, are related to all that surrounds us – to plants and creatures, to rocks and sea, to sky and earth, and to natural phenomena, including rain and wind. This worldview is evident in a birth chant for Queen Emma, "Hānau ke aliʻi, hānau ka ua me ka makani" (The chiefess was born, the rain and wind, too, were born). Our kūpuna had an intimate relationship with the elements. They were keen observers of their environment, with all of its life-giving and life-taking forces. They had a nuanced understanding of the rains of their home. They knew that one place could have several different rains, and that each rain was distinguishable from another. They knew when a particular rain would fall, its color, duration, intensity, the path it would take, the sound it made on the trees, the scent it carried, and the effect it had on people (Akana and Gonzalez 2015: xv).

To the Native Hawaiians, no two rains are ever the same. Rain can be distinguished based on its intensity, the way it falls, and its duration, among other things. The following are a collection of rains that occur within the region. Moʻolelo, ʻōlelo noʻeau (traditional sayings), mele, oli (chants), etc., associated with the particular rain name are also provided to give insight into the importance and cultural significance that the different types of rains have to the Native Hawaiian people.

The follow are rain names associated with East Maui.

*Table 2. Rain Names Associated with East Maui*

| Rain Name | Description / Notes |
| --- | --- |

| | |
|---|---|
| Ka ua Laniha‘aha‘a | The Rain of the Low Sky – gentle yet persistent, tied to stories of Ka‘eokulani sheltering beneath banana leaves in a sudden downpour. |
| Ka ua ‘Uahiapele | The Rain of Pele’s Smoke – a warm misty rain, often rising with steam from volcanic activity. |
| Ka ua Hāwanawana | The Whispering Rain – so light it barely touches the leaves, heard more than seen. |
| Ka ua Helekulani | The Rain that Visits the Heavens – a high mist rain, usually seated above forest lines. |
| Ka ua Pa‘akai | The Salt Rain – mingled with sea spray, carried inland from stormy ocean winds. |
| Nāulu | Rain-bearing cloud or sudden rain shower, common in poetic references to Hāna. |

### 4.2.5 Winds

In Hawaiian culture, wind names carry deep significance, often tied to specific places, events, and ancestral knowledge. Each wind has a unique name that reflects its behavior, direction, and relationship to the land. These names are woven into mele, mo‘olelo, and place-based identity, serving as markers of ‘ike kūpuna (ancestral knowledge) and environmental awareness. Knowing the winds of a place—such as the Moa‘e or the ‘Āpa‘apa‘a—demonstrates a deep connection to ‘āina and its rhythms. Wind names also inform fishing, farming, and voyaging practices, making them essential to cultural survival, navigation, and the perpetuation of Hawaiian ‘ike and identity.

One of the most famous wind mo‘olelo is that of the Wind Gourd of La‘amaomao. This legendary gourd was gifted to Pāka‘a, a me‘e (hero) and skilled navigator, by his mother, who descended from La‘amaomao, the goddess of the winds. The gourd held the names and powers of all the winds of Hawai‘i, allowing Pāka‘a to call upon specific winds to aid in travel or protect his people. The story emphasizes the sacred relationship between kānaka and the elements, highlighting the importance of knowing and respecting the natural forces that sustain life and connect generations through oral tradition.

*Table 3. Wind Names Associated with East Maui*

| Wind Name | Description / Notes |
|---|---|
| Kaomi | Gentle wind associated with peace and calm. |
| Koholalele | Favorable for canoe travel; steady breeze. |
| Koholapehu | Stormy wind that stirs the sea and brings mist inland. |
| Kapae | Angled offshore wind; causes stormy seas. |
| Hoolua | Fierce easterly wind; roughens harbor waters. |
| Aimaunu | Productive fishing wind; calm mornings followed by rain. |
| Lauawaawa | Mild inland wind fluttering through groves. |
| Paiolopaowa | Upland wind bringing soaking fine rain. |
| Halemauu | Morning wind from upper forest zone; fades by noon. |
| Kiu | Cold, swift wind that disrupts cliffs and sea. |
| Kona | Rare southern wind bringing heavy rains and stillness. |
| Haemaui | Listed near Hāna on map; local wind, possibly unique to area. |
| ʻĀinaumū | Appears in map near Hāna; possibly a wind with localized significance. |
| Kaʻūiki | Possibly wind tied to Kaʻūiki Hill; appears in mele and moʻolelo. |

### 4.3 Intangible Cultural Resources

It is important to note that Honua Consulting’s unique methodology divides cultural resources into two categories: biocultural resources and built environment resources. We define biocultural resources as elements that exist naturally in Hawaiʻi without human contact. These resources and their significance can be shown, proven, and observed through oral histories and literature. We define built environment resources as elements that exist through human interaction with biocultural resources whose existence and history can be defined, examined, and proven through anthropological and archaeological observation. Utilizing this methodology is critical in the preparation of a CIA as many resources, such as those related to akua (Hawaiian gods), do not necessarily result in material evidence, but nonetheless are significant to members of the Native Hawaiian community.

Hawaiian culture views natural and cultural resources as being one and the same: without the resources provided by nature, cultural resources could and would not be procured. From a Hawaiian perspective, all natural and cultural resources are interrelated, and all natural and cultural resources are culturally significant. Kepā Maly, ethnographer and Hawaiian language scholar, points out, “In any culturally sensitive discussion on land use in Hawaii, one must understand that Hawaiian culture evolved in close partnership with its natural environment. Thus, Hawaiian culture does not have a clear dividing line of where culture ends and nature begins” (Maly 2001: 1).

### 4.3.1 ‘Ōlelo No‘eau

‘Ōlelo no‘eau are another source of cultural information about the area. ‘Ōlelo no‘eau literally means “wise saying” and they encompass a wide variety of literary techniques and multiple layers of meaning common in the Hawaiian language. Considered to be the highest form of cultural expression in old Hawai‘i, ‘ōlelo no‘eau bring us closer to understanding the everyday thoughts, customs, and lives of those that created them.

The ‘ōlelo no‘eau presented here relate to Hāna. These ‘ōlelo no‘eau are found in Pukui’s *‘Ōlelo No‘eau: Hawaiian Proverbs & Poetical Sayings* (1983). The number preceding each saying is provided.

#451 “Hāna i ka i‘a iki.
Hāna of the little fish.”

[Believing slanderous tales about Ku‘ula and his wife, Hinahele, the ruling chief of Hāna ordered them destroyed. Having mana over the fish of the sea, the two caused a scarcity until their son ‘Ai‘ai brought them back to life. Ku‘ula and Hinahele were worshipped as deities by fishermen.]

#460 “Hāna, mai Ko‘olau a Kaupō.”
Hāna, from Ko‘olau to Kaupō.

[The extent of the district of Hāna, Maui.]

#1566 “Ka ua kea o Hāna.
“The white rain of Hāna.”

[Refers to the misty rain of Hāna, Maui, that comes in from the sea.]

#1578 Ka ua Laniha‘aha‘a o Hāna.
The Rain-of-the-low-sky of Hāna

[Refers to Hāna, Maui. once, the young warrior chief Ka‘eokulani ran to a banana grove to escape a sudden squall. As he stood safe and dry in the shelter of the banana leaves he lifted his spear. It accidentally pierced through the leaves and a trickle of water came through. He remarked that the sky where he stood was so low he had pierced it.]

#2124 Mālia Hāna ke ahuwale nei Kaihuokala.
Hāna is calm, for Kaihuokala is clearly seen.

Kaihuokala is a hill on the Hāna side of Haleakalā. When no cloud rests upon it, it is a sign of clear weather. Also expressed Mālie Maui, ke waiho maila Kaihuokala.

#2359 ‘O Hāna ia, he ‘āina au pehu.
That is Hāna, land where lack was known.

#1990 Lewa ka waha o ka puhi o Laumeki. The mouth of the eel of Laumeki gapes.

[Said of one who talks so much that his mouth is hardly ever closed. Laumeki was an eel-man who lived at Wailau, Moloka‘i. When he saw that Ku‘ula’s fishpond at Hāna, Maui, was always full of fish, he decided to assume his eel form and go there to steal some. On one of his thieving expeditions, he was caught by a magic hook and drawn ashore, where his jaw was smashed and left gaping.]

#### 4.3.2 Mele

Honua Consulting completed searches of mele written about the ahupuaʻa of Wailua, neighboring ahupuaʻa and Hāna.[14] Maui historian Inez Ashdown wrote in 1976 about the importance of mele:

> The natives of Hawaiʻi Neʻi saw the Creator in everything and the Haku Mele or Music Masters delighted in presenting the chants and songs, mele and oli, to inspire the people. Such mele tell of God's assistant spirits which, to the imaginative natives, represented the winds, rains, and so on. Each spirit of creation was depicted as male or female and was given a personality and a name indicative of purpose. Hence the name of the volcanic action creating and cleansing the earth. She is beautiful, alluring, desirable. She also is unpredictable because she is temperamental and usually full of fiery emotions. She is an old woman asking help when she lies to test mortals, and woe betide anyone who is rude or inconsiderate of this form of an older person to whom respect and Aloha must be given (Ashdown 1976: 3).

Across generations, mele have served as records of place-based knowledge in Hāna, preserving names, resources, and cultural practices through poetic language. From traditional mele like "Koali" to more contemporary compositions such as "Hasegawa General Store," these songs offer insight into the environmental, social, and spiritual life of the region. "Koali" references lipoa seaweed, Kanewai surf, ʻiwa birds, and swaying coconut fronds, indicating a coastline rich with biodiversity and traditional gathering practices. Similarly, "Waiʻānapanapa" honors sacred freshwater sources and references the moʻolelo of Pōpōʻalaea, tying specific locations to legend, memory, and spiritual caution.

Landmarks like Kaʻuiki repeatedly appear in mele including "Haʻaheo o Hāna," "Kaʻahumanu," and "Nani Hāna," positioning the puʻu as a symbol of protection, chiefly lineage, and cultural continuity. Weather patterns like the Moaʻe wind or Kanilehua rain convey emotional tone and ecological rhythm, offering listeners a sensory map of Hāna's environment. Other mele, such as "Hāna No E Ka ʻOi," speak directly to aliʻi heritage and local pride, while English-language songs like "Heavenly Hāna" and "Hasegawa General Store" reveal 20th-century shifts toward tourism, local commerce, and community life. Collectively, these mele illustrate how Hawaiians encode ecological awareness, political identity, and emotional ties to ʻāina through song. They are not just artistic expressions—they are repositories of knowledge, grounding people to place across time.

[14] It should be noted that there are numerous mele about the larger Wailuku area that have not been included in this assessment as they did not yield information closely associated with the project area.

The following is a well-known traditional mele about Koali, the ahupuaʻa east of Wailua ahupuaʻa. While a traditional mele, it has been recently recorded by Hawaiian musicians.

#### *4.3.2.1 Koali (Traditional)*

He aloha nō koali
I ka nalu haʻi mai aʻo Kanewai
Me ka lipoa paoʻa ala
Anu makehewa kēlā

E hoʻi ka ulu i ka hale loke
I ka hale lau o ka ʻiwaʻiwa
Me nā ʻiwa e walea ai
Kikaha maile i ka lāʻi lā lāʻe lāʻe

Nani Wailua i ka ehu o ke kai
I ka holu nape o ka lau o ka niʻu
I kowelo haʻaheo hae Hawaiʻi
Kū kilakila i ka lāʻi lā lāʻe lāʻe

Haʻina ʻia mai ana ka puana
I ka nalu haʻi mai aʻo Kanewai
Me ka lipoa paoʻa ala
Anu makehewa kēlā

Translation:

Koali is dearly loved
For the breaking surf of Kanewai
With the lipoa's heady fragrance
An overwhelming chill is the result

Returned to that rose garden
The house of the maidenhair ferns
Delighting with the ʻiwa birds
Soaring smoothly in the peacefulness

Lovely is Wailua in the seaspray
In the swaying of the coconut fronds

Streaming proudly like the Hawaiian flag
Regal in the calm

The story is told
Of the breaking surf of Kanewai
With the lipoa's heady fragrance
An uncontrollable chill is what you get

The traditional mele "Koali" serves as both a poetic tribute and a cultural map, rich with environmental and sensory detail that reflects a deep relationship to the land. This mele names places like Kanewai and Wailua—both located in East Maui—rooting the listener in a landscape known for its abundance and beauty. Kanewai, remembered for its breaking surf and rich coastal ecosystem, is associated here with lipoa, a fragrant seaweed traditionally gathered along rocky shorelines. Lipoa's inclusion not only evokes scent memory but also signifies the ecological richness of the area, reflecting the sustainable gathering practices of coastal communities.

The presence of the iwa bird—often considered a sign of calm seas and guidance—adds a symbolic layer of navigation, freedom, and spiritual observation. References to niu (coconut) fronds swaying and the ehu kai (sea spray) of Wailua deepen the mele's ties to natural rhythm and elemental connection. These images ground the listener in a dynamic, living environment where land, sea, and sky are intimately intertwined.

The mele also speaks to personal emotion and cultural memory. Phrases like anu makehewa (a chilling sorrow) and the return to a home of ferns and roses suggest themes of longing, love, and return—common in Hawaiian poetry and deeply resonant in a post-colonial context.

Modern recordings by artists such as Keali‘i Reichel, The Brothers Cazimero and Cyril Pahinui help preserve and share "Koali," allowing new generations to experience its poetic and geographical richness through music and memory.

The following mele are about Hāna generally.

**4.3.2.2 Hāna No E Ka ‘Oi**

**By:** John Pi‘ilani Watkins
**Source:** McKee Collection, translated by Kanani Mana

ʻO Hāna nō e ka ʻoi
Ka home o nā aliʻi
E kuʻu ʻāina hānau eia lā
ʻO Hāna nō e ka ʻoi
Maui nō e ka ʻoi

E kuʻu lei lokelani
Ua ʻako nei ʻia no ʻoe
E kuʻu pua ʻala onaona lā
ʻO Hāna nō e ka ʻoi
Hāna nō e ka ʻoi

He puʻu kau mai i luna
I lalo nei ʻo Kaʻuiki
He ala nui kīkeʻekeʻe lā
ʻO Hāna nō e ka ʻoi
Maui nō e ka ʻoi

Haʻina mai ka puana
E kuʻu lei lokelani
E kuʻu ʻāina hānau eia lā
ʻO Hāna nō e ka ʻoi
Hāna nō e ka ʻoi

Mālama
E kuʻu ʻāina

Translation:

Hāna is the best
Home of the chiefs
Land of my birth, here it is
Hāna is the best
Maui, the best of the islands

My rose lei
Plucked just for you
My fragrant flower

Hāna is the best
Maui, the best

A hill stands above
And below is Kaʻuiki
A winding road leads to it
Hāna is the best
Maui, the best

Tell the refrain
My rose lei
Land of my birth, here it is
Hāna is the best
Maui, the best

Take care
Of my land

#### *4.3.2.3 Hana Chant*

**Traditional**

Haʻaheo o Hāna lā
Haʻaheo o Hāna lā
E ala e ala - E ala e ala
Kuʻu Puʻu Kaʻuiki lā
Kuʻu Puʻu Kaʻuiki lā
He uʻi lā - He uʻi lā
Kuʻu lei loke lani lā
Kuʻu lei loke lani lā
He pua onaona lā - He pua onaona lā
He aliʻi lā
He aliʻi lā
Eō
Kaʻahumanu lā - no Kamehameha
Kaʻahumanu lā - no Kamehameha
E ala e ala e a

The chant “Haʻaheo o Hāna” is a proud and poetic expression of love and reverence for Hāna, a region on the eastern coast of Maui that holds deep cultural and historical importance. The repetition of haʻaheo—meaning pride or glory—establishes the chant’s central emotion: a sense of identity rooted in place.

Central to this chant is the reference to Puʻu Kaʻuiki, a prominent hill that stands as a sentinel over Hāna Bay. Kaʻuiki is more than a geographic feature; it is a wahi pana (storied place) associated with significant moʻolelo (stories), battles, and chiefly lineages. Describing Kaʻuiki as kuʻu puʻu (my beloved hill) and he uʻi (a beauty) reflects a deep, emotional connection to the land and reveals the intimate and affectionate relationship Native Hawaiians hold with their ʻāina.

The mention of lei loke lani (heavenly rose lei) and pua onaona (sweet-smelling flower) draws imagery of Hāna’s lushness and its association with beauty, fragrance, and ceremonial honor.

The chant culminates in tribute to Kaʻahumanu, a high-ranking aliʻi born in Hāna who became a powerful queen and advisor to Kamehameha I. Her name anchors the chant in legacy and governance, serves as a reminder that Hāna not only nurtures natural beauty but also powerful leaders who shaped Hawaiian history.

#### *4.3.2.4 Nani Hāna*

**Composer:** Kealiʻikaleoʻolaeanuikaumanamana VIII Blaisdell
**Source:** Huapala – Nani Hāna

Nani Hāna i ka ua Kanilehua
Ka makani ʻoluʻolu o ka ʻāina
ʻO Kaʻuiki puʻu o ka ʻāina
Kaulana hoʻi i ke ahi a ka Wahine

ʻAkahi nō au a ʻike i ka nani
Ke oneuli o Waiʻānapanapa
Hoʻohihi au i nā wai a Hāna
I ka hāwanawana a ke kai

Hōloi ʻia nei nā kolo o ke ala
Me he wai hua ʻole lā ka nohona

Hoʻolale ʻia mai nā kulu o ke aloha
I ke one ʻo Hāmoa i ka laʻi

Haʻina ʻia mai ana ka puana
Nani Hāna i ka ua Kanilehua
Hoʻohihi au i nā wai a Hāna
I ka hāwanawana a ke kai

Translation:

Beautiful is Hāna in the Kanilehua rain
The gentle wind of the land
Kaʻuiki, the hill of the land
Famous for the fire of the Woman

Now I finally see the beauty
The dark sand of Waiʻānapanapa
I'm enchanted by the waters of Hāna
By the whispering of the sea

The footprints on the path are washed away
Life is like water without fruit
Teardrops of love are stirred
On the sands of Hāmoa in the calm

The story is told in the refrain
Beautiful is Hāna in the Kanilehua rain
I'm enchanted by the waters of Hāna
By the whispering of the sea

The mele "Nani Hāna," composed by Kealiʻikaleoʻolaeanuikaumanamana VIII Blaisdell, is a poetic celebration of the natural beauty and spiritual power of Hāna, a cherished region in East Maui. The mele opens with a reference to the Kanilehua rain—more commonly associated with Hilo—but here, it softly envelops Hāna, suggesting a gentle, nourishing presence. This blending of place and poetic rain name reflects the Hawaiian tradition of using weather phenomena to convey mood, identity, and memory.

Kaʻuiki, the prominent puʻu that overlooks Hāna Bay, is mentioned as a storied and powerful landmark. Known in moʻolelo as a site of ancient conflict and chiefly residence, Kaʻuiki stands as a symbol of both protection and continuity. Waiʻānapanapa, with its striking black sand beach, and Hāmoa, with its calm, crescent shore, are named not just as beautiful places, but as embodiments of emotional memory and longing.

The imagery of washed-away footprints and water without fruit speaks to the ephemeral nature of life and love. Hawaiian mele often draw emotional power from such metaphors, connecting land and sea to internal experience. "Nani Hāna" beautifully continues this tradition by linking Hāna's physical landscape with deep personal and cultural meaning.

#### *4.3.2.5 Heavenly Hāna*

**Composer:** John Piʻilani Watkins

In the moonlight in Hawaiʻi
There's a magic in the air
It's a paradise of lovers
Dreaming by the starlight's glare

In the land of old Hāna
Where the tradewinds softly blow
Heavenly Hāna
That's the place where I long to go

Heavenly Hāna is a beloved mele composed by John Piʻilani Watkins, written in English and celebrated for its lyrical portrayal of Hāna as a romantic and idyllic destination. Though the lyrics are brief, they express a profound emotional connection to place, reflecting the way Hāna has long been imagined as a peaceful sanctuary, especially for lovers and dreamers. The reference to moonlight and starlight evokes the gentle rhythms of nature that define Hāna's nighttime ambiance, a setting often associated with calm, reflection, and intimacy.

The mention of trade winds—so characteristic of East Maui—anchors the song in the physical environment, inviting listeners to feel the breeze and atmosphere unique to this region. These gentle winds are more than meteorological features; they are signs of balance and comfort, part of what makes Hāna feel sacred and welcoming.

While many Hawaiian mele are rooted in chant and composed in ʻōlelo Hawaiʻi, this English-language song by a respected Native Hawaiian composer bridges traditional sentiment with broader accessibility. Watkins' use of English does not diminish the cultural depth of the song. Instead, it extends the emotional reach of Hāna's beauty, allowing generations of listeners to connect with the land through a shared sense of longing and aloha.

#### *4.3.2.6 Waiʻānapanapa (Traditional)*

Aia i Waiʻānapanapa ka uʻi
Ka wai o Pōpōʻalaea
I nā po i nalowale aku ai
I ka piʻi ʻana i ka pali aʻo Kaʻuiki

Nani Hāna i ka ua Noe
ʻIke ʻia ka nani o ka ʻāina
He pua ʻaʻala i ka malu o ke ao
He lei no nā kupa o ka ʻāina

Haʻina ʻia mai ana ka puana
Aia i Waiʻānapanapa ka uʻi
I ka piʻi ʻana i ka pali aʻo Kaʻuiki

Translation:

The beauty lies at Waiʻānapanapa
The waters of Pōpōʻalaea
In the nights that faded away
Climbing the cliffs of Kaʻuiki

Beautiful is Hāna in the misty rain
The beauty of the land is seen
A fragrant flower in the shelter of the clouds
A lei for the native people of the land

The story is told in the refrain
The beauty lies at Waiʻānapanapa
As one climbs the cliffs of Kaʻuiki

The traditional mele *Waiʻānapanapa* honors one of the most iconic and storied places in Hāna. Waiʻānapanapa, with its striking black sand beach, freshwater caves, and lava sea arches, holds deep cultural and spiritual significance. The mele references the waters of Pōpōʻalaea, which are tied to a famous moʻolelo about a woman named Pōpōʻalaea who fled from an abusive chief. She hid in the caves at Waiʻānapanapa but was ultimately discovered and killed, and it is said her blood turned the waters red. This legend continues to be shared across generations and underscores the site's emotional and historical power.

The mele also describes the climb to Kaʻuiki, the towering puʻu overlooking Hāna Bay. As in other mele, Kaʻuiki is featured as a geographic and symbolic marker—one that links the physical journey with spiritual and ancestral awareness. The mists of Hāna, described in the mele as ua noe, create a veil of sacredness over the landscape, enhancing the sense of reverence.

Waiʻānapanapa is more than a place of scenic beauty; it is a piko of cultural memory. The mele captures this by referring to the land as a flower in the shelter of the clouds and as a lei for the descendants who continue to honor it

#### *4.3.2.7 Kaʻahumanu (Traditional)*

ʻO Kaʻahumanu nō hoʻi au
Ke liko o ka lau o ka lehua
Ka pua i luna o Kaʻuiki
I ka makani a ka Moaʻe

ʻO Kaʻahumanu nō hoʻi au
Ke ala ʻala i ka pua
I ka moani a ka makani
Ke ʻala o ka lehua

Haʻina ʻia mai ka puana
ʻO Kaʻahumanu nō hoʻi au
Ke liko o ka lau o ka lehua
Ka pua i luna o Kaʻuiki

Translation:

I am Kaʻahumanu
The tender shoot of the lehua leaf
The flower that blooms atop Kaʻuiki
In the breeze of the Moaʻe wind

I am Kaʻahumanu
The fragrance of the flower
In the gentle Moaʻe breeze
The scent of the lehua blossom

The refrain is told
I am Kaʻahumanu
The tender shoot of the lehua leaf
The flower blooming atop Kaʻuiki

This traditional mele honors Kaʻahumanu, a high-ranking aliʻi wahine born in Hāna and raised at Kaʻuiki, the prominent hill overlooking Hāna Bay. Kaʻuiki serves as both a physical landmark and a spiritual foundation, appearing in many mele as a symbol of chiefly identity and ancestral grounding. In this chant, Kaʻahumanu is compared to the liko of the lehua—a tender leaf bud that carries the potential and beauty of the blossom. The lehua flower is revered in Hawaiian culture for its resilience and is often associated with royalty and sacredness.

The Moaʻe wind, a steady easterly breeze, adds another layer of symbolism, evoking fragrance, movement, and the breath of the land. The repetition of Kaʻahumanu's name throughout the mele affirms her presence, mana, and connection to place. This mele is a powerful example of how poetry and chant were used to convey personal identity, genealogical pride, and the enduring relationship between aliʻi and ʻāina.

#### *4.3.2.8 Hasegawa General Store*

**Composer:** Paul Weston (1961)

**Verse 1:**
Upon the island of Maui, far from Waikiki
There's a place called Hāna that is heavenly
And when you go there, you've got to see
The Hasegawa General Store

**Verse 2:**
Now as you walk through the doorway, what a great surprise
There's a wonderful variety of merchandise
It's all spread out there before your eyes
At the Hasegawa General Store

**Verse 3:**
You'll find a baseball bat, and a paniolo hat
Sunburn cream and the latest magazines
Muʻumuʻus, some mangoes, and ʻukuleles too
And a hamburger for a malihini like you

**Verse 4:**
They say a cheerful "Aloha" when you first come by
And a sweet "Mahalo nui" when you say goodbye
You can't resist it, once you try
The Hasegawa General Store

**Verse 5:**
They've got kukui nuts and assorted cold cuts
Surfer's pants and papaya plants
A shiny koa calabash to catch your eye
And some ʻokolehao if your throat goes dry

**Verse 6:**
You must walk very slowly as the tour begins
Among pineapples and cereals and bobby pins
Spears and goggles and swimming fins
At the Hasegawa General Store

**Verse 7:**
If you want to lamalama, they've got kerosene
If you want a lomilomi, they've got rubbing cream
And guava jelly that's just supreme
The Hasegawa General Store

**Verse 8:**
So if you're ever in Hāna with some time to spare
Then you've got to holoholo down to you-know-where
You just name it, they've got it there
At the Hasegawa General Store

**Final Tag:**
All you do is name it, and they've got it there
The Hasegawa General Store

*Hasegawa General Store* is a humorous and affectionate mele written in 1961 by mainland composer Paul Weston. Inspired by a visit to Hāna, the song catalogs the wide variety of items sold at the real-life Hasegawa General Store, a community fixture in East Maui since 1910. The mele reflects the rural charm and resourcefulness of Hāna life, where a single store served as a central hub for groceries, clothing, tools, and everyday needs. Each verse names specific goods—ranging from paniolo hats to ʻukulele and guava jelly—showcasing not only the store's diversity, but also the cultural blending of Hawaiian and Western influences.

The lyrics integrate Hawaiian words such as muʻumuʻu (a loose-fitting dress), malihini (newcomer), ʻokolehao (a ti-root liquor), lomilomi (massage), lamalama (to light a torch), and holoholo (to go cruising or strolling). These terms are used both informatively and playfully, making the mele both a lesson in vocabulary and a cultural snapshot. The song is a celebration of the small-town aloha spirit, emphasizing hospitality, familiarity, and the joy of everyday moments.

First brought to life by Pua Almeida on the popular radio show "Hawaii Calls," the song gained further popularity when recorded by the Hoʻopiʻi Brothers, whose falsetto harmonies helped elevate the mele to iconic status. Today, it is cherished as a musical time capsule of 20th-century rural Hawaiʻi, capturing a spirit of humor, community, and deep affection for local identity. The Hasegawa General Store still stands as a symbol of continuity in Hāna and remains beloved both for its practicality and the song that immortalized it.

## 5.0 Traditional or Customary Practices Historically in the Study Area and Surrounding Area

In traditional (pre-western contact) culture, named localities served a variety of functions, informing people about: (1) places where the gods walked the earth and changed the lives of people for good or worse; (2) heiau or other features of ceremonial importance; (3) triangulation points such as koʻa (fishing markers) for fishing grounds and fishing sites (4) residences and burial sites; (5) areas of planting; (6) water sources; (7) trails and trail side resting places (oʻioʻina), such as a rock shelter or tree shaded spot; (8) the sources of particular natural resources/resource collections areas, or any number of other features; or (9) notable events which occurred at a given area. Through place names, knowledge of the past and places of significance was handed down across countless generations. There is an extensive collection of native place names recorded in the moʻolelo (traditions and historical accounts) published in Hawaiian newspapers.

This is not intended to be a comprehensive list of all the practices that historically or contemporaneously occur in the project area. This is meant to show the range of traditional or customary practices that took place in the larger geographic extent. Many of these practices may not have taken place within the project area, although they may actively occur within the larger ahupuaʻa.

Prior to contact and modernization, a range of cultural practices likely took place in the project area. These practices would have been predominantly related to traditional agriculture and aquaculture and were obstructed beginning in the 19th century by Western modernization.

### 5.1 Moʻolelo

Moʻolelo is the practice of storytelling and developing oral histories for the purpose of transmitting knowledge information and values intergenerationally. Moʻolelo are particularly critical in protecting and preserving traditional culture in that they are the primary form through which information was transmitted over many generations in the Hawaiian Islands and particularly in the Native Hawaiian community. In a collection of essays about moʻolelo, professors C.M. Kaliko Baker and Tammy Hailiʻōpua Baker explain: "*Moʻolelo*, loosely translated as stories and histories, are the *kūkulu* "pillars" that shoulder and chronicle Kanaka Maoli narratives and beliefs. The moʻo, or successions, of *ʻōlelo* "words" are the foundation for the many genres of moʻolelo which collectively represent the prowess of the Kanaka Maoli literary canon" (2023, 2).

Storytelling, oral histories, and oration are widely practiced throughout Polynesia and important in compiling the ethnohistory of the area. The Native Hawaiian newspapers were particularly valued for their regular publication of different moʻolelo about native Hawaiian history. Were it not for the newspapers having the foresight to allow for the printing and publication of moʻolelo, far less information about the cultural history of the Hawaiian people would be available today.

There are moʻolelo about Wailua and the geographic extent. These moʻolelo are provided in **Sections 3.2 (Traditional Period)** and in **Section 4.0 (Cultural Resources)**.

### 5.2 Habitation

Hawaiians lived extensively throughout the islands. Handy, Handy, and Pukui (1991) identify how different kānaka and their ʻohana lived in accordance with what the authors termed "occupational contrasts" (286), meaning that based on occupation (i.e., planter or fisherman, for example), habitation systems differed. They describe, "The typical homestead or *kauhale*… consisted of the sleeping or common house, the men's house, women's eating house, and storehouse, and generally stood in relative isolation in dispersed communities. It was only when topography or the physical character of an area required close proximity of homes that villages exist. There was no term for village. Kauhale meant homestead, and when there were a number of kauhale close together the same term was used. The old Hawaiians, in other words, had no conception of village or town as a corporate social entity. The terrain and the subsistence economy naturally created the dispersed community of scattered homesteads" (284).

The traditional Hawaiian home was known as a hale, which was a simple structure made of natural materials, such as wood, thatch, and lava rocks. The hale was typically rectangular in shape, with a sloping roof that was thatched with palm fronds or other accessible vegetation. The walls were made of woven mats or a framework of wooden poles covered with woven coconut leaves or bark. The floor was typically made of packed dirt or crushed coral.

Traditional habitation in Hāna reflected a close relationship with the ʻāina, characterized by multi-generational living, subsistence practices, and strong community ties. Matthew Kalalau described his childhood home near Kaʻinalimu Bay as a two-story plantation-style house with a separate kitchen, surrounded by taro patches and sweet potato fields. "It had a beautiful view of the whole bay… I enjoyed just sitting outside the porch and watching the ocean," he said (Kalalau 1998). Jackie Kahula, raised in Hamoa, recalled living on a two-and-a-half-acre property with three homes, a cookhouse, and a garage used for both weaving and daily chores. Her family preserved food without electricity, using kukui hele pō lanterns and kerosene refrigerators (Kahula 1998).

These accounts reflect traditional Hawaiian living patterns adapted to 20th-century realities, where extended families lived together and managed their own resources. The coastal villages of Hāna remained rooted in self-sufficiency, cultural practice, and communal identity.

### 5.3 Travel and Trail Usage

The ability to travel was essential to Hawaiians and enabled their sustainability. Travel, and the freedom to move throughout different areas, had different names, including huakaʻi, kaʻapuni, or kaʻahele. Traveling by sea had distinct names as well, like ʻaumoana. Traveling through the mountains was sometimes referred to as hele mauna. Travel, and moving throughout various places and regions was an essential practice and way of life in traditional Hawaiʻi.

The freedom to travel safely was so important that Kamehameha I would come to pass a well-known law protecting travelers, Ke Kānāwai Māmalahoe (The Law of the Splintered Paddle). It is explained by the William S. Richardson School of Law as follows:

> As a young warrior chief, Kamehameha the Great came upon commoners fishing along the shoreline. He attacked the fishermen, but during the struggle caught his foot in a lava crevice. One of the fleeing fishermen turned and broke a canoe paddle over the young chief's head. The fisherman's act reminded Kamehameha that human life was precious and deserved respect, and that it is wrong for the powerful to mistreat those who may be weaker.
>
> Years later when Kamehameha became ruler of Hawaiʻi, he declared one of his first laws, *Ke Kānāwai Māmalahoe* (the Law of the Splintered Paddle), which guaranteed the safety of the highways to all. This royal edict was law over the entire Hawaiian kingdom during the reign of Kamehameha the Great. Considered one of the most important *kānāwai* (royal edict), the law gave the Hawaiian people an era of freedom from violent assault (William S. Richardson School of Law 2021).

The kānāwai (law) reads:

| | |
|---|---|
| E nā kānaka | O my people |

| | |
|---|---|
| E mālama ʻoukou i ke akua | Honor thy god |
| A e mālama hoʻi | Respect alike, the rights of |
| Ke kānaka nui a me kānaka iki | All men great and humble |
| E hele ka ʻelemakule | See to it that our aged, |
| Ka luahine, a me ke kama | Our women, and children |
| A moe i ke ala | Lie down to sleep by the roadside |
| Aʻohe mea nana e hoʻopilikia | Without fear of harm |
| Hewa no, make | Disobey, and die |

The law would have such long-lasting resonance that it would be expressly incorporated into the Hawaiʻi State Constitution.[15]

As traveling through traditional trails was the primary means by which people traveled on land throughout most of Hawaiian history, the traditional trail system is particularly important throughout the Hawaiian Islands. Throughout the islands, there were numerous trails that allowed for people to access different locations. This trail system was critical not only for maintaining a healthy population and managing this population, but it was also important for the traditional economic system of bartering. The trail system allowed for different localized communities to engage and interact. This also allowed for the trade of goods throughout island communities.

Trails and travel through the Hāna region were essential aspects of daily life, shaped by the area's rugged terrain and remote geography. Several interviewees recalled walking long distances to school, the store, or neighboring villages. Matthew Kalalau described walking from Waikoloa to Hāna School each morning, noting, "We walked to school every morning and also we walked to the store… we enjoyed walking" (Kalalau 1998). Jackie Kahula shared similar memories, recounting how she would walk from Hamoa to school, often trudging through mud during rainy days or cutting time by walking along the beach at low tide (Kahula 1998).

Eddie Oliveira discussed travel in and around Nahiku, referencing older mountain trails such as the Old Wagon Road, once used to access upper homestead lots. These testimonies reveal a landscape navigated primarily on foot or horseback, with deep

[15] Article IX. Section 10 of the Hawaii State Constitution reads: "The law of the splintered paddle, mamala-hoe kanawai, decreed by Kamehameha I--Let every elderly person, woman and child lie by the roadside in safety--shall be a unique and living symbol of the State's concern for public safety."

familiarity and resilience, where travel was not only necessary but a shared part of East Maui life.

### 5.4 Farming

Farming in the Hāna District of East Maui played a central role in sustaining the livelihoods, economies, and spiritual lives of its Native Hawaiian inhabitants. The district's geographic diversity—from its high-rainfall windward valleys to its drier, rugged southern coastline—supported a range of agricultural strategies adapted to the unique conditions of each ahupuaʻa. While much scholarly attention has been given to the extensive wetland taro cultivation in larger valleys like Wailuanui and Kaʻeleku, farming in Hāna as a whole encompassed both loʻi kalo (irrigated taro terraces) and dryland field systems that produced sweet potato (*ʻuala*), banana (*maiʻa*), sugarcane (*kō*), and other important crops.

In the northern and central Hāna ahupuaʻa, taro (*kalo*) was the staple crop and the cornerstone of cultural life. Loʻi kalo were carefully engineered along perennial streams such as Wailuanui Stream and Kawaipapa Stream, which provided the consistent water flow necessary for irrigated agriculture (Handy et al. 1972). These systems were highly labor-intensive and required constant maintenance, but they produced a stable and abundant food source that was integral to daily sustenance, ritual observance, and social organization. The work of Maly and Maly (2001) documents extensive oral histories in which kūpuna describe generations of families tending the same loʻi, reinforcing a deep pilina (connection) to ʻāina.

Along the southern coastline of Hāna—in smaller, drier ahupuaʻa like Wailua (Hāna), Muʻolea, and Puʻuhaoa—taro cultivation was more limited due to the absence of large, perennial water sources. Here, dryland agriculture predominated. Farmers cultivated crops suited to lower rainfall and thinner soils, particularly sweet potato (*ʻuala*), which was known for its hardiness and ability to thrive in sandy, rocky terrain. These dryland fields were typically located on kula lands (lowland slopes) and required skilled management of soil fertility and planting cycles to remain productive (Handy et al. 1972).

In addition to sweet potato, southern ahupuaʻa also supported the cultivation of banana (*maiʻa*), breadfruit (*ʻulu*), and sugarcane (*kō*), the latter of which was used not only for food but also for ceremonial and medicinal purposes. Oral traditions collected in *Wai o ke Ola* indicate that families in these areas often practiced mixed cropping systems, using interplanting methods to maximize yields and minimize pest pressure (Maly & Maly 2001).

Farmers also relied on knowledge passed down through generations about moon phases (*kaulana mahina*), seasonal rains, and planting rituals to guide their agricultural practices.

Generally, Hāna's farming history is widely celebrated to this day. Perhaps the most iconic of Hāna's annual events is the East Maui Taro Festival, a beloved celebration of kalo (taro), one of the most revered plants in Hawaiian culture. Traditionally held each April at the Hāna Ballpark, this festival was founded to educate the public about the importance of kalo cultivation and to support local East Maui taro farmers. But it has grown into something much deeper—a symbol of the Hāna community's strength, identity, and relationship to the land.

At the festival, cultural demonstrations, hula performances, local food vendors, and arts and crafts booths line the park. The smell of fresh laulau and poi fills the air, while kupuna share moʻolelo (stories) about East Maui's agricultural heritage. Educational booths teach visitors about loʻi kalo (taro patch) systems, the hydrology of East Maui, and the revival of ancient irrigation practices. The festival also includes live music and talks from community leaders and cultural practitioners who remind everyone that kalo is both food and metaphor—symbolizing sustenance, resilience, and unity.

*Figure 13. Participants at the East Maui Taro Festival*

More than just an event, the East Maui Taro Festival is an experience that offers a window into the values that guide Hāna: aloha ʻāina (love for the land), kuleana (responsibility), and mālama (care). It is a space where tradition is celebrated and passed forward, generation after generation.

Traditional farming in Hāna was a cornerstone of daily life, rooted in subsistence and a close relationship with the land. Matthew Kalalau recalled his family's regular practice of cultivating taro and sweet potato, especially in the uplands above Waikoloa near Kaʻinalimu Bay. "Every weekend, we would go up to the mountains and clean up the taro patch and pull taro to go home and make poi," he explained, emphasizing that the work sustained the family throughout the week (Kalalau 1998). Jackie Kahula also described the use of family lands for taro cooking and preparation, recalling a large cookhouse where her mother processed hala and cooked taro for daily meals (Kahula 1998). These accounts illustrate how traditional farming in Hāna was both practical and ceremonial, tied to rhythms of weather, moon phases, and community sharing. It required careful kilo (observation) and deep familial knowledge, passed down through generations.

### 5.5 Traditional Clothing (Clothes Making, Dyeing, Weaving, and Lei Making)

Kapa (commonly known as barkcloth) was the traditional material made through a traditional method of gathering, treating, and beating plant fibers, often, but not limited to, wauke (*Broussonetia papyrifera*) to make fabric that was used to make lole (clothing). Pacific and Hawaiian kapa was known for its wide range of colors and the application of watermarks.

One article describes the process for making kapa:

> The finest kapa came from the paper of the mulberry tree. These trees were cultivated on plantations and grew to heights of more than twelve feet. As the tree grew, the branches were nipped off along the main trunk, ensuring a long piece of bark which was easily peeled from the tree.
>
> The manufacture of kapa was an important occupation for women. After the bark had been peeled from the tree, the inner bark was separated and soaked in sea water to make it soft and pulpy. The softened bark was placed on an anvil and beaten with a cylindrical wooden beater. The first beating separated the fibers and produced strips about eight or nine feet long and ten to fourteen inches wide. These strips could be dried and stored until needed. When needed, the strips were soaked in water, placed in layers between banana leaves, and left for about ten

> days to mature by "retting" which is the decomposition and removal of softened tissues, leaving the finer fibers. These partially decomposed layered strips were beaten a second time with specially carved four-sided beaters. The patterns carved on the beaters were functional as they produced the necessary characteristics in the kapa for its end use. These carved designs left the equivalent of a watermark on the kapa.
>
> Kapa which was to be extremely soft and pliable, such as that used for the malo or loincloth, was subjected to an additional softening process. This process, which produced a finely ribbed fabric, was done by dampening the cloth, stretching it over a grooved board, and running a wooden grooving tool along the indentations in the board. When the cloth dried, permanent ribs remained. The hand was very similar to our crinkle gauze of today (Furer 1981:109-110).

Hawaiians were skilled at utilizing plants and materials to dye their clothing and other materials. Different methods would be employed to hōʻawa, extract dye colors from their source material(s). These dyes would be placed in a cup, known as a kā kāpala. Even foreign or exotic plants were utilized for this practice. Hawaiians used different words for the various types of dyeing activities and methods.

- Weʻa – a red dye or to print or dye red
- Hili – bark dye, as hili kukui, hili kōlea, hili noni; also kapa dyed with bark or the name for dyeing with the use of bark
- Kūhili – to dye (or stain) by soaking in water containing mashed bark, such as used for nets; also mulberry bark before it is beat into kapa
- Kūpenu – to dye by dipping material
- Kiʻolena – to dye kapa
- Hōlei –native tree (*Ochorosia compta*) related to the hao (*Rauvolfia*), which yields a yellow dye for kapa
- Kīheʻaheʻa palaʻā – dye made from the palaʻā (Sphenomeria chinensis syn. chusana) fern; palaʻā also references a kapa made from the māmaki (*Pipturus spp.*) bark which is then dyed a brownish-red with palaʻā fern

Hawaiians also had a lexicon for the various colors that could be achieved through this traditional practice.

- ʻŌlenalena – yellow
- Hili – Dark-brown dye made from bark

- Puakai – red
- Nao – dark red
- Pōkohukohu – color made from the noni (*Morinda citrifolia*) root
- ʻĀkala – color made from raspberry or thimbleberry juice
- ʻŌmaʻomaʻo – light green color made from maʻo leaves

Similarly, lei making was a regular occurrence in traditional Hawaii. Anderson-Fung and Maly (2009) write about the traditional practice:

> In old Hawaiʻi, lei could have important ceremonial functions, such as in religious offerings and for chiefly regalia, but lei were also enjoyed as personal adornment by Hawaiians of all levels of society. The aliʻi (chiefs) and the makaʻainäna (the common people who tended the land) all wore lei. Even the akua (gods, deities, spirits), it was believed, sometimes wore lei when they walked the land in human form. The following observation by the French botanist Gaudichaud, who visited the islands in 1819, paints a picture of Hawaiʻi as a place where the lei was an integral part of everyday life:
>
>> "It is indeed rare to encounter one of the natives of this archipelago who does not have an ornamental plant on his head or neck or some other part of his body…[The] women … change [the plants they wear] according to the seasons, [and for them] all the fragrant plants, all flowers, and even the colored fruits, serve as attire, one after another. …The young girls of the people, those of the island of Hawaiʻi especially, seem to be fond of the [kou, Cordia subcordata], a tree very abundant in all the cultivated areas… The young girls of the mountains, who live near the forests, give their preference to the flowers of the [Erythrina (wiliwili) and a species of Canavalia, called ʻawikiwiki], the lively color of which makes magnificent garlands. Such natural attire is much more rich, much more striking, than all the dazzling creations of the elegant European ladies."
>
> This account and others like it suggest that lei worn for personal adornment were fashioned from the favorite plant materials that were readily available and abundant in the lei maker's environment (4).

Lei making continues as an important practice today, as the making and giving of lei as an expression of aloha to loved ones still regularly occurs throughout the Hawaiian

Islands. Practitioners of these crafts actively practice in the Hāna moku, although there is no indicator that the project area is specifically used for any of these practices.

Additionally, hala weaving in Hāna, Maui, was an integral part of daily life and cultural practice, particularly among women who preserved the skill across generations. Jackie Kahula provides a detailed account of her mother's weaving traditions, describing a lifestyle deeply rooted in the cultivation, preparation, and use of hala (Pandanus) leaves. In her childhood home in Hamoa, Jackie recalled a large cookhouse where they boiled taro and prepared hala for weaving. "My mom used to do a lot of hala weaving," she explained, noting that the leaves were dried and softened in a dedicated garage space, where they were also ironed with old charcoal irons (Kahula 1998). This process was labor-intensive and communal, often involving multiple family members. The hala was used to make lauhala mats and other household goods essential to Hawaiian life.

### 5.6 Lāʻau Lapaʻau

Lāʻau lapaʻau is the practice of traditional Hawaiian medicine. For centuries, native Hawaiians relied upon the environment around them to provide them medicine. It is still actively taught and practiced today. Medicinal experts or healers have intimate knowledge about plants and other resources to cure ailments illnesses and sicknesses. Traditional medicine is practiced by native peoples and local communities around the world. Similarly, Native Hawaiians, over many generations, have learned how to properly care for, utilize, and prepare plants to maintain the community's health.

It was important to not only have plants and have access to plants but to ensure that these plants were healthy and in good condition. In the list of biological resources, plants with medicinal capacity and components are identified. These resources are cultural resources. They are critical to the ongoing practice of traditional medicine and healing within the Native Hawaiian community. There are still many traditional medicine practitioners in the Hawaiian community and throughout the Hawaiian Islands today. It is a practice that is still taught to the younger generation, and it is a practice that is still honored and utilized in many Hawaiian households throughout the state.

It was important that medicinal plants existed throughout the Hawaiian Islands so that when people traveled throughout different places on in the islands, they would always have access to the medicine they needed. In some cases, some plants were extremely rare, and, in those cases, it was particularly important to make sure that these populations were well protected and well cared for. An identification of plants of cultural value for medicinal purposes that grow naturally within the project area is included in **Section 4.2**.

There were also numerous gods associated with health, healing, and medicine. They are listed in **Table 2**.

Table 4. Hawaiian Gods Associated with Health, Healing and Medicine

| **Hawaiian gods associated with health, healing, and medicine (Pukui, 1971)** |
|---|
| *Hiʻiakaikapolio Pele* |
| *Lonopūhā* |
| *Maʻiola* |
| *Hiʻiakaikapuaʻenaʻena* |
| *Hauwahine* |
| *Hina* |
| *Hinaʻea* |
| *Hinalaulimukala* |
| *Kamakanuiʻahuʻilono* |
| *Kanaloa* |
| *Kū* |
| *Kūkeoloʻewa* |
| *Mauliola* |
| *ʻŌpeluhuikauhaʻailo* |

Maui has an active community of healing practitioners. These practitioners actively practice in the Hāna, although there is no indicator that the project area is currently used for any of these practices. Lāʻau lapaʻau practitioners in Hāna have long relied on the diverse endemic and introduced plant species of East Maui's lush environment. Plants like noni, ʻawapuhi, kī, and ʻuluhe are harvested with ritual and care, often accompanied by oli (chants) acknowledging the plants and the spirits of the land. Remedies are prepared using knowledge passed on orally or through family practice lines, emphasizing the interconnectedness of people and nature.

Groups such as *Hāna Health*, while integrating Western care, continue to support the preservation and integration of traditional healing knowledge, and cultural practitioners in the community often work quietly, offering guidance and treatment to those in need. In recent years, there has been a revitalization of interest in these practices, especially as community members seek cultural reconnection and health sovereignty through ancestral knowledge.

Traditional medicine played a vital role in the lives of Hāna residents, rooted in generational knowledge and a deep relationship with the ʻāina. While not the primary focus of most interviews, several interviewees referenced practices and environments tied to lāʻau lapaʻau. Jackie Kahula recalled how her family prepared and used plants such as hala in a dedicated cookhouse, a space often used for drying and processing medicinal leaves as well (Kahula 1998). Nanette "Nan" Kuʻulei Akau described her teacher at Kealahou School encouraging students to taste native plants like ʻōhelo and alpine strawberry to understand their properties, explaining, "In order to understand certain things, especially when it comes to food or medicine, you have to try it" (Cabatbat 2021). These insights reflect how traditional medicine in Hāna was experiential and interwoven with daily life, passed down through hands-on learning and familial guidance in a landscape rich with healing resources.

### 5.7 Kilo

Kilo are observational traditions and people who examine, observe, or forecast are identified as kilo and serve as traditional climate and weather experts. Kilo "references a Hawaiian observation approach which includes watching or observing [the] environment and resources by listening to the subtleties of place to help guide decisions for management and pono practices" (ʻĀuamo Portal 2021). The practice of kilo is seeing a resurgence on Hawaiʻi Island and in the Hawaiian Islands.

Kilo hōkū are traditional astronomers, or those who study the stars. A hale kilo or hale kilo hōkū were observatories or star observatories respectfully. Kilo makani were those who traditionally observed the winds. Kilo moana were traditionally oceanographers. Kilo ʻuhane were those who observed and communicated with spirits.

Traditionally the practice of kilo or observation was critical to the management of traditional Hawaiian landscapes. This practice is very closely tied to traditional or customary access as observers would require access to specific vistas, viewsheds or areas in order to observe environmental phenomenon.

As illustrated in the proceeding section, Native Hawaiians created a wide range of terms for the environment and understanding the ecosystems around them. These terms were often quite specific, and many were tied closely to a specific geographic area. This level of specificity illustrated the close kinship Hawaiians shared to their surrounding environment. The ability to observe and understand all elements of their ecosystem was essential to both the successful care of natural resources and the survival of the Hawaiian people.

The ability to effectively and accurately read weather phenomena was essential to the ability of Hawaiian people who farm, fish, navigate, and conduct any number of practices in a sustainable and successful manner. The knowledge Hawaiians acquired about their environment around them, including weather phenomena were the result of multi-generational observations that comprised an extensive body of information passed down through oral traditions. The following Hawaiian names and their descriptions of weather phenomena include words for clouds, rains, and winds that are utilized by kilo to help guide activities and practices:

ao akua – godly cloud, figurative representative of a rainbow.
ao loa – long cloud or high, distant cloud. Status cloud along the horizon.
ao ʻōnohi – cloud with rainbow, ʻōnohi, colors contained within it.
ao puaʻa – cumulus clouds of various sizes piled together, like a mother pig with piglets clustered around her. The Kona coast is famous for ao puaʻa, a sign of good weather and no impending storms.
ao pehupehu – continually growing cumulus typical of summer. Drifting with the tradewinds, these clouds pick up moisture and darken at their base, finally releasing their rain on the windward mountain cliffs.
hoʻomalumalu – sheltering cloud.
hoʻoweliweli – threatening cloud.
ānuenue – rainbow, a favorable omen.
ua loa – extended rainstorm.
ua poko – short rain spell.

There are numerous points identified in **Section 3.1**. These points would have been traditionally used by kilo iʻa, skilled ocean observers who would identify marine resources for gathering. These locations for kilo are typically located in nearshore coastal areas from elevations along the shoreline where schools of fish can be observed.

Observational practices were an integral part of life in Hāna, guiding everything from farming and fishing to spiritual protocol. This deep attention to environmental cues is evident throughout the interviews. Matthew Kalalau described how his family would travel upland each weekend to tend taro patches, observing water flow, weather patterns, and plant health to determine when to harvest: “Every weekend we’d pound poi and that poi would last us from that Saturday through the next” (Kalalau 1998). Similarly, Nanette Kuʻulei Akau emphasized learning through direct sensory experience, noting that her teacher encouraged tasting native plants to understand their effects and observing seasonal shifts in flora: “Do you remember this tree? Do you remember this plant?” (Cabatbat 2021). Walter Pu also described working with his uncle Eddie Pu, a spiritual practitioner who walked the island, relying on kilo to guide his journey. These testimonies underscore kilo as both science and spirituality.

### 5.8 Ceremonial Practices

The ceremonial practices of traditional Hawaiians are extensive. Throughout the course of Hawaii's history, traditional Hawaiians have integrated religious, spiritual, and ceremonial practices in their daily lifestyle. Traditional or customary practices are then not distinct ceremonial practices but rather a part of their way of life. Therefore, it is challenging to define in discrete terms ceremonial practices associated with traditional Hawaiian customs. For the purpose of this section, the ceremonial practices discussed here focus primarily on customs carried out by general populations of Hawaiians, as opposed to activities or rituals carried out by trained and recognized specialists, kahuna.

Ceremonial practices are incorporated throughout numerous, if not all, of the activities identified in this section. For example, there is a great level of ceremonial practice and ritual associated with the care of the dead, burial remains, and funerary objects. Native Hawaiians as with most indigenous peoples integrated ceremony into most of their practices especially those that occurred out in the natural landscape or related to their way of life. There was no specific site or materials required for ceremony *per se*.

Nonetheless, shrines were sometimes associated with ceremonial practices. Shrines for the purpose of this assessment are distinct from heiau, which were places of worship. Again, the distinction is the nature in which these features or sites were created. Heiau required the advice and guidance of a kahuna, who would help ali‘i determine the best location in which to erect a heiau. Conversely, shrines were erected by maka‘āinana (working class) as part of their daily or occupational functions.

Makahiki is one example of a practice that has taken place prior to contact and continues post-contact and involves ceremonial elements. One of these elements is the akua loa, described by Malo as "the image of the Makahiki god, Lono-makua … This work was called ku-i-ke-pa-a" (Malo, 1951: 143). Further described by Malo:

> 22. This Makahiki idol was a stick of wood having a circumference of about ten inches and a length of about two fathoms. In form, it was straight and staff-like, with joints carved at intervals and resembling a horse's leg; and it had a figure carved at its upper end.

> 23. A cross piece was tied to the neck of this figure, and to this cross piece, kea, were bound pieces of the edible pala[16] fern. From each end of this cross piece were hung feather lei that fluttered about, also feather imitations of the kaʻupu bird[17], from which all the flesh and solid parts had been removed.
>
> 24. The image was also decorated with a white tapa cloth made from wauke[18] kakahi[19], such as was grown at Kuloli[20]. … One end of this tapa was pasted? to the cross piece, from which it hung down in one piece to a length greater than that of the pole. The width of this tapa was the same as the length of the cross piece, about sixteen feet.
>
> 25. The work of fabricating this image, I say, was called kuikepaa. The following night the chiefs and people bore the image in grand procession, and anointed it with cocoanut (sic) oil. Such was the making of the Makahiki god. It was called Lono-makua (father Lono), also the akua loa. This name was given it because it made the circuit of the land (Malo, 1951: 144-145).

Makahiki ceremonies are still conducted along the coastline makai of the project area. The akua loa was taken to each ahupuaʻa. This custom was important to the care, stewardship, and worship of the gods. These practices were intimately tied to the proper care and sustainable stewardship of all cultural and natural resources. Ethnographic data indicates that such practices take place within the project area.

As with many concepts of traditional Hawaiian living and practices, the contemporaneous concept of the kahuna has been largely influenced by Western thought. The roles and responsibilities of the kahuna are well explained by Professor Terry Kanalu Young in his text, *Rethinking the Native Hawaiian Past*, in which he writes:

> As recipients of hana lawelawe[21], the Aliʻi Nui were themselves serves of a sort. They were responsible for maintaining a positive spiritual relationship with the Akua through pono conduct. Pono was defined for individuals of that era within the

[16] Native fern (*Marattia douglasii)* used for medicinal purposes as well as in ceremony.
[17] Laysan albatross (*Diomedea immutabilis*), written with diacritical markings as kaʻupu.
[18] Paper mulberry (*Broussonetia papyrifera*)
[19] Meaning outstanding or of high quality, as in reference to the white kapa (tapa) made from these fibers.
[20] Likely a reference to the place in Pelekunu Valley at Kamalō, Molokaʻi, located between the peaks of Kaunuohua and Pēpēʻōpae.
[21] Hana lawelawe are defined by Young as "service tasks" by which kaukau aliʻi (lower ranked chiefs) served the Aliʻi Nui (high chiefs). These hana lawelawe were critical to the ability of the Aliʻi Nui to effectively govern (Young 1989).

context of a particular task specialty. Kahuna who functioned as experts in specific skill areas like medicinal healing, canoe building, or spiritual advising were consulted by leaders. The experts were looked to as responses for what was considered pono in their respective realms of knowledge (Young 1998).

Kahuna were critical to traditional Hawaiian lifeways as their extensive expertise helped to provide sound and strategic advice to aliʻi and other leaders on proper spiritual, cultural, and ecological management. There are numerous types of kahuna in Hawaiian traditions. including, but not limited to:

kahuna ʻanāʻanā - sorcerer who practices black magic and counter sorcery.

kahuna aʻo - teaching preacher, minister, sorcerer.

kahuna hāhā - an expert who diagnoses, as sickness or pain, by feeling the body.

kahuna haʻiʻōlelo - preacher, especially an itinerant preacher.

kahuna hoʻohāpai keiki - medical expert who induced pregnancy.

kahuna hoʻopiʻopiʻo - malevolent sorcerer, as one who inflicts illness by gesture.

kahuna hoʻoulu ʻai - agricultural expert.

kahuna hoʻoulu lāhui - priest who increased population by praying for pregnancy.

kahuna hui - a priest who functioned in ceremonies for the deification of a king.

kahuna kālai - carving expert, sculptor.

kahuna kālai waʻa - canoe builder.

kahuna kiʻi - caretaker of images, who wrapped, oiled, and stored them, and carried them into battle ahead of the chief.

kahuna kilokilo - priest or expert who observed the skies for omens.

kahuna lapaʻau - medical doctor, medical practitioner, healer. Lit., curing expert.

kahuna makani - a priest who induced spirits to possess a patient so that he might then drive the spirits out.

kahuna nui - high priest and councilor to a high chief; office of councilor.

kahuna poʻo - high priest.

kahuna pule - preacher, pastor, minister, parson, priest. clergyman. Lit., prayer expert.

kahuna pule kaʻahele - preacher

kahuna pule wahine - priestess

One of the oldest Hawaiian traditions still observed today in Hāna is the Makahiki season, an ancient festival that begins in the fall and lasts into the early part of the new year. Dedicated to Lono, the god of agriculture, fertility, and peace, Makahiki was a time when warfare ceased, taxes were collected, and the land and people were celebrated for their abundance and resilience.

In Hāna, Makahiki events include traditional games such as ʻulu maika (stone bowling), haka moa (chicken fighting), and kūkini (foot races). Ceremonial offerings and chants mark the season's spiritual dimensions. Students and community groups often participate in reenactments and demonstrations, helping keep these practices alive.

Figure 14. Hundreds of community participants joined for Makahiki events in 2024 (Photo: Shandelle Nakaneula)

### 5.9 Haku Mele, Haku Oli, and Hula

This practice is related to the composition of songs and chants. This is a practice that has existed for many centuries in the Hawaiian culture. When the Hawaiian culture primarily relied on an oral tradition to pass on knowledge and information, the ability to create songs and chants was essential to pass information from one generation to the next. As Donaghy (2013) notes, Hawaiians had hundreds of terms associated with this practice.

Songs and chants are largely influenced by the environment around them. As a pedagogical device it was important if not imperative that these songs or chants effectively captured data from the environment around the composer and passed on this information for others to utilize when managing natural resources. In a very real sense, the land and natural resources act as a muse for composers. The category of songs that provide information on or speak to natural resources are called mele ʻāina (songs of the land). As shown in the previous section, there are numerous traditional chants and songs about the project area and its surrounding landscape.

Much like mele and oli, hula serves as a way of both honoring place and telling the story of place. Many hula, especially those based on mele ʻāina, require intimate understanding of the place where the mele was composed, including the natural elements of that ʻāina.

Hula hālau will regularly take huakaʻi, or journeys, to visit and honor the place a particular mele speaks of. The ability to visit the place and learn about it is important to the practice of hula.

Hula, as well as mele or oli, are also offered as gifts to kupuna or gods. This practice also requires access to traditional sites. Associated with hula would have been the practices of lei making and the use of plants to dye clothing.

### 5.10 Ranching and Paniolo Culture

The Hawaiian paniolo were the first cowboys in the United States. In 1793, Captain George Vancouver brought cattle to Kamehameha as a gift shortly after Kamehameha unified the Hawaiian Kingdom under his rule. This was the introduction of ranching to the islands. In order to grow the population so Hawaiians could export cattle and use them throughout the islands, Kamehameha first put a kapu on the cattle. The cattle grew sharply in numbers, and soon large numbers of cattle were roaming wild throughout Hawaii Islands (Harrington, 2019). The introduction of horses had a transformative effect on Hawaiian society. Before the arrival of horses, Hawaiians primarily traveled by foot or by canoe. The use of horses revolutionized transportation and warfare, allowing faster and more efficient movement across the islands.

In order to begin to get the growing population of cattle under control, Kamehameha brought the vaqueros from Mexico, who had the expertise to manage the cattle with horses. Hawaiians could not initially pronounce the term vaqueros, so they would attempt to use the term "españoles" (Spanish speaking males) instead. Unable to pronounce this term properly, the term "paniolo" was created.

Horses would be landed on both Hawaiʻi Island and Maui Island. They were gifts to John Young, one of Kamehameha I's close advisors. A 1892 publication from the Papers of the Hawaiian Historical Society explains about Spanish influence in Hawaiʻi:

> [The Mexican Hispano-Indian] was called by the Hawaiian, specifically, Huanu, Hoke, Hoakina, etc. these names of course meaning Jean, Jose, Joachin, etc. He had with him sometimes full-blooded Indians of Mexican origin, who I say in my boyhood. He was called generically "Paniolo" or "Espangnol," the word that now-a-days means "cow=boy." He brought with him the Mexican saddle in all its rich adornment of stamped bull-hide leather, and stirrups broad-winged. He brought the jingling spur with bells of hand-wrought steel. He brought the hair-rope in strands of alternative black and white, and the hand-whirled wheel for twisting it; also the hand-wrought bit, not so crude as it looked to be, and a necessity in

> bullock-hunting. All this away back in the [eighteen] thirties, long before the birth of the modern cow-boy. Do not I remember him well, this Spaniard, the red bandanna handkerchief tied over his head under the broad flapping hat with rim up-turned in front? Did not the scrape – poncho we always called it, and the name much have come from South American – commend itself to our common sense as a defence (sic) from rain? We adopted it, and the red silk sash in the bargain, and the leggins not buttoned. Last but not least, the lasso or lariat, braided evenly and lovingly from four strands of well-chosen hide, then well-stretched and oiled, coiled in the same left hand, that with the little and third finger held the finely braided bridle rein; (Mexican too this was, and Mexican the causing of the rein to bear on the horse's neck, instead of to pull on the mouth) (Lyons 1892: 26).

Hawaiians took the lessons and teachings from their Spanish and Mexican instructors and created their own traditions revolved around cattle and horses. Hawaiian paniolo, are considered to be some of the best ranchers and cowboys in the world. Hawaiian paniolo like Ikua Purdy became world-famous for competing in rodeo competitions in the United States, and the skill and craftsmanship of paniolo has been noted throughout history. In places like Makawao, paniolo culture and practices are still actively practiced today.

The paniolo are regarded with great esteem. While they were not intended to remain in the islands, soon marriages between the paniolo and local population resulted in Hawaiian paniolo. The cowboy lifestyle became a way of life. They were considered particularly masculine and historic record and songs reflect this (M. Sproat, per. comm. 2021). As horses spread throughout the islands, they were introduced to South Maui as well. The fertile lands and open spaces in the region made it conducive to raising and keeping horses. The availability of horses allowed for easier communication and trade between South Maui and other parts of the island.

Horses played a crucial role in agriculture and ranching on South Maui. They were used for plowing fields, transporting goods, and herding cattle on ranches. The emergence of paniolo culture in the 19th century further solidified the significance of horses in South Maui's agricultural and ranching practices. Paniolo culture, which blends traditional Hawaiian practices with the horsemanship and cattle-handling techniques brought by Mexican vaqueros, thrived in South Maui. Skilled cowboys, known as Paniolo, were essential for managing the expanding cattle industry on the island.

The Paniolo are a distinct cultural group, or folk society, with origins to numerous ethnic groups including Mexicans, Hawaiians, Portuguese, and others (Mills et. al, 2013). Records show that ranching and the Paniolo utilized the project area and geographic extent significantly. (See Paniolo Hall of Fame Oral History Interviews, Oʻahu Cattlemen's Association.) In this region, these Paniolo were largely of Native Hawaiian descent, and they integrated not only Hawaiian practices learned from their families but Hawaiian words and language into their practices as Paniolo.

*Figure 15. "Typical Hawaiian Cowboys" - Hawaii State Archives, Paniolo Collection, PP-13-6-015 (n.d.)*

The vaqueros also brought the Spanish guitar with them. It is through this introduction that slack key music was also born. It is said that slack key music came from Mexicans leaving their guitars with local Hawaiians, but for Hawaiians who did not know how to properly tune the guitars, they would "slack the keys" creating tuning that originated in the islands. For many decades, "slack key" music grew and was perpetuated within the Paniolo community.

There are also numerous songs written for and by the Paniolo. National Heritage Fellow Clyde "Kindy" Sproat, traveled to the Smithsonian Folklife Festival in 1989 to share mele and moʻolelo about the paniolo, slack key music, and falsetto singing. At that festival, when sharing the song "Adios Ke Aloha" by Prince Leleiohoku, the younger brother to King Kalākaua and Queen Liliʻuokalani, Sproat said, "'Adios Ke Aloha' was written by Prince Leleiōhoku, and he wrote this in honor of the Mexicans that came to teach the cowboys how to rope and ride and all of that. That is my heritage, believe it or not. One of my great-grandfathers was one of those Mexicans that came to teach the Hawaiians how to rope and ride" (Harrington, 2019).

Ranching and cowboy life formed a distinctive thread in the cultural landscape of Hāna and the broader East Maui region. Eddie Oliveira recalled his father working as a cowboy for Nahiku Ranch, which operated across roughly 500 acres. "My dad was a cowboy," he said, fondly remembering helping round up cattle as a child. He described these moments of ranch work—clearing pastures, riding horseback, and rounding up livestock—not as chores but as adventures: "That was the fun time—round up cattle time" (Oliveira 1998). Ranching provided not just livelihood but a communal rhythm to rural life in Nahiku.

Similarly, Rose Cambra Freitas, though raised in Puʻunēnē and later Makawao, had strong ties to East Maui through her decades of volunteer service at Haleakalā National Park, including in the Kīpahulu district. A celebrated cowgirl, she and her husband Raymond—also a paniolo—worked on feral animal control and cabin upkeep in remote parts of the park. Their ranching background equipped them with skills for managing terrain and livestock in rugged backcountry conditions. Rose emphasized that her lifestyle, steeped in horseback riding and rodeo traditions, was also a means of stewarding the land. These accounts reveal ranching as both cultural identity and stewardship across East Maui. Other famed paniolo from Hāna are discussed below.

### *5.10.1 William Miki Kalaniopio Sr.: A Pillar of Hāna Ranch*

Born in Lahaina, Maui, William Miki Kalaniopio Sr. was a full-blooded Hawaiian who spent his formative years in ʻUlupalakua. His early exposure to ranch life instilled in him a passion for working with cattle and horses. After serving in the U.S. Army during the Korean War and receiving a Purple Heart, Kalaniopio moved to Hāna, where he began working as a mounted tour guide for Hotel Hāna-Maui. Recognizing his potential, Hāna Ranch manager John Hanchett hired him as a ranch hand in 1955. Kalaniopio quickly rose through the ranks, becoming Acting Head Cowboy and Ranch Cattle Foreman in 1965, and later Ranch Supervisor in 1972, a position he held until his retirement in 1986. His leadership was instrumental in developing a skilled crew capable of managing the unique challenges of ranching along the Hāna coast, including high humidity and treacherous terrain. Kalaniopio's dedication to the paniolo lifestyle and his community left an indelible mark on Hāna's ranching history.

### *5.10.2 Francis Napua Poouahi: Guardian of Kaupō Ranch*

Francis Napua Poouahi, affectionately known as "Uncle Frank," was born in Kaupō, Maui, in 1938. After working briefly in the pineapple fields, he returned to his roots and joined Kaupō Ranch in 1959, following in the footsteps of his father, Keawe Poouahi. Over a 43-year career, Uncle Frank became an indispensable asset to the ranch, known for his exceptional horsemanship, knowledge of the land, and versatility in roles ranging from gatekeeping during cattle work to operating heavy machinery for land clearing. Even after retirement, he remained an active and respected figure in the ranching community, offering guidance and sharing his extensive knowledge of Kaupō Ranch's history and operations.

### *5.10.3 Ephraim Palaima Hai: Bridging Traditions from Kaupō to Waiheʻe*

Born in 1914 in Kaupō, Maui, Ephraim Palaima Hai began his working life with the Civilian Conservation Corps in Keʻanae before transitioning to ranch work at Kaupō Ranch. After marrying Alice Eulalia Kailiehu of Waiheʻe, he moved to Waiheʻe and worked at the local dairy as a cowboy. Hai later joined the Hawaiian Pineapple Ranch on Oʻahu, which became part of Kahuā Ranch Ltd., where he continued his work with cattle until his retirement in 1984. Known for his excellent horsemanship and dedication to his work, Hai's career exemplified the adaptability and commitment of paniolo who navigated the evolving landscapes of Hawaii's ranching industry.

## 5.11 Pāʻū Riders

When Captain Richard J. Cleveland introduced horses to Hawaiʻi in 1803, Hawaiian men and women took to horse riding, starting the equestrian traditions in the islands. When horses first arrived in the islands, the westerners that were demonstrating how to ride horses were all male, so Hawaiian women joined the men in learning to ride horses astride rather than sidesaddle. Women began to wear long skirts, pāʻū, in order to protect their legs or their nice clothes while traveling on horseback. Aliʻi wāhine, female rulers, often wore a pāʻū when they rode horses in order to dress up for an occasion. The pāʻū used for horse riding is made of nine to twelve yards of fabric that is wrapped so that the skirt flows past the stirrups to the ground. The skirt is tied so that the women's legs are covered and protected like pants, while offering the elegance of the long train of skirt that flows from the riders' waist, over the horse, towards the ground. Traditionally the pāʻū were twisted with kukui nuts and tucked into the waistband in order to secure the long fabric. Wāhine holo lio pāʻū, female pāʻū riders, also utilized foliage and lei making traditions in order to adorn themselves and their horses when they rode, making their rides a beautiful sight to behold.

Over time the tradition of pāʻū riding grew into displays and performances, and wāhine holo lio pāʻū became known as skilled and elegant horse riders. Pāʻū riding faced a decline after the overthrow of the Hawaiian Kingdom, however, it has since been revitalized and today there are many wāhine holo lio pāʻū who still wear the traditional pāʻū. In 1901, the then displaced Queen Liliʻuokalani rode from her home on Beretania Street into Waikīkī escorted by a troupe of wāhine holo lio pāʻū who wore the traditional riding pāʻū for the journey. In 1906, Lizzie Puahi organized the Paʻu Riderʻs Club in Waikīkī. Soon after, other people with pāʻū knowledge, like Theresa Wilcox, started additional riding societies, reviving the unique tradition of pāʻū riding in Hawaiʻi. Today, pāʻū riding is alive and well, especially in places like Makawao where riders participate in rodeos and parades, showing off their beautiful traditions and their true elegance.

The following articles pulled from the Hawaiian language newspaper archives discuss female horse riders and the general rules or customs surrounding this tradition. Many of the rules discussed are centered on self-presentation, and making sure that you look the part, as well as the proper way to wear your pāʻū without accidentally revealing yourself. The first two articles were published in 1861 in the first editions of the very first Hawaiian newspaper that was edited and run by Native Hawaiians, *Ka Hoku o ka Pakipika.*

**W.K.* "Mau Rula no na wahine holo Lio." *Ka Hoku o ka Pakipika,* September 26, 1861. Page 3.**

Mau Rula no na wahine holo Lio.

1. A i holo oe maluna o ka lio, mai holo oe me kou pau ole iwaena o ke kaona nei. He mea ino wale ia.
2. Mai kau wale oe i kou pau ma ke alo wale no, a koe kou lemu, me ka ike ia o kou mau oloolo wawae. He mea hilahila loa ia, ke hele oe iwaena o ke akea.
3. E hana mua oe i kou wahi papale a maikai, alaila e kau ae oe maluna o ka lio. E olelo mai auanei kahi poe ia oe, nou ke lai o ke ahiahi.
4. Mai holo oe iwaena o ke kaona, me ka luhelelei i kou lauoho; e kahi mua oe i kou lauoho a maikai kau iho kahi papale, lawe mai hoi na wahi papahi lei ilima, alaila e i ia mai auanei oe, maikai wale, e lawe ana.

5. Mai hoohaahaa i kou pau, aka, e hookiekie iki ae, i elua a ekolu paha iniha maluna o ka puhaka, e huki a pau ka alualu o kou pau, e hoomaloeloe mua oe ia lalo, e liki iho hoi oe a moliolio pono o hope.
6. I kou holo ana, mai hina oe ihope, aole hoi e hio ma na aoao, aole no hoi e kulou imua, aka, e noho pono, me ka haka pono i kou mau maka imua. Alaila, e ike auanei kahi poe ia oe, a na lakou ia e hoopuka pokole ae i kau wahi mele pokole:

   Holo mai oe, kilakila;
   Noho mai oe, hanohano;
   Ai ka manu ia luna,
   Ka huila o Kapahukea,
   E niniu nei i ka lai.

Oia ka mahalo a ka poe makaikai ke ike aku i ka maikai o kou holo ana mai.

(Aole i pau) W. K.*

Some Rules for Female Horse Riders.

1. When you ride on your horse, do not ride without your skirt through the center of town. This is very unwholesome.
2. Do not gird your skirt in the front only and leave your buttocks exposed so that you can see your calves. This is extremely shameful, should you ride in public.
3. Put on your hat and make sure it looks nice and then climb aboard your horse. Soon some people will say that afternoon peace is yours.
4. Do not ride through town with messy hair. You should brush your hair first until it looks nice, put on a hat, and bring some adornments of ‘ilima lei. Then you will be the best, truly fine, and ready to go.
5. Do not lower your skirt, rather, keep it high, perhaps two or three inches above the waist. Pull it until there are no wrinkles in your skirt; first you should make the bottom taunt, pulling it until the back is properly tight.
6. When you ride, you should not lean back, do not fall sideways, and do not bow forward, however, sit upright and set your eyes straight ahead. Then some people will just see you and they will quickly utter this short little song:

   You ride this way with poise;
   You sit dignified;
   The birds are in the expanse above
   The wheel of Kapahukea,

Spinning in the calm.

This is a compliment from the spectators when they see how beautifully you ride.

(To be continued.) W.K.*

**Elua**, "No na Wahine Holo Lio."** ***Ka Hoku o ka Pakipika,*** **October 3, 1861. Page 3.**

No na Wahine Holo Lio.

Mai holo oe maluna o ka lio me kou manao ana paha, e holo oe iwaena o ke kulanakauhale nei, me ke kau o ka paka kika i ka waha, a ipupaka maoli paha; he mea ino loa ia, a he mea hilahila loa no hoi iwaena o ka poe maikai. I ka hale no pau ke puhi ana o ka paka, ke kau ka maluna o ka lio hookahi no hana, o ka hana ia oe a mikioi, o ka lawe ae a aulii.

I kou holo ana, mai manao oe, o ka hapuku wale mai no i ka lei a kaumaha ka ai, a me ke poo, he hana ia na ka pupule, hookahi no lei o ka wahine maikai.

I holo oe iloko o ke kulanakauhale, mai holo mau loa oe iwaena o na alanui a pau, he mea pakua loa ia. I hookahi no holo ana o ke kulanakauhale nei, a puni no, alaila no hoi no i ka hele, o ka holo ana iho la no ia o ka wahine maikai.

No ko'u ike ana iho, ua mahuahua iki iwaena o keia lahui kahi naauao i loaa mai mai na kumu a kakou, nolaila, ua hookomo iho au i keia mau rula i mea e hiki ai ia kakou ke hoomaopopo i ke ano o ka noho ana, a me na hana ana o ka naauao, a i mea hoi e hiki ai ia kakou ke hilahila i na hana o ka aoao naaupo.

Na'u,
Elua**
Honolulu, Sept. 30, 1861.

Concerning Female Horse Riders.

Do not ride upon your horse intending to perhaps ride through town with chewing tobacco in your mouth, or even within an actual tobacco pipe. This is very unwholesome, and extremely shameful among good people. You should finish smoking at the house; should you ride one horse for work, you should work to make it neat, undertaking it until it is exquisite.

When you ride do not decide to just hastefully gather lei so that your neck and head become heavy. This is what insane people do. Beautiful women should wear just one lei.

When riding within town, do not continually ride through all of the streets; this is a very common practice. Ride through town just once and when you have circled town, then return home. This is how good women ride.

Because I have noticed that some of the teachings received from our teachers have slightly increased among this nation, therefore, I have included these rules in order for us to be able to understand the way enlightened people live and work, and to allow us to shame acts of ignorance.

Sincerely,
Elua**
Honolulu, Sept. 30, 1861.

***Ka Nupepa Kuokoa,* April 26, 1901. Page 1.**

Female Pāʻū Riders Escort Queen Liliʻuokalani in 1901.

E ukali ia ana ka Moiwahine Liliuokalani e kekahi mau wahine holo lio mai kona home noho ma ke Alanui Beretania a hiki i Waikiki hookahi pule mai ka la apopo aku. E holo ana lakou me na paʻu holo lio o ka wa kahiko. He luau ke hoomakaukau ia ana no lakou i ko lakou hiki ana ma Waikiki.

Queen Liliʻuokalani will be escorted by some female horse riders from her residence on Beretania Street to Waikīkī a week from tomorrow. They are going to ride in horse riding pāʻū from the days of old. There is a lūʻau being prepared for them upon their arrival in Waikīkī.

Figure 16. Historic photo of pāʻū riders from Makawao. Photo Credit: M. Taylor Collection

Figure 17. Pāʻū riders in Hāna Maui festival. (Photo Credit: Festivals of Aloha)

### 5.12 Modern Hunting

While modern hunting is not a traditional Hawaiian practice, it has certainly become a cultural practice throughout Hawaiʻi. Traditionally, most animals were domesticated, making the need for hunting obsolete. It was not until after foreign contact, when certain land mammals and ungulates were introduced and allowed to roam wild as well as hunting weapons, like guns, were introduced to the Hawaiian people, that hunting as we know it today began to gain popularity. The term for hunting in Hawaiian is hahai holoholona, to pursue animals. The need for hunting in Hawaiʻi did not arise until new species of animals arrived in the islands and became wild and widespread, at which point there was a need to hahai holoholona. Like the paniolo traditions of Hawaiʻi, hunting is a more modern cultural practice that is influenced by foreign contact, yet Hawaiians have been using introduced technology, including bows and guns, to hunt introduced species such as deer as well as native species, like boar, for generations. In places like South Maui, hunting practices are still very active, and many residents still hunt for their food as a part of subsistence living practices. Hunting is considered to be a significant cultural practice within Wailua and Hāna, including the lands located near the project area. Hunting is also identified in the ethnographic data. There is an extensive deer population in the area. These ungulates are considered invasive. Hunting is important to managing this invasive species.

### 5.13 Fishing and Spearfishing

Across Maui, the nearshore reef environment provides a rich biodiversity that has helped to sustain this community for generations. The area is known for fishing and diving, especially for heʻe (octopus), which the ethnographic data identified to be associated with the name of the area (**Section 6**). This area is also known historically for limu picking, although limu has become scarcer in recent times, likely from development and environmental degradation.

This ocean expertise was critical to traditional Hawaiian practices. In *Hawaiian Fishing Traditions*, Moses Manu and Others write,

> With a knowledge of fishing areas and seasons and an array of implements that included hooks and lines, lures, nets, basket traps, poisonous plants, and spears, a fisher supplied his family or his aliʻi with fish and shellfish from streams, fishponds, reefs, and ocean. Sometimes the catch was so huge, fish could be fed to the pigs and dogs, with some left over to dry as food or fuel for fire; some was left to rot. Those fishers that could supply large amounts of fish from ponds or

> catches at sea were believed to possess mana kupua, or supernatural power, to attract fish at will or make them multiply. Successful fishing implements, such as hooks or cowry shell lures became famous and were prized, passed on to heirs, and sometimes fought over (Manu 2006, ix).

This ocean-based lifestyle remains vibrant in South Maui. While subsistence may not be as prevalent as it is in other Maui communities, there are still practitioners who actively use the ocean as a cultural resource and place to gather food resources.

Traditional fishing was central to life in Hāna, deeply intertwined with subsistence, observation, and cultural practice. Matthew Kalalau vividly described growing up in Waikoloa near Kaʻinalimu Bay, where his family lived just 150 feet from the ocean. Fishing was a daily part of life: "We lived mostly on the ocean—fish. We picked ʻopihi, caught fish," he said, recalling how closely their lives revolved around the sea (Kalalau 1998). He and his siblings swam, fished, and gathered seafood with their extended family and neighbors—many of whom were also relatives. The coastline provided both sustenance and a communal gathering space.

Similarly, Jackie Kahula recounted how weekends were cherished opportunities to swim and play at the beach, though weekdays were often too full with chores. Her home in Hamoa was just steps from the ocean, making shoreline access easy and routine (Kahula 1998). Eddie Oliveira, raised in Nahiku, also spoke of coastal living and the intergenerational knowledge required for subsistence, including ranching and fishing practices passed down through family.

Together, these testimonies highlight traditional fishing in Hāna as more than food gathering—it was a way of life grounded in kilo (observation), communal effort, and an intimate understanding of seasonal rhythms, ocean conditions, and familial responsibility.

### 5.14 Limu Gathering

Traditional limu (seaweed) picking is a vital part of Hawaiian cultural practice, particularly in communities like Hāna, where deep ties to the ocean have long sustained food systems, medicinal knowledge, and spiritual values. In Hāna, the practice of gathering limu is more than just subsistence—it is a cultural identity linked to kilo (observation), seasonal rhythms, and intergenerational learning. Along the coastline of East Maui, the rocky shorelines and pristine waters are home to numerous species of limu, including limu kohu, manauea, huluhuluwaena, and ʻeleʻele, each with specific uses for food, ceremony, and healing.

While few of the interviews from the Haleakalā Oral History Project mention limu specifically, their emphasis on shoreline gathering, familial fishing traditions, and subsistence from the ocean offer context for understanding limu's cultural role. Matthew Kalalau spoke of growing up near Kaʻinalimu Bay, where his family lived just 150 feet from the ocean. He recalled, "We lived mostly on the ocean—fish. We picked ʻopihi, caught fish," (Kalalau 1998) suggesting the routine nature of shoreline foraging. Though he doesn't mention limu by name, these shoreline activities almost certainly included limu picking, as it was a common practice among families who gathered ʻopihi, crustaceans, and fish from the intertidal zone. This kind of coastal subsistence culture is where limu knowledge was passed down—from observing which types grew in which seasons to understanding the ecological signs of healthy reefs and tides.

In recent years, efforts have been made to revitalize traditional limu knowledge in Hāna, most notably through the Hāna Limu Festival. Founded in 2013 by Kaimi Kaupiko and others in collaboration with the Hāna Chapter of the Hawaiian Civic Club and the Office of Hawaiian Affairs, the festival seeks to restore limu knowledge in East Maui and celebrate the essential role it plays in ocean health and Hawaiian identity. The festival typically includes limu identification workshops, cultural demonstrations, hula and oli, and community conversations about sustainable gathering practices and marine conservation.

Held at Kapueokahi (Hāna Bay), the festival attracts kūpuna, keiki, and local practitioners who share moʻolelo (stories), teach planting and replanting of limu, and emphasize mālama ʻāina (caring for the land and ocean). The focus is not only on harvesting but also on protection and restoration. Overharvesting, pollution, and invasive species have contributed to the decline of native limu in many parts of Hawaiʻi, including East Maui. In response, the festival promotes practices like reseeding reefs and educating younger generations on ethical gathering. These efforts reflect a broader resurgence of traditional knowledge and a return to communal responsibility for marine resources.

In Hāna, where much of the shoreline remains relatively untouched and culturally intact, limu picking continues to hold both practical and symbolic significance. Whether taught on rocky outcrops by kūpuna or revived through community festivals, the knowledge of limu endures as part of Hāna's living heritage. The Hāna Limu Festival represents not just cultural revival but environmental resilience, bridging ancestral practices with modern stewardship to ensure that the gathering of limu—both physically and spiritually—remains part of the ocean's gift to the people of East Maui.

## 6.0 Ethnographic Data

Previously conducted oral interviews from kūpuna of the area were summarized to inform the identification of resources.

### 6.1 Oral Histories

There are a number of oral history projects that have been completed by federal agnecies for this region. Relevant interviews are summarized below.

#### 6.1.1 Legario “Hanky” Eharis

**Interview Date:** May 7, 2021
**Interview Location:** Kīpahulu, Maui

Legario “Hanky” Eharis was born and raised in Hāna, Maui, and his intimate relationship with the region is rooted in generations of familial and cultural connection. Both of his parents were employed by the National Park Service, with his father working on an archaeological survey crew and his mother employed in the interpretive division. Hanky’s first formal engagement with the park began when he was just fourteen years old through the Youth Conservation Corps. Over the years, his work evolved into a full-time career in various park operations, ranging from fencing and backcountry work to cultural stewardship.

His deep roots in Hāna and Kīpahulu shaped his understanding of land management from a Native Hawaiian perspective. As he explains, “Being from Hāna and having that type of background of hunters and subsistence off the land with fishing and everything—I fell right into it.” He recounted early trail building projects at ʻOheʻo and described how the elders, including his father and uncles, “were trying to put in those places and was part of the crew to help build those areas for visitors.” Hanky notes the transition over time, lamenting the current disconnect with local community representation in the park workforce, which once included predominantly local families like his own. His memories present a layered portrait of intergenerational service and the blending of cultural knowledge with federal stewardship models.

#### 6.1.2 Nanette “Nan” Kuʻulei Akau (Cabatbat)

**Interview Date:** June 11, 2021
**Interview Location:** Hosmer Grove, Haleakalā

Nanette “Nan” Kuʻulei Akau Cabatbat’s lifelong dedication to Hawaiian cultural practices and environmental stewardship is reflected in her decades-long service at Haleakalā National Park. Born in Richmond, California in 1950, Nan returned to Hawaiʻi at age six. Her mother hailed from Kūʻau, near Pāʻia on Maui's north shore, while her father was from Hilo. After marrying James “Kimo” Cabatbat, a park ranger, Nan herself began working at the Haleakalā Summit Visitor Center and became known for her daily sunrise oli (chants), which she performed with great reverence.

Although much of Nan’s direct work took place at the Summit, she was deeply aware of the cultural complexity and regional specificity across Maui. When asked about the cultural distinctions within the park, she observed that "translation depends upon are you from Oʻahu, Lahaina, or the slopes here, Hāna side, Kaupō side. How you interpret it comes out differently.” This comment reflects a sophisticated understanding of place-based knowledge and regional dialects, and how such nuances influence oral history, moʻolelo, and even naming conventions.

While she didn’t focus explicitly on Kīpahulu, her recognition of these different interpretations reinforces the importance of consulting cultural practitioners from each area. She emphasized the resurgence of traditional names and identities, noting that “there's been a resurgence, let's go back to using the correct names because there are stories about that,” suggesting a shift toward deeper cultural authenticity within the park system.

### 6.1.3 Walter Pu

**Interview Date:** May 7, 2021
**Interview Location:** Kīpahulu, Maui

Walter Pu stands as a living embodiment of Kīpahulu heritage. Born in Hāna, he descends from at least seven generations of East Maui residents, and his career as a park ranger has been deeply entwined with the land, waters, and stories of the Kīpahulu district. Walter began his journey in 1998 with the Hawaiʻi Natural History Association before joining the National Park Service in 2006, where he has remained for over sixteen years.

Walter’s reflections are deeply personal and culturally resonant. He describes the land not only as a workplace but as ancestral ground: “This is the roots of dad, and my grandfather, and my great grandfather, and my great greats there, they came from this area." This connection was spiritually affirmed when he felt called to return to Maui and take the position in the park, a journey echoing that of his uncle, Eddie Pu, a revered cultural figure who once walked the island of Maui as a spiritual act.

His memories of childhood trips from Hāna to Haleakalā are vivid, filled with stories of bumpy plantation roads, streams used to cool overheated car engines, and long, winding journeys across East Maui: "It felt like it took almost a day and a half," he recalls with laughter. Walter speaks proudly of the cultural and ecological knowledge rooted in Kīpahulu, including early surveys conducted in 1967 by figures like Jack Lind. He also helped construct a traditional Polynesian canoe under a hale near the visitor center with navigator Tava Taupu, reinforcing the importance of living cultural practice in resource management and education.

### 6.1.4 Jackie Kahula

**Interview Date:** April 24, 1998
**Interview Location:** Hana Community Center

Jackie Kahula was born in Hilo in 1935 but raised from infancy in Hāna, Maui, after being adopted by her uncle and aunt, James and Mary Ki'i Kahula. Growing up in the small village of Hamoa, Jackie was surrounded by a tight-knit Hawaiian community with strong subsistence ties to the land and ocean. She vividly describes the rural compound where she was raised, which included three homes, a cookhouse for boiling taro and drying lau hala, and a garage where her mother prepped leaves for weaving and where the family ironed clothes with old charcoal irons. The property, about two-and-a-half acres, sat right next to the beach, "about ten steps away from the ocean," she noted, emphasizing the closeness of their daily lives to the shoreline.

Jackie's childhood in Hamoa was filled with traditional activities and collective labor. Her mother was a skilled hala weaver, and the family's lifestyle was deeply connected to the rhythms of farming, fishing, and communal work. While she recalled the occasional game of softball near the old seaplane landing field, most days were focused on chores and responsibilities. "From my age, which was six years old, on up to the oldest in the house, each one had some duties to do," she explained.

Schooling took place right in Hāna, at the same community center where the interview was conducted. Jackie remembered walking to school from Hamoa—sometimes through the mud, sometimes along the beach during low tide—because there were no paved roads or school buses in those days. Her early teachers, like Mrs. Akana, taught her and a class of about 30 children basic academic and social skills, offering a gentle transition from the village into the broader Hāna community. Jackie also painted a picture of Hāna in the mid-20th century, when there were several mom-and-pop stores, a bustling Hasegawa General Store, and a village feel that has since changed significantly. Her memories preserve a vibrant portrait of Hamoa as a microcosm of traditional Hawaiian life on the southeast coast of Maui.

### 6.1.5 Eddie Oliveira

**Interview Date:** April 23, 1998
**Interview Location:** Hana Community Center

Eddie Oliveira was born in Nahiku on December 1, 1922, into a large family with deep roots in Maui's homesteading era. His parents were of Portuguese ancestry—his mother born in Hamakua Poko and his father in Kaupakalua. Eddie grew up in Nahiku in a house his father built around 1932 or 1933, one of several residences the family occupied near what is now the Hāna Highway. His recollections reflect the mixed cultural world of Nahiku, a coastal region situated between Hāna and Keʻanae, where ranching, homesteading, and subsistence farming were central to life.

His father, John Oliveira, had served in World War I and later worked as a cowboy for the Nahiku Ranch, which covered around 500 acres. "My dad was a cowboy," Eddie recalled, and growing up, Eddie and his siblings helped on the ranch, clearing land, building fences, and rounding up cattle. These activities, he emphasized, were not just work but also moments of joy and bonding. "That was the fun time—round up cattle time," he said.

Eddie attended Kaʻelekī School for early grades before transferring to Hāna School, describing a time when education required significant travel by foot along unpaved trails and through dense forests. The family's connection to the land was formalized through homestead land grants, offered by the Territory of Hawaiʻi at a dollar per acre, with a requirement to build and reside on the land for five years. Eddie remembered his grandfather obtaining such land, first deep in the forest and later trading it for property closer to the highway—a move that marked the family's shift from mountain subsistence to a more settled roadside life.

His memories document not only a specific place but also a transitional moment in East Maui's history, when sugar and cattle intersected with Hawaiian land systems and immigrant labor communities, helping to shape the modern cultural landscape of Nahiku and the greater Hāna District.

### 6.1.6 Henry Kahula, Sr.

**Interview Date:** April 24, 1998
**Interview Location:** Hotel Hana Maui

Born in Naʻalehu, Kaʻū, on the Big Island in 1916, Henry Kahula moved to Hāna, Maui, at the age of five when his family came to work at the local sugar plantation. His father, Jack Naluahi Kahula, was a mechanic and heavy equipment operator, and Henry recalled their first residence in Hāna as "house number one"—a small, two-bedroom plantation home that doubled as a dispensary. From these humble beginnings, Henry and his siblings grew up immersed in the multiethnic, labor-driven world of the plantation era.

Henry described Hāna in the 1920s and 1930s as a lively, community-oriented place. Though there were only about five cars in town at the time, the village bustled with commerce. "There were more stores before than we have today," he said, listing Chinese and Japanese stores, a coffee shop, restaurants, barbershops, and even a movie theater where silent films played for ten cents. The theater also hosted live performances, such as Japanese dokkoi-sho dances with drumming and singing that continued late into the night. "We stayed right over there," he remembered, "especially if we go to the movie and the movie gets through about nine o'clock. Everybody walk down there to the Japanese[-language] school… and join the dance."

Henry also recalled the geographic isolation of Hāna, surrounded by sugarcane fields and dimly lit by sparse streetlights, yet rich with community events and cultural celebrations. His reflections offer a window into the plantation society of East Maui, a world both physically distant and yet deeply interconnected through kinship, labor, and cultural adaptation.

### 6.1.7 Rose Cambra Freitas

**Interview Date:** May 6, 2021
**Interview Location:** Makawao, Maui

Rose Cambra Freitas, born in Puʻunēnē in 1932, is known across Maui and beyond as a trailblazing cowgirl and decades-long volunteer with Haleakalā National Park. While she did not grow up in Hāna, her reflections include powerful memories of traveling across

Maui to the southeast coast and volunteering at the park's Kīpahulu district. Rose and her husband Raymond Freitas—also a cowboy—spent over fifty years in service to the park, working in the cabins, assisting with feral animal control, and leading efforts to engage the public in park stewardship.

She recalls their honeymoon spent in Palikū cabin within Haleakalā Crater in 1952, describing the experience with poetic reverence. Rose, who was eventually named an honorary park ranger and inducted into the National Cowgirl Hall of Fame, brought a sense of kuleana to her volunteer work, driven by her love for the ʻāina and her paniolo heritage. "We helped in any way we could," she noted, reflecting on their humble contributions to park maintenance and cultural education.

Though she lived in Makawao, her volunteer work brought her regularly to Kīpahulu and the remote reaches of the park, bridging the gap between Upcountry and East Maui. Her stories reflect the evolving interface of community, conservation, and cultural identity that characterizes the park's relationship to the southeastern coast.

### 6.1.8 Matthew Kalalau, Sr.

**Interview Date:** July 18, 1998
**Interview Location:** Hamoa, Maui

Matthew Kalalau, Sr., born in Hāna in 1930, provides one of the most personal and vivid accounts of life in Waikoloa near Kaʻinalimu Bay—a small community located just a few miles from central Hāna. The son of parents from Kaupō and Kahikinui, Kalalau is of pure Hawaiian ancestry and grew up immersed in the subsistence lifestyle of East Maui. His family lived in a two-story plantation-style home just 150 feet from the ocean. "It had a beautiful view of the whole bay, Kaʻinalimu Bay," he said. "I enjoyed just sitting outside the porch and watching the ocean and watch people go fishing and catch ʻopihi, which was part of my life."

Kalalau recalled a life centered around fishing, taro farming, and music. His family made poi every weekend from taro harvested in the uplands, and his father taught him and his siblings to play music. He later worked at the Hotel Hana Maui and served as emcee for lūʻau events. The landscape and seascape around Waikoloa were home to just four families—the Malaikinis, Noas, Koas, and Nahes—many of them relatives, forming a tight intergenerational network.

He also recounted walking to school in Hāna each day, sometimes staying out late to play at Hana Bay and getting in trouble when his father came looking. “Sometimes my dad would walk up—come looking for us. And you know what happens when you do that?” he laughed. His memories capture the rhythm of life in rural Hāna: physically demanding, deeply familial, and intimately tied to the land and sea. Kalalau’s testimony is a rare and rich portrait of a Hawaiian boyhood along the southeast coast of Maui.

## 7.0 Impact Assessment

The project as currently conceptualized would not adversely impact cultural resources or traditional or customary practices. There are wahi pana (storied places) within the overall property in which the project area is located, but it is not currently anticipated that any of the resources or practices in the area would be adversely impacted as a result of the project activities.

### 7.1 Impacts to Flora

While no federally or state-listed threatened or endangered plant species were observed, the presence of culturally significant endemic and Polynesian-introduced flora highlights the importance of landscape-level cultural values. These plants support a range of traditional practices—spanning food cultivation, lei-making, medicine, and ceremonial use.

It is recommended that the project team avoid unnecessary disturbance to areas where these species are found and consider opportunities for cultural interpretation or restoration plantings, where appropriate.

### 7.2 Impacts to Fauna

The presence of endemic freshwater species and native insects highlights the ecological integrity of the Wailua Stream system. These fauna play an important role not only in native ecosystems but also in perpetuating traditional knowledge, food practices, and cultural identity. Continued stewardship is recommended to ensure these species and their habitats are protected during and after construction.

### 7.3 Impacts to Historic Sites

Both bridges will be impacted. These impacts as well as any other potential impacts to historic sites will be addressed through the HRS 6E process.

### 7.4 Impacts to Intangible Cultural Resources

Intangible cultural resources refer to those resources without physical form, such as hula or mele. As there are no known or identified cultural practices currently taking place on the property, and it is unlikely the proposed activities would adversely impact intangible cultural resources on the property or in adjacent areas.

## 7.5 Impacts to Cultural Practices

It is unlikely that the project would adversely impact any cultural practices in the area. There may be some practices associated with the streams in the area. These water resources support a range of ecological functions and are also associated with traditional knowledge systems that link water sources to the Hawaiian gods Kāne and Kanaloa. In Hawaiian tradition, Kāne is viewed as the deity most closely connected to water, and the presence of natural springs, streams, and pools across the islands is often associated with his actions.

Given the cultural importance of water and its longstanding role in Native Hawaiian practices—particularly agriculture and religious observances—it is appropriate for this CIA to consider how water use associated with the project may intersect with cultural concerns. While the proposed bridge replacements are not expected to significantly alter regional hydrology, any temporary changes to stream access, flow, or water quality during construction should be monitored and managed to avoid unintended impacts.

It is recommended that the project:

- Maintain natural stream flow to the extent practicable during construction;
- Implement appropriate best management practices (BMPs) to minimize sedimentation or water quality degradation;
- Avoid direct impacts to any springs or water sources that may support cultural or subsistence practices;
- Coordinate with community members and cultural practitioners, where appropriate, to remain informed of any concerns regarding stream or water resource use.

By taking these considerations into account, the project can better align with both environmental requirements and cultural values related to water stewardship in the Hāna region.

## 7.6 Cumulative and Indirect Impacts

Adverse cumulative and indirect impacts to cultural resources are often overlooked in CIAs, as they are difficult to assess. Cumulative impacts are cultural impacts that result from the incremental impacts of an activity when added to past, present, and reasonably foreseeable future actions and activities. Indirect impacts are impacts on cultural resources which are not a direct result of the project, but a secondary or tertiary result of the project. It is currently not anticipated that the project will have any cumulative or indirect impacts.

## 7.7 Mitigation and Best Management Practices

Any mitigation recommended under HRS 6E should be implemented. Construction BMPs should be implemented during project construction to limit any potential impacts to nearby water resources. Native plants should be used extensively throughout the project area as recommended in the ethnographic data to minimize erosion and to create additional cultural resources for use by practitioners.

## 8.0 *Ka Paʻakai* Analysis

It has long been the law of the land that the State of Hawaiʻi has an "obligation to protect the reasonable exercise of customary and traditionally exercised rights of Hawaiians to the extent feasible" *Public Access Shoreline Hawaiʻi v. Hawaiʻi County Planning Commission ("PASH")* 79 Hawaiʻi 425, 450 n. 43, 903 P.2d 1246, 1271 n. 43 (1995). In 2000, in the *Ka Paʻakai* decision, the Court established a framework "to help ensure the enforcement of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development interests." 94 Hawaiʻi 31, 35, 7 P.3d 1068, 1972 (2000). This analysis is used here to fulfill the goal of this CIA (**Section 1.4**).

Based on the guidelines set forth in *Ka Paʻakai*, the Hawaiʻi Supreme Court provided government agencies an analytical framework to ensure the protection and preservation of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development, or other interests. The Court has stated: "that in order to fulfill its duty to preserve and protect customary and traditional Native Hawaiian rights to the extent feasible, as required by Article XII, Section 7 of the Hawaiʻi Constitution, an administrative agency must, at minimum, make specific findings of fact and conclusions of law as to the following:

1) The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area.
2) The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
3) The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist. *Ka Paʻakai*, 94, Hawaii at 47, 7 P.3d at 1084." Cited in *Matter of Contested Case Hearing Re Conservation District Use Application (CDUA) HA-3568 for the Thirty Meter Telescope at the Mauna Kea Science Reserve, Kaʻohe Mauka, Hāmākua, Hawaiʻi*, 143 Hawaiʻi 379, 431 P.3d 752 (2018).

In order to complete a thorough CIA that complies with statutory and case law, it is necessary to fully consider information available from, and provided by, Native Hawaiian cultural practitioners and cultural descendants from the project area. From thorough research, data was extrapolated that provides a comprehensive look at the cultural resources in this ʻāina. Through this research, the factors from *State v Hanapi* are met. These factors are: "to establish that his or her conduct is constitutionally protected as a native Hawaiian right, he or she must show, at minimum, the following three factors. First, he or she must qualify as a "native Hawaiian" within the guidelines set out in PASH . . . [as] "those persons who are 'descendants of native Hawaiians who inhabited the islands prior to 1778,' … regardless of their blood quantum." Second, once a defendant qualifies as a native Hawaiian, he or she must then establish that his or her claimed right is constitutionally protected as a customary or traditional native Hawaiian practice…. Finally, a defendant claiming his or her conduct is constitutionally protected must also prove that the exercise of the right occurred on undeveloped or "less than fully developed property."" 89 Hawai'i 177, 185-86, 970 P.2d. 485, 493-94 (1998).

The *Ka Pa'akai* analysis is largely a legal analysis, as the applicable tests are legal standards. Therefore, a strong analysis is one conducted by someone with sufficient legal training. Additionally, at the core of a thoughtful *Ka Pa'akai* analysis is a comprehensive understanding of traditional and customary practices. In breaking down the Court's tests, it is important to evaluate the different elements that contribute to each test.

The first test - "The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area" – actually consists of two separate elements. First, the simple identification and existence of valued cultural, historical, or natural resources. These resources are tangible in nature. They can include sacred places, culturally valuable plants, or a religious or historic site. This survey has sought to exhaustively identify the great multitude of resources that may exist in the project area or adjacent areas.

As to this test, this survey shows there are historic sites (the historic bridges) within the project area. There is no evidence to show that these bridges have particular cultural importance to Hawaiians or other ethnic group.

The second element of this first test is access. Access requires two things to occur. One is the existence of a resource. Whether a plant, an animal, a place, or site, the resource must exist in order a practitioner to access it. The second thing is physical access. This includes, but it is not limited to, the ability to physically access a plant, animal, site, or location associated with a particular practice. This can also include the traditional and customary route or path taken to access the resource. This can also include cultural protocols that existed in accessing a resource. These are often temporal, in that access protocols can be at a certain time of day or year. Makahiki would be a good example of a traditional custom that has specific cultural protocols associated with access. In the case of Makahiki, the custom takes place at a certain time of year.

Therefore, the first test under *Ka Paʻakai* should include not only a listing of resources, but the identification of ways in which those resources are accessed and utilized in association with a traditional and customary practice.

Therefore, the second test – "The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action" – also looks at two separate elements. First, does the proposed action and its alternatives have an adverse impact on the existence of resources? This would include the alteration, destruction, modification, or harm of sites, including biological resources, sacred places, burial sites, etc. It also includes a loss of species. Any adverse impact or harm to resources alone is an effect or impairment caused by the proposed action.

In addition to this, any action that impacts traditional and customary access to resources, even if there is no direct adverse impact to the resource itself, would result in an effect or impairment resulting from the proposed action. Therefore, the limitations on access that could result from development or use of the project area could create an adverse impact under *Ka Paʻakai.* Conditions and best management practices are recommended that ensure no cultural resources are impacted during project construction. If followed, it is not anticipated that any impacts to cultural access would result from this project.

The third part of the *Ka Paʻakai* framework aims to identify "[t]he feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist." Determining whether or not action has been suitably "feasible" is a matter for the State. These feasible actions could include continued access to the project as needed to conduct cultural practices. Since there no anticipated impact, feasible action is moot.

## 9.0 Conclusion

In Hawaiian culture, natural and cultural resources are largely viewed as being one and the same. Without the resources provided by nature, cultural resources could not and would not be procured. From a Hawaiian perspective, all natural and cultural resources are interrelated, and all natural and cultural resources are culturally significant. Ethnographer and Hawaiian language scholar Kepā Maly observed, "In any culturally sensitive discussion on land use in Hawaii, one must understand that Hawaiian culture evolved in close partnership with its natural environment. Thus, Hawaiian culture does not have a clear dividing line of where culture ends and nature begins" (Maly, 2001:1).

The kinship between Hawaiians and their land extends back across many generations, and it was the depth and intimacy of this relationship that enabled Hawaiians to thrive sustainability in the islands for hundreds of years prior to the arrival of Europeans. Therefore, Hawaiians are entitled to the pain and anguish they feel at the loss of their lands and resources.

This loss lies at the heart of Hawaiian struggles for traditional or customary access. Therefore, the obligation of the state to ensure that these rights are protected is much more than a legal obligation, as such rights are a necessity of indigenous human life. Recognition and respect for these rights also enables a more mutually respectful and beneficial relationship between the Planned Development and Hawaiians.

Act 50 was passed by the state recognizing:

> … the past failure to require native Hawaiian cultural impact assessments has resulted in the loss and destruction of many important cultural resources and has interfered with the exercise of native Hawaiian culture. The legislature further finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture (Act 50, SLH 2000).

The CIA is a construct of state law and a requirement of HRS Chapter 343. The legislative intent quoted above is critical to the due consideration of the effects the proposed action has and will have on cultural practices, because it specifies the importance of ensuring "the continued existence, development, and exercise" of culture. This recognizes that culture is not static; it is dynamic. It changes over time. Act 50 specifically calls for consideration of the effects a proposed action may have on the continued "development" of native Hawaiian culture. Which means it is insufficient to simply look back to historic practices. Considering effects to the continued development of culture means the state, specifically the governing state or county agency, as the accepting authority of the Chapter 343 EIS, of which this CIA is a requirement.

Additionally, the State Environmental Review Program (ERP, formerly OEQC) offers specific guidelines for what elements and issues a CIA should address. The section of this CIA which addresses that element is also provided.

Table 8. Table listing ERP compliance requirements and their corresponding sections in this assessment.

| **ERP notes that in addition to the content requirements for the draft EIS, which are set out in HAR §11-200.1 et seq., the assessment concerning cultural impacts should address, but not necessarily be limited to, the following matters:** | |
|---|---|
| **A. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.** | A detailed methodology section is provided in **Section 2**, *Methodology*. |
| **B. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.** | A discussion of the effort to gather into from persons familiar with the area or other stakeholders is provided in **Section 2.6**, *Ethnographic Methodology*. |
| **C. Ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.** | A discussion of procedures, including constraints or limitations, is provided in **Section 2.6**. |
| **D. Biographical information concerning the individuals and** | Biographical information was provided for each interviewee in **Section 6.0**. |

| | |
|---|---|
| **organizations consulted, their expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.** | |
| **E. A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched and the level of effort undertaken. This discussion should include, if appropriate, the perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.** | A discussion of the materials consulted is provided in **Section 2**. An extensive cultural and historical overview, which uses both Hawaiian and English language resources is also provided in **Section 2**.<br><br>Stakeholders are given significant consideration. Petitions and other materials by project opponents are included in the appendices and are addressed in the context of this assessment. |
| **F. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.** | In addition to the cultural and historical overview, an extensive discussion concerning cultural resources, practice and beliefs are provided throughout the document by subfield. |
| **G. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area affected directly or indirectly by the proposed project.** | A thorough discussion concerning the nature of traditional or customary practices and the significance of the cultural resources affected directly or indirectly by the proposed alternatives is provided in **Section 7.0**, *Impact Assessment*. |

| | |
|---|---|
| **H. An explanation of confidential information that has been withheld from public disclosure in the assessment.** | There was no confidential information withheld from public disclosure, except for personal emails, addresses, or phone numbers. |
| **I. A discussion concerning any conflicting information regarding identified cultural resources, practices and beliefs.** | There was no conflicting information regarding cultural resources, practices, or beliefs. |
| **J. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.** | A thorough analysis is provided in **Section 7.0**. |
| **K. A bibliography of references and attached records of interviews which were allowed to be disclosed.** | References are included in **Section 10.0**. |

The standard under which an EIS is considered sufficient is also well-established in Hawaii state case law. The court has held:

> …an EIS need not be exhaustive to the point of discussing all possible details bearing on the proposed action but will be upheld as adequate if it has been compiled in good faith and sets forth sufficient information to enable the decision-maker to consider fully the environmental factors involved and to make a reasoned decision after balancing the risks of harm to the environment against the benefits to be derived from the proposed action, as well as to make a reasoned choice between alternatives" *Price v Obayashi Hawaii Corp*, 81 Hawaii 171, 182 (1996), upheld in *Kaleikini v Yoshioka*, 283 P. 3d 60, 74 (2012).

It is the obligation of this CIA to disclose information as required under Act 50 sufficiently and in good faith that the state may consider all impacts when acting as decision-maker in this proposed action. This assessment is not a policy document, nor does it intend to influence decision-making in any fashion. Rather, it has sought to document the complex, and often elusive, history of past and present cultural practices within the project area and larger region. It is ultimately the responsibility of the state to accept or reject the adequacy of this assessment, and then, if accepted, consider the information disclosed herein when deciding on the proposed action.

In applying *Ka Paʻakai*, cultural, historical, or natural resources have been identified in the project area. Traditional or customary Native Hawaiian rights do not appear to be currently exercised in the project area, but they are practiced in the nearby coastal areas. Any adverse effects to these practices can potentially be avoided or minimized through the implementation of the recommendations provided in **Section 7.0**.

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## Appendix I: Glossary of Hawaiian Terms

The following list of terms were used throughout this report. All definitions were compiled using Pukui and Elbert's *Hawaiian Dictionary* (1986).

| | |
|---|---|
| Ahupuaʻa | 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 (puaʻa), or because a pig or other tribute was laid on the altar as tax to the chief. |
| ʻĀina | Land, earth. |
| Akua | 1. God, goddess, spirit, ghost. 2. Divine, supernatural, godly. |
| Ala | Path, road, trail. |
| Aliʻi | 1. Chief, chiefess, ruler, monarch. 2. Royal, regal. 3. To act as chief, reign. |
| ʻAumakua | Family or personal gods, deified ancestors who might assume the shape of sharks, owls, hawks, dogs, plants, etc. A symbiotic relationship existed; mortals did not harm or eat them, and the ʻaumakua warned or reprimanded mortals in dreams, visions, and calls. |
| ʻAumākua | Plural of ʻaumakua. |
| ʻAuwai | Irrigation ditch, canal. |
| Haku mele | Poet, composer; to compose song or chant. |
| Hālau | 1. Long house, as for canoes or hula instruction; meeting house. 2. Large, numerous; much. |
| Hale | House, building, institution, lodge, station, hall. |
| Hale pili | House thatched with pili grass. |
| Heiau | Pre-Christian place of worship, shrine. Some heiau were elaborately constructed stone platforms, other simple earth terraces. |
| Hula | A Polynesian dance form accompanied by chant or song. |
| ʻIli | Land section, next in importance to ahupuaʻa and usually a subdivision of an ahupuaʻa. |
| ʻIli kūpono | A nearly independent ʻili land division within an ahupuaʻa, paying tribute to the ruling chief and not to the chief of the ahupuaʻa. Transfer of the ahupuaʻa from one chief to another did not include the ʻili kūpono located within its boundaries. |
| Iwi | Bone, carcass. The bones of the dead, considered the most cherished possession, were hidden, and hence there are many figurative expressions with iwi meaning life, old age. |

| | |
|---|---|
| Kalo | Taro (*Colocasia esculenta*), a kind of aroid cultivated since ancient times for food, spreading wildly from the tropics of the Old World. In Hawaiʻi, taro has been the staple from earliest times to the present, and here its culture developed greatly, including more than 300 forms. All parts of the plant are eaten, its starchy root principally as poi, and its leaves as lūʻau. |
| Kanaka | Human being, man, person, individual, party, mankind, population. |
| Kānaka | Plural of kanaka. |
| Kāne | Male, husband, male sweetheart, man; brother-in-law of a woman. |
| Kanikau | 1. Dirge, lamentation, chant of mourning, lament. 2. To chant, wail, mourn. |
| Kapu | 1. Taboo, prohibition. 2. Special privilege or exemption from ordinary taboo. 3. Sacredness, prohibited, forbidden, sacred, holy, consecrated.<br>4. No trespassing, keep out. |
| Kuleana | Right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province. |
| Kumu | Teacher, tutor, manual, primer, model, pattern. |
| Kumu hula | Hula teacher. |
| Kupuna | Grandparent, ancestor, relative or close friend of the grandparent's generation, grandaunt, granduncle. |
| Kūpuna | Plural of kupuna. |
| Limu | A general name for all kinds of plants living under water, both fresh and salt, also algae growing in any damp place in the air, as on the ground, on rocks, and on other plants; also mosses, liverworts, lichens. |
| Loʻi | Irrigated terrace, especially for taro, but also for rice and paddy. |
| Loko iʻa | Traditional Hawaiian fishpond. |
| Lua | A type of dangerous hand-to-hand fighting in which the fighters broke bones, dislocated bones at the joints, and inflicted severe pain by pressing on nerve centers. There was much leaping, and (rarely) quick turns of spears. Many of the techniques were secret. Lua holds were named. Lua experts were bodyguards to chiefs. |
| Mahi ʻai | Farmer, planter; to farm, cultivate; agricultural. |
| Makai | On the seaside, toward the sea, in the direction of the sea. |
| Māla | Garden, plantation, patch, cultivated field, as māla ʻai, māla kalo, māla kō, māla kūlina. |

| | |
|---|---|
| Mālama | To take care of, tend, attend, care for, preserve, protect, beware, save, maintain. |
| Manaʻo | Thought, idea, belief, opinion, theory, thesis, intention, meaning, suggestion, mind, desire, want; to think, estimate, anticipate, expect, suppose, mediate, deem, consider. |
| Mauka | Inland, upland, towards the mountain. |
| Mele | 1. Song, anthem, or chant of any kind. 2. Poem, poetry. 3. To sing, chant. |
| Mele mākaʻikaʻi | Travel chant. |
| Mōʻī | King, sovereign, monarch, majesty, ruler, queen. |
| Moku | 1. District, island, islet, section, forest, grove, clump, fragment. 2. To be cut, severed, amputated, broken in two. |
| Moʻo | Lizard, reptile of any kind, dragon, serpent. |
| Moʻolelo | Story, tale, myth, history, tradition, literature, legend, journal, log, yard, fable, essay, chronicle, record, article. |
| Moʻowahine | Female lizard deity. |
| Nīʻau-piʻo | Offspring of the marriage of a high-born brother and sister, or half-brother and half-sister. |
| ʻOhana | Family, relative, kin group; related. |
| ʻŌlelo noʻeau | Proverb, wise saying, traditional saying. |
| Oli | Chant that was not danced to, especially with prolonged phrases chanted in one breath, often with a trill at the end of each phrase; to chant thus. |
| ʻŌʻō | Digging stick, digging implement, spade. |
| Pae ʻāina | Group of islands, archipelago. |
| Piʻo | Marriage of full brother and sister of nīʻaupiʻo rank, presumably the highest possible rank. Their offspring had the rank of naha, which is less than piʻo but probably more than nīʻaupiʻo. Later piʻo included marriage with half-sibling. |
| Pueo | Hawaiian short-eared owl (*Asio flammeus sandwichensis*), regarded often as a benevolent ʻaumakua. |
| Wai | Water, liquid or liquor of any kind other than sea water. |
| Wahi pana | A sacred and celebrated/legendary place. |
| Wahine | Woman, lady, wife; sister-in-law, female cousin-in-law of a man. |
| Wao | 1. Realm. 2. A general term for inland region usually forested but not precipitous and often uninhabited. |

# Appendix D. Jurisdictional Waters Determination for Hāna Highway, Bridge No. 23 and No. 26 in Kīpahulu, East Maui. AECOS, Inc. March 18, 2025.

*AECOS* No. 1659B

# Jurisdictional Waters determination for Hāna Highway Bridge No. 23 and No. 26 in Kīpahulu, East Maui


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January 12, 2023

# Jurisdictional Waters determination for Hāna Highway Bridge No. 23 and No. 26 in Kīpahulu, East Maui

January 12, 2023 | *AECOS* No. 1659B

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## Introduction

The County of Maui, Department of Public Works, in cooperation with the State of Hawai'i Department of Transportation (HDOT) and the Federal Highway Administration (FHWA), is proposing to replace two bridges on the Hāna Highway near Kīpahulu, south of Hāna ("Project"; Figure 1). The bridges are South Wailua Bridge (Hāna Highway Bridge No. 23) crossing Honolewa Stream, and Waikāko'i Bridge (Bridge No. 26) crossing Waikāko'i Stream.

Bridge No. 23 (originally constructed in 1947) is proposed to be replaced with a single span, single lane structure in the location of the existing bridge or, as an alternative, a new off-alignment bridge would be constructed on the *makai* side of the existing structure and the old bridge either removed or retained. Bridge No. 26 (originally constructed in 1911) is proposed to be replaced on the existing alignment with a similar single lane structure. A temporary ACROW bridge (prefabricated modular bridge) is proposed to be set up on the *makai* side of the existing bridge to direct traffic around the new bridge construction. The proposed structure will be phased to allow the existing structure to remain in service during construction. Temporary, short duration, roadway closures will be implemented as needed to construct the proposed bridge on the existing alignment.

HDR Inc. contracted *AECOS* Inc. to undertake Jurisdictional Waters surveys and natural resource surveys at both bridge locations. This report presents results of the Jurisdictional Waters surveys for these bridge replacement projects[1]. The natural resources surveys of the two bridge sites are presented in *AECOS* (2022).

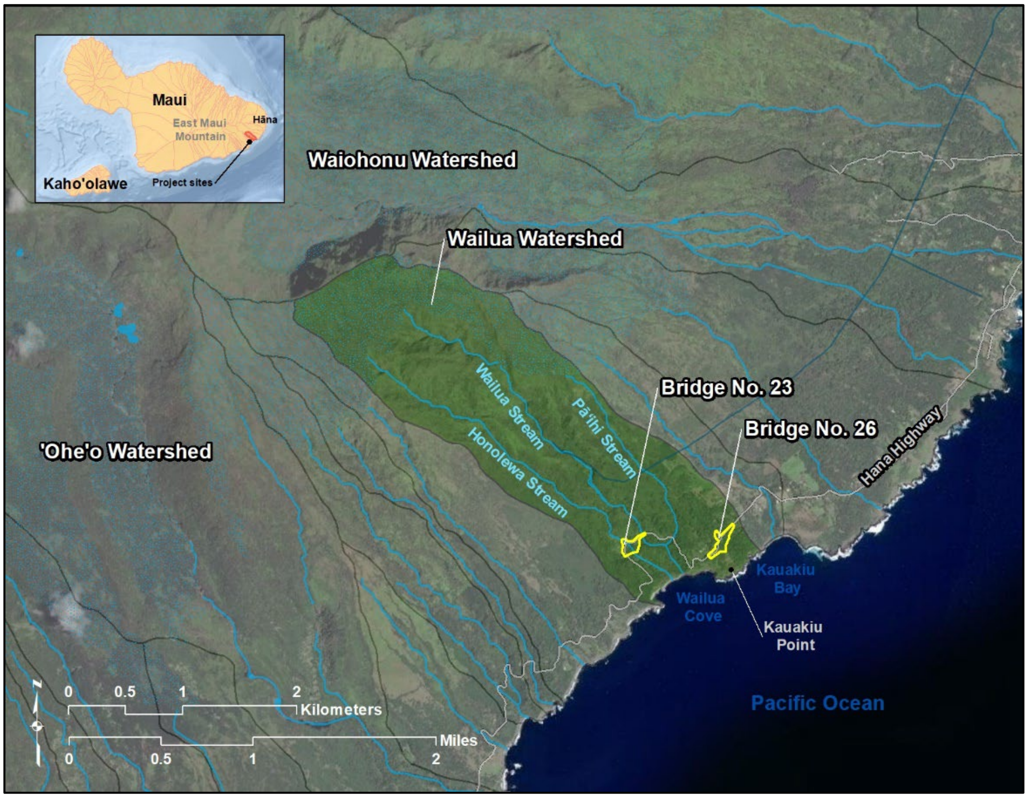


**Figure 1. Project locations in Wailua Watershed, Kipahulu, Maui, Hawai‘i.**

## Site Description

The two Project bridges along Hāna Highway are in the Wailua watershed in the Kahikinui Region of East Maui below Haleakalā Crater (see Fig. 1). Wailua watershed occupies approximately 4.9 sq km (1.9 sq mi) along East Maui from a maximum elevation of approximately 1,138 m (3,734 ft) above sea level (ASL). The watershed drains a portion of a large plateau that formed between the larger Waiohonu Valley to the north and Kīpahulu Valley to the east. *The Atlas of Hawaiian Watersheds* describes land use within the valley as 73% conservation, 27% agriculture, and less than 1% urban (Parham et al., 2008).

The Wailua watershed receives high annual rainfall. The National Oceanic and Atmospheric Administration-National Centers for Environmental Information

[1] This report is intended to become part of the public record and incorporated into an EA for the subject project.

(NOAA-NCEI) *Climate Normals* from the nearest climate station to the Project, "Ohe'o 258, HI US" estimates mean annual rainfall as 1,963 mm (77.29 in) based on a 30-year average of climatological variables from 1991 to 2020 (NOAA-NCEI, 2022). *The Rainfall Atlas of Hawaiʻi* estimates mean annual rainfall as 2,232 mm (87.87 in) at the bridge locations (Giambelluca et al, 2013). Compared to the *Climate Normals* dataset, *The Rainfall Atlas of Hawaiʻi* is drawn from a broader but older dataset (from 1874-2007). Rainfall occurs throughout the year but is highest during the wet season between November and April. The *Köppen Climate Types of Hawaiʻi* indicates this area is a tropical rainforest (OSU-PRISM Climate Group, nd). Both sites are covered in broadleaf evergreen trees, predominantly of non-native species (Figure 2).

**Figure 2. Dense non-native broadleaf forest along Honolewa Stream, downstream of Bridge No. 23.**

Three perennial streams drain Wailua watershed: Wailua Stream, Honolewa Stream, and Pāʻihi Stream (Fig. 1). The three streams are mapped in the U.S. Geological Survey (USGS) topography (USGS, 2017a), *National Hydrography Dataset* (NHD; USGS, 2022), and U.S. Fish and Wildlife Service (USFWS) *National Wetlands Inventory* (NWI; USFWS, nd-c).

Honolewa Stream, alongside Wailua and Pāʻihi streams, drains a montane bog that spans the upper watershed and several adjoining valleys. Kekuapoʻowai Falls and Wailua Falls (not located on Wailua Stream) occur on Honolewa Stream.

The latter falls is visible upstream of Bridge No. 23, making it a popular tourist attraction. Honolewa Stream passes beneath Bridge No. 23 at around 58 m (190 ft) ASL and discharges over an *ʻiliʻili* (pebble) beach into Wailua Cove and the Pacific Ocean some 550 m (1,800 ft) downstream of the bridge. The outlet for the combined flow of Wailua and Pāʻihi streams is only 100 m (330 ft) west of the Honolewa Stream mouth, perhaps alluding to the name of Wailua Watershed (lit. two waters).

The stream feature that passes beneath Bridge No. 26 is listed as Waikākoʻi Stream in the *National Bridge Inventory* (USDOT-FHWA, nd.) and generates as a blue-line feature when calculated with the USGS *StreamStats* GIS application (USGS 2017b; Figure 3) but is not mapped in any of the aforementioned federal or state hydrography datasets. The drainage basin of Waikākoʻi Stream (calculated using *StreamStats*) is estimated at 0.28 sq km (0.11 sq mi), or about 6% of Wailua watershed total area (Figure 3). A pipeline diverts water from Wailua Stream to Hāna Town and crosses the Waikākoʻi drainage basin at around 300 m (1000 ft) ASL, approximately 0.8 km (0.5 mi) upslope of Bridge No. 26. Hāna Highway crosses Waikākoʻi Stream on Bridge No. 26 around 100 m (330 ft) ASL. Topography maps and aerial imagery indicate the stream falls into the Pacific Ocean from a seacliff at Kauakiu Point, less than 300 m (980 ft) downslope from Bridge No. 26.

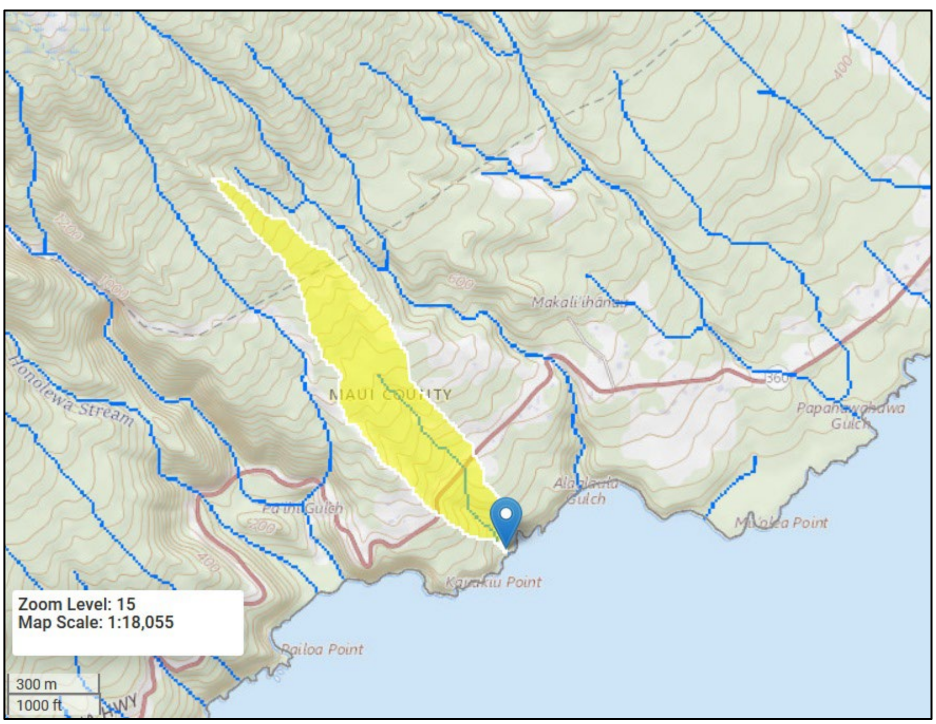


**Figure 3. Waikākoʻi Stream drainage basin (in yellow), from USGS StreamStats (USGS, 2017b).**

Volcanic soils at the Project site are of older Kula Volcanics dating from approximately one million years ago. More recent flows (dating between 5000 and 13,000 years ago) from the East Rift Zone descended through Kipahulu and Waiohonu Valleys in the Project areas (USGS, nd.). The U.S. Dept. of Agriculture-Natural Resources Conservation Service (USDA-NRCS) maps soils at Bridge No. 26 as Maka'alae extremely stony silty clay, 7 to 25 % slopes (MJD), while Bridge No. 23 is entirely Rough mountainous land (rRT), surrounded by MJD soils (USDA-NRCS, 2022; see Figure 4). Neither of these soil types are listed as hydric soil in the *Soil Data Access, Hydric Soils List – Island of Maui* (USDA-NRCS, nd.).

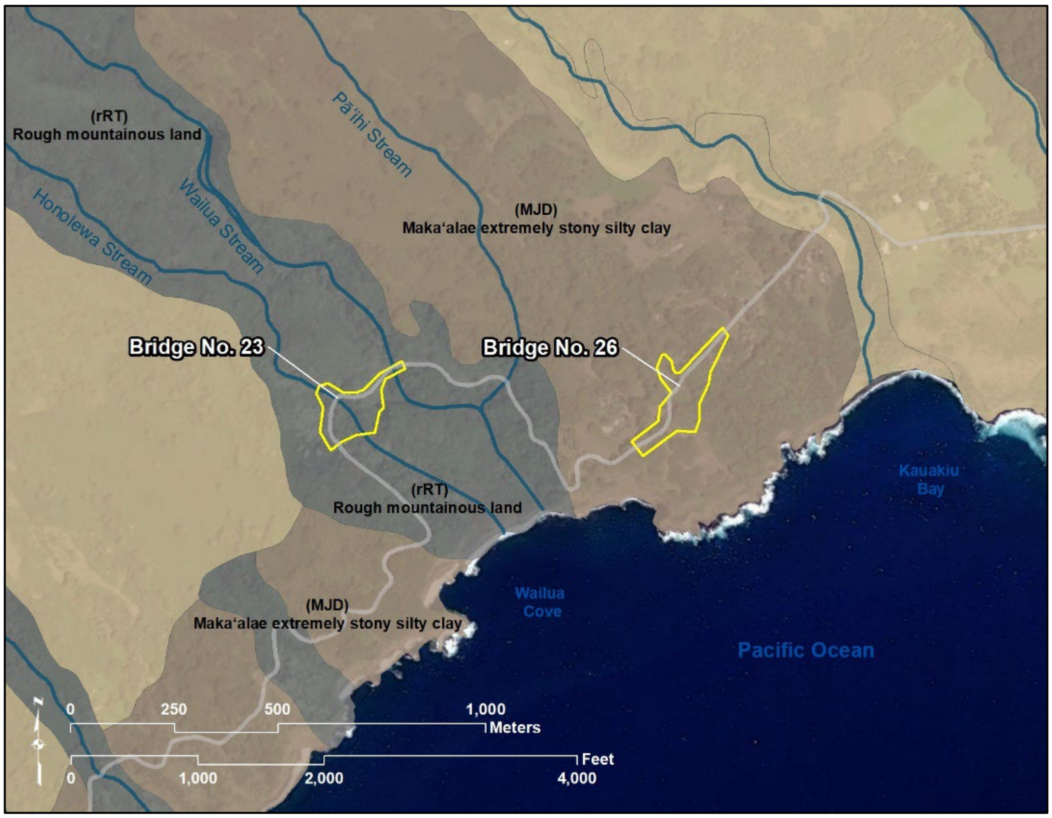


**Figure 4. Project areas (in yellow) with NWI and NRCS soils overlay.**

## Federal Jurisdictional Waters

"Waters of the U.S." (also called "Jurisdictional Waters") are surface waters that come under federal jurisdiction as authorized by the Clean Water Act (CWA) and the Rivers and Harbors Act (RHA). Authority over these waters is granted to various federal agencies, including the U.S. Environmental Protection Agency (USEPA), with the U.S. Army Corps of Engineers (USACE) having permit authority for some actions that impact Jurisdictional Waters (33 CFR 323). Jurisdictional Waters include all tidal waters and a subset of streams, lakes, reservoirs, and wetlands.

Ecosystem boundaries tend to be gradients in nature, so the official definition of the jurisdiction boundary can be a politically influenced one. Supreme Court cases (including *Rapanos v. United States*, *SWANCC v. USACE*, and *Carabell v. United States*), a guidance memorandum (USEPA and DA, 2008), and recent published rules (USACE and USEPA, 2015; 2020) have each variously defined Waters of the U. S. Most recently, on August 20, 2021, a District Court order (US District Court for AZ, 2021) remanded and vacated the last definition of Waters of the U.S. and, until a new rule is published, the definition reverts back to pre-2015 regulatory language, decided upon by the Supreme Court and described in a 2008 guidance memorandum (USEPA and DA, 2008). The USACE and USEPA have initiated another round of rulemaking by publishing a proposed rule to again revise the definition of Waters of the U.S. (USACE and USEPA, 2021), so the definition is likely to remain in flux for a while. Our Jurisdictional Waters assessment, as presented herein, is based upon our best professional judgement, but the USACE must concur for our findings to become official determinations of federal jurisdiction. If a feature is determined by the USACE to be jurisdictional, certain activities would require a permit from that agency before undertaking work within the boundaries of that feature.

## Hawaiʻi State Waters

State waters fall under jurisdiction authorized under Hawaiʻi Revised Statutes (HRS), State Water Code (HRS § 174C-3, 2021) and Water Pollution Chapter (HRS § 342D-1, 2021). The State Water Code defines a “stream” as “…any river, creek, slough, or natural watercourse in which water usually flows in a defined bed or channel. It is not essential that the flowing be uniform or uninterrupted. The fact that some parts of the bed or channel have been dredged or improved does not prevent the watercourse from being a stream.” A “watercourse” “means a stream or any canal, ditch, or other artificial watercourse in which water usually flows in a defined bed or channel. It is not essential that the flowing be uniform or uninterrupted.” State waters are defined in the Water Pollution Chapter as “all waters, fresh, brackish, or salt, around and within the State, including, but not limited to, coastal waters, streams, rivers, drainage ditches, ponds, reservoirs, canals, ground waters, and lakes; provided that drainage ditches, ponds, and reservoirs required as part of a water pollution control system are excluded.”

# Methods

## Federal Jurisdictional Waters

*AECOS* conducted a literature review of the Project site prior to the field survey. The literature review included: prior Jurisdictional Water delineation reports for Waikākoʻi Bridge (Haley Aldrich, 2022) and the nearby Koukouai Gulch (*AECOS*, 2018); published climate data, including recent rainfall (*Hawaii Rainfall Summary 90 Day Archive*; NOAA-NWS, 2022) and historic rainfall (*Hawaii Climate Data Portal*; Longman et al., nd); drainage basin characteristics (*StreamStats*; USGS, 2017b); and geospatial references for soil types (*Web Soil Survey*; USDA-NRCS, nd), surface waters (*National Hydrography Dataset-Hawaii Data*; USGS, 2020), wetlands (*National Wetlands Inventory*; USFWS, nd), and flood zones (*Flood Hazard Assessment Tool*; HDLNR, 2019; FEMA, 2018). Relevant data are presented in the Introduction section of this report. *AECOS* conducted the Jurisdictional Waters survey of the Project sites on August 25, 2022.

### ***Tributaries***

Jurisdictional Waters include non-navigable tributaries that contribute relatively permanent flow to traditional navigable waters (TNWs). Hydrography datasets indicate Honolewa Stream and Waikākoʻi Stream have a direct surface connection to the Pacific Ocean (a TNW), and Honolewa Stream contributes perennial (year-round) flow to the TNW (USGS, 2022; Parham et al., 2008). Waikākoʻi Stream has little relevant data and the duration of flow (perennial vs. intermittent) remains to be verified.

The tributaries at the Project sites are elevated well above the influence of ocean tidal ebb and flow. The extent of federal jurisdiction of non-tidal tributaries is drawn at the Ordinary High Water Mark (OHWM). We used the following list of physical characteristics to identify the OHWMs in the field, as defined in the Corps *Regulatory Guidance Letter 05-05*: *Ordinary High Water Mark Identification* (USACE, 2005):

| | |
|---|---|
| Natural line impressed on the bank | Sediment sorting |
| Shelving | Leaf litter disturbed or washed away |
| Changes in the character of soil | Scour |
| Destruction of terrestrial vegetation | Deposition |
| Presence of litter and debris | Multiple observed flow events |
| Wracking | Bed and banks |
| Water staining | Vegetation matted down, bent, or absent |
| Change in plant community | |

We delineated OHWM by marking paired locations along the stream channels that exhibited the listed physical characteristics. We marked locations with colored flagging tape and recorded the positions using a handheld global navigation satellite system (GNSS) instrument (Trimble 7x Series) with sub-meter accuracy. The resulting shapefiles were processed with GPS Pathfinder, including differential correction, and exported as ArcMap shapefiles projected as NAD 1983 UTM, Zone 4N. ControlPoint Surveying Inc. established by survey the locations of our flags on August 26 and 27, 2022.

#### Wetlands

Wetland determinations follow the methods described in the Corps of Engineers Wetland Delineation Manual ("Manual"; USACE, 1987) and Regional Supplement for Hawaiʻi and Pacific Islands (USACE, 2012). With considerations to existing topography, mapped soils, and hydrology, along with observations made of vegetation and site-characteristics in the field, we determined that no adjacent wetlands occur in the Project areas. Therefore, we did not apply wetland delineation methodologies to this effort.

# Results

## Jurisdicitonal Waters

#### Existing Condition

Weather conditions prior to and during our August 2022 survey can be considered within 'typical' climate values for the purposes of the Jurisdicitonal Waters survey. The nearest NOAA rain station, Hana Airport (HNAH1), is located 7.5 mi to the northeast of the Project bridges. Rainfall over the past 10 months was 1,385 mm (54.52 in), 92% of the 30-year average for the station in that period. The station three months prior to our survey received 362 mm (14.26 in), 90% of the average rainfall (Table 2; NOAA-NWS, 2022; NOAA-NCEI, 2022). In the week preceding our survey, 29 mm (1.14 in) of rain was recorded at the gage, with 14.6 mm (0.56 in) falling in a 24-hr period two days prior.

#### Honolewa Stream at Bridge No. 23

The mapped OHWM delineation of Honolewa Stream at Bridge No. 23 is depicted in Attachment A. No additional jurisdictional tributaries or wetlands were found at the Project site, so the limit of federal jurisdiction is drawn at the OHWM of

Honolewa Stream. In all, we delineated approximately 145 m (475 ft) of OHWM along the banks of Honolewa Stream using 14 paired points.

**Table 2. Prior rainfall conditions for field dates of August 25-26, 2022.**

**Hana Airport (HNAH1), NOAA-NCEI**

| 10-Month | | 3-Month | | 1-Week | |
|---|---|---|---|---|---|
| **Total rainfall (in)** | **Highest monthly rain (in)** | **Total rainfall (in)** | **Highest monthly rain (in)** | **Total rainfall (in)** | **Highest 24-hr rain (in)** |
| 54.52<br>92% of AVG | 13.37<br>Dec 2021 | 14.26,<br>90% of AVG | 5.45<br>July 2022 | 1.14 | 0.56<br>Aug 5, 2022 |

The bed and bank of Honolewa Stream at the Bridge No. 23 Project area are entirely natural. The stream spans nearly the entire width of a narrow ravine with deeply incised, near-vertical walls. Wailua Falls is just upstream of the bridge (Figure 5). Here, smoothed basalt bedrock and undercut banks are primary indicators of OHWM. The stream is a series of runs and pools down the ravine to the bridge, which spans Honolewa Stream. The two concrete footings under the bridge are scarified and eroded by boulder strikes and flowing water, exposing rebar reinforcing rods.

Immediately seaward (*makai*) of the bridge, Honolewa Stream falls into a wide pool (Figure 6), then continues as a series of runs and small pools down the ravine (Figure 7). A plant community dominated by tall breadfruit (*Artocarpus altilis*) trees, pothos (*Epipremnum pinnatum*) vine, and shoebutton ardisia (*Ardisia elliptica*) crowd the top of the ravine and the left bank downslope of the highway (*AECOS*, 2022). Exposed roots, scour, undercut banks, and changes in soil characteristics are primary indicators of OHWM downstream of the bridge. Wetlands do not form on the steep banks adjacent to Honolewa Stream at the Project area.


**Figure 5. Undercut banks at Wailua Falls, just upstream of Bridge No. 23 (OHWM approximated by yellow dashed line).**


**Figure 6. Wide pool at the base of Bridge No. 23 (OHWM approximated by yellow dashed line).**


**Figure 7. Steep ravine walls downstream of Bridge No. 23 (OHWM approximated by yellow dashed line).**


**Figure 8. Waikākoʻi Stream beneath Bridge No. 26 (OHWM approximated by yellow dashed line).**

### *Waikākoʻi Stream at Bridge No. 26*

The results of our OHWM delineation of Waikākoʻi Stream at the Bridge No. 26 Project site are depicted in Attachment A. No additional jurisdictional tributaries or wetlands were found at the Project site, so the limit of federal jurisdiction is drawn at the OHWM of Waikākoʻi Stream. In all, we delineated approximately 55 m (180 ft) of OHWM along the banks using 10 paired points. The findings of our survey are reinforced by an earlier report (Haley Aldrich, 2022) that included a delineation of the OHWM at Bridge No. 26. That survey found no adjacent wetlands. No attempt was made by us to compare or reconcile any differences between the two OHWM surveys. Given the steepness of the channel banks in the Project location, differences are likely to be minor or the result of sdmall drawing errors.

Waikākoʻi Stream is a low-volume stream that descends a steep, narrow ravine at the Project area. During our survey, the County of Maui was performing emergency repairs to the bridge abutments (Figure 8, above). The stream bed was accessible by a temporary construction ladder and would otherwise be very difficult to access given the steepness of the terrain. With the exception of a (soon-to-be) shotcrete segment of bank near the bridge, the stream course of Waikākoʻi has a natural earthen bed and bank. Guppies (*Poecilia reticulata*) were observed in the stream at the bridge, adding support to our determination that these waters are relatively permanent.

Upstream from Bridge No. 26, the stream flows in a ravine between two residences. Thick stands of elephant grass (*Cenchrus purpureus*) and paca fern (*Diplazium esculentum*) form a vegetative 'tunnel' over the stream. The stream daylights near a stand of banana (*Musa* hybrid) just upstream of the bridge, then descends beneath the bridge as a series of narrow runs and short drops covering a relatively steep grade. From there, the stream flows through a deep earthen channel characterized by narrow pools and short drops. The rusted remains of a vehicle are wedged into the channel downstream of the bridge. Banks are lined with avocado (*Persea americana*), shoebutton ardisia and pothos vine (Figure 9), and are very steep throughout the remaining Project area. We used changes in plant community, changes in soil characteristic, and a natural line impressed on the bank as our primary indicators of OHWM.


**Figure 9. Waikākoʻi Stream downstream of Bridge No. 26 (OHWM approximated in yellow dashed line).**

# Discussion and Recommendations

## Jurisdicitonal Waters

Honolewa Stream and Waikākoʻi Stream are perennial tributaries to the Pacific Ocean and are therefore jurisdictional waters of the U.S. The limit of federal jurisdiction is the OHWM of the streams, as delineated within the Project area and depicted in Attachment A. Federal jurisdiction is solely determined by the USACE and is based upon the USACE accepting our findings as reported herein. Acceptance may require a field visit by a USACE representative from the Regulatory Branch to confirm our delineation. Our delineation is not official until an acceptance letter from the USACE is received by the applicant.

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**ATTACHMENT A**

OHWM DELINEATION
(Figures by ControlPoint Surveyors)

BENCHMARK:

BRONZE TABLET "50 M 1923"
SET IN CONCRETE
ELEV.=334.896 FT.

AZIMUTHS AND COORDINATES ARE REFERRED TO HAWAII STATE PLANE NAD83, ZONE 2, U.S. FT.

ABBREVIATIONS:

| | | | |
|---|---|---|---|
| AC | ASPHALT | REF | REFLECTOR |
| B | BOTTOM | T | TOP |
| CONC | CONCRETE | TB | TOP BANK |
| BW | BOTTOM WALL | TW | TOP WALL |
| CRM | CONCRETE RUBBLE MASONRY (ROCK) WALL | G | GROUND |
| D | DIAMETER OR DRAIN | H | HEIGHT |
| ELEV | ELEVATION | | |

NOTES:

THIS MAP AND ASSOCIATED CADD FILE IS A TOPOGRAPHIC SURVEY OF THE SUBJECT PARCEL OR PROJECT SITE. THE DEPICTION OF BOUNDARIES AND ENCUMBRANCES AFFECTING THE PROJECT SITE ARE TAKEN FROM LATEST TAX MAPS ONLY. OBTAINING A COPY OF THE CURRENT TITLE REPORT OR DEED FOR AREAS WHERE PROPERTY AND ENCUMBRANCE ISSUES ARE CRITICAL IS RECOMMENDED PRIOR TO ANY DESIGN AND CONSTRUCTION WORK.

UNDERGROUND UTILITY LINES AND/OR STRUCTURES, IF SHOWN, ARE PROVIDED BASED ON INFORMATION FROM PLANS/MAPS PREPARED BY OTHERS, AND NEED TO BE REVIEWED BY PUBLIC UTILITY AGENCIES OR ASSOCIATED FACILITIES.

UNLESS OTHERWISE NOTED, ALL LOCATIONS OF UNDERGROUND UTILITY LINES AND/OR STRUCTURES ARE APPROXIMATE. NO GUARANTEE IS MADE ON THE ACCURACY OF COMPLETENESS OF THE INFORMATION SHOWN. THE USER(S) OF THIS TOPOGRAPHIC SURVEY MAP SHALL VERIFY THE INFORMATION, AS NEEDED, DURING DESIGN AND CONSTRUCTION.

GRAPHIC SCALE

20 0 10 20 40 80

( IN FEET )
1 inch = 20 ft.

# TOPOGRAPHIC SURVEY MAP
# SOUTH WAILUA BRIDGE REPLACEMENT

HANA, MAUI, HAWAII

TMK: (2) 1-5-008, 010
SCALE: 1 in. = 20 ft. OCTOBER 17, 2022
JOB NO. 2020005-04 FIELD BOOK : 3675-66
DRN: FLD: JP

CONTROLPOINT SURVEYING, INC.
615 PIIKOI STREET, SUITE 700
HONOLULU, HAWAII 96814

# TOPOGRAPHIC SURVEY MAP
# WAIKAKOI BRIDGE REPLACEMENT

HANA, MAUI, HAWAII

TMK: (2) 1-5-009

SCALE: 1 in. = 20 ft. OCTOBER 17, 2022

JOB NO. 2020005-04 FIELD BOOK : 3675-66

DRN: FLD: JP

CONTROLPOINT SURVEYING, INC.
615 PIIKOI STREET, SUITE 700
HONOLULU, HAWAII 96814

**BENCHMARK:**

BRONZE TABLET "50 M 1923"
SET IN CONCRETE
ELEV.=334.896 FT.

AZIMUTHS AND COORDINATES ARE REFERRED TO HAWAII STATE PLANE NAD83, ZONE 2, U.S. FT.

**ABBREVIATIONS:**

| | | | |
|---|---|---|---|
| AC | ASPHALT | GW | GUY WIRE |
| BW | BOTTOM WALL | H | HEIGHT |
| CMU | CONCRETE MASONRY UNIT (HOLLOW TILE) | HB | HOSE BIB |
| CC/CONC | CONCRETE | O/H | OVERHEAD |
| CRM | CONCRETE RUBBLE MASONRY (ROCK) WALL | TP | TOP PIPE |
| D | DIAMETER OR DRAIN | TW | TOP WALL |
| ELEV | ELEVATION | UP | UTILITY POLE |
| G | GROUND | WM | WATER METER |

**NOTES:**

THIS MAP AND ASSOCIATED CADD FILE IS A TOPOGRAPHIC SURVEY OF THE SUBJECT PARCEL OR PROJECT SITE. THE DEPICTION OF BOUNDARIES AND ENCUMBRANCES AFFECTING THE PROJECT SITE ARE TAKEN FROM LATEST TAX MAPS ONLY. OBTAINING A COPY OF THE CURRENT TITLE REPORT OR DEED FOR AREAS WHERE PROPERTY AND ENCUMBRANCE ISSUES ARE CRITICAL IS RECOMMENDED PRIOR TO ANY DESIGN AND CONSTRUCTION WORK.

UNDERGROUND UTILITY LINES AND/OR STRUCTURES, IF SHOWN, ARE PROVIDED BASED ON INFORMATION FROM PLANS/MAPS PREPARED BY OTHERS, AND NEED TO BE REVIEWED BY PUBLIC UTILITY AGENCIES OR ASSOCIATED FACILITIES.

UNLESS OTHERWISE NOTED, ALL LOCATIONS OF UNDERGROUND UTILITY LINES AND/OR STRUCTURES ARE APPROXIMATE. NO GUARANTEE IS MADE ON THE ACCURACY OF COMPLETENESS OF THE INFORMATION SHOWN. THE USER(S) OF THIS TOPOGRAPHIC SURVEY MAP SHALL VERIFY THE INFORMATION, AS NEEDED, DURING DESIGN AND CONSTRUCTION.

GRAPHIC SCALE

20 0 10 20 40 80

( IN FEET )
1 inch = 20 ft.

# Appendix E. A Natural Resources Assessment for Hāna Highway, Wailua and Waikakoi Bridges, Kīpahulu, East Maui. AECOS, Inc. March 12, 2025.

*AECOS* No. 1659

# A natural resources assessment for Hana Highway, Wailua and Waikakoi bridges Kīpahulu, East Maui


*AECOS* Inc.
45-939 Kamehameha Highway
Suite 104
Kāneʻohe, Hawaiʻi 96744


March 12, 2025

# A natural resources assessment for Hana Highway, Wailua and Waikakoi bridges Kīpahulu, East Maui

March 12, 2025 *AECOS* No. 1659

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## Introduction

The County of Maui, Department of Public Works, in cooperation with the State of Hawaiʻi Department of Transportation (HDOT) and the Federal Highway Administration (FHWA), is proposing to replace two bridges on the Hāna Highway near Kīpahulu, south of Hāna ("Project"; Figure 1). The bridges are South Wailua Bridge (Hāna Highway Bridge No. 23) crossing Honolewa Stream, and Waikākoʻi Bridge (Bridge No. 26) crossing Waikākoʻi Stream.

Bridge No. 23 (originally constructed in 1947) is proposed to be replaced with a single span, single lane structure in the location of the existing bridge or, as an alternative, a new off-alignment bridge would be constructed on the *makai* side of the existing structure and the old bridge either removed or retained. Bridge No. 26 (originally constructed in 1911) is proposed to be replaced on the existing alignment with a similar single lane structure. A temporary ACROW bridge (prefabricated modular bridge) is proposed to be set up on the *makai* side of the existing bridge to direct traffic around the new bridge construction. The proposed structure will be phased to allow the existing structure to remain in service during construction. Temporary, short duration, roadway closures will be implemented as needed to construct the proposed bridge on the existing alignment.

HDR Inc. contracted *AECOS* Inc. to undertake natural resources surveys and jurisdictional waters surveys at both bridge locations. This report presents results of the natural resources (flora and fauna) surveys for these bridge repair/replacement projects[1].

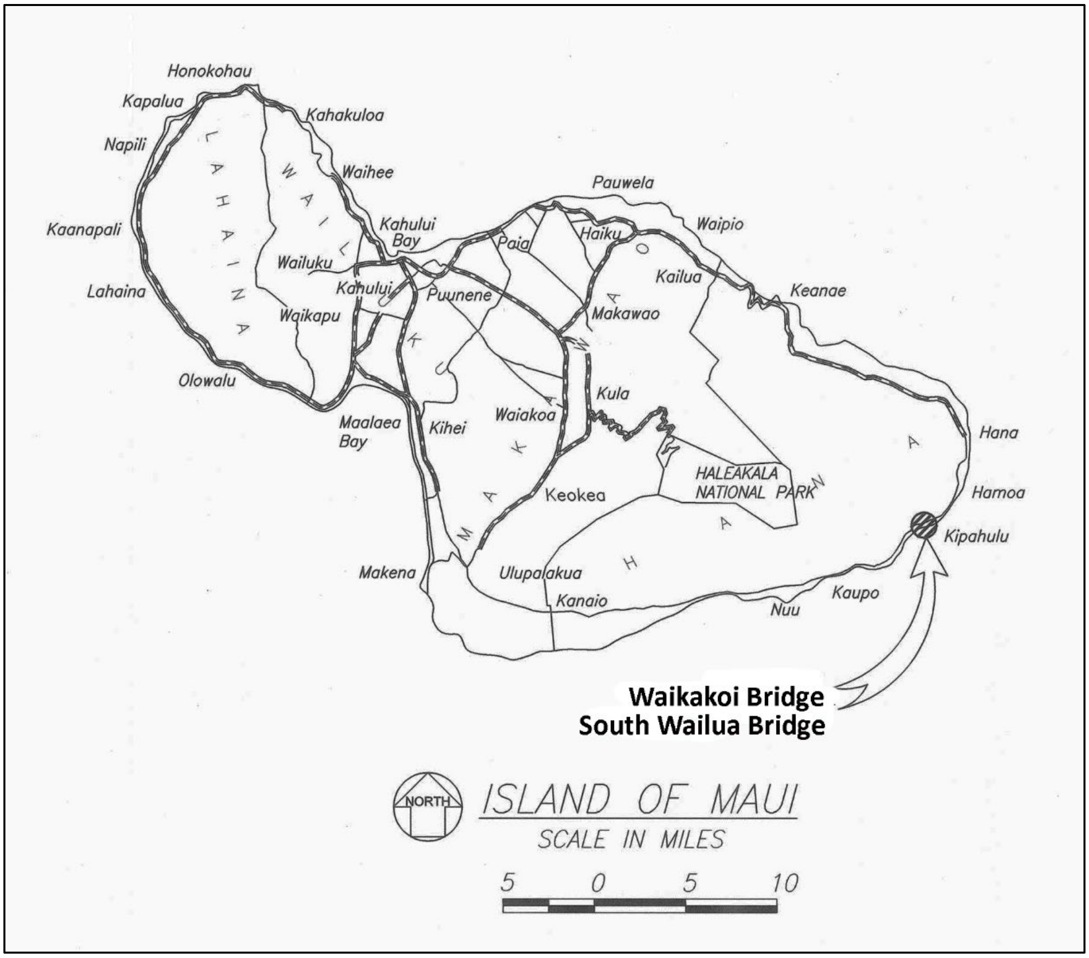


**Figure 1. Project location on Maui.**

## Site Description

The Waikakoi Bridge was constructed in 1911. The bridge is a single lane crossing over Waikākoʻi Stream at milepost 45.4 in Kipahulu, Maui (Haley Aldrich, 2022). At the bridge, the stream is incised over 25 ft (7.6 m) in a narrow ravine that is difficult to access because of the steepness of the side walls.

The South Wailua Bridge spans Honolewa Stream a short distance downstream from Wailua Falls, one of the most photographed waterfalls on Maui, despite its

[1] This report is intended to become part of the public record and incorporated into an EA for the subject project.

relative remoteness beyond the far end of Hana Highway (state rte. 330; 44.75 mile marker of Piilani Hwy, state rte. 31) .

# Methods

## Water Quality Survey

On August 24, 2022, we established four water quality sampling stations in the project areas at Waikakoi and Wailua bridges to characterize ambient water quality. At Waikakoi Bridge, a single point in the stream was sampled a short distance upstream of the bridge as Station "Waikakoi". On Wailua Stream, three locations were sampled: Station "Wailua Up", located in the plunge pool at the base of Wailua Falls, Station "Wailua Bridge", located beneath Wailua Bridge; and Station "Wailua Down", located downstream of the bridge.

*In situ* field measurements were made for temperature, conductivity, pH, and dissolved oxygen. Water samples were collected from just below the water surface and placed on ice, then taken to the *AECOS* Laboratory (*AECOS* Log No. 45995) in Kāneʻohe, Oʻahu for analyses of turbidity, total suspended solids (TSS), and nutrients. Table 1 lists the instruments and analytical methods used in the field and laboratory to analyze these water samples.

**Table 1. Analytical methods used for water quality analysis.**

| Analysis | Instrument/Method | Reference |
|---|---|---|
| Temperature | YSI ProPlus/thermister calibrated to NBS. Cert. thermometer/ SM 2550 B | SM (1998) |
| Conductivity | YSI ProPlus/SM 2510-B | SM (1998) |
| pH | SM 4500 H+ | SM (1998) |
| Dissolved Oxygen | YSI ProPlus/SM 4500-O G | SM (1998) |
| Turbidity | EPA 180.1 Rev 2.0 | USEPA (1993) |
| Total Suspended Solids | SM 2540 D | SM (1998) |
| Nitrate + Nitrite | EPA 353.2 | USEPA (1993) |
| Total Nitrogen | ASTMD5176-08 | ASTM (2015) |
| Total Phosphorus | EPA 365.5 (Persulfate digestion) | USGS (2003), USEPA (1993) |

## Botanical Survey

*AECOS* botanist, Eric Guinther, surveyed both project sites on August 25, 2022. Plant species were identified as they were encountered during wandering transects that covered the roadway approaches to the bridges and areas designated for construction laydown. Species names follow *Manual of the Flowering Plants of Hawaiʻi* (Wagner, Herbst, & Sohmer, 1990; Wagner & Herbst, 1999) for native and naturalized flowering plants, *Hawaiʻi's Ferns and Fern Allies* (Palmer, 2003) for ferns, and *A Tropical Garden Flora* (Staples & Herbst, 2005) for ornamental plants. More recent name changes for naturalized plant species follow Imada (2019).

## Aquatic Fauna

No special effort to conduct aquatic fauna surveys at the subject bridge crossings was made, with the exception that attention was paid to the presence of any odonates (damselfies and dragonflies) in particular as part of the ordinary high water mark survey (*AECOS,* 2023) being conducted simultaneously. Aquatic animals were noted as they were observed from the shore.

## Terrestrial Vertebrates Survey

### *Avian Survey*

A bird survey was conducted by Reginald David at both bridge sites in the morning hours of August 25, 2022. A single point count station was established in the center of each bridge. A single, eight-minute avian point-count was made at each station. Additionally, a single 30-minute time dependent waterbird count was conducted at both sites.

Birds were identified to species by visual observation, aided by Leica 8 X 42 binoculars, and by listening for vocalizations. Weather conditions were ideal, with unlimited visibility, no precipitation, and winds between 1 and 5 kilometers per hour. The avian phylogenetic order and nomenclature used in this report follows the AOU Check-List of North and Middle American Birds 2021 and the 63rd Supplement to the Checklist (Chesser et al., 2021, 2022).

### *Mammalian Survey*

A list was made of mammals encountered during the surveys. Indicators of mammalian presence, such as tracks, scat, and other sign were noted. Mammalian phylogenetic order and nomenclature follow *Mammal Species of the World* (Wilson and Reeder, 2005). Hawaiian names are given for native species.

# Results

## Water Quality

Results of the August 2022 water quality measurements are presented in Table 2. Wailua Stream was notably clear, whereas the stream at Waikakoi Bridge was not and the difference is reflected in the turbidity and TSS results. Water temperature was the same at all stations, despite the sampling at Waikakoi later in the afternoon. Dissolved oxygen concentrations ranged from 7.77 to 8.04 mg/L, corresponding to respectable 91% to 95% DO saturation levels. Values for stream pH ranged from 6.14 to 6.28. Stream water conductivity was low in Wailua Stream, but relatively high at Waikakoi (155 µmhos/cm).

**Table 2. Physical and chemical water quality at the Bridge project location for samples collected August 24, 2022.**

| Station | Time | Temp. (°C) | Cond. (µmhos/cm) | pH | DO (mg/L) | DO sat. (%) |
|---|---|---|---|---|---|---|
| Waikakoi | 1440 | 23.6 | 155 | 6.28 | 8.04 | 95 |
| Wailua Up | 1130 | 23.3 | 73.4 | 6.13 | 7.81 | 91 |
| Wailua Bridge | 1115 | 23.2 | 75.4 | 6.14 | 7.97 | 94 |
| Wailua Down | 1110 | 23.4 | 80.2 | 6.14 | 7.77 | 91 |

| Station | Turbidity (ntu) | TSS (mg/L) | Ammonia (µg N/L) | $NO_3$+$NO_2$ (µg N/L) | Total N (µg N/L) | Ortho-P (µg P/L) | Total P (µg P/L) |
|---|---|---|---|---|---|---|---|
| Waikakoi | 12.0 | 13.5 | 10 | 54 | 136 | 34 | 68 |
| Wailua Up | 1.50 | 1.2 | 12 | <1 | 159 | <1 | 16 |
| Wailua Bridge | 1.54 | 1.3 | <5 | 6 | 149 | 2 | 6 |
| Wailua Down | 1.47 | 1.2 | 11 | 12 | 113 | 2 | 26 |

Regarding stream nutrients, soluble (dissolved) forms were low at all of the Waikakoi Stream stations. Nitrate+nitrite and ortho-phosphate were higher by comparison at Waikakoi, but not excessively so. Total nitrogen and total phosphorus reflect the sum of the respective soluble forms plus nitrogen and phosphorus in organic particulates in the water. Thus, the slightly higher total nitrogen in Wailua Stream indicates a difference in the nature of the particulates in that stream compared with Waikakoi, the latter being mostly mineral in content.

## Vegetation

The Waikakoi Bridge is located within a lightly developed area in Kīpahulu; that is, many of the surrounding parcels are homes. Thus, ornamentals are recorded as part of the vegetation. A forest of tall trees occurs on the downslope side of the highway near the bridge.

The Wailua Bridge crosses a moderately deep gorge surrounded by forest with a variety of very tall trees, and dense growth of herbs, shrubs, vines, and bamboo.

## Flora

A listing of plants recorded during the August 2022 survey is presented as Table 3 and shows 110 species observed occurring in the two survey areas. In the Wailua survey area, 70 species are listed; for Waikakoi, the number is also 70 species.

The report by Haley Aldrich (2022) covering the Waikakoi project area, includes a listing of identified plants (a flora). We have included in Table 3 species reported by Haley Aldrich that we did not record from the same area. These species are marked with an "X" in the abundance column for Waikakoi. In general, the Haley Aldrich survey species list is a good match to our listing. If we include all the species recorded by Haley Aldrich, the total for Waikakoi becomes 82 species occurring in this project area .

Considering the full list (both sites and the Haley Aldrich survey), four indigenous and two endemic plant species were recorded. The endemics found are *kikawaiō* (*Christella cyatheoides*) at Waikakoi and *niʻaniʻaniau* (*Nephrolepis exaltata hawaiiensis*) at Wailua. Two of the indigenous natives are fern/fern allies as well: *kāʻapeʻape* (*Cyrtomium caryotideum*) and *moa* (*Psilotum nudum*). Both *moa* and *niʻaniʻaniau* are commonly encountered in a range of habitats in Hawaiʻi. Two other indigenous species were recorded: *kāʻeʻe* or sea bean (*Mucuna gigantea*) at Wailua and *pōpolo* (*Solanum americanum*) at Waikakoi.

With respect to early Polynesian introductions (so-called "canoe plants"), a total of 9 species were observed. Eight occur in the Wailua Bridge area, 4 in the Waikakoi Bridge area, and 3 in both areas. All are common plants in the Hawaiian Islands.

**Table 3. Flora listings for Wailua and Waikakoi stream project areas.**

| Species listed by family | Common name | Status | Abundance Wailua | Abundance Waikakoi | Notes |
|---|---|---|---|---|---|
| | | | | | |
| ***FERNS and FERN ALLIES*** | | | | | |
| ATHYRIACEAE | | | | | |
| *Diplazium esculentum* (Retz.) Sw. | *paca (hoʻiʻo)* | Nat | U | -- | |
| CYATHEACEAE | | | | | |
| *Sphaeropterus cooperi* (Hook. ex F. Muell.) R. M. Tryon | Australian tree fern | Nat | -- | R | <2> |
| DRYOPTERIDIACEAE | | | | | |
| *Cyrtomium caryotideum* (Wall.) C. Presl. | *kāʻapeʻape* | **Ind** | -- | R | |
| NEPHROLEPIDACEAE | | | | | |
| *Nephrolepis exaltata hawaiiensis* W. H. Wagner | *niʻaniʻau* | **End** | O | -- | |
| POLYPODIACEAE | | | | | |
| *Phlebodium aureum* (L.) J. Sm. | rabbit's-foot fern | Nat | -- | U | |
| *Phymatosorus grossus* (Langsd. & Fisch.) Brownlie | *lauaʻe* | Nat | O | O | |
| PSILOTACEAE | | | | | |
| *Psilotum nudum* (L.) P. Beauv. | *moa* | **Ind** | --- | X | |
| PTERIDACEAE | | | | | |
| *Adiantum hispidulum* Sw, | rough maidenhair fern | Nat | U | U | |
| *Adiantum raddianum* C. Presl. | --- | Nat | -- | X | |
| THELYPTERIDACEAE | | | | | |
| *Christella cyatheoides* (Kaulf.) Holttum | *kikawaiō* | **End** | -- | X | |
| *Christella dentata* (Forssk.) Brownsey & Jermy | wood fern | Nat | -- | X | |
| *Christella parasitica* (L.) H. Lév | wood fern | Nat | O | U | |
| *FLOWERING PLANTS* **MAGNOLIIDS** | | | | | |
| LAURACEAE | | | | | |
| *Persea americana* Mill. | alligator pear | Nat | C | U | |
| *FLOWERING PLANTS* **MONOCOTS** | | | | | |
| ARACEAE | | | | | |
| *Alocasia macrorrhizos* (L.) G. Don | *ʻape* | Nat | O | U | |
| *Colocasia esculenta (L.) Schott* | *kalo* | Pol | R | X | <2> |

Table 3 (continued).

| Species listed by family | Common name | Status | Abundance Wailua | Abundance Waikakoi | Notes |
|---|---|---|---|---|---|
| ARACEAE (cont.) | | | | | |
| *Dieffenbachia maculata* (Loddg.) G. Don | dumb cane | Orn | -- | U | <2> |
| *Epipremnum pinnatum* (L.) Engler | pothos | Nat | AA | A | |
| *Monstera deliciosa* Lieb. | ceriman | Orn | -- | U | |
| *Monstera siltepecana* Matuda | Swiss-cheese vine | Orn | R | -- | |
| *Syngonium* sp. | nephthytis | Nat | R | R | |
| *Xanthosoma sagittifolium* (L.) Schott | *ʻape* | Nat | U | -- | |
| ASPARAGACEAE | | | | | |
| *Cordyline fruticosa* (L.) A. Chev. | *ki*; green ti | **Pol** | C | C | |
| *Cordyline fruticosa* cultivars | ti cultivars | Orn | O | Oc | <2> |
| *Dracaena sanderiana* M. T. Masters | sanderiana | Orn | -- | R | <2> |
| *Sansevieria trifasciata* Prain | mother-in-law tongue | Orn | -- | R | |
| ARECACEAE | | | | | |
| *Cocos nucifera* L. | coconut palm | **Pol** | U | -- | |
| *Archontophoenix alexandrae* (F. v. Muell.) H. A. Wendl. & Drude | Alexander palm | Nat | U | R | |
| BROMELIACEAE | | | | | |
| *Tillandsia cyanea* K. Koch | Kamehameha's-paddle | Orn | R | -- | <2> |
| COMMELINACEAE | | | | | |
| *Commelina diffusa* N. L. Burm. | dayflower | Nat | O | C | <1> |
| *Dichorisandra thyrsiflora* J. C. Mikam | blue-ginger | Orn | Uc | -- | |
| COSTACEAE | | | | | |
| *Costus speciosus* (J. König) J. E. Smith | Malay ginger | Orn | -- | R | |
| *Costus woodsonii* Maas | Indian-head ginger | Orn | O | -- | |
| CYPERACEAE | | | | | |
| *Cyperus rotundus* L. | nut grass | Nat | -- | R | <1> |
| *Kyllinga mindorensis* Steud. | *kiliʻoʻopu* | Nat | U | C | <1> |
| HELICONIACEAE | | | | | |
| *Heliconia psittacorum* L. | rhizomatosa heliconia | Orn | -- | R | <2> |
| LILIACEAE | | | | | |
| *Crinum asiaticum* L. | giant lily | Nat | R | R | |
| MARANTACEAE | | | | | |
| *Goeppertia majestica* (Linden) Borchs. & S. Suàrez | pinstripe calathea | Orn | -- | R | <2> |

Table 3 (continued).

| Species listed by family | Common name | Status | Abundance Wailua | Abundance Waikakoi | Notes |
|---|---|---|---|---|---|
| MUSACEAE | | | | | |
| *Musa* hybrid | banana | Orn | U | U | <2> |
| ORCHIDACEAE | | | | | |
| *Oncidium* sp. | popcorn orchid | Orn | -- | R | <2,3> |
| PASSIFLORACEAE | | | | | |
| *Passiflora* cf. *laurifolia* L. | yellow grandilla | Nat | R | -- | <3> |
| POACEAE (GRAMINEAE) | | | | | |
| *Axonopus compressus* (Swartz) P. Beauv. | brd-lvd carpetgrass | Nat | U | Ca | <2> |
| *Bambusa vulgaris* J. C. Wendl. | golden bamboo | Nat | U | -- | |
| *Cenchrus purpureus* (Schumach.) Morrone | elephant grass | Nat | O | A | |
| *Digitaria ciliaris* (Retz.) Koeler | Henry's crabgrass | Nat | O | -- | <1> |
| *Digiteria horizontalis* Willd. | --- | Nat | U | -- | <1> |
| *Digitaria insularis* (L.) Mez ex Ekman | sourgrass | Nat | -- | O | |
| *Digiteria radicosa* (J. Presl.) Miq. | --- | Nat | R | O | <1> |
| *Eleusine indica* (L.) Gaertn. | wiregrass | Nat | U | O | <1> |
| *Eragrostis amabilis* (L.) Wight & Arnott | Japanese lovegrass | Nat | -- | U | <1> |
| *Megathyrsus maximus* (Jacq.) B.K. Simon & W.L. Jacobs | Guinea grass | Nat | Ua | -- | |
| *Opliemenus hirtellus* (L.) P. Beauv. | basket grass | Nat | O | C | |
| *Paspalum conjugatum* Bergius | Hilo grass | Nat | -- | O | <1> |
| *Sporobolis* cf. *africanus* (Poir.) Robyns &Tournay | smutgrass | Nat | R | C | <1> |
| *Urochloa mutica* (Forssk.) Nguyen | California grass | Nat | -- | R | |
| ZYNGIBERACEAE | | | | | |
| *Alpinia purpurata* (Vieil.) K. Schum. | red ginger | Nat | A | O | |
| *Curcuma longa* L. | *'olena* | **Pol** | R | -- | <3> |
| *Etlingera cevuga* (Seem.) R. M. Smith | --- | Nat | R | -- | |
| *Hedychium coronarium* J. König | white ginger | Nat | Uc | -- | |
| *Hedychium flavescens* N. Carey ex Roscoe | yellow ginger | Nat | Uc | -- | |
| *FLOWERING PLANTS* | | | | | |
| **MAGNOLIIDS** | | | | | |
| LAURACEAE | | | | | |
| *Persea americana* Mill. | alligator pear, avocado | Nat | -- | X | |

Table 3 (continued).

| Species listed by family | Common name | Status | Abundance Wailua | Abundance Waikakoi | Notes |
|---|---|---|---|---|---|
| | *FLOWERING PLANTS* **EUDICOTS** | | | | |
| ACANTHACEAE | | | | | |
| *Hemigraphis reptans* (G. Forster) T. Anderson | --- | Nat | R | -- | |
| *Odontonema cuspidatum* (C. Nees) Kuntze | fire-spike odontonema | Orn | -- | U | |
| *Thunbergia fragrans* Roxb. | sweet clockvine | Nat | -- | O | |
| ANACARDIACEAE | | | | | |
| *Mangifera indica* L. | mango | Nat | O | Oc | |
| APIACEAE | | | | | |
| *Centella asiatica* (L,) Urb.. | Asiatic pennywort | Nat | -- | X | |
| APOCYNACEAE | | | | | |
| *Plumeria rubra* L. | graveyard flower | Orn | R | -- | <2> |
| ARALIACEAE | | | | | |
| *Polyscuas guilfoylei* (W. Bull) L.H. Bailey | panax | Orn | -- | Uo | <2> |
| *Schefflera actinophylla* (Endl.) Harms | octopus tree | Nat | R | O | |
| ASTERACEAE (COMPOSITAE) | | | | | |
| *Ageratum conyzoides* L. | *maile hohono* | Nat | R | -- | <1> |
| *Calyptocarpus vialis* Less. | | Nat | -- | X | |
| *Conyza* sp. | horseweed | Nat | R | -- | <1,3> |
| *Crassocephalum crepidioides* (Benth.) S. Moore | --- | Nat | R | -- | <1> |
| *Cyanthillium cinereum* (L.) H. Rob. | little ironweed | Nat | R | -- | <1> |
| *Emilia fosbergii* Nicolson | Flora's paintbrush | Nat | -- | U | <1> |
| *Sigesbeckia orientalis* L. | small yellow crown-beard | Nat | -- | U | <1> |
| *Sphagneticola triloba* (L.) Pruski | wedelia | Nat | -- | Oa | |
| *Youngia japonica* (L.) DC. | Oriental hawksbeard | Nat | U | O | <1> |
| BEGONIACEAE | | | | | |
| *Begonia hirtella* Link | begonia | Nat | -- | U | |
| BIGNONIACEAE | | | | | |
| *Spathodea campanulata* P. Beauv. | African-tulip tree | Nat | O | U | |
| CARICACEAE | | | | | |
| *Carica papaya* L. | papaya | Nat | R | R | |
| CONVOLVULACEAE | | | | | |
| *Ipomoea obscura* (L.) Ker-Gawl. | --- | Nat | R | -- | |

Table 3 (continued).

| Species listed by family | Common name | Status | Abundance Wailua | Abundance Waikakoi | Notes |
|---|---|---|---|---|---|
| CONVOLVULACEAE (cont.) | | | | | |
| *Ipomoea* sp. | --- | Nat | O | -- | |
| CUCURBITACEAE | | | | | |
| *Momordica charantia* L. | wild bitter melon | Nat | R | -- | |
| DIOSCOREACEAE | | | | | |
| *Dioscorea bulbifera* L. | *hoi* | **Pol** | C | -- | |
| EUPHORBIACEAE | | | | | |
| *Aleurites moluccana* (L.) Willd. | *kukui* | **Pol** | O | O | |
| *Euphorbia heterophylla* L. | *kaliko* | Nat | -- | Oc | |
| *Euphorbia hirta* L. | garden spurge | Nat | R | C | <1> |
| *Euphorbia hypericifolia* L. | graceful spurge | Nat | -- | X | |
| *Codiaeum variegatum* (L.) Blume | croton | Orn | R | -- | |
| *Ricinus communis* L. | castor bean | Nat | -- | U | |
| FABACEAE | | | | | |
| Indet. shrub | --- | Orn | -- | R | |
| *Canavalia cathartica* Thours | *maunaloa* | Nat | -- | U | |
| *Chamaecrista nictitans* (L.) Moench | partridge pea | Nat | -- | U | <1> |
| *Desmodium incanum* DC. | Spanish clover | Nat | R | -- | |
| *Leucaena leucocephala* (Lam.) deWit | *koa haole* | Nat | -- | O | |
| *Mucuna gigantea* (Willd.) DC. | sea bean, *kāʻeʻe* | **Ind** | R | -- | |
| MALVACEAE | | | | | |
| *Sida rhombifolia* L. | --- | Nat | U | O | |
| MELASTOMACEAE | | | | | |
| *Clidemia hirta* (L.) D. Don | Koster's curse | Nat | R | R | |
| MELIACEAE | | | | | |
| *Melia azedarach* L. | Chinaberry | Nat | -- | R | |
| MORACEAE | | | | | |
| *Artocarpus altilis* (Z.) Fosberg | ʻ*ulu*, breadfruit | **Pol** | C | U | |
| *Ficus microcarpa* L. fil. | Chinese banyan | Nat | -- | R | |
| MORINGACEAE | | | | | |
| *Moringa oleifera* Lam. | *malunggay* | Nat | -- | R | |
| MYRSINACEAE | | | | | |
| *Ardisia elliptica* Thunb. | shoebutton ardisia | Nat | AA | O | |
| MYRTACEAE | | | | | |
| *Psidium guajava* L. | common guava | Nat | U | -- | |
| *Syzygium cumini* (L.) Skeels. | Java plum | Nat | -- | U | |
| *Syzigium malaccense* (L.) Merr. & L. M. Perry | mountain-apple | **Pol** | C | -- | |

Table 3 (continued).

| Species listed by family | Common name | Status | Abundance Wailua | Abundance Waikakoi | Notes |
|---|---|---|---|---|---|
| NYCTAGINACEAE | | | | | |
| *Mirabilis jalapa* L. | marvel of Peru | Nat | -- | X | |
| OXALIDACEAE | | | | | |
| *Oxalis corniculata* L. | yellow wood sorrel | **Pol** | -- | X | |
| *Oxalis corymbosa* DC. | pink wood sorrel | Nat | -- | R | <3> |
| PASSIFLORACEAE | | | | | |
| *Passiflora laurifolia* L. | yellow granadilla | Nat | R | R? | <3> |
| PORTULACACEAE | | | | | |
| *Portulaca pilosa* L. | --- | Nat | R | -- | <1> |
| PROTEACEAE | | | | | |
| *Grevillea robusta* A. Cunn. ex R. Br. | silk oak | Nat | -- | R | |
| RUBIACEAE | | | | | |
| *Hedyotis corymbosa* (L.) Lam. | --- | Nat | -- | O | |
| *Morinda citrifolia* L. | *noni* | **Pol** | R | | |
| *Pentas lanceolata* (Forsk.) Deflers | pentas | Orn | -- | U | |
| SOLANACEAE | | | | | |
| *Solanum americanum* Mill. | *pōpolo* | **Ind** | -- | U | |
| URTICACEAE | | | | | |
| *Pilea microphylla* (L.) Lieb. | artillery plant | Nat | R | -- | <1> |
| VERBENACEAE | | | | | |
| *Clerodendrum philippinum* Schauer | *pikake hohono* | Nat | R | -- | |
| *Stachytarpheta australis* Moldenke | --- | Nat | R | -- | |
| *Stachytarpheta cayennensis* (Rich.) Vahl | --- | Nat | -- | U | |

Legend to Table 3

Status = distributional status

- **End** = endemic; native to Hawai'i and found naturally nowhere else.
- **Ind** = indigenous; native to Hawai'i, but not unique to the Hawaiian Islands.
- Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, And well-established outside of cultivation.
- Orn = exotic, ornamental or cultivated crop; plant not naturalized (not well-established outside of cultivation, at least at this location).
- **Pol** = Polynesian introduction; brought to the Hawaiian Islands before 1778.

Abundance = occurrence ratings for plants on property in March 2008

- R – Rare - only one or two plants seen.
- U - Uncommon - several to a dozen plants observed.
- O - Occasional - found regularly, but not abundant anywhere.
- C - Common - considered an important part of the vegetation and observed numerous times.
- A - Abundant - found in large numbers; may be locally dominant.
- AA - Abundant - very abundant and dominant; defining vegetation type.
- X - Species reported by Haley Aldrich (2022) but not observed in our survey.

Notes:

- <1> Associated with the ruderal verge.
- <2> Associated with landscape plantings in the area.
- <3> Plant lacking flowers or fruit; identification uncertain.

## Aquatic Fauna

Only the common guppy or rainbowfish (*Poecilia reticulata*) was noted as present in the stream under the Waikakoi Bridge.

The aquatic fauna in Wailua Stream is moderately diverse: native animals observed included *ʻoʻopu naniha* (*Stenogobius hawaiiensis*), *ʻoʻopu nākea* (*Awaous stamineus*), and *hihiwai* (*Neritina granosa*). Common in the stream is the introduced Tahitian prawn (*Macrobrachium lar*). Flying about the large pool at the base of Wailua Falls were two dragonflies: native (*Anax strenuus*) and non-native Chinese dragonfly (*Crocothemus servilia*). No damselflies were observed around either stream area.

The Hawaii Stream Atlas (Parham et al., 2008) presents results for Wailua Stream from surveys made by the Department of Aquatic Resources (DAR). Table 4 shows the results of DAR surveys in the middle reach of the stream.

**Table 4. Aquatic fauna previously reported from Wailua Stream (Parham et al., 2008).**

| GROUP<br>*Species* | COMMON NAME | STATUS |
|---|---|---|
| ARTHROPODS | | |
| *Macrobrachium lar* | Tahitian prawn | Non-native |
| SNAILS | | |
| *Cipangopaludina chinensis* | Chinese mystery snail | Non-native |
| *Pila conica* | --- | Non-native |
| *Pomacea canaliculata* | Apple snail | Non-native |
| FISHES | | |
| *Lentipes concolor* | *ʻOʻopu alamoʻo* | Endemic |
| *Awaous stamineus** | *ʻOʻopu nākea* | Endemic |
| *Sicyopterus stimpsoni* | *ʻOʻopu nōpili* | Endemic |

* Formerly as *A. guamensis* (see Lindstrom et al., 2012),

## Avian Fauna

### *Point Counts*

Given that these two sites are 0.65 mile apart along the roadway and in similar, mostly forested habitat, we have combined the data from both count stations in

Table 5 to provide a more complete picture of the avifauna present within the project areas. A total of 39 individual birds of 11 species, representing eight separate families, was recorded during station counts at the bridge sites.

**Table 5. Avian species detected at Wailua and Waikakoi bridge project areas.**

| Common Name | *Species* (ORDER / FAMILY) | Status | *RA* |
|---|---|---|---|
| | COLUMBIFORMES | | |
| | COLUMBIDAE - Pigeons & Doves | | |
| Spotted Dove | *Streptopelia chinensis* | A | 0.60 |
| Zebra Dove | *Geopelia striata* | A | 0.60 |
| | PASSERIFORMES | | |
| | ZOSTEROPIDAE - White-eyes | | |
| Warbling White-eye | *Zosterops japonicus* | A | 1.80 |
| | LEIOTHRICHIDAE - Babblers | | |
| Chinese Hwamei | *Garrulax canorus* | A | |
| | STURNIDAE - Starlings | | |
| Common Myna | *Acridotheres tristis* | A | 0.20 |
| | MUSICAPIDAE - Old World Flycatchers | | |
| White-rumped Shama | *Copsychus malabaricus* | A | 0.20 |
| | ESTRILDIDAE - Estrildid Finches | | |
| Scaly-breasted Munia | *Lonchura punctulata* | A | 0.40 |
| Chestnut Munia | *Lonchura atricapilla* | | |
| | PASSERIDAE - Old World Sparrows | | |
| House Sparrow | *Passer domesticus* | A | 0.60 |
| | CARDINALIDAE - Cardinals & Allies | | |
| Northern Cardinal | *Cardinalis cardinalis* | A | 1.20 |

Key to Table 5.

Status: A = Alien; not native to the Hawaiian Islands.
*RA* = Relative Abundance: species count / number of point-count stations (n=2).

All the avian species recorded are alien to the Hawaiian Islands. Avian diversity and densities were in keeping with the locations and vegetation present within the project sites. Three species—Warbling White-eye (*Zosterops japonicus*), Scaly-breasted Munia (*Lonchura punctulata*), and Northern Cardinal(*Cardinalis cardinalis*)—accounted for 54% of all birds recorded during station counts. The most frequently recorded species was Warbling White-eye, accounting for 23% of the total number of individual birds recorded.

#### ***Time-dependent Waterbird Counts***

No waterbirds were observed during either of the two time-dependent waterbird counts.

### Mammals

Two terrestrial mammalian species were detected during this survey: three small Asian mongoose (*Herpestes javanicus*) were seen along the roadways and several dogs (*Canis lupus familiaris*) were heard barking from properties outside of the survey areas.

## Discussion and Recommendations

Recommendations are partly based on U.S. Fish and Wildlife Service, Animal Avoidance and Minimization Measures (USFWS-PIFWO, 2022). Implementation of the recommendations (provided below as bulleted items) by the Project contractor will minimize impacts to listed species to the maximum extent practicable.

### Floral Resources

The Waikakoi Bridge survey area has minimal "native" plants present in the area. None are of conservation interest or listed as threatened or endangered under state or federal statutes (HDLNR, 1998; USFWS, nd-a). The Wailua Bridge project area has a few indigenous/endemic natives and a large number of early Polynesian introductions, presumably reflecting less alteration of the forest since ancient times. However, again no listed species are present, and the loss of cultural value of the forest would minimal considering the project plans for the bridge replacement/repair as proposed.

### Aquatic Resources

#### ***Fishes and Invertebrates***

The aquatic fauna observed in Wailua Stream suggests a healthy stream system as might be anticipated this far east on East Maui. This stream is rated high by Parham et al. (2008), primarily for the absence of introduced fishes. The presence of only a single, introduced poeciliid fish at the Waikakoi Bridge indicates just the opposite for that stream system.

### *Damselflies*

Some 26 species and subspecies of damselflies occur in Hawaiʻi. Although terrestrial, flying insects, all have aquatic juvenile stages and most tend to remain close to aquatic environments as adults. The genus, *Megalagrion*, is endemic to Hawaiʻi and 23 species and subspecies are currently recognized (Polhemus and Asquith, 1996). Of these, 6 are listed as endangered (USFWS, nd-a), including *M. xanthomelas, M. nesiotes, and M. pacificum* known from Maui. Species known to have populations in the project vicinity are *M. calliphya*, *M. hawaiiense*, *M. nesiotes*, and *M. pacificum. M. pacificum* is a listed species that utilizes pools in overflow channels for breeding; *M. nesiotes* is a listed species that may breed in vegetation and apparently not necessarily associated with stream habitats (Polhemus and Asquith, 1996). Because our survey found no damselflies present in the project areas, combined with characteristic behaviors of the two listed species—*M. nesiotes* breeding in vegetation and *M. pacificum* breeding in overflow pools as opposed to the streams under the existing bridges—no impact from project activities on listed *Megalagrion* damselflies are anticipated.

### *Stream BMPs*

Best management practices (BMPs) developed and employed during construction to avoid adverse water quality impacts will protect aquatic biota. Project BMPs should be monitored closely to ensure that native stream fauna is not adversely impacted by impairments to water quality.

- Downstream and upstream migration pathways must be maintained for anadromous fauna (species that migrate between suitable upper reach habitats and the ocean) .

- New structures should not include drains or grates that may entrain drifting larvae, nor overhanging culverts that may obstruct upstream movement of recruiting juveniles.

- Construction BMPs for work in aquatic environments should be incorporated into the Project plan to minimize the degradation of water quality and impacts to fish and wildlife resources.

## Avian Resources

### *Waterbirds*

No waterbirds were recorded during the surveys conducted at the two bridge sites. Currently, usage of the area around the bridge and pools in Wailua Stream by hundreds of tourists and local residents on a daily basis creates conditions unsuitable for waterbird foraging or nesting in the area immediately downstream of Honolewa Stream. At the Waikakoi Bridge, the narrow, overgrown stream confined by near vertical walls is unsuitable waterbird habitat.

### *Seabirds*

Protected night-flying seabirds in Hawaiʻi include Hawaiian Petrel (*Pterodroma sandwichensis*), Wedge-tailed Shearwater (*Ardenna pacifica*), Newell's Shearwater (*Puffinus newelli*), and Band-rumped Storm-petrel (*Hydrobates castro*). Hawaiian Petrel and Newell's Shearwater nest in upland mountainous habitat. In the summer and fall, night-flying seabirds (especially fledglings) transiting to the sea from inland locations can become disoriented by exterior lighting. When disoriented, these birds can collide with man-made structures or with the ground. If not killed outright, dazed, or injured birds are easy prey for feral mammals (Podolsky et al., 1998; Ainley et al., 2001; Day et al., 2003). The primary cause of mortality in the four protected species is predation by alien mammalian species at the nesting colonies (USFWS, 1983; Ainley et al., 2001). Collision with man-made structures is considered the second most significant cause of mortality of these seabirds in Hawaiʻi. No suitable nesting habitat for seabird species occur in the project areas.

- From an avian resource's perspective, night-time construction should be avoided during the seabird fledging season that extends from September 15th through December 15th each year. This minimization measure will ensure that fledgling birds are not attracted to and disoriented by construction lights. All exterior lighting related to the projects should be dark sky complaint and shielded (See HDLNR-DOFAW, 2016).

## Mammalian Resources

Our surveys identified only small Asian mongoose near the roadway at both sites, and it is expected that one or more of the four alien Muridae (rats and mice) currently established on the Island of Maui utilize the area to some extent. The findings of the mammalian survey are consistent with the location of the habitats present.

It is possible that the native Hawaiian hoary bat or *ʻōpeʻapeʻa* (*Lasiurus cinereus semotus*) uses resources (trees suitable for roosting and insects attracted to the aquatic environments) within the project vicinities. Hawaiian hoary bat is potentially ubiquitous in this part of Maui. Although suitable roost trees do overhang the streams, this bat uses multiple roosts within a home territory (Bonaccorso et al., 2015), so any disturbance associated with trimming of branches would be minimal. An exception might be during the pupping season, if a female bat carrying a pup is unable to rapidly vacate a roost tree that is being felled, or if an unattended pup is unable to flee a tree that is being felled or trimmed.

- Potential adverse impacts to Hawaiian hoary bat can be avoided by not clearing woody vegetation taller than 4.6 m (15 ft) between June 1 and September 15, the bat pupping season.

## Other Resources of Potential Concern

### *Jurisdictional Waters*

A jurisdictional waters survey and mapping was provided by Haley Aldrich (2022) and *AECOS* (2023) for Waikakoi Bridge; and for Wailua Bridge (AECOS, 2023).

### *Critical Habitat*

Federally delineated Critical Habitat is not present in the project areas (USFWS, nd-b). No equivalent designation exists under state law.

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# Appendix F. Traffic Assessment Report for the Proposed Waikakoi and South Wailua Bridge Replacement Hāna, Maui, Hawaii. Austin, Tsutsumi & Associates, Inc. August 2025.

AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS
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#21-502

August 19, 2025

Mr. Troy K. Ching, PE, LEED AP
Civil Project Manager
HDR Engineering, Inc.
305 South High Street, Suite 101
Wailuku, Hawaii 96793

Dear Mr. Ching:

**Subject: Traffic Assessment Report**
**For the Proposed Waikakoi and South Wailua Bridge Replacement**
**Hana, Maui, Hawaii**

This report documents the findings of a traffic study conducted by Austin, Tsutsumi, and Associates, Inc. (ATA) to provide professional traffic engineering services for the Waikakoi and South Wailua Bridge Replacement (hereinafter collectively referred to as the "Project"), located in Hana, Maui, Hawaii.

**Project Description**

The County of Maui plans to replace both the Waikakoi Bridge (milepost 45.4) and the South Wailua Bridge (milepost 44.6) along Hana Highway. The Project will require temporary bypass roads to maintain access through the area to mitigate any significant traffic impacts during construction. See Figure 1 for Project location.

This traffic study will define the existing and future traffic along Hana Highway to assist in the design and construction of the new Waikakoi and South Wailua bridges. A temporary bridge should be provided to detour traffic around Project construction work.

**Study Methodology**

- Determine existing traffic characteristics of Hana Highway within the Project Vicinity which includes 85$^{th}$ percentile speeds, heavy vehicle truck percentage breakdown, Average Daily Traffic (ADT) and the directional split of traffic volumes.
- Determine future traffic characteristics of Hana Highway within the Project Vicinity which includes projected ADT with the completion of the Project, 20-Year ADT and 20-Year design hourly volume (DHV) from existing conditions, and projected 30 to 50-Year ADT from completion of the Project.

# WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT TA

AustinTsutsumi
& ASSOCIATES, INC.
Engineers & Surveyors


FIGURE 1

LOCATION MAP

**Existing Conditions**

The following are brief descriptions of the existing roadway within the vicinity of the Project:

Hana Highway is generally an east-west, two-way, two-lane undivided arterial roadway in the vicinity of the Project. The posted speed limit is 15 miles per hour (mph) in the study area. Due to the winding alignment of Hana Highway and frequency of narrow travel lanes, sharp turns and one-lane bridges, warning signs recommend reduced speeds of 5 or 10 mph. This roadway runs along Maui's coastline providing local connectivity between Hana and Kaupo and regional connectivity to Kula/Upcountry Maui.

Both the Waikakoi Bridge and South Wailua Bridge are one-lane bridges that require yielding on either approach. The existing Waikakoi Bridge is located along Hana Highway, at milepost 45.4 with a roadway width of 15' and length of 33'. The existing South Wailua Bridge is located along Hana Highway, at milepost 44.6 with a roadway width of 15.5' and length of 57'.

**Existing Traffic Characteristics for Hana Highway Within the Project Vicinity**

24-hour pneumatic tube count data was collected on Thursday, March 18, 2021 at one (1) location along Hana Highway, east of the Waikakoi Bridge. Table 1 shown below, summarizes the traffic characteristics along Hana Highway for the weekday 24-hour Average Daily Traffic (ADT) volumes, speed and heavy vehicle axle breakdown. Traffic data sheets are shown in Appendix A.

Table 1: Existing 2021 Roadway Characteristics

| | | |
|---|---|---|
| ADT | 962 vpd | |
| Eastbound D% | 53% | |
| Heavy Vehicle % | 7.3% | |
| 85th Percentile Speed | 29 mph | |
| | AM Peak | PM Peak |
| Peak Hour Volume (vph) | 46 | 151 |
| Eastbound D% | 65% | 38% |
| K Factor | 4.8% | 15.7% |

Notes:

1. Eastbound is Hana bound and westbound is Kaupo bound.
2. AM peak 9:00-10:00AM and PM peak 3:15-4:15PM.
3. Saturday count was conducted on March 20, 2021, but not included since it yielded lower traffic data than weekday.

**Future Traffic Characteristics for Hana Highway Within the Project Vicinity**

Projections for Future Year scenarios over a 20-, 30- and 50-year build-out was based on the Maui Regional Travel Demand Model (MRTDM) growth for forecast years between 2007 and 2035. The overall annual growth rate along the studied roadways was approximately 0.6% per year.

Table 2: Future 2041 Roadway Characteristics (20-Year forecast)

| | | |
|---|---|---|
| ADT | 1,084 vpd | |
| Eastbound D% | 53% | |
| Heavy Vehicle % | 7.3% | |
| 85th Percentile Speed | 29 mph | |
| | AM | PM |
| Peak Hour Volume (vph) | 51 | 167 |
| Eastbound D% | 67% | 35% |
| K Factor | 4.8% | 15.7% |

Table 3: Future 2051 Roadway Characteristics (30-Year forecast)

| | | |
|---|---|---|
| ADT | 1,151 vpd | |
| Eastbound D% | 53% | |
| Heavy Vehicle % | 7.3% | |
| 85th Percentile Speed | 29 mph | |
| | AM | PM |
| Peak Hour Volume (vph) | 54 | 178 |
| Eastbound D% | 67% | 35% |
| K Factor | 4.8% | 15.7% |

Table 4: Future 2071 Roadway Characteristics (50-Year forecast)

| | | |
|---|---|---|
| ADT | 1,297 vpd | |
| Eastbound D% | 53% | |
| Heavy Vehicle % | 7.3% | |
| 85th Percentile Speed | 29 mph | |
| | AM | PM |
| Peak Hour Volume (vph) | 61 | 200 |
| Eastbound D% | 67% | 35% |
| K Factor | 4.8% | 15.7% |

**Conclusions**

- The Existing 2021 traffic characteristics of Hana Highway in the vicinity of the Waikakoi and South Wailua Bridges are as follows:
  - ADT: 962 vehicles/day
  - Peak Hour Volume: 148 vehicles/hour
  - Heavy Vehicles: 7.4% heavy vehicles/day
- The forecast 2071 (50-year projection) traffic characteristics of Hana Highway in the vicinity of the Waikakoi and South Wailua Bridges are as follows:
  - ADT: 1,297 vehicles/day
  - Peak Hour Volume: 200 vehicles/hour
  - Heavy Vehicles: 7.4% heavy vehicles/day
- A temporary bridge should be provided to detour traffic around Project construction work.
- Upon completion of the Project, advanced warning signs should be installed in advance of the bridge and yield signs adjacent to each bridge approach should be installed to warn motorists of the one-lane bridge.

We appreciate the opportunity to prepare this Traffic Assessment for the Project. Should you require clarification, please contact me at (808) 244-8044.

Sincerely,

AUSTIN, TSUTSUMI & ASSOCIATES, INC.

By

TYLER K. FUJIWARA, P.E.
Chief Transportation Engineer - Maui

Attachments: Appendix A

Y:\2021\21-502 HDR Waikakoi & S. Wailua Bridge Replacement TA\Report\250819 Waikakoi & Wailua Bridge Replacement TA.docx

# APPENDICES

# APPENDIX A

## TRAFFIC DATA SHEETS – VOLUME DATA

**Austin, Tsutsumi and Associates**
1871 Wili Pa Loop, Suite A
Wailuku, Hawaii, 96793
**Phone: (808) 244-8044 Fax: (808) 242-9163**

Volume_Hana 1_ WD
Site Code: Hana 1

| Start | 18-Mar-21 | Kaupo Bound | | Hour Totals | | Hana Bound | | Hour Totals | | Combined Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Time | Thu | Morning | Afternoon | Morning | Afternoon | Morning | Afternoon | Morning | Afternoon | Morning | Afternoon |
| 12:00 | | 0 | 14 | | | 1 | 20 | | | | |
| 12:15 | | 0 | 15 | | | 0 | 7 | | | | |
| 12:30 | | 0 | 12 | | | 0 | 22 | | | | |
| 12:45 | | 1 | 13 | 1 | 54 | 0 | 7 | 1 | 56 | 2 | 110 |
| 01:00 | | 0 | 8 | | | 0 | 14 | | | | |
| 01:15 | | 0 | 14 | | | 0 | 19 | | | | |
| 01:30 | | 0 | 9 | | | 0 | 18 | | | | |
| 01:45 | | 1 | 17 | 1 | 48 | 0 | 15 | 0 | 66 | 1 | 114 |
| 02:00 | | 0 | 11 | | | 0 | 17 | | | | |
| 02:15 | | 0 | 10 | | | 1 | 16 | | | | |
| 02:30 | | 0 | 6 | | | 0 | 20 | | | | |
| 02:45 | | 0 | 13 | 0 | 40 | 0 | 11 | 1 | 64 | 1 | 104 |
| 03:00 | | 1 | 14 | | | 1 | 10 | | | | |
| 03:15 | | 0 | 14 | | | 0 | 14 | | | | |
| 03:30 | | 0 | 31 | | | 2 | 19 | | | | |
| 03:45 | | 0 | 26 | 1 | 85 | 0 | 10 | 3 | 53 | 4 | 138 |
| 04:00 | | 0 | 23 | | | 0 | 14 | | | | |
| 04:15 | | 0 | 14 | | | 0 | 12 | | | | |
| 04:30 | | 1 | 19 | | | 0 | 16 | | | | |
| 04:45 | | 1 | 7 | 2 | 63 | 0 | 8 | 0 | 50 | 2 | 113 |
| 05:00 | | 0 | 8 | | | 0 | 4 | | | | |
| 05:15 | | 0 | 6 | | | 0 | 8 | | | | |
| 05:30 | | 0 | 13 | | | 0 | 3 | | | | |
| 05:45 | | 0 | 8 | 0 | 35 | 0 | 6 | 0 | 21 | 0 | 56 |
| 06:00 | | 1 | 4 | | | 1 | 4 | | | | |
| 06:15 | | 2 | 7 | | | 1 | 3 | | | | |
| 06:30 | | 7 | 1 | | | 1 | 2 | | | | |
| 06:45 | | 3 | 2 | 13 | 14 | 2 | 4 | 5 | 13 | 18 | 27 |
| 07:00 | | 2 | 0 | | | 2 | 3 | | | | |
| 07:15 | | 2 | 1 | | | 2 | 4 | | | | |
| 07:30 | | 1 | 0 | | | 2 | 0 | | | | |
| 07:45 | | 9 | 0 | 14 | 1 | 7 | 1 | 13 | 8 | 27 | 9 |
| 08:00 | | 6 | 1 | | | 5 | 1 | | | | |
| 08:15 | | 4 | 1 | | | 3 | 2 | | | | |
| 08:30 | | 3 | 1 | | | 6 | 3 | | | | |
| 08:45 | | 2 | 0 | 15 | 3 | 4 | 1 | 18 | 7 | 33 | 10 |
| 09:00 | | 6 | 0 | | | 8 | 0 | | | | |
| 09:15 | | 6 | 0 | | | 6 | 1 | | | | |
| 09:30 | | 3 | 0 | | | 6 | 0 | | | | |
| 09:45 | | 1 | 0 | 16 | 0 | 10 | 1 | 30 | 2 | 46 | 2 |
| 10:00 | | 3 | 0 | | | 6 | 1 | | | | |
| 10:15 | | 5 | 0 | | | 10 | 1 | | | | |
| 10:30 | | 3 | 0 | | | 8 | 1 | | | | |
| 10:45 | | 1 | 0 | 12 | 0 | 16 | 2 | 40 | 5 | 52 | 5 |
| 11:00 | | 7 | 0 | | | 16 | 1 | | | | |
| 11:15 | | 9 | 1 | | | 17 | 0 | | | | |
| 11:30 | | 8 | 1 | | | 9 | 0 | | | | |
| 11:45 | | 9 | 0 | 33 | 2 | 10 | 0 | 52 | 1 | 85 | 3 |
| Total | | 108 | 345 | | | 163 | 346 | | | 271 | 691 |
| Percent | | 23.8% | 76.2% | | | 32.0% | 68.0% | | | 28.2% | 71.8% |
| Grand Total | | 108 | 345 | | | 163 | 346 | | | 271 | 691 |
| Percent | | 23.8% | 76.2% | | | 32.0% | 68.0% | | | 28.2% | 71.8% |
| ADT | | ADT 962 | | AADT 962 | | | | | | | |

# APPENDIX A

## TRAFFIC DATA SHEETS – SPEED DATA

# Austin, Tsutsumi and Associates

1871 Wili Pa Loop, Suite A
Wailuku, Hawaii, 96793
**Phone: (808) 244-8044 Fax: (808) 242-9163**




Speed_Hana 1_WD
Site Code: Hana 1

Kaupo Bound, Hana Bound

| Start Time | 1 5 | 6 10 | 11 15 | 16 20 | 21 25 | 26 30 | 31 35 | 36 40 | 41 45 | 46 9999 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 03/18/21 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 00:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 00:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 00:45 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 |
| 01:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01:45 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 02:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02:15 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 02:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02:45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 03:00 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| 03:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03:30 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 2 |
| 03:45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 4 |
| 04:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04:30 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 04:45 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 2 |
| 05:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05:45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 06:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 |
| 06:15 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 3 |
| 06:30 | 0 | 0 | 0 | 0 | 3 | 2 | 2 | 0 | 1 | 0 | 8 |
| 06:45 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 0 | 0 | 0 | 5 |
| | 0 | 0 | 0 | 0 | 4 | 5 | 6 | 1 | 2 | 0 | 18 |
| 07:00 | 0 | 0 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 4 |
| 07:15 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 4 |
| 07:30 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 3 |
| 07:45 | 0 | 0 | 0 | 1 | 3 | 8 | 1 | 3 | 0 | 0 | 16 |
| | 0 | 0 | 0 | 2 | 4 | 14 | 3 | 4 | 0 | 0 | 27 |
| 08:00 | 0 | 0 | 0 | 2 | 3 | 3 | 3 | 0 | 0 | 0 | 11 |
| 08:15 | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 1 | 0 | 0 | 7 |
| 08:30 | 0 | 0 | 0 | 1 | 3 | 1 | 3 | 1 | 0 | 0 | 9 |
| 08:45 | 0 | 0 | 0 | 1 | 2 | 1 | 2 | 0 | 0 | 0 | 6 |
| | 0 | 0 | 0 | 4 | 9 | 9 | 9 | 2 | 0 | 0 | 33 |
| 09:00 | 0 | 0 | 1 | 1 | 3 | 4 | 4 | 1 | 0 | 0 | 14 |
| 09:15 | 0 | 0 | 0 | 0 | 2 | 5 | 5 | 0 | 0 | 0 | 12 |
| 09:30 | 0 | 0 | 0 | 2 | 6 | 1 | 0 | 0 | 0 | 0 | 9 |
| 09:45 | 0 | 0 | 0 | 5 | 5 | 0 | 1 | 0 | 0 | 0 | 11 |
| | 0 | 0 | 1 | 8 | 16 | 10 | 10 | 1 | 0 | 0 | 46 |
| 10:00 | 0 | 0 | 1 | 1 | 3 | 1 | 3 | 0 | 0 | 0 | 9 |
| 10:15 | 0 | 0 | 1 | 2 | 5 | 3 | 4 | 0 | 0 | 0 | 15 |
| 10:30 | 0 | 0 | 0 | 1 | 6 | 2 | 1 | 1 | 0 | 0 | 11 |
| 10:45 | 0 | 0 | 2 | 8 | 5 | 2 | 0 | 0 | 0 | 0 | 17 |
| | 0 | 0 | 4 | 12 | 19 | 8 | 8 | 1 | 0 | 0 | 52 |
| 11:00 | 0 | 0 | 2 | 10 | 6 | 4 | 1 | 0 | 0 | 0 | 23 |
| 11:15 | 0 | 0 | 2 | 11 | 3 | 4 | 5 | 1 | 0 | 0 | 26 |
| 11:30 | 0 | 1 | 1 | 3 | 5 | 7 | 0 | 0 | 0 | 0 | 17 |
| 11:45 | 0 | 0 | 0 | 2 | 5 | 7 | 5 | 0 | 0 | 0 | 19 |
| | 0 | 1 | 5 | 26 | 19 | 22 | 11 | 1 | 0 | 0 | 85 |
| Total | 0 | 1 | 10 | 52 | 76 | 70 | 50 | 10 | 2 | 0 | 271 |

**Austin, Tsutsumi and Associates**
1871 Wili Pa Loop, Suite A
Wailuku, Hawaii, 96793
**Phone: (808) 244-8044 Fax: (808) 242-9163**

Speed_Hana 1_WD
Site Code: Hana 1

Kaupo Bound, Hana Bound

| Start Time | 1 5 | 6 10 | 11 15 | 16 20 | 21 25 | 26 30 | 31 35 | 36 40 | 41 45 | 46 9999 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 PM | 2 | 0 | 6 | 12 | 10 | 3 | 1 | 0 | 0 | 0 | 34 |
| 12:15 | 0 | 0 | 1 | 3 | 13 | 4 | 1 | 0 | 0 | 0 | 22 |
| 12:30 | 0 | 2 | 3 | 4 | 16 | 5 | 3 | 0 | 1 | 0 | 34 |
| 12:45 | 0 | 0 | 2 | 5 | 8 | 4 | 0 | 1 | 0 | 0 | 20 |
| | 2 | 2 | 12 | 24 | 47 | 16 | 5 | 1 | 1 | 0 | 110 |
| 13:00 | 1 | 0 | 4 | 4 | 11 | 2 | 0 | 0 | 0 | 0 | 22 |
| 13:15 | 0 | 1 | 2 | 11 | 11 | 7 | 1 | 0 | 0 | 0 | 33 |
| 13:30 | 0 | 0 | 1 | 9 | 15 | 2 | 0 | 0 | 0 | 0 | 27 |
| 13:45 | 0 | 0 | 4 | 9 | 15 | 4 | 0 | 0 | 0 | 0 | 32 |
| | 1 | 1 | 11 | 33 | 52 | 15 | 1 | 0 | 0 | 0 | 114 |
| 14:00 | 0 | 0 | 2 | 11 | 11 | 3 | 1 | 0 | 0 | 0 | 28 |
| 14:15 | 0 | 0 | 4 | 6 | 10 | 6 | 0 | 0 | 0 | 0 | 26 |
| 14:30 | 0 | 0 | 4 | 10 | 6 | 4 | 2 | 0 | 0 | 0 | 26 |
| 14:45 | 2 | 1 | 3 | 10 | 5 | 2 | 1 | 0 | 0 | 0 | 24 |
| | 2 | 1 | 13 | 37 | 32 | 15 | 4 | 0 | 0 | 0 | 104 |
| 15:00 | 1 | 0 | 3 | 5 | 9 | 3 | 2 | 1 | 0 | 0 | 24 |
| 15:15 | 0 | 0 | 2 | 7 | 9 | 8 | 2 | 0 | 0 | 0 | 28 |
| 15:30 | 1 | 0 | 3 | 11 | 27 | 7 | 0 | 0 | 1 | 0 | 50 |
| 15:45 | 0 | 0 | 4 | 11 | 14 | 5 | 2 | 0 | 0 | 0 | 36 |
| | 2 | 0 | 12 | 34 | 59 | 23 | 6 | 1 | 1 | 0 | 138 |
| 16:00 | 1 | 0 | 1 | 5 | 19 | 6 | 4 | 1 | 0 | 0 | 37 |
| 16:15 | 0 | 0 | 0 | 2 | 12 | 7 | 5 | 0 | 0 | 0 | 26 |
| 16:30 | 2 | 1 | 0 | 5 | 12 | 11 | 3 | 1 | 0 | 0 | 35 |
| 16:45 | 0 | 0 | 0 | 3 | 2 | 9 | 1 | 0 | 0 | 0 | 15 |
| | 3 | 1 | 1 | 15 | 45 | 33 | 13 | 2 | 0 | 0 | 113 |
| 17:00 | 0 | 0 | 1 | 1 | 3 | 5 | 2 | 0 | 0 | 0 | 12 |
| 17:15 | 0 | 0 | 0 | 1 | 6 | 2 | 5 | 0 | 0 | 0 | 14 |
| 17:30 | 0 | 0 | 0 | 2 | 5 | 6 | 3 | 0 | 0 | 0 | 16 |
| 17:45 | 1 | 0 | 1 | 2 | 6 | 2 | 2 | 0 | 0 | 0 | 14 |
| | 1 | 0 | 2 | 6 | 20 | 15 | 12 | 0 | 0 | 0 | 56 |
| 18:00 | 0 | 0 | 0 | 0 | 3 | 3 | 1 | 1 | 0 | 0 | 8 |
| 18:15 | 0 | 0 | 0 | 1 | 4 | 5 | 0 | 0 | 0 | 0 | 10 |
| 18:30 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 3 |
| 18:45 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 1 | 0 | 0 | 6 |
| | 0 | 0 | 0 | 1 | 10 | 10 | 4 | 2 | 0 | 0 | 27 |
| 19:00 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 3 |
| 19:15 | 0 | 0 | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 5 |
| 19:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19:45 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 1 | 0 | 4 | 3 | 1 | 0 | 0 | 0 | 9 |
| 20:00 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 20:15 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 3 |
| 20:30 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 4 |
| 20:45 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 0 | 1 | 1 | 1 | 5 | 1 | 0 | 1 | 10 |
| 21:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21:15 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 21:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21:45 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 |
| 22:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 22:15 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 22:30 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 22:45 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 2 |
| | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 1 | 0 | 0 | 5 |
| 23:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 23:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 23:30 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 23:45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 3 |
| Total | 11 | 5 | 52 | 151 | 273 | 133 | 53 | 10 | 2 | 1 | 691 |
| Grand Total | 11 | 6 | 62 | 203 | 349 | 203 | 103 | 20 | 4 | 1 | 962 |

Stats

| | |
|---|---|
| 15th Percentile : | 16 MPH |
| 50th Percentile : | 22 MPH |
| 85th Percentile : | 29 MPH |
| 95th Percentile : | 33 MPH |
| Mean Speed(Average) : | 23 MPH |
| 10 MPH Pace Speed : | 21-30 MPH |
| Number in Pace : | 552 |
| Percent in Pace : | 57.4% |
| Number of Vehicles > 55 MPH : | 0 |
| Percent of Vehicles > 55 MPH : | 0.0% |

# APPENDIX A

## TRAFFIC DATA SHEETS - AXLE DATA

**Austin, Tsutsumi and Associates**
1871 Wili Pa Loop, Suite A
Wailuku, Hawaii, 96793
**Phone: (808) 244-8044 Fax: (808) 242-9163**

Axle_Hana 1_WD
Site Code: Hana 1

Kaupo Bound, Hana Bound

| Start Time | Bikes | Cars & Trailer | 2 Axle Long | Buses | 2 Axle 6 Tire | 3 Axle Single | 4 Axle Single | <5 Axl Double | 5 Axle Double | >6 Axl Double | <6 Axl Multi | 6 Axle Multi | >6 Axl Multi | Not Classe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 03/18/21 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 00:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 00:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 00:45 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 01:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01:45 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 02:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02:15 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 02:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02:45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 03:00 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 03:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03:30 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 03:45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 04:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04:30 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 04:45 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 05:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 06:30 | 0 | 3 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| 06:45 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
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| 07:00 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
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| 07:45 | 0 | 7 | 7 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
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| 08:00 | 0 | 3 | 6 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| 08:15 | 0 | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| 08:30 | 0 | 3 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| 08:45 | 0 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| | 0 | 13 | 15 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33 |
| 09:00 | 0 | 9 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| 09:15 | 0 | 7 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |
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| 11:00 | 1 | 15 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| 11:15 | 0 | 15 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 |
| 11:30 | 0 | 11 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 |
| 11:45 | 0 | 12 | 6 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| | 1 | 53 | 30 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 85 |
| Total | 2 | 158 | 87 | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 271 |
| Percent | 0.7% | 58.3% | 32.1% | 0.0% | 8.9% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | |

# Austin, Tsutsumi and Associates

1871 Wili Pa Loop, Suite A
Wailuku, Hawaii, 96793
**Phone: (808) 244-8044 Fax: (808) 242-9163**


Axle_Hana 1_WD
Site Code: Hana 1

Kaupo Bound, Hana Bound

| Start Time | Bikes | Cars & Trailer | 2 Axle Long | Buses | 2 Axle 6 Tire | 3 Axle Single | 4 Axle Single | <5 Axl Double | 5 Axle Double | >6 Axl Double | <6 Axl Multi | 6 Axle Multi | >6 Axl Multi | Not Classe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 PM | 0 | 22 | 8 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 34 |
| 12:15 | 0 | 11 | 8 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| 12:30 | 0 | 18 | 12 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 34 |
| 12:45 | 0 | 15 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 |
| | 0 | 66 | 31 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 110 |
| 13:00 | 0 | 15 | 5 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 22 |
| 13:15 | 0 | 20 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33 |
| 13:30 | 0 | 17 | 7 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 |
| 13:45 | 0 | 25 | 5 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
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| 14:15 | 0 | 16 | 8 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 |
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| 15:30 | 0 | 39 | 4 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 50 |
| 15:45 | 0 | 23 | 12 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 |
| | 1 | 98 | 24 | 0 | 11 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 138 |
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| 17:30 | 0 | 11 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
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| Total | 1 | 450 | 179 | 0 | 44 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 15 | 691 |
| Percent | 0.1% | 65.1% | 25.9% | 0.0% | 6.4% | 0.0% | 0.0% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.2% | |
| Grand Total | 3 | 608 | 266 | 0 | 68 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 15 | 962 |
| Percent | 0.3% | 63.2% | 27.7% | 0.0% | 7.1% | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.6% | |

# Appendix G. Waikakoi Bridge Replacement (Bridge #26) Structure Selection Report. HDR, Inc. April 2024.

# WAIKAKOI BRIDGE REPLACEMENT (BRIDGE #26)

## MAUI, HAWAII

# STRUCTURE SELECTION REPORT

*Prepared for:*

County of Maui Department of Public Works
Engineering Division

*Prepared* by:


HDR

305 South High Street, Ste 101
Wailuku, HI 96793


April 2024

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## Appendices



## Figures



## Tables

# 1.0 EXECUTIVE SUMMARY

## 1.1 Purpose of Report

The purpose of this report is to determine the recommended structural alternative to replace the existing Waikakoi Bridge (Bridge #26) on State Route 360 (Hana Highway) in Maui County, Hawaii.

## 1.2 Review of Existing Conditions

A topographic survey of the site conditions around Waikakoi Bridge was conducted September 2022 utilizing both LiDAR technology and supplemental traditional survey methods. Electronic base map files were prepared for the design team use in October 2022. The existing single lane structure has a width of approximately 15'-4" between the bridge barrier walls. Overall, the structure has a length of 30' and a width of 16'-8" out to out. In July 2022, an emergency repair was conducted to repair the Hana side abutment due to surface erosion of the CRM abutment and supporting soils. The Hana side abutment repairs consisted of reinforcing the soil under the abutment with a ground nail system and shotcrete encapsulation of the surface. Additionally, a geotechnical boring and probing program was carried out to determine the subsurface and pavement conditions near the bridge in February 2021.

## 1.3 Design Criteria and Evaluation Criteria

The design criteria for the structural design of this project will include the current 9th Edition of the LRFD AASHTO Bridge Design Specifications; as supplemented by the January, 2018 HDOT Design Criteria for Bridges and Structures, along with relevant Maui County specific standards.

The Evaluation Criteria (including sub-criteria) for the evaluating feasible alternatives is as follows:

- Construction Impacts & Constructability
  - Minimization of Traffic Impacts & Accelerated Bridge Construction (ABC) potential
  - Local Availability
  - Complexity Risk
  - Constructability
- Historic Character
- Construction Cost
- Environmental Resources
  - Hydraulic Opening Impacts
  - Resource Impacts

- Right of Way (ROW)
  - Permanent ROW Impacts
  - Temporary ROW Impacts

## 1.4 Temporary Bridge during Construction & Accelerated Bridge Construction

A discussion on a temporary bridge layout is provided in this report in Section 5. The use of a temporary bridge is tied to the chosen alignment (online vs. offline) and is discussed more in Section 7.

Additionally, methods of Accelerated Bridge Construction techniques are presented to aid in the potential rapid construction of the bridge improvement. The intention of this report is not to select a construction method, as that is a means and methods determination by the selected contractor at the time construction of the bridge improvement, but rather a representation of potential accelerated methods to determine each alternative's potential to be constructed in an accelerated manner, should the project dictate rapid construction, as opposed to conventional construction methods.

## 1.5 Structural Alternatives

In Section 7 of this report, there is a discussion regarding the preferred alignment for the new bridge. After analysis, discussed in that section, a partial offline alignment was selected. Below are the typical structural alternatives for this corridor which would be considered with regards to the evaluation criteria established for the project:

- Alternative 1A - Prestressed Inverted Tee Girders on new, pile-supported abutments behind existing abutment
- Alternative 1B - Prestressed Bridge Planks on new, pile-supported abutments behind existing abutment
- Alternative 1C - Reinforced Concrete T-beams on new, pile-supported abutments behind existing abutment
- Alternative 1D - Cast-in-place (CIP) Post-Tensioned Slab on new, pile-supported abutments behind existing abutment
- Alternative 1E – Reinforced Concrete Through Girder on new, pile-supported abutments behind existing abutment
- Alternative 2A - Prestressed Inverted Tee Girders on newly constructed abutments
- Alternative 2B - Prestressed Bridge Planks on newly constructed abutments
- Alternative 2C - Reinforced Concrete T-beams on newly constructed abutments
- Alternative 2D - Cast-in-place (CIP) Post-Tensioned Slab on newly constructed abutments

- Alternative 2E – Reinforced Concrete Through Girder on newly constructed abutments

Both bridge railings and approach railings are also presented in this report. According to the structural design criteria for the project, MASH TL-2 is specified for this project. Each structural alternative above is evaluated relative to its ability to incorporate a MASH TL-2 railing.

## 1.6 Recommended Structural Alternative

From the typical alternatives noted above, only one alternative (Alternative 1E) can be constructed without the use of a temporary bridge and/or temporary support system for a bridge slide, and can be constructed while keeping traffic on the existing bridge. However, further recent review of the layout of this alternative found that lateral impacts into private property and existing utility poles on the mauka side of the bridge will result in conflicts for this option. It was also determined that due to the limited space surrounding the existing bridge, it would be difficult to impossible to create enough space for construction equipment to safely operate adjacent to live traffic for the through girder or phased construction options. Thus, night closures would have to take place to construct the majority of these alternatives. These night closures would result in significant noise and light pollution throughout the night that would result in adverse impacts to local residents and wildlife. There was also a concern about being able to temporarily lift the night closure fast enough to allow emergency vehicles to pass through the construction site if needed. Lastly, the through girder option carried the lowest score in terms of matching the visual character of the site, due to the larger size of the edge beams required. Because of these reasons, it has been concluded that Alternative 1C constructed with a Temporary Bridge is the most desirable option.

This proposed structure will have a span length of 48’-6” with an out-to-out width of 18’-0”. This span length will allow the new bridge foundations to clear the recent emergency ground nail wall repair extents (see Figure 3 in Section 3.2 of this report) and minimize construction conflicts with the ground nails. However, as design progresses, an opportunity to save approximately 5’ to 8’ of bridge length with selective demolition of these ground nails can be investigated to reduce the span length, structure depth, and overall bridge cost.

The proposed structure is a single span structure. With the existing structure consisting of two spans and a pier, a decision should be made as to whether to keep the pier in the stream. Temporarily keeping the pier during the reconstruction of the bridge will allow for the use of this pier as support for the shoring and formwork needed for casting the new superstructure. However, once the new bridge is complete, if it is determined that the pier shall remain for resource impacts and/or historic preservation, analysis and details will be required to evaluate and provide stability for the existing pier to remain.

An in-depth analysis of the evaluation process for the structural alternatives considered is provided in this report.

# 2.0 PURPOSE, SCOPE, DESIGN CRITERIA

## 2.1 Purpose of Report

The purpose of this report is to determine the recommended structural alternative to improve the Waikakoi Bridge (Bridge #26) on State Route 360 (Hana Highway) in Maui County, Hawaii.

## 2.2 Scope of the Structure Selection Report

This report will focus on the selection of the structural alternative to improve Bridge #26. It includes background material on the existing site conditions at Bridge #26, a description of evaluation criteria for comparing alternatives, development of replacement alternatives, and the selection of a recommended alternative for design and construction.

## 2.3 Location

The Waikakoi Bridge is located near mile point 40.8, approximately 6.9 miles south of Hana on the Hana Highway (State Route 360; Figure 1).

**Figure 1. Waikakoi Bridge Location**

### 2.4 Design Criteria

The proposed improvements at Bridge #26 will adhere to the relevant provisions of the American Association of State Highway and Transportation Officials (AASHTO) specifications and guidelines, the Hawaii Department of Transportation (HDOT) Design Criteria for Bridge and Structures, and site specific geotechnical, hydraulic, and structural investigation data and reports. Design exceptions will be required to match the recommendations in the Maui County Hana Bridges Preservation Plan and precedent set on other similar bridge replacement projects along the Hana Highway.

## 3.0 EXISTING CONDITIONS

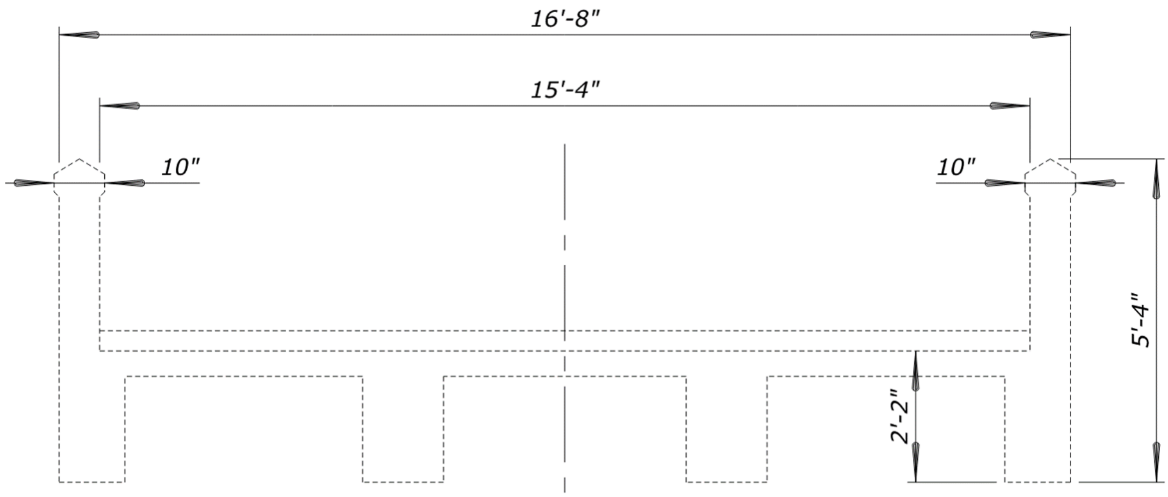
### 3.1 Topographic/Site Conditions

Bridge #26 carries Hana Highway over Waikakoi stream near mile point 40.8. A site survey was completed in September 2022 utilizing Lidar scanning in order to provide a topographic survey map of the Bridge #26 site and surrounding area. Bridge #26 is a two-span bridge that is approximately 30’-0” long with a center pier. The bridge out to out width is approximately 16’-8”. The bridge consists of a conventionally reinforced concrete T-beam superstructure with 4 beams that are supported by a reinforced concrete abutment on the Kaupo side and a CRM abutment on the Hana side. As seen in Figure 2, the rail-to-rail width of Bridge #26 is 15’-”, and it is only for single lane use.

At the Kaupo end of the bridge on the downstream (makai) side, there is a large diameter mature tree and several smaller trees. Photos from a site visit performed in February 2021 showed that a significant portion of the large mature tree has broken off. An existing roadside fruit stand located on private property is also located in the vicinity of the bridge. The trees and structure may complicate installing a temporary bridge or offline replacement structure should they need to be preserved. Short concrete rubble masonry wingwalls exist at all corners. There are also utility poles immediate adjacent to the bridge abutments on the mauka side on both the Hana and Kaupo sides. Additionally, there is an overhead telephone and/or electrical wire which is suspended above the existing bridge. The topography drops abruptly down to the stream below at all four corners of the bridge. Bridge #26 has a pier height of approximately 21’-7”. The roadway grade is fairly level at the structure.

Similar to most bridges along Hana Highway, access is very challenging due to the winding, narrow nature of the highway. It is estimated that the largest truck that can navigate the road to the bridge is a standard width truck that is 40’ long based on the dimensions of maintenance trucks that are used along Hana Highway. With a maximum truck length of 40’, the maximum piece lengths that can be expected to be shipped out will be about 30’ long, unless specialized equipment is used. There is precedent based on the Paihi Bridge replacement project that, with specialized equipment, up to a 60’ piece length can be trucked in from the Kahului side. However, transporting a piece this size effectively blocked the Hana Highway during a multi-day transport. Additionally, weight limitations will be imposed on construction material taken to the bridge site due to load posting of the bridges along Hana Highway. These limitations will be a significant logistical challenge of any replacement option presented for Bridge #26.

**Figure 2. Typical Section of Existing Bridge #26 Structure**
Note: dimensions are approximate based on topographic survey and limited existing plans

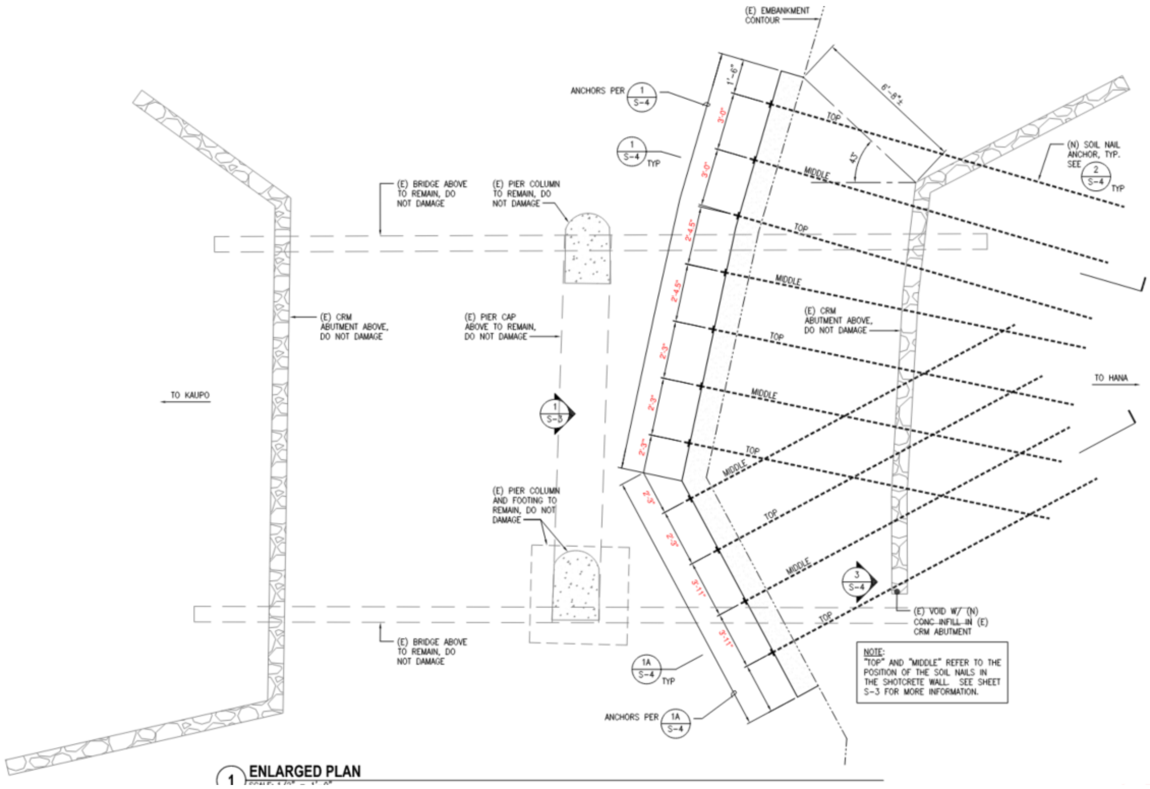



## 3.2 Existing Structure Condition

The 2020 inspection report shows Bridge #26 has an NBI condition rating of 3 for the deck condition, a 3 for the superstructure condition, and a 4 for the substructure condition. A rating of 3 stands for serious condition characterized by advanced section loss, deterioration, spalling, or scour that has seriously affected primary structural components with local failures possible. A rating of 4 stands for poor condition which suggests the elements have advanced corrosion, deterioration, cracking or chipping. Some of the deficiencies noted are significant spalls with exposed rebar, water staining and efflorescence in the deck and superstructure, eroding of the downstream Hana embankment, cracking and vegetation growth on the abutments, and spalling with exposed rebar in the pier columns. Bridge #26 is load posted for 12 tons preceding the bridge on both sides. This posting is in relation to the low legal load rating factors for Bridge #26 of which some are less than 1.0.

In early 2022, there was a significant erosion event near the Hana side abutment which washed away a portion of the CRM abutment and supporting soil. A ground nail wall (see Figure 3) was installed to aid in stabilizing the existing abutment and streambed.

**Figure 3. As-Built Plan Layout of Ground Nail Repair at Hana side abutment**




## 3.3 Geotechnical Evaluation Results

Geolabs provided a geotechnical investigation at Bridge #26. Based on initial feedback from Geolabs, subsurface conditions vary from weathered rock to soils, suggesting new bridge structures are to be supported on micropile foundation systems. A preliminary Geotech report will be prepared prior to 30% design.

## 3.4 Hydrology and Hydraulics Results

HDR Engineering completed a hydrology and hydraulic modeling for Bridge #26. The hydraulic modeling for Bridge #26 showed that the bridge will be able to convey all evaluated storms and maintains the minimum 2’ freeboard design requirement during the 50-year design storm. Scour was also investigated during the hydrology and hydraulics testing. At Bridge #26, there is potential for minimal scour. Please see the Hydrology and Hydraulic report for additional information.

# 4.0 CONTRIBUTING FACTORS AND EVALUATION CRITERIA

In an effort to provide a consistent approach to evaluate each feasible alternative, each solution for replacement will be discussed as it relates to the following five evaluation criteria:

- Construction Impacts & Constructability
- Historic Character
- Construction Cost
- Environmental Resources
- ROW Considerations

Each of the evaluation criteria listed above will be broken down into evaluation sub-criteria in order to adequately cover the aspects that affect a specific evaluation criteria. The evaluation category ratings will then be used to assist in identifying preferred alternatives for each structure.

The alternatives discussion included in Section 8 of this report is relevant to Bridge #26 structural alternatives only. The intent is to use this analysis to compare the Bridge #26 proposed structural alternatives given the site-specific conditions, constraints and opportunities, while remaining within the parameters and objectives identified in the evaluation criteria. A preferred structural alternative for Bridge #26 will be determined and presented based on this analysis.

Below is a brief synopsis of each evaluation criteria and their sub-criteria.

## 4.1 Construction Impacts & Constructability

Construction impacts will cover components that influences the difficulty of construction and construction time for each bridge. The following list gives the sub criteria that will be evaluated in order to assess construction impacts.

- **Minimization of Traffic Impacts & Accelerated Bridge Construction (ABC) potential—** This will cover how a particular solution may be suitable for ABC techniques that will reduce the duration of construction. (See Accelerated Bridge Construction Alternatives section for more detail)
- **Local Availability-** This criteria will give weight to whether or not an alternative can be sourced locally in Maui or if it needs to be brought from the mainland and/or other islands resulting in increased lead times, cost, and logistical challenges.
- **Complexity Risk-** This considers how challenging the structural details of the specific alternative will be to implement in the field.
- **Constructability—** This criteria will weigh how challenging it may be to deliver materials and equipment to the site. Furthermore, this criterion will evaluate the available area at the site to store and maintain necessary materials and/or equipment.

## 4.2 Historic Character

Historic character will cover how well each alternative provides context sensitive solutions at the bridge. The structural solution will be subject to Section 106 and Section 6E-8 review and potential mitigation, therefore each solution will be evaluated based on its ability to retain the historic character of the roadway and bridge.

### 4.3 Construction Cost

Cost criteria will include the cost components related to the bridge solution. These costs include initial costs for materials and construction of the permanent structure. Additional costs, such as temporary bridge costs, will also be shown.

### 4.4 Environmental Resources

Environmental criteria will cover impacts of a given solution to the physical environment around the bridge. This will include hydraulic impacts and resource impacts.

- **Hydraulic Opening Impacts—**this pertains to the effects a bridge solution will have on the hydraulics and hydrology of the site.
- **Resource Impacts—**this will consider how the construction effort and the final alignment will affect the sensitive site locations such as biological resources, wetlands, etc.

### 4.5 ROW Considerations

- **Permanent ROW Impacts—**this considers the final bridge configuration impact on adjacent ROW to the Hana Highway
- **Temporary ROW Impacts—** this considers the temporary impacts on adjacent ROW to the Hana Highway during construction of the new bridge.

## 5.0 TEMPORARY BRIDGE DURING CONSTRUCTION

The ability to maintain traffic at each bridge is a key component to the constructability of each structural alternative. With Hana Highway being the main route connecting Hana to Kaupo, it is of high importance to maintain access along the highway during construction. Given the narrow nature of these bridges, it is challenging to provide a viable construction phasing plan that keeps a lane open across the bridge without changing the alignment significantly. Further, temporary bridges have been used successfully around the Hawaiian Islands to maintain traffic and facilitate construction in remote locations such as the Hana Highway.

At both the Hana and Kaupo ends of the bridge, there are relatively large landing areas for a temporary bridge with vehicle pullout areas makai of the road on each approach. The approach to the bridge is also relatively straight compared to other bridges on the Hana Highway, which should provide ample launching space and relatively straightforward approach geometry for a temporary bridge. It is anticipated that a temporary bridge could be installed from the Hana side of the bridge with relative ease utilizing standard launching procedures. The proposed temporary bridge length is 100’, which is within the span capabilities of modular temporary bridges. The plan view of a temporary bridge location relative to the existing bridge is shown in Figure 4. The mauka side of the existing bridge has steep embankments along with several utility poles carrying overhead lines and is considered infeasible for the temporary bridge alignment.

There is a large diameter mature tree, several smaller trees, along with an existing structure on private property makai of the existing bridge on the Kaupo side (see Figures 4 & 5) which will interfere with the proposed alignment of the temporary bridge. This may be challenging and prove to be infeasible if both the mature tree and existing fruit stand are to be preserved, due to the geometry of the approach and ROW impacts. Because the fruit stand is not a significant structure, it would be recommended that discussions are made regarding temporarily relocating this structure or rebuilding a new one after construction if the temporary bridge is utilized. The temporary bridge can then be swung further to the Makai side of the existing bridge, thus completely avoiding impacts to the existing mature tree.

**Figure 4. Plan View of Temporary Bridge Location at Bridge #26**
(Approximate proposed temporary bridge shown in orange next to existing alignment)

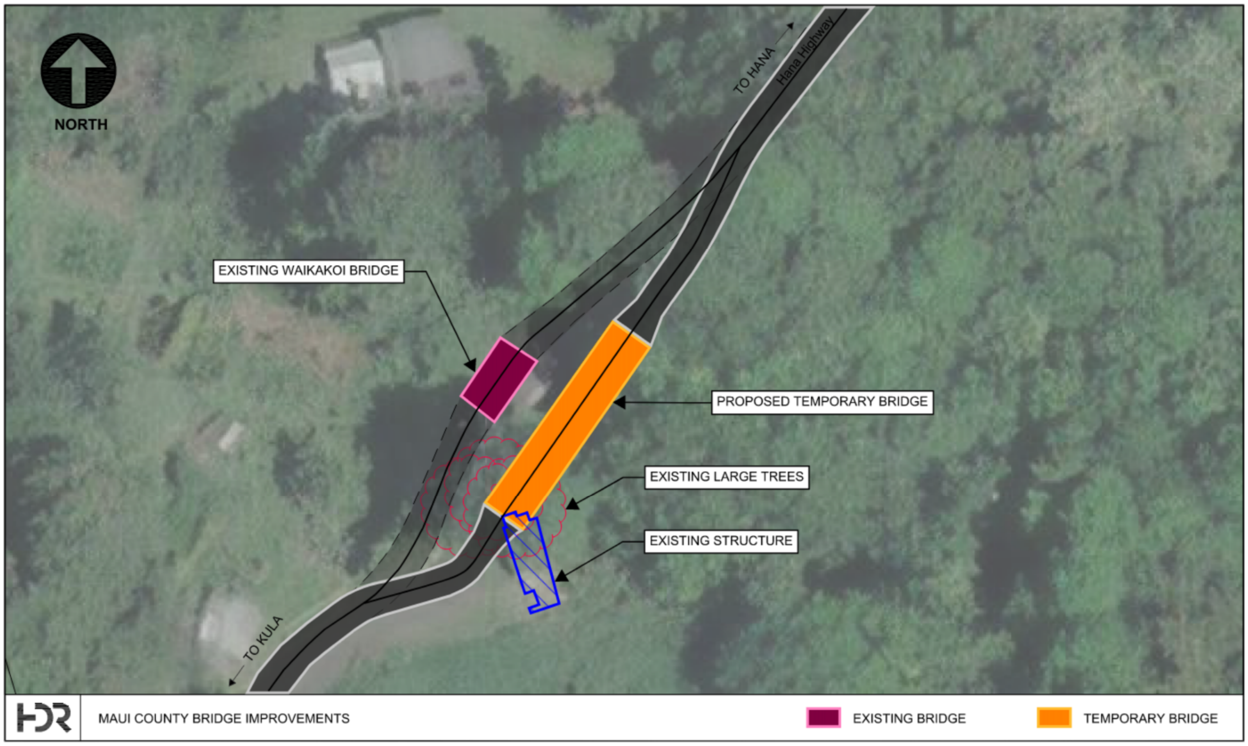



**Figure 5. View of Existing Waikakoi Bridge from Kaupo Side**
(Large diameter tree with broken limb and Existing fruit stand Makai of Bridge on Kaupo approach)

On similar recent projects along the Hana Highway, ROW considerations have been a key factor in determining the applicability of the use of temporary bridges during construction. Because a temporary bridge shifts public traffic onto adjacent, sometimes privately owned land, a legal description and transaction has been required. Along the Hana Highway, there are several areas where ROW is not well defined and legal descriptions and/or metes and bounds may not be readily available. This should be considered when determining the appropriate method of construction and maintenance of traffic during construction. For cost and ROW reasons, construction using Accelerated Bridge Construction (ABC) methods, in which the bridge can be constructed without re-routing traffic onto adjacent land and/or structures, is also considered and described in more detail in Section 6.

# 6.0 ACCELERATED BRIDGE CONSTRUCTION (ABC) ALTERNATIVES

Hana Highway is a major route for commuter traffic, tourists, emergency vehicles and commercial traffic alike. If Hana Highway is not operational, the detour is extensive and requires lengthened travel times to access the eastern side of Maui from Hana. Because of this, limiting impacts to Hana Highway during construction is of paramount importance. In the previous section of this report, the use of a temporary bypass bridge was covered. This section will cover potential constructability alternatives to further limit impacts to Hana Highway, to the extent practical, while also focusing on reducing the construction duration, regardless of the use of a temporary bypass bridge. Even if a temporary bypass bridge is used, accelerated construction may still be desirable to reduce temporary impacts to the corridor by shortening the construction duration window.

Below, five (5) ABC and constructability alternatives will be covered considering project specific constraints. These ranged from piece length restrictions, weight restrictions, limited laydown and staging areas, topographic challenges, geometric challenges of working alongside the existing structures and the waterways below, among others. Further in this report, the feasibility of each of these alternatives for the specific structural alternative will be evaluated.

## 6.1 ABC Alternative 1—Through Girder Alternative

This alternative includes building new “through girders” outboard of the existing bridge while the existing bridge remains in service. The new through girders will be supported on substructure units positioned outside of the existing bridge footprint. Once the through girders are in place, precast bridge planks can be placed over the existing roadway overnight with a “ramp” utilized to allow traffic to cross the bridge during the day. A variation of this alternative would be under a multi-day closure window to remove the existing superstructure after the through girders are in place and then place transverse bridge planks once the exiting superstructure is removed. This would allow the bridge to remain on the same vertical alignment as the existing bridge. Due to the existing utility poles mauka of the bridge, this alternative would most likely be a partial offline alignment so the mauka side through girder doesn’t impact these utility poles. The option to place planks over the existing bridge would require a vertical adjustment of the roadway.

Post-tensioning can also be used to reduce the section depth if required to minimize impacts to vertical adjustments of the roadway profile.

Since the footings for the through girders are constructed outboard from the existing abutments, significant lengthening of the through girder bridge would be needed to avoid impacts to the wingwalls of the existing bridge. These impacts are more significant on the makai side, where Waikakoi gulch quickly widens and the wingwalls are constructed parallel to the existing road.

Figure 6 depicts some concept sketches of ABC Alternative 1—Through Girder Alternative, and Figure 6a illustrates the limited landing spots for outboard footings on the makai side of the bridge

**Figure 6. ABC Alternative 1—Through Girder Alternative**

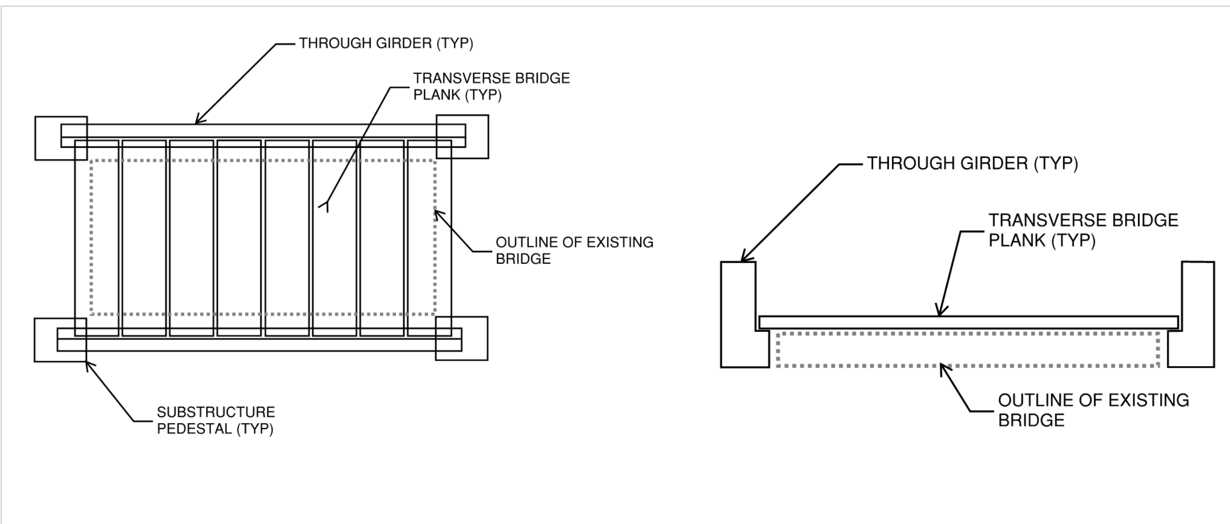
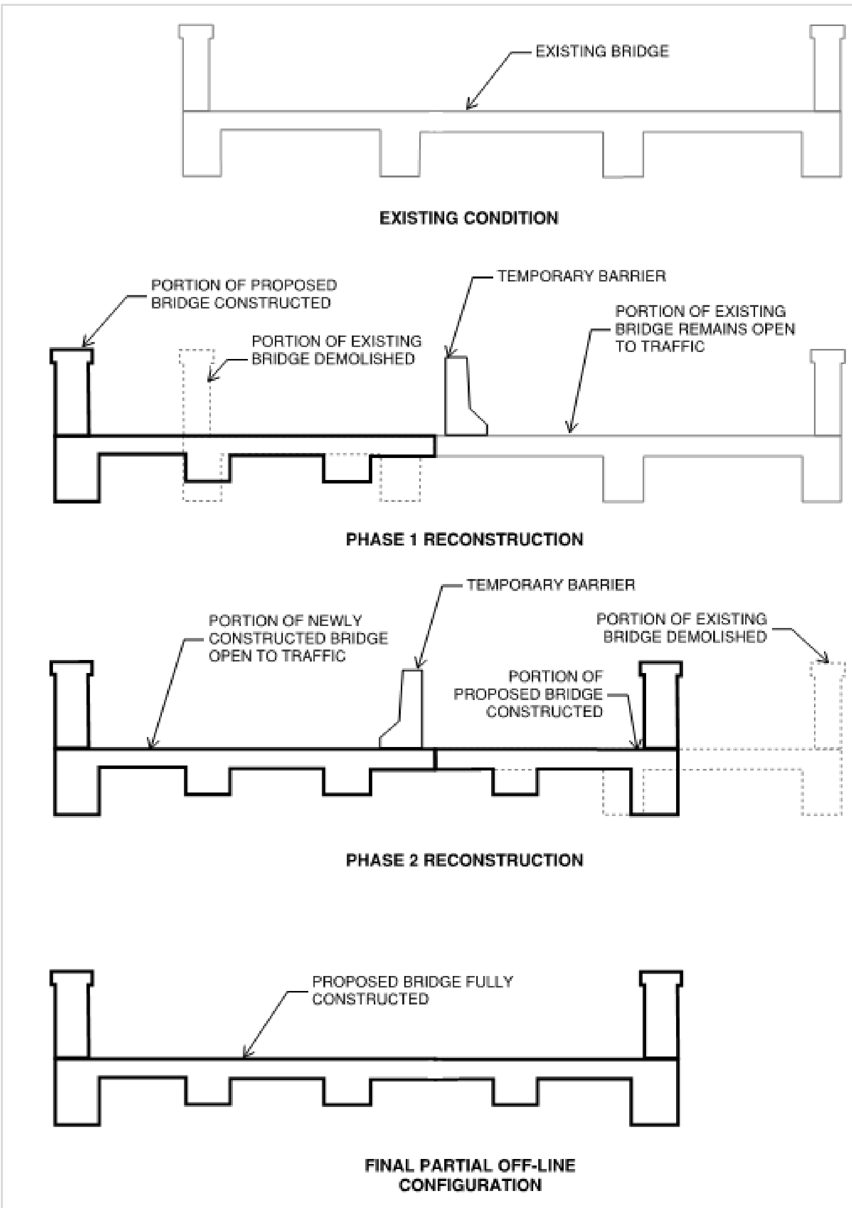



**Figure 7a. ABC Alternative 1—Limited Landing Spots on Makai Side**

## 6.2 ABC Alternative 2—Partial Off-line Staged Construction

This alternative includes using the existing bridge during construction to maintain traffic on the existing structure as the new bridge is constructed partially off-line and partially within the footprint of the existing structure. This approach requires the existing bridge to have multiple girder lines and/or a continuous slab and adequate width to accommodate single lane traffic shifts (anticipated 10'-6" minimum single lane between barriers). Similar to Alternative 1, this option would also face challenges with span length and impacts to the existing makai wingwalls due to limited space for abutments. Figure 8 depicts a concept sketch of Alternative 2—Partial Off-line Staged Construction.

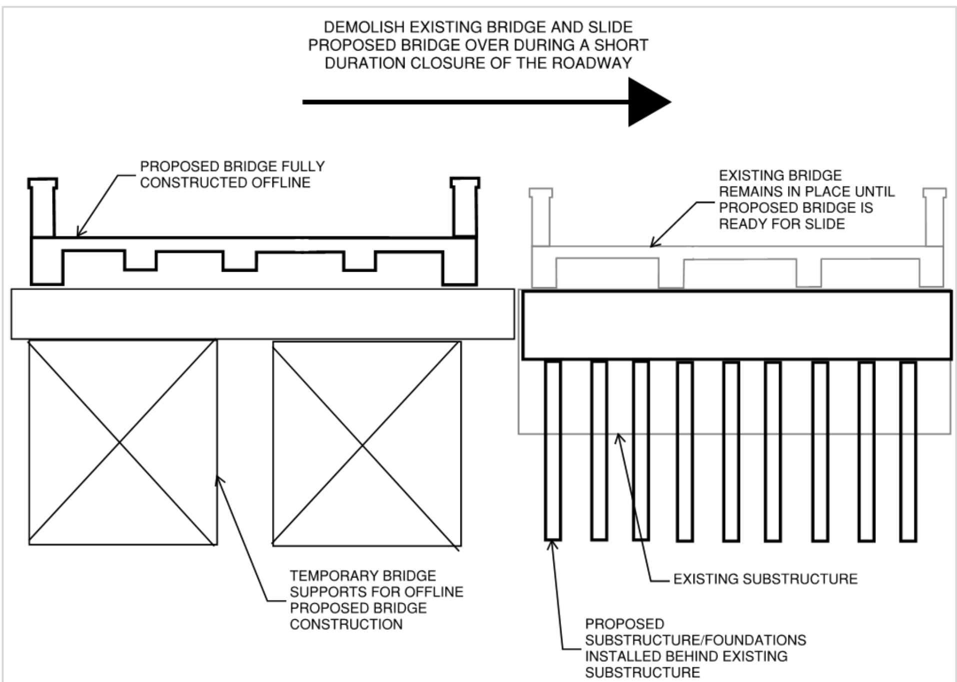
**Figure 8. ABC Alternative 2—Partial Off-line Staged Construction**



## 6.3 ABC Alternative 3—Transverse Bridge Slide

This alternative is to construct the proposed bridge transversely off-line from the existing structure on temporary foundations and then complete a transverse slide to set the bridge on new abutments during a short bridge closure. This would allow the existing structure to remain in place and in service during the proposed structure construction. The proposed substructure would likely be constructed either on substructure units outside of the existing bridge footprint, similar to the ABC Alternative 1, to allow for traffic to be maintained during the day with substructure construction occurring during night and/or off peak hours. Steel plates or some form of portable structural system would be required to cover the excavations for re-opening to traffic. Figure 9 shows a sketch of ABC Alternative 3—Transverse Bridge Slide.

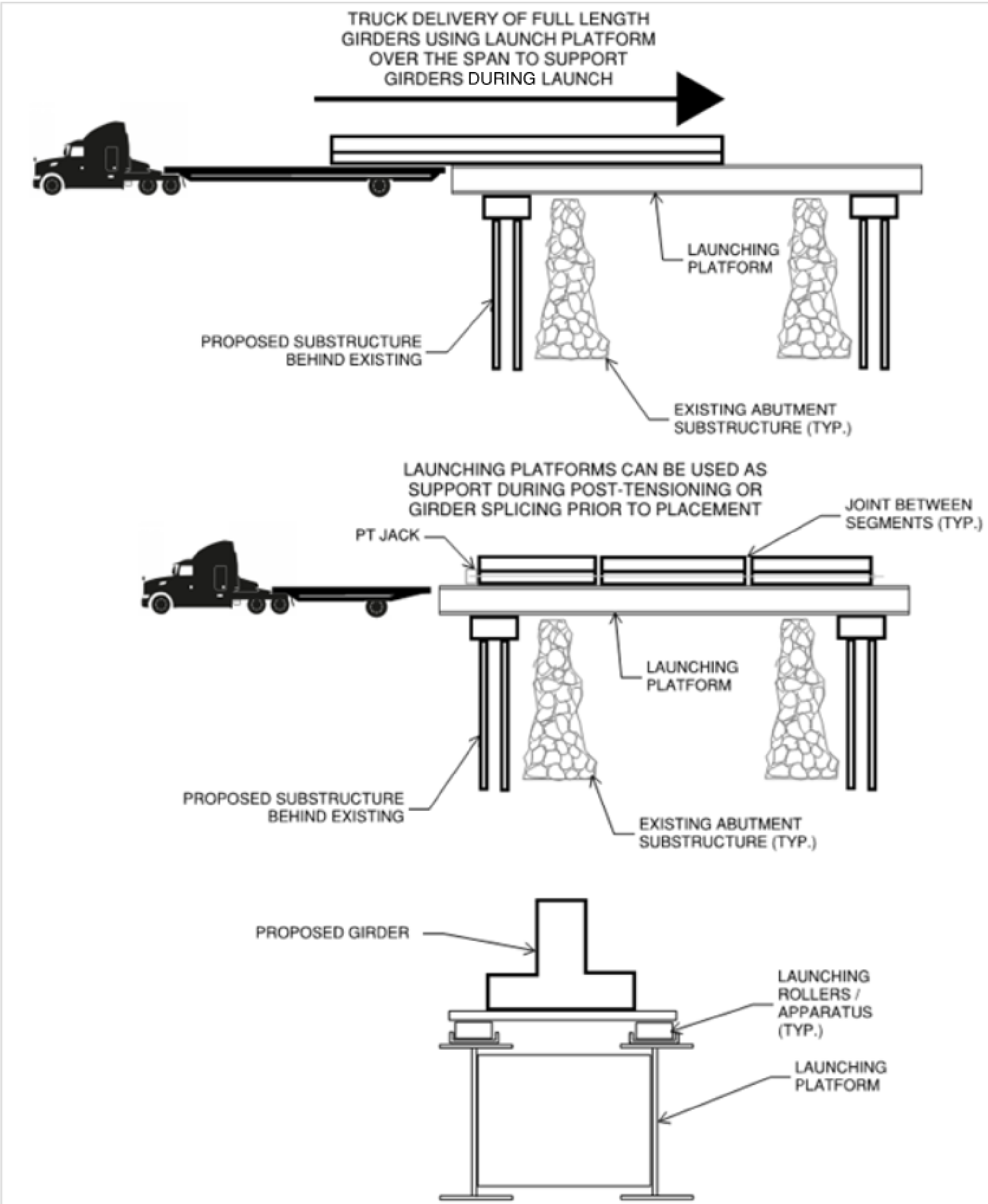
**Figure 9. ABC Alternative 3—Transverse Bridge Slide**




## 6.4 ABC Alternative 4—Longitudinal Bridge Slide/Launch

This alternative utilizes longitudinal launching strategies to install the superstructure across the span, launching from one abutment to the other. A launching structure (W-section steel girders, temporary bridge truss panels, etc.) can be installed across the channel. These launching structures can be outfitted with rollers or sliding surfaces to push the proposed girders across the span. Once the girders are positioned above the proposed bearings, cranes on either side of the span can lower the girders onto the proposed bearings. A benefit of this alternative is that the launching structures can be assembled in pieces (connected steel truss panels or spliced steel beams) and also can support permanent girder segments for post-tensioning if a longer span is needed than what can be transported to the site. Similar to ABC Alternative 3, new substructure units could be installed behind the existing abutments during night closures and covered with temporary steel plates during the day to allow for traffic to pass. Figure 10 is a sketch of ABC Alternative 4—Longitudinal Bridge Slide/Launch.

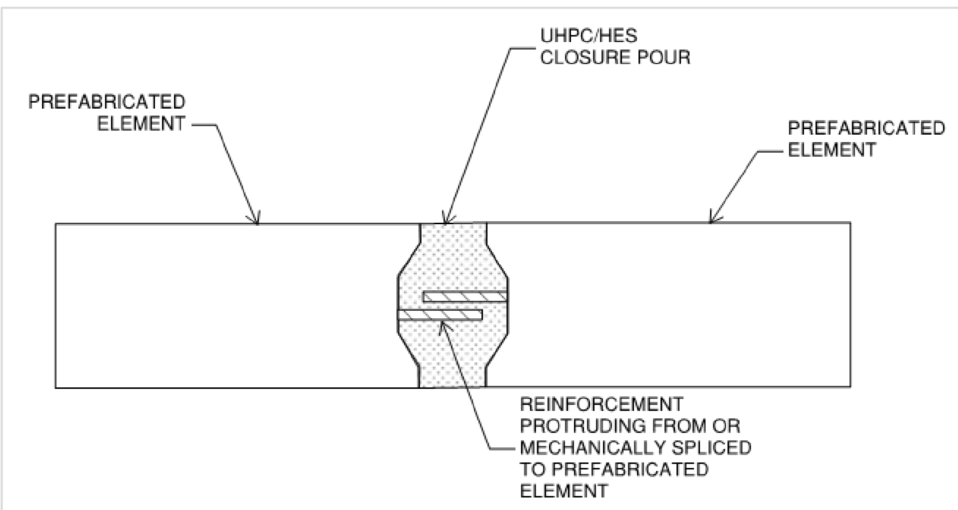
**Figure 10. ABC Alternative 4—Longitudinal Bridge Slide/Launch**



### 6.5 ABC Alternative 5—Modular Bridge (Prefabricated units with High Early Strength/ Ultra-High Performance Concrete (HES/UHPC) connections)

This alternative utilizes prefabricated units with rapid setting connections between the pre-fabricated elements to install the bridge in a quick and efficient manner. The typical application for this type of ABC is the use of longitudinal closure pours between bridge elements over the spans, with the potential for transverse closure pours over the piers. Depending on the structure type, the prefabricated elements and the closure pours themselves could be used for the final deck surface of the bridge. Otherwise, prefabricated deck panels can be utilized with rapid setting connections. In addition to the superstructure elements, new substructure units can be constructed of prefabricated elements with rapid setting connection pours as well. As an alternative, the substructures can be installed behind the existing abutments, similar to other ABC alternatives described above. Figure 11 are sketches of ABC Alternative 5—Modular Bridge (Prefabricated units with HES/UHPC connections).

**Figure 11. ABC Alternative 5—Modular Bridge**
(Prefabricated units with HES/UHPC connections)




## 7.0 BRIDGE AND ROADWAY ALIGNMENT CONSIDERATIONS

For the Waikakoi Bridge, both an online/partial offline alignment and fully offline alignment were considered. A comparative analysis for the alignment options for the proposed Bridge #26 are as follows:

### Online/Partial Offline Alignment Replacement Option

This alignment option consists of building a replacement bridge utilizing the existing alignment of the current roadway and structure.

To maintain traffic flow during construction, an online alignment option would require either accelerated bridge construction (ABC) and phased construction as discussed in Section 6 or a temporary bridge, as discussed in Section 5. Traffic may still be disrupted temporarily depending on the ABC methodology used and superstructure type. Superstructure options may be limited due to available materials and the capabilities of local contractors. Although a viable option, ABC typically involves more complicated construction practices such as bridge slides or multiphase bridge construction. ABC options are typically used when existing topography and/or ROW proves challenging for offline alignments. Both permanent and temporary ROW impacts may be reduced since this replacement option would require little additional space outside the existing bridge limits. A temporary bridge is feasible as discussed in Section 5, though the associated cost would be higher and preserving the existing fruit stand the Kaupo end would not be possible.

A partial offline replacement would involve shifting the alignment of the existing bridge by a few feet to the makai side of the current alignment to avoid the existing utility poles on the mauka side of the existing bridge and to accommodate the wider new bridge. The construction of the proposed bridge would be limited to the through girder ABC alternative (ABC Alternative #1) and utilize construction phasing to maintain traffic flow. By inspection, a partial-offline alignment would be preferable to the other online ABC alternatives due to the restricted spatial constraints required for the other alternatives such as the required area for a bridge slide or temporary bridge and associated significant cost increases with these options. However, this option creates some challenges with the Waikakoi gulch on the makai side of the bridge, as the gulch rapidly gets wider as you move away from the existing bridge. Significant modifications or removal of the existing makai wingwalls would be required to construct the makai portions of the partial offline bridge.

The online and partial offline replacement options would cover or remove most of the existing bridge and limit options for historic preservation of the existing bridge, though this can be mitigated with CRM facades along the entire fascia of the exterior through girders replicating the historic character.

### Offline Alignment Replacement Option

This alignment option consists of building a replacement bridge with a new alignment makai of the existing structure.

The topography makai of the existing bridge provides necessary space for the new offline bridge. However, the gulch steepens and gets wider, necessitating a much longer bridge than the existing bridge, possibly requiring an intermediate pier. Traffic would be maintained on the existing structure and alignment for the duration of construction, negating the need for a temporary bridge resulting in significant cost savings. An offline construction does not require ABC construction, which could mitigate or eliminate traffic disruption and utilize more conventional construction methodologies requiring no phasing or bridge slides simplifying construction. The existing bridge could remain in place, preserving its historic character. Since an offline bridge will be outside of the existing bridge limits, permanent ROW acquisition is anticipated. If the existing bridge is to remain open to pedestrian traffic, it could impose future maintenance costs. Preserving the existing large tree and structure would likely not be possible with this alignment option.

### Selected Alignment for Bridge #26

Following careful analysis of both alignment options listed above, it was determined that an online replacement option is the recommended alignment to move forward to final design. It was determined that use of a temporary bridge will be required for this option. An exhibit of the temporary and proposed alignments can be found in Appendix A. An online alignment will eliminate the need to relocate existing utility line on the mauka side of the existing bridge since the slightly wider new bridge will extend slightly makai. This option should also eliminate the need to remove the large tree and existing structure on the Kaupo side of the existing bridge, but will result in needing to relocate or remove the roadside fruit stand. This alignment will require temporary ROW easements to allow traffic to continue flowing throughout the duration of construction. Use of a temporary bridge will eliminate the need for temporary nighttime closures and concerns over passage of emergency vehicles during closures. Concerns over staging construction equipment adjacent to live traffic in the extremely limited space at the existing bridge are also eliminated by using a temporary bridge.

# 8.0 STRUCTURE SELECTION RECOMMENDATION

As determined in the previous section, the preferred alternative is to replace the existing bridge on an online alignment. The online alignment alternative will position the new bridge over the existing bridge, with the slightly wider new bridge section extending to the makai side. Traffic flow will be routed onto a temporary bridge throughout construction.

As part of the process for determining the best solution several substructure and superstructure replacement options were evaluated. The substructure will be new abutments clearing the existing abutments and extents of the recent soil nail repairs. This was considered to have less associated risk than demolishing the existing abutments and nail repairs. It was determined that superstructure replacement options are limited especially when considering the vast amount of project constraints that surround this bridge.

The structural alternatives for Bridge #26 are:

- Alternative 1A - Prestressed Inverted Tee Girders on new, pile-supported abutments behind existing abutment
- Alternative 1B - Prestressed Bridge Planks on new, pile-supported abutments behind existing abutment
- Alternative 1C - Reinforced Concrete T-beams on new, pile-supported abutments behind existing abutment
- Alternative 1D - Cast-in-place (CIP) Post-Tensioned Slab on new, pile-supported abutments behind existing abutment
- Alternative 1E – Reinforced Concrete Through Girder on new, pile-supported abutments behind existing abutment

- Alternative 2A - Prestressed Inverted Tee Girders on newly constructed abutments
- Alternative 2B - Prestressed Bridge Planks on newly constructed abutments
- Alternative 2C - Reinforced Concrete T-beams on newly constructed abutments
- Alternative 2D - Cast-in-place (CIP) Post-Tensioned Slab on newly constructed abutments
- Alternative 2E – Reinforced Concrete Through Girder on newly constructed abutments

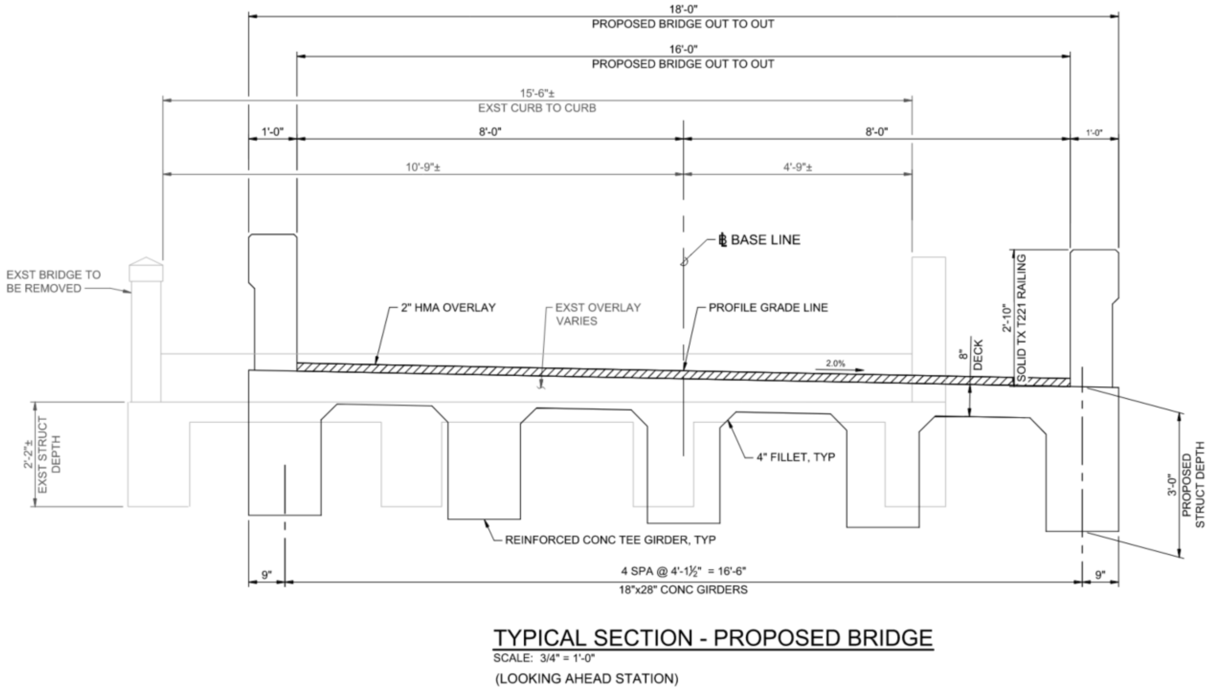
By inspection, considering these alternatives in conjunction with the selected online alignment, it was determined that all these options are feasible to construct since a temporary bridge is being utilized. However, due to the impacts to the stream and risks associated with removing the soil nail repairs, only the Alternative “1” options will be considered for the new bridge.

For the bridge superstructure, various material types were considered and ruled out including steel, timber, and Hybrid Composite Beams (HCB). Steel superstructures were not considered as HDOT does not currently allow steel superstructures in Hawaii. Timber was ruled out as it doesn’t match any of the structures along the corridor and would have very poor evaluations for the design criteria considered. HCB structures were ruled out as they could not be post-tensioned together and they are a proprietary system with no alternatives which could not be justified for this project.

## 8.1 Selected Alternative 1C (Reinforced Concrete T-Beams)

Alternative 1C was determined to be the best solution based on the criteria used for this project, including cost. This alternative meets the design criteria specified while also balancing costs, constructability, environmental resource impacts, and ROW considerations. The evaluation criteria will be discussed below. This alternative would be a conventionally reinforced, cast-in-place concrete T-Beam option. Solid bridge railing parapets will be provided that closely resemble the existing parapets. A reinforced concrete (R/C) T-Beam system matches the existing structure type as shown in Figure 11.

**Figure 12. Typical Section of T-Beam System**




For the replacement of Bridge #26 with a R/C T-beam alternative, the structure depth will increase from the current structure depth due to the span increasing by approximately 18 feet. This proposed span length will span over the existing abutments and recent ground nail repairs. As design progresses, an opportunity to save approximately 5' to 8' of bridge length with selective demolition of these ground nails can be investigated to reduce the span length, structure depth, and overall bridge cost.

### 8.1.1 Construction Impacts

#### Local Availability

R/C T-beams are not commonly used in bridges anymore as they have become outdated with the advent of prestressed sections. However, the feasibility of RC T-Beams is dependent on the availability of ready-mix concrete at the construction site. There are ready-mix batch facilities on the island of Maui making this a section that can be constructed within the island of Maui. Additionally, this alternative could be constructed with non-prestressed precast sections; however, the primary prestressing plant for the Hawaiian Islands is located on the island of Oahu. There are no known prestressing plants on the island of Maui that could be used to fabricate these sections. Having the ability to avoid shipping sections in from another island, or the mainland may provide a significant cost savings.

#### Complexity Risk

At Bridge #26, the R/C T-beam option is feasible for 48.5' span lengths. If cast-in-place concrete is used, this structure could be constructed at full length, with no limits on the piece length as with the precast sections. For this alternative, there would be the option to use post-tensioning with the cast-in-place or precast options. However, adding any post-tensioning to the structure increases some of the complexity and construction risk. To minimize these risks, conventionally reinforced R/C T-Beams are recommended.

#### Constructability

With a fully cast-in-place superstructure the weight restriction constraint on delivered pieces to the site is also reduced or eliminated. If the structure is constructed with cast-in-place concrete, the weight limitation constraint will be driven by the amount of concrete a concrete truck can carry without exceeding the truck weight. Only about 3.5 cubic yards of concrete will be allowed to be transported per truck due to weight. A standard concrete truck can carry about 8-10 cubic yards of concrete, so this may prove to be a significant limitation in how much concrete can be transported to the site. If the amount of concrete is limited to the 3.5 cubic yards per truck, it may be challenging to cast large portions of the structure in one pour. Further complicating the constructability of a cast-in-place option, the concrete will require admixtures in order to delay the setting of the concrete. The reason admixtures will be necessary is due to the time it will take to get a ready-mix truck to the bridge site as all of the batch facilities are located in Kahului. For Bridge #26 it may not be feasible to get concrete to the site before setting no matter what admixtures are used. Alternatively, an on-site batching area or nearby temporary batching plant may be needed for Bridge #26 if it were to be cast-in-place. In either case, a cast-in-place option will require falsework over the stream in order to support forms. Providing falsework over the stream will be a challenge in this environment and will add to the constructability complexity.

### 8.1.2 Historic Character

The existing structure is an R/C T-beam structure so replacing this bridge with the same type of structure will most closely maintain the historic character of this site compared to the other alternatives. The new R/C T-Beam bridge will appear slightly deeper than the existing bridge, due to the slightly longer span length. Additionally, the existing pier and remaining CRM abutment walls can remain in place, further mitigating historic impacts.

### 8.1.3 Environmental

#### Hydraulic Opening Impacts

A longer R/C T-Beam superstructure replacement will likely increase the structure depth from the current 26” girder depth. By increasing the section depth, there may be a negative impact to the hydraulic opening of the bridge. This negative impact of the hydraulic opening due to structure depth could be mitigated by adjusting the R/C T-Beam design to match or raise the existing low chord.

#### Resource Impacts

Environmental impacts of the cast-in-place superstructure will be slightly better than the prestressed alternatives due to the potential to eliminate the use of a crane and other heavy equipment which will result in a smaller construction footprint. However, if cast-in-place concrete is used then there will be an environmental impact due to construction of formwork and falsework over the stream. Considering there is flexibility in this alternative either being precast or cast-in-place this may be mitigated.

### 8.1.4 ROW Considerations

**Permanent ROW Impacts**

Due to the on-alignment position of the proposed structure, no permanent acquisition of the adjacent properties is anticipated.

**Temporary ROW Impacts**

Outside of the permanent ROW impacts noted above, there would be additional temporary impacts on the makai side of the existing bridge for the temporary bridge and contractor use during construction. The parcels anticipated to be impacted, primarily by contractor right of entry easements, for temporary ROW impacts are as follows, according to County of Maui GIS data:

- Parcel No. 150090100000 – Private landowner
- Parcel No. 150090090000 – Private landowner

## 8.2 Bridge Barrier and Approach Wall Barrier

### 8.2.1 MASH TL-2 Bridge Barrier

The new bridge barrier will be a MASH TL-2 crash tested barrier in the similar style to the existing barrier (Figure 13). For Bridge #26 the proposed, best match replacement barriers that have successfully been crash tested to MASH TL-2 standards (or better) are the Texas Type T221 and the HDOT Solid Bridge Rail. The superstructure will provide a new deck with adequate width and the strength to transfer the design impact loading.

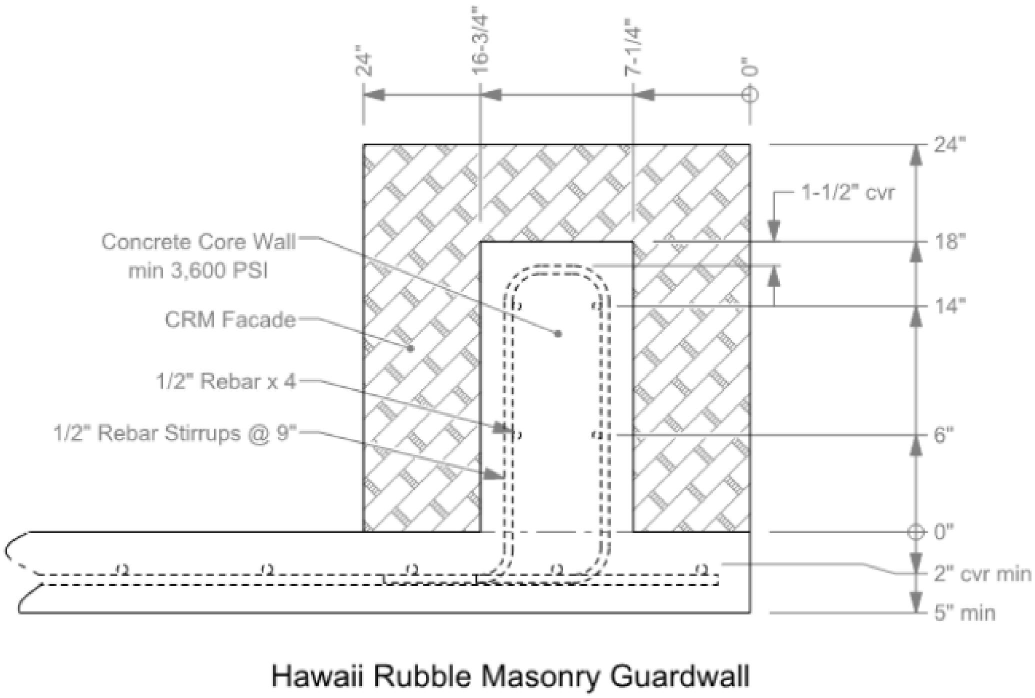
**Figure 13. Depiction of MASH TL-2 bridge Barrier**

### 8.2.2 Approach Wall Barrier

Generally, the approach wall barrier is similar to the bridge barrier listed above. The existing CRM approach wall barriers do not meet MASH crash testing standards. MASH crash tested transition barriers would replace the existing CRM barriers upon removal.

To match the historic character of the existing bridge, the use of a Hawaii CRM barrier which is internally strengthened with reinforced concrete to replace the approach wall barriers, as shown in Figure 14, is recommended. This CRM barrier has been analyzed by Texas A&M Transportation Institute for compliance with MASH TL-2 based on the MASH TL-1 crash tested CRM barrier. This analysis is documented in a report entitled “TL-2 MASH Compliance of Hawaii Rubble Masonry Wall – Task 3.2,” prepared for FHWA- Federal Lands Highway in December 2021. This report has received concurrence from both FHWA and HDOT for use on bridge projects in Hawaii.

**Figure 14. Typical Guardwall Cross Section (Double Face)**




The internally reinforced CRM barrier shown above and proposed for this project will be either connected directly to the bridge approach slab or connected to a moment slab, or anchor slab, depending on the location of the barrier placement.

# 9.0 PRELIMINARY COST ESTIMATE

A detailed cost estimate for Alternative 1C is presented in Table 1. This cost estimate only includes the construction items related to the permanent and temporary bridge and does not include other anticipated costs such as roadway. The cost estimate assumes a 48'-6" length traditionally reinforced concrete T-Beam. Selective ground nail demolition can be investigated to reduce the associated costs with the longer and deeper structure depth. A contingency item of 30% of construction item costs is included in this estimate. Standard construction methods were assumed for this cost estimate.

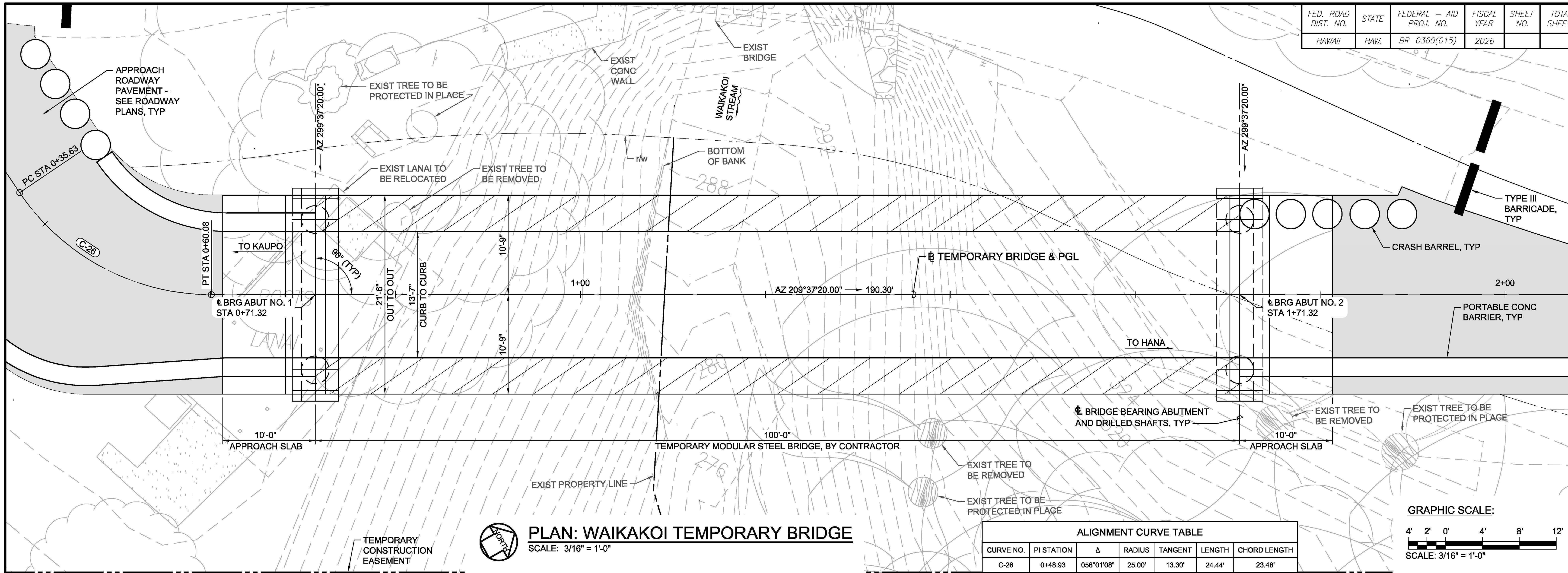
**Table 1. Preliminary Cost Estimate for the Preferred Alternative—Alternative 1C**

| Pay Item Description | Unit | Unit Price | Estimated Quantities Bid Schedule | Total Cost |
|---|---|---|---|---|
| MINOR ITEMS AND CONTINGENCY 30% OF CONST ITEMS | LPSM | $1,070,514.56 | 1 | $1,070,515 |
| TEMPORARY BRIDGE SUPERSTRUCTURE | LPSM | $825,000 | 1 | $825,000 |
| REMOVAL OF BRIDGE SUPERSTRUCTURE | LPSM | $272,870 | 1 | $272,870 |
| REMOVAL OF STONE MASONRY | CUYD | $1,670 | 6 | $10,020 |
| STRUCTURE EXCAVATION | CUYD | $200 | 175 | $35,000 |
| STRUCTURAL BACKFILL | CUYD | $350 | 55 | $19,250 |
| SHORING AND BRACING | SQFT | $500 | 925 | $462,500 |
| AGGREGATE BASE GRADING C, 8-INCH DEPTH | CUYD | $95.70 | 25 | $2,393 |
| STRUCTURAL CONCRETE, CLASS A | CUYD | $3,440.00 | 130 | $447,200 |
| REINFORCING STEEL | LB | $7.80 | 27500 | $214,397 |
| BRIDGE RAILING, CONCRETE | LNFT | $1,950.00 | 103 | $200,850 |
| BEARING DEVICE, ELASTOMERIC | EACH | $8,250.00 | 14 | $115,500 |
| MICROPILE | LNFT | $890.00 | 1600 | $1,424,000 |
| STONE MASONRY | SQYD | $6,627.50 | 11 | $72,903 |
| STONE MASONRY GUARDWALL | LNFT | $2,915.00 | 100 | $291,500 |
| MileStone: 30% Submittal - Waikakoi Bridge 26 - Alternative 1C - Cast-In-Place T-Girders with Temp Bridge | | | | $5,463,896 |

Appendix A.

# TS&L PLANS

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR–0360(015) | 2026 | | |

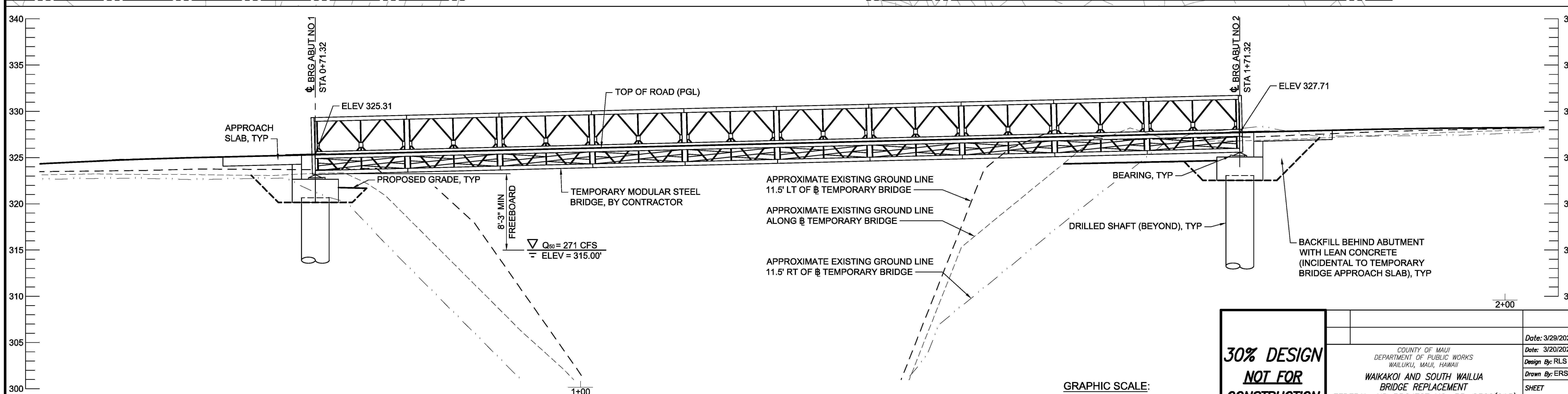



## PLAN: WAIKAKOI TEMPORARY BRIDGE

SCALE: 3/16" = 1'-0"

ALIGNMENT CURVE TABLE

| CURVE NO. | PI STATION | Δ | RADIUS | TANGENT | LENGTH | CHORD LENGTH |
|---|---|---|---|---|---|---|
| C-26 | 0+48.93 | 056°01'08" | 25.00' | 13.30' | 24.44' | 23.48' |




## PROFILE - WAIKAKOI TEMPORARY BRIDGE

SCALE: HORIZ: 3/16"=1'0"
VERT: 3/16"=1'0"

GRAPHIC SCALE:
4' 2' 0' 4' 8' 12'
SCALE: 3/16" = 1'-0"

**30% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

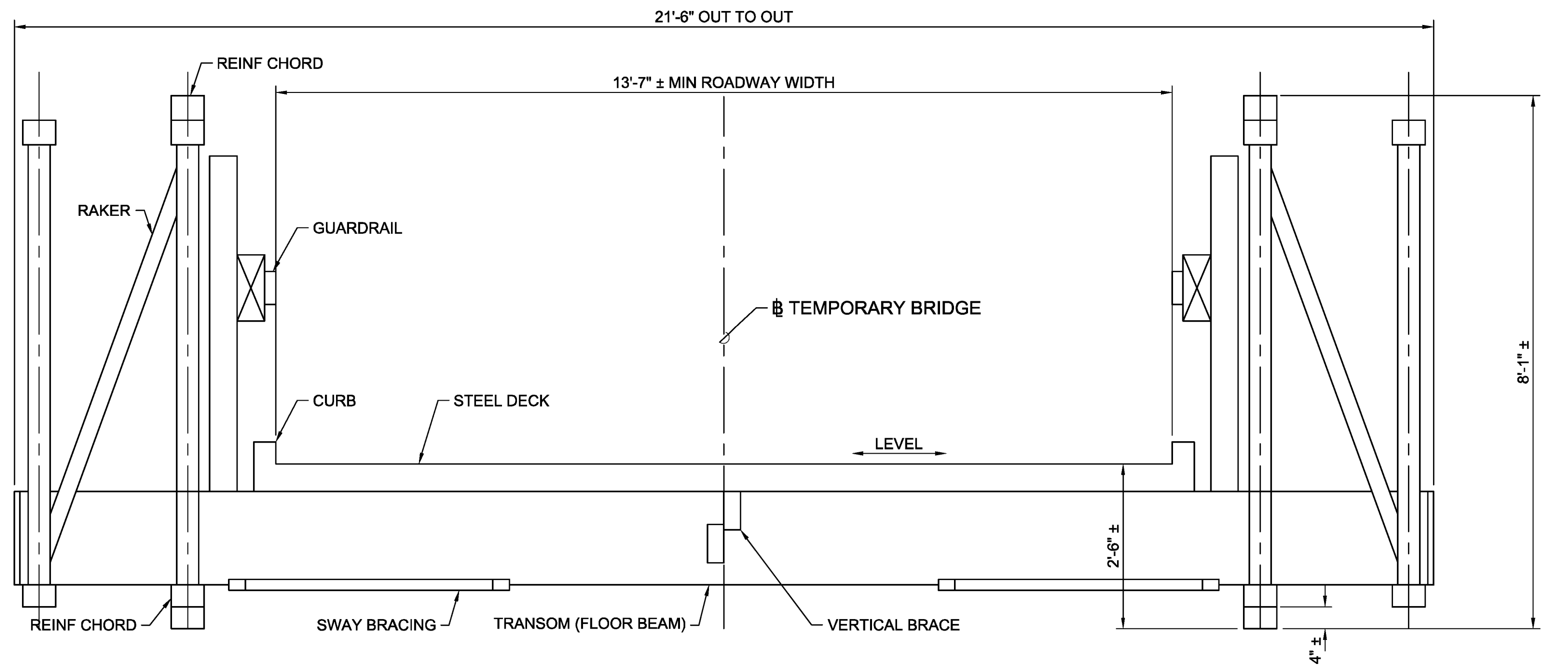
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI TEMPORARY BRIDGE PLAN AND PROFILE

Date: 3/29/2024
Date: 3/20/2024
Design By: RLS
Drawn By: ERS
SHEET S–018
of Sheets

PROJ. NO.: 2020040
Date Saved: Wed, 17 Apr 2024 – 10:09am
CAD File Name: C:\pwworking\west01\d1900569\S-018 – Waikakoi Temp Bridge Plan & Profile01.dwg

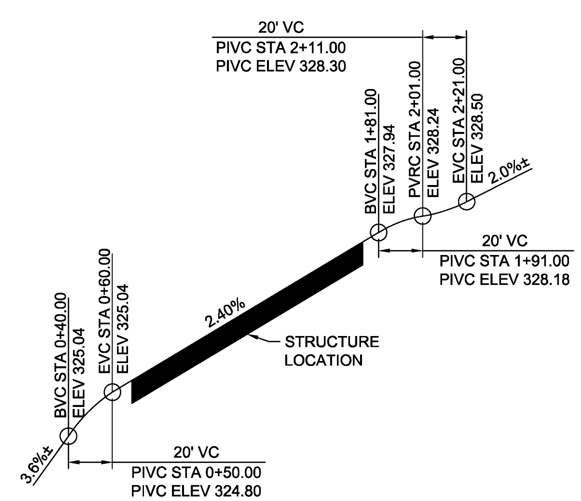
| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | | |




## TYPICAL SECTION - TEMPORARY BRIDGE

SCALE: 3/4" = 1'-0"

(LOOKING AHEAD STATION)




## PROFILE GRADE DIAGRAM

SCALE: NO SCALE

GRAPHIC SCALE:

1' 0' 1' 2' 3'

SCALE: 3/4" = 1'-0"

**30% DESIGN**

**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

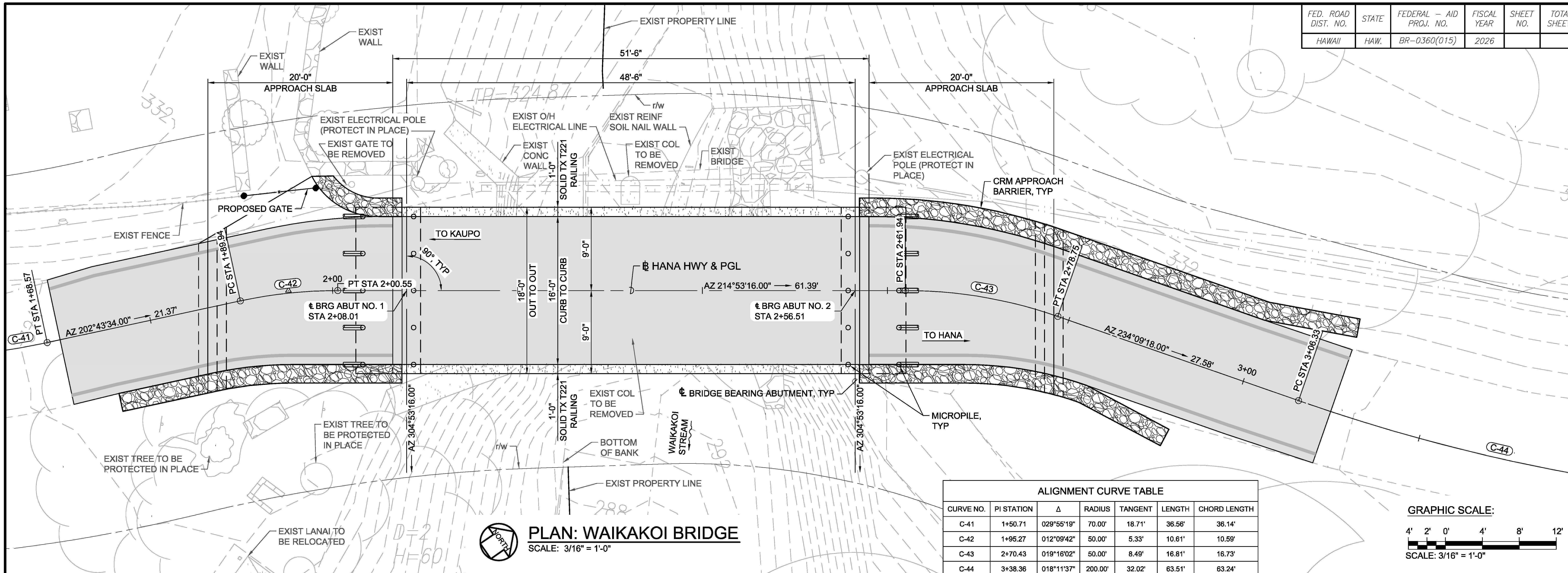
WAIKAKOI TEMPORARY BRIDGE
TYPICAL SECTION

Date: 3/29/2024
Date: 3/20/2024
Design By: RLS
Drawn By: ERS
SHEET
S-019
of Sheets

PROJ. NO.: 2020040

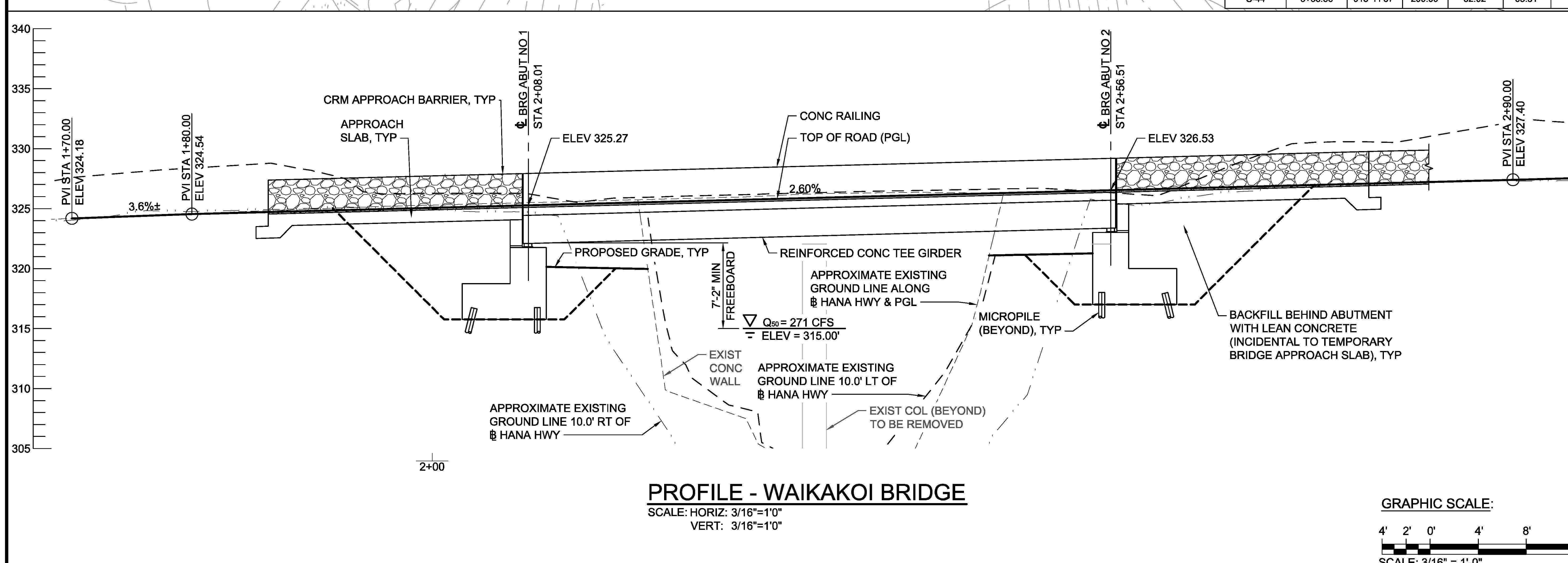
Date Saved: Tue, 16 Apr 2024 — 10:08am
CAD File Name: C:\pwworking\west01\d1900569\S-018 — Waikakoi Temp Bridge Plan & Profile01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR–0360(015) | 2026 | | |




ALIGNMENT CURVE TABLE

| CURVE NO. | PI STATION | Δ | RADIUS | TANGENT | LENGTH | CHORD LENGTH |
|---|---|---|---|---|---|---|
| C-41 | 1+50.71 | 029°55'19" | 70.00' | 18.71' | 36.56' | 36.14' |
| C-42 | 1+95.27 | 012°09'42" | 50.00' | 5.33' | 10.61' | 10.59' |
| C-43 | 2+70.43 | 019°16'02" | 50.00' | 8.49' | 16.81' | 16.73' |
| C-44 | 3+38.36 | 018°11'37" | 200.00' | 32.02' | 63.51' | 63.24' |




**30% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

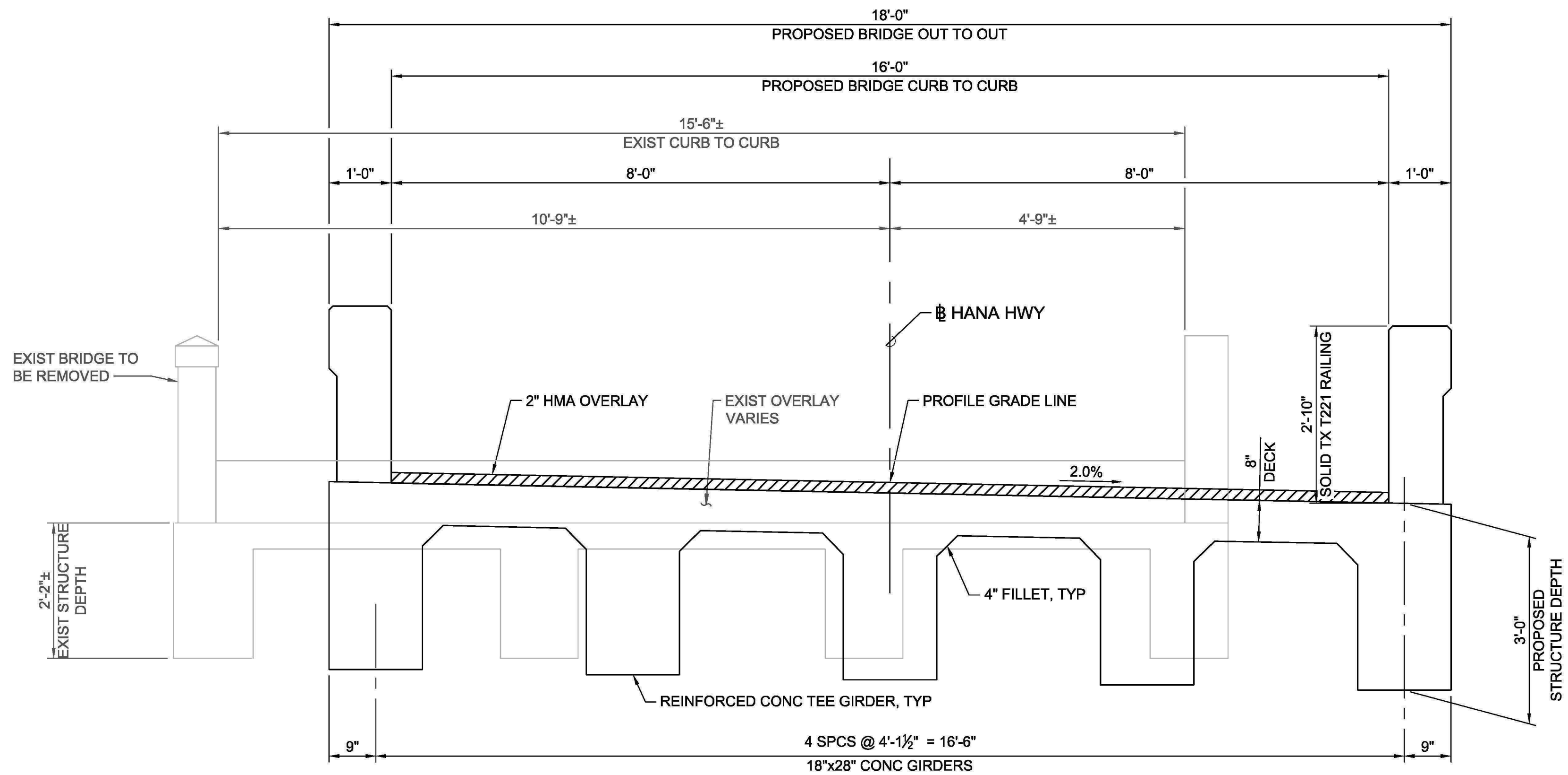
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

## WAIKAKOI PERMANENT BRIDGE PLAN AND PROFILE

Date: 3/29/2024
Date: 3/20/2024
Design By: RLS
Drawn By: ERS
SHEET S–024
of Sheets

PROJ. NO.: 2020040
Date Saved: Tue, 16 Apr 2024 – 10:01am
CAD File Name: C:\pwworking\west01\d1900569\S–024 – Waikakoi Perm Bridge Plan & Profile01.dwg

| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR–0360(015) | 2026 | | |




## TYPICAL SECTION - PROPOSED BRIDGE

SCALE: 3/4" = 1'-0"

(LOOKING AHEAD STATION)

GRAPHIC SCALE:

1' 0' 1' 2' 3'

SCALE: 3/4" = 1'-0"

**30% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL–AID PROJECT NO. BR–0360(015)

WAIKAKOI PERMANENT BRIDGE
TYPICAL SECTION

Date: 3/29/2024
Date: 3/20/2024
Design By: RLS
Drawn By: ERS
SHEET S–025
of Sheets

PROJ. NO.: 2020040

Date Saved: Tue, 16 Apr 2024 – 10:19am
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# Appendix H. South Wailua Bridge Replacement (Bridge #23), Structure Selection Report. HDR, Inc. April 2024.

# SOUTH WAILUA BRIDGE (BRIDGE #23)

## MAUI, HAWAII

# STRUCTURE SELECTION REPORT

*Prepared for:*

County of Maui Department of Public Works
Engineering Division

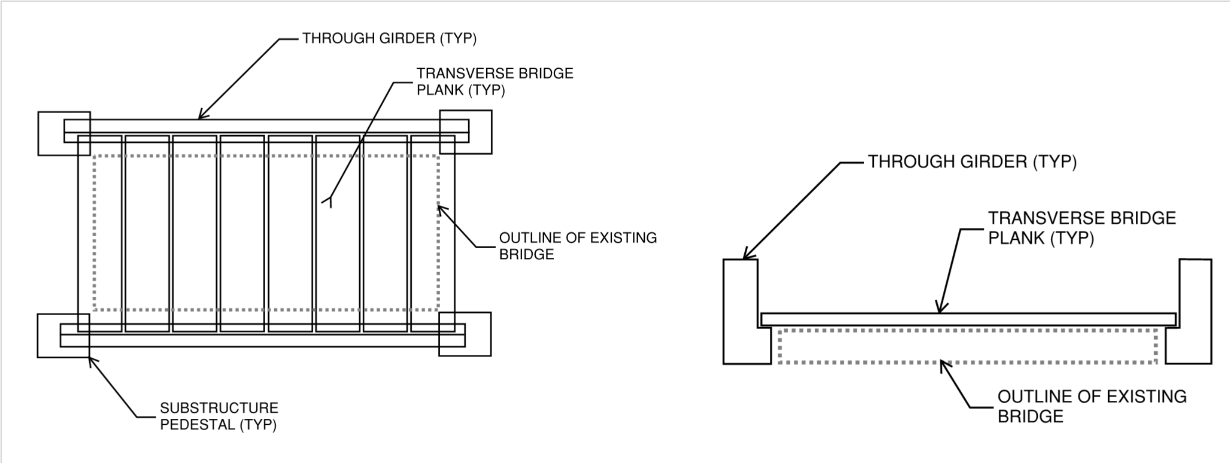
*Prepared* by:

HDR

305 South High Street, Ste 101
Wailuku, HI 96793

April 2024

**Figure 3. ABC Alternative 1—Through Girder Alternative**




## 6.2 ABC Alternative 2—Partial Off-line Staged Construction

This alternative includes using the existing bridge during construction to maintain traffic on the existing structure as the new bridge is constructed partially off-line and partially within the footprint of the existing structure. This approach requires the existing bridge to have multiple girder lines and/or a continuous slab and adequate width to accommodate single lane traffic shifts (anticipated 10’-6” minimum single lane between barriers). Figure 4 depicts a concept sketch of Alternative 2—Partial Off-line Staged Construction.

# CONTENTS

## Appendices



## Figures

## Tables

# 1.0 EXECUTIVE SUMMARY

## 1.1 Purpose of Report

The purpose of this report is to determine the recommended structural alternative to replace the existing South Wailua Bridge (Bridge #23) on State Route 360 (Hana Highway) in Maui County, Hawaii.

## 1.2 Review of Existing Conditions

A topographic survey of the site conditions around South Wailua Bridge was conducted September 2022 utilizing both LiDAR technology and supplemental traditional survey methods. Electronic base map files were prepared for the design team use in October 2022. The existing structure to be replaced is approximately 16'-8" out to out and carries a single lane roadway approximately 15'-6" wide between the existing bridge barriers. The existing structure is approximately 57' in length. A geotechnical boring and probing program was carried out to determine the subsurface and pavement conditions near the bridge in February 2021.

## 1.3 Design Criteria and Evaluation Criteria

The design criteria for the structural design of this project will include the current 9th Edition of the LRFD AASHTO Bridge Design Specifications; as supplemented by the January, 2018 HDOT Design Criteria for Bridges and Structures, along with relevant Maui County specific standards. The Evaluation Criteria (including sub-criteria) for evaluating feasible alternatives is as follows:

- Construction Impacts & Constructability
  - Minimization of Traffic Impacts & Accelerated Bridge Construction (ABC) potential
  - Local Availability
  - Complexity Risk
  - Constructability
- Historic Character
- Construction Cost
- Environmental Resources
  - Hydraulic Opening Impacts
  - Resource Impacts
- Right of Way (ROW)
  - Permanent ROW Impacts
  - Temporary ROW Impacts

## 1.4 Temporary Bridge during Construction & Accelerated Bridge Construction

A discussion on a temporary bridge layout is provided in this report in Section 5. The use of a temporary bridge is tied to the chosen alignment (online vs. offline) and is discussed more in Section 7.

Additionally, methods of Accelerated Bridge Construction techniques are presented to aid in the potential rapid construction of the bridge improvement. The intention of this report is not to select a construction method, as that is a means and methods determination by the selected contractor at the time construction of the bridge improvement, but rather a representation of potential accelerated methods to determine each alternative's potential to be constructed in an accelerated manner, should the project dictate rapid construction, as opposed to conventional construction methods.

## 1.5 Structural Alternatives

Below are the structural alternatives evaluated with regards to the evaluation criteria established for the project:

- Alternative A - Prestressed Inverted Tee Girders
- Alternative B - Prestressed Bridge Planks
- Alternative C - Reinforced Concrete T-beams
- Alternative D - Cast-in-place (CIP) Post-Tensioned Slab
- Alternative E - Prestressed I-Girders

Both bridge railings and approach railings are also presented in this report. According to the precedent for the corridor established by the Hawaii Department of Transportation (HDOT), MASH TL-2 is anticipated for this project. Each structural alternative above is evaluated relative to its ability to incorporate a MASH TL-2 railing.

## 1.6 Recommended Structural Alternative

Following careful analysis of each of the alternatives listed above, it was determined that Alternative D — Cast-in-Place (CIP) Post-Tensioned Slab is the recommended structural alternative to move forward to final design. This proposed structure will have a span length of 60'-0" with an out-to-out width of 18'-0".

The proposed structure is a single span structure which will replace the existing bridge in its current location. A temporary bridge will be constructed that will allow for the uninterrupted flow of traffic throughout construction. Traffic will be rerouted to the new bridge upon completion. Please refer to section 7.0 of this report of an in-depth discussion of the alignment considerations.

An in-depth analysis of the evaluation process for the structural alternatives considered is provided in this report.

# 2.0 PURPOSE, SCOPE, DESIGN CRITERIA

## 2.1 Purpose of Report

The purpose of this report is to determine the recommended structural alternative to improve the South Wailua Bridge (Bridge #23) on State Route 360 (Hana Highway) in Maui County, Hawaii.

## 2.2 Scope of the Structure Selection Report

This report will focus on the selection of the structural alternative to improve Bridge #23. The report will provide background material on the existing site conditions at Bridge #23, a description of evaluation criteria for comparing alternatives, development of replacement alternatives, and the selection of a recommended alternative for design and construction.

## 2.3 Location

The South Wailua Bridge is located near mile point 41.5, approximately 7.6 miles south of Hana on the Hana Highway (State Route 360; Figure 1).

**Figure 1. South Wailua Bridge Location**

### 2.4 Design Criteria

The proposed improvements at Bridge #23 will adhere to the relevant provisions of the American Association of State Highway and Transportation Officials (AASHTO) specifications and guidelines, the Hawaii Department of Transportation (HDOT) Design Criteria for Bridge and Structures, and site specific geotechnical, hydraulic, and structural investigation data and reports. Design exceptions will be required to match the recommendations in the Maui County Hana Bridges Preservation Plan and precedent set on other similar bridge replacement projects along the Hana Highway.

## 3.0 EXISTING CONDITIONS

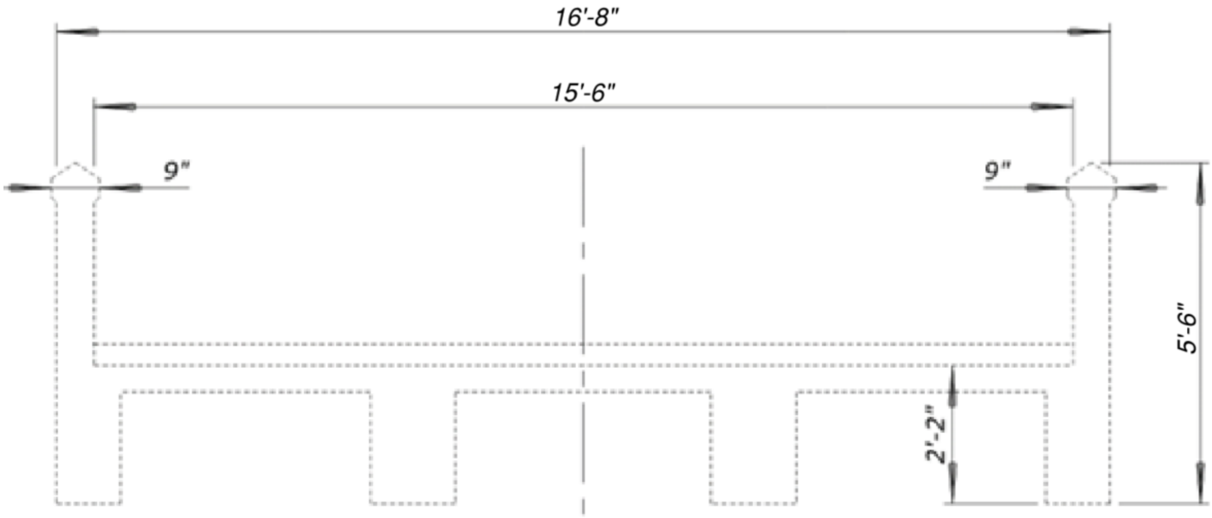
### 3.1 Topographic/Site Conditions

Bridge #23 carries Hana Highway over Honolewa stream near mile point 41.5. A site survey was completed in September 2022 utilizing Lidar scanning in order to provide a topographic survey map of the Bridge #23 site and surrounding area. Bridge #23 is a two-span bridge that is approximately 57’-0” in length with a center pier consisting of two concrete columns supporting a concrete cap. The bridge out to out width is approximately 16’-8”. The bridge consists of a conventionally reinforced concrete T-beam superstructure with 4 beams that are supported by reinforced concrete abutments. As seen in Figure 2, the rail-to-rail width of Bridge #23 is 15’-6”, and it is only for single lane use.

The potential for rocks falling on to the roadway from steep embankments on the mauka side of both bridge approaches is high. Additionally, heavy vegetation exists around all four corners of the bridge and is growing along the curb lines of the bridge. Short concrete rubble masonry wingwalls exist at all corners except the Hana mauka corner of the structure. The topography drops abruptly down to the stream below at all four corners of the bridge. Bridge #23 has a pier height of approximately 23’-6”. The roadway grade is fairly level at the structure.

Similar to most bridges along Hana Highway, access is very challenging due to the winding, narrow nature of the highway. It is estimated that the largest truck that can navigate the road to the bridge is a standard width truck that is 40’ long based on the dimensions of maintenance trucks that are used along Hana Highway. With a maximum truck length of 40’, the maximum piece lengths that can be expected to be shipped out will be about 30’ long, unless specialized equipment is used. There is precedent based on the Paihi Bridge replacement project that with specialized equipment up to a 60’ piece length can be trucked in from the Kahului side of the island to the site. However, transporting a piece this size effectively blocked the Hana Highway during a multi-day transport. Additionally, weight limitations will be imposed on construction material taken to the bridge site due to load posting of the bridges along Hana Highway. These limitations will be a significant logistical challenge of any replacement option presented for Bridge #23.

**Figure 2. Typical Section of Existing Bridge #23 Structure**




## 3.2 Existing Structure Condition

The 2020 bridge inspection report shows Bridge #23 has an NBI condition rating of 4 for the deck condition, a 3 for the superstructure condition, and a 5 for the substructure condition. A rating of 3 stands for serious condition characterized by advanced section loss, deterioration, spalling, or scour that has seriously affected primary structural components with local failures possible. A rating of 4 stands for poor condition which is characterized by advanced section loss, deterioration, spalling, or scour. A rating of 5 stands for fair condition which suggests the elements are sound but may have minor section loss, cracking, or spalling. Some of the deficiencies noted are significant spalls with exposed rebar for the entire length in both exterior girders, water staining and efflorescence in the deck and superstructure, scouring of the Hana rock cliff embankment below abutment, cracking and vegetation growth on the abutments, and spalling with exposed rebar in the pier columns. Bridge #23 is load posted for 9 tons preceding the bridge on both sides. This posting is in relation to the low legal load rating factors for Bridge #23 which are all less than 1.0. A recent site visit to this bridge in January 2024 found that the barrier at the makai/Hana corner of the bridge has been broken away and there is currently a gap in the bridge railing. Traffic cones and temporary steel posts have been placed across the gap to warn bridge users.

## 3.3 Geotechnical Evaluation Results

Geolabs provided a geotechnical investigation at Bridge #23. Based on initial feedback from Geolabs, subsurface conditions vary from weathered rock to soils, suggesting new bridge structures are to be supported on micropile foundation systems. A preliminary Geotech report will be prepared prior to 60% design and submitted separately from this report.

## 3.4 Hydrology and Hydraulics Results

HDR Engineering completed a preliminary hydrology and hydraulic model for Bridge #23. The hydraulic modeling for Bridge #23 showed that the bridge will be able to convey all evaluated storms and maintains the minimum 2' freeboard design requirement during the 50-year design storm. Scour was also investigated during the hydrology and hydraulics testing. At Bridge #23, there is potential for moderate scour with the existing pier column footing exposed. See the Hydrology and Hydraulic report for additional information.

# 4.0 CONTRIBUTING FACTORS AND EVALUATION CRITERIA

To provide a consistent approach to evaluate each feasible alternative, each solution for replacement will be discussed as it relates to the following five evaluation criteria:

- Construction Impacts & Constructability
- Historic Character
- Construction Cost
- Environmental Resources
- ROW Considerations

Each of the evaluation criteria listed above will be broken down into evaluation sub-criteria in order to adequately cover the aspects that affect a specific evaluation criteria. Each sub criteria will be given a qualitative rating of good, fair, or poor. A rating of good means that the criteria being discussed is considered a positive for a given alternative when compared to others. A fair rating means that the alternative is neither a positive nor a negative when compared to others. Last, a rating of poor means that the alternative being presented is not a good solution for the given criteria. The evaluation category ratings will then be used to assist in identifying preferred alternatives for each structure.

The alternatives analysis included in Section 8 of this report is relevant to Bridge #23 structural alternatives only. The intent is to use this analysis to compare the Bridge #23 proposed structural alternatives given the site-specific conditions, constraints, and opportunities. A preferred structural alternative for Bridge #23 will be determined and presented based on this analysis.

Below is a brief synopsis of each evaluation criteria and their sub-criteria.

## 4.1 Construction Impacts & Constructability

Construction impacts will cover components that influences the difficulty of construction and construction time for each bridge. The following list gives the sub criteria that will be evaluated to assess construction impacts.

- **Minimization of Traffic Impacts & Accelerated Bridge Construction (ABC) Potential**— This will cover how a particular solution may be suitable for ABC techniques that will reduce the duration of construction (See Accelerated Bridge Construction Alternatives in Section 6 for more detail).

- **Local Availability-** This criteria will give weight to whether an alternative can be sourced locally in Maui or if it needs to be brought from the mainland and/or other islands resulting in increased lead times, cost, and logistical challenges.
- **Complexity Risk-** This considers how challenging the structural details of the specific alternative will be to implement in the field.
- **Constructability-** This criteria will weigh how challenging it may be to deliver materials and equipment to the site. Furthermore, this criterion will evaluate the available area at the site to store and maintain necessary materials and/or equipment.

## 4.2 Historic Character

Historic character will cover how well each alternative provides context sensitive solutions at the bridge. The structural solution will be subject to Section 106 and Section 6E-8 review and potential mitigation, therefore each solution will be evaluated based on its ability to retain the historic character of the roadway and bridge.

## 4.3 Construction Cost

Cost criteria will include the cost components related to the bridge solution. These costs include initial costs for materials and construction of the permanent structure. Additional costs, such as temporary bridge costs, will also be shown.

## 4.4 Environmental Resources

Environmental criteria will cover impacts of a given solution to the physical environment around the bridge. This will include hydraulic impacts and resource impacts.

- **Hydraulic Opening Impacts—**this pertains to the effects a bridge solution will have on the hydraulics and hydrology of the site.
- **Resource Impacts—**this will consider how the construction effort and the final alignment will affect the sensitive site locations such as biological resources, wetlands, etc.

## 4.5 ROW Consideration

- **Permanent ROW Impacts—**this considers the final bridge configuration impact on adjacent ROW to the Hana Highway.
- **Temporary ROW Impacts—** this considers the temporary impacts on adjacent ROW to the Hana Highway during construction of the new bridge.

# 5.0 TEMPORARY BRIDGE DURING CONSTRUCTION

The ability to maintain traffic at each bridge is a key component to the constructability of each structural alternative. With Hana Highway being the main route connecting Hana to Kaupo, as well as the Hana area to central and west Maui more broadly, it is of high importance to maintain access along the highway during construction. Given the narrow nature of these bridges, it is challenging to provide a viable construction phasing plan that keeps a lane open across the bridge without changing the alignment significantly. Further, temporary bridges have been used successfully around the Hawaiian Islands to maintain traffic and facilitate construction in remote locations such as the Hana Highway.

The use of a temporary bridge at Bridge #23 over Honolewa Stream may be challenging due to the limited landing distance on each side of the bridge. At both the Hana and Kaupo ends of the bridge, there is approximately 20' to 40' of available landing distance that can be utilized for a proposed temporary alignment. In addition to there being a short landing distance on both sides of the structure, there is a sharp radius turn between the existing and temporary alignment on the Hana side of the structure. Given the sharp turn created, options such as skewing the approach barriers, or flaring the approach slab can be explored to improve sight distance. The proposed temporary bridge length is approximately 110' which is within the span capabilities of temporary bridges. Given the parking lot on the Kaupo side of the bridge, launching the proposed temporary bridge from this side could be feasible. However, the alignment and launching of the proposed temporary bridge for this structure will need to be further investigated if it is determined to be necessary.

On similar recent projects along the Hana Highway, ROW considerations have been a key factor in determining the applicability of the use of temporary bridges during construction. Because a temporary bridge shifts public traffic onto adjacent, sometimes privately owned land, a legal description and transaction has been required. Along the Hana Highway, there are several areas where ROW is not well defined and legal descriptions and/or metes and bounds may not be readily available. This should be considered when determining the appropriate method of construction and maintenance of traffic during construction.

For the South Wailua project site there is available topography to construct a temporary bridge offline makai of the existing bridge, negating the need for phased construction across the existing bridge or an offline new bridge as traffic will be maintained on the temporary bridge for the duration of construction. This will be discussed more in Section 7.

# 6.0 ACCELERATED BRIDGE CONSTRUCTION (ABC) ALTERNATIVES

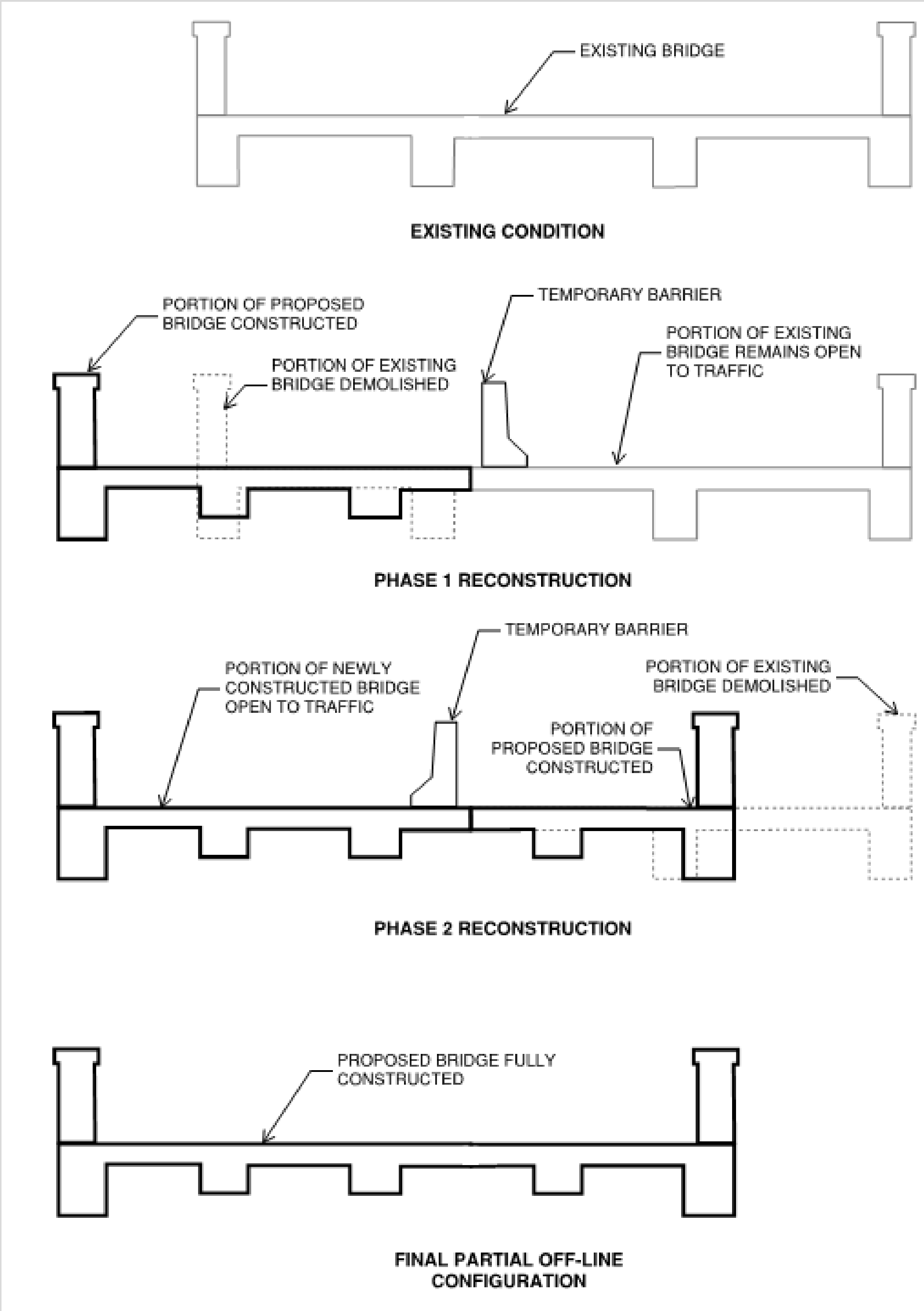
Hana Highway is a major route for commuter traffic, tourists, emergency vehicles and commercial traffic alike. If Hana Highway is not operational, the detour is extensive and requires lengthened travel times to access the eastern side of Maui from Hana. Because of this, limiting impacts to Hana Highway during construction is of paramount importance. In the previous section of this report, the use of a temporary bypass bridge was covered. This section will evaluate potential constructability alternatives to further limit impacts to Hana Highway, to the extent practical, while also focusing on reducing the construction duration, regardless of the use of a temporary bypass bridge. Even if a temporary bypass bridge is used, accelerated construction may still be desirable to reduce temporary impacts to the corridor by shortening the construction duration window.

Below, five (5) ABC and constructability alternatives will be covered considering project specific constraints. These ranged from piece length restrictions, weight restrictions, limited laydown and staging areas, topographic challenges, geometric challenges of working alongside the existing structures and the waterways below, among others. Further in this report, the feasibility of each of these alternatives for the specific structural alternative will be evaluated.

## 6.1 ABC Alternative 1—Through Girder Alternative

This alternative includes building new “through girders” outboard of the existing bridge while the existing bridge remains in service. The new through girders will be supported on substructure units positioned outside of the existing bridge footprint. Once the through girders are in place, precast bridge planks can be placed over the existing roadway overnight with a “ramp” utilized to allow traffic to cross the bridge during the day. A variation of this alternative would be under a multi-day closure window to remove the existing superstructure after the through girders are in place and then place transverse bridge planks once the existing superstructure is removed. This would allow the bridge to remain on the same vertical alignment as the existing bridge. The option to place planks over the existing bridge would require a vertical adjustment of the roadway. Figure 3 depicts some concept sketches of ABC Alternative 1—Through Girder Alternative.

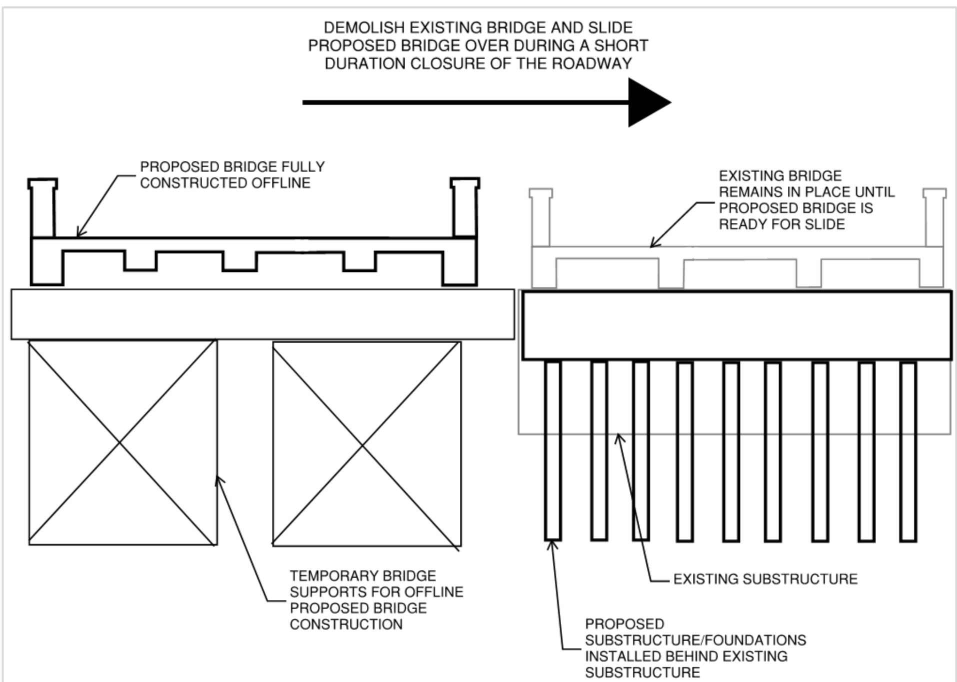
**Figure 4. ABC Alternative 2—Partial Off-line Staged Construction**



## 6.3 ABC Alternative 3—Transverse Bridge Slide

This alternative is to construct the proposed bridge transversely off-line from the existing structure on temporary foundations and then complete a transverse slide to set the bridge on new abutments during a short bridge closure. This would allow the existing structure to remain in place and in service during the proposed structure construction. The proposed superstructure would likely be constructed either on substructure units outside of the existing bridge footprint, similar to the ABC Alternative 1, to allow for traffic to be maintained during the day with substructure construction occurring during night and/or off-peak hours. Cover plates would be needed while constructing the permanent abutments to allow for traffic to resume during the day. Figure 5 shows a sketch of ABC Alternative 3—Transverse Bridge Slide.

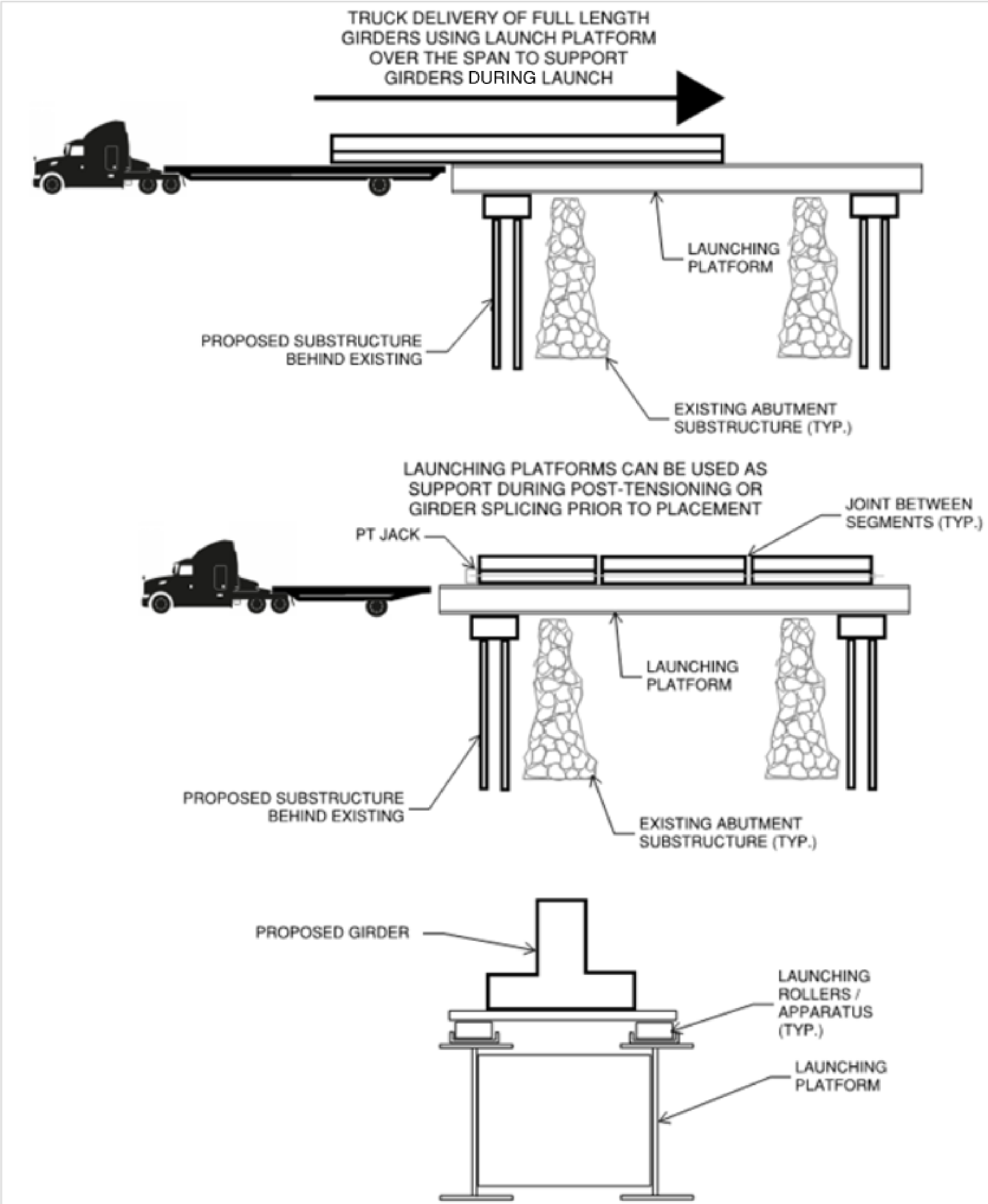
**Figure 5. ABC Alternative 3—Transverse Bridge Slide**




## 6.4 ABC Alternative 4—Longitudinal Bridge Slide/Launch

This alternative utilizes longitudinal launching strategies to install the superstructure across the span, launching from one abutment to the other. A launching structure (W-section steel girders, temporary bridge truss panels, etc.) can be installed across the channel. These launching structures can be outfitted with rollers or sliding surfaces to push the proposed girders across the span. Once the girders are positioned above the proposed bearings, cranes on either side of the span can lower the girders onto the proposed bearings. A benefit of this alternative is that the launching structures can be assembled in pieces (connected steel truss panels or spliced steel beams) and also can support permanent girder segments for post-tensioning if a longer span is needed than what can be transported to the site. Similar to ABC Alternative 3, new substructure units could be installed behind the existing abutments during night closures and covered with temporary steel plates during the day to allow for traffic to pass. Figure 6 is a sketch of ABC Alternative 4—Longitudinal Bridge Slide/Launch.

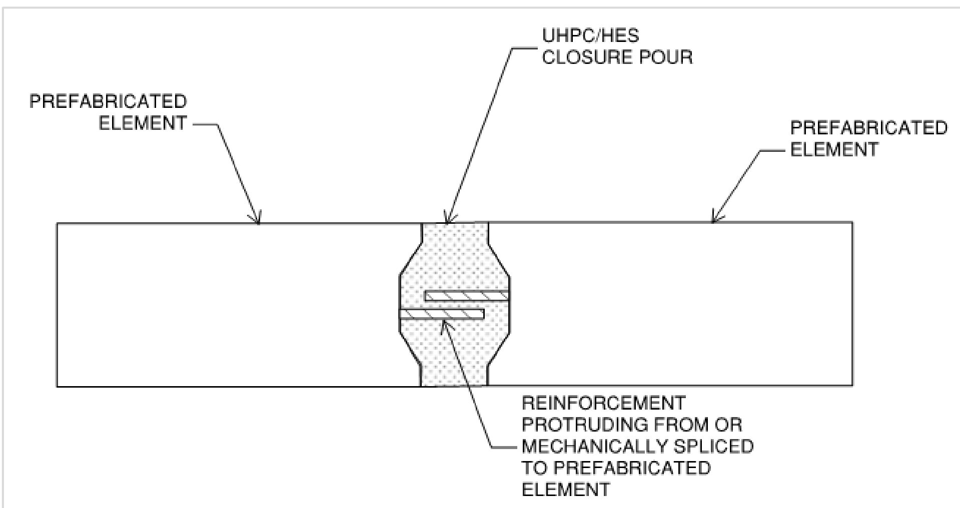
**Figure 6. ABC Alternative 4—Longitudinal Bridge Slide/Launch**



### 6.5 ABC Alternative 5—Modular Bridge (Prefabricated units with High Early Strength/ Ultra-High Performance Concrete (HES/UHPC) connections)

This alternative utilizes prefabricated units with rapid setting connections between the pre-fabricated elements to install the bridge in a quick and efficient manner. The typical application for this type of ABC is the use of longitudinal closure pours between bridge elements over the spans, with the potential for transverse closure pours over the piers. Depending on the structure type, the prefabricated elements and the closure pours themselves could be used for the final deck surface of the bridge. Otherwise, prefabricated deck panels can be utilized with rapid setting connections. In addition to the superstructure elements, new substructure units can be constructed of prefabricated elements with rapid setting connection pours as well. As an alternative, the substructures can be installed behind the existing abutments, similar to other ABC alternatives described above. Figure 7 are sketches of ABC Alternative 5—Modular Bridge (Prefabricated units with HES/UHPC connections).

**Figure 7. ABC Alternative 5—Modular Bridge (Prefabricated units with HES/UHPC connections)**




# 7.0 BRIDGE AND ROADWAY ALIGNMENT CONSIDERATIONS

For the South Wailua Bridge, both an online alignment and offline alignment were considered. A comparative analysis for the alignment options for the proposed Bridge #23 are as follows:

### Online/Partial Online Alignment Replacement Option

This alignment option consists of building a replacement bridge utilizing the existing alignment of the current roadway and structure.

To maintain traffic flow during construction, this alignment option would require either accelerated bridge construction (ABC) as discussed in Section 6 or a temporary bridge. Traffic may still be disrupted temporarily depending on the ABC methodology used and superstructure type. Superstructure options may be limited due to available materials and the capabilities of local contractors. Although a viable option, ABC typically involves more complicated construction practices such as bridge slides or multiphase bridge construction. ABC options are typically used when existing topography and/or ROW proves challenging for offline alignments. Both permanent and temporary ROW impacts may be reduced since this replacement option would require little additional space outside the existing bridge limits. A temporary bridge may be feasible as discussed in Section 5, though the associated cost would be high.

The online replacement option would also remove or cover over most of the existing bridge and limit options for historic preservation of the existing bridge.

### Offline Alignment Replacement Option

This alignment option consists of building a replacement bridge with a new alignment makai of the existing structure.

The topography makai of the existing bridge provides necessary space for a new offline bridge. Though there is a tight radius of the roadway on the Hana side of the bridge, skewing or curving the Hana side approach slab could improve this radius and sight distance with a new alignment. Traffic could be maintained on the existing structure and alignment for the duration of construction, negating the need for a temporary bridge resulting in significant cost savings. An offline construction does not require ABC construction, which could mitigate or eliminate traffic disruption and utilize more conventional construction methodologies requiring no phasing or bridge slides and simplify construction. The existing bridge may remain in place, presenting the opportunity to mitigate impacts associated with Section 106 and 6E-8 consultation, by preserving its historic character. Since an offline bridge will be outside of the existing bridge limits, ROW acquisition is anticipated but expected to be minimal. If the existing bridge is to remain open to pedestrian traffic, it could impose future maintenance costs.

### Selected Alignment for Bridge #23

Following careful analysis of both alignment options listed above, it was determined that a partial online replacement option is the recommended alignment to move forward to final design. It was determined that use of a temporary bridge will be required for this option. An exhibit of this alignment can be found in Appendix A. An online alignment proves viable due to the benefits of historic preservation of the existing roadway alignment, traffic flow, and simplified construction over phased partial offline or offline replacement.

# 8.0 STRUCTURE ALTERNATIVES

As determined in the previous section, the preferred alternative is to replace the existing bridge on the original alignment, with the slightly wider new bridge extending slightly makai of the existing bridge. The existing bridge superstructure will be removed and the pier in the stream can either be demolished or remain in place.

The structural alternatives which will be considered for the proposed Bridge #23 structure are as follows:

- Alternative A - Prestressed Inverted Tee Girders
- Alternative B - Prestressed Bridge Planks
- Alternative C - Reinforced Concrete T-beams
- Alternative D - Cast-in-place (CIP) Post-Tensioned Slab
- Alternative E - Prestressed I-Girders

Additionally, various material types were considered and ruled out including steel, timber, and Hybrid Composite Beams (HCB). Steel superstructures were not considered as HDOT does not currently allow steel superstructures in Hawaii. Timber was ruled out as it doesn't match any of the structures along the corridor and would have very poor evaluations for the design criteria considered. HCB structures were ruled out as they could not be post-tensioned together and they are a proprietary system with no alternatives which could not be justified for this project.

## 8.1 Equal Evaluation Criteria Rating Regardless of Alternative

For each of the alternatives identified, the following evaluation criteria are the same regardless of the alternative discussed and therefore, those evaluation criteria are discussed below, rather than the discussions specific to each alternative in the subsequent sections.

### 8.1.1 Construction Impacts

#### Minimization of Traffic Impacts and ABC Potential

Because the structure will be constructed on-alignment from the existing bridge, it is anticipated that a temporary bridge will maintain traffic during construction with minimal interruptions. Due to site constraints for contractor operations as well as the existing roadway limited width and challenging geometry, there will likely be some traffic control and management impacts during construction, which may include temporary traffic signals, lane width reductions, single lane approaches, etc. However, traffic impacts for a temporary bridge solution are considered to be much less than those for a partial off-alignment solution, as previously discussed in this report.

While ABC techniques can certainly be utilized for an on-alignment structure to speed up construction, the premium in construction costs for implementing these techniques is not justified, as traffic will remain relatively unaffected by the use of a temporary bridge.

For these reasons, the minimization of traffic impacts for all alternatives is considered to be **good**.

### 8.1.2 Historic Character

Construction of a new bridge on-alignment provides the opportunity to retain portions of the existing bridge in place, as well as maintaining the historic alignment of the Hana Highway. For the new structure, the substructures and approach walls to support the new roadway approach alignment can be detailed with CRM masonry façade. For all alternatives these CRM materials will resemble the aesthetic character of other structures along the Hana Highway, however for

Alternatives C and E, the increase in structure depth of approximately 1.5'-3' represents a substantial increase in scale. For these reasons, the historic character criteria of Alternatives A, B, and D is considered to be **good**, and Alternatives C and E is considered to be **fair**.

### 8.1.3 ROW Considerations

#### Permanent ROW Impacts

With the mostly on-alignment position of the proposed structure, it is unlikely that the proposed structure will require permanent acquisition of the adjacent properties on the makai side of the existing bridge. Use of a temporary bridge on the makai side will require temporary easements. Based on preliminary review of ROW in the immediate project area, there appears to be two parcels which will be affected by the proposed structure according to County of Maui GIS data:

- Parcel No. 150080010000 – Private landowner
- Parcel No. 150100080000 – Publicly owned by the State of Hawaii

Because there will not likely be permanent ROW acquisitions the permanent ROW impacts of alternatives A, B, D, and E are considered to be **good**. Since Alternative C is somewhat deeper than the other options, it is anticipated that more approach roadway work may be required in order to maintain low chord elevation. Therefore, this alternative was scored as **fair**.

#### Temporary ROW Impacts

In addition to the temporary bridge, there will likely be additional temporary impacts on both the mauka and makai side of the existing bridge for contractor use during construction. The additional parcels (in addition to the permanent ROW impacted parcels noted above) anticipated to be impacted by temporary ROW impacts are as follows, according to County of Maui GIS data:

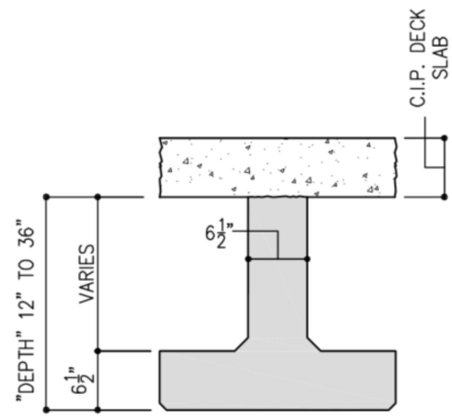
- Parcel No. 150080020000 – Private landowner (same landowner as Parcel No. 150080010000)
- Parcel No. 150080040000 – Publicly owned by the State of Hawaii

There are some additional, multiple interest, privately owned parcels makai of the existing Hana Highway in the vicinity of the project site, but it does not appear that construction should impact those parcels and limitations can be placed in the contract to avoid these parcels if necessary. Because there will likely be temporary construction easements, but those easements are only anticipated for a small portion of one privately owned parcel, which is the same owner as the affected permanent ROW parcel, and the temporary construction easements shift public traffic onto private parcels during construction, the temporary ROW impacts of this alternative are considered to be **poor**.

## 8.2 Alternative A (Prestressed Inverted Tee Girders)

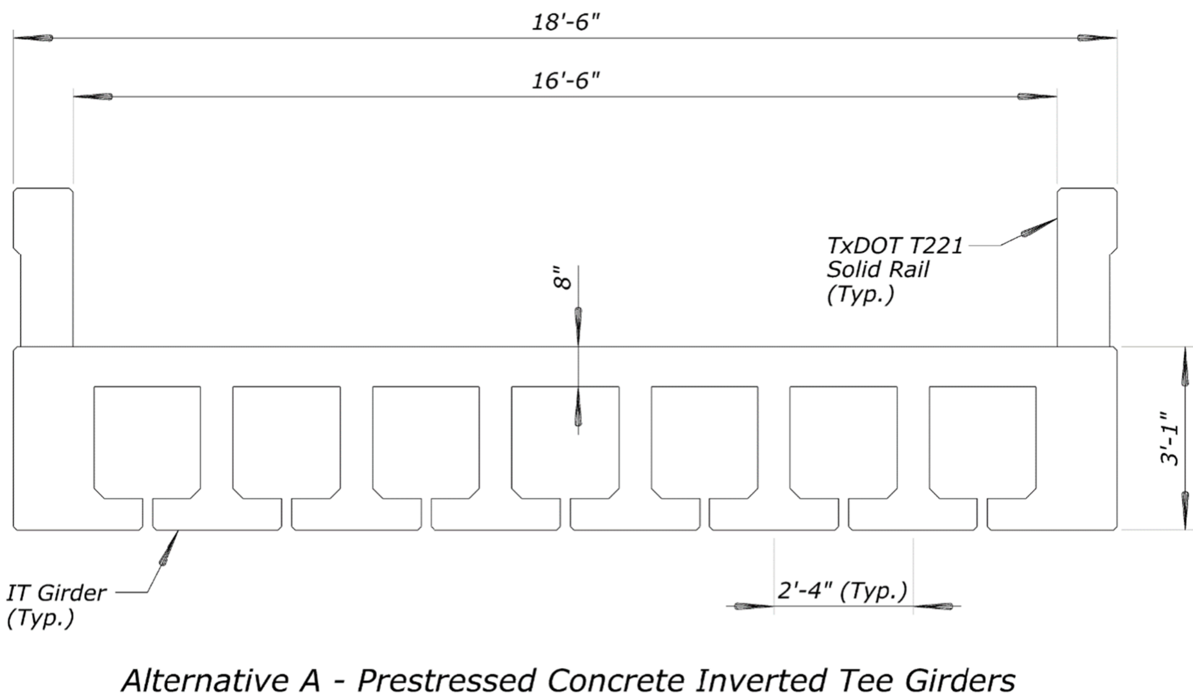
Inverted Tee (IT) girders are used fairly commonly in more remote locations in Hawaii due to their weight and ability to be handled easily. IT sections are precast beam sections that consist of a bottom flange and a web section that connects to the deck where the deck is intended to make up the top flange. Figure 8 illustrates these shapes.

**Figure 8. Section View of Standard Inverted Tee (IT) Section from GPRM Prestress Product Data**




The span ranges for IT sections extend up to 90 feet making them a possible solution for the potential span lengths for Bridge #23. The depth of the IT section will vary between 12” and 36” depending on the span length needed. A full bridge cross section of this alternative is shown in Figure 9. The existing girder depth at Bridge #23 is 24”. Depending on the exact replacement span length it is very likely the IT section used would exceed the current bridge depth as the replacement bridge is anticipated to be a single span due to constructability challenges and environmental impacts of placing a pier in the stream.

**Figure 9. Typical Section for the Inverted Tee (IT) Alternative A**



Bridge #23 has an existing length of 57'-0". To minimize impacts to the stream banks, the proposed bridge will be approximately 6' longer than the existing bridge, resulting in a span length of approximately 63'-0".

### 8.2.1 Construction Impacts

#### Local Availability

The IT sections are commonly used for bridges on the Hawaiian Islands as they are suited well for construction in many of the remote locations across each island. The primary prestressing plant for the Hawaiian Islands where these IT sections are cast is located on the island of Oahu. There are no known prestressing plants on the island of Maui that could be used to fabricate these sections. For this reason, the local availability of any prestressed section will be considered to be **fair**.

#### Complexity Risk

At Bridge #23, the proposed replacement superstructure is one span of approximately 63'. It was determined that typical trailers can transport a piece length of up to 30' on Hana Highway. However, with specialized equipment, up to 61' piece lengths have been transported along Hana Highway from Haiku. Therefore, prestressed IT girders would have to be delivered to the site in multiple pieces, spliced, and post-tensioned (PT) together. At a minimum, each girder would be shipped in two pieces approximately 34' each. This will lead to more complex design and field complexity to perform the field splice of the prestressed girders. Post-tensioning these girders in the field would involve additional construction steps in the field where strand tensioning and tendon grouting would be necessary. It should be noted that PT splicing of the IT girders may be especially difficult due to a small section size as well having added difficulty with post-tensioning sequences since the girders are delivered with no top flange. The required splice will require a nearly 30' falsework tower to be constructed in the streambed which may prove challenging due to the stream topography and falsework height. PT splicing of IT girders for Bridge #23 would add significant design complexity and construction complexity that comes with additional risk.

However, the shorter girder pieces will be easier to transport along the Hana Highway to the site and may mitigate risk of traffic impacts that would be associated with the specialized equipment hauls for lengthier girders. The placement of prestressed girders may reduce the need for falsework and shoring associated with cast-in-place concrete, however, still require some form of falsework for the splicing tower. The complexity risk for Alternative A is considered to be **fair**.

#### Constructability

Due to the light weight and ease of handling of the IT sections, they are in general a very constructable bridge replacement option. At Bridge #23, the preliminary weight per IT girder segment (assuming 2 equal 34'+/- segments per girder) is approximately 13 kips per piece. Based on approach bridge load restrictions, precedent of loads on the Hana Highway, and the HDOT typical maintenance vehicle configuration, it is likely that delivery of prestressed IT segments may be limited to a maximum of 2 girder segments per delivery, if not limited to one segment per delivery. This means that there may be as many as 8 to 16 deliveries to the site for the IT segments required.

Once the girders are delivered to the site, they then need to be placed, which will likely require a crane. Finding room for a crane big enough to pick up these girders may create a constructability challenge. Additionally, finding room for staging these girders may be a challenge. This may require girders to be placed as they are delivered to the project site. Bridge #23 does have a pullout area immediately to the Kaupo side of the bridge on the makai side, but some of that area will be used by the temp bridge. This area may be used for girder storage prior to installation. The overall bridge width for this superstructure alternative will be approximately 18’-6” which will require 8 of these IT girders to be placed (the two exterior girders are modified IT sections to provide solid fascia look). Once all 8 of these girders are placed, the girder segments will need to be post-tensioned together and a conventional or precast deck will need to be placed which acts as the top flange for these girders. Considering the above reasons, the constructability rating for this alternative is considered to be **poor**.

### 8.2.2 Environmental

#### Hydraulic Opening Impacts

An IT superstructure replacement will likely increase the structure depth from the current 24” girder depth by approximately 4” to 8”. Increasing the structure depth may have a negative impact to the hydraulic opening of the bridge. However, if the existing bridge remains in place mauka of the proposed structure, it will likely remain the controlling feature for the hydraulic opening through the site. Furthermore, given the topography makai of the existing structure where the new structure is proposed, the water surface elevation for the design flood is anticipated to be significantly lower than that of the existing structure. Given the increase in structure depth, it is not anticipated that the proposed structure will have a significant impact on the existing hydraulic condition at the site but could lower the low chord of the bridge affecting hydraulic capacity. If the existing structure is not retained, the proposed structure will likely improve the hydraulic capacity at the site through the elimination of a multi-span bridge with a clear span regardless of increases in structure depth.

Additionally, the new bridge installed off-alignment may provide an opportunity to adjust the roadway profile grade line to mitigate hydraulic impacts if necessary. For these reasons, the hydraulic impacts of this alternative are considered to be **fair** for Alternative A.

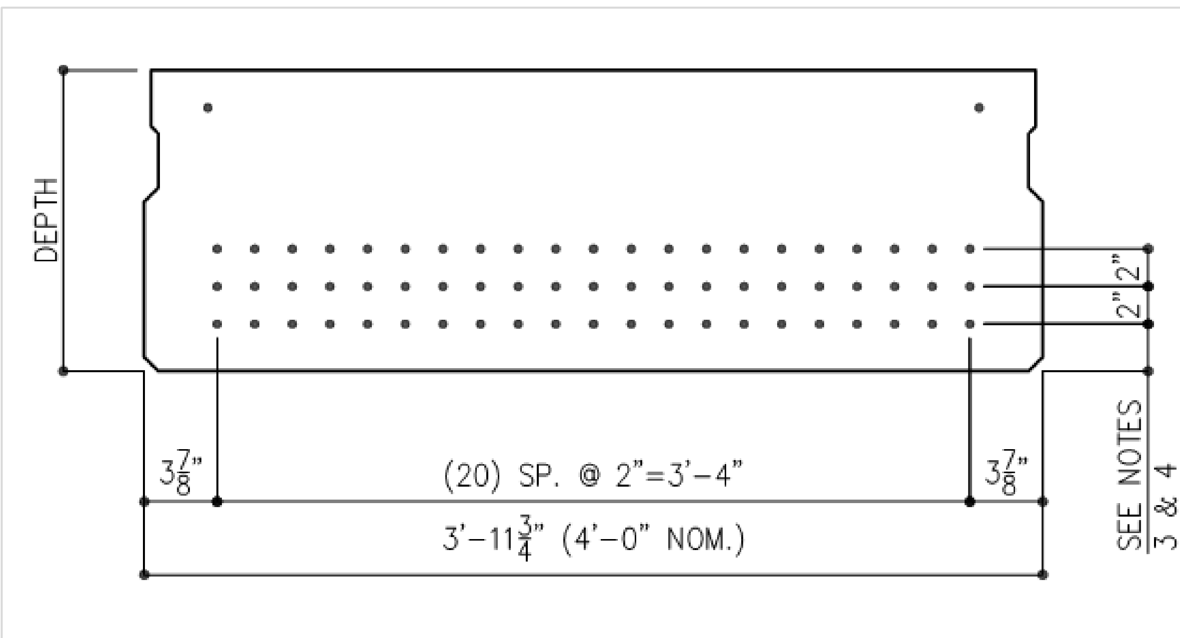
#### Resource Impacts

The largest environmental impacts will likely be due to construction activities that will need to take place in close proximity to the stream and surrounding area. By going with the IT superstructure option there is potential to minimize the amount of construction impacts in the stream. This superstructure alternative will likely arrive in precast segments, which will be post-tensioned together, likely requiring a support platform in the stream, or some type of strongback spanning the stream, to support the segments prior to post-tensioning. For the IT superstructure there is also a concern that the small gaps between the bottom flanges of each girder will provide a nesting site for birds in the area. Bird nesting on structures has been an issue requiring mitigation on structures in other regions of the United States and should be considered for the IT Alternatives. Given that the proposed structure is anticipated to span the stream such that abutments fall outside of the ordinary highwater limits, any potential permanent stream impacts can be avoided. However, temporary impacts during construction for splicing towers placed in the streambed will be unavoidable. For these reasons the resource impacts of this alternative are considered to be **fair**.

## 8.3 Alternative B (Prestressed Bridge Planks)

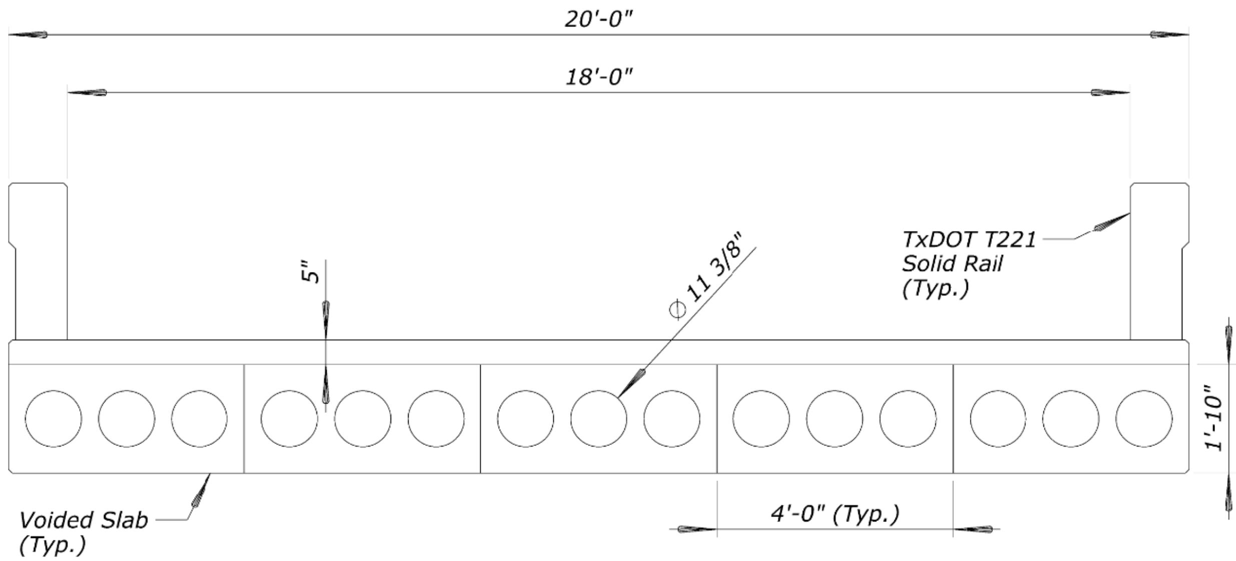
The second superstructure replacement alternative being considered is a prestressed concrete slab with or without voids, also known as a bridge plank section by local Hawaii pre-cast facilities. Bridge plank sections are used commonly in Hawaii for a variety of short to medium span bridges. Bridge plank sections are typically advantageous where section depth is a concern. Bridge planks are a rectangular section with straight prestressing strands placed at the bottom of the section as shown in Figure 10. As span lengths increase, using voids within bridge planks becomes necessary in order to remain an efficient section and reduce dead load.

**Figure 10. Section view of standard Prestressed Bridge Plank section from GPRM Prestress product data**




The span ranges for Bridge Plank sections extend up to 70 feet making them feasible for the potential span length for Bridge #23. The depth of the bridge plank section will vary depending on the span length needed but will generally range between a 16” and 24” depth depending on whether or not it is detailed with voids and what the final span length is. A typical section using the Bridge Plank alternative can be seen in Figure 11. The existing girder depth at Bridge #23 is 24” so depending on the exact replacement span length the bridge plank section would not exceed the current depth.

**Figure 11. Typical Section for the Bridge Plank Alternative B**




*Alternative B - Prestressed Concrete Voided Slab*

Bridge #23 has an existing length of 57'-0". To minimize impacts to the stream banks as well as mitigate impacts on the existing structure should it remain in place, the proposed bridge will be approximately 6' longer than the existing bridge, resulting in a span length of approximately 63'-0".

### 8.3.1 Construction Impacts

#### Local Availability

The Prestressed Bridge Plank sections are commonly used for short span bridges on the Hawaiian Islands. The primary prestressing plant for the Hawaiian Islands where these sections are cast is located on the island of Oahu. There are no known prestressing plants on the island of Maui that could be used to fabricate these sections. For this reason, the local availability of any precast section will be considered to be **fair** for Alternative B.

#### Complexity Risk

The complexity risk criteria is very similar for the bridge plank alternative as the IT alternative. Because the proposed span length for Bridge #23 is anticipated to be approximately 63', the prestressed bridge planks might not be able to be delivered full length as their length would be close to the high-end precedent of 61' piece lengths previously discussed in this report. Therefore, prestressed bridge planks would have to be delivered to the site in multiple pieces, spliced, and post-tensioned together. At a minimum, each girder would be shipped in two pieces approximately 30' each. This will lead to more complex design and field complexity to perform the field splice of the prestressed girders. Post-tensioning these girders in the field would involve additional construction steps in the field where strand tensioning and tendon grouting would be necessary. It should be noted that PT splicing of the bridge planks may be especially difficult due to a small section size. The required splice will require a nearly 30' falsework tower to be constructed in the streambed which may prove challenging due to the stream topography and falsework height. PT splicing of bridge planks for Bridge #23 would add significant design complexity and construction complexity that comes with additional risk.

However, the shorter girder pieces will be easier to transport along the Hana Highway to the site and may mitigate risk of traffic impacts that would be associated with the specialized equipment hauls for lengthier girders. The placement of prestressed planks may reduce the need for falsework and shoring associated with cast-in-place concrete, however, still require some form of falsework for the splicing tower. The complexity risk for Alternative B is considered to be **fair**.

### Constructability

Due to the increased weight of the prestressed bridge plank sections, additional limitations on delivery of the girders may be present as compared to the IT girder alternative. At Bridge #23, the preliminary weight per bridge plank segment (assuming 2 equal 30'+/- segments per girder) is approximately 33 kips per piece. Based on approach bridge load restrictions, precedent of loads on the Hana Highway, and the HDOT typical maintenance vehicle configuration, it is likely that delivery of prestressed bridge plank segments may be limited to a maximum of 1 plank segment per delivery. This means that there may be as many as 10 deliveries to the site for the prestressed bridge plank segments required.

Once the planks are delivered to the site, they then need to be placed, which will likely require a crane. Finding room for a crane big enough to pick up these girders may create a constructability challenge. Additionally, finding room for staging these girders may be a challenge. This may require girders to be placed as they are delivered to the project site. Bridge #23 does have a pullout area immediately to the Kaupo side of the bridge on the makai side, but some of that area will be used by the temp bridge. This area may be used for girder storage prior to installation. The overall bridge width for this superstructure alternative will be approximately 20' which will require 5 of these bridge planks to be placed. Once all 5 of the planks are placed, the plank segments will need to be post-tensioned together and a concrete topping slab/riding surface will need to be placed. Considering the above reasons, the constructability rating for this alternative is considered to be **fair**.

## 8.3.2 Environmental

### Hydraulic Opening Impacts

The depth of the bridge plank superstructure will not be increased compared to the existing structure with the bridge plank alternative. By not increasing the structure depth there will be no negative impact to the hydraulic opening at Bridge #23. Additionally, the proposed bridge will be placed makai of the existing structure. Makai of the existing structure, the water surface elevation for the design storm event is anticipated to be lower in elevation than what controls for the existing structure. Additionally, if the existing structure remains in place, that structure would control any applicable stream hydraulic impacts, not the proposed structure. For this reason, the hydraulic impacts of this alternative are considered to be **good** for Alternative B.

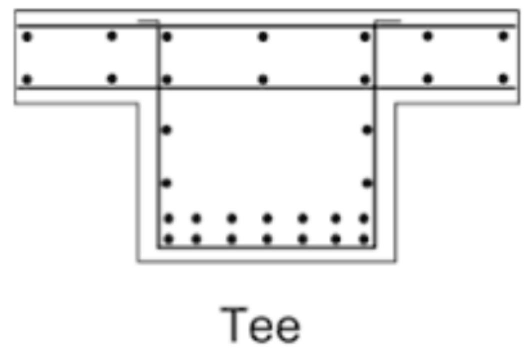
### Resource Impacts

The largest environmental impacts will likely be due to construction activities that will need to take place in close proximity to the stream and surrounding area. The bridge plank superstructure option has potential to minimize the amount of construction impacts in the stream. This superstructure alternative will likely arrive in precast segments, which will be post-tensioned together, likely requiring a support platform in the stream, or some type of strongback spanning the stream, to support the segments prior to post-tensioning. Given that the proposed structure is anticipated to span the stream such that abutments fall outside of the ordinary highwater limits, the potential permanent stream impacts can be avoided. However, temporary impacts during construction for splicing towers placed in the streambed will be unavoidable. For these reasons the resource impacts of this alternative are considered to be **fair**.

## 8.4 Alternative C (Reinforced Concrete (R/C) T-beams)

The third superstructure replacement alternative being considered is a reinforced concrete T-beam superstructure. This alternative would be a conventionally reinforced, cast-in-place concrete option. This type of structure is not commonly seen in new construction anymore due to the improved efficiency of prestressed sections that has effectively made these types of structures obsolete. However, in specific situations such as this project, it may be prudent to investigate a conventionally reinforced section due to the different construction methodology and historic character. An R/C T-beam superstructure will closely match the existing shape of the bridge, as shown in Figure 12.

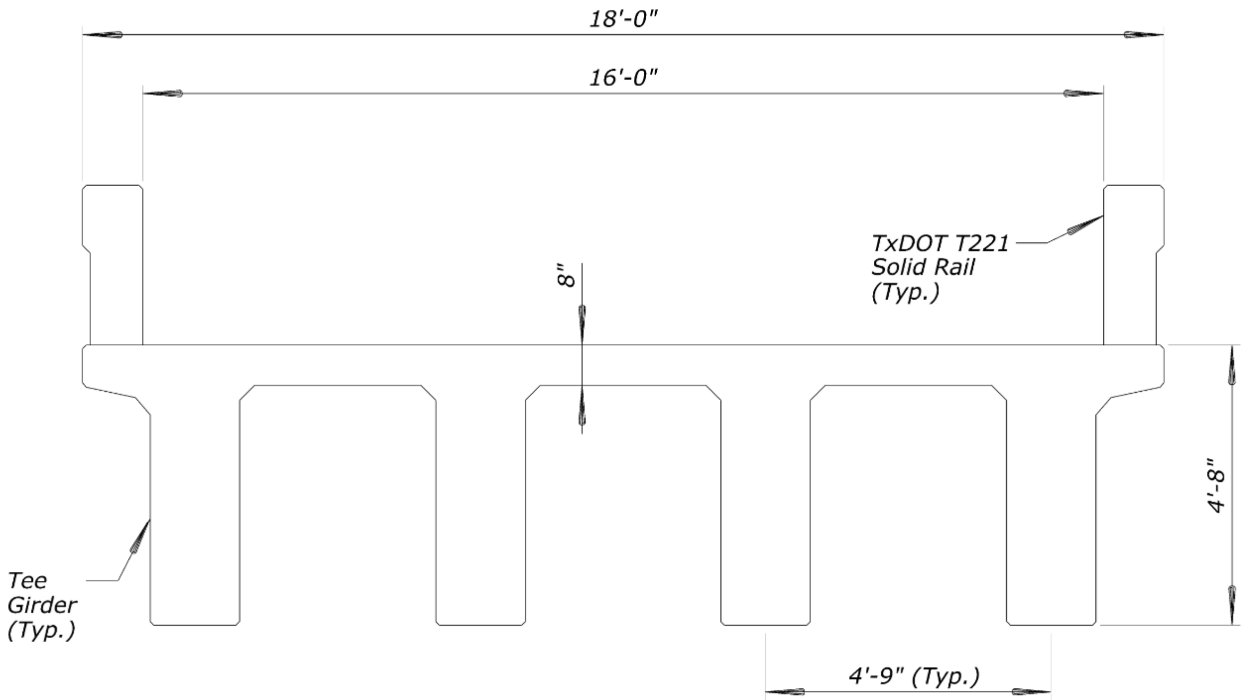
**Figure 12. Section View of Example Reinforced Concrete T-beam Section.**




Section of reinforced concrete tee beam with reinforcing steel shown as black circles (source: FHWA, Bridge Inspector's Reference Manual, 2012)

The span range for an R/C T-beam structure is more a function of structure depth requirements than the precast options discussed in the previous two replacement alternatives. The reason for this is that there is a lot of flexibility in structure dimensions as the forms are constructed on site. For the Bridge #23 replacement, the span length will be approximately 63'. Regardless of the resulting span length, the structure depth will likely need to be increased by up to 2'-2" deep possibly creating a 4'-8" deep superstructure section. Additionally, the number of girders may need to be increased up to 5 girders if a shallower girder depth is desired for the proposed span configuration. This typical cross section can be seen in Figure 13.

**Figure 13. Typical Section for the R/C T-beam Replacement Alternative**




*Alternative C - Reinforced Concrete Tee Girders*

Bridge #23 has an existing length of 57'-0". To minimize impacts to the stream banks as well as mitigate impacts on the existing structure should it remain in place, the proposed bridge will be approximately 6' longer han the existing bridge, resulting in a span length of approximately 63'-0".

### 8.4.1 Construction Impacts

#### Local Availability

The R/C T-beam sections are not commonly used in bridges anymore as they have become outdated with the advent of prestressed sections. However, the availability of them is dependent on the availability of ready-mix concrete at the construction site or local batch facilities. There are ready-mix batch facilities on the island of Maui allowing this alternative to be sourced within the island of Maui. Having the ability to avoid shipping sections in from another island, or the mainland may provide a significant cost savings. For this reason, the local availability of the R/C T-beam alternative will be considered to be **good** for Alternative C.

#### Complexity Risk

At Bridge #23, cast-in-place concrete for this structure would be constructed at full length, with no limits on the piece length deliveries, which represent limitations on the precast alternatives. The primary complexity associated with this alternative is the need to provide falsework during the concrete superstructure pours. This will require falsework to be constructed in the stream, or the use of a strongback system to span the stream and support the structure as it is poured and cures. While the construction methodologies to build the superstructure are very typical, building the falsework system may be challenging. For these reasons, the complexity risk is considered to be **fair** for Alternative C.

### Constructability

By moving to a fully cast-in-place superstructure, the weight restriction constraint on delivered material to the site is also reduced. If the structure is constructed with cast-in-place concrete the weight limitation constraint will be driven by the amount of concrete a concrete truck can carry without exceeding the truck weight. A standard concrete truck weighs 27,000 pounds empty, so if the 41,000 pound total limit is used, then approximately 14,000 pounds of concrete can be carried at a time. Each cubic yard of concrete weighs approximately 4000 pounds, so only about 3.5 cubic yards of concrete will be allowed to be transported per truck. A standard concrete truck can carry about 8-9 cubic yards of concrete, so this may prove to be a limitation in how much concrete can be transported to the site.

If the amount of concrete is limited to the 3.5 cubic yards per truck, it may be challenging to cast large portions of the structure in one pour. Further complicating the constructability of a cast-in-place option, the concrete may require a mobile batch plant to be set up in Hana given the time it would take to get a ready-mix truck to the bridge site as all of the batch facilities are located in the central valley near Kahului. This option would also require the use of admixtures in order to delay the setting of the concrete. Alternatively, an on-site volumetric concrete mixer may be worth investigating for these sites, but due to space constraints at the site and poor control of concrete quality using an on-site facility, this alternative is less preferable than trucking concrete in from a plant located in central Maui. In either case, a cast-in-place option will require falsework over the stream in order to support forms. Providing falsework over the stream will be a challenge in this environment and will add to the constructability challenges. Even with the concrete volume per truck limits mentioned above, multiple trucks can be scheduled for fast and efficient delivery of concrete and is not anticipated to be an issue. CIP Concrete is a common bridge material on the island familiar to contractors and presents minimal construction challenges once on site.

Considering the readily available CIP concrete material and familiarity of CIP construction, the constructability rating for this alternative is considered to be **good** for Alternative C.

## 8.4.2 Environmental

### Hydraulic Opening Impacts

A reinforced concrete superstructure replacement will likely increase the structure depth from the current 24” girder depth by approximately 2’ to 3’. By increasing the section depth, there may be a negative impact to the hydraulic opening of the bridge. However, if the existing bridge remains in place mauka of the proposed structure, it may remain the controlling feature for the hydraulic opening through the site. Furthermore, given the topography makai of the existing structure where the new structure is proposed, the water surface elevation for the design flood is anticipated to be significantly lower than that of the existing structure. However, given that the increase in structure depth is significant when compared to the existing structure, the benefit of placement makai of the existing structure may be offset by this increased structure depth. If the existing structure is not retained, the proposed structure may improve the hydraulic capacity at the site through the elimination of a multi-span bridge with a clear span.

Additionally, the new bridge installed off-alignment may provide an opportunity to adjust the roadway profile grade line to mitigate structure depth increase to hydraulic impacts if necessary. But it is unlikely that the approach grade can be changed enough to completely offset the 2' to 3' increase in structure depth. For these reasons, the hydraulic impacts of this alternative are considered to be **fair** for Alternative C.

### Resource Impacts

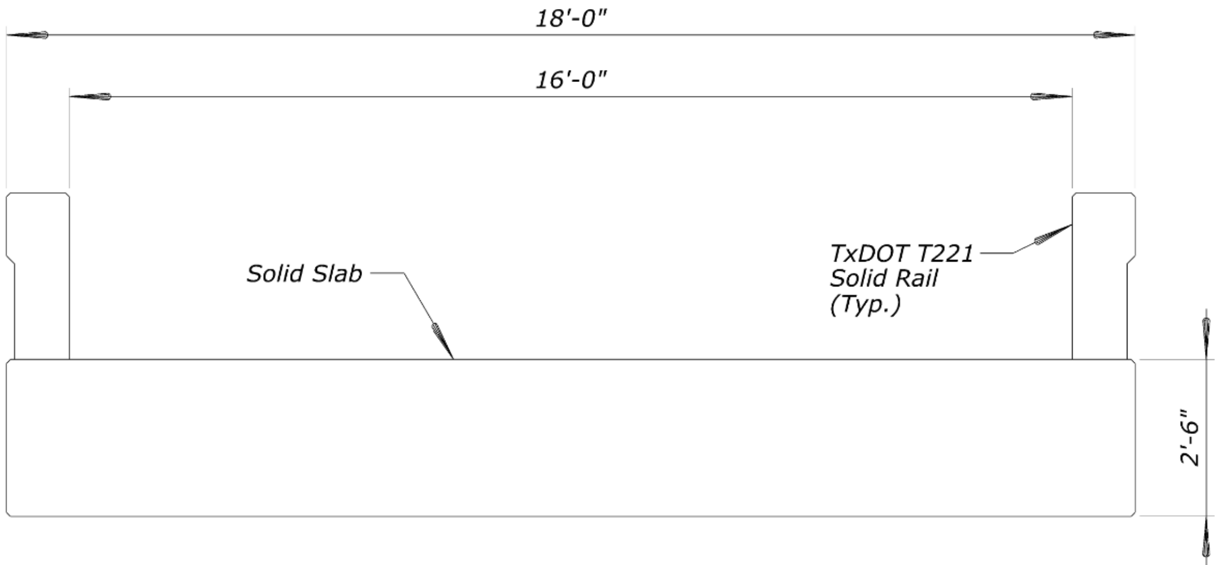
The largest environmental impacts will likely be due to construction activities that will need to take place in close proximity to the stream and surrounding area. The reinforced concrete T-beam bridge will require falsework which may increase impacts to the stream during construction, although this can be mitigated through use of strongback style falsework that spans the steam. The proposed structure is anticipated to span the stream such that abutments fall outside of the ordinary highwater limits, reducing the potential permanent stream impacts. For these reasons the resource impacts of this alternative are considered to be fair.

## 8.5 Alternative D (Cast-in-place (CIP) Post-Tensioned Slab)

The fourth superstructure replacement alternative being considered is a CIP Post-Tensioned Slab superstructure. This alternative would be a conventionally reinforced, cast-in-place concrete option with post-tensioning installed to provide primary flexural resistance and increase shear capacity prior to removal of falsework. This type of structure is common in this area of Maui and has been proposed and/or constructed on several bridges along the Hana Highway corridor for similar applications.

The span range for an CIP Post-Tensioned Slab structure is more a function of structure depth requirements than the precast alternatives. The reason for this is that there is a lot of flexibility in structure dimensions as the forms are constructed on site. For the Bridge #23 replacement, the span length will be approximately 63'-0". The structure depth is anticipated to be approximately 2'-6", which will match the overall structure depth of the existing structure at 2'-6", but the existing bridge also has a wearing surface, whereas the proposed bridge is anticipated to provide a bare deck riding surface (although a wearing surface can still be utilized). This typical cross section can be seen in Figure 14.

**Figure 14. Typical Section for the CIP Post-Tensioned Slab Replacement Alternative**




*Alternative D - Post Tension Cast-In-Place Concrete Slab*

### 8.5.1 Construction Impacts

#### Local Availability

There are ready-mix batch facilities on the island of Maui allowing this alternative to be sourced within the island of Maui. Having the ability to avoid shipping sections in from another island, or the mainland may provide a significant cost savings. For this reason, the local availability of the CIP Post-Tensioned Slab alternative will be considered to be **good** for Alternative D.

#### Complexity Risk

At Bridge #23, cast-in-place concrete for this structure would be constructed at full length, with no limits on the piece length deliveries, which represent limitations on the precast alternatives. The primary complexity associated with this alternative is the need to provide falsework during the concrete superstructure pours. This will require falsework to be constructed in the stream, or the use of a strongback system to span the stream and support the structure as it is poured and cures. In addition to the falsework, post-tensioning operations will also be required. However, there is precedent for post-tensioned slabs along this corridor and the contracting community appears to be familiar with these methods. While the construction methodologies to build the superstructure are very typical, building the falsework system may be challenging. For these reasons, the complexity risk is considered to be **fair** for Alternative D.

#### Constructability

By moving to a fully cast-in-place superstructure, the weight restriction constraint on delivered material to the site is also reduced. If the structure is constructed with cast-in-place concrete the weight limitation constraint will be driven by the amount of concrete a concrete truck can carry without exceeding the truck weight. A standard concrete truck weighs 27,000 pounds empty, so if the 41,000 pound total limit is used, then approximately 14,000 pounds of concrete can be carried at a time. Each cubic yard of concrete weighs approximately 4000 pounds, so only about 3.5 cubic yards of concrete will be allowed to be transported per truck. A standard concrete truck can carry about 8-9 cubic yards of concrete, so this may prove to be a limitation in how much concrete can be transported to the site.

If the amount of concrete is limited to the 3.5 cubic yards per truck, it may be challenging to cast large portions of the structure in one pour. Further complicating the constructability of a cast-in-place option, the concrete may require a mobile batch plant to be set up in Hana given the time it would take to get a ready-mix truck to the bridge site as all of the batch facilities are located in the central valley near Kahului. This option would also require the use of admixtures in order to delay the setting of the concrete. Alternatively, an on-site volumetric concrete mixer may be worth investigating for these sites, but due to space constraints at the site and poor control of concrete quality using an on-site facility, this alternative is less preferable than trucking concrete in from a plant located in central Maui. In either case a cast-in-place option will require falsework over the stream in order to support forms. Providing falsework over the stream will be a challenge in this environment and will add to the constructability challenges. Even with the concrete volume per truck limits mentioned above, multiple trucks can be scheduled for fast and efficient delivery of concrete and may not be an issue. CIP Concrete is a common bridge material on the island familiar to contractors and presents minimal construction challenges once on site.

Considering the readily available CIP concrete material and familiarity of CIP construction, the constructability rating for this alternative is considered to be **good** for Alternative D.

### 8.5.2 Environmental

#### Hydraulic Opening Impacts

A CIP Post-Tensioned Slab superstructure replacement will likely match or decrease the proposed structure depth requirement as compared to the existing structure depth. Furthermore, given the topography makai of the existing structure where the new structure is proposed, the water surface elevation for the design flood is anticipated to be significantly lower than that of the existing structure. If the existing structure is not retained, the proposed structure may improve the hydraulic capacity at the site through the elimination of a multi-span bridge with a clear span.

For these reasons, the hydraulic impacts of this alternative are considered to be **good** for Alternative D.

#### Resource Impacts

The largest environmental impacts will likely be due to construction activities that will need to take place in close proximity to the stream and surrounding area. The CIP Post-Tensioned Slab bridge will require falsework which may increase impacts to the stream during construction, but this can be mitigated through the use of a strongback style system that spans the stream. The proposed structure is anticipated to span the stream such that abutments fall outside of the ordinary highwater limits, reducing the potential permanent stream impacts. For these reasons the resource impacts of this alternative are considered to be **fair**.

## 8.6 Alternative E (Prestressed I-Girders)

Prestressed I-Girders are used fairly commonly in Hawaii. Specifically for the span at Bridge #23, it is anticipated that the AASHTO III Girder will be applicable. Figure 15 illustrates these shapes.

While the span ranges for the smaller AASHTO II girder can typically accommodate up to a 70' to 80' span length, it is anticipated that the AASHTO III girder will be required as delivery length limitations will likely require the girders to be delivered in segments and post-tensioned in the field. This will lead to some loss of efficiency as stresses are balanced between delivery demands of the segments and the final stresses from post-tensioning the overall girder. The depth of the prestressed I-girder section is anticipated to be approximately 4'-6" from the top of the structural deck to the bottom of the girder. A full bridge cross section of this alternative is shown in Figure 16. The existing girder depth at Bridge #23 is 24". The Prestressed I-Girder section used will exceed the current bridge depth as the replacement bridge is anticipated to be a single span due to constructability challenges and environmental impacts of placing a pier in the stream.

**Figure 15. Section View of Standard Prestressed AASHTO III Girder Section from GPRM Prestress Product Data**

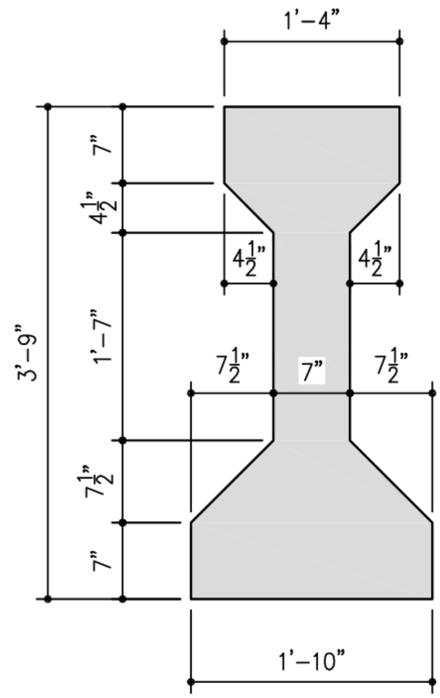
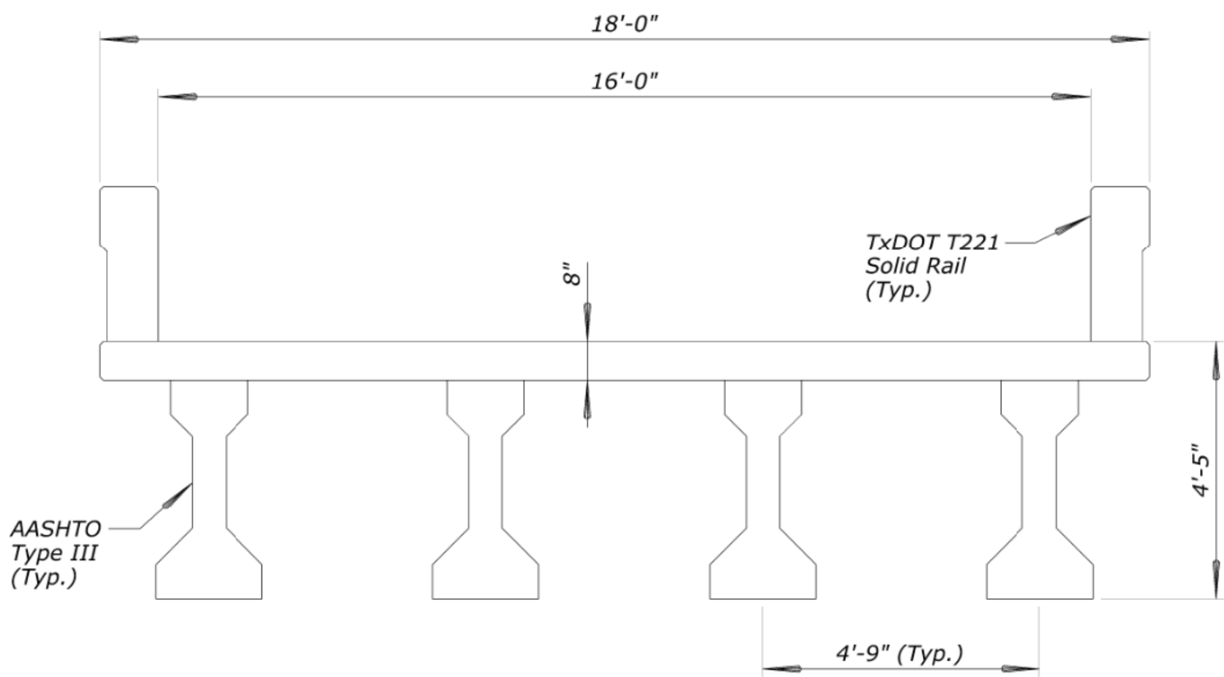


**Figure 16. Typical Section for the Prestressed I-Girder Alternative E**




*Alternative E - Prestressed Concrete I-Girders*

Bridge #23 has an existing length of 57'-0". To minimize impacts to the stream banks as well as mitigate impacts on the existing structure should it remain in place, the proposed bridge will be approximately 6' longer than the existing bridge, resulting in a span length of approximately 63'-0".

### 8.6.1 Construction Impacts

**Local Availability**

The Prestressed I-Girder sections are commonly used for bridges on the Hawaiian Islands. The primary prestressing plant for the Hawaiian Islands where these Prestressed I-Girder sections are cast is located on the island of Oahu. There are no known prestressing plants on the island of Maui that could be used to fabricate these sections. For this reason, the local availability of any prestressed section will be considered to be **fair**.

**Complexity Risk**

At Bridge #23, the proposed replacement superstructure is one span of approximately 63'. It was determined that typical trailers can transport a piece length of up to 30' on Hana Highway. However, with specialized equipment, up to 61' piece lengths have been transported along Hana Highway from Haiku. Therefore, prestressed girders would have to be delivered to the site in multiple pieces and post-tensioned together. At a minimum, each girder would be shipped in two pieces approximately 34' each. This will lead to more complex design and field complexity to perform the field splice of the prestressed girders. Post-tensioning these girders in the field would involve additional construction steps in the field where strand tensioning and tendon grouting would be necessary. The required splice will require a nearly 30' falsework tower to be constructed in the streambed which may prove challenging due to the stream topography and falsework height. PT splicing of girders for Bridge #23 would add significant design complexity and construction complexity that comes with additional risk.

However, the shorter girder pieces will be easier to transport along the Hana Highway to the site and may mitigate risk of traffic impacts that would be associated with the specialized equipment hauls for lengthier girders. The placement of prestressed girders may reduce the need for falsework and shoring associated with cast-in-place concrete, however, still require significant falsework for the splicing tower. The complexity risk for Alternative E is considered to be **fair**.

### Constructability

Due to the weight and ease of handling of these sections, they are in general a very constructable bridge replacement option. At Bridge #23, the preliminary weight per I-Girder segment (assuming 2 equal 34'+/- segments per girder) is approximately 20 kips per piece. However, based on approach bridge load restrictions, precedent of loads on the Hana Highway, and the HDOT typical maintenance vehicle configuration, it is likely that delivery of Prestressed I-Girder segments may be limited to a maximum of 1 girder segment per delivery. This means that there may be as many as 8 deliveries to the site for the girder segments required.

Once the girders are delivered to the site, they then need to be placed, which will likely require a crane. Finding room for a crane big enough to pick up these girders may create a constructability challenge. Additionally, finding room for staging these girders may be a challenge. This may require girders to be placed as they are delivered to the project site. However, Bridge #23 does have a pullout area immediately to the Kaupo side of the bridge on the makai side, but some of that area will be used by the temp bridge. This area may be used for girder storage prior to installation. The overall bridge width for this superstructure alternative will be approximately 18'-0" which will require 4 of these I-Girders to be placed. Once all 4 of these girders are placed, a conventional or precast deck will need to be placed over top of the girders. Considering the above reasons, the constructability rating for this alternative is considered to be **poor**.

## 8.6.2 Environmental

### Hydraulic Opening Impacts

A Prestressed I-Girder superstructure replacement will increase the structure depth from the current 24" girder depth by approximately 1.75' to 2'. By increasing the section depth, there may be a negative impact to the hydraulic opening of the bridge. However, if the existing bridge remains in place mauka of the proposed structure, it may remain the controlling feature for the hydraulic opening through the site. Furthermore, given the topography makai of the existing structure where the new structure is proposed, the water surface elevation for the design flood is anticipated to be significantly lower than that of the existing structure. Given that the increase in structure depth is significant when compared to the existing structure, the benefit of placement makai of the existing structure may be offset by this increased structure depth. If the existing structure is not retained, the proposed structure may improve the hydraulic capacity at the site through the elimination of a multi-span bridge with a clear span.

Additionally, the new bridge installed off-alignment may provide an opportunity to adjust the roadway profile grade line to mitigate structure depth increase to hydraulic impacts if necessary. But it is unlikely that the approach grade can be changed enough to completely offset the 1.75' to 2' increase in structure depth. For these reasons, the hydraulic impacts of this alternative are considered to be **fair** for Alternative E.

### Resource Impacts

The largest environmental impacts will likely be due to construction activities that will need to take place in close proximity to the stream and surrounding area. By going with the Prestressed I-Girder superstructure option there is potential to minimize the amount of construction impacts in the stream. This superstructure alternative will likely arrive in precast segments, which will be post-tensioned together, likely requiring a support platform in the stream, or some type of strongback spanning the stream, to support the segments prior to post-tensioning. Given that the proposed structure is anticipated to span the stream such that abutments fall outside of the ordinary highwater limits, the potential permanent stream impacts can be reduced. However, temporary impacts during construction for splicing towers placed in the streambed will be unavoidable. For these reasons the resource impacts of this alternative are considered to be **fair**.

## 8.7 Bridge Barrier and Approach Wall Barrier

### 8.7.1 MASH TL-2 Bridge Barrier

The new bridge barrier will be a MASH TL-2 crash tested barrier in the similar style to the existing barrier (Figure 17). For Bridge #23 the proposed, best match replacement barriers that have successfully been crash tested to MASH TL-2 standards (or better) are the Texas Type T221 and the HDOT Solid Bridge Rail. The superstructure will provide a new deck with adequate width and the strength to transfer the design impact loading.

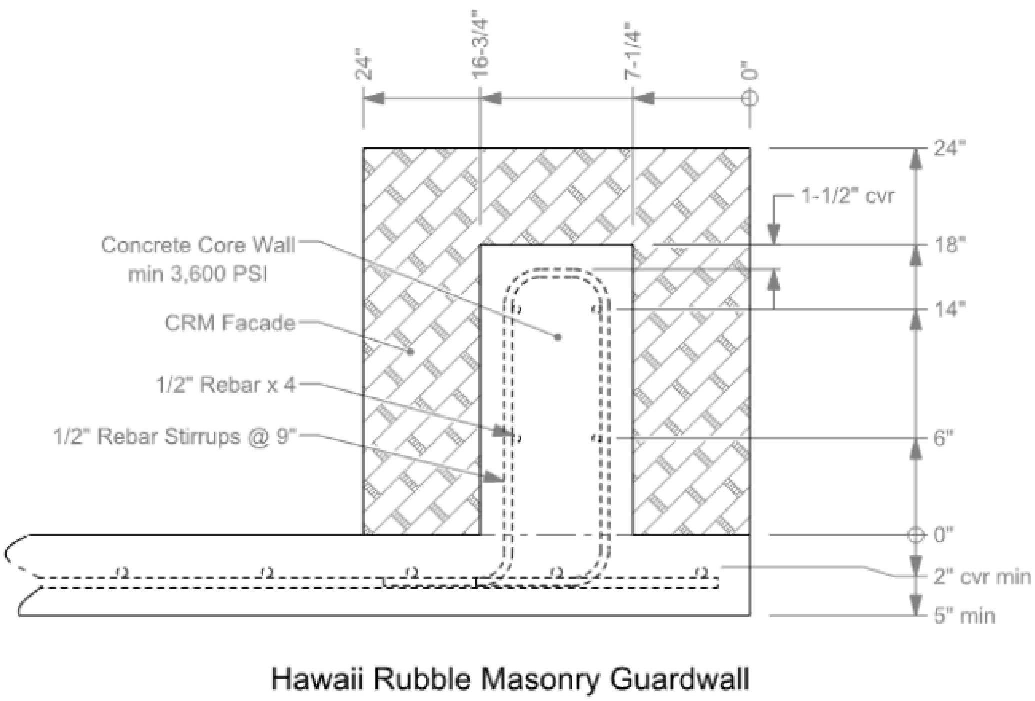
**Figure 17. Depiction of MASH TL-2 Bridge Barrier**

### 8.7.2 Approach Wall Barrier

Generally, the approach wall barrier is similar to the bridge barrier listed above. The existing CRM approach wall barriers do not meet MASH crash testing standards. MASH crash tested transition barriers will be provided.

To match the historic character of the existing bridge, the use of a Hawaii CRM barrier which is internally strengthened with reinforced concrete to replace the approach wall barriers, as shown in Figure 18, is recommended. This CRM barrier has been analyzed by Texas A&M Transportation Institute for compliance with MASH TL-2 based on the MASH TL-1 crash tested CRM barrier. This analysis is documented in a report entitled “TL-2 MASH Compliance of Hawaii Rubble Masonry Wall – Task 3.2,” prepared for FHWA- Federal Lands Highway in December 2021. This report has received concurrence from both FHWA and HDOT for use on bridge projects in Hawaii.

**Figure 18. Typical Guardwall Cross Section (Double Face)**




The internally reinforced CRM barrier shown above and proposed for this project will be either connected directly to the bridge approach slab or connected to a moment slab, or anchor slab, depending on the location of the barrier placement.

# 9.0 EVALUATION OF FEASIBLE ALTERNATIVES

The chart shown below summarizes the ratings for the Bridge #23 replacement alternatives. Criteria that was given a “good” rating will show as a full green circle in the chart, “fair” will show as a half yellow circle, and “poor” will show as an empty red circle. These good, fair, and poor ratings match the ratings given in each alternative discussion in the preceding sections. This will help with graphically evaluating each alternative relative to the other alternatives for a specific bridge. It is important to note that these ratings are relative to other alternatives at Bridge #23 only and therefore may not directly correlate to the ratings at different structures along the corridor that will have similar challenges. Below the ratings for each alternative and an estimated cost for bridge construction for each alternative is given. These costs are based on recent pricing data and similar projects in the area. The estimates include major bridge constructions items and unit costs that were selected to compare the costs of each structure. These costs reflect the construction costs of the bridge only and do not include the roadway construction items or other project costs. These bridge alternative costs provide a valuable point of reference for comparison purposes, but do not reflect the overall project cost to replace the bridge. See Appendix B for cost estimates. As evidenced by the chart below, Alternative D was determined to be the best solution based on the criteria used for this project.

**Table 1. Evaluation Criteria Chart Illustrating the Rating for Each Criteria Considered**

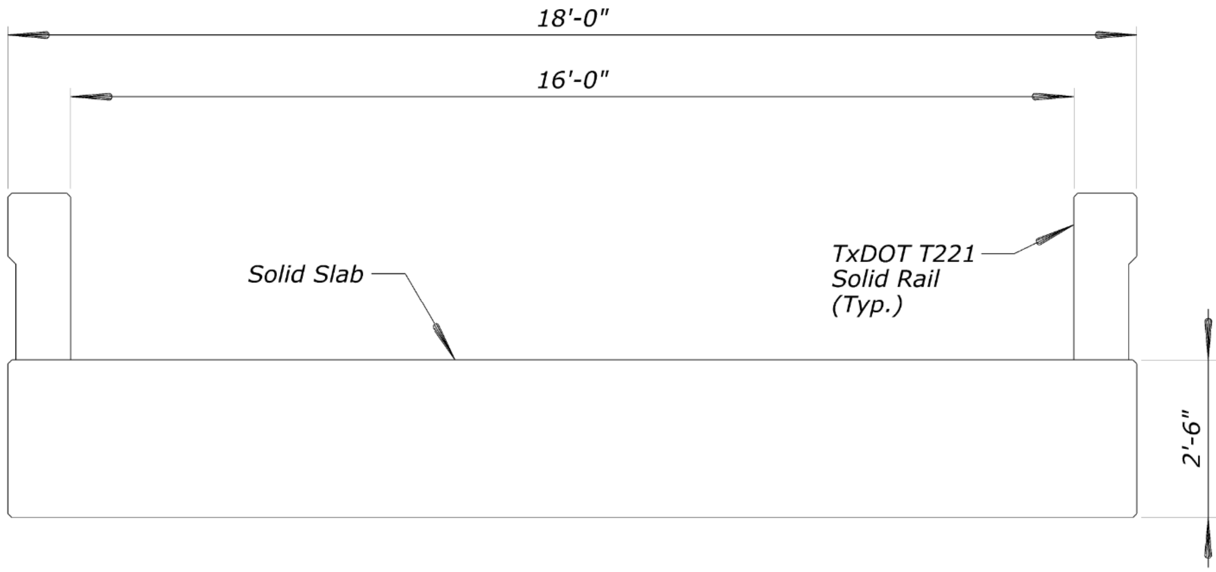
| Purpose and Need Criteria | Alternative Evaluation Criteria | **Replacement Alternative A** Prestressed Inverted Tee Girders with Temp Bridge | **Replacement Alternative B** Prestressed Bridge Plank With Temp Bridge | **Replacement Alternative C** Reinforced Concrete (R/C) T-beam with Temp Bridge | **Replacement Alternative D** Cast-in-place (CIP) Post-Tensioned Slab with Temp Bridge | **Replacement Alternative E** Prestressed I-Girders with Temp Bridge |
|---|---|---|---|---|---|---|
| **Construction Impacts & Constructability** | Minimization of Traffic Impacts and ABC Potential | ● | ● | ● | ● | ● |
| | Local Availability | ◒ | ◒ | ● | ● | ◒ |
| | Complexity Risk | ◒ | ◒ | ◒ | ◒ | ◒ |
| | Constructability | ○ | ◒ | ● | ● | ○ |
| **Historic Character** | | ● | ● | ◒ | ● | ◒ |
| **Environmental Resources** | Hydraulic Opening Impacts | ◒ | ● | ◒ | ● | ◒ |
| | Resource Impacts | ◒ | ◒ | ◒ | ◒ | ◒ |
| **Right of Way (ROW)** | Permanent ROW Impacts | ● | ● | ◒ | ● | ● |
| | Temporary ROW Impacts | ○ | ○ | ○ | ○ | ○ |
| **Construction Cost*** | | $7,532,333 | $7,360,031 | $6,014,223 | $6,268,635 | $6,621,852 |

* Construction Costs presented are only related to the proposed bridge improvement items. Other project construction costs such as roadway approaches are not included in these preliminary estimates for structural alternative analysis. See Table 2 and Appendix B for more information.

# 10.0 STRUCTURE SELECTION RECOMMENDATION

As discussed in the evaluation of feasible alternatives, Alternative D is the recommended alternative for Bridge #23. The typical section for Alternative D is shown in Figure 19. This alternative meets the design criteria specified while also balancing costs, constructability, historic character, environmental resource impacts, and ROW considerations.

**Figure 19. Typical Section for the Preferred Alternative Recommendation**




*Alternative D - Post Tension Cast-In-Place Concrete Slab*

# 11.0 PRELIMINARY COST ESTIMATE

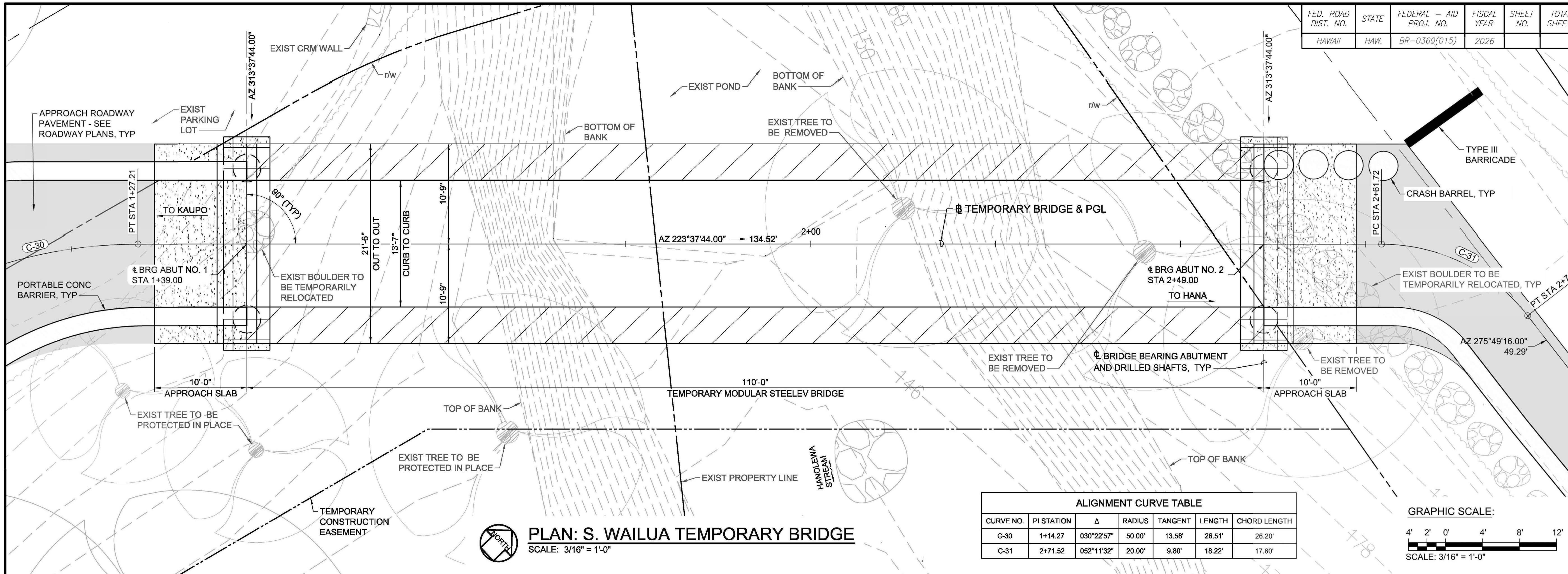
A detailed cost estimate for Alternative D is presented in Table 2. This cost estimate does not cover the construction items that are anticipated for Alternative D including roadway costs. The roadway items should be similar costs across each alternative. A contingency item of 30% of construction item costs is included in this estimate. Standard construction methods were assumed for this cost estimate. As this structure is considered for final design, this cost estimate will be refined.

**Table 2. Preliminary Cost Estimate for the Preferred Alternative—Alternative D**

| Pay Item Description | Unit | Unit Price | Estimated Quantities<br>Bid Schedule | Total Cost |
|---|---|---|---|---|
| MINOR ITEMS AND CONTINGENCY 30% OF CONST ITEMS | LPSM | $1,256,223 | 1 | $1,256,223 |
| TEMPORARY BRIDGE | LPSM | $825,000 | 1 | $825,000 |
| REMOVAL OF BRIDGE | LPSM | $272,870 | 1 | $272,870 |
| REMOVAL OF STONE MASONRY | CUYD | $1,670 | 4 | $6,680 |
| STRUCTURE EXCAVATION | CUYD | $200 | 278 | $55,600 |
| STRUCTURAL BACKFILL | CUYD | $350 | 142 | $49,700 |
| SHORING AND BRACING | SQFT | $500 | 1134 | $567,000 |
| AGGREGATE BASE GRADING C, 8-INCH DEPTH | CUYD | $95.70 | 34 | $3,254 |
| STRUCTURAL CONCRETE, CLASS A | CUYD | $3,440.00 | 197 | $677,680 |
| REINFORCING STEEL | LB | $7.80 | 31017 | $241,933 |
| BRIDGE RAILING, CONCRETE | LNFT | $1,950.00 | 126 | $245,700 |
| BEARING DEVICE, ELASTOMERIC | EACH | $8,250.00 | 8 | $66,000 |
| MICROPILE | LNFT | $800.89 | 800 | $640,710 |
| DRILLED SHAFTS | LNFT | $5,000.00 | 160 | $800,000 |
| STONE MASONRY GUARDWALL | LNFT | $2,915.00 | 79 | $230,285 |
| PRESTRESSING SYSTEM | LPSM | $330,000.00 | 1 | $330,000 |
| MileStone: 30% Submittal - South Wailua Bridge 23 - Alternative D - Post Tensioned, Cast-In-Place Slab with Temp Bridge | | | | $6,268,635 |

Appendix A.

# TS&L PLANS

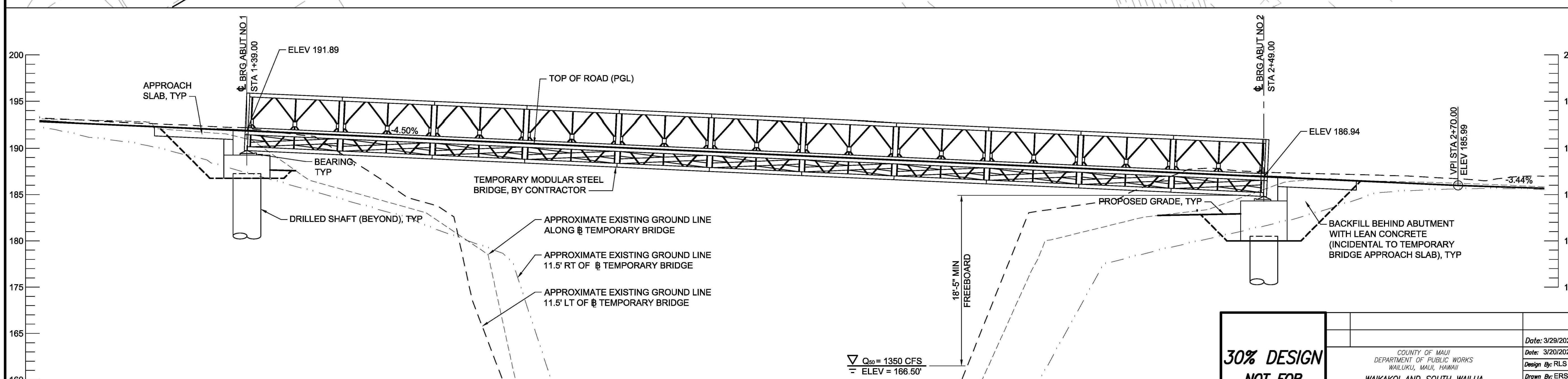



## PLAN: S. WAILUA TEMPORARY BRIDGE

SCALE: 3/16" = 1'-0"

**ALIGNMENT CURVE TABLE**

| CURVE NO. | PI STATION | Δ | RADIUS | TANGENT | LENGTH | CHORD LENGTH |
|---|---|---|---|---|---|---|
| C-30 | 1+14.27 | 030°22'57" | 50.00' | 13.58' | 26.51' | 26.20' |
| C-31 | 2+71.52 | 052°11'32" | 20.00' | 9.80' | 18.22' | 17.60' |




## PROFILE - S. WAILUA TEMPORARY BRIDGE

SCALE: HORIZ: 3/16"=1'-0"
VERT: 3/16"=1'-0"

GRAPHIC SCALE:
4' 2' 0' 4' 8' 12'
SCALE: 3/16" = 1'-0"

| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0360(015) | 2026 | | |

**30% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE PLAN AND PROFILE

Date: 3/29/2024
Date: 3/20/2024
Design By: RLS
Drawn By: ERS
SHEET S-003
of Sheets

PROJ. NO.: 2020040
Date Saved: Wed, 17 Apr 2024 - 10:18am
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| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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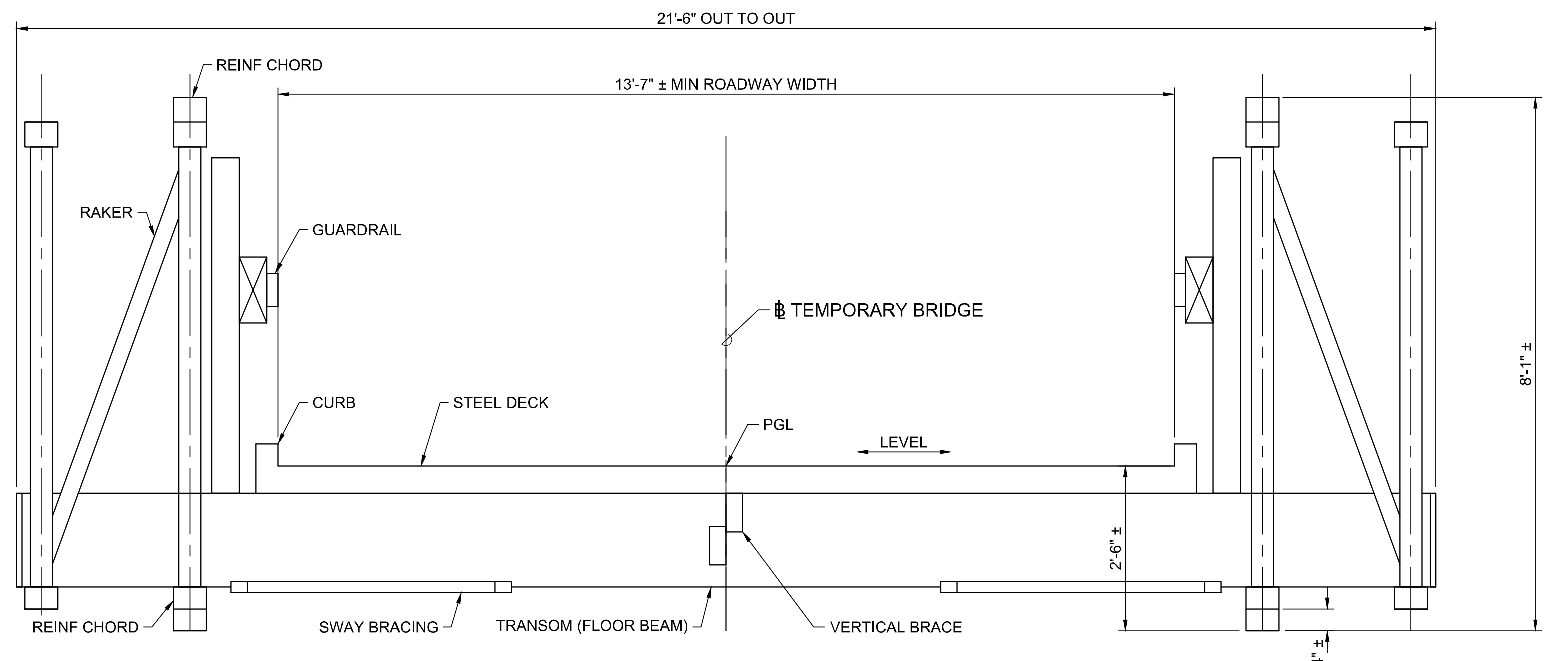


## TYPICAL SECTION - TEMPORARY BRIDGE

SCALE: 3/4" = 1'-0"

(LOOKING AHEAD STATION)

GRAPHIC SCALE:

1' 0' 1' 2' 3'

SCALE: 3/4" = 1'-0"

**30% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA TEMPORARY BRIDGE
TYPICAL SECTION

Date: 3/29/2024
Date: 3/20/2024
Design By: RLS
Drawn By: ERS
SHEET
S-004
of Sheets

PROJ. NO.: 2020040

Date Saved: Tue, 16 Apr 2024 — 10:14am
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| FED. ROAD DIST. NO. | STATE | FEDERAL – AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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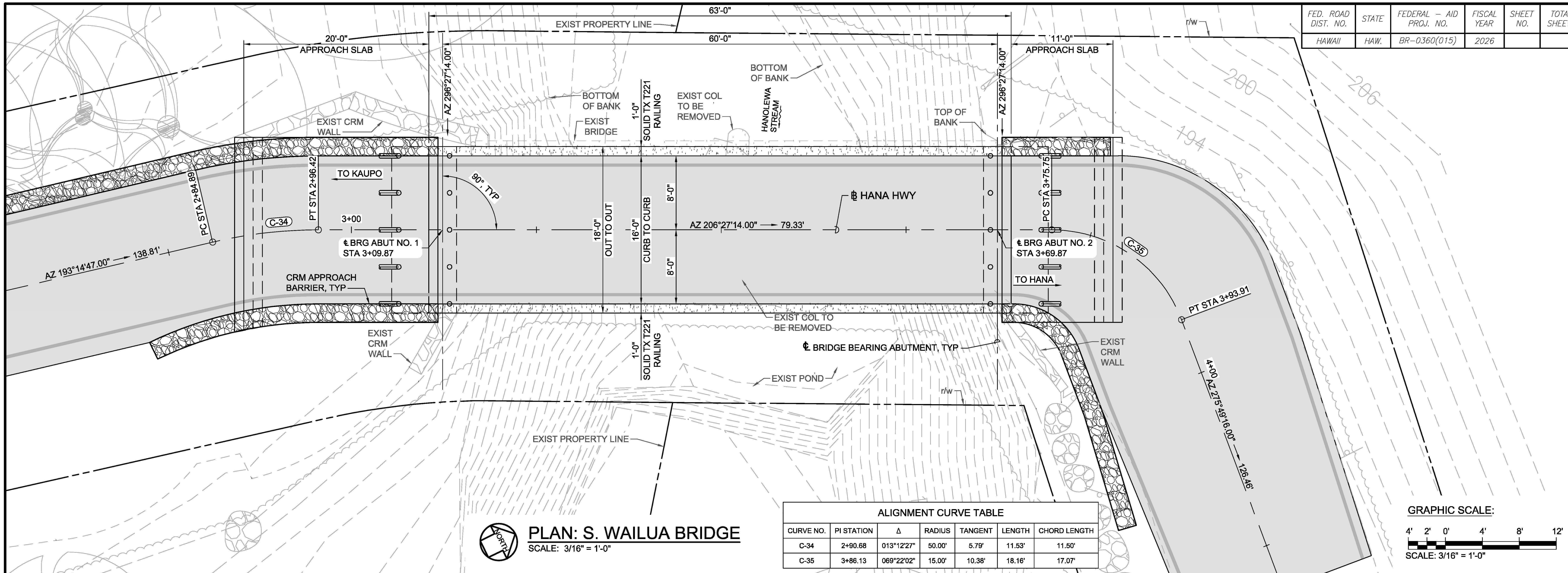
| HAWAII | HAW. | BR–0360(015) | 2026 | | |




## PLAN: S. WAILUA BRIDGE

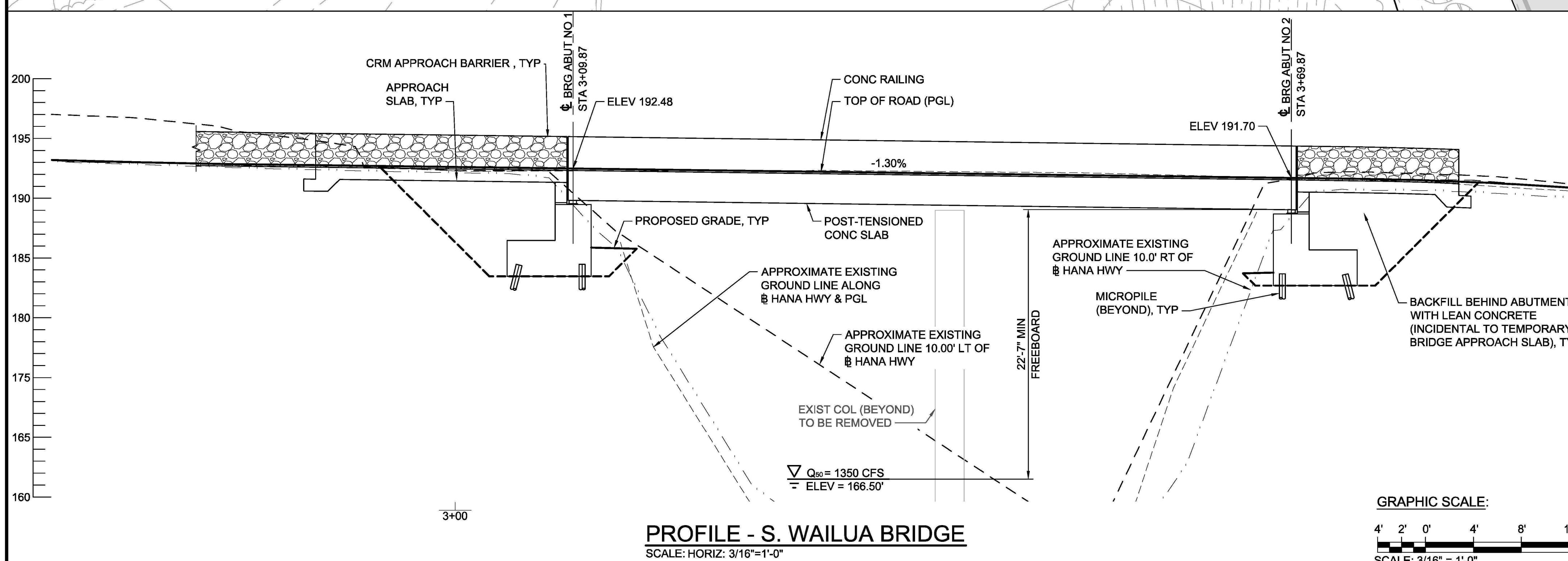
SCALE: 3/16" = 1'-0"

| ALIGNMENT CURVE TABLE | | | | | | |
|---|---|---|---|---|---|---|
| CURVE NO. | PI STATION | Δ | RADIUS | TANGENT | LENGTH | CHORD LENGTH |
| C-34 | 2+90.68 | 013°12'27" | 50.00' | 5.79' | 11.53' | 11.50' |
| C-35 | 3+86.13 | 069°22'02" | 15.00' | 10.38' | 18.16' | 17.07' |

GRAPHIC SCALE:

4' 2' 0' 4' 8' 12'

SCALE: 3/16" = 1'-0"




## PROFILE - S. WAILUA BRIDGE

SCALE: HORIZ: 3/16"=1'-0"
VERT: 3/16"=1'-0"

GRAPHIC SCALE:

4' 2' 0' 4' 8' 12'

SCALE: 3/16" = 1'-0"

**30% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE PLAN AND PROFILE

Date: 3/29/2024
Date: 3/20/2024
Design By: RLS
Drawn By: ERS
SHEET S-009
of Sheets

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| FED. ROAD DIST. NO. | STATE | FEDERAL - AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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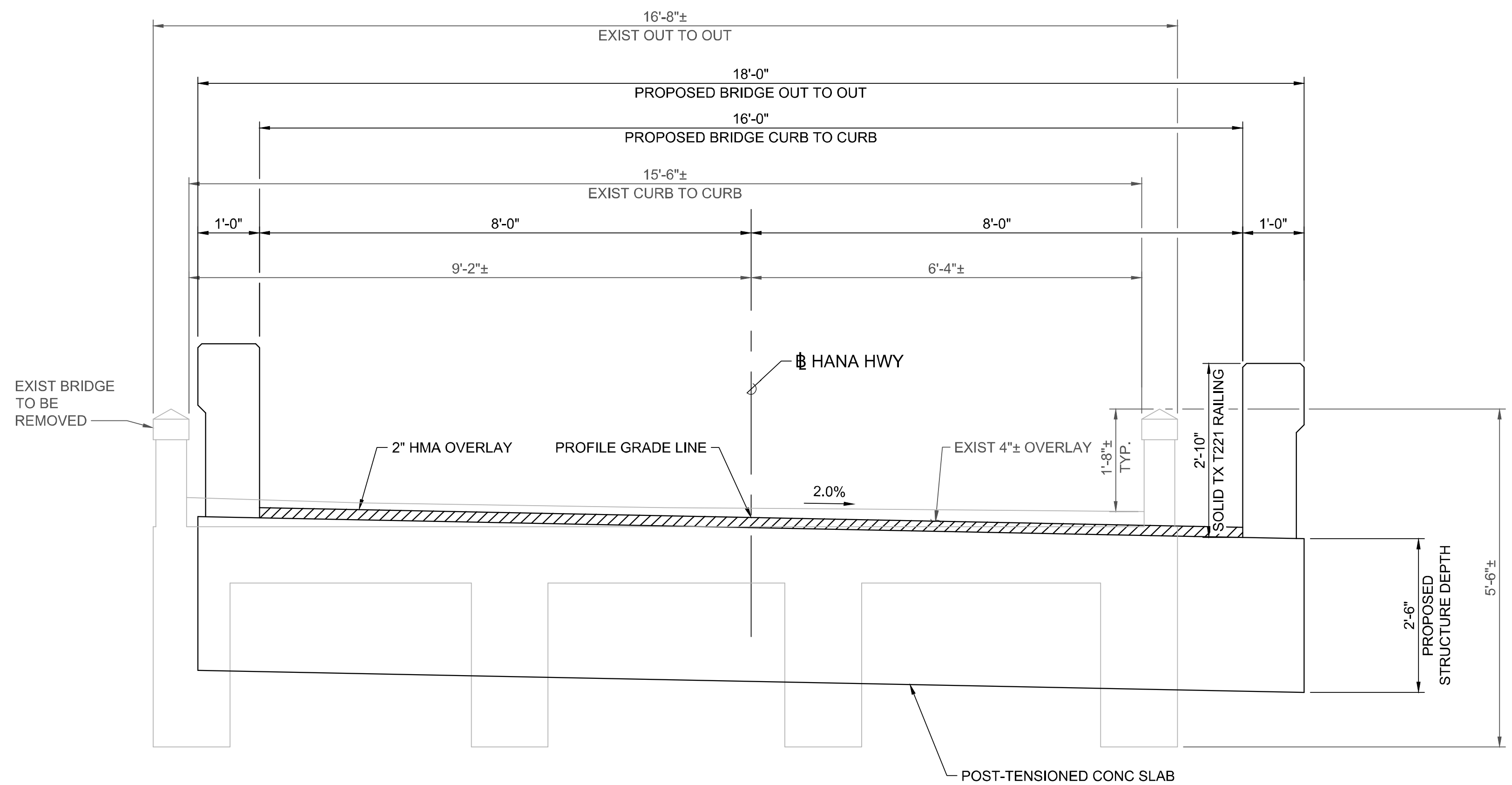
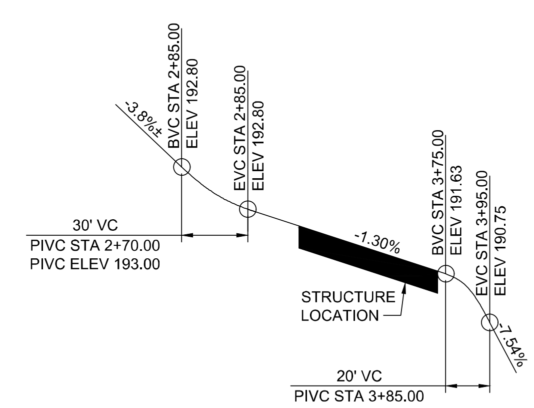



## S. WAILUA TYPICAL SECTION - PROPOSED BRIDGE

SCALE: 3/4" = 1'-0"

(LOOKING AHEAD STATION)




## PROFILE GRADE DIAGRAM

SCALE: NO SCALE

GRAPHIC SCALE:

1' 0' 1' 2' 3'

SCALE: 3/4" = 1'-0"

**30% DESIGN**
**NOT FOR CONSTRUCTION**

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
WAILUKU, MAUI, HAWAII

WAIKAKOI AND SOUTH WAILUA
BRIDGE REPLACEMENT
FEDERAL-AID PROJECT NO. BR-0360(015)

S. WAILUA PERMANENT BRIDGE
TYPICAL SECTION

Date: 3/29/2024
Date: 3/20/2024
Design By: RLS
Drawn By: ERS
SHEET
S-010
of Sheets

PROJ. NO.: 2020040

Date Saved: Tue, 16 Apr 2024 – 10:17am
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Appendix B.

# ALTERNATIVE COST ESTIMATES

Alternative A – Prestressed Concrete, Precast Inverted Tee Girders

| Pay Item Description | Unit | Unit Price | Estimated Quantities<br>Bid Schedule | Total Cost |
|---|---|---|---|---|
| MINOR ITEMS AND CONTINGENCY 30% OF CONST ITEMS | LPSM | $1,547,846.14 | 1 | $1,547,846 |
| TEMPORARY BRIDGE | LPSM | $825,000 | 1 | $825,000 |
| REMOVAL OF BRIDGE | LPSM | $272,870 | 1 | $272,870 |
| REMOVAL OF STONE MASONRY | CUYD | $1,670.00 | 4 | $6,680 |
| STRUCTURE EXCAVATION | CUYD | $200.00 | 278 | $55,600 |
| STRUCTURAL BACKFILL | CUYD | $350.00 | 142 | $49,700 |
| AGGREGATE BASE GRADING C, 8-INCH DEPTH | SQYD | $95.70 | 34 | $3,254 |
| STRUCTURAL CONCRETE, CLASS A | CUYD | $3,440.00 | 104 | $358,637 |
| PRECAST STRUCTURAL CONCRETE | CUYD | $4,675.00 | 27 | $126,225 |
| PRECAST INVERTED TEE GIRDERS | LNFT | $3,069.00 | 536 | $1,644,984 |
| REINFORCING STEEL | LB | $7.80 | 20327 | $158,552 |
| BRIDGE RAILING, CONCRETE | LNFT | $1,950.00 | 126 | $245,700 |
| BEARING DEVICE, ELASTOMERIC | EACH | $8,250.00 | 20 | $165,000 |
| MICROPILE | LNFT | $890.00 | 800 | $712,000 |
| DRILLED SHAFTS | LNFT | $5,000.00 | 160 | $800,000 |
| STONE MASONRY GUARDWALL | LNFT | $2,915.00 | 79 | $230,285 |
| PRESTRESSING SYSTEM | LPSM | $330,000.00 | 1 | $330,000 |
| MileStone: 30% Submittal - South Wailua Bridge 23 - Alternative A - Prestressed Concrete, Precast Inverted Tee Girders | | | | $7,532,333 |

Alternative B – Prestressed Concrete, Precast Voided Slab

| Pay Item Description | Unit | Unit Price | Estimated Quantities<br>Bid Schedule | Total Cost |
|---|---|---|---|---|
| MINOR ITEMS AND CONTINGENCY 30% OF CONST ITEMS | LPSM | $1,508,084 | 1 | $1,508,084 |
| TEMPORARY BRIDGE | LPSM | $825,000 | 1 | $825,000 |
| REMOVAL OF BRIDGE | LPSM | $272,870 | 1 | $272,870 |
| REMOVAL OF STONE MASONRY | CUYD | $1,670 | 4 | $6,680 |
| STRUCTURE EXCAVATION | CUYD | $200 | 158 | $31,600 |
| STRUCTURAL BACKFILL | CUYD | $350 | 109 | $38,150 |
| AGGREGATE BASE GRADING C, 8-INCH DEPTH | SQYD | $95.70 | 15 | $1,436 |
| STRUCTURAL CONCRETE, CLASS A | CUYD | $3,440 | 99 | $339,430 |
| PRECAST STRUCTURAL CONCRETE | CUYD | $4,675 | 27 | $126,225 |
| PRECAST, PRESTRESSED CONC. SLABS, 48-INCH VOIDED | LNFT | $4,873 | 335 | $1,632,455 |
| REINFORCING STEEL | LB | $7.80 | 18541 | $144,616 |
| BRIDGE RAILING, CONCRETE | LNFT | $1,950 | 126 | $245,700 |
| BEARING DEVICE, ELASTOMERIC | EACH | $8,250 | 14 | $115,500 |
| MICROPILE | LNFT | $890 | 800 | $712,000 |
| DRILLED SHAFTS | LNFT | $5,000.00 | 160 | $800,000 |
| STONE MASONRY GUARDWALL | LNFT | $2,915 | 79 | $230,285 |
| PRESTRESSING SYSTEM | LPSM | $330,000 | 1 | $330,000 |
| MileStone: 30% Submittal - South Wailua Bridge 23 - Alternative B - Prestressed Concrete, Precast Voided Slab | | | | $7,360,031 |

Alternative C – Reinforced Concrete, Cast-In-Place Tee Girders

| Pay Item Description | Unit | Unit Price | Estimated Quantities<br>Bid Schedule | Total Cost |
|---|---|---|---|---|
| MINOR ITEMS AND CONTINGENCY 30% OF CONST ITEMS | LPSM | $1,197,513 | 1 | $1,197,513 |
| TEMPORARY BRIDGE | LPSM | $825,000 | 1 | $825,000 |
| REMOVAL OF BRIDGE | LPSM | $272,870 | 1 | $272,870 |
| REMOVAL OF STONE MASONRY | CUYD | $1,670 | 4 | $6,680 |
| STRUCTURE EXCAVATION | CUYD | $200 | 200 | $40,000 |
| STRUCTURAL BACKFILL | CUYD | $350 | 151 | $52,850 |
| SHORING AND BRACING | SQFT | $500 | 1206 | $603,000 |
| AGGREGATE BASE GRADING C, 8-INCH DEPTH | SQYD | $95.70 | 15 | $1,436 |
| STRUCTURAL CONCRETE, CLASS A | CUYD | $3,440 | 162 | $558,803 |
| PRECAST STRUCTURAL CONCRETE | CUYD | $4,675 | 27 | $126,225 |
| REINFORCING STEEL | LB | $7.80 | 31136 | $242,861 |
| BRIDGE RAILING, CONCRETE | LNFT | $1,950 | 126 | $245,700 |
| BEARING DEVICE, ELASTOMERIC | EACH | $8,250 | 12 | $99,000 |
| MICROPILE | LNFT | $890 | 800 | $712,000 |
| DRILLED SHAFTS | LNFT | $5,000.00 | 160 | $800,000 |
| STONE MASONRY GUARDWALL | LNFT | $2,915 | 79 | $230,285 |
| MileStone: 30% Submittal - South Wailua Bridge 23 - Alternative C - Reinforced Concrete, Cast-In-Place Tee Girders | | | | $6,014,223 |

Alternative E – Prestressed Concrete, Precast I-Girders

| Pay Item Description | Unit | Unit Price | Estimated Quantities<br>Bid Schedule | Total Cost |
|---|---|---|---|---|
| MINOR ITEMS AND CONTINGENCY 30% OF CONST ITEMS | LPSM | $1,337,735 | 1 | $1,337,735 |
| TEMPORARY BRIDGE | LPSM | $825,000 | 1 | $825,000 |
| REMOVAL OF BRIDGE | LPSM | $272,870 | 1 | $272,870 |
| REMOVAL OF STONE MASONRY | CUYD | $1,670 | 4 | $6,680 |
| STRUCTURE EXCAVATION | CUYD | $200 | 196 | $39,200 |
| STRUCTURAL BACKFILL | CUYD | $350 | 147 | $51,450 |
| AGGREGATE BASE GRADING C, 8-INCH DEPTH | SQYD | $95.70 | 15 | $1,436 |
| STRUCTURAL CONCRETE, CLASS A | CUYD | $3,440 | 103 | $355,080 |
| PRECAST STRUCTURAL CONCRETE | CUYD | $4,675 | 27 | $126,225 |
| PRECAST, PRESTRESSED CONCRETE AASHTO GIRDER | LNFT | $3,850 | 268 | $1,031,800 |
| REINFORCING STEEL | LB | $7.80 | 20178 | $157,391 |
| BRIDGE RAILING, CONCRETE | LNFT | $1,950 | 126 | $245,700 |
| BEARING DEVICE, ELASTOMERIC | EACH | $8,250 | 12 | $99,000 |
| MICROPILE | LNFT | $890 | 800 | $712,000 |
| DRILLED SHAFTS | LNFT | $5,000.00 | 160 | $800,000 |
| STONE MASONRY GUARDWALL | LNFT | $2,915 | 79 | $230,285 |
| PRESTRESSING SYSTEM | LPSM | $330,000 | 1 | $330,000 |
| MileStone: 30% Submittal - South Wailua Bridge 23 - Alternative E - Prestressed Concrete, Precast I-Girders | | | | $6,621,852 |

# Appendix I. Pre-Assessment Comment Letters and Draft EA Comment Letters.

# Appendix I-1. Pre-Assessment Comment Letters.

March 18, 2025

**SUBJECT: Pre-Assessment Consultation for an Environmental Assessment**
**Hawaiʻi Revised Statutes, Chapter 343**
**Waikakoi and South Wailua Bridge Replacement Project**
**District of Hāna, Island of Maui**
**Federal Aid Project No. BR-0360(015)**
**Tax Map Keys: (2) 1-5-008: 001, 002, 004;1-5-009: 009, 010, 011, 012; 1-5-010: 008; and Hāna Highway Right-of-Way**

Dear Participant:

On behalf of the County of Maui (County), Department of Public Works (DPW), HDR is preparing a Draft Environmental Assessment (EA) in accordance with Hawaiʻi Revised Statutes (HRS), Chapter 343 and Hawaiʻi Administrative Rules (HAR), Section 11-200.1 for the Waikakoi and South Wailua Bridge Replacement Project in the District of Hāna on the island of Maui (Figure 1). DPW, in coordination with the Federal Highway Administration and the State of Hawaiʻi (State), Department of Transportation (HDOT), proposes to replace the two existing structurally deficient bridges, the Waikakoi Bridge and South Wailua Bridge, with new single-lane bridges to provide safe and functional stream crossings. The project involves the use of State and County lands and/or funds and is therefore subject to environmental review requirements.

The project area is approximately 2.73 acres comprised of 1.21 acres surrounding Waikakoi Bridge and 1.52 acres surrounding South Wailua Bridge. The area encompasses permanent and temporary bridge construction, roadway approaches, and anticipated staging areas. The purpose of the project is to address the existing structural deterioration and load capacity deficiencies by upgrading the structures to be consistent with current design standards and guidelines. To accommodate traffic during construction, it is anticipated that temporary bypass bridges would be installed *makai* of each bridge.

In accordance with HAR, Section 11-200.1-18(a), DPW is seeking input from agencies, organizations, and/or individuals who have jurisdiction, an area of expertise, or may be reasonably affected by the project to help guide the scope and development of the Draft EA.

We request your written comments via U. S. mail or email to the following address within 30 days of receipt of this letter by April 12, 2025:

HDR
Attn: Chris J. Nakamura, P.E., LEED AP
1001 Bishop Street, Suite 400
Honolulu, HI 96813
(808) 697-6297
Email: dpwbridges@hdrinc.com

Thank you for your participation in the environmental review process.

Sincerely,

Chris J. Nakamura, P.E., LEED AP
Hawaii Transportation Business Group Manager

Enclosure

cc: Ty Takeno, DPW (sent via electronic mail)


**Figure 1: Project Location and Vicinity**

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



STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES | KA ʻOIHANA KUMUWAIWAI ʻĀINA
**COMMISSION ON WATER RESOURCE MANAGEMENT | KE KAHUWAI PONO**
P.O. BOX 621
HONOLULU, HAWAII 96809

Apr 7, 2025

REF: RFD.6405.6

TO: Chris Nakamura, P.E., LEED AP
HDR

FROM: Ciara W.K. Kahahane, Deputy Director
Commission on Water Resource Management

SUBJECT: Waikakoi and South Wailua Bridge Replacement Project

FILE NO.: RFD.6405.6
TMK NO.: (2) 1-5-008:001, (2) 1-5-008:002, (2) 1-5-008:004, (2) 1-5-009:009, (2) 1-5-009:010, (2) 1-5-009:011, (2) 1-5-009:012, (2) 1-5-010:008

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://dlnr.hawaii.gov/cwrm.

Our comments related to water resources are checked off below.

- [ ] 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.
- [ ] 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.
- [ ] 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.
- [ ] 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP as having high water efficiency can be found at http://www.epa.gov/watersense.
- [x] 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/
- [ ] 6. We recommend the use of alternative water sources, wherever practicable.
- [ ] 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program.
- [ ] 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

- [x] 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.
- [ ] 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.
- [ ] 11. The Hawaii Water Plan is directed toward the achievement of the utilization of reclaimed water for uses other than drinking and for potable water needs in one hundred per cent of State and County facilities by December 31, 2045 (§174C-31(g)(6), Hawaii Revised Statutes). We strongly recommend that this project consider using reclaimed water for its non-potable water needs, such as irrigation. Reclaimed water may include, but is not limited to, recycled wastewater, gray water, and captured rainwater/stormwater. Please contact the Hawaiʻi Department of Health, Wastewater Branch, for more information on their reuse guidelines and the availability of reclaimed water in the project area.
- [ ] 12. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.
- [ ] 13. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.
- [ ] 14. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.
- [ ] 15. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.
- [ ] 16. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.
- [ ] 17. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.
- [ ] 18. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.
- [ ] 19. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

- [ ] OTHER:

If you have any questions, please contact Ryan Imata of the Groundwater Regulation Branch at (808) 587-0225 or Katie Roth of the Planning Branch (808) 587-0216.

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**
**Office of Conservation and Coastal Lands**
P.O. BOX 621
HONOLULU, HAWAII 96809



REF:OCCL:AA

Correspondence: MA 25-161

Apr 7, 2025

RECEIVED
APR 09 2025
HDR ENGINEERING, INC

Chris J. Nakamura, P.E., LEED AP
1001 Bishop Street, Suite 400
Honolulu, Hawai'i 96813

SUBJECT: Environmental Assessment (EA) Pre-Consultation for the Waikāko'i and South Wailua Bridge Replacement Project location at Por. Koali & Pu'uhao, Hana, Maui, TMK(s): (2) 1-5-008:001, 002, 004, (2) 1-5-009:009 & 010 (2) 1 5-010: 008

Dear Chris J. Nakamura,

The Office of Conservation and Coastal Lands has reviewed your correspondence regarding a pre consult for an Environmental Assessment (EA). On behalf of the County of Maui, Department of Public Works (DPW), HDR is preparing a draft EA for the Waikāko'i and South Wailua Bridge replacement project. The above noted parcels are partially located in the Conservation District within the Limited and Resource subzones

The purpose of the proposed project is to address existing structural deterioration and load capacity deficiencies. Temporary bypass bridges will be constructed makai of each bridge. The project area is approximately 2.73 acres comprised of 1.21 acres surrounding the Waikāko'i Bridge and 1.52 acres surrounding South Wailua Bridge. The area encompasses permanent and temporary bridge construction, roadway approaches and staging areas.

The OCCL is unable to determine the type of permit needed at this time as it is unclear what work will be conducted outside the ROW within the Conservation District. Once sufficient details are provided for intended land uses, then the OCCL can make a determination as to what type of authorization may be required.

The rules and regulations of the Conservation District, noted as the Hawaii Administrative Rules (HAR) Chapter 13-5, can be found at https://dlnr.hawaii.gov/occl/rules/ . Should you have any questions, contact Alyssa Accardo of the Office of Conservation and Coastal Lands at alyssa.m.accardo@hawaii.gov or at (808) 587-0048.

Sincerely,

S Michael Cain

S. Michael Cain, Administrator
Office of Conservation and Coastal Lands

*CC: MDLO, County of Maui, Planning Dept. & DPW*

# STATE OF HAWAIʻI
# OFFICE OF PLANNING
# & SUSTAINABLE DEVELOPMENT

JOSH GREEN, M.D.
GOVERNOR

SYLVIA LUKE
LT. GOVERNOR

MARY ALICE EVANS
DIRECTOR

235 South Beretania Street, 6th Floor, Honolulu, Hawaiʻi 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaiʻi 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: https://planning.hawaii.gov/

Coastal Zone Management Program

Environmental Review Program

Land Use Commission

Land Use Division

Special Plans Branch

State Transit-Oriented Development

Statewide Geographic Information System

Statewide Sustainability Branch


DTS202503211430HE

April 11, 2025

HDR
Attn: Mr. Chris J. Nakamura, P.E., LEED AP
Project Manager
1001 Bishop Street, Suite 400
Honolulu, Hawaiʻi 96813

Dear Mr. Nakamura:

Subject: Pre-Assessment Consultation for an Environmental Assessment Hawaiʻi Revised Statutes, Chapter 343 Waikakoi and South Wailua Bridge Replacement Project District of Hana, Island of Maui; Federal Aid Project No. BR-0360(015); Tax Map Keys: (2) 1-5-008: 001, 002, 004;1-5-009: 009, 010, 011, 012; 1-5-010: 008; and Hana Highway Right-of-Way

The State of Hawaii Office of Planning and Sustainable Development (OPSD) is in receipt of your early consultation request, dated March 18, 2025, regarding the replacement of Waikakoi and South Wailua Bridges, located in Hana, Maui. The request notified our office of the Draft Environmental Assessment (Draft EA), Hawaiʻi Revised Statutes (HRS) Chapter 343 that is being prepared on this proposed action by the County of Maui, Department of Public Works (DPW).

It is our understanding that DPW, in coordination with the Federal Highway Administration (FHWA) and the State of Hawaiʻi, Department of Transportation (HDOT), seeks to replace the two existing structurally deficient bridges, the Waikakoi Bridge and South Wailua Bridge, with new single-lane bridges to provide safe and functional stream crossings. The purpose of the project is to address the existing structural deterioration and load capacity issues by upgrading the bridges to be consistent with current HDOT design standards and guidelines.

We have reviewed the submitted material, and we offer the following comments:

1. <u>List of Permits and Agency Approvals/Maps & Diagrams</u>

The Draft EA shall discuss the triggers for the preparation of an Environmental Assessment set forth in HRS Chapter 343, as well as a list of all required permits and approvals for the proposed bridge project. Furthermore, the Draft EA should include project location maps and drawings of the proposed bridge structure, and various maps and diagrams indicating actions taken within proximity to streams, flooding zones, and land use boundaries.

2. <u>Coastal Zone Management (CZMA) federal consistency</u>
According to the review request, the South Wailua Bridge spans Honolewa Stream and located along Hana Highway of east Maui. If any federal permits or approvals are required, such as a Department of Army Permit, this project may be subject to CZMA federal consistency. Furthermore, the role of the FHWA for this project needs to be discussed in the Draft EA. A CZMA federal consistency review may be triggered if the FHWA is directly involved with this project, or mainly the funding agency via the Catalog of Domestic Federal Assistance (CDFA) 20.205 Highway Planning and Construction.

OPSD is the lead agency for the State of Hawaiʻi with the authority to perform federal consistency reviews. At your earliest convenience, please consult our office on the applicability of federal consistency for this project.

3. <u>Hawaiʻi Coastal Zone Management (CZM) Program</u>
Pursuant to HRS § 205A-4, in implementing the objectives of the CZM program, agencies shall consider ecological, cultural, historic, esthetic, recreational, scenic, open space values, coastal hazards, and economic development. The Draft EA should include an assessment as to how the proposed project conforms to each of the CZM objectives and supporting policies set forth in HRS § 205A-2, as amended.

Disclosure of impacts to CZM objectives and supporting policies, as it relates to HRS Chapter 343 requirements, will aid our office in determining impacts to the resources of the coastal zone, and evaluate the feasibility of potential mitigation measures. If a CZMA federal consistency review is needed, then the information provided in the Draft EA can serve as support documentation for this review.

4. <u>Special Management Area (SMA) Use Permitting</u>
The Draft EA needs to provide a map of the proposed bridge project in relation to the county designated special management area. OPSD recommends that the County of Maui Planning Department be consulted on the applicability of SMA Use Permitting.

5. <u>Stormwater Runoff, Erosion Mitigation, and Water Resources</u>
Pursuant to Hawaiʻi Administrative Rules (HAR) § 11-200.1-18(d)(7) – identification and analysis of impacts and alternatives considered; to ensure that nearshore resources of Hana, Maui remain protected, the negative effects of stormwater runoff and sediment loading from the proposed project site should be evaluated.

Issues that may be examined include, but are not limited to, project site characteristics in relation to flood and erosion prone areas, or vulnerability of the nearshore environment to volume or flow rate of stormwater runoff. As this project may involve work in and near the bed and banks of the Honolewa Stream, as well as associated land disturbing activity, the Draft EA should include mitigation measures for the protection of the nearshore coastal ecosystem and the maintenance of water quality, pursuant to HAR § 11-200.1-18(d)(8).

6. <u>Climate Change Adaptation/Sea Level Rise (SLR)</u>
As HRS Chapter 343 Significance Criteria rules require analysis on climate change and SLR impacts, the Draft EA should include an examination of the potential vulnerability of the bridge and roadway to SLR. The Draft EA should evaluate the project site's vulnerability to SLR, and other natural threats associated with climate change.

To assess the potential environmental impacts and vulnerability of this site, we suggest the Draft EA refer to the findings of the Hawai'i Sea Level Rise Vulnerability and Adaptation Report (2022), prepared by the State of Hawai'i Department of Land and Natural Resources, Office of Conservation and Coastal Lands. That report can be accessed via this link:
<u>https://dlnr.hawaii.gov/occl/files/2024/08/OCCL23-Sea-Level-Rise-Report-FY22-1.pdf</u>

The Report and the Hawai'i SLR Viewer at: <u>https://www.pacioos.hawaii.edu /shoreline/slrhawaii/</u> identifies a 3.2-foot SLR exposure area across the main Hawaiian Islands, as a starting evaluation point. The Draft EA should provide a map of the SLR exposure area in relation to the project area, evaluate potential SLR adaptation measures and safeguards when feasible.

If you have any questions or concerns, please contact Joshua Hekekia at (808) 587-2845 or by email to Joshua.K.Hekekia@hawaii.gov. If you wish to respond to this comment letter, please include DTS202503211430HE in the subject line.

Sincerely,

Mary Alice Evans

Mary Alice Evans,
Director

**RICHARD T. BISSEN, JR.**
Mayor

**LORI TSUHAKO**
Director

**JESSICA CROUSE**
Deputy Director

RECEIVED
MAR 3 1 2025
HDR ENGINEERING, INC.

**DEPARTMENT OF HUMAN CONCERNS**
COUNTY OF MAUI
2200 MAIN STREET, SUITE 546
WAILUKU, MAUI, HAWAIʻI 96793
PHONE: (808) 270-7805

March 21, 2025

HDR
Attn: Chris J. Nakamura, P.E., LEED AP
1001 Bishop Street, Suite 400
Honolulu, HI 96813

Dear Mr. Nakamura:

**SUBJECT: PRE-ASSESSMENT CONSULTATION FOR AN ENVIRONMENTAL ASSESSMENT HAWAII REVISED STATUTES, CHAPTER 343
WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT PROJECT
DISTRICT OF HANA, ISLAND OF MAUI
FEDERAL AID PROJECT NO. BR-0360(015)
TAX MAP KEYS: (2) 1-5-008: 001, 002, 004;1-5-009: 009, 010, 011, 012; 1-5-010: 008; AND HANA HIGHWAY RIGHT-OF-WAY**

Thank you for notification of the pre-assessment consultation for an environmental assessment for the proposed subject project. Upon review of the materials provided, I have determined that this project will not have an impact on any existing or proposed projects, plans, policies, or programs coordinated by the Department of Human Concerns. I have no additional comments to provide at this time.

Sincerely,

Lori Tsuhako

LORI TSUHAKO, LSW, ACSW
Director of Human Concerns

**RICHARD T. BISSEN, JR.**
Mayor

**KATE L. K. BLYSTONE**
Director

**ANA LILLIS**
Deputy Director

**DEPARTMENT OF PLANNING**
COUNTY OF MAUI
ONE MAIN PLAZA
2200 MAIN STREET, SUITE 315
WAILUKU, MAUI, HAWAIʻI 96793

April 2, 2025

HDR
Attn: Chris J. Nakamura, P.E., LEED AP
1001 Bishop Street, Suite 400
Honolulu, Hawaiʻi 96813

Dear Mr. Nakamura:

**SUBJECT: REQUEST FOR PRE-ASSESSMENT CONSULTATION FOR AN ENIVORNMENTAL ASSESSMENT, HAWAIʻI REVISED STATUTES (HRS), CHAPTER 343, WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT PROJECT, DISTRICT OF HĀNA, ISLAND OF MAUI, FEDERAL AID PROJECT NO. BR-0360(015), TMK (2) 1-5-008:001, 002, 004; 1-5-009:009, 010, 011, 012; 1-5-010:008; AND HĀNA HIGHWAY RIGHT-OF-WAY (RFC2025-00030)**

The Maui Planning Department (Department) is in receipt of your letter, dated March 18, 2025, seeking a pre-assessment consultation for the preparation of an Environmental Assessment (EA) for the Waikakoi and South Wailua Bridge Replacement Project in the Hāna District. The proposed project includes the replacement of two existing structurally deficient bridges, the Waikakoi Bridge and South Wailua Bridge, with new single-lane bridges to provide safe and functional stream crossings. The proposed use of State and County lands and or funds triggers Chapter 343, HRS, and a Draft Environmental Assessment (DEA) is being prepared to examine potential impacts and mitigation measures resulting from the implementation of the proposed project.

The project location (multiple parcels) is also located in the County's Special Management Area (SMA). Pursuant to Chapter 205A-22, HRS, the proposed action is considered to be a "development" and does not qualify for an SMA exemption. For any development within the SMA that has a valuation over $500,000.00, an SMA Use Permit (SM1) is required. The SM1 involves a public hearing and the approving authority is the Maui Planning Commission (MPC).

The shoreline setback for the project site is the erosion hazard line (EHL) that corresponds with 3.2 feet of sea level rise. Since the project site is located mauka of the EHL, the project is not subject to the Shoreline Rules for the MPC.

Should you have any questions, please contact Staff Planner, Collette Cardoza at collette.cardoza@co.maui.hi.us or (808) 270-8219.

Sincerely,

DANNY A. DIAS
Planning Program Adminsitrator

*for* KATE L. K. BLYSTONE
Director

xc: Collette Cardoza, Staff Planner (PDF)
Chris J. Nakamura, P.E., LEED AP
KLKB:DAD:CMC:lp
K:\WP_DOCS\Planning\RFC\2025\00030_EAConsultationWaileaBridgeReplacementHana\Response.docx

| | |
|---|---|
| **From:** | Nicholas P. Krau |
| **To:** | 10270482_2020040COMDPWBridgeReplacement |
| **Cc:** | Keola Tom; Gabriele Yacapin; Davlynn L. Racadio |
| **Subject:** | Pre-Assessment Consultation Waikakoi and South Wailua Bridge Replacement |
| **Date:** | Friday, March 21, 2025 2:43:15 PM |



Aloha Chris Nakamura,

My name is Lieutenant Nick Krau, and I serve as the Commander of the Maui Police Department's East Maui District. Our agency is solely responsible for providing law enforcement and public safety services to this region.

In regard to the Waikakoi and South Wailua Bridge replacement project, we do not have any input to provide on the environmental review requirements.

However, maintaining emergency services during road construction projects in East Maui presents unique challenges due to the rural nature of the district and the significant distances between communities. Even under normal conditions, response times can be delayed due to the terrain and winding roads. All emergency services including Police, Fire, and Medics are based out of Hāna Town, so any construction activity near South Wailua Bridge or Waikakoi Bridge will require advanced planning and coordination.

In some cases, it may be more efficient to reroute resources from other districts rather than have East Maui crews delayed at construction zones. Will emergency vehicles and Fire Trucks be able to fit on and utilize the temporary bridges? To make those decisions effectively, it's crucial that we coordinate closely with the construction foreman and traffic control teams.

Please know that we fully support these much needed bridge repairs and are committed to assisting in any way to ensure the safety of both the community and the construction crews. As we approach the start of construction, I respectfully request a meeting between the project coordinator, job foreman, traffic control lead, and representatives from East Maui Police, Fire, and Medics. This will help establish clear communication, align expectations, and allow us to develop contingency plans that preserve emergency access and minimize impacts on response times.

Mahalo for your attention to this matter and for your continued partnership.

Very Respectfully,

Lieutenant Nick Krau
Commander, Hana Patrol District
Maui Police Department

# Appendix I-2. Draft EA Comment Letters.

JOSH GREEN, M.D.
GOVERNOR OF HAWAIʻI
KE KIAʻĀINA O KA MOKUʻĀINA ʻO HAWAIʻI

KENNETH S. FINK, MD, MGA, MPH
DIRECTOR OF HEALTH
KA LUNA HOʻOKELE

STATE OF HAWAII
DEPARTMENT OF HEALTH
KA ʻOIHANA OLAKINO
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
File:
24-288A CAB

July 3, 2024

**MEMORANDUM**

TO: Agencies and Project Owners

FROM: MARIANNE ROSSIO, P.E., CHIEF
Clean Air Branch

**SUBJECT: Clean Air Branch Standard Project Comments**

**This memo is provided for your information and sharing. You are encouraged to share this memo with your project partners, team members, and appropriate personnel.**

The Department of Health (DOH), Clean Air Branch (CAB), will no longer be responding directly to requests for comments on the following documents (including pre-consultation, early consultation, preparation notice, draft, final, addendums, and/or supplements):

- Environmental Impact Statements (EIS)
- Environmental Assessments (EA)
- Anticipated Finding of No Environmental Significant Impacts (AFONSI)
- Conservation District Use Applications (CDUA)
- Special Management Area Permits (SMAP)

For agencies or project owners requiring DOH-CAB comments on one or more of these documents, please utilize the DOH-CAB Standard Comments below regarding your project's responsibilities to maintain air quality and any necessary permitting. DOH-CAB Standard Comments are also available on the DOH-CAB website located at: https://health.hawaii.gov/cab/files/2024/07/Standard-Comments-for-Land-Use-Reviews-Clean-Air-Branch-July_2024.pdf.

If you have any questions, please the Clean Air Branch at (808) 586-4200.

CH:rkb

**Standard Comments for Land Use Reviews**
**Clean Air Branch**
**Hawaii State Department of Health**
**July 3, 2024**

**All project activities shall comply with Hawaii Administrative Rules (HAR), Chapter 11-59 and 11-60.1.**

**If your proposed project:**

**Requires an Air Pollution Control Permit**

- You must obtain an air pollution control permit from the Clean Air Branch and comply with all applicable conditions and requirements. If you do not know if you need an air pollution control permit, please contact the Permitting Section of the Clean Air Branch.
- Permit application forms can be found here: https://health.hawaii.gov/cab/permit-application- forms/

**Has the potential to generate fugitive dust**

- You must reasonably control the generation of all airborne, visible fugitive dust. Note that construction activities that occur near existing residences, businesses, public areas and major thoroughfares exacerbate potential dust concerns. It is recommended that a dust control management plan be developed which identifies and mitigates all activities that may generate airborne, visible fugitive dust. The plan, which does *not* require Department of Health approval, should help you recognize and minimize potential airborne, visible fugitive dust problems.
- Construction activities must comply with the provisions of Hawaii Administrative Rules, §11- 60.1-33 on Fugitive Dust. In addition, for cases involving mixed land use, it is strongly recommended that buffer zones be established, wherever possible, in order to alleviate potential dust concerns.
- You must provide reasonable measures to control airborne, visible fugitive dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:
  - Planning the different phases of construction, focusing on minimizing the amount of airborne, visible fugitive dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
  - Providing an adequate water source at the site prior to start-up of construction activities;
  - Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
  - Minimizing airborne, visible fugitive dust from shoulders and access roads;
  - Providing reasonable dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
  - Controlling airborne, visible fugitive dust from debris being hauled away from the project site.
- If you have questions about fugitive dust, please contact the Enforcement Section of the Clean Air Branch. Please also see fugitive dust fact sheet at: https://health.hawaii.gov/cab/files/2024/02/Hawaii-Fugitive-Dust-Fact-Sheet-February-2024.pdf.

**<u>Includes construction, demolition, or renovation activities that involve potential asbestos and lead containing materials</u>**

- Please contact the Indoor and Radiological Health Branch at (808) 586-4700 or visit: https://health.hawaii.gov/irhb/

**<u>Increases the population and potential number of vehicles in an area</u>**

- The creation of apartment buildings, complexes, and residential communities may increase the overall population in an area. Increasing the population in an area may inadvertently lead to more air pollution via vehicle exhaust. Vehicle exhaust releases pollutants in the air that can negatively impact human health and air quality, including lung irritants, carcinogens, and greenhouse gases.
- Ensure that drivers keep vehicle idling times to three (3) minutes or less.
- Consider and incorporate support for alternative transportation options such as bike racks and/or electric vehicle charging stations where possible.

If you have any questions, please contact the Clean Air Branch at (808) 586-4200 or at cab@doh.hawaii.gov.

**RICHARD T. BISSEN, JR.**
Mayor

**JOSIAH K. NISHITA**
Managing Director

**PATRICK S. MCCALL**
Director

**SHANE T. DUDOIT**
Deputy Director

**DEPARTMENT OF PARKS AND RECREATION**
COUNTY OF MAUI
700 HALIʻA NAKOA STREET, UNIT 2
WAILUKU, MAUI, HAWAIʻI 96793
www.mauicounty.gov

RECEIVED
JUL 21 2025
HDR ENGINEERING, INC.

July 15, 2025

Noelle Besa Wright, AICP
Senior Environmental Planner, HDR Inc.
1001 Bishop Street, Suite 400
Honolulu, HI 96813

Dear Ms. Wright:

**SUBJECT: NOTIFICATION OF PUBLIC COMMENT PERIOD FOR DRAFT ENVIRONMENTAL ASSESSEMENT HAWAIʻI REVISED STATUTES, CHAPTER 343**
**WAIKAKOI AND SOUTH WAILUA BRIDGE REPLACEMENT PROJECT**
**DISTRICT OF HANA, ISLAND OF MAUI**
**FEDERAL AID PROJECT NO. Br-0360(015)**
**TAX MAP KEYS: HANA HIGHWAY RIGHT-OF WAY; (2) 1-5-008: 001, 002, 004; 1-5-009: 009, 010, 011, 012; and, 1-5-010: 008**

Thank you for the opportunity to review and comment on the subject project. The Department of Parks and Recreation has no comment at this time.

Should you have any questions, please feel free to contact me or Samual Marvel, Chief of Planning and Development, at samual.marvel@co.maui.hi.us or (808) 270-6173.

Sincerely,

PATRICK S. MCCALL
Director of Parks and Recreation

c: Samual Marvel, Chief of Planning and Development

PSM:SAM:gh

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
Office of Conservation and Coastal Lands
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. KANAKAʻOLE
FIRST DEPUTY

CIARA W.K. KAHAHANE
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

REF:OCCL:AA

RE: Correspondence: MA 25-161

Jul 17, 2025

Noelle Besa Wright, AICP, Senior Environmental Planner
1001 Bishop Street, Suite 400
Honolulu, Hawaiʻi 96813

SUBJECT: Draft Environmental Assessment (DEA) for the Waikākoʻi and South Wailua Bridge Replacement Project location at Por. Koali & Puʻuhao, Hana, Maui, TMK(s): (2) 1-5-008:001, 002, 004, (2) 1-5-010: 008

Dear Noelle Besa Wright,

The Office of Conservation and Coastal Lands has reviewed your correspondence regarding the availability of the DEA. On behalf of the County of Maui, Department of Public Works (DPW), HDR prepared a draft EA for the Waikākoʻi and South Wailua Bridge replacement project. The above noted parcels are partially located in the Conservation District within the Limited and Resource subzones

The purpose of the proposed project is to address existing structural deterioration and load capacity deficiencies. Temporary bypass bridges will be constructed makai of each bridge. The project area is approximately 2.73 acres comprised of 1.21 acres surrounding the Waikākoʻi Bridge and 1.52 acres surrounding South Wailua Bridge. The area encompasses permanent and temporary bridge construction, roadway approaches and staging areas.

The DEA states that portions of the project's temporary construction staging, and temporary bypass bridge construction will occur outside of the County ROW within the Conservation District **(Exhibit A).**

The temporary bypass bridges will be installed makai of each bridge to facilitate traffic flow. Each temporary bridge will accommodate a single lane of traffic and is anticipated to span approximately 100 feet long and have and out to out width of 21.5 feet, The modular steel bridge structures will rest on reinforces concrete abutments with micro pile foundations. Temporary gabion basket retaining walls will be installed at each bridge approach to mitigate potential erosion. Temporary signage, pavement markings, portable concrete barriers, and crash barrels will be placed at the bridge approaches to serve as safety and traffic control measures.

The proposed land use appears to be an identified land use, pursuant to Hawaiʻi Administrative Rules (HAR) §13-5-22, P-6 PUBLIC PURPOSE USES (D-1) *Not for profit land uses undertaken in support of a public service by an agency of the county, state, or federal government, or by an independent non-governmental entity, except that an independent non-governmental regulated* *public utility may be considered to be engaged in a public purpose use. Examples of public purpose uses may include but are not limited to public roads, marinas, harbors, airports, trails, water systems and other utilities, energy generation from renewable sources, communication systems, floor or erosion control projects, recreational facilities, community centers, and other public purpose uses, intended to benefit the public in accordance with public policy and the purpose of the conservation district.* Please be advised, however, that this finding does not constitute approval of the proposal. The Board of Land and Natural Resources (BLNR) has the final decision to grant, modify, or deny the proposal.

The OCCL offers the following comments on the DEA for the Final EA:

- Delineate the work being proposed within the Conservation District and outside the Right-of-Way in a figure
- The OCCL requests the Final EA include a figure that identifies the County Right-of-Way in relation to proposed improvement or structure.
- Should the staging area take place makai of the ROW, please consult with the County regarding a Special Management Area (SMA) determination.
- As a government agency, DPW is responsible for Hawai'i Revised Statutes (HRS) 6E compliance. To help facilitate the processing of a CDUA for the project, please include an HRS 6E determination letter with the application.

The rules and regulations of the Conservation District, noted as the Hawaii Administrative Rules (HAR) Chapter 13-5, can be found at https://dlnr.hawaii.gov/occl/rules/ . Should you have any questions, contact Alyssa Accardo of the Office of Conservation and Coastal Lands at alyssa.m.accardo@hawaii.gov or at (808) 587-0048.

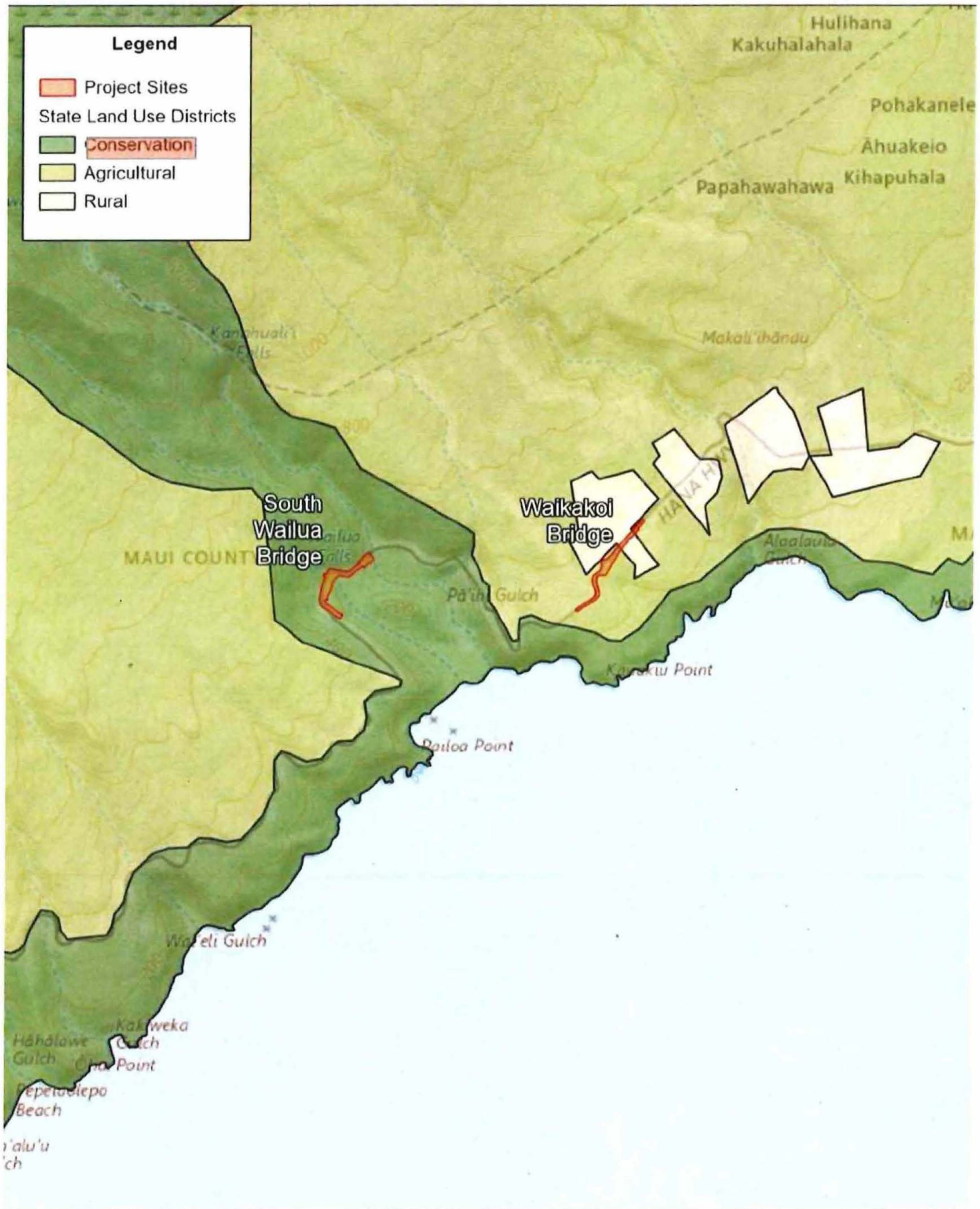
Sincerely,

S Michael Cain

S. Michael Cain, Administrator
Office of Conservation and Coastal Lands

CC: MDLO
County of Maui, Planning Dept, DPW

# Exhibit A


Legend
Project Sites
State Land Use Districts
Conservation
Agricultural
Rural
Hulihana
Kakuhalahala
Pohakanele
Āhuakeio
Papahawahawa
Kihapuhala
Makali'ihānau
South Wailua Bridge
Waikakoi Bridge
MAUI COUNT
Pā'ihi Gulch
Point
Pailoa Point
Hāhālawe Gulch
Beach

| | |
|---|---|
| **From:** | Kaweni Ibarra |
| **To:** | 10270482_2020040COMDPWBridgeReplacement |
| **Cc:** | Kamakana Ferreira |
| **Subject:** | OHA Comment Re: DEA for Waikakoi and S Wailua Bridge Replacement at Hana, Maui |
| **Date:** | Monday, August 4, 2025 8:40:29 AM |
| **Attachments:** | Outlook-k1xoq0u4.png |



Aloha e Noelle,

The Office of Hawaiian Affairs (OHA) is in receipt of your letter dated July 2, 2025, regarding the Draft Environmental Assessment (DEA) for the Waikakoi and South Wailua Bridge Replacement project in Hana, Maui.

OHA supports the decision to conduct archaeological monitoring for this project.

Additionally, we further support the recommendations within the AIS to avoid site Honua 1 if possible, and to otherwise conduct data recovery work. For site Honua 2, we support the AIS's call to consult with the neighboring landowner to determine ownership. As with Honua 1, we recommend avoidance if at all possible for Honua 2.

Mahalo for your time. We look forward to receiving the requested information. Please feel free to contact me should you have any questions.

Mahalo,

Kaweni Ibarra

***Kaweni Ibarra***
Compliance Advocate
Office of Hawaiian Affairs
OHA
OFFICE OF HAWAIIAN AFFAIRS

# STATE OF HAWAIʻI
# OFFICE OF PLANNING
# & SUSTAINABLE DEVELOPMENT

**JOSH GREEN, M.D.**
GOVERNOR

**SYLVIA LUKE**
LT. GOVERNOR

**MARY ALICE EVANS**
DIRECTOR

235 South Beretania Street, 6th Floor, Honolulu, Hawaiʻi 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaiʻi 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: https://planning.hawaii.gov/

Coastal Zone Management Program

Environmental Review Program

Land Use Commission

Land Use Division

Special Plans Branch

State Transit-Oriented Development

Statewide Geographic Information System

Statewide Sustainability Branch


DTS202507081639HE

August 5, 2025

Ms. Noelle Besa Wright, AICP
Senior Environmental Planner
HDR
1001 Bishop Street, Suite 400
Honolulu, Hawaiʻi 96813

Subject: Draft Environmental Assessment, Hawaiʻi Revised Statutes, Chapter 343 Waikakoi and South Wailua Bridge Replacement Project District of Hana, Island of Maui Federal Aid Project No. BR-0360(015); Tax Map Keys: Hana Highway Right-of-Way; (2) 1-5-008: 001, 002, 004; 1-5-009: 009, 010, 011, 012; and 1-5-010: 008

The Office of Planning and Sustainable Development (OPSD) appreciates the opportunity to provide comments on the Draft Environmental Assessment (Draft EA) for the Waikakoi and South Wailua Bridge Replacement Project.

It is our understanding that the Proposed Action consists of replacing the existing structurally deficient Waikakoi and South Wailua Bridges along Hāna Highway on Maui with new bridges consistent with current design standards. The intent of this Department of Public Works (DPW), County of Maui proposed project, is to address the structural deterioration and load capacity deficiencies of both bridges by replacing them with new structures that meet current design standards. These improvements are needed to ensure that the bridges, as well as the Hāna Highway corridor, remain safe for its users.

Our office has reviewed the submitted material and offers the following comments:

1. <u>Issues of Programmatic Concern</u>
   We acknowledge that the Draft EA addresses our previously expressed concerns found in our Early Consultation letter, DTS202503211430HE, dated April 11, 2025. These included: a comprehensive list of the permits and approvals needed; as well as analysis on the applicability of Hawaiʻi Revised Statutes (HRS) § 205A; Special Management Area Use Permitting; stormwater runoff mitigation measures and surface water resources; and includes sea level rise/climate change adaptation measures.

2. <u>Coastal Zone Management Act (CZMA) federal consistency</u>
Section 5.1.3, page 87 of the Draft EA acknowledges that DPW will consult OPSD on a CZMA federal consistency. This project intends to use funding from the U.S. Department of Transportation, Federal Highway Administration (FHWA). Additionally, DPW will consult with the U.S. Army Corps of Engineers on a Department of the Army Permit, Section 404 of the Clean Water Act, and a Nationwide Permit #3 (Maintenance). All of these are potential triggers for a federal consistency review. Please contact our office on federal consistency, as OPSD is the lead state agency with the authority to conduct federal consistency reviews.

If you have any questions or concerns, please contact Joshua Hekekia at (808) 587-2846 or by email to Joshua.K.Hekekia@hawaii.gov. If you wish to respond to this comment letter, please include DTS202507081639HE in the subject line.

Mahalo,

Mary Alice Evans

Mary Alice Evans
Director

# Appendix J. Draft EA Public Meeting Presentation.

# Waikakoi and South Wailua Bridge Replacement Draft Environmental Assessment

County of Maui Department of Public Works (DPW)

# Project Team

## County of Maui, Department of Public Works (DPW)

- Ty Takeno, Project Manager

## HDR – Environmental and Design

- Chris Nakamura, Project Manager
- Noelle Besa Wright, Environmental Lead
- **Environmental Team:**
  - Outreach – Munekiyo Hiraga
    - Gwendolyn Rivera
  - Permitting – Haley & Aldrich
  - Biology – AECOS, Inc.
  - Cultural/Historic Resources – Honua Consulting
  - Traffic Assessment – Austin, Tsutsumi & Associates, Inc.

# Project Location & Vicinity

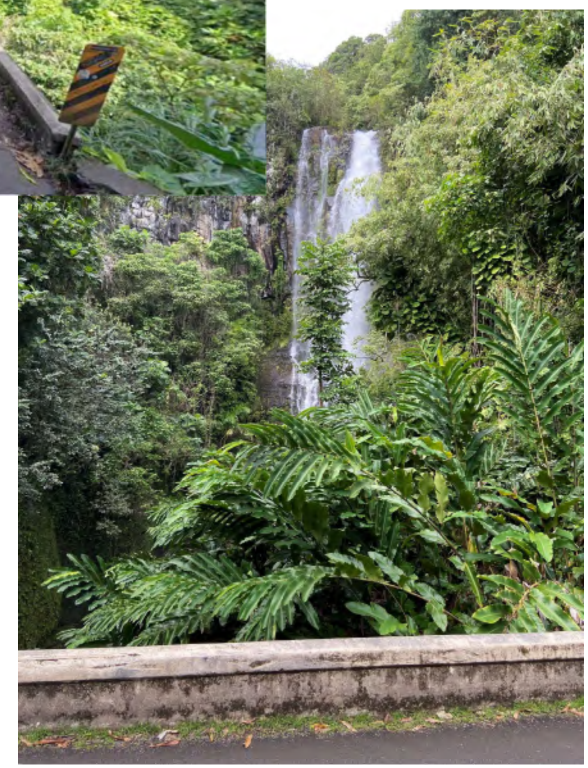
- Hāna Highway Historic District
- DPW maintains approximately 18 miles of the highway, including 14 bridges

# Waikakoi Bridge

- Carries Hāna Highway over the Waikakoi Stream
- Mile marker 45.4
- ~6.9 miles south of Hāna Town
- ~33 feet long, 16.7 feet wide

# South Wailua Bridge

- Carries Hāna Highway over Honolewa Stream
- Mile marker 44.6
- ~7.6 miles south of Hāna Town
- ~57 feet long, ~16.7 feet wide



# Purpose and Need

Address the structural deterioration and load capacity deficiencies of both the Waikakoi and South Wailua Bridges by replacing the existing bridges with new structures that meet current design standards.

Ensure that the bridges, and therefore the Hāna Highway, remain safe and functional for highway users.

# Objectives

**Address structural deterioration and load capacity deficiencies** by resolving the “serious” and “poor” condition ratings and restoring full functional capacity.

**Improve safety and reliability for highway users** by ensuring the bridges meet current design and safety standards.

**Maintain reliable access to and from the Hāna region** for residents, visitors, emergency services, and commercial deliveries.

Reduce long-term maintenance costs and burden on County resources by **replacing aging structures with current infrastructure**.

Utilize **context-sensitive design that preserves the historic and scenic character of the Hāna Highway**, consistent with the Hāna Highway Historic District, *Hāna Bridges Preservation Plan* (DPW, 2001), and County policies such as the Hāna Community Plan.

**Avoid or minimize environmental and long-term right-of-way (ROW) impacts**.

# Project Description

Replace the two existing structurally deficient bridges, the Waikakoi Bridge and South Wailua Bridge, with new, single-lane bridges in the same general location to provide safe and functional stream crossings.

## Project Components

**Temporary Bypass Bridges to minimize construction impacts**

**Demolition and Removal of Existing Bridges**

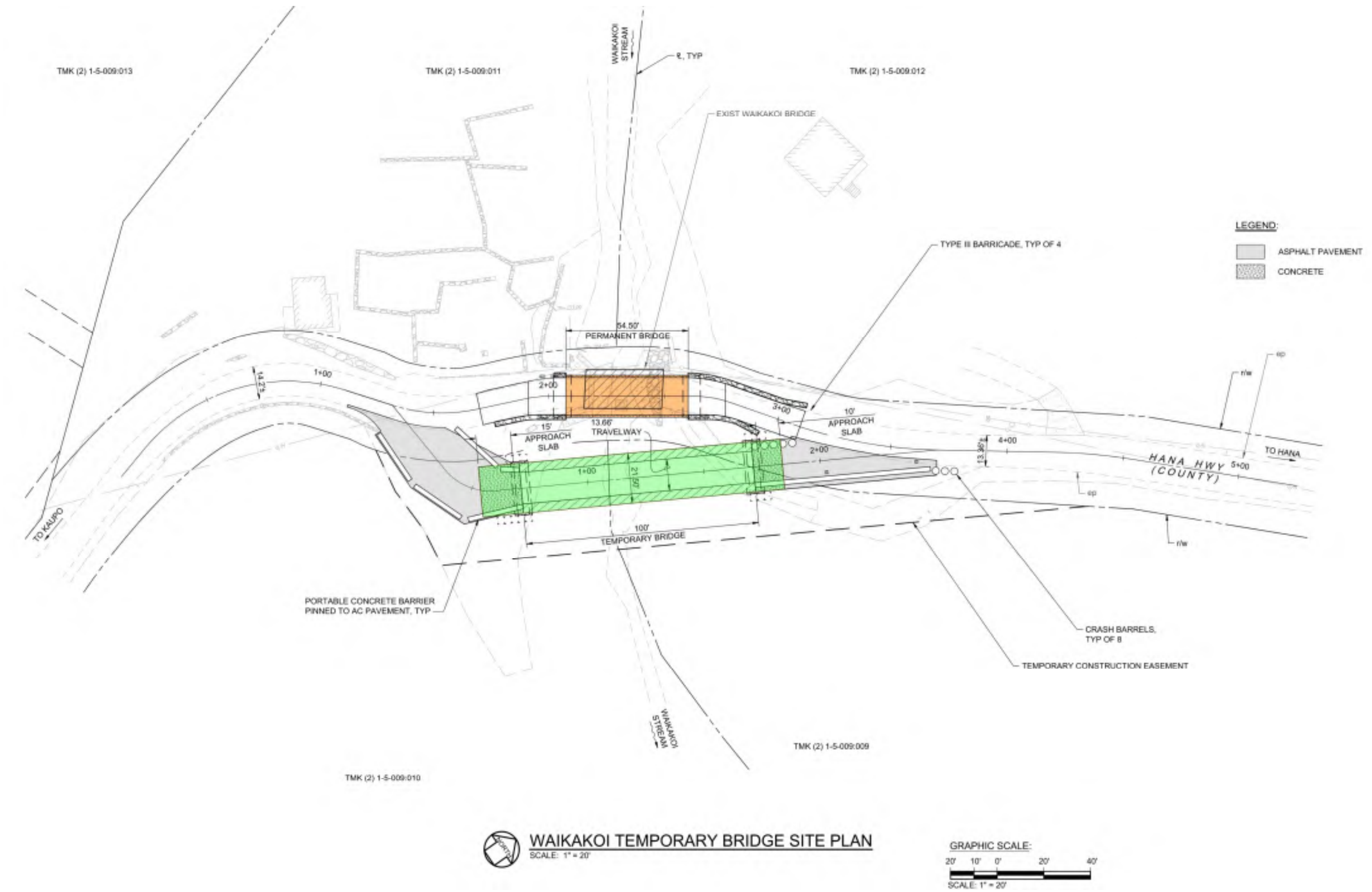
**Grading and Drainage Improvements**

**Replacement and Construction of New Waikakoi and South Wailua Bridges – single-lane, same location**

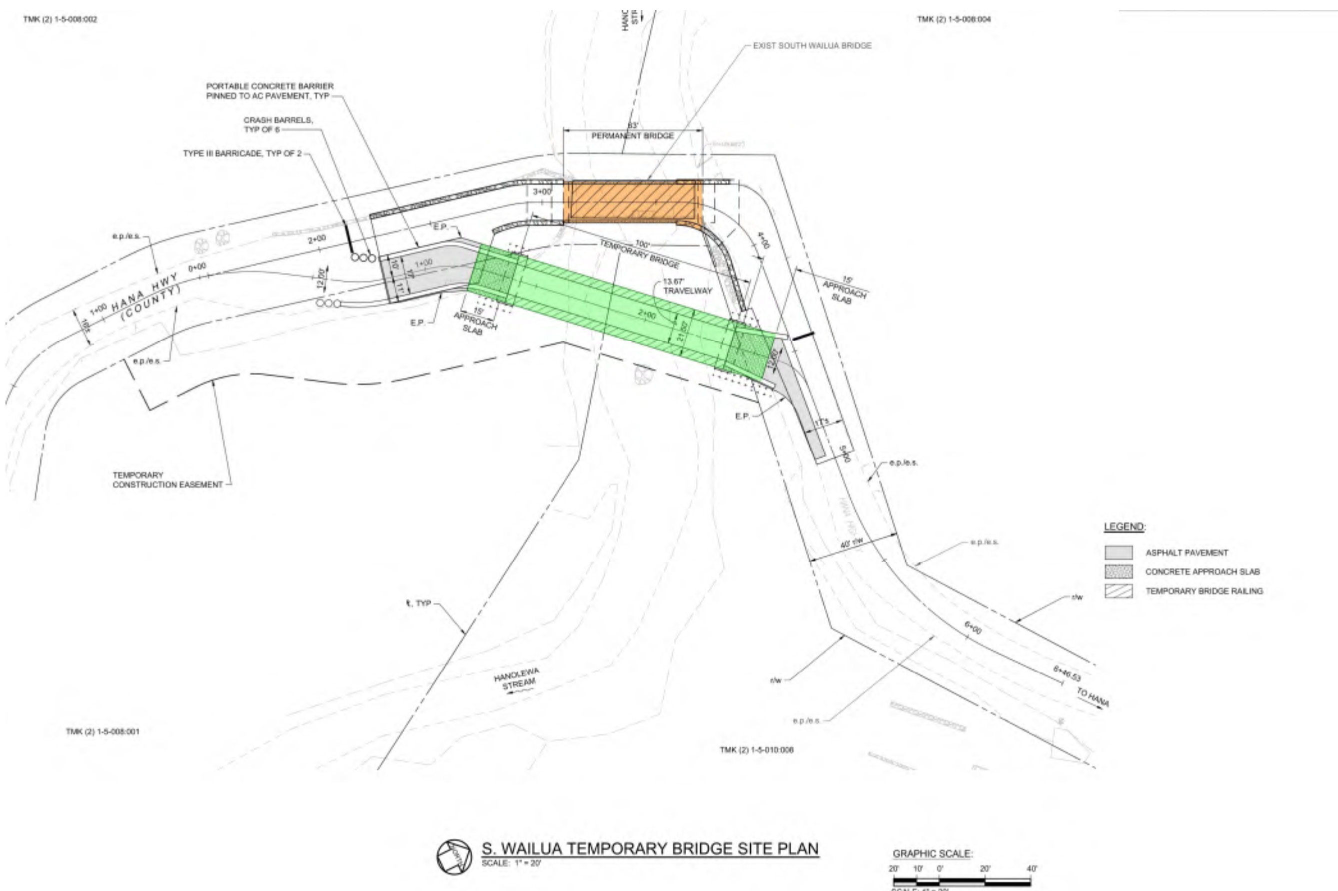
**Roadway Improvements and Utility Relocation**

# Temporary Bridge – Paihi Bridge Example

# Temporary Bypass Bridge – Plan View



# Temporary Bypass Bridge – Plan View



**Existing Waikakoi Bridge**

**Proposed Waikakoi Bridge (Illustrative Rendering)**

**Existing South Wailua Bridge**

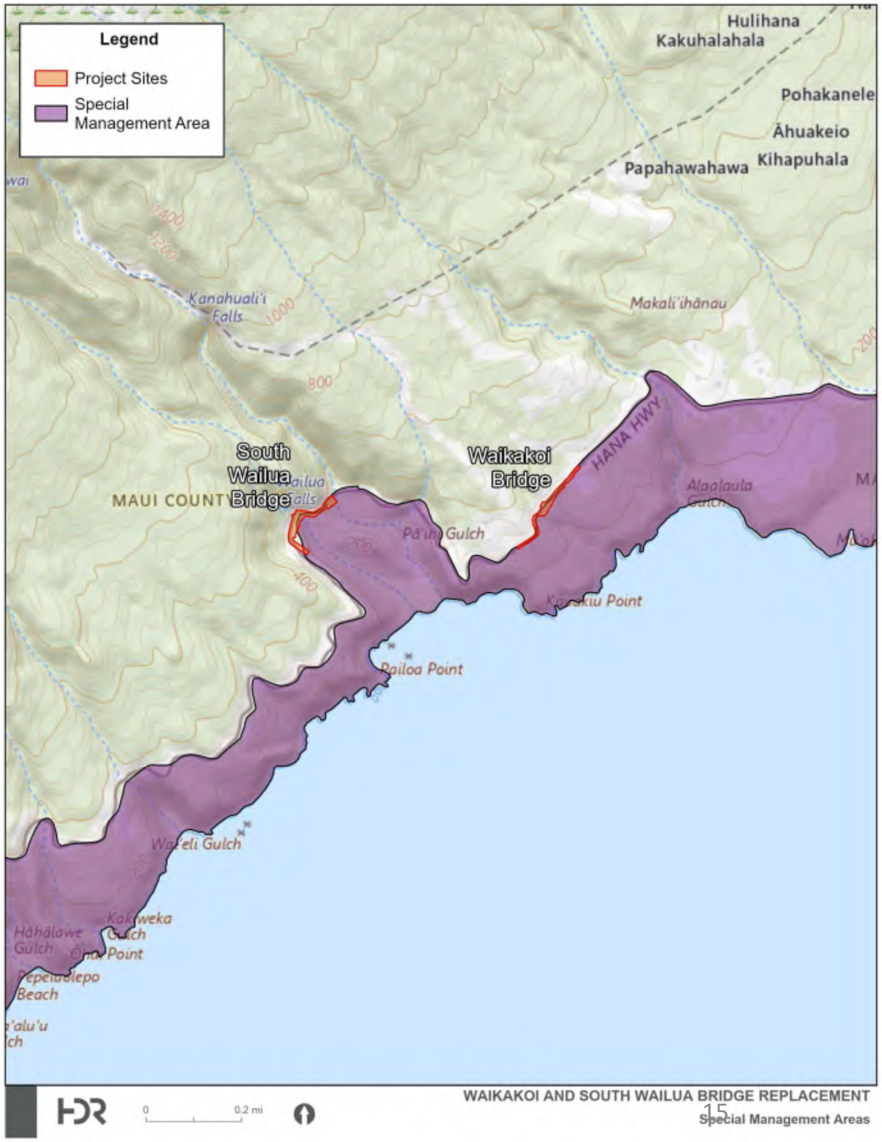
**Proposed South Wailua Bridge (Illustrative Rendering)**

# State Land Use District

- Waikakoi Bridge: Agricultural, Rural
- South Wailua Bridge: Conservation

# Special Management Area (SMA)

- Within the SMA



# Cultural and Historic Resources

- Waikakoi and South Wailua Bridge contribute to the federally-listed Hāna Highway Historic District
- Archaeological Inventory Survey (AIS) and Cultural Impact Assessment (CIA) prepared by Honua Consulting

# Anticipated Land Use Permits & Approvals

**Federal**

- National Environmental Policy Act (NEPA) Categorical Exclusion
- Section 106 National Historic Preservation Act Consultation
- Section 7 Endangered Species Act Consultation
- Clean Water Act (CWA) Section 404 Nationwide Permit

**State**

- Site Plan Approval or Conservation District Use Application
- CWA Section 401 Water Quality Certification
- HRS Chapter 6E-8 Historic Preservation Review
- Various construction-related permits

**County**

- Special Management Area Use Permit
- Various construction-related permits

# Environmental Review Process

**Pre-consultation Comment Period**
March 18 – April 18, 2025

→

**Draft EA / Anticipated Finding of No Significant Impact Publication**
July 2025

→

**Public Comment Period**
July 8 – August 7, 2025

→

**Final EA / Finding of No Significant Impact Publication**
Late 2025

# How to view the Draft EA

- Hard copy available at the Hāna Public and School Library
  - 4111 Hāna Highway
- Download a PDF on the State Environmental Review Program's website:

# How to Provide Comments

- Provide comments on the Draft EA by August 7, 2025:
  - **U.S. Mail:**

    HDR

    Attn: Noelle Besa Wright, AICP

    1001 Bishop Street, Suite 400

    Honolulu, HI 96813
  - **Email:** dpwbridges@hdrinc.com

# Anticipated Construction Schedule

Anticipated start: late 2027

New bridges will be constructed in a sequence

Anticipated duration of construction:

Approximately 2 years (1 year for each bridge)

# Questions?

- Contact the County of Maui Department of Public Works with additional questions:
    - Ty Takeno, County of Maui DPW Project Manager
        - Ty.takeno@co.maui.hi.us
        - (808) 270-7745