Bernard P. Carvalho, Jr.
Mayor

Nadine K. Nakamura
Managing Director

Lyle Tabata
Acting County Engineer

DEPARTMENT OF PUBLIC WORKS
County of Kaua'i, State of Hawai'i
4444 Rice Street, Suite 275, Līhu'e, Hawai'i 96766
TEL (808) 241-4992 FAX (808) 241-6604

April 12, 2016

Mr. Scott Glenn, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu HI 96813

Dear Mr. Glenn:

Subject: Draft Environmental Assessment for Puuopae Bridge Replacement, TMK: 4-4-002, Kawaihau District, County of Kaua'i, State of Hawai'i

With this letter, the County of Kaua'i, Department of Public Works (DPW) hereby transmits the draft environmental assessment and anticipated finding of no significant impact (DEA-AFONSI) for the subject project for publication in the next available edition of the Environmental Notice.

Enclosed is a completed OEQC Publication Form, one copy of the DEA-AFONSI, a CD with an Adobe Acrobat PDF file of the same and an electronic copy of the publication form in MS Word.

Please contact Kuppusamy Venkatesan at (808) 241-4885 if you have any questions.

Sincerely,

Lyle Tabata
Acting County Engineer

Attachments: As noted above

Cc: (w/o attach) - Ron Terry, Ph.D., Project Environmental Consultant
Michael Hunnemann, KAI Hawaii, Inc.

AGENCY
PUBLICATION FORM

Project Name:	Puuopae Bridge Replacement
Project Short Name:	Puuopae Bridge Replacement
HRS §343-5 Trigger(s):	Use of County Land and County Funds
Island(s):	Kaua'i
Judicial District(s):	Kawaihau
TMK(s):	(4th.): 4-4-02
Permit(s)/Approval(s):	Compliance with Chapter 343 and NEPA National Pollutant Discharge Elimination System (NPDES) Permit ; Community Noise Control Permit; Historic Sites Review (Section 106 of NHPA and Chapter 6e, HRS); Work in County Right-of-Way; Subdivision Approval (potential) Grading, Grubbing, Excavating and Stockpiling Permits
Proposing/Determining Agency:	County of Kaua'i Department of Public Works
Contact Name, Email, Telephone, Address	Kuppusamy Venkatesan kvenkatesan@kauai.gov (808) 241-4885 4444 Rice Street, Suite 275 Līhu'e, Kaua'i, Hawai'i 96766-1340
Accepting Authority:	(for EIS submittals only)
Contact Name, Email, Telephone, Address	
Consultant:	Geometrician Associates
Contact Name, Email, Telephone, Address	Ron Terry rterry@hawaii.rr.com (808) 969-7090 PO Box 396 Hilo HI 96721

Status (select one)	Submittal Requirements
__X__ DEA-AFNSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.
____ FEA-FONSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.
____ FEA-EISPN	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.
____ Act 172-12 EISPN ("Direct to EIS")	Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.
____ DEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.
____ FEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice.

____ FEIS Acceptance Determination	The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.
FEIS Statutory Acceptance	Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.
____ Supplemental EIS Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice.
____ Withdrawal	Identify the specific document(s) to withdraw and explain in the project summary section.
____ Other	Contact the OEQC if your action is not one of the above items.

Project Summary. The project would replace Puuopae Bridge by implementing structural and safety improvements that retain the bridge's original one-lane width, length and basic appearance. It would provide a safe bridge accommodating any legal weight of truck or bus, maximize safety for motor vehicles, pedestrians and bicycles, be practical to maintain, and preserve the bridge's historic character.New concrete abutments will be created behind the existing ones, with no alteration to the stream bank. A new concrete deck will rest on a girder extended to the new abutments and hidden behind an end wall. The deck will have an asphalt pavement overlay. For bicycle safety, the deck will be marked with a bicycle "sharrow" symbol to indicate a shared lane and promote driver awareness. The historic character of the bridge is being preserved through a number of design elements that help retain the existing appearance. Extensive mitigation to prevent erosion and sedimentation and impacts to water quality and wildlife will be implemented.

PUUOPAE BRIDGE REPLACEMENT
DRAFT ENVIRONMENTAL ASSESSMENT

TMK ($4^{th.}$): Plat 4-4-02
Kawaihau District, County of Kauaʻi, State of Hawaiʻi

Submitted Pursuant to Chapter 343, Hawaiʻi Revised Statutes (HRS)
County of Kauaʻi, Department of Public Works

May 2016

Prepared for:

County of Kauaʻi
Department of Public Works
4444 Rice Street, Suite 275
Līhuʻe, Hawaiʻi 96766

Prepared by:
Geometrician Associates
PO Box 396
Hilo, Hawaiʻi 96721

and KAI Hawaii
31 N. Pauahi St., 2nd Floor
Honolulu, Hawaiʻi 96817

PUUOPAE BRIDGE REPLACEMENT
DRAFT ENVIRONMENTAL ASSESSMENT

TMKs (4th.): 4-4-02
Kawaihau District, County of Kauaʻi, State of Hawaiʻi

Submitted Pursuant to Chapter 343, Hawaiʻi Revised Statutes (HRS)
County of Kauaʻi, Department of Public Works

Prepared for:

County Of Kauaʻi
Department of Public Works

Prepared by:
Geometrician Associates and KAI Hawaii

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PREFACE

This Draft Environmental Assessment (DEA) has been prepared pursuant to Chapter 343, Hawai‘i Revised Statutes (HRS), and Title 11, Chapter 200, Hawai‘i Administrative Rules (HAR). The County of Kaua‘i Department of Public Works (DPW) proposes to replace Puuopae Bridge in the Kawaihau District, Island of Kaua‘i.

This EA assesses the potential impacts of the project. It is required since County funds will be used for the design and construction of the proposed improvements, which occur on County lands. A Finding of No Significant Impact (FONSI) is anticipated.

In addition to County funds, Federal Highway Administration (FHWA) funds will be used for the design and construction of the project. Separate environmental documentation will be prepared to satisfy the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (Pub. L. 91-190, 42 U.S. Code 4321-4347), Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations 1500-1508), and 23 Code of Federal Regulations Part 771, Environmental Impact and Related Procedures.

SUMMARY OF PROJECT

PROJECT NAME:	Puuopae Bridge Replacement
PROPOSING/ APPROVING AGENCY:	County of Kaua‘i Department of Public Works 4444 Rice Street, Suite 275 Līhu‘e, Kaua‘i, Hawai‘i 96766-1340
LOCATION, TAX MAP KEY & LAND OWNERSHIP:	Kawaihau District, Kaua‘i (4th.) 4-4-02
CLASS OF ACTION	Use of County lands and funds
PROPOSED ACTION:	Replacement of Puuopae Bridge by implementing structural and safety improvements that retain the bridge’s original one-lane width, length and basic appearance. New concrete abutments will be created behind the existing abutments, which will remain, with no need to alter the stream bank. The appearance of the stream will not change. A new concrete deck will replace the existing steel beams, which will rest on a girder that will be extended to the new abutments and hidden behind an end wall to retain the existing appearance. The deck will have an asphalt pavement overlay. The new deck system will support any emergency vehicle of current size/weight classes, and will be

	rated to support any legal weight bus or truck. For bicycle safety, the deck will be marked with a bicycle "sharrow" symbol on both approaches to indicate a shared lane and promote driver awareness. The historic character of the bridge is being preserved through a number of design elements that help retain the existing appearance, including: retention of historic end posts behind new guardrails; replacement of the girders in-kind; use of rebars instead of I-beams on the embedded transverse concrete beams of the new deck; and installation of new crash-tested steel railings to resemble the steel or wood railings that were in place on Puuopae Bridge when placed on the Historic Registers.
PURPOSE:	Provide a safe bridge that supports any legal weight bus or truck, maximizes safety for motor vehicles, pedestrians and bicycles, is practical to maintain in an adequate condition, and preserves the historic integrity and character of the bridge, which is on the State and National Registers of Historic Places.
STATE LAND USE DISTRICT:	Rural/Agricultural
ZONING:	Agriculture District (A)
COUNTY GENERAL PLAN:	Agriculture
PERMITS REQUIRED:	*State of Hawai'i Department of Health* • Community Noise Control Permit • National Pollutant Discharge Elimination System (NPDES) Permit *Department of Land and Natural Resources, Historic Preservation Division* • Concurrence with Chapter 6E, HRS Historic Preservation, and Section 106 National Historic Preservation Act *County of Kaua'i Department of Public Works* • Grubbing and Grading Permit and Road Permit
DETERMINATION:	Anticipated FONSI

PART 1: PROJECT DESCRIPTION, PURPOSE AND NEED AND ENVIRONMENTAL ASSESSMENT PROCESS

1.1 Project Location and Description of Existing Bridge

The project involves the replacement of Puuopae Bridge (Figures 1-1 to 1-4). The single-lane, 48-foot long bridge crosses Kalama Stream on Puuopae Road near Kīpapa Road. It was originally constructed in 1915 and was trussed with a concrete-encased steel floor, but the truss was removed in 1958. The endposts of the bridge were recycled from demolition of the Wailua River Bridge in 1919, and the bridge has been modified several times since then as well. The bridge was listed on the State Register of Historic Places in 2004 and on the National Register of Historic Places in 2005 because of its significant role in the development and success of the Kapa‘a (Waipouli) Homesteads.

1.2 Purpose and Need

The Need for the replacement of the Puuopae Bridge is based on the following factors (see Figures 1-4a-d for photographs that document the condition and appearance of the bridge and stream).

- The bridge is seriously deteriorated. It is classified as a “non-redundant” type of bridge, because it is supported by only two girders. If one of the girders were to fail, the entire bridge would fail. The condition of the existing steel girders is poor, with corrosion so severe that holes have formed in the girder webs, reducing the shear capacity of the girders. The flanges are heavily corroded as well, with significant section loss. Because of the extent of this loss, it is not feasible to repair or rehabilitate the girders.
- The bridge currently cannot support loads over 5 tons, which means that school buses, fire trucks, and many other large vehicles cannot cross it, which causes ongoing detours of up to two miles (assuming an alternate path using Kamalu and Olohena Roads) and associated inconvenience and expense.
- If major repairs are not conducted, the County will be forced for safety reasons to close the bridge, leading to serious inconveniences for residents and businesses.

While the Need for the project describes the deficiencies, the project Purpose defines the problem to be solved. Defining the Purpose is necessary to determine the range of alternatives to be considered; each alternative must meet the Purpose and address the identified Need to be considered a viable solution.

The Purpose of the Puuopae Bridge replacement project has four elements:

- Design and build a safe bridge that supports any legal weight bus or truck
- Improve approaches to the bridge to maximize safety for motor vehicles, pedestrians and bicycles
- Provide a design that is practical to maintain in an adequate condition in the future
- Preserve the historic integrity and character of the bridge in keeping with its listed status on the National and State Registers of Historic Places

Figure 1-1. USGS Location Map

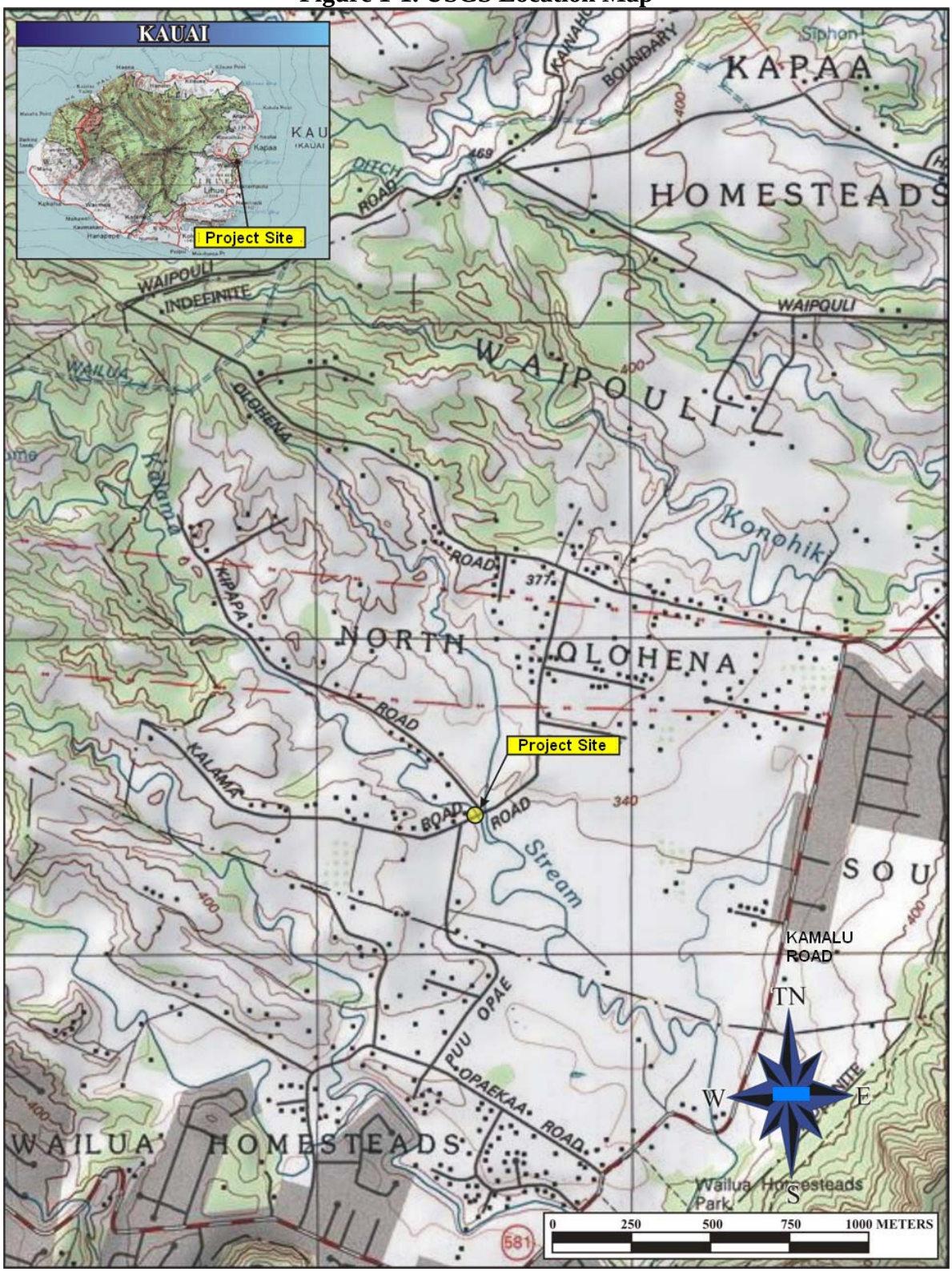


Figure 1-2. TMK Map

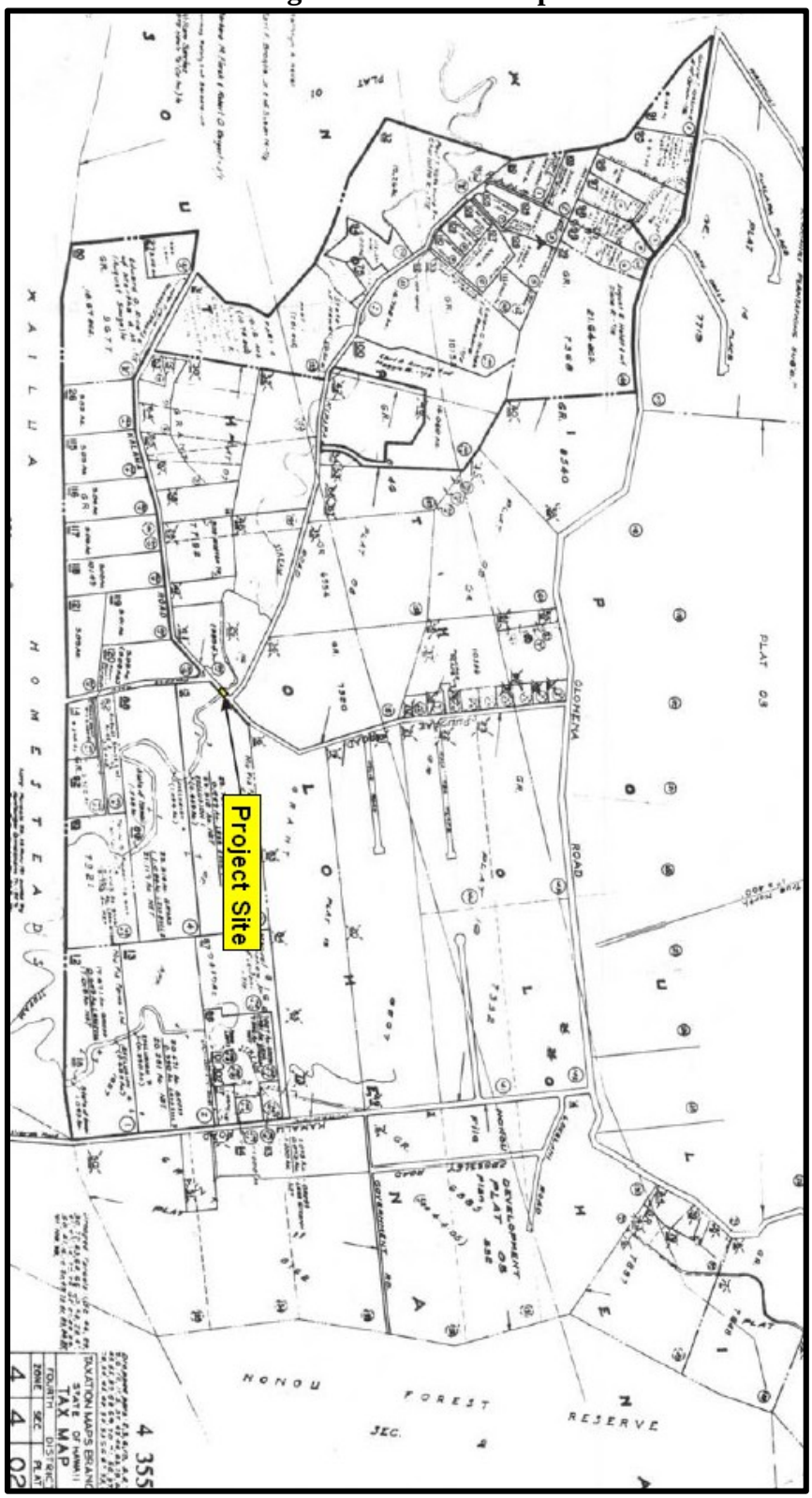


Figure 1-3. Aerial Image

Figure 1-4. Project Site Photos

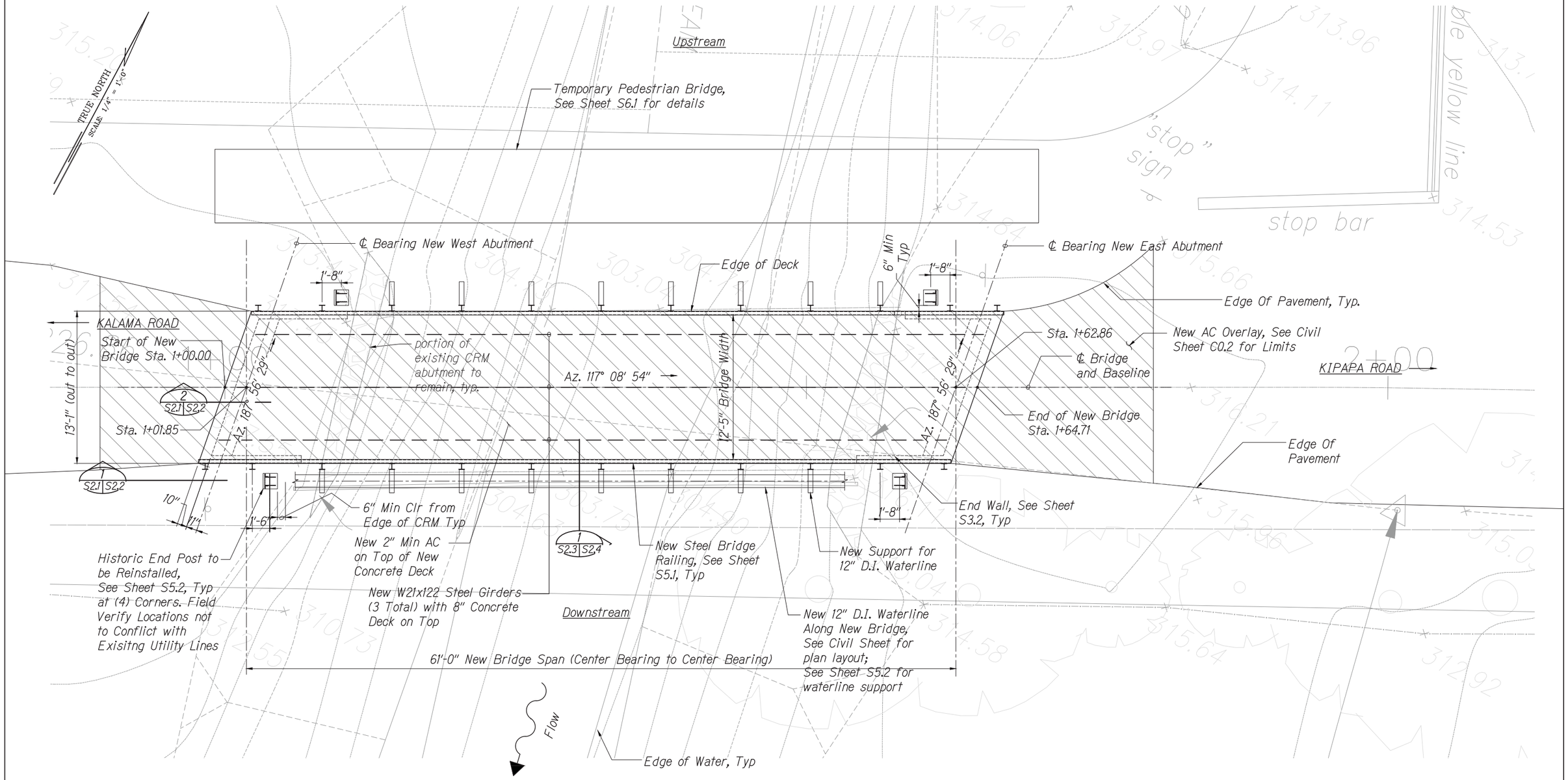
Figure 1-4a: Puuopae Bridge from northeast approach ▲ ▼ Figure 1-4b: Endposts and guard rails

Figure 1-4. Project Site Photos

Figure 1-4c: Kalama Stream bed and banks under bridge ▲ ▼ Figure 1-4b Downstream condition

Site Plan 1-5a

New Bridge Layout



BRIDGE LAYOUT PLAN

1 S2.1 S2.1

Scale: 1/4" = 1'-0"

Note:
1. For top of ac pavement elevations, see detail 1/S2.3

MANAGER AND CHIEF ENGINEER,
DEPARTMENT OF WATER
COUNTY OF KAUAI

DATE

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

0' 2' 4' 8' 12'
1/4" = 1'-0"

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COUNTY OF KAUAI
DEPARTMENT OF PUBLIC WORKS

PUUOPAE BRIDGE REPLACEMENT
KAUAI, HAWAII
Federal Aid Project No. BR-0700(59)

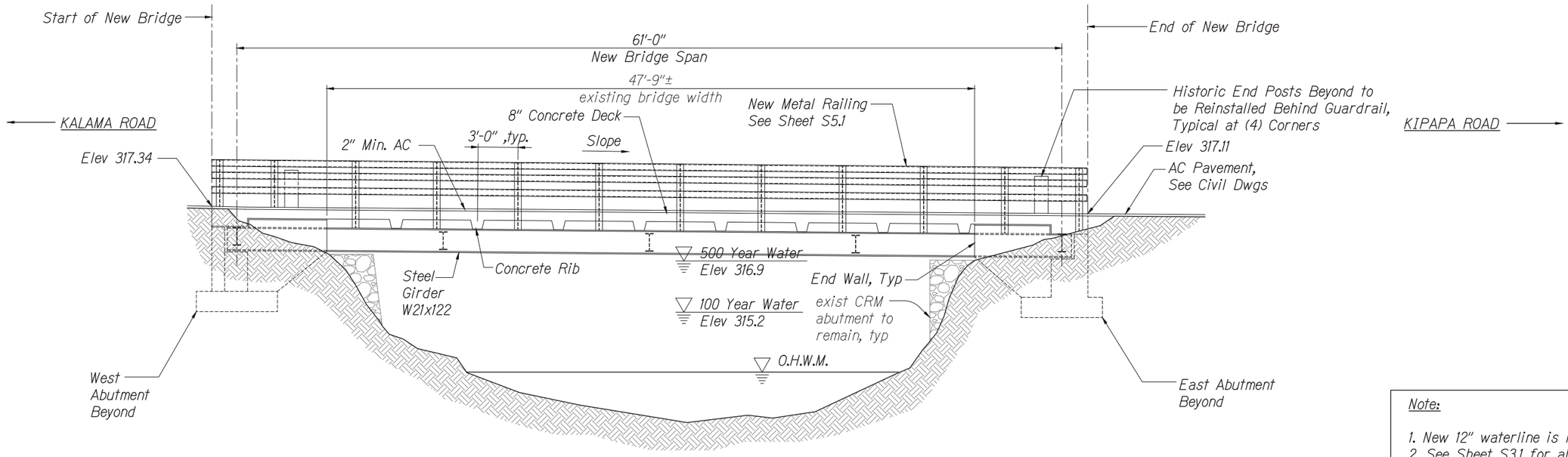
NEW BRIDGE LAYOUT PLAN

SCALE: AS SHOWN			DATE: APRIL, 2016
DRAWN BY: JC	F.B.	C.B.	
TRACED BY:			SHEET
CHECKED BY: BL	X	X	S2.1
APPROVED _____ COUNTY ENGINEER			OF 38 SHEETS

TMK: (4) 4-4-002:ROAD

Site Plan 1-5b

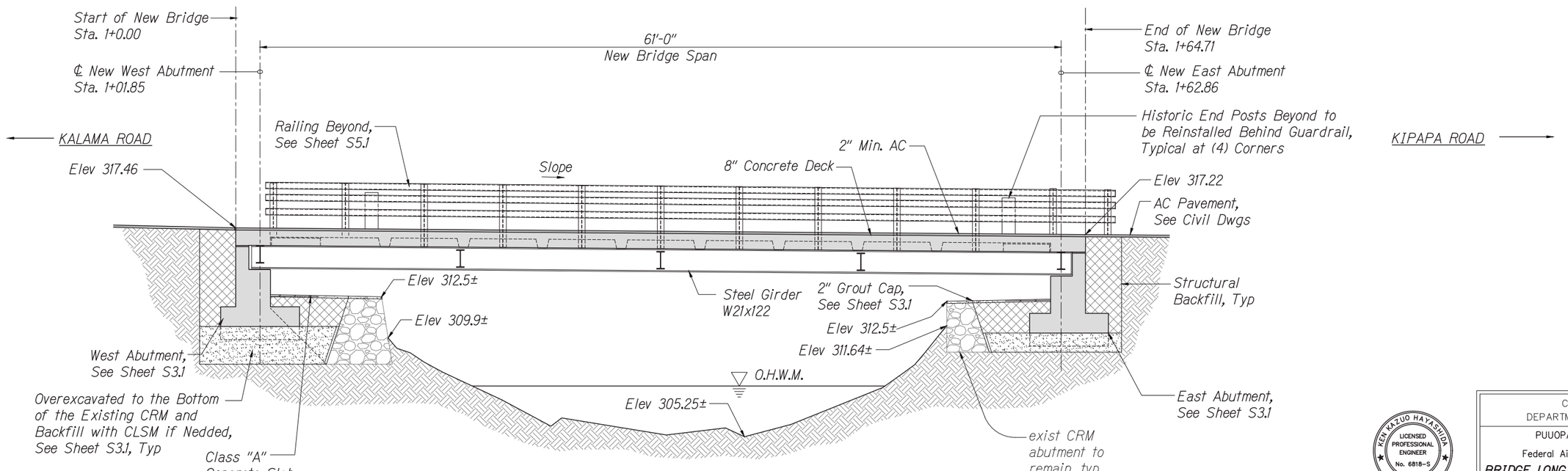
Bridge Longitudinal Section and Elevation



BRIDGE LONGITUDINAL ELEVATION 1
Scale: 1/4" = 1'-0"
S2.1 | S2.2

Note:

1. New 12" waterline is not shown for clarity.
2. See Sheet S3.1 for abutment elevations.



BRIDGE LONGITUDINAL SECTION ALONG BASELINE 2
Scale: 1/4" = 1'-0"
S2.1 | S2.2

0' 2' 4' 8' 12'
1/4" = 1'-0"

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

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COUNTY OF KAUAI
DEPARTMENT OF PUBLIC WORKS

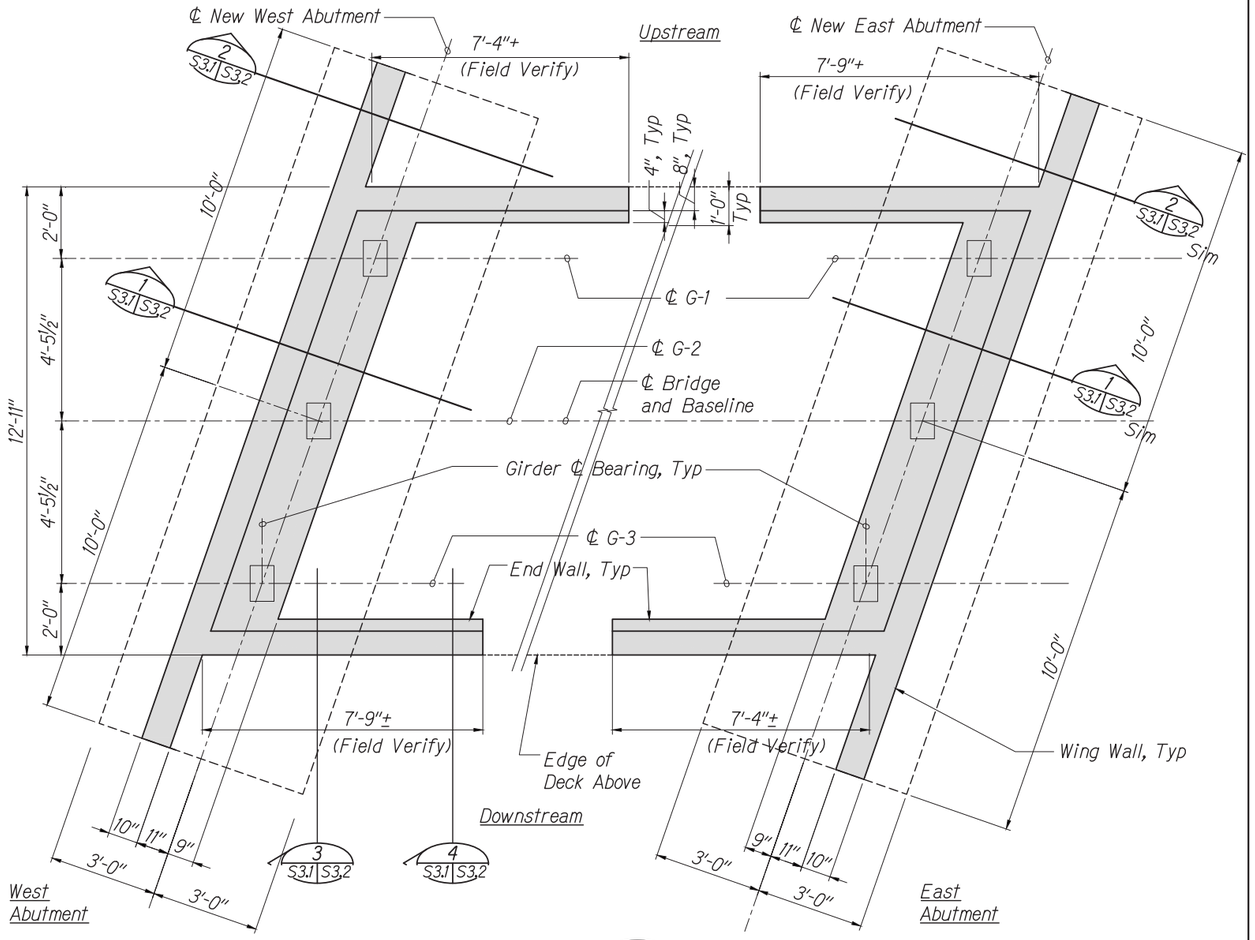
PUUOPAE BRIDGE REPLACEMENT
KAUAI, HAWAII
Federal Aid Project No. BR-0700(59)

BRIDGE LONGITUDINAL ELEV. & SECTION

SCALE: AS SHOWN | DATE: APRIL, 2016
DRAWN BY: JC
TRACED BY:
CHECKED BY: BL
F.B. X | C.B. X
APPROVED _____ COUNTY ENGINEER
SHEET S2.2 OF 38 SHEETS

TMK (4) 4-4-002:ROAD

Site Plan 1-5c



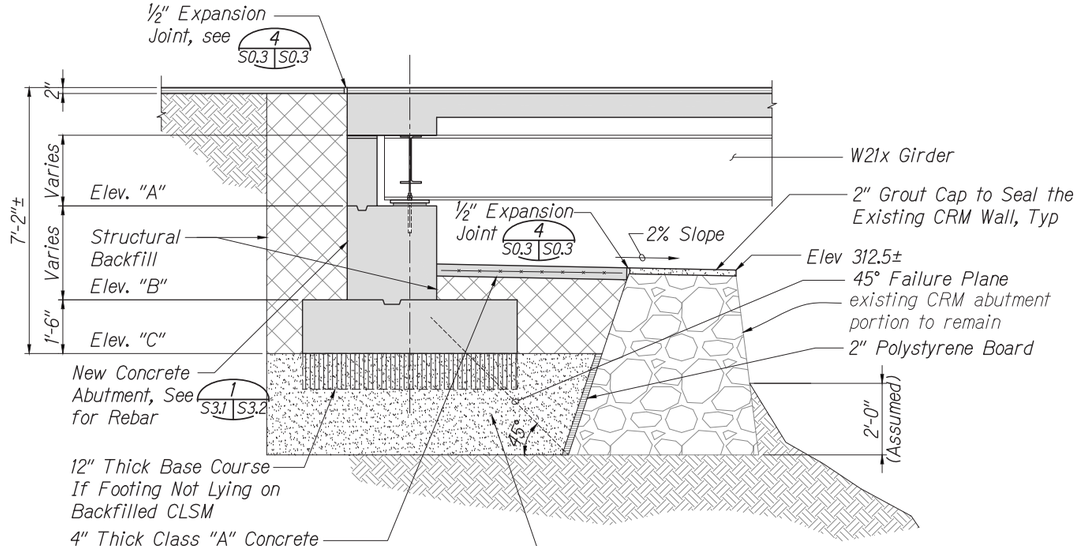
ABUTMENT FOUNDATION PLAN — 1 S3.1 S3.1

Scale: 1/2" = 1'-0"

Notes:

1. The Abutment Elevation shown is a projected view.
2. Waterline and railings are not shown for clarity.
3. Contractor to conduct a survey by licensed surveyor prior to the construction to verify the elevations.
4. Contractor shall notify the Engineer of any discrepancies during the field excavation.

Abutment Plan, Elevation and Section



If the Elev "C" of new footing is located above the 45° imaginary (failure) plane, excavate down to the bottom of existing CRM footing. Backfill with CLSM up to Elev "C". The CLSM shall be placed in uniform lifts of no more than 4 feet in height. The next lift shall not be poured until the previous lift has cured for 8 hours minimum. Cost for CLSM backfill shall be incidental to Section 203 - Excavation and Embankment.

	West Abutment	East Abutment
Elev "A"	313.94	313.73
Elev "B"	311.61	311.38
Elev "C"	310.11	309.88

Notes:

1. All Elevations shown are at the Centerlines of Abutment.
2. For top of AC Elevations, see 1/S2.3
3. Exploratory work at the back of the existing CRM footing (no work allowed along the stream side) shall be performed to ensure the Elev "C" of new abutments is to be located below the 45° imaginary (failure) plane of the existing abutments per Geotechnical recommendation.
4. As an alternative to embedding footings below the 45 degree imaginary (failure) plane, the soils underlying the new footings should be overexcavated down to the bottom of the existing CRM abutment wall elevation and replaced with CLSM (Controlled Low-Strength Material) with a minimum compressive strength of 500 pounds per square inch. Prior to placement of CLSM, the exposed subgrade at the bottom of the overexcavations should be thoroughly tamped and cleaned of all loose material.

ABUTMENT SECTION — 2 S3.1 S3.1

Scale: 1/2" = 1'-0"

0' 1' 2' 3' 4' 5' 6'

1/2" = 1'-0"

KEN KAZUO HAYASHIDA — LICENSED PROFESSIONAL ENGINEER — No. 6818-S — HAWAII, U.S.A.

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COUNTY OF KAUAI
DEPARTMENT OF PUBLIC WORKS

PUUOPAE BRIDGE REPLACEMENT
KAUAI, HAWAII
Federal Aid Project No. BR-0700(59)

ABUTMENT PLAN, ELEV. AND SECTION

SCALE: AS SHOWN — DATE: APRIL, 2016

DRAWN BY: JC
TRACED BY:
CHECKED BY: BL

F.B. X — C.B. X

SHEET S3.1 OF 38 SHEETS

APPROVED _____ COUNTY ENGINEER

TMK (4) 4-4-002:ROAD

Site Plan 1-5d

Detour Plan

True North
Not To Scale

R11-3A
60"x30"
BRIDGE CLOSED
ON PUUOPAE RD
AT KALAMA RD
DETOUR
SC3(CA)
48"x18"

M4-10(L)
48"x18"
DETOUR

R11-3A
60"x30"
BRIDGE CLOSED
BEFORE KALAMA RD
LOCAL TRAFFIC ONLY
DETOUR
M4-10(L)
48"x18"

OLOHENA RD
PUUOPAE PL
KALA KEA PL
KIPAPA RD
PUUOPAE RD
HOLIO RD
LOKOMAIKAI PL
LOKELANI RD
CROSSLEY RD
KAMALU RD
HEAMOI PL
PILIKUA PL
KOKOLIA

M4-10(R)
48"x18"
DETOUR

M4-10(L)
48"x18"
DETOUR

R11-3A
60"x30"
BRIDGE CLOSED
ON PUUOPAE RD
AT KALAMA RD
DETOUR
M4-10(L)
48"x18"

M4-10(R)
48"x18"
DETOUR

M4-10(L)
48"x18"
DETOUR

END
DETOUR
M4-8a
24"x18"

R11-2A
48"x30"
BRIDGE
CLOSED
DETOUR
M4-10(L)
48"x18"

KALAMA RD

R11-2A
48"x30"
BRIDGE
CLOSED
DETOUR
M4-10(R)
48"x18"

Project Location
Puuopae Bridge

R11-3A
60"x30"
BRIDGE CLOSED
BEFORE KIPAPA RD
LOCAL TRAFFIC ONLY
DETOUR
M4-10(R)
48"x18"

M4-10(L)
48"x18"
DETOUR

M4-10(R)
48"x18"
DETOUR

PUUPILO RD
MAKANA RD
PUUOPAE RD
HALO PL
KOLOPULA ST
OPAEKAA RD
KAMALU RD
OHE ST
KANAE PL

R11-3A
60"x30"
BRIDGE CLOSED
ON PUUOPAE RD
AT KIPAPA RD
DETOUR
SC3(CA)
48"x18"

M4-10(R)
48"x18"
DETOUR

R11-3A
60"x30"
BRIDGE CLOSED
ON PUUOPAE RD
AT KIPAPA RD
DETOUR
SC3(CA)
48"x18"

M4-10(L)
48"x18"
DETOUR

R11-3A
60"x30"
BRIDGE CLOSED
ON PUUOPAE RD
AT KIPAPA RD
DETOUR
M4-10(R)
48"x18"

OPAEKAA
KUAMOO RD
LOI KALOMEHA DR
AHELE PL
LAUONE RD
KUAMOO RD

DETOUR PLAN
Not To Scale

AKINAKA & ASSOCIATES, LTD.
JONI C. TANIMOTO
LICENSED PROFESSIONAL ENGINEER
No.11878-C
HAWAII, U.S.A.

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COUNTY OF KAUAI
DEPARTMENT OF PUBLIC WORKS

PUUOPAE BRIDGE REPLACEMENT
KAUAI, HAWAII
Federal Aid Project No. BR-0700(59)

DETOUR PLAN

SCALE: AS SHOWN
DATE: APRIL 2016

	F.B.	C.B.
DRAWN BY: GHK		
TRACED BY:	X	X
CHECKED BY: JCT		

APPROVED _____
COUNTY ENGINEER

SHEET C0.8
OF 38 SHEETS

TMK (4) 4-4-002:ROAD

1.3 Environmental Assessment Process

This Draft Environmental Assessment (EA) assesses the potential impacts of the project. The EA is required since County of Kauaʻi funds will be used for the design and construction of the proposed improvements, which occur on County lands. Chapter 343 of the Hawaiʻi Revised Statutes (HRS) is the basis for the environmental impact process in the State of Hawaiʻi. The content requirements and procedures are specified by Chapter 343, HRS, and its implementing regulations, Title 11, Chapter 200, of the Hawaiʻi Administrative Rules (HAR).

An EA is prepared to document the consequences of a proposed action and determine whether the action would produce significant impacts. When an EA supports a Finding of No Significant Impact (FONSI), the EA and its associated FONSI satisfies the proponent's need to comply with Chapter 343, HRS. When the EA does not support a FONSI, the EA facilitates preparation of an Environmental Impact Statement (EIS). Therefore, if the Approving Agency (in this case, DPW) concludes that no significant impacts would occur from implementation of the proposed action, a FONSI is prepared and the action will be permitted to proceed and obtain other necessary permits. If the Approving Agency finds that significant impacts are expected to occur as a result of the proposed action, then an EIS will be prepared. At the present time, a Finding of No Significant Impact (FONSI) is anticipated for the project. Part 5 of this EA lists these criteria and DPW's findings regarding significance.

In addition to County funds, Federal Highway Administration (FHWA) funds will be used for the design and construction of the project. Separate environmental documentation will be prepared to satisfy the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (Pub. L. 91-190, 42 U.S. Code 4321-4347), Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations 1500-1508), and 23 Code of Federal Regulations Part 771, Environmental Impact and Related Procedures. The NEPA environmental documentation will also address the requirements of the law commonly known as Section 4(f) (49 U.S.C. §303 and 23 U.S.C. §138 implemented by FHWA through regulation 23 CFR 774), established to require consideration of park and recreational lands, wildlife and waterfowl refuges, and historic sites in transportation project development.

1.4 Public Involvement and Agency Coordination

The following agencies and organizations were consulted through early consultation letters as part of the development of the EA.

Federal:

U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Natural Resources Conservation Service

State:

Department of Health, Environmental Planning Office
Department of Land and Natural Resources, Division of Forestry and Wildlife
Department of Land and Natural Resources, State Historic Preservation Division

Department of Land and Natural Resources, Office of the Chairperson
Department of Land and Natural Resources, Division of Aquatic Resources
Department of Land and Natural Resources, Land Division
Department of Land and Natural Resources, Engineering Division
Department of Land and Natural Resources, Commission on Water Resources Mgmt.
Office of Hawaiian Affairs

County:

Planning Department
Department of Public Works
Fire Department
Police Department
County Council
Civil Defense

Private:

Wailua-Kapa‘a Neighborhood Association
Kaua‘i County Historic Preservation Review Commission
Historic Hawai‘i Foundation

Copies of the early consultation letter and written communications received during early consultation are contained in Appendix 1a.

The County of Kaua‘i held a series of publicly advertised meetings concerning this bridge replacement project and two other projects in December 2011, April 2012 and November 2013. Minutes and sign-in sheets are provided in Appendix 1b. At the first meeting, the balance between improving safety and preserving the historic character of the bridge was identified as the primary issue. Subsequent meetings focused on modifying the design to accomplish this element of the purpose. A series of meetings was also held with the Kaua‘i County Historic Preservation Review Commission (KHPRC), the State Historic Preservation Division (SHPD) and the Historic Hawai‘i Foundation (HHF) to receive periodic input on the success of the designs in achieving historic preservation goals.

The County of Kaua‘i welcomes comments on the proposed project, which may be submitted during the 30-day public comment period specified in the *OEQC Environmental Notice* that announces the availability of this EA and provides instructions for submitting comments.

PART 2: ALTERNATIVES

This section discusses the alternatives that have been considered in the EA, including no action and the proposed action, as well as alternatives that have been evaluated but dismissed from further consideration because they do not adequately and efficiently address the purpose and need of the project discussed in Section 1.2.

2.1 No Action

The No Action Alternative is the baseline against which the proposed action alternative is compared. Under the No Action Alternative, the bridge replacement would not be implemented. The No Action Alternative would not correct the situation that causes the bridge to be considered structurally deficient and deteriorated and unable to carry loads over 5 tons, and the critical structural elements would be not fully repaired or replaced. School buses, fire trucks, and many other large vehicles would continue to face detours of up to two miles and associated inconvenience and expense. Engineers have determined that normal maintenance would not be adequate to cope with the situation. Furthermore, these deficiencies may lead to sudden collapse and potential injury or loss of life, as well as and closure of the bridge for an undetermined length of time. The No Action Alternative is considered unacceptable by the lead agencies because these conditions pose serious and unacceptable safety hazards to the residents of the Wailua and Kapa‘a Homesteads area, as well as visitors, farms, ranches, and businesses and emergency service providers, placing an intolerable restriction on transport and travel.

2.2 Proposed Action

The proposed action consists of structural and safety improvements that retain the bridge’s original one-lane width, length and basic appearance (See Figure 1-5a-d).

First, new concrete abutments will be created behind the existing abutments to provide the structural support the bridge requires. The existing abutments, which face the stream banks, will remain, meaning that there will be no need to alter the stream bank and the appearance near the stream will not change. There will be a new concrete deck to replace the existing steel beams, which will rest on a girder that will be extended to the new abutments and hidden behind an end wall to retain the existing appearance. The deck will have an asphalt pavement overlay. The new deck system will be strong enough to carry any emergency vehicle of current size/weight classes, and will be rated to support any legal weight bus or truck. For bicycle safety, the deck will be marked with a bicycle “sharrow” symbol on both approaches to indicate a shared lane and promote driver awareness.

The historic character of the bridge is being preserved through a number of design elements. The project will:

- Retain and re-install existing historic end posts behind new guardrails, with repair and coating to follow Preservation Briefs and the Secretary of Interior Standards.
- Replace the girders in-kind, with a wing wall to hide the extra length of girder from exterior view. Any additional needed girders will be hidden from view.
- Use rebars instead of I-beams on the embedded transverse concrete beams of the new deck to make the new deck resemble the existing one, but with current technology.

- Locate the new abutments behind existing abutments, which will be preserved.
- Install new crash-tested steel railings that will resemble the steel or wood railings that were part of Puuopae Bridge when it was placed on the Historic Registers. These will replace the existing W-beams, which were installed subsequently.

The project would necessitate a detour during construction, which would be expected to last as much as 12 months. The construction detour route will involve rerouting traffic along Olohena and Kamalu Roads, depending on traveler origin/destination (see Figure 1-5d).

2.3 Alternatives Evaluated but Dismissed from Further Consideration

Various alternative designs or strategies were examined that had at least some potential to address and satisfy some or all of the needs and purposes of the project.

2.3.1 Repair Bridge Leaving Design Elements in Place

Engineers have determined that normal maintenance cannot cope with the present state of deterioration. If one of the girders were to fail, the entire bridge would fail. The condition of the existing steel girders is poor, with corrosion so severe that holes have formed in the girder webs, reducing the shear capacity of the girders. The flanges are heavily corroded as well, with significant section loss. Because of the extent of this loss, it is not feasible to repair or rehabilitate the girders. At present, the bridge currently cannot support loads over five tons, and if major repairs are not conducted, the County will be forced for safety reasons to close the bridge, leading to serious inconveniences for residents and businesses.

2.3.2 Build on New Location Nearby Without Using Existing Bridge

An alternative to replacing or reconstructing Puuopae Bridge was to construct a new bridge on a new location or parallel to the old bridge. This alternative could completely preserve the bridge exactly as it is without altering any of its character. In the case of Puuopae Bridge, the existing road geometry is unusual. There is a severe bend in Puuopae Road and an intersection with Kalama Road on the west side, and on the east side Kīpapa Road intersects within 50 feet of the bridge. A residence is present on the northwest side of the bridge. The only reasonable intersection location given these constraints would be a complete realignment of Puuopae Road a hundred feet or more to the south, involving at least 500 feet of Puuopae Road and intersections with Kalama Road and Kīpapa Road. This would disrupt undisturbed land, including farmland, stream channels and wetlands. The advantage of this alternative is that it could completely preserve the bridge intact without altering any of its character, and the bridge could also be used for pedestrians. However, even for pedestrian use it would require some structural repairs, and maintenance would continue to be an issue, especially after stream flooding. Although the bridge itself would appear identical, the presence of a modern bridge directly adjacent would detract from its appearance. Private land would need to be acquired through purchase or even condemnation to allow this action, adding considerably to the cost. The County of Kaua‘i considered this but determined that the advantages were outweighed by the substantial disadvantages, and dismissed this alternative from further consideration.

PART 3: ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION MEASURES

The project involves the replacement of Puuopae Bridge, which crosses Kalama Stream on Puuopae Road near Kīpapa Road (see Figures 1-4). Kīpapa Road is perpendicular to Puuopae Road and parallel to the stream. A small concrete culvert is present slightly upstream from the bridge, adjacent to Kīpapa Road. The northern flanks of the bridge contain existing roads and a residence on either side of Puuopae Road. Beyond the eastern flank of the bridge, pasture lands are present. To the southwestern flank of the bridge is a residence, and western flank bordered by pasture land and residences. The bridge along with the immediately surrounding area is referred to throughout this EA as the *project site*. The term *project area* is used flexibly to describe the general environs of Puuopae and the Waipouli Homesteads, the Kawaihau District, and in some cases, the entire island of Kauaʻi.

3.1 Physical Environment

3.1.1 Climate, Geology, Soils and Geologic Hazards

Environmental Setting

The average maximum daily temperature is approximately 80 degrees F., with an average minimum of 67 degrees, and annual rainfall averages approximately 70 inches (Giambelluca et al 2014). Rainfall is highly variable and storms can produce significant rainfall in short periods of times.

Kauaʻi, the oldest and fourth largest of the eight main Hawaiian Islands, was formed from one great shield volcano (Macdonald and Abbott 1970:458-461). At one time, this vast volcano supported the largest caldera in the islands, horizontally extending 10 to 14 miles across. Mount Waiʻaleʻale, which forms the central hub of the island, rises to 5,148 feet above sea level. Topographically, Kauaʻi is a product of heavy erosion with broad, deep valleys, and large alluvial plains.

The project site is about 320 feet above sea level. The surface of the project site is composed of late Pliocene and Pleistocene-era lava flows from the Kōloa Volcanic Series (Sherrod et al 2007). The project site soil is classified by the U.S. Natural Resources Conservation Service (formerly Soil Conservation Service) as Puhi silty clay loams and (PnA, PnB, PnC and PnD) and Kapaa silty clay (KkB, KkC and KkD and KkE). The Puhi series consists of well-drained soils on uplands with varying slope. The Kapaa Series consists primarily of alluvial-washed silty clays. These well-drained soils on Kauaʻi's uplands occur on gentle to extreme slopes. These soils exhibit moderate permeability and runoff and erosion hazard that varies with slope.

The entire Island of Kauaʻi is rated Zone 1 Seismic Hazard. Zone 1 areas have a low chance of experiencing severe shaking in any given 50-year period (http://hvo.wr.usgs.gov/earthquakes/hazards/). The Island of Kauaʻi is rated within the lowest seismic hazard zone by the Uniform Building Code (Uniform Building Code, 1997 Edition, Figure 16-2). The project site does not appear to be at major risk of subsidence, landslides or other forms of mass wasting, although stream banks are inherently unstable and require geotechnical investigations for all footings and other foundation work. A detailed field reconnaissance of Kalama Stream and the Puuopae Bridge was conducted by project consultants examining expected flow patterns at the project site and recording

field data for the hydraulic and scour analysis. Although there is evidence of 12 to 16 inches of erosion on one abutment, there appeared to be only minor long-term degradation and/or lateral channel migration.

The Agricultural Lands of Importance in the State of Hawai‘i (ALISH), prepared by the State Department of Agriculture, classifies lands into three categories: 1) Prime Agricultural Land, (2) Unique Agricultural Land, and (3) Other Important Agricultural Land. According to maps, the project site is mapped within Prime Agricultural Land (refer to Section 3.7.5 for a discussion of the project's compliance with the Farmland Protection Policy Act).

Impacts and Mitigation Measures

Project of bridge elements and approach paving would take soil properties into account through geotechnical investigations, and the bridge will be built in conformance with the Uniform Building Code's seismic standards.

Special Contract Requirements incorporated into the construction contract documents will stipulate that in the event that a previously undetected lava tube is breached during construction, particularly during excavation for the new abutments, DPW will notify the State Historic Preservation Division and immediately cease work in the vicinity, in order to allow determination of whether human remains or historic properties might be present.

The Proposed Project involves replacement of an existing transportation and no new development of vacant land and will not affect farmland in any adverse way.

The No Action Alternative would not avoid geologic hazards and risks, and in fact the bridge would be more vulnerable to earthquake shaking if it is not structurally rehabilitated or replaced.

3.1.2 Streams, Water Quality, Drainage and Waters of the U.S.

Existing Environment: Streams and Water Quality

A biological and water quality study of the project site was performed by AECOS Inc. The report is attached as Appendix 3 and summarized in this section and in Section 3.1.3, below. Scholarly references have been removed for readability.

The project site is located on Kalama Stream on Puuopae Road near Kīpapa Road. Because of relatively impermeable soils and a well-developed stream network, much of the rainfall that falls on this part of Kaua‘i and does not evapotranspire reaches the sea as stream flow rather than through groundwater percolation.

Kalama Stream is a tributary of the Wailua River and arises as two small streams on the eastern slope of the Kamo‘oho‘opulu Ridge near Kapuka‘iki and Puuopae in the Kawaihau district of east Kaua‘i. Both branches are intersected above their confluence by the Wailua Ditch, a water supply flume that flows southwest to the Wailua Reservoir. Kalama Stream flows generally southeast, reaching the Puuopae Bridge at about 310-foot elevation. The stream continues southeast, turning south of Nounou Mountain (also known as Sleeping Giant) before its confluence with Opaekaa Stream near the 260-foot elevation and upstream of Opaekaa Falls. Opaekaa Stream joins the Wailua River a half mile west of its mouth at Wailua Bay.

Kalama Stream (State ID code 2-2-004) is classified by the State of Hawai‘i as a perennial tributary of Wailua River (ID Code: 2-2-008). The stream appears on the Hawai‘i Department of Health list of impaired waters in Hawai‘i (HDOH, 2008), prepared under Clean Water Act §303(d). The listing indicates that water quality within the stream may not meet all State water quality standards for streams. Wailua River is listed as impaired for enterococcus bacteria in the wet season, with impairment for all other measured parameters unknown. The Wailua River is not impaired for any measured parameter during the dry season.

In order to investigate baseline water quality of the stream in this area, AECOS conducted field measurements for temperature, dissolved oxygen, and pH and collected and water samples for analysis of conductivity, total suspended solids, turbidity, nitrate-nitrite nitrogen, total nitrogen, and total phosphorus from three stations near the Puuopae Bridge on October 20, 2011. Nutrient concentrations were found to be low. During the water quality sampling, Kalama Stream near the Puuopae Bridge had good water quality. Turbidity levels and total suspended solids concentrations were low, and total nitrogen concentrations and total phosphorus were at levels considered excellent for Hawaiian streams. However, values found in the survey cannot be directly compared with the water quality standards to assess compliance because comparison requires that representative geometric mean values be calculated from a minimum of three sampling events.

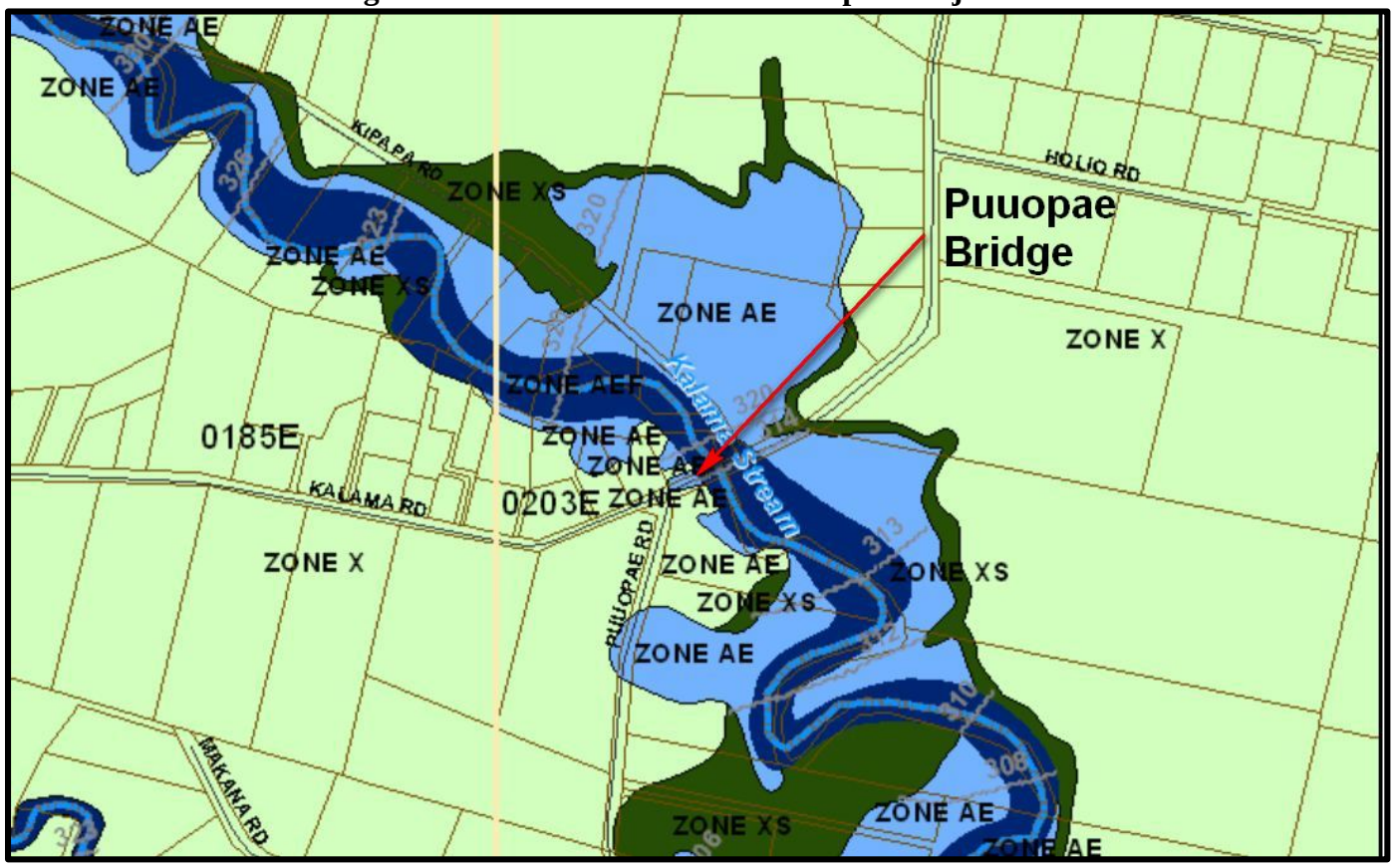
Existing Environment: Drainage and Waters of the U.S.

The Flood Insurance Rate Map (FIRM) for the project area indicate that the project site is designated Zone AE, within a designated floodplain for which flood elevations have been determined (Figure 3-1). Because there is thus some potential for floods to occur at the bridge, hydraulic consultants analyzed the potential for damage to the bridge if it were replaced. Fieldwork in January 2012 provided information on the expected flow patterns in the stream to assist in the hydraulic and scour analysis. Local residents interviewed during bridge inspections reported that a few times a year, flow will go over a dip in the roadway along the left overbank (facing downstream). Approximately 12 to 16 inches of erosion was observed along the left abutment. No erosion was observed along the right abutment.

According to the latest EPA guidance (http://www.epa.gov/indian/pdf/wous_guidance_4-2011.pdf), based on the EPA’s interpretation of the Clean Water Act (CWA), implementing regulations and relevant case law, the following waters are considered waters of the U.S. protected by the CWA:

- Traditional navigable waters;
- Interstate waters;
- Wetlands adjacent to either traditional navigable waters or interstate waters
- Non-navigable tributaries to traditional navigable waters that are relatively permanent, meaning they contain water at least seasonally; and
- Wetlands that directly abut relatively permanent waters.

Figure 3-1: Flood Insurance Rate Map of Project Site



Source: FEMA Flood Insurance Rate Map (FIRM 15002010185E)

In addition, the following waters are protected by the Clean Water Act if a fact-specific analysis determines they have a "significant nexus" to a traditional navigable water or interstate water:

- Tributaries to traditional navigable waters or interstate waters;
- Wetlands adjacent to jurisdictional tributaries to traditional navigable waters or interstate waters; and
- Waters that fall under the "other waters" category of the regulations.

Relevant potential water bodies in the vicinity of Puuopae Bridge include Kalama Stream itself and, potentially, flanking wetlands.

Impacts and Mitigation Measures: Construction-Phase

The project occurs on a designated floodplain, which is unavoidable based on the necessity of replacing a bridge over a stream with a floodplain wider than the area between the stream banks for most of its course. No additional use of the floodplain will occur, and the project does not encourage inappropriate development within the floodplain.

Construction in a floodplain triggers the need to determine if there is an effect to the hydraulic characteristics Hydraulic analysis of the proposed condition was conducted. A "No Rise" certification for the action has been received and there is no effect on the 100-year flood elevation.

One of the goals of project design has been to avoid the discharge of dredged or fill materials into waters of the U.S., which are presumed to be present in Kalama Stream below the Ordinary High Water Mark (OHWM), which is defined in federal regulations [33 CFR 328.3(e)] as:

> "… the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

No formal survey of the OHWM was conducted, but the project would not involve any construction whatsoever in the stream bed or stream banks; the new abutments would be placed behind the existing ones, on County right of way elevated at least five feet above the stream. No dredge or fill in waters of the U.S. would occur.

If not properly mitigated, construction in any project can produce uncontrolled excess sediment from soil erosion during and after excavation and construction, which may impact natural watercourses, water quality and flooding. Contaminants associated with heavy equipment and other sources during construction may impact surface water and groundwater if not mitigated effectively. The potential for impacts at the project site is limited because of the small scale of a few hundred square feet of construction. Design has taken into account the potential discharge of sediment-laden storm water runoff into the stream. In order to minimize the potential for sedimentation and erosion, the contractor shall perform all earthwork and grading in conformance with the Kauaʻi County Code. The project will disturb less than an acre of surface but will require dewatering and hydrotesting for relocation/upsizing of a water line. Therefore, a National Pollutant Discharge Elimination System (NPDES) permit from the State Department of Health will be required.

The project will include a number of best management practices (BMPs) for the project in conformance with the requirements of the County Sediment and Erosion Control Permit and NPDES permit. The project will also incorporate a mitigation measure suggested by U.S. Fish and Wildlife Service (USFWS) in its technical assistance letters April 6, 2012 (see Appendix 1a), and additional communications related to a separate project, the replacement of Kapahi Bridge. Measures will include, but may not be limited to, the following:

- *Drainage*. On-site drainage shall be handled in such a way as to control erosion, prevent damage to downstream properties and to return water to the natural drainage course in a manner that minimizes sedimentation or other pollution to the maximum extent practicable.
- *Dust control*. All areas disturbed by construction activities shall control dust emissions to the maximum extent practicable through the application of BMPs that may include watering with trucks or sprinklers, erection of dust fences, limiting the area of disturbance, and timely grassing of finished areas.
- *Vegetation*. Whenever feasible, natural vegetation, especially grass, will be retained. After being uprooted, displaced, or dislodged from the ground by excavation, clearing or grubbing, any trees, timber, plants, shrubbery and other woody vegetation that must be removed will not be stored in or deposited

along the banks of the stream. This material will be removed within a reasonable time, no longer than three months from when it was uprooted, displaced, or dislodged.

- *Erosion controls*. Any disturbed areas shall be stabilized with erosion control measures that may include: staging construction; clearing only areas essential for construction; locating potential nonpoint pollutant sources away from steep slopes, water bodies, and critical areas; routing construction traffic to avoid existing or newly planted vegetation; protecting natural vegetation with fencing; tree armoring, and retaining walls or tree wells; stockpiling topsoil, covering the stockpile to prevent dust, and reapplying the topsoil; covering or stabilizing all soil stockpiles; using wind erosion control; intercepting runoff above disturbed slopes and conveying it to a permanent channel or storm drain; constructing benches, terraces, or ditches at regular intervals to intercept runoff on long or steep disturbed or man-made slopes; providing linings or other method to prevent erosion of storm water conveyance channels; using check dams where needed to slow flow velocities; using seeding and fertilizing, mulching, sodding, matting, blankets, bonded fiber matrices, or other effective soil erosion control technique; and providing vehicle wheel wash facilities for vehicles before they leave the site.
- *Sediment control*. Measures shall be taken to capture sediment that is transported in runoff to prevent the sediment from leaving the site. Sediment control measures include sediment basins; sediment traps; filter fabric silt fences; straw bale, sand bag, or gravel bag barriers; inlet protection: stabilized construction entrances, and other measures to minimize off site tracking of sediment by construction vehicles; and vegetated filter strips.
- *Material and waste management*. Measures to insure the proper storage of toxic material and prevent the discharge of pollutants associated with construction materials and waste shall be implemented
- *Timing of control measure implementation*. Timing of control measure implementation shall be in accordance with the approved erosion control plan. At a minimum, disturbed areas of construction sites that will not be redisturbed for twenty-one days or more shall be stabilized (grassed or graveled) by no later than the fourteenth day after the last disturbance.
- Erosion control devices should be monitored on a weekly basis and augmented as necessary if new erosion points are discovered. In the event of pending storms, erosion control devices will be inspected to ensure that such devices are in place and are functional. If erosion control devices are found to be non-functional, they shall be repaired within 24 hours. Monitoring and maintenance of erosion control devices and adjacent disturbed areas should continue during and immediately after significant storm events.

The No Action Alternative would avoid potential impacts to water quality during construction, but the eventual deterioration of the bridge would require dismantling activities that would entail precautions similar to those that will be necessary during the proposed project in order to avoid impacts.

Impacts and Mitigation Measures: Operational

Continued operation and maintenance of the Puuopae Bridge would have only a minimal impact on Kalama Stream's floodplain, and would not involve impacts in terms of dredge or fill in waters of the U.S., erosion, sedimentation or water quality. In terms of operation and maintenance, there would be no differences between the proposed project and the No Action Alternative.

To minimize the potential for damage to the bridge itself during high water events, hydraulic engineers ran a computer hydraulic model using the 2-year, 100-year, and 500-year recurrence interval discharges. These floods have a 50 percent, 1 percent, and 0.2 percent chance of recurring each year, respectively. The two-year event was run to confirm the validity of the model (i.e., computing water surface elevations that reach the existing top of bridge elevation). Based on the hydraulic model results, the 100-year flow overtops the bridge/roadway elevation by approximately 0.7 feet in the left overbank, but does not overtop the bridge/roadway in the right overbank. The 500-year flow overtops the bridge/roadway by approximately 2.5 feet in the left overbank and 0.5 feet over the bridge and right overbank. Calculations of scour indicate that there would be no issues, but the analysis determined that a safety factor needed to be considered. Therefore, a scour depth of 3 feet below the minimum channel elevation was recommended and will be used in final design. Because the new abutments will be placed behind the existing abutments, which will remain in place, the need for additional erosion/scour protection is not anticipated.

3.1.3 Flora, Fauna and Ecosystems

A biological and water quality study of the project site was performed by AECOS Inc. The report is attached as Appendix 3 and summarized in the section below and in Section 3.1.2, above. Most scholarly references have been removed for readability.

Existing Environment: Terrestrial Flora

Gagne and Cuddihy (1990) described the vegetation in fairly undisturbed areas of the main Hawaiian Islands with geology and climate similar to the project area as lowland mesic forest. It is difficult to speculate on the more specific pre-human vegetation of the area, since early Hawaiian and subsequent agricultural activities together with the spread of weedy plants and trees have totally transformed the area, including even the soil and microclimate.

A botanist with AECOS conducted a survey of the flora in the immediate vicinity of the existing Puuopae Bridge and 400 feet upstream and downstream for areas within 30 to 40 feet of the stream bank. The vegetation near the Puuopae Bridge is mostly naturalized species, with wedelia (*Sphagneticola trilobata*), *honohono* (*Commelina diffusa*), and Guinea grass (*Panicum maximum*) composing the bulk of plant life beneath the bridge. Wedelia, wood rose (*Merremia tuberosa*), graceful spurge (*Euphorbia hypericifolia*), hairy horseweed (*Conyza bonariensis*) and scattered small trees cover the upper stream banks in close proximity of the bridge. The roadway shoulders of the bridge are home to an assemblage of weeds such as beggartick (*Bidens pilosa*), Florida beggarweed (*Desmodium tortuosum*), and Spanish clover (*Desmodium incanum*). Artillery plant (*Pilea microphylla*) and dropseed (*Sporobolus* sp.) grow conspicuously along the verges of the road approaches to the bridge. A *hau* (*Hibiscus tiliaceus*) thicket shades the stream upstream of the bridge. A few ferns like *laua‘e* (*Phymatosorus grossus*) grow alongside Koster’s curse (*Clidemia hirta*) on the shaded stream banks. Just downstream of the bridge, yellow ginger (*Hedychium flavescens*) and Guinea grass dominate the banks while a few hydrophilic species like primrose willow (*Ludwigia octovalvis*) and *Cyperus halpan* grow along the margins of the stream. Further downslope, the stream flows through a pasture where Hilo grass (*Paspalum*

conjugatum), Glenwood grass (*Sacciolepis indica*), *Cyperus difformis,* and a species of fimbry sedge (*Fimbristylis dichotoma*) grow along the stream.

In all, 49 species of ferns and flowering plants were identified from the riparian zone at the project site (see Table 4 of Appendix 3). Of these, two species (4%) are considered plants indigenous to the Hawaiian Islands. All four are generally common species in Hawai‘i but uncommon on the project site. One species, *Oxalis corniculata,* is a very common weed that is an early Polynesian introduction. The remaining species are plants introduced (non-native) and now naturalized in the Islands. Naturalized species are not regarded as special or deserving of protection, although larger trees that shade the stream may provide a useful ecological function.

None of the plant species at the Puuopae Bridge site is listed as threatened or endangered species by State (HDLNR 1998) or federal (USFWS 2016) regulations, and none is important from a resource conservation perspective.

Existing Environment: Terrestrial Fauna

One avian point count station was situated on the southwest side of the bridge. An 8-minute point count was made at this count station, and the area was walked to observe other birds. Additionally, a 30-minute time-dependent waterbird count was conducted from the bridge. Twenty-five individual birds of 10 different species representing 7 separate families were recorded during the point count (see Table 6 of Appendix 3). All species detected are alien to the Hawaiian Islands. Avian diversity and densities were in keeping with the vegetation present on the site, and its location. The most commonly recorded species was Nutmeg Mannikin (*Lonchura punctulata*). No waterbirds or water obligate species were detected during the course of the 30-minute time dependent waterbird count, although they are probably occasionally present. Additional observations made subsequently on three occasions (in 2012, 2013 and 2015) have also failed to observe native waterbirds here, although non-native Cattle Egrets (*Bubulcus ibis*) were observed. Avian diversity and densities are in keeping with habitats present within the site.

Although not detected during this survey, the Hawaiian Petrel (*Pterodroma sandwichensis*) and the Hawaiian sub-species of Newell’s Shearwater (*Puffinus auricularis newelli*) have been recorded over-flying the general project vicinity between late April and the middle of December each year. Additionally, the Save Our Shearwaters Program has recovered both species from the general area on an annual basis over the past three decades. The *‘uluhe* (*Dicranopteris linearis*) fern-covered slopes of Kaiwa Ridge is typical of the nesting habitat used by both species, though it is currently unknown if there are any colonies in close to the project site.

The petrel is listed as endangered, and the shearwater as threatened, under both federal and State of Hawai‘i endangered species statutes. The primary cause of mortality in both Hawaiian Petrels and Newell’s Shearwaters in Hawai‘i is thought to be predation by alien mammalian species at the nesting colonies. Collision with man-made structures is another significant cause. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with manmade structures and, if not killed outright, become easy targets of predatory mammals. No suitable nesting habitat for either of these seabird species exists at the project site.

The principal potential impact that the project poses to Newell's Shearwaters and Hawaiian Petrels is the threat that birds will be downed after becoming disoriented by exterior lighting if used in conjunction with night construction activities, servicing of construction equipment at night, or streetlights erected for public safety reasons. To reduce the potential for adverse interactions between nocturnally flying seabirds and structures, all external lighting associated with the project needs to be properly shielded.

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*; *ʻōpeʻapeʻa*), all terrestrial mammals currently found on the Island of Kauaʻi are alien species. Most are ubiquitous. The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. The only mammal detected was a domestic cow (*Bos taurus*).

The endangered Hawaiian hoary bat was not detected during the course of this survey. It is, however, probable that this species uses resources within the general project area on a seasonal basis, as the species is all but ubiquitous in the lowlands of Kauaʻi. The impact that the project potentially poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site may temporarily displace bats using the vegetation for roosting. As bats use multiple roosts within their home territories, this disturbance from the removal of vegetation is likely to be minimal. However, during the pupping season, female bats carrying pups may be less able to rapidly vacate a roost site when the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage and very small pups may be unable to flee a tree that is being felled. Potential adverse impacts from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 15 feet between June 1 and September 15, the period when female bats are likely to be tending pups.

Existing Environment: Aquatic Biota

The Wailua River watershed is home to at least one known population of Newcomb's snail (*Erinna newcombi*), a lymnaeid snail listed as threatened under the provisions of Endangered Species Act. Critical habitat for the species has been designated (USFWS 2002) and includes two areas upstream in the Kapaʻa Watershed above 600 feet in elevation. Newcomb's snail is not known to be present in the stream near Puuopae Bridge and would not be anticipated to be encountered at the site as neither the habitat type or existing water quality at the site are suitable for the species.

Aquatic resources within Kalama Stream were identified during the October 2011 survey by using dip nets and visual observation at three locations, at the project site and upstream at the 300- and 400-foot elevations). Aquatic biota comprised only introduced species (see Table 5 of Appendix 3). Mixed schools of mosquitofish (*Gambusia affinis*) and mollies (*Poecilia* spp.) swim beneath the bridge. Smallmouth bass (*Micropterus dolomieu*), blackchin tilapia (*Sarotherodon melanotheron*), and koi (*Cyprinus carpio*) are also present in lesser numbers. Apple snail (*Pomacea canaliculata*) eggs are visible on emergent vegetation growing in the stream. At upstream and downstream locations in Kalama Stream at the 300- and 400-foot elevations, smallmouth bass, koi, tilapia, and mollies were present in low densities. It should be noted that the Wailua River system is host to two species of native *ʻoʻopu* (*Awaous guamensis* and *Sicyopterus stimpsioni*) and a native *ʻōpae* (*Atyoida bisulcata*) that traditionally inhabit the middle reaches of streams in the Hawaiian Islands. Though no native species were encountered during surveys, it is possible that native *ʻoʻopu* and *ʻōpae* utilize Kalama Stream waters near the project, or at least as passage routes to habitats upstream.

Impacts and Mitigation Measures

The biological effects of the project would be limited to the construction area in and directly adjacent to the bridge. The area is dominated by non-native species, and no rare, threatened or endangered plant or aquatic species is present.

As discussed above, several terrestrial vertebrates listed by the federal and State governments as threatened or endangered are present in this part of Kaua‘i and may overfly, roost, nest, or utilize resources in the project area, including the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened Newell's Shearwater (*Puffinus auricularis newelli*). No night work, temporary or permanent lighting or erect structures such as poles are planned, and there is no installation or significant movement of existing utility lines and therefore no potential impacts to listed seabirds are anticipated. Woody vegetation taller than 15 feet, which may serve as roosts for Hawaiian hoary bats, will not cleared between June 1 and September 15, the period when female bats are likely to be tending pups.

The project includes Best Management Practices (BMP) that will be developed as part of grading permits and other approvals that will minimize any environmental impacts to water quality and aquatic biota in the vicinity of the project site during construction. Stream flow will be maintained at all times to allow passage of native species.

The following additional mitigation will be implemented, which have been developed in consideration of comments provided by the U.S. Fish and Wildlife Service (USFWS) in its technical assistance letter of April 6, 2012 (see Appendix 1a), and additional communications related to a separate project, the replacement of Kapahi Bridge:

- All on-site project personnel will be apprised that they are working in an environmentally sensitive area and that endangered Hawaiian waterbirds may be in the vicinity of the project.
- If any federally protected species appears in the project area, work activity will be temporarily suspended until the bird leaves the area of its own accord.
- The project will conserve the maximum amount of stream and riparian habitat for native stream species by avoiding placement of fill or structures in the stream for temporary diversion or construction purposes, and minimizing any stream hardening (including concrete channelization) associated with the bridge replacement or restoration of the stream bed.
- A biological monitor will conduct Hawaiian waterbird and nest surveys at the proposed project site prior to project initiation (per the Service's recommended *Hawaiian Waterbird Survey Protocols*).
- Any documented nests or broods within the project vicinity should be reported to the Service within 48 hours.
- A 100-foot buffer will be established and maintained around all active nests and/or broods until the chicks/ducklings have fledged. No potentially disruptive activities or habitat alteration should occur within this buffer.
- The USFWS will be notified immediately prior to project initiation and provided with the results of pre-construction Hawaiian waterbird surveys.

- A biological monitor will be present on the project site during all construction or earth moving activities to ensure that Hawaiian waterbirds and nests are not adversely impacted.
- A post-construction report will be submitted to the USFWS within 30 days of the completion of the project. The report will include the results of Hawaiian waterbird surveys, the location and outcome of documented nests, and any other relevant information.

The No Action Alternative would avoid any disturbance of existing conditions.

Environmental documentation that will be prepared in conformance with NEPA subsequent to the conclusion of this State of Hawai‘i EA process will document the results of consultation under Section 7 of the Endangered Species Act. This will include the determination of whether the project is likely to adversely affect listed species and additional mitigation measures, if required.

3.1.4 Air Quality, Noise, and Scenic Resources

Environmental Setting

Air pollution in the project area, which is far from sources of manmade pollution, is generally excellent, with no violations of criteria pollutants. During dry periods, construction activities and farming can produce occasional dust. Occasionally in the winter visibility is affected by particulates derived from sulfur dioxide (SO_2) emissions drifting up on southerly winds from Kilauea Volcano on the Island of Hawai‘i. The SO_2 component of these emissions is converted into vog (i.e., volcanic smog) when it interacts chemically with sunlight, atmospheric oxygen, moisture, and dust. At the concentrations and frequencies found in Kaua‘i, vog is generally not considered a health hazard.

Noise on the project site is generally quite low, and is derived principally from motor vehicles, adjacent pastures and nearby residences.

Views on the site are rural and scenic, typical of streamside areas of Kaua‘i with a mixture of farming and residential uses (see Figure 1-4). Puuopae Bridge offers a manmade, historic element that contrasts with the dense vegetation and flowing stream waters.

Impacts and Mitigation Measures: Air Quality

There is some potential for fugitive dust emissions during grading and construction. Short-term direct and indirect impacts on air quality could occur during construction, principally through fugitive dust from vehicle movement and soil excavation, and exhaust emissions from onsite construction equipment. The State of Hawai‘i Air Pollution Control Regulations (Chapter 11-60, HAR) prohibit visible emissions of fugitive dust from construction activities beyond the property line. Thus, an effective dust control plan for the project construction phase is essential.

As discussed in Section 3.1.2, above, the County of Kaua‘i Sediment and Erosion Control Permit will include provisions to control dust. All areas disturbed by construction activities shall control dust emissions to the

maximum extent practicable through the application of BMPs that may include watering with trucks or sprinklers, erection of dust fences, limiting the area of disturbance, and timely grassing of finished areas.

Onsite mobile and stationary construction equipment also would emit air pollutants from engine exhaust. The largest of this equipment is usually diesel powered. Nitrogen oxide emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Carbon monoxide emissions from diesel engines, on the other hand, are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

In addition, to avoid air quality impacts from slow-moving construction vehicles traveling to and from the site on major roadways, heavy construction equipment will be moved on-site during periods of low traffic volume.

The No Action Alternative would avoid the mostly mitigable potential air quality impacts described above.

Impacts and Mitigation Measures: Noise

Noise impacts would occur during removal of portions of the bridge, grading of approaches, and construction of new bridge elements. These activities would generate noise exceeding 95 decibels at times, impacting nearby areas. In cases where construction noise is expected to exceed the Department of Health's (DOH) "maximum permissible" property-line noise levels, contractors are required to obtain a permit per Title 11, Chapter 46, HAR (Community Noise Control) prior to construction, in conformance with the statements provided by the Department of Health, Indoor and Radiological Health Branch's letter of April 28, 2012, in response to early consultation. DOH would review the proposed activity, location, equipment, project purpose, and timetable in order to decide upon conditions and mitigation measures, such as restriction of equipment type, maintenance requirements, restricted hours, and portable noise barriers.

The No Action Alternative would involve no construction noise. If the bridge deteriorates to the point where it needs to be removed, operational noise impacts would shift to other crossing locations.

Impacts and Mitigation Measures: Scenic Resources

Permanent adverse visual impacts, such as interference with scenic views or insertion of incongruous or clashing visual elements, would not occur. The proposed Puuopae Bridge replacement project essentially duplicates existing visual conditions with very minor changes. Through repair of damaged elements and replacement of non-historical features with new components that more closely match the original condition, the bridge will be more visually attractive than its current condition. Visual conditions will be slightly affected during construction, which constitutes an impact that will be temporary and not significant.

The No Action Alternative would preserve existing views, at least until the bridge deteriorated to a point where it would need to be closed and removed.

3.1.5 Hazardous Substances, Toxic Materials and Hazardous Conditions

Existing Environment, Impacts and Mitigation Measures

No known hazardous substances are present on the project site. Although it is unlikely that any potentially hazardous, toxic or radioactive waste would be found on the proposed project site, reasonable precautions would be undertaken in the context of the project's BMP plan to include provisions for the appropriate response and remediation should any such hazardous, toxic, or radioactive material be encountered during the construction phase of the project.

3.2 Socioeconomic and Cultural

3.2.1 Socioeconomic Characteristics

Existing Environment

The project would affect and benefit all users of the bridge in the project area, including residents, businesses, schools, emergency service and visitors. Table 3-1 provides information from the United States 2010 census on the socioeconomic characteristics of the Wailua-Anahola area (the smallest census unit that includes detailed data for the project area) along with those of the State of Hawai‘i as a whole for comparison.

In general, the Wailua-Anahola area is fairly typical of State of Hawai‘i communities, but with slightly greater proportions of whites and fewer Asians, a slightly higher median age and fewer young people (but also fewer elderly), greater incomes, a lesser poverty rate, smaller households and higher home vacancy rates than the State of Hawai‘i as a whole.

Impacts and Mitigation Measures

Overall, the project would substantially benefit socioeconomic conditions by providing a safe bridge that will continue to allow efficient access from homes, farms and ranches to jobs, medical care, schools, and other destinations. Pedestrians and especially bicyclists using the bridge will benefit from markings that promote driver awareness and safer conditions. There is no need for extensive right-of-way acquisition that would have an effect on any resident or business.

The project would provide some short-term construction jobs which would almost certainly be filled by on-island residents, and would not induce in-migration. The reader is referred to Section 3.7.9 for a discussion of environmental justice.

3.2.2 Public Services

Existing Environment, Impacts and Mitigation Measures

The current five-ton load restriction on the bridge limits the access of larger vehicles associated with schools and emergency services. Kapa‘a Elementary, Middle and High Schools are all located near each other on the

Table 3-1
Selected Socioeconomic Characteristics

U.S. CENSUS OF POPULATION, 2010		
CHARACTERISTIC	State of Hawai‘i	Wailua-Anahola CCD
POPULATION		
Total population	1,360,301	12,607
Under 21 years old	26.2%	24.9%
65 years and older	14.3%	13.5%
Median Age	38.6 years	42.5 years
RACE		
White	24.7%	39.6%
Asian	18.6%	38.6%
Native Hawaiian and Other Pacific Islander	10.0%	13.0%
Two or More Races	23.6%	27.3%
HOUSEHOLDS AND HOUSING		
Households with children under 18 years	27.7%	26.0%
Householder living alone	22.4%	23.3%
Average household size	2.89 persons	2.74 persons
Owner-occupied housing units	57.7%	61.4%
Percent vacant housing units	12.4%	17.8%
AMERICAN COMMUNITY SURVEY 2005-2009, ESTIMATES		
CHARACTERISTIC		
Median household income (in 2009 inflation-adjusted dollars)	$63,030	$70,408
Individuals below poverty level	10.7%	7.9%
Households with Food Stamp/SNAP benefits in the past 12 months	3.9%	9.1%
Born in U.S.	78.9%	92.7%
Born in different state	23.9%	35.6%
Speak language other than English in home	25.9%	9.3%
Persons 25 or older, high school graduate or higher	89.9%	93.4%
Population 16 years or older in labor force	66.6%	69.7
OCCUPATION		
Management, business, science, and arts	33.0%	32.8%
Service	22.4%	19.9%
Sales and office	26.3%	25.7%
Natural resources, construction, and maintenance	10.2%	13.4%
Production, transportation and material moving	8.1%	8.3%

Source: U.S. Census Bureau, 2010 Census. 2010 Census Redistricting Data (Public Law 94-171) Summary File, Tables P1, P2 P3, P4, H1; and American Community Survey (U.S. Census Bureau American Factfinder Webpage. (X) data not available or applicable.
Note: for small populations such as Wailua-Anahola, error estimates are often large.

north end of Kapa‘a on Kawaihau and Mailihuna Roads. The Kapa‘a Fire Station is located on Kuhio Highway just north of Kuamo’o Road in Wailua. Puuopae Bridge is the most *mauka* connection between upper areas of Wailua Homesteads and the upper Waipouli area that enables north-south travel in the homesteads area. School buses, fire trucks and ambulances are at least occasionally all required to take the more circuitous *makai* route (i.e., via Kuamo’o, Kamalu and Olohena Roads) to access their routes or destinations. This restriction would be lifted by the proposed project, saving time and fuel and improving emergency response.

3.2.3 Cultural Resources

Scientific Consultant Services, Inc. (SCS), prepared a Cultural Impact Assessment (CIA) for the project. The CIA involved study of historical and ethnographic material as well as consultation with an extensive set of individuals. Readers are referred to Appendix 4 for a discussion of background, methodology and historical and cultural details. The section below summarizes the findings of the CIA, from which most scholarly references have been removed for readability.

Cultural and Historical Background

The project site is within South Olohena, one of ten *ahupua‘a* located in the area known as Puna Moku during traditional times (Handy and Handy 1972:423). South Olohena is the southernmost *ahupua‘a* of the Kawaihau District and borders Līhu‘e District. The project area and environs occur in the former Kapa‘a Homesteads 2nd Series that was created in 1913. The area is currently known as the Kapa‘a Homesteads. The project site, which includes Kalama Stream, and adjacent lands bordering the stream and bridge access points, has undergone numerous modifications in the past, including the bridge construction and road construction.

Approximately 600 years ago, the Hawaiian population had expanded throughout the Hawaiian Islands to a point where large political districts could be formed. At that time, Kaua‘i consisted of six districts, or *moku*: East and West Kona, Puna, Ko‘olau, Halele‘a, and Nāpili. Land was considered to be the property of the king or *ali‘i ‘ai moku* (the leader who controls the island/ district), which he held in trust for the gods. The title of *ali‘i ‘ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted; his higher chiefs received large parcels from him, and in turn, distributed smaller parcels to lesser chiefs. The *maka‘āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku*, *ahupua‘a*, *‘ili* or *‘ili‘āina* were used to delineate various land sections. A *moku* contained smaller land divisions (*ahupua‘a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua‘a* were therefore able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua‘a* to be self-sufficient by supplying the needed resources from different environmental zones. The *‘ili* or *‘ili ‘āina* were smaller land divisions next in importance to the *ahupua‘a* and were administered by the chief who controlled the *ahupua‘a* in which it was located. The *mo‘o‘āina* were narrow strips of land within an *‘ili*. The land holding of a tenant or *hoa ‘āina* residing in an *ahupua‘a* was called a *kuleana*.

The Hawaiian economy was based on agricultural production and harvesting marine resources, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua‘a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dryland, both of which

were dependent upon geography and physiography. River valleys, such as those on Kauaʻi, provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) — agriculture that incorporated pond fields and irrigation canals *(auwai*). Other cultigens, such as *kō* (sugarcane, *Saccharum officianarum*), *maiʻa* (banana, *Musa sp*.), and *ʻuala* (sweet potato, *Ipomoea batatas*) were also grown.

Coastal zones were utilized for marine resources, habitation, burials, and ceremonial structures often associated with fishing. Often, land sections located in back of the shoreline contained pond fields and dunes that were used for sweet potato production. Trails linked the *makai* and *mauka* sections of the *ahupuaʻa*, allowing easy access to its resources. Other trails skirted the coast, which made communication between *ahupuaʻa* possible.

It is said that many years ago, the fire goddess Pele and her family briefly stopped on Kauaʻi to explore the possibility of finding a permanent home. She dug a deep pit, but it was instantly filled with water, so they left Kauaʻi and traveled on, and eventually settled in Halemaʻumaʻu, on the island of Hawaiʻi, where she resides to this day (Beckwith 1976).

Handy and Handy (1972: 424) state that Kapaʻa "is famous as the home of the great *aliʻi* Moʻikeha who lived there in his later years." It was also the home of the boy Pākaʻa, who lived there with his mother and uncle. Pākaʻa longed to go with the fishermen who caught his favorite food (*mālol*o, flying fish), but they always refused his pleas. So, Pākaʻa invented the crab-clawed sail and challenged the fishermen to a race, betting that whoever reached the shore first could keep the day's catch. Pākaʻa won the race and that night he and his family had all the *mālolo* they could eat (Wichman 1998:85).

The inland portion of Puna District (Kawaihau) contains a number of small streams along which small *loʻi* were developed. Wailua Ahupuaʻa lies just south of the project area. Wailua River cuts between two mountains just before the river enters the sea. During the pre-Contact period, the lower portion of this *ahupuaʻa*, where Wailua Stream meets the ocean, was called Wailua Nui Hoano (Great Sacred Wailua). This was one of the two most sacred areas in the Hawaiian archipelago and was *kapu* to commoners. It was crucial that all the Kauaʻi *aliʻi* were birthed at the Birthstones located in an area of Wailua called Holoholokū. During periods "[w]hen the chiefly class became diminished for some reason, the King selected women of common birth to deliver children at the Birthstones. Legend says such a child would be a chief" (Joesting 1987:5–9). The important role the Birthstones of Holoholukū played during ancient times is exemplified in an ancient chant:

> The child of a chief born at Holoholo-ku is a high chief;
> The child of a commoner born at Holuholu-ku becomes a chief also;
> The child of a high chief born outside of Holoholo-ku is no chief, a commoner he! (Joesting 1987:5–9).

Another measure of importance, at least politically, can be found in the remains of religious features such as *heiau*. There were approximately nine *heiau* listed in the 1880s between Keālia and Kapaʻa, suggesting that this area contained more significance than is presently known (Bushnell et al. 2002). Sadly, the location of most of these structures has been lost. Bennett (1931:31) calculated 122 *heiau* on the Island of Kauaʻi. No documented *heiau* were recorded in the vicinity of the project area. However, numerous *heiau* were recorded along Wailua River and also in Kapaʻa, toward the coastline. Within a radius of approximately one and a half miles from the Wailua River mouth are six important temples and associated sites which have officially been designated a National Historical Landmark (Kirch 1996:16).

The first recorded Western contact in the Hawaiian Islands was made in 1778 on the southern coast of Kauaʻi, but there is no description of the eastern coast until Captain George Vancouver traveled up the coast from Wailua in 1793. As there was no anchorage, he sailed towards Kapaʻa, noting that this was: "…the most fertile and pleasant district of the island…" (Joesting 1987:50).

In the 1840s, traditional land tenure shifted drastically with the introduction of private land ownership based on Western law. The Māhele of 1848 divided Hawaiian lands between the king, the chiefs, the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were made available and private ownership was instituted, the *makaʻāinana* (commoners) were able to claim the plots on which they had been cultivating and living, if they had been made aware of the procedures. These claims did not include any previously cultivated but presently fallow land, stream fisheries, or many other resources necessary for traditional life. If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent after which they could take possession of the property.

The Puuopae Bridge location does not itself fall into any LCAs or land grants. However, there are adjacent lands demarcated as land grants and land court applications. A majority of these inland claims were associated with streams, where wetland *kalo* was produced and house sites were scattered about the agricultural area.

Commercial sugarcane agriculture came to Keālia during the middle to late 19th century. The Keālia Sugar Plantation was in operation from 1869 until 1885, and the Makee Sugar Company ran from 1877 until 1933. Sugar brought with it not only agricultural transformation but also a steamer landing, railroads, ditch water systems, and new towns to support the thousands of foreign laborers from China, Portugal, Japan and elsewhere.

The Keālia Sugar Plantation began as a partnership between Captain Makee and King Kalākaua and his partners in the Hui Kawaihau. Makee was given land in Kapaʻa for a mill and he agreed to grind cane supplied by the Hui members. Kalākaua also established a new district in Kauaʻi (Kawaihau) that included all of the land between Wailua and Moloaʻa, where the Hui could cultivate their crops.

Puuopae Bridge is located in and most directly serves Waipouli Homesteads, and it is an integral part of the homesteading story on Kauaʻi. Initially, many in the government did not see homesteading in Wailua, Waipouli and Kapaʻa as a highly viable venture. Most of the proposed homestead lands were at the time controlled by large businesses and the government, who characterized homesteads as a land grab that would remove lands from the profitable sugarcane industry. This argument did not prevail and the lands became available to homesteaders.

On April 29, 1913, 167 lots of Waipouli (called the Kapaʻa Homesteads 2nd Series) lands were sold by lottery to homesteaders. Two individuals, A. Ohai and M. Ferreira, were awarded the parcels on either side of the bridge. At that time, there was little access for the homesteaders to reach their property to build their houses or cultivate, as only ox-carts could make the trip; there was also no water availability via pipes and irrigation. In 1913, the Governor also sold water rights to the Makee Sugar Company, forcing the settlers to pay a monthly rate if they choose to use the water from any stream in the area. By 1918, the settlers had secured water rights

by petitioning the territory board in Honolulu and by 1919, when the Wailua Homesteads opened to the south, several roads were built in the area: Puupilo, Puuopae, and Kamalu (Griffin 2005).

Puuopae Bridge was constructed in 1915, two years after the homestead was opened. By 1917, ninety homesteaders were producing on the Olohena-Waipouli tract of 3,140 acres, and harvested some 31,500 tons of sugar cane worth $197,000 and some pine trees (Griffin 2005). The Makee Sugar Company grew both sugar cane and pineapple in the area, which the Makee train steaming through the homesteads to collect sugar cane from the homesteads and take it to the mill near Keālia. In 1919, at the mouth of the Wailua River, a new bridge was constructed, the older bridge sections having been removed and "donated" for other small, local bridges in the area, including Puuopae Bridge. It was during this time period, ca. 1920s, that much road building occurred in both the Waipouli and Wailua Homesteads, including additional work on Puuopae Bridge.

Puuopae Bridge provided an integral transportation link that led to the success of the homestead lands. Griffin (2005:4) noted that this and other bridges and roads in the area increased in importance after nearby Wailua Homesteads opened because the Wailua roads did not transverse the land in a typical *mauka-makai* fashion, but rather they were connected to the Kapaʻa Homestead roads which ran parallel to the slopes, along the base of Nounou Mountain. It was only Olohena Road which allowed homesteaders to meet up with the Belt Road. The Wailua Homesteads themselves were not linked to the Belt Road until 1936, when Opaekaa Bridge was constructed and Kuamoʻo Road was extended to the coastline.

In the early days of the homesteads, some of the homesteaders were successfully cultivating sugar cane, with many people from surrounding areas filling labor positions on the lands. However, by 1945 homestead cultivation of sugar cane became a difficult venture as sugar prices dropped significantly and small-scale enterprises were difficult to sustain. Griffin (2005:4) states that by the mid-century mark, many of the Kapaʻa Homesteaders abandoned the farming lifestyle and took up other occupations. Through time, many of these homestead areas were rezoned for residential use. However, some of the lands adjacent to Puuopae Bridge contain some of the only remaining areas of agricultural lands in the region (Griffin 2005:4).

Traditional Cultural Resources and Practices on the Project Site

Documentary and field research indicated that the Puuopae Bridge project site does not appear in itself to have significance in the traditional Hawaiian cultural history of the area, and does not seem to be the site for cultural practices, including gathering. The archaeological and historic sites work discussed in the next section identified just one historic property, Puuopae Bridge itself, which is important for its association with 20th century homesteading.

In addition to documentary and field research, an effort was made to consult with knowledgeable parties about potential traditional cultural properties and associated practices that might be present or have taken place in this area of Kauaʻi. Consultation for the CIA was conducted via telephone, e-mail, and the U.S. Postal Service with a number of local residents, historic and cultural experts, and others. A CIA Notice was published on multiple dates in the *Honolulu Star-Advertiser*, the *Garden Island*, and the OHA newspaper, *Ka Wai Ola*. These notices requested information of cultural resources or activities in the area of the proposed project, stated the TMK number, and where to respond with pertinent information.

The responses, which are detailed in Appendix 4, assisted in developing the assessment of the potential effects on cultural resources in the project area. Responses in general focused on the historic value of the bridge in the context of the Kapa‘a Homesteads area, and there were no suggestions or information from the contacted individuals and organizations regarding Hawaiian or other cultural sites or practices that might be present and affected by the bridge replacement. Several community informational meetings that were well attended by local residents did not reveal any cultural concerns or issues. In summary, the project site itself does not appear to support any traditional resource uses, nor are there any specific Hawaiian customary and traditional rights or practices known to be associated with affected area.

Impacts and Mitigation Measures

It is reasonable to conclude based on the lack of identified cultural resources or practices that the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by development activities.

Although there are no indications so far from literature review or consultation with State Historic Preservation Division, the Office of Hawaiian Affairs, or local residents knowledgeable about Hawaiian cultural practices that there are any specific traditional cultural properties or practices on or near the project site, various parties were supplied a copy of the Draft EA in order to help finalize this finding.

3.2.4 Archaeology and Historic Sites

Scientific Consultant Services, Inc. (SCS), prepared an Archaeological Inventory Survey (AIS) (CIA) for approximately 1.3 acres on and around the Puuopae Bridge in Wailua, South Olohena Ahupua‘a, Kawaihau District, Kaua‘i Island, Hawai‘i (TMK: (4) 4-4-002). The AIS included field inspection of the site, a review of previous archaeological and historic work in the area, including the nomination and acceptance of Puuopae Bridge to the State and National Registers of Historic Places. Readers are referred to Appendix 2 for a discussion of background, methodology and historical and cultural details, and are also referred to Section 3.2.3 above, which includes historical information not presented here to avoid redundancy. In the interest of readability, the summary below has eliminated most scholarly references; readers interested in sources may consult Appendix 2.

Existing Environment

As part of National Historic Preservation Act (NHPA) Section 106 compliance (36 CFR 800.4(a)(1)) for this project[1], a conservative Area of Potential Effects (APE) was established by DPW that made up about 1.30 acres, including all land at and around the bridge that could be impacted in any way (Figure 3-2). Staging areas for construction, which would be on County right-of-way near the bridge, are also included in the APE.

[1] As discussed in Chapter 1, although this document is meant to comply with Chapter 343, HRS, only, the need to comply with NEPA has been recognized and effects to historic properties have been conducted in conformance with Section 106 of the NHPA. By letter of April 25, 2012 to the SHPO, the Federal Highway Administration, Hawai‘i Division delegated authorization to the Hawai‘i Department of Transportation and the County of Kaua‘i, Department of Public Works, to conduct this consultation. This section is also meant to discuss compliance with Chapter 6e, HRS.

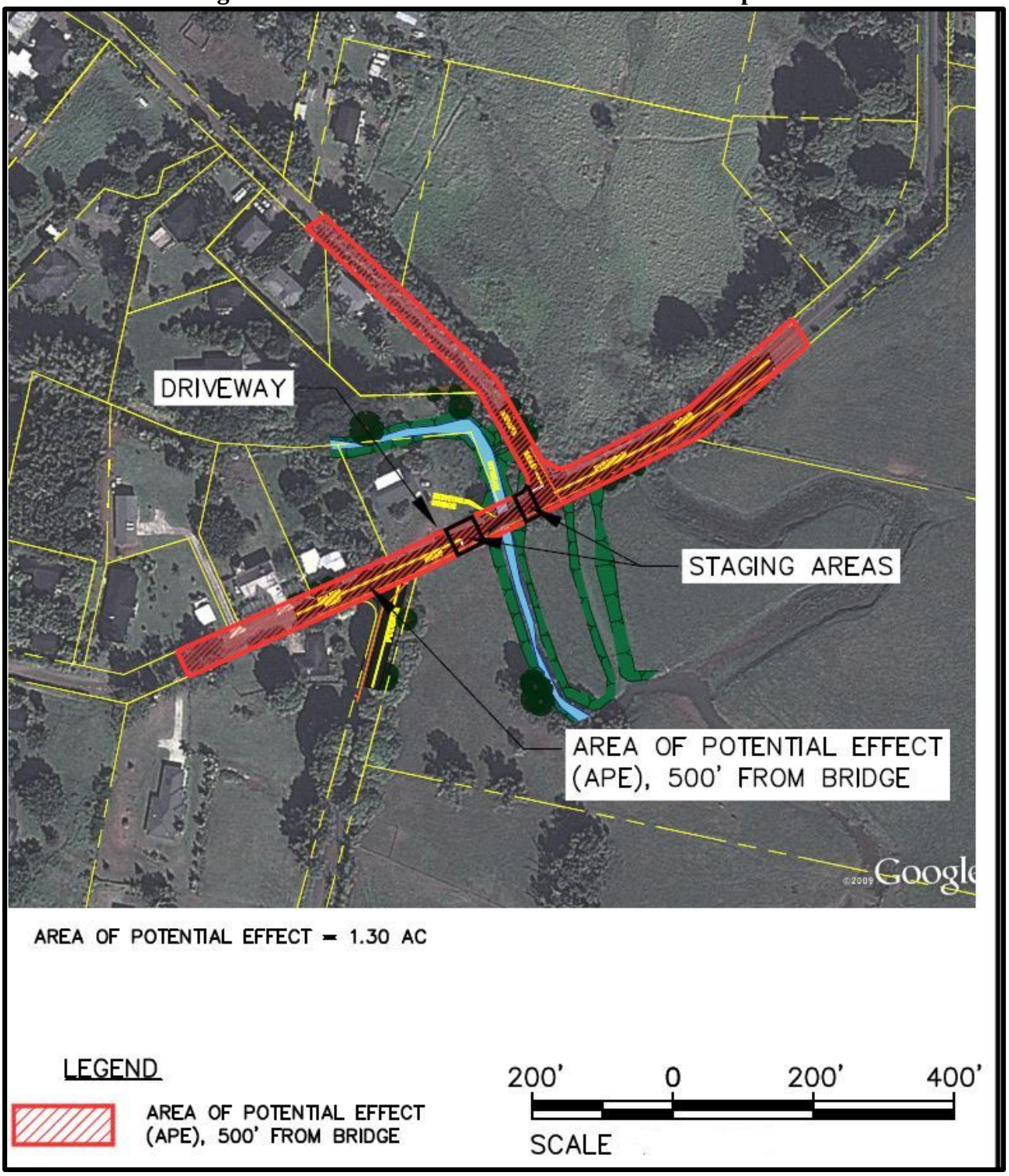
The AIS conducted on about 1.3 acres on and around the Puuopae Bridge identified only one site, the historic Puuopae Bridge (State Site 50-30-08-9397, sometimes called Kalama Bridge or Kapaa Homesteads Bridge No. 2). Puuopae Road was formally constructed in 1912, prior to the land tracts were subdivided for settlement in 1913. While some conflicting data appears in the references, Puuopae Bridge appears to have been initially constructed in 1915 (Griffin 2005). The single-lane bridge measures 48 feet long. The bridge was originally trussed with a concrete-encased steel floor, but the truss was removed in 1958. The current endposts were recycled from demolition of the Wailua River Bridge in 1919. In 1958, two 48-foot I-beams were installed below the concrete and steel girder floor for structural support. To install the I-beams, the headwalls above the stone abutments were broken and repaired with concrete. Additionally, the wooden railings of the bridge have been repaired over time and replaced in 2000 with galvanized guardrails. Rusting and collision damage have adversely affected the bridge's workmanship and original appearance.

In terms of its physical characteristics, an evaluation by a historic architectural firm (Spencer Mason Architects 1989:217) noted that the bridge does not have great engineering complexity or artistic value. As such, the ratings for this bridge were not "high" when compared with others. However, the bridge appears to be a good example of the early 20th century type bridge utilizing materials from an earlier bridge and also has an "interesting" rivet pattern. It is one of three bridges on Kaua‘i where metal construction is apparent, the others being the Hanalei River Bridge and Opaekaa Bridge. The bridge itself is also one of two bridges on Kaua‘i that contain a steel girder floor system (‘Ele‘ele being the other). As noted in the National Register application (Griffin 2005:7), the bridge is purely a functional structure and has no artistic characteristics.

As detailed in the previous section, Puuopae Bridge played a pivotal role in transportation in the homesteads area, represents a strong relationship with early to mid-20th century land use in the Kapa‘a Homesteads area, and there are those in the community who value the bridge and its contribution to early homesteading in the area.

Puuopae Bridge was listed on the State Register of Historic Places in 2004 as State Site 30 08 9397 and on the National Register of Historic Places in 2005 as Site 05000536. Puuopae Bridge has been evaluated according to criteria established for the Hawai‘i State Register of Historic Places (HAR§13-275-6) and found to be significant under Criterion D, for information content. The site was considered as significant per Federal standards under Criterion A, associated with events that have made a significant contribution to the broad patterns of history. The period of significance is designated as 1925-1949 and 1900-1924, and the bridge it is listed as a transportation function (road-related). The area of significance attributed to the bridge includes transportation, social history, community planning and development, commerce, and exploration/settlement.

Figure 3-2. Area of Potential Effect to Historic Properties



Impacts and Mitigation Measures

The original design proposed for the current bridge project included both one- and two-lane options. Informal consultation with various parties through the EA early consultation process and a series of public and County meetings, including community members, the State Historic Preservation Division, and the Kaua‘i Historic Preservation Advisory Council (KHPRC), which assists SHPD in designating historic properties and assessing effects, indicated that options that proposed widening the bridge or modernizing its appearance might have an adverse effect on this listed property. In the words of Pat Griffin, the chair of the KHPRC:

> " ... [… the one-lane bridge on Kalama Road (local folks here know it as Yasutake's Bridge…. has parts from the old Wailua River Bridge... [and is]e part of a network of passages that tell a strong story about the history of homesteading on Kauai in the early territorial period."

The letter of January 15, 2014, in Appendix 2 from FHWA to the State Historic Preservation Officer William L. Aila outlines the consultation process in detail. This engagement resulted in an iterative design process, the County of Kaua‘i arrived at a one-lane design (see Figure 1-5a) that minimized alteration of the appearance of the bridge but addressed critical safety concerns. With the design finalized, the FHWA made an effects determination in the aforementioned letter. The determination stated:

> "Based on our analysis, site observations, and consultation with the SHPD, KHPRC, HHF and other interested parties and individuals, the FHWA has determined no adverse effect with the following conditions.
>
> - The end-posts will be repaired only where necessary, cleaned and coated following Preservation Briefs and Secretary of Interior Standards. Determination will be made by consulting structural design engineer, historic architect, County of Kauai and SHPD representatives. Reflectors shall not be placed on the end-posts.
> - Specs will include benchmark site visits by the above personnel to ensure proper follow through.
> - Qualified personnel meeting the Secretary of Interiors Standards for historic architect will be included in the review process.
> - Above qualified personnel will also be involved in the review of designated submittals by contractor such as shop drawings or request for substitutions, and at key milestones in the construction process.
> - The SHPD will review at phases such as 65% design, 100% design and specifications to ensure the above design direction is followed.

Mitigation Policies

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

- If cultural materials are discovered during construction, all earth-moving activity within and around the immediate discovery area will be diverted until a qualified archaeologist can assess the nature and significance of the find.
- If human remains are discovered, Hawaii Administrative Rules Title 13. Subtitle 13, Chapter 300 states that further disturbances and activities shall cease in any area or nearby area suspected to overlie remains, and SHPD and Police Department will be contacted. The appropriate process would then proceed in conformance with Hawaii Administrative Rules §13-300 Subchapter 4 'Procedures for Property Treatment of Burial Sites and Human Skeletal Remains.'

The County of Kauai will prevent the disturbance or taking of any historic property or resource to the extent possible by instituting these mitigation measures and enforcing their implementation by contractors."

The Kauaʻi Historic Preservation Advisory Council (KHPRC), which assists SHPD in designating historic properties and assessing effects, reviewed the design during its November 2013 meeting. In a letter of November 25, 2013 (see end of Appendix 2 for this and other letters referenced in this paragraph), KHPRC concurred that the replacement would have no adverse effect, under the condition that the County would preserve the existing end posts, duplicate the existing floor beams, and maintain existing width of the bridge. These conditions are part of design. As the agency responsible for Section 106 consultation, the FHWA submitted a letter to State Historic Preservation Officer (SHPO) William L. Aila on January 15, 2014 (see end of Appendix 2), outlining the project history and consultation process. The letter also asked for SHPO concurrence with FHWA's "no adverse effect" determination for the subject project, which was made in consultation with KHPRC, SHPD, the Historic Hawaiʻi Foundation, and other interested parties and individuals. SHPD requested revisions to the supporting archaeological inventory survey (AIS), which was revised and resubmitted on April 30, 2014. On July 22, 2014, SHPD provided a letter approving the revised AIS. Subsequently, SHPD requested an archaeological monitoring plan (AMP) to ensure appropriate action if cultural materials or archaeological features were uncovered during construction. The draft AMP was submitted to SHPD on January 26, 2015, and in a letter of July 31, 2015, SHPD requested revisions to the plan. A revised AMP was submitted on September 28, 2015, which was approved by SHPD by letter of January 29, 2016. Subsequently, SHPD concurred with FHWA's determination of no adverse effect by letter of April 8, 2016.

3.3 Infrastructure

3.3.2 Utilities

Existing Facilities, Impacts and Mitigation Measures

Puuopae Bridge carries Puuopae Road over Kalama Stream close to the intersection with Kīpapa Road. Overhead utility lines run along Kīpapa Road and intersect with a line of utility poles running on the east side of Puuopae Road. No poles are present at or near the bridge, but the project may include moving the overhead lines from the outrigger on one side of the poles that flank the bridge to the outrigger on the other side, so that a crane can safely remove and replace elements of the bridge structure.

A waterline and associated support structure crosses Kalama Stream east of the bridge. The waterline will be temporarily moved until construction of the new bridge deck is completed, at which time the waterline will be upgraded from 6 inches to 12 inches and permanently mounted to the bridge.

Electrical, telephone and water utility companies and agencies will be coordinated with throughout the design and construction process, and no adverse impacts to utilities or their customers are expected to occur.

3.3.1 Traffic

Existing Facilities and Services

The bridge crosses Kalama Stream on Puuopae Road just north of Kīpapa Road (see Figure 1-1). An automated study of vehicle traffic was conducted from 10/25/2012 at 02:00 PM to 11/01/2012 at 02:00 PM, with data recorded in 120-minute time periods. A total of 8,573 vehicles passed through the location with a peak volume of 245 on 10/31/2012 at 4:00 PM and a minimum volume of 1 on 10/31/2012 at 2:00 AM. Average daily traffic was 1,225. Most vehicles were passenger cars, with trucks or buses representing less than a percent of traffic. At least half of the vehicles were traveling at the 20-24 MPH speed or lower, with about a quarter of vehicles exceeding the posted speed of 25 MPH. In-person observations noted that pedestrian and bicycle use accounted for only a small fraction of total use.

Impacts and Mitigation Measures

The project would necessitate a detour during construction, which would be expected to last as much as 12 months. The construction detour route will involve rerouting traffic along Olohena and Kamalu Roads, depending on traveler origin/destination (see Figure 1-5d).

Long-term, the replacement will benefit traffic flow by allowing passage by school buses, fire trucks, and other large vehicles that currently experience ongoing detours and associated inconvenience and expense. The “sharrow” markings that promote driver awareness will benefit all traffic and create safer conditions for pedestrians and bicyclists using the bridge.

Under the No Action Alternative, if Puuopae Bridge were to deteriorate to the point where it required permanent closure, traffic would be obliged to take a more circuitous makai route (i.e., via Olohena and Kamalu Roads) to access certain routes, just as vehicles that exceed the 5-ton limit such as fire trucks and heavy cargo trucks currently must.

3.4 Secondary and Cumulative Impacts

Secondary impacts from road projects can include significant population changes or effects on public facilities. Although the project would provide some short-term construction jobs, these would almost certainly be filled by local residents and would not induce in-migration. The project would only serve to alleviate road closures from natural causes and maintain highway access, and no adverse secondary impacts are expected.

Cumulative impacts result when implementation of several projects that individually have limited impacts combine to produce more severe impacts or conflicts in mitigation measures. At the current time, there are no other known construction projects in the area with impacts that have potential to combine with those from the bridge replacement project. The adverse construction effects of the project – very minor and temporary disturbance to air quality, noise, visual and traffic congestion quality during construction – are very limited in severity, nature and geographic scale. Retaining the historic character of the bridge to the greatest feasible degree through retaining its original width and using materials in harmony with the original design have minimized impacts to the historic character of the bridge that could accumulate with other changes in the area to become significant. None of the impacts from the project would accumulate with adverse impacts from any other projects.

3.5 Required Permits and Approvals

Table 3-2 provides a list of major required permits and approvals.

Table 3-2. Permits and Approvals

Permit/Approval	Applicable Activities	Regulatory Agency
Compliance with NEPA (National Environmental Policy Act)	Separate review to be completed post-Chapter 343, HRS EA	Federal Highway Administration (FHWA)
National Pollutant Discharge Elimination System (NPDES) Permit	Hydrotesting and dewatering	State Department of Health (DOH), Clean Water Branch
Community Noise Control Permit	Construction with potential to cause noise	State DOH, Indoor and Radiological Health (IRH) Branch
Historic Sites Review (Section 106 of NHPA and Chapter 6e, HRS)	Any construction in the vicinity of a designated historic place or archaeological site	State Department of Land and Natural Resources (DLNR), Historic Preservation Division
Work in County Right-of-Way	Any work	County of Kauaʻi Department of Public Works (DPW)
Subdivision Approval	Dividing or consolidating parcels of land for right-of-way, if additional ROW required	County of Kauaʻi Planning Department
Grading, Grubbing, Excavating and Stockpiling Permits	Any excavation or fill, removal of vegetation from the surface, or the purposeful accumulation and set-aside of loose soil	County DPW

After the Chapter 343/NEPA documentation and associated approvals are complete, the project will apply for Grading/Grubbing/Stockpiling permits. Finally, the construction permits and subdivision will be processed.

3.6 Consistency with Government Plans and Policies

3.6.1 Hawai‘i State Plan

Adopted in 1978 and last revised in 1991 (Hawai‘i Revised Statutes, Chapter 226, as amended), the Plan establishes a set of themes, goals, objectives and policies that are meant to guide the State’s long-run growth and development activities. The three themes that express the basic purpose of the Hawai‘i State Plan are individual and family self-sufficiency, social and economic mobility and community or social well-being. The project would promote these goals primarily by enhancing public safety through replacing a bridge that has degraded to the point where there are serious safety concerns and restrictions on many types of vehicles, including school buses and fire trucks, while preserving historic character.

3.6.2 Hawai‘i State Land Use Law

All land in the State of Hawai‘i is classified into one of four land use categories – Urban, Rural, Agricultural, or Conservation – by the State Land Use Commission, pursuant to Chapter 205, HRS. The project area around the bridge includes land in both the State Land Use Rural and Agricultural Districts. The project is consistent with permitted uses within these districts.

3.6.3 Kaua‘i General Plan and Zoning

The *Kaua‘i General Plan* was adopted in November 2000 and provides broad policy statements to guide land use regulations, new developments and facilities, and planning for County facilities and services (County of Kaua‘i 2000). The General Plan employs projections of employment and population to 2020 in forecasting land supply and infrastructure needs and, subsequently, in developing land use plans and long-range plans for public facilities and services.

In Chapter 5 of the General Plan, “Preserving Kaua‘i’s Rural Character”, an essential part of the Vision and one of the driving ideas of the General Plan is to preserve Kaua‘i’s special rural character, which includes “how the built areas relate to the natural features of the landscape, how people get around.” Among characteristics cited are the relatively small scale of Kaua‘i’s roads and the presence of natural vegetation along the roads.

The Kawaihau Land Use map, as well as Section 7.1.3 of Plan identifying future projects needed by 2020, includes future roadways but does not include bridges that require rehabilitation/replacement. It is presumed that existing bridges that serve rural communities are important transportation elements that need to be maintained and improved. In Chapter 6 of the General Plan, Section 6.2 addresses policies for the Kawaihau District. Among community assets identified in the area are “rural scenery, open space, and agricultural lands.”

The General Plan notes that:

> “The vast basin between the Wailua River and the Kapa‘a Homesteads continues its transition from agricultural to residential use. Home-building continues to increase, as small holdings are divided up. Conversion of land from Agricultural zoning to Residential zoning, the subdivision of agricultural lots, and the building of Additional Dwelling Units (ADUs) have all contributed to increasing the population

of this area. Local roads and water systems were not designed to support residential uses and, in many cases, are overburdened. Fire protection is a problem because of poor road access and lack of fire-flow capacity in the water systems. Traffic, water, fire protection and drainage problems will compound as the number of residences continues to grow" (p. 6-10).

In Section 6.2.3 on Issues and Opportunities, the General Plan states:

> "In conclusion, the County should take measures to assure that adequate roads and other facilities are available to serve the homestead areas as they build out to their zoned densities. In addition, the County should refrain from zoning changes that would increase density, considering the potential cumulative impacts" (p. 6-11).

In that the project replaces a transportation facility that is important for local transportation, improves safety for pedestrians and bicycles, does not increase lane capacity and preserves rural character, and preserves the historic character of the bridge to the greatest practical degree, the project is highly consistent with the General Plan.

The area is zoned for agricultural and has a land use designation of "Agriculture" in the Kawaihau Land Use Map of the GP. Public facilities such as roads and bridges are permitted and appropriate uses in these designations.

3.7 Federal Laws and Executive Orders

Section 3.7 discusses federal laws and executive orders that will be addressed in more depth in the upcoming NEPA environmental documentation. Some have already been referenced in the context of resource evaluation in other sections of this chapter.

3.7.1 Coastal Zone Management Act (CZMA) and Coastal Barriers

No Coastal Barriers are present in the State of Hawai‘i. The Hawai'i Coastal Zone Management (CZM) Program was established in 1977 through the adoption of the Coastal Zone Management Act, incorporated in Chapter 205A HRS. Projects with federal involvement significantly affecting areas under jurisdiction of the State CZM Agency must undergo review for consistency with the State's approved coastal program. The entire State of Hawai‘i is included in the coastal zone for such purposes. The CZM objectives are outlined as follows.

- Recreational Resources. Provide coastal recreational opportunities accessible to the public.
- Historic Resources. Protect, preserve, and, where desirable, restore those natural, man-made historic, and pre-historic resources in the CZM area that are significant in Hawaiian and American history and culture.
- Scenic and Open Space Resources. Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.
- Coastal Ecosystems. Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems.

- Economic Use. Provide public or private facilities and improvements important to the State's economy in suitable locations.
- Coastal Hazards. Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, and subsidence.
- Managing Development. Improve the development review process, communication, and public participation in the management of coastal resources and hazards.
- Public Participation. Stimulate public awareness, education, and participation in coastal management, and maintain a public advisory body to identify coastal management problems and provide policy advice and assistance to the CZM program.
- Beach Protection. Protect beaches for public use and recreation; locate new structures inland from the shoreline setback to conserve open space and minimize loss of improvements due to erosion.
- Marine Resources: Implement the state's ocean resources management plan.

The County of Kauaʻi, Department of Public Works has evaluated the project and has concluded that the project does not impact these coastal zone resources and is consistent with the objectives of the program. FHWA will perform its own evaluation and coordinate with the Hawaiʻi CZM Program during the NEPA environmental documentation process to determine whether a formal CZM consistency review is applicable.

Chapter 205A also established the *Special Management Area* (SMA), which is an area of particular concern that requires a higher level of management to ensure the coastal resources are appropriately protected and managed. Accordingly, any development proposed within the SMA requires the approval of a minor or major use permit from the County of Kauaʻi, depending on the cost and impact of the proposed activity. The project site is outside the SMA.

3.7.2 Clean Water Act, as Amended (33 USC 1251 et seq.)

It has been determined through fieldwork and confirmed through consultation with the U.S. Army Corps of Engineers (see letter of in Appendix 1a) that implementation of the project would not involve the discharge of dredged or fill materials into waters of the United States, as discussed in Section 3.1.2, above. This is predicated on the fact that the project will not involve work at, near or below the Ordinary High Water Mark of Kalama Stream, nor in any wetlands. The project would thus be in compliance with the Clean Water Act, Section 404(b)(1) Guidelines. None of the proposed construction materials would be expected to contain any contaminants.

As discussed in Section 3.1.2, the project is expected to disturb less than an acre of surface, but dewatering and hydrotesting will be required. Therefore, the project will require a National Pollutant Discharge Elimination System (NPDES) permit from the State Department of Health, pursuant to Section 402 of the Clean Water Act. This permit and the Storm Water Pollution Prevention Plan (SWPPP) that will be prepared to comply with the grading ordinances of the County of Kauaʻi will include Best Management Practices (BMPs) to control erosion and sedimentation. The BMPS will be part of construction documents and implemented during construction.

3.7.3 Clean Air Act As Amended (42 USC 7401, et seq.)

The Clean Air Act requires states to develop plans, called State Implementation Plans (SIP), for eliminating or reducing the severity and number of violations of National Ambient Air Quality Standards (NAAQS) while achieving expeditious attainment of the NAAQS.

The State of Hawai‘i and the federal government periodically monitor air quality to determine whether it meets the AAQ standards. Areas that do not meet these standards are termed non-attainment areas and are subject to Conformity Rules. These rules were issued by the Environmental Protection Agency (EPA) in response to Section 176 of the 1977 Clean Air Act. Conformity Rules prohibit any federal agency from engaging in any actions that do not conform to a state's plan to correct nonattainment situations. The entire State of Hawai‘i is considered to have acceptable air quality and is thus an attainment area not subject to application of Conformity Rules.

The project would have no long-term effect on air quality. All equipment used in construction will be required to meet appropriate emission standards.

3.7.4 Wild and Scenic Rivers Act (16 U.S.C. 1271-1287)

The Wild and Scenic Rivers Act (P.L. 90-542, as amended) selected rivers of the Nation that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values. The purpose of the Act is to preserve these rivers in their freeflowing condition, and protect them for the benefit and enjoyment of present and future generations. An inventory, the National Wild and Scenic Rivers System, was established in December 1, 1992 and is published by the Department of the Interior and the Department of Agriculture, Forest Service and can be found at the web site http://www.rivers.gov/hawaii.php No rivers in Hawai‘i are on this list (website accessed April 2016), and thus there will thus be no impact to Wild and Scenic Rivers.

3.7.5 Farmland Protection Policy Act (7 U.S.C. 4201, et seq.)

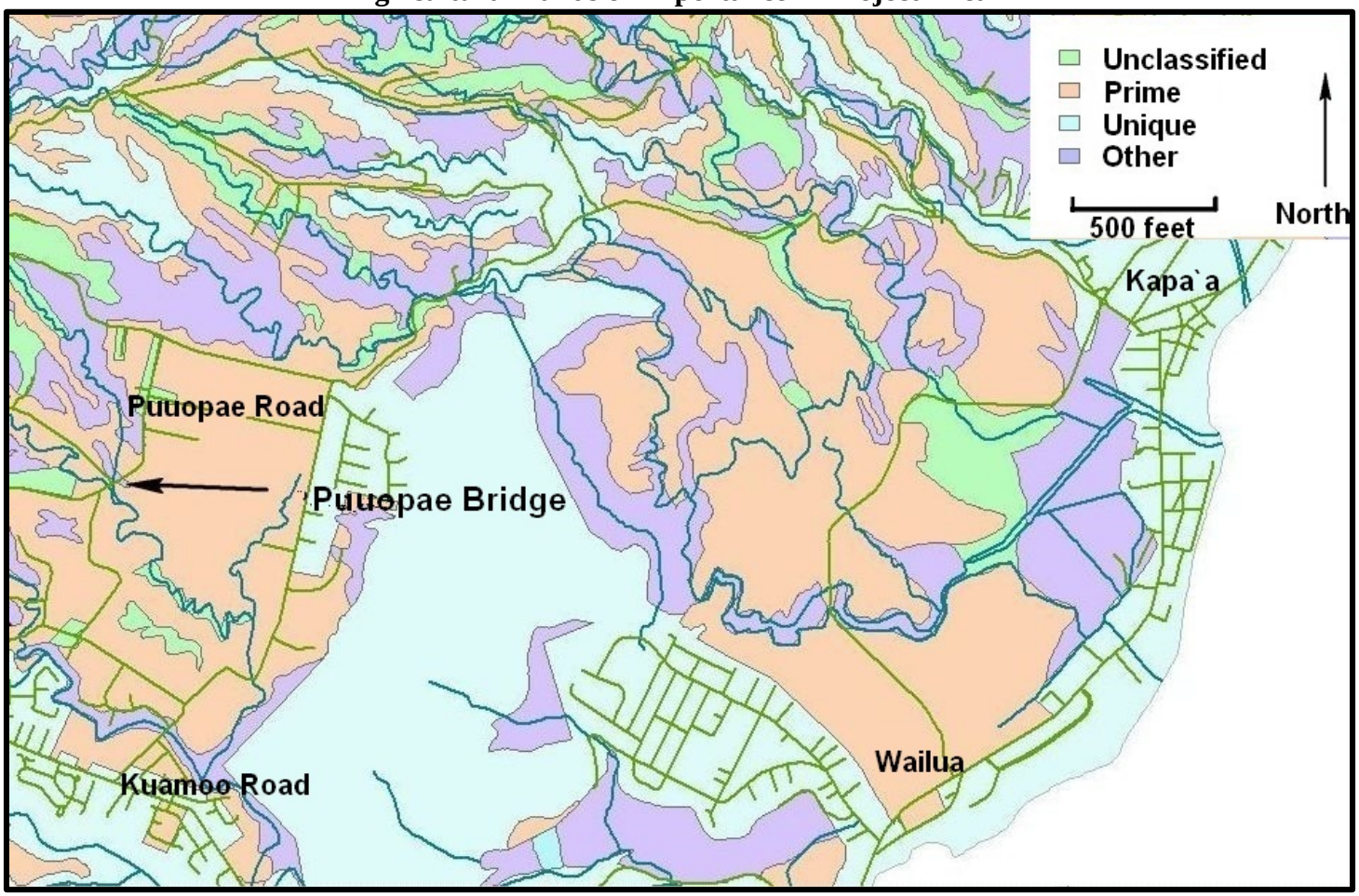
The Farmland Protection Policy Act (Public Law 97-98, Sec. 1539-1549) requires identification of proposed actions that would affect any lands classified as prime and unique farmlands. Agencies must consider alternative actions that could reduce adverse effects and ensure that their programs, to the extent practicable, are compatible with State, local government and private programs and policies to protect farmland. The Agricultural Lands of Importance in the State of Hawai‘i (ALISH), prepared by the State Department of Agriculture, classifies lands into three categories: 1) Prime Agricultural Land, (2) Unique Agricultural Land, and (3) Other Important Agricultural Land. As shown in Figure 3-3, areas surrounding the project site are classified as Prime Agricultural Land. However, the actual bridge and associated construction sites are on or directly adjacent to road rights-of-way that are not capable of being farmed. No farmland would be lost. On the contrary, farming and ranching activities are currently inconvenienced by the 5-ton load restrictions, and loss of the bridge altogether due to deterioration beyond the ability to keep the bridge open would impose serious inconveniences on all drivers, including farmers and ranchers. In that sense, the proposed project supports farming. Alternate bridge locations would also involve at least some loss of Prime farmland, although the amount of acreage might not be significant.

3.7.6 Executive Order 11988, Floodplain Management (24 May 1977)

Executive Order 11988 requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy of the floodplain, and to avoid direct and indirect support of floodplain development where there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains."

The project site is located within the 100-year floodplain, but involves no expansion of use, and is a necessary transportation infrastructure facility that is not inconsistent with EO 11988.

Figure 3-3
Agricultural Lands of Importance in Project Area



Source: Hawai'i State GIS system

3.7.7 Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.)

RCRA was enacted in 1976 to address the issue of how to safely manage and dispose of municipal and industrial waste, regulate underground storage tanks (USTs) that store petroleum or hazardous substances, establish a system for managing solid (primarily nonhazardous) waste, including household waste, and set forth the framework for EPA's comprehensive waste management program.

No systematic records evaluation (i.e. Phase I Environmental Site Assessment and subsequent investigations) or intensive field investigation have been undertaken at the project site. The project site has been used as a bridge crossing for many decades, with no known history of industrial use, and there is no obvious evidence of dumping. Although it is unlikely that any potentially hazardous, toxic or radioactive waste would be found on the proposed project site, reasonable precautions would be undertaken in the context of the project's BMP plan to include provisions for the appropriate response and remediation should any such hazardous, toxic, or radioactive material be encountered during the construction phase of the project, in accordance with RCRA or CERCLA requirements. The project is in compliance with RCRA.

3.7.8 Executive Order 11990, Protection of Wetlands (24 May 1977)

Executive Order 11990 and 23 CFR 771.126(a)(1)) state that it is federal policy to avoid long and short-term adverse impacts associated with the destruction or modification of wetlands, and to avoid direct and indirect support of new construction in wetlands where there is a practicable alternative. The Order further directs federal agencies to avoid undertakings in wetlands unless the head of the agency finds that there is no practicable alternative to such construction, and that the proposed action includes all practicable mitigation measures to minimize harm to wetlands which may result from such use. In the case of the project site, wetlands associated with streams may be present in various areas along Kalama Stream, but the project does not involve any work in the stream banks or stream channel, and there is no activity within, or which would affect, wetlands.

3.7.9 Executive Order 12898, Environmental Justice

Executive Order 12898 directs every federal agency to identify and address disproportionately high and adverse human health or environmental effects of agency programs and activities on minority and low-income populations.

The project site is located in the Waipouli Homesteads/ Kapa‘a Homesteads in Kaua‘i. As discussed in Section 3.2.1, the project area is a microcosm of Kaua‘i. Although in general the area has slightly greater proportions of whites and fewer Asians, greater incomes, a lesser poverty rate, smaller households and higher home vacancy rates than the State of Hawai‘i or as a whole or certain other areas of Kaua‘i, both minority and low-income populations are present, as shown in Table 3-1. On balance, low-income and minority populations would substantially benefit from the project, because the lack of a safe bridge is a hindrance in traveling to medical care, schools, jobs and family. As the project does not have adverse social effects such as extensive right-of-way acquisition or permanent noise impacts, it would not produce disproportionately high and adverse human health or environmental effects for low-income or minority populations.

3.7.10 National Historic Preservation Act

The National Historic Preservation Act (16 USC 470 et seq., 110). The proposed project involves federal funds, and thus environmental documentation is being prepared pursuant to the National Environmental Policy Act (NEPA), the implementing regulations of the Council on Environmental Quality (40 CFR 1500-1508), and the U.S. Department of Transportation regulations for NEPA (23 CFR 771). To comply with these environmental regulations with respect to assessing potential impacts to historic properties, the archaeological survey was prepared in accordance with Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations (36 CFR 800).

Section 106 requires that federal agencies identify and assess the effects of federally assisted undertakings on historic properties and to consult with others to find acceptable ways to resolve adverse effects. Properties protected under Section 106 are sites, buildings, structures, or objects included on or eligible for listing on the National Register of Historic Places. Eligible properties must generally be at least 50 years old, possess integrity of physical characteristics, and meet at least one of four criteria for significance. Regulations implementing Section 106 (36 CFR Part 800) encourage maximum coordination with the environmental review process required by the National Environmental Policy Act (NEPA) and with other statutes. Hawai‘i Revised Statutes 6E, Historic Preservation, also applies to the project.

As discussed above in Section 3.2.4, after a series of design and public meetings with a number of parties identified during the Section 106 consultation process, the FHWA submitted a letter to State Historic Preservation Officer (SHPO) William L. Aila on January 15, 2014 (see Appendix 2), outlining the project history and consultation process. This process resulted in the revised design for Puuopae Bridge presented in this EA that does not involve widening and includes preservation of most visual elements. The FHWA has determined “no adverse effect” with a number of conditions. SHPD concurred with FHWA’s determination of no adverse effect by letter of April 8, 2016 (see Appendix 2).

3.7.11 Section 4(f)

The material in this section references 42 U.S.C. 4332(2)(c), 49 U.S.C, 303, 23 U.S.C 138, and 23 CFR 774 (referred to as Section 4(f)). These requirements apply to all actions or projects undertaken by agencies of the U.S. Department of Transportation. The purpose of Section 4(f) is to ensure that special efforts are made to protect public parks and recreation lands, wildlife and waterfowl refuges, and historic sites. The law states that the Secretary of Transportation shall approve a project which requires the use of publicly owned land from a public park, recreation area, wildlife or waterfowl refuge, or historic site of significance only if (1) there is no prudent and feasible alternative to such use and (2) the project includes all possible planning to minimize harm to the resource being used. At this point in time, it does not appear that any use of these resources will occur, as it has been confirmed through fieldwork and consultation of agencies that there are no public parks and recreation lands or wildlife and waterfowl refuges at or near the Puuopae Bridge. As discussed above, FHWA has determined and SHPD has concurred in a letter of April 8, 2016 (see Appendix 2) that the project will have no adverse effect on the historic property represented by Puuopae Bridge. As such, it currently appears that the project will not will not represent a “use” of this historic property in the context of Section 4(f). The FHWA will address this in detail in the NEPA environmental documentation for the project.

3.7.12 Endangered Species Act and Related Laws

The Endangered Species Act of 1973, as amended (16 USC 1531-1544) the Migratory Bird Treaty Act and Migratory Bird Conservation Act (16 USC 701-715), and the Fish and Wildlife Coordination Act, as amended (16 USC 661 et seq.). In accordance with Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. The U.S. Fish and Wildlife Service (USFWS) was notified of the project location and action by letter in March 2012. As discussed in Section 3.1.3, the U.S. Fish and Wildlife Service (USFWS) provided a technical assistance letter in response to an early consultation request on April 6, 2012 (see Appendix 1a). The letter provided information on survey recommendations, measures to preserve aquatic habitat function avoid and minimize impacts to federally listed, endangered Hawaiian waterbirds, seabirds, and other resources in the project area, and general best management practices for aquatic areas. Many of the Best Management Practices have been incorporated into the project, as discussed above under mitigation measures. The NEPA environmental documentation will include the results of consultation under Section 7 of the Endangered Species Act and related laws, including the determination of whether the project is likely to adversely affect listed species and additional mitigation measures, if required.

PART 4: DETERMINATION

Based on information to this point, the County of Kaua‘i, Department of Public Works, expects to determine that the project will not significantly alter the environment, as impacts will be minimal, and that an Environmental Impact Statement is not warranted. The agency expects to issue a Finding of No Significant Impact (FONSI). Comments on the Draft EA will be reviewed in order to ascertain whether this anticipated determination is appropriate.

PART 5: FINDINGS AND REASONS

Chapter 11-200-12, Hawai‘i Administrative Rules, outlines those factors State of Hawai‘i agencies must consider when determining whether an Action has significant effects:

1. *The project will not involve an irrevocable commitment or loss or destruction of any natural or cultural resources*. No valuable natural resources would be committed or lost. The project replaces an existing bridge and avoids impacts to natural resources. The replacement of the bridge will maintain its existing appearance to the greatest degree practical and has been determined by FHWA to not have an adverse effect on this historic property.
2. *The project will not curtail the range of beneficial uses of the environment*. No restriction of beneficial uses would occur. The project represents a beneficial use of the environment for essential transportation purposed.
3. *The project will not conflict with the State's long-term environmental policies. The State’s long-term environmental policies are set forth in Chapter 344, HRS*. The broad goals of this policy are to conserve natural resources and enhance the quality of life. The project is minor, environmentally beneficial, and fulfills aspects of these policies calling for an improved social environment. It is thus consistent with all elements of the State’s long-term environmental policies.

4. *The project will not substantially affect the economic or social welfare of the community or State.* The project would not have any adverse effect on the economic or social welfare of the County or State. It would improve the social welfare of the community by curing a critical deficiency in the bridge infrastructure, allowing use by school buses and fire trucks and more safely accommodating pedestrians and bicyclists.
5. *The project does not substantially affect public health in any detrimental way*. The project would affect public health and safety in only beneficial ways by continuing to allow residents to access homes, jobs, school and emergency services in a safe and convenient manner.
6. *The project will not involve substantial secondary impacts, such as population changes or effects on public facilities*. The project would involve no population changes or effects on public facilities.
7. *The project will not involve a substantial degradation of environmental quality.* The potential for air and water quality impacts during construction would be mitigated, and there will be no substantial degradation of any aspect of environmental quality.
8. *The project will not substantially affect any rare, threatened or endangered species of flora or fauna or habitat*. The project site supports overwhelmingly alien vegetation, and there will be no impacts to rare, threatened or endangered species of flora. Impacts to wide ranging threatened or endangered vertebrates will be avoided through construction timing and practices.
9. *The project is not one which is individually limited but cumulatively may have considerable effect upon the environment or involves a commitment for larger actions*. The adverse effects of the project – very minor and temporary disturbance to air quality, noise, visual and traffic congestion quality during construction – are very limited in severity, nature and geographic scale. None of the impacts from the project would accumulate with adverse impacts from other projects in the area.
10. *The project will not detrimentally affect air or water quality or ambient noise levels.* No adverse effects on these resources would occur. Mitigation of construction-phase impacts will preserve air and water quality. Ambient noise impacts due to construction will be temporary and restricted to daytime hours.
11. *The project does not affect nor would it likely to be damaged as a result of being located in environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal area*. Although the project is located in an area with flooding risk, it is an appropriate site for a bridge and the project is not imprudent to undertake.
12. *The project will not substantially affect scenic vistas and viewplanes identified in county or state plans or studies*. No scenic vistas and viewplanes identified in County or State plans or studies will be adversely affected by the project.
13. *The project will not require substantial energy consumption*. The construction and maintenance of the project would require consumption of energy, but no adverse effects would be expected.

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PUUOPAE BRIDGE REPLACEMENT ENVIRONMENTAL ASSESSMENT

TMK (4th.): Plat 4-4-02
Kawaihau District, County of Kauaʻi, State of Hawaiʻi

Submitted Pursuant to Chapter 343, Hawaiʻi Revised Statutes (HRS)
County of Kauaʻi, Department of Public Works

APPENDIX 1a
Comments in Response to Early Consultation and Related Correspondence

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geometrician
ASSOCIATES, LLC
integrating geographic science and planning

phone: (808) 969-7090 fax: (866) 316-6988 PO Box 396 Hilo Hawaii 96721
rterry@hawaii.rr.com

March 30, 2012

Dear Agency/Organization Official:

Subject: **Early Consultation for Environmental Assessment for Rehabilitation of Puuopae Bridge, Island of Kaua'i**

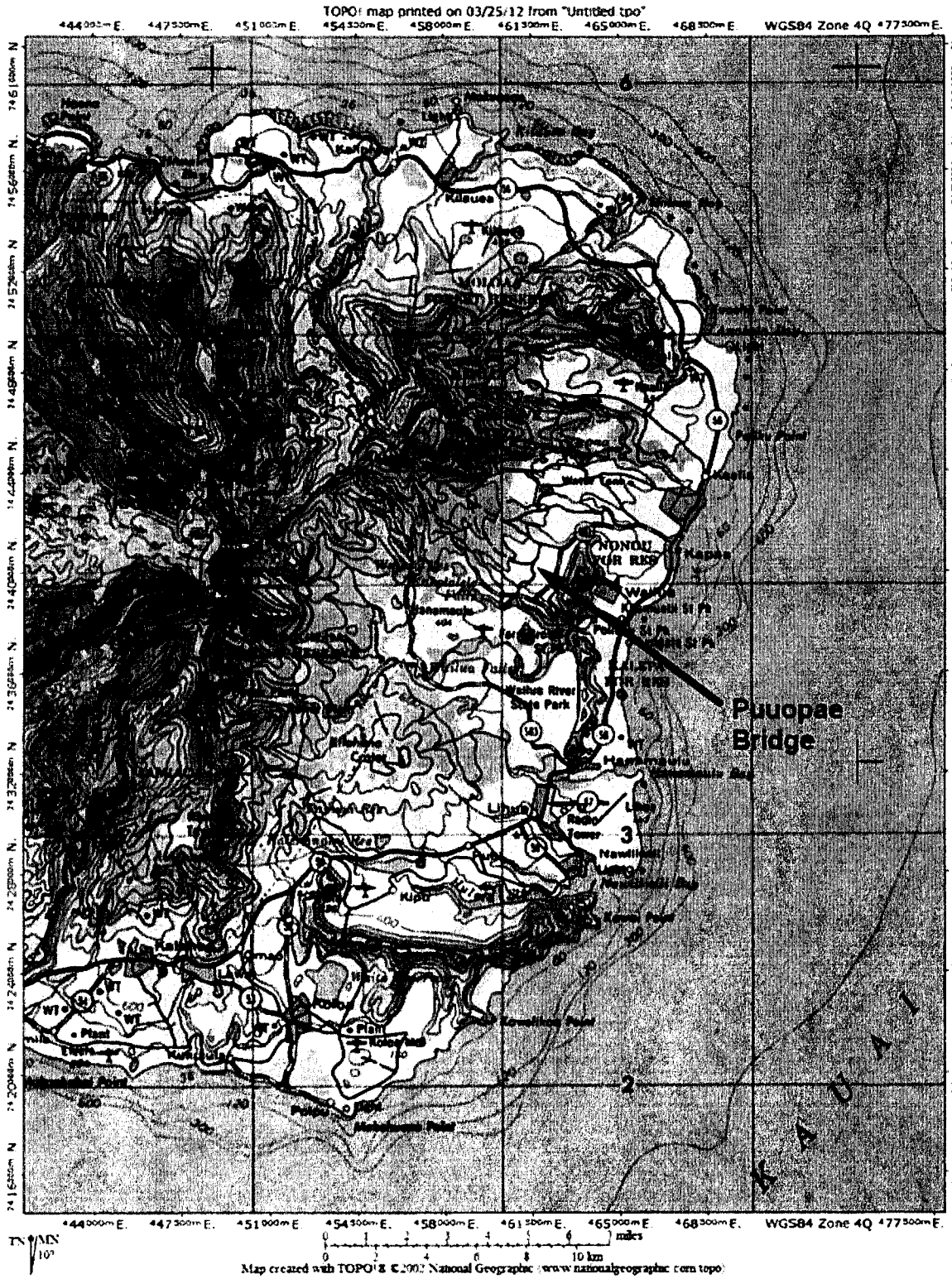
I am in the process of preparing a Draft Environmental Assessment (DEA) for a proposed County of Kaua'i activity that involves design and construction of a new bridge over Kalama Stream on Puuopae Road near Kipapa Road.

Puuopae Bridge was originally constructed in 1915 and was trussed with a concrete-encased steel floor, but the truss was removed in 1958. The endposts of the bridge were recycled from demolition of the Wailua River Bridge in 1919. The bridge was listed on the State Register of Historic Places in 2004 and on the National Register of Historic Places in 2005.

The single-lane, 48-foot long bridge is seriously deteriorated. The bridge cannot support loads over 5 tons, which means that school buses, fire trucks, and many other large vehicles cannot cross it, which causes ongoing detours of up to 3 miles and associated inconvenience and expense. If major repairs are not conducted, the County will be forced for safety reasons to close the bridge, leading to serious inconveniences for residents and businesses.

The alternatives that will be presented in the EA will be formulated and evaluated per Section (4) requirements of the U.S. Department of Transportation. Investigations to date indicate that it may be feasible and prudent to rehabilitate the bridge while preserving its historic integrity.

The EA process will be in compliance with the Hawai'i Environmental Policy Act, Chapter 343, HRS, and administrative rules at Title 11, Chapter 200, HAR. The project will be partially funded by the Federal Highway Administration (FHWA) and therefore the EA also needs to comply with the National Environmental Policy Act (NEPA) and implementing regulations thereof at 40 CFR Parts 1500 through 1508 and 23 CFR 771, as well as other relevant federal environmental laws and policies.


TOPO! map printed on 03/25/12 from "Untitled.tpo"
WGS84 Zone 4Q
Puuopae Bridge
Map created with TOPO!® ©2002 National Geographic (www.nationalgeographic.com/topo)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

12-062
Puuopae Bridge

April 3, 2012

Mr. Ron Terry, Principal
Geometrician Associates, LLC
P.O. Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

SUBJECT: Early Consultation for Environmental Assessment for Rehabilitation of Puuopae Bridge, Island of Kaua`i

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your letter, dated March 30, 2012. Thank you for allowing us to review and comment on the subject document. The document was routed to the various branches of the Environmental Health Administration. We have no comments at this time, but reserve the right to future comments. We strongly recommend that you review all of the Standard Comments on our website: www.hawaii.gov/health/environmental/env-planning/landuse/landuse.html. Any comments specifically applicable to this application should be adhered to.

The United States Environmental Protection Agency (EPA) provides a wealth of information on their website including strategies to help protect our natural environment and build sustainable communities at: www.epa.gov/sustainability. The DOH encourages State and county planning departments, developers, planners, engineers and other interested parties to apply these strategies and environment principles whenever they plan or review new developments or redevelopments projects. We also ask you to share this information with others to increase community awareness on healthy, sustainable community design. If there are any questions about these comments please contact me.

Sincerely,

Laura Leialoha Phillips McIntyre, AICP
Environmental Planning Office Manager
Environmental Health Administration
Department of Heath
919 Ala Moana Blvd., Ste. 312
Honolulu, Hawaii 96814
Phone: 586-4337
Fax: 586-4370
Email: laura.mcintyre@doh.hawaii.gov
Website: www.hawaii.gov/health/environmental

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

April 5, 2012

Ref.:RFD.3503.2

Mr. Ron Terry
Geometrician Associates, LLC
P.O. Box 396
Hilo, HI 96721

Dear Mr. Terry:

Request for Determination
Rehabilitation of Puuopae Road Bridge, Kamala Stream
Wailua, Kauai, TMK: (4) 4-4-002:015

We are responding to your March 30, 2012, letter to the Commission on Water Resource Management (Commission) requesting a determination for the proposed rehabilitation of the Puuopae Road Bridge across Kalama Stream in Wailua, Kauai (TMK: (4) 4-4-002:015).

The Commission has the responsibility to protect stream channels from alteration whenever practicable to provide for fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses in the State of Hawaii under the authorization of the State Water Code (Code), Hawaii Revised Statutes (HRS), Chapter 174C, and Hawaii Administrative Rules Chapter 13-169 (Protection of Instream Uses of Water).

Under HRS §174C-71(3)(A), the Commission "shall require persons to obtain a permit from the Commission prior to undertaking a stream channel alteration." The term "stream channel" is defined as a "watercourse with a definite bed and banks which periodically or continuously contains flowing water." HRS §174C-3. The Code defines "stream" as any "natural watercourse in which water usually flows in a defined bed or channel."

Although the Code allows the maintenance of existing facilities, major repairs to the Puuopae Road Bridge may require a Stream Channel Alteration Permit (SCAP) for the project. Please provide additional information on the proposed scope of work and an environmental assessment for the proposed bridge rehabilitation so that the Commission can determine whether or not a SCAP will be required.

Please be advised that your proposal may require other agency approvals regarding wetlands, water quality, grading, stockpiling, and floodways. This letter should not be used for other regulatory jurisdictions or used to imply compliance with other federal, state, or county rules.

If you have any questions, please contact Robert Chong in the Stream Protection and Management Branch at (808) 587-0266, or toll free from the Big Island at 974-4000, extension 70266, or robert.k.chong@hawaii.gov.

Very truly yours,

WILLIAM M. TAM
Deputy Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2012-CPA-0044
2012-CPA-0045
2012-CPA-0046

APR 0 6 2012

Mr. Ron Terry, Principal
Geometrician Associates, LLC
P.O. Box 396 Hilo, HI 96721

Subject: Request for Early Consultation for Draft Environmental Assessment for Puuopae, Kapahi, and Opaekaa Bridges Rehabilitation on Kauai Island, Hawaii.

Dear Mr. Terry:

This is a consolidated response to your three letters, all dated March 30, 2012, requesting early consultation and technical assistance on the subject bridge repairs. These actions will be partially funded by Federal Highway Administration (FHWA) and addressed through the National Environmental Policy Act (NEPA) process. Your specific request to the U.S. Fish and Wildlife Service (Service) was to identify concerns that should be evaluated and addressed in your Draft Environmental Assessment (DEA). The Service appreciates the opportunity to provide technical assistance early in the planning process so that impacts to trust resources can be avoided through project design, construction and operation.

These comments are provided under section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA); the Fish and Wildlife Coordination Act of 1934 (16 U.S.C. 661 *et seq.*; 48 Stat. 401), as amended (FWCA); the Clean Water Act (33 U.S.C. 1251 *et seq.*; 62 Stat. 1155), as amended (CWA), and the NEPA.

Upon completion of your DEA, and as you initiate permit applications with the U.S. Army Corps of Engineers for work in waters or wetlands, or as FHWA provides funding to the project, the lead federal agency will request a species list and consultation with the Service under the ESA. Your request notes that areas of investigation will include but not be limited to: water quality assurance, wastewater treatment, flora, fauna, ecosystems and other environmental factors. Therefore, to assist you in your project planning; 1) survey recommendations (Attachment 1) are provided, as well as 2) recommended measures to avoid and minimize impacts to federally listed, endangered Hawaiian waterbirds, seabirds, and other possible trust resources in the project area (Attachment 2); and 3) to preserve aquatic habitat function, Best Management Practices are also

recommended (Attachment 3) to incorporate into your design, construction and operational plans.

The DEA should include a description of the habitat within the project action area, and any measures that will be used to avoid or minimize impacts to listed species, and stream and riparian habitats. Upon request and review of the DEA or other coordination document submitted by the lead federal agency, species lists and consultation under ESA will be provided.

If you have any questions please contact Paula Levin at 808-792-9417. If you have any questions regarding endangered species or section7 consultation, please contact Patrice Ashfield at 808-792-9400.

Sincerely,

For Loyal Mehrhoff
Field Supervisor

Enclosure (3)
Cc: FHWA

Attachment 1. Waterbird Survey Recommendations:

The Hawaiian duck (*Anas wyvilliana*), Hawaiian coot (*Fulica alai*), Hawaiian common moorhen (*Gallinula chloropus sandvicensis*), and Hawaiian stilt (*Himantopus mexicanus knudseni*) (*collectively referred to as "Hawaiian waterbirds"*) were federally listed as endangered under the Endangered Species Conservation Act of 1968, later replaced by the Endangered Species Act (ESA) of 1973, as amended [16 U.S.C. 1531 *et seq.*] The Recovery Plan for Hawaiian waterbirds was finalized in 1978, and revised in 1985. A draft Revised Recovery Plan for Hawaiian waterbirds was published in August, 2005 (USFWS 2005) and is available online at http://www.fws.gov/pacific/ecoservices/endangered/recovery/documents/HawaiianWaterbirdsDraftRevRecoveryPlan5-05.pdf.

The U.S. Fish and Wildlife Service (Service) works with project proponents to address potential impacts to federally listed species and their habitats. Surveys should be conducted for projects that may impact wetlands or waterways to determine whether endangered Hawaiian waterbirds are present.

- Each project site should be surveyed multiple times. Small wetlands, ponds, or streams (less than 10 acres) should be surveyed a minimum of four times during a period of three weeks.
- All surveys should be conducted between sunrise and noon.
- If the proposed project site is intermittently wet, or an ephemeral wetland, surveys should be timed so that they occur when water is present at the site.
- Monitors should spend a minimum of 30 minutes at the site per visit. If the site is large, or if Hawaiian waterbirds are observed, monitors should plan to spend more time surveying the area to determine use (i.e., foraging, nesting, breeding, etc.).

If endangered Hawaiian waterbirds are present at a project site, survey details and results, as well as a description of the habitat (e.g., type of vegetation, water depth, size of wetland, etc.) should be submitted to the Service. Additional surveys may be needed prior to the start of the project to determine the seasonality of Hawaiian waterbird presence and whether breeding activity occurs within the area.

Attachment 2. Avoidance and Minimization Measures

1. All on-site project personnel should be apprised that they are working in an environmentally sensitive area and that endangered Hawaiian waterbirds may be in the vicinity of the project.

2. If any federally protected species appears in the project area, work activity should be temporarily suspended until the bird leaves the area of its own accord.

3. If bird surveys indicate the Hawaiian waterbirds are present in the vicinity of the project site, nest surveys should be conducted immediately prior to starting work, and after any subsequent delay of three or more days. If a waterbird nest is discovered, all work in the area should cease and our office should be contacted immediately.

4. To prevent impacts to seabirds, no night time construction activities or construction lights should be allowed. Any permanent street lighting should be fully shielded. If the proposed project involves the installation or movement of existing utility lines, please contact our office with project details so we may assist you in determining potential adverse impacts to listed seabird species.

5. Hawaiian hoary bats may be present in the area, roosting in both exotic and native woody vegetation. They leave their young unattended in "nursery" trees and shrubs when they forage. If trees or shrubs suitable for bat roosting are cleared during the bat breeding season (May to August), there is a risk that young bats could inadvertently be harmed or killed. To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet (4.6 meters) tall should not be removed or trimmed during the bat birthing and pup rearing season (June 1 through September 15).

Attachment 3. Best Management Practices to Conserve Aquatic Habitat Functions

The following Best Management Practices (BMPs) should be implemented to protect water quality, reduce runoff, erosion and sedimentation to the streams.

1. It is understood that all proposed bridge rehabilitation actions are intended to span each watercourse and that no in-water work is planned, or impacts to the stream beds proposed. Please ensure the design plans clearly reflect your intention to conserve the maximum amount of stream and riparian habitat for native stream species, by avoiding placement of fill or structures in the stream for temporary diversion or construction purposes, and minimizing any stream hardening (including concrete channelization) associated with the bridge replacement or restoration of the stream bed.

2. If temporary culverts and associated fill are proposed for construction in dry conditions, culverts and associated fill should be removed and the stream area restored once construction is complete. Whether temporary or permanent culverts will be used, the Service recommends the plans include appropriately sloped and textured apron or similar structure beneath these culverts on both ends, to facilitate constant flow and to prevent vertical drop or scour-hole formation on either the up- or downstream ends of the culverts that would inhibit migration of stream species.

3. Design plans should include only native or non-invasive vegetation to be used for proposed riparian plantings on reinforced stream banks and drainage swales.

4. Design plans should indicate how storm runoff will be managed to dissipate the energy of the flow and reduce bank erosion, and to minimize introduction of roadway contaminants to the stream. Construction and operation of the rehabilitated bridges should contain measures to capture, filter, or treat sediments and/or contaminants associated with stormwater runoff. Although these concerns may be addressed through your NPDES permit review process, we recommend incorporating storm water management in this project to protect the water quality and habitat functions of the stream.

5. The upper parts of the Kalama, Kapahi, and Opaekaa Streams sustain perennial surface flow and under certain flood conditions, connection to tidal waters, therefore providing potential habitat for native fish and mollusk species that could access the upper stream. Work should be timed and designed for construction in low flow periods and to avoid temporary or permanent impairment of this connectivity.

6. To improve stream habitat conditions including water temperature, please replace any removed or disturbed native riparian vegetation on streambanks that were stabilized or otherwise impacted by construction.

7. All project-related materials and equipment (dredges, barges, backhoes, etc.) will be cleaned of pollutants prior to use.

8. No project-related materials (fill, revetment rock, pipe, etc.) will be stockpiled in the

water (intertidal zones, reef flats, stream channels, wetlands, etc.) or where they could be washed into the water from adverse weather or tidal conditions. Stockpiling of any materials, during project implementation, will be located a minimum of 50 meters away from buffer zones or areas of potential runoff. All stockpiles will be removed or covered and protected with soil stabilization measures, and a temporary perimeter sediment barrier, prior to the onset of precipitation.

9. All debris removed from the environment will be disposed of at an approved upland landfill site.

10. No contamination (trash or debris disposal, alien species introductions, etc.) of adjacent terrestrial or marine/aquatic environments (reef flats, channels, open ocean, stream channels, wetlands, etc.) shall result from project-related activities.

11. Fueling of project-related vehicles and equipment should take place away from the water and a contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored on-site, if appropriate, to facilitate the clean-up of accidental petroleum releases.

Erosion Control

1. An erosion control and restoration plan to control short-term and long-term erosion and sedimentation effects should be implemented. The plan should include all the necessary local jurisdiction requirements regarding erosion control and will implement Best Management Practices for erosion and sediment control as required.

2. Erosion control devices should be monitored on a weekly basis and augmented as necessary if new erosion points are discovered. In the event of pending storms, erosion control devices will be inspected to ensure that such devices are in place and are functional. If erosion control devices are found to be non-functional, they should be repaired within 24 hours. Monitoring and maintenance of erosion control devices and adjacent disturbed areas should continue during and immediately after significant storm events.

3. Turbidity and siltation from project-related work should be minimized and contained within the vicinity of the site through the appropriate use of effective silt containment devices and the curtailment of work during adverse weather or tidal conditions.

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 30, 2012

Geometrician Associates, LLC
Attention: Mr. Ron Terry
P.O. Box 396
Hilo, Hawaii 96721

via email: rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: Early Consultation for Environmental Assessment for Rehabilitation of Puuopae Bridge, Island of Kaua`i

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from (1) Land Division - Kauai District; and (2) Commission on Water Resource Management, on the subject matter. No other comments were received as of the suspense date. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2012 APR 25 A 9:22

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

April 4, 2012

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_ Engineering Division
___Div. of Forestry & Wildlife
___Div. of State Parks
_X_ Commission on Water Resource Management
_X_ Office of Conservation & Coastal Lands
_X_ Land Division – Kaua`i District
_X_ Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Early Consultation for Environmental Assessment for Rehabilitation of Puuopae Bridge, Island of Kaua`i
LOCATION: Puuopae Bridge, Island of Kaua`I, TMK (4) 4-4-02
APPLICANT: Geometrician Associates, LLC for the County of Kaua`i

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document. Please submit any comments by April 26, 2012.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
(X) We have no comments.
( ) Comments are attached.

Signed:
Date: 4/16/12

cc: Central Files

4/20/12

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 4, 2012

2012 APR -9 AM 10:26

RECEIVED
LAND DIVISION
2012 APR 12 P 3:01
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

TO:

DLNR Agencies:
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
X Engineering Division
___Div. of Forestry & Wildlife
___Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Kaua`i District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Early Consultation for Environmental Assessment for Rehabilitation of Puuopae Bridge, Island of Kaua`i
LOCATION: Puuopae Bridge, Island of Kaua`I, TMK (4) 4-4-02
APPLICANT: Geometrician Associates, LLC for the County of Kaua`i

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document. Please submit any comments by April 26, 2012.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached. More info required

Signed: [signature]
Date: 4/18/12

cc: Central Files

FILE ID: BFD 3503.2
DOC ID: 9129.1

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

LUD - 4 4 4 002 001-ID954
Rehab Puuopae Bridge

April 11, 2012

Mr. Ron Terry, Principal
Geometrician Associates, LLC
P.O. Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

Subject: Early Consultation for Environmental Assessment for Rehabilitation of Puuopae Bridge between Puuopae Road and Kipapa Road Kilauea, Island of Kauai 96754 TMK (4) 4-4-002: 001

Thank you for the opportunity to provide commentson the subject project. We have no comments to provide at this time since the project scope does not involve the design and construction of a domestic wastewater treatment system.

Should you have any questions, please contact the Planning & Design Section of the Wastewater Branch at our direct toll free phone number 274-3141 ext. 64294 or fax to (808) 586-4300.

Sincerely,

MARSHALL LUM, P.E., ACTING CHIEF
Wastewater Branch

LM:cle

c: Ms. Lori Vetter – DOH/WWB – Kauai Office
Environmental Planning Office (EPO-12-062)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
File:
12-453A CAB

May 29, 2012

Mr. Ron Terry
Principal
Geometrician Associates, LLC
P.O. Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

SUBJECT: Early Consultation for Environmental Assessment for Rehabilitation of Kapahi, Opaekaa and Puuopae Bridges on Kauai

A significant potential for fugitive dust emissions exists during all phases of construction. The proposed activities will occur in proximity to public areas and thoroughfares, thereby exacerbating potential dust problems. The activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust.

We encourage the contractor to implement a dust control plan, which does not require approval by the Department of Health, to comply with the fugitive dust regulations.

Dust control measures include, but are not limited to, the following:

a) Planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
b) Providing an adequate water source at the site prior to start-up of construction activities;
c) Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
d) Minimizing dust from shoulders and access roads;
e) Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
f) Controlling dust from debris being hauled away from the project site. Also, controlling dust from daily operations of material being processed, stockpiled, and hauled to and from the facility.

If you have any questions, please contact Mr. Barry Ching of the Clean Air Branch at (808) 586-4200.

Sincerely,

NOLAN S. HIRAI
Acting Manager, Clean Air Branch

BC:rg

c: Environmental Planning Office

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 1, 2012

Geometrician Associates, LLC
Attention: Mr. Ron Terry
P.O. Box 396
Hilo, Hawaii 96721

via email: rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: Early Consultation for Environmental Assessment for Rehabilitation of Opaekaa Bridge, Island of Kaua`i

Thank you for the opportunity to review and comment on the subject matter. In addition to the comments previously sent you on April 30, 2012, enclosed are comments from the Historic Preservation Division on the subject matter. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
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

RECEIVED
LAND DIVISION
2012 MAY 31 A 10:
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAHUHIHEWA BUILDING
601 KAMOKILA BLVD, KAPOLEI HI 96707

DATE: May 19, 2012

LOG: 2012.1020
DOC: 1205RS50

TO: Steve Molmen
Land Division
Department of Land and Natural Resources
Post Office Box 621
Honolulu, HI 96809

SUBJECT: **National Historic Preservation Act (NHPA) Section 106 Consultation**
Permit # (None)
Owner: County of Kauai
Location: Opaekaa Bridge, Kapaa, Kauai
Tax Map Key: (4) 4-2-002:022

Date Received by SHPD: April 4, 2012

Description of Project/Undertaking: Early consultation for Environmental Assessment for rehabilitation of Opaekaa Bridge, Island of Kauai

Area of Potential Effect (APE): Present bridge footprint, and approaches

Description of Resource: Originally constructed in 1919 using steel recycled from the Wailua Bridge of 1896. Steel originally forged in Scotland in 1890. The bridge employs a Warren pony truss.

Eligibility: Listed on both the Hawaii and National Registers of Historic Places in 1983. [No. 30-08-9377]

Documentation Received: Two maps, photograph of bridge from downstream

SHPD Determination: SHPD would prefer construction that retains the look and feel of the existing bridge while meeting the need for emergency vehicle access. This would include retaining salvageable steel truss members, repair or replacement of heavily damaged members, cleaning and painting, new concrete deck, unprotected pedestrian sidewalk, and retention of existing stone abutments. We attended an April public hearing and continue to welcome consultation with the County and Federal Highway Administration on this project.

Any questions should be addressed to Ross W. Stephenson, SHPD Historian, at (808) 692-8028 (office), (808) 497-2233 (cell) or ross.w.stephenson@hawaii.gov.

Mahalo for the opportunity to comment.

AWestfall

Angie Westfall
Architecture Branch Chief, Hawaii Historic Preservation Division

In the event that historic resources, including human skeletal remains, lava tubes, and lava blisters/bubbles are identified during construction activities, all work should cease in the immediate vicinity of the find, the find should be protected from additional disturbance, and the State Historic Preservation Division should be contacted immediately at (808) 692-8015.

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

June 19, 2012

Regulatory Branch

POH-2012-00101

Geometrician Associates, LLC
Attn: Ron Terry
PO Box 396
Hilo, HI 96721

Dear Mr. Terry:

We have received your request dated March 30, 2012, for the Department of the Army to review and comment on the proposed Kapahi Bridge rehabilitation on Kawaihau Road in Kapaa, Kauai. We have assigned the project the reference number **POH-2012-00101**. Please cite this reference number in any correspondence with us concerning this project. We have completed our review of the submitted document and have the following comments:

Section 10 of the Rivers and Harbors Act of 1899 (Section 10) requires that a Department of the Army (DA) permit be obtained from the U.S. Army Corps of Engineers (Corps) prior to undertaking any construction, dredging, and other activities occurring in, over, or under navigable waters of the U.S. For tidal waters, the shoreward limit of the Corps' jurisdiction extends to the Mean High Water Mark. Section 404 of the Clean Water Act (Section 404) of 1972 (33 U.S.C. 1344) requires that a DA permit be obtained for the **discharge, or placement, of dredge and/or fill materia**l into waters of the U.S., including wetlands. For tidally influenced waters, in the absence of adjacent wetlands, the shoreward limit of the Corps; jurisdiction extends to the High Tide Line, which in Hawaii may be approximated by reference to the Mean Higher High Water Mark. For non-tidal waters, the lateral limits of the Corps' jurisdiction extend to the **Ordinary High Water Mark** or the approved delineated boundary of any adjacent wetlands.

The perennial, **Kapahi Stream**, with end terminus in the Pacific Ocean, **is a water of the U.S., subject to Corps jurisdiction.** Based on our review of the submitted documents, it is unclear if the proposed bridge rehabilitation will result in the discharge of fill material. If the project results in the discharge of fill material into the Kapahi Stream, a Section 404 permit may be required.

If the project design should change and work is to be proposed in wetlands, streams, drainage ditches, the Pacific Ocean, or other aquatic resource, including the Kapahi Stream, (whether or not water is present in that resource during project construction) please contact our office to request a jurisdictional determination. We can then determine if any regulatory requirements apply to work that may impact those resources.

Thank you for contacting us regarding this project. We look forward to working with you on this project as well as any future projects. Should you have any questions, please contact Kaitlyn Seberger, at (808) 835-4300 or via email at Kaitlyn.R.Seberger@usace.army.mil.

Sincerely,

George P. Young, P. E.
Chief, Regulatory

Aloha Ron- The Office of Hawaiian Affairs is in receipt of your three (3) March 30, 2012 letters seeing comments ahead of draft environmental assessments (DEA) which will be prepared to support the rehabilitation of the Puu 'Opae, 'Opaekaa and Kaphai bridges (projects) on the Island of Kaua'i. Please see the attached letter, which OHA has sent to another consultant who we understand is preparing a cultural impact assessment (CIA) for these projects. Some of our CIA comments may be applicable to the DEA. It seems that Puu 'Opae and 'Opaekaa are both listed on the National Register of Historic Places. While OHA does not assign significance to these historic properties, other organizations with demonstrated expertise and knowledge in these resources might. OHA suggests that you contact Kiersten Faulkner, Executive Director of the Historic Hawai'i Foundation and seek comments from them.

Please send us electronic copies of the DEA on CD to OHA attn.: Compliance Monitoring Program when they are prepared.

Thanks, Keola

Keola Lindsey
Office of Hawaiian Affairs
Compliance Program
711 Kapiolani Boulevard
Honolulu, Hawai'i 96813
Phone: (808) 594-0244
Email: keolal@oha.org

PHONE (808) 594-1888 FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD11/6055

February 1, 2012

Cathleen Dagher, Senior Archaeologist
Scientific Consultant Services, Inc.
711 Kapi'olani Boulevard, Suite 975
Honolulu, Hawai'i 96813

Re: Pre-Cultural Impact Assessment Consultation
Bridge Replacements
Island of Kaua'i

Aloha e Cathleen Dagher,

The Office of Hawaiian Affairs (OHA) is in receipt of your December 12, 2011 and January 3, 2012 letters requesting comments ahead of a cultural impact assessment (CIA) which will be prepared to support the replacement of three existing bridges (the project) on the Island of Kaua'i: Pu'u 'Ōpae Bridge, 'Ōpaeka'a Bridge and the Kapahi Bridge (bridges).

The statement in your letter *that archaeological reports of studies conducted in the areas of these bridges can be found on file at the State Historic Preservation Division (SHPD) Office* seems to imply that it is our responsibility to go to the SHPD office to review these reports to determine whether there are historic properties of significance to the Hawaiian people identified within the project. If this is indeed what you are suggesting, OHA finds this to be unacceptable. In traditional Hawaiian thinking, archaeological resources are cultural resources and thus, we believe it is your responsibility to provide a summary of identified cultural sites within or in the vicinity of the project area to consulting parties.

The reference in your letter to applicability of the requirements of the National Environmental Policy Act (NEPA) indicates that there is a federal nexus to this project and we request specific clarification what this federal nexus is. If the requirements of the NEPA are applicable to this project, then we would expect that the requirements of the National Historic Preservation Act (NHPA) are also applicable. Section 106 of the NHPA requires that the 'lead federal agency" initiate consultation with interested parties, including Native Hawaiian Organizations and that a "good faith effort" to identify historic properties within the project area be completed.[1] Our ability to assess whether such a"good faith effort" has indeed been completed is dependant on the information within the "archaeological reports" on file with the SHPD being summarized and provided to OHA and other consulting parties.

[1] See NHPA implementing regulations 36 CFR §800.2-4.

If U.S. Department of Transportation involvement in this project provides the federal nexus and 'trigger" for applicable federal statutes and regulations, then the requirements of the U.S. Department of Transportation Act, including a Section 4(f) evaluation will also be applicable. We note that your letter confirms that the Pu'u 'Ōpae Bridge and 'Ōpaeka'a Bridge are both listed on the National Register of Historic Places (NRHP). While OHA does not assign significance to these NHRP listed historic properties, we do encourage you to initiate consultation with organizations that do.

Thank you for the opportunity to provide comments at this early stage. We look forward to receiving our requested clarifications. Should you have any questions or concerns, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Richard Pezzulo
Interim Chief Executive Officer

RP:kl

C: OHA, Kaua'i Community Outreach Coordinator

TO WHOM IT MAY CONCERN:

Thank you for hearing my testimony, however, I am unable to present this in person. With respects, please allow the following letter into your records and be read publicly:

I am a 13 year resident of Kauai and would support the immediate upgrade and/or replacement of one-lane bridges across the island. More specifically, I am a parent of an 18 year old driver and a newly licensed 16 year old driver. It would please my family if the government powers decide post-haste to improve Kauai's roadways by replacing one-lane bridges with two-lane bridges. It is common knowledge today that the existing one-lane bridges pose a danger for modern travelers on the roadways of this county.

There was a time for these bridges, but those days are gone. Additionally, consider this perspective:

From the County of Kauai Charter:

ARTICLE II, POWERS OF THE COUNTY, Section 2.01. Powers: "To promote the general welfare and the safety, health, peace, good order, comfort and morals of its inhabitants, the county shall have and may exercise all powers necessary for local self government..." Safety is at or near the top of all our founding documents. This word in the County of Kauai Charter is profound and if you look to parallel language of both the Hawaii State Constitution and The United States Constitution you will find the same emphasis for safety.

Government appears to heap '**safety** of its citizenry' atop its priority list time and again. And it should. *Safety* is about the only thing government is for. That, and building good roads. So I do sincerely hope this testimony finds good company. But beyond that I believe government has, over time, reached beyond its natural scope. You hear it every day in the language of the politician.

When elected officials and their tax-funded emissaries wax poetic on the public dime orating the likes of "cultural values" or "win-win tourism opportunity" or "revenue streams of the public golf course" or that "Kauai's one-lane bridges are untouchable historic treasures", I ponder whether these "representatives" have lost sight of the core-goal and purpose of the Republic.

Please indulge me this reference, so that the many other aspect of bridge building are an aside for a moment.

Therefore the central argument put to me whether or not the loss to a handful of community members and at least one Council Person "historical one-lane bridges" as a greater burden to the people than a statistical fact-- that replacing these one-lane bridges with two-lane bridges provides *more safety* for commuter-constituents.

Yes, the statistics do not lie. Two-lane bridges are far safer and therefore I implore the government to proceed.
But, this discussion becomes then a philosophical debate about 'one-lane historical bridges'-- beautiful in their familiarity, old-time tradition and nostalgia **versus** a plainly- rational, two-lane, modern bridge construct, built for practicality, efficiency, and, first and foremost, ***safety***.
Why, that's the main purpose of a bridge is it not?- to get us across an otherwise dangerous expanse *safely*. Whether or not that bridge's aesthetics resonates over time in the nostalgic-heart becomes secondary. Who's to say? Perhaps the gentle people in time-- including those here today arguing for nostalgia, will grow to endear the two-lane bridge just as they love today's one-lane bridge.
And so, should there then be any question in the office of government barring some great public outcry? No.
And I ask you, in light of *safety*-- a duty of government-- does not the appeal to aesthetics pale? If my argument falls short and the one-lane bridges prevail based solely on this point, have we failed so in the name of vanity, not *safety*?
All issues being equal in consideration of the financial burden to the tax-payer, I support the construction of the two-lane bridges for Kauai.
The sooner, the better, and for our safety.

Mahalo,
Rolf Bieber
5015 Malie Rd. Kapaa, HI 96746/ 821-2194

(6) 9 (7)

Tue, Oct 19, 2004 8:26 AM

From: KC Lum <KCLum@kauai.hawaii.gov>
To: Glenn Mickens <rmk@aloha.net>
Date: Monday, October 18, 2004 6:48 PM
Subject: FW: Bridges

FYI

-----Original Message-----
From: Joseph Kaauwai
Sent: Tuesday, October 12, 2004 8:40 AM
To: KC Lum
Subject: Bridges

We have checked with the information available to the Traffic Safety Unit and do concur with the findings of the State of Hawaii, Department of Transportation, State Traffic Engineer, Alvin TAKESHITA.

The information that the State Of Hawaii is giving to Mr. MICKENS was obtained through this office, this information only reflects the major traffic crashes in these areas, and not the minor crashes.

Glenn Mickens' Testimony----Bridges 12/7/11

It appears that we are now redoing or duplicating what we did or tried to do in 2003-2004---rebuild or put in a new Puuopae and Opaekaa bridge.

I have documented E Mails from Alvin Takeshita, State Traffic Engineer and KPD officer Kaauwai along with Chief Lum in 04 showing that on Kauai there are 3 times more accidents on 1 lane bridges than on 2 lane bridges.

The Feds would only fund a bridge if it were built to their standards and two lanes were one of their mandatory requirements.

In 04 these bridges were 80% ready to be rebuilt but a group of people got them put on the Historical Register and stopped the process. Since the Fed funds were time sensitive we, the tax payers forfeited $189,600 of the design phase funds.

The actual cost of building these bridges today---contingent on the type we use (the Olohena Bridge costing us $4.8 million to build it over a ditch whereas the Acrow type used over the Wailua River would have cost us well under a million dollars) will probably be 5 times more than it would have in 04.

So, my questions to you are: why are we having these duplicate meetings today that we had 8 years ago?; what type of bridges are we proposing to build?; are the Feds still mandating that 2 lanes are used for their 80% funding?; does the county have the funding to do this project with or without the Feds funding?; with safety for school buses and emergency vehicles and statistics listed above, will we ignor them and still build these bridges one lane for historical purposes?

Your answers will be appreciated.

(5)

KCLUM

Fri, Apr 30, 2004 1:16 PM

From: Alvin.Takeshita@hawaii.gov
To: <rmk@aloha.net>
Cc: <Rodney.Haraga@hawaii.gov>, <Grace.Ichikawa@hawaii.gov>, <Glenn_Yasui@exec.state.hi.us>, <Wilhelmina_Bartolome@exec.state.hi.us>, <Scott.Ishikawa@hawaii.gov>, <Steven_Kyono@exec.state.hi.us>
Date: Wednesday, April 28, 2004 11:33 AM
Subject: PUBLIC INQUIRY: One/Two Lane Bridges on Kauai (Glenn Mickens)

(Sent to KC Sum 10/6/04 asking for his verification of these figures)

Aloha Glenn,

I have been asked to help you with your inquiry regarding safety for 1 or 2 lane bridges on Kauai.

Our traffic accident records verify that two-lane bridges on Kauai are safer than one-lane bridges. There are 12 one-lane bridges and 39 two-lane bridges on Kauai. Our statistics show that historically on Kauai, there are about 3 times more accidents per bridge at one-lane bridges than two-lane bridges. It is interesting to note that almost 50% of accidents that occurred on the 12 one-lane bridges occurred at Hanalei Bridge. We speculate that heavy tourist traffic contributed heavily to this statistic. One third of drivers had out-of-state driver licenses.

From an engineering standpoint, the two-lane bridges are safer because they are wider, provide more clearance with bridge railings, and do not create vehicle conflicts caused by one-lane bridges, where vehicles traveling in opposite directions must yield. It should also be noted that one-lane bridges tend to be older bridges that do not have the latest engineering safety features enjoyed by newer structures.

If there are any questions, please feel free to e-mail me at: Alvin.Takeshita@Hawaii.Gov

Mahalo,
Alvin Takeshita
State Traffic Engineer

From: Alvin.Takeshita@hawaii.gov
Subject: **Re: One-Lane Bridges on Kauai**
Date: December 30, 2011 3:13:24 PM HST
To: glennruth@hawaiiantel.net
Cc: Jan.Higaki@hawaii.gov, Sean.Hiraoka@hawaii.gov

Aloha Glenn,

Thank you for your request of Dec. 15, 2011, regarding accidents at 1-lane versus 2-lane bridges.

As requested, we used more recent accident data (years 2004 - 2009) to update our prior findings for Kauai. The major accidents used for this study were located through a bridge inventory provided by our Bridge Design Section. Accident that were reported at other locations (other than what was provided by our Bridge Design Section) or couldn't be clarified as one-lane or two-lanes were not counted.

We found that there are still more major traffic accidents occurring on 1-lane bridges versus 2-lane bridges. This study was conducted on 12 1-lane bridges and 41 2-lane bridges on Kauai. We found that 1-lane bridges had a rate of 2.33 accidents per bridge and 2-lane bridges had a rate of 1.24 accidents per bridge. The accidents occurring at 1-lane bridges are close to twice as much as at 2-lane bridges. Hanalei Bridge contributes to 50% of the accidents that occurred at the 1-lane bridges used for this study.

Through my previous years of traffic engineering experience and verified by this recent study update, it is understandable that 1-lane bridges would have traffic flow operational concerns. The study verifies that 1-lane bridges have a higher accident rate than 2-lane bridges.

If there are any questions, please feel free to contact my Traffic Safety staff at 692-7684.

Alvin Takeshita
Interim Administrator
Highways Division

HISTORIC HAWAI'I FOUNDATION

VIA EMAIL TO:

TO: Kuuleialoha Santos, Chairperson
Kaua'i Historic Preservation Review Commission

MEETING DATE: Thursday, March 1, 2012
3:00 p.m.
Līhu'e Civic Center, Moikeha Building, Meeting Room 2A/2B

FROM: Kiersten Faulkner, Executive Director
Historic Hawaii Foundation
Kiersten@historichawaii.org
(808) 523-2900

RE: **'Ōpaeka'a, Pu'uopae, and Kapahi Bridge Design Presentation**

Since 1974, Historic Hawai'i Foundation (HHF) has been a statewide leader for historic preservation. HHF's mission is to preserve and encourage the preservation of historic properties significant to the history of Hawai'i.

HHF has reviewed the design options submitted by KAI Hawai'i for the 'Ōpaeka'a, Pu'uopae, and Kapahi bridges. Both the 'Ōpaeka'a and Pu'uopae bridges are listed on the National Register of Historic Places (NHRP). The Kapahi bridge, while not listed on the register, is over fifty years old, and therefore its historic significance and integrity should be evaluated and weighed carefully when making planning decisions for this bridge.

The submittal from KAI Hawai'i to KHPRC lacked critical information that is needed to evaluate and provide meaningful comments on historic preservation issues. In particular, the applicant should provide:

1. A summary of the historic significance, character-defining features and elements of historic integrity (i.e. location, setting, design, materials, workmanship, association, feeling) for each of the bridges;
2. A summary of the design goals and issues that need to be addressed, which is the purpose, need and scope of the undertaking;
3. Their analysis of character-defining features, each alternative's effect on integrity, and how each alternative meets Secretary of Interior Standards for the Treatment of Historic Properties (SOI). They should identify which features are original, which would be retained and which are proposed for alteration/destruction. They should also present which elements of integrity would be affected by each of the alternatives.

D.3., D.4., D.5.

MAR 0 1 2012

This information is necessary in order for the KHPRC, as well as county, state and federal agencies, and members of the public to understand each alternative's potential effect on historic properties and to provide input on ways in which the adverse effect may be avoided or minimized.

Although this basic and fundamental information was not provided, HHF has preliminary comments based on the alternatives provided.

HHF strongly encourages the long term maintenance and repair of these historic bridges. They should retain their current location, as moving any of them would destroy their historic character. They should also retain their character-defining features so that they retain their historic integrity. For all three bridges the current width is a feature that should be preserved. Widening these bridges would significantly impact their historic integrity and their eligibility for listing on the NHRP.

ʻŌpaekaʻa Bridge

One of ʻŌpaekaʻa Bridge's most visually distinctive features is the wrought iron truss system. It is imperative to maintain the historic trusses by repairing them where needed and replacing portions that are badly deteriorated with "in kind" materials. The Secretary of the Interior's Standards for Rehabilitation set forth standards and guidelines for repairing historic buildings, structures, and objects. These standards allow for a property to change over time to meet the current needs of the structure, but also seek to ensure that the major character-defining features are identified and maintained during such changes.

For ʻŌpaekaʻa Bridge, design option two is the only option that proposes retaining the existing bridge in its current location. While we have concerns regarding some aspects of this proposal, it is the best starting point for discussion. This option proposes to reuse existing steel trusses and to repair or replace only those members that are heavily damaged; clean and paint; retain the existing stone abutments; replace the existing concrete deck with a new one that is strong enough to carry emergency vehicles; make one or two lanes; and create an unprotected pedestrian sidewalk.

Retention and repair should be made with in-kind replacement of heavily damaged members, as well as retention of the existing stone abutments. This would maintain the overall historic appearance of the bridge. Should the concrete deck need to be replaced to increase its load-bearing capacity to accommodate emergency vehicles, we do not have concerns provided that its appearance remains the same as the existing asphalt concrete deck.

ʻŌpaekaʻa bridge should not be widened, as this would dramatically affect its historic integrity. The applicant should provide data on pedestrian usage of this bridge, as we question the need for a pedestrian sidewalk on this bridge and would like to see what data supports this need. The drawing submitted to the KHPRC depicts guard rails on the bridge deck inside the trusses. These distract from the historic appearance of the trusses and should be eliminated or redesigned.

Puʻuopae Bridge

HISTORIC HAWAI'I FOUNDATION

The most important aspects of Pu'uopae Bridge lie in its visual appearance and the contribution it makes to rural feeling of the area. It is important to maintain the bridge's existing width and abutments. We would prefer that the existing steel girders remain if they are in good condition, but do not have concerns with additional girders being added to carry the load of emergency vehicles.

Again, we question the necessity of creating a pedestrian sidewalk. This would almost certainly necessitate widening the bridge, which would dramatically affect its historic integrity.

Kapahi Bridge

The two options presented for this bridge both involve making it either one or two lanes; replacing steel girders; a new concrete deck; new steel or concrete railings; strengthening it to carry emergency vehicles; and both propose a pedestrian sidewalk. They differ in whether or not the sidewalk is protected.

The historic railings should be retained if still extant and able to be repaired. If the current railings are not historic, the new railings should not detract from the historic character of the area. Provided that it does not change the appearance, we do not have concerns regarding the replacement of steel girders or a new concrete deck. We again have concerns regarding the widening of the bridge and question the necessity of adding a pedestrian sidewalk.

Generally we feel that the plans submitted would need to be developed further to give a better understanding of the scope of the proposed projects. The options as submitted to the KHPRC do not provide enough information to know exactly what type of work is proposed. Information such as current and proposed width and length of the bridges; current and proposed railing height; and current and desirable weight limits would help to give a fuller understanding of the proposed projects.

Thank you for the opportunity to comment.

Very truly yours,

Kiersten Faulkner

Kiersten Faulkner, AICP
Executive Director

Cc: Ross Stephenson & Angie Westfall, State Historic Preservation Division
Larry Dill, County of Kaua'i Engineer
Pat Phung, Federal Highways Administration
Mike Hunneman, KAI Hawai'i
Tonia Moy, Fung Associates, Inc.

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PAT L GRIFFIN
POST OFFICE BOX 3213
LĪHU'E, HAWAI'I 96766
PHONE: (808) 639 1019
E-MAIL: PATGRIFFIN
@HAWAIIANTEL.NET

January 18, 2012

copy

Larry Dill, County Engineer
County of Kaua'i
4444 Rice St.
Līhu'e HI 96766

Dear Mr. Dill,

I am writing to express my grave concerns regarding the review process currently underway for 'Ōpaeka'a and Pu'u'ōpae bridges. These bridges are listed on both the State Register of Historic Places and the National Register of Historic Places. That status affords them special consideration under the National Historic Preservation Act of 1966 and the Department of Transportation Act of 1966, which protect them from casual destruction and define consultative and regulatory requirements to be followed while contemplating substantive change when federal monies are used.

Those requirements were not apparent at the community meeting about the bridges held by the county-contracted engineering firm, Kai Hawaii, on December 7, 2011. None of the several consultants in attendance provided any explanation of the historical review process, not even the preservation specialist, whom I know to be capable and experienced. As a result, the few people from the community who attended the meeting were given the false impression that they could simply take a vote about what conduit they thought might be useful over the two stream crossings. Furthermore, the attendees were encouraged, given the lack of an explanation of the process or setting of any other ground rules, to complain at length about rural byway safety issues (e.g., speeding drivers, lack of sidewalks) that occur as far as two miles away along Kamalu Rd.—issues totally non germane to the historic bridges themselves.

The meeting was sparsely attended for several reasons, not least of which because many people in the community thought the issue of Pu'u'ōpae Bridge had been settled when it was placed on the National Register (it joined the 'Ōpaeka'a Bridge as the only two county-owned bridges to enjoy that distinction). I attach minutes from both the March 30, 2004 and June 30, 2004 community meetings that explored alternatives to the then planned, massive, inappropriate 32-foot-wide replacement. *[Enclosure A]* Approximately 90 people attended the first meeting, and speeding/neighborhood safety was an issue then too. Then, however, only two of those present voted for a 2-lane bridge (both of whom were vocal at the 12/07/11 meeting). Mayor Baptiste was the person who encouraged me to pursue historic register nomination for Pu'u'ōpae Bridge, since its placement on the register was believed to afford the ability to create design exceptions to several AASHTO standards. Despite persistent rumors to the contrary, the passionate community members who attended the 2004 meetings were not "antidevelopment"; they simply understood that bigger-wider-straighter-faster does not equal safer. However, the transportational concerns about safety on roadways around these historic bridges is not the point. What is relevant to the historical distinction of the two bridges—and their care—is their structural safety.

Both ʻŌpaekaʻa and Puʻuʻōpae bridges have suffered from decades of neglect. Twenty years ago the need for repair was already an issue. In 1992 the county hired Wilson Okimoto Corporation to review ʻŌpaekaʻa Bridge. The company asked internationally renowned bridge engineer Abba Lichtenstein to make recommendations about its restoration. Those are filed in the Department of Public Works' offices (or were filed there when I reviewed them on July 18, 2008). I enclose copies of several pages from them, including Lichtenstein's three restoration concepts. *[Enclosure B]*

Despite his excellent recommendations, ones that would honor the history of ʻŌpaekaʻa Bridge while making it structurally safe, nothing seems to have been done to repair or restore the bridge. And the lack of even minimal attention to care for the fine old trusses has resulted in accelerating deterioration.

Among the most disturbing findings in the Public Works files was a Kai Hawaii "Inspection Report" for ʻŌpaekaʻa Bridge dated November 2007. *[Enclosure C]* In it the firm's concluding recommendation was for the county to "replace bridge immediately." No mention in that report was made of the bridge's historic designation and subsequent requirements. The combination of that recommendation and the dismal way the December 7th meeting was conducted is at best disquieting. Deepening the unease is notification I've received from people who have been unable to contribute input to the Cultural Impact Assessment, which was requested in *The Garden Island* notices last December, because no one at SCS knowledgeable about the projects was available at the phone number listed. Now I've received a copy of a letter from SCS senior archaeologis Cathleen Dagher, who wrote, "according to documents supplied by KAI Hawaii, Inc., the existing Puʻu ʻŌpae Bridge, ʻŌpaekaʻa Bridge, and Kapahi Bridge are going to be replaced"! *[Enclosure D]* Disquiet is slipping into alarm.

The history of the homesteading movement in Hawaiʻi is little known; these bridges are a proud part of a story that can and should be appreciated. They contribute to the heritage of Hawaiʻi and to engineering heritage as well. ʻŌpaekaʻa is arguably the most historic bridge on Kauaʻi, certainly among the most historic in the state. It is located in a settled rural area that isn't likely to experience a considerable amount of increased density. Engineers well practiced in preservation techniques can restore both bridges to well-functioning spans which continue to serve the community long into the future. But the county must have the will to do so—and to direct its consultants accordingly. The established legal processes and creative engineering for historic bridges should be followed with an eye to preservation, not destruction. All evidence now seems to be going the other way. I urge you to set this process on its appropriate legal path and to take a strong leadership role in restoring these bridges to the place of honor they deserve.

Very truly yours,

Pat Griffin

Pat L Griffin

encl

Federal Emergency Management Agency

Washington, D.C. 20472

CERTIFICATION OF A "NO-RISE" DETERMINATION

FOR A PROPOSED FLOODWAY DEVELOPMENT

County of Kauai
Community Name

Puuopae Bridge Replacement
Development Name

Note: Refer to Table 1 for hydraulic model results - Proposed vs. Existing Conditions for the 100-year floodway. The hydraulic model used for the analysis is described in the "Puuopae Bridge Replacement Hydraulic & Scour Analysis" prepared for the KAI Hawaii and the Hawaii Department of Transportation by WEST Consultants, Inc., 2013.

Lot/Property Designation

Property Owner

I hereby certify that the proposed remedial measures, in combination with the property development designated above, will result in no loss of flow conveyance during the occurrence of the 1 percent annual chance of exceedence (100-year flood) discharge.

I further certify that the data submitted herewith in support of this request are accurate to the best of my knowledge, that the analyses have been performed correctly and in accordance with sound engineering practice, and that the proposed structural works are designed in accordance with sound engineering practice.

September 12, 2014
Date

Andreas Jake Gusman
Registered Professional Engineer

Seal

This work was prepared by me or under my supervision.

Table 1. Hydraulic Model Results (100-year Floodway Discharge) – Existing vs. Proposed Bridge

River Station	Existing 100-yr Floodway WSEL (ft)	Proposed 100-yr Floodway WSEL (ft)	Elevation Change (ft) *(Proposed - Existing)*
397	316.19	315.74	-0.45
368	316.12	315.64	-0.48
341	315.90	315.41	-.049
310	Existing Bridge	Proposed Bridge	
296	314.09	314.09	0.00
236	314.09	314.09	0.00
201	314.05	314.05	0.00
111	313.99	313.99	0.00

Water surface elevation decrease (ft)

PUUOPAE BRIDGE REPLACEMENT ENVIRONMENTAL ASSESSMENT

TMK (4th.): Plat 4-4-02
Kawaihau District, County of Kaua‘i, State of Hawai‘i

Submitted Pursuant to Chapter 343, Hawai‘i Revised Statutes (HRS)
County of Kaua‘i, Department of Public Works

APPENDIX 1b
Public Involvement Documentation

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COMMUNITY MEETING NOTICE

OPAEKAA BRIDGE

PUUOPAE BRIDGE

KAPAHI BRIDGE

DATE: Thursday, November 3, 2011

PLACE: Wailua Homestead Park Pavilion
Kamalu Road

TIME: 5:30 – 7:30 P.M.

A presentation by KAI Hawaii, Inc. will be given to the local community and all interested parties regarding the condition of the Opaekaa, Puuopae, and Kapahi Bridges. Due to the advanced deterioration of all three bridges, the presentation will give the attendees a good sense of the structural condition of the bridges.

The meeting will be an information gathering session where the design consultants will listen to ideas and concerns that the community may have regarding one or all of the bridges.

All public are welcome. This will be the first of several community meetings regarding the above noted bridges.

PUUOPAE-OPAEKAA BRIDGE

12/7/11 Waiwa Homesteads

Name (Print)	Org.	Contact Info
Lelan Nishek	Kauai Nursery & Landscaping	6599500
Tonia Moy	FAI-	941-3000
Mike Hennemann	KAI Hawaii	791-3980
Allen A. Smith	AA Smith Assoc.	639-0808
CHARLES JURY	AKINAKA & ASSOC. LTD	836-1900
Glenn Mickens	None	822 0998
K. VENKATESAN	COK	241-4885
M. Agena	Resident	635-0997
Lea Nishida	Resident	639-3187
Mike Lega	SCS	597-1182
Jim Powell	"	651-5924
KEN TAYLOR		taylork021@hawaii.rr.com
Elsie/Tom Godbey	resident	821-0447
Pat Griffin		808 639 1019
Kiersten Faulkner	Historic Hawaii Foundation	808-523-2900
Kirk Ishima	Co/K	241-4991
WALLACE KUDO	COK ENG DIV	241-4891
Rayne Reqush	W-RNA	651-1318
Lyle Tabata	COK	241-4994
LARRY BELL	COK	241 4996
MARK MARSHALL	Redwissler Farms / Kupaa Ridge	651-24 87
STANFORD Iwamoto	RESIDENT	241-3015

Name	Org	Contact Info
Tommy Noyes	Resident	thomasnoyes@hawaiiantel.net 808 634-1018
Patrick Shimamoto		
HANS HELLRIEGEL	Resident	808 2456500
WALTER AGENA	RESIDENT	652-9837
ROBERT GAUSEPOHL	KPD	241-1611
Lincoln Ching	Resident	6526434

Mike Hunnemann

From: CHARLES KING [cgking@me.com]
Sent: Tuesday, December 06, 2011 8:41 AM
To: Mike Hunnemann
Cc: Allan Smith
Subject: Bridges Improvements: Opaeka'a and Pu'uopae

I cannot attend your meeting on this 12/7, but would like to submit this as my testimony in favor of improving these two bridges. While the existing bridges may be quaint and historical, they do not provide the service our growing area needs. I hope that you can get these projects approved and moving forward as quickly as possible.

Charlie King
Kauai 808.482.2800
Cell 808.651.3613
Sent from my iPad

Glenn Mickens' Testimony----Bridges 12/7/11

It appears that we are now redoing or duplicating what we did or tried to do in 2003-2004---rebuild or put in a new Puuopae and Opaekaa bridge.

I have documented E Mails from Alvin Takeshita, State Traffic Engineer and KPD officer Kaauwai along with Chief Lum in 04 showing that on Kauai there are 3 times more accidents on 1 lane bridges than on 2 lane bridges.

The Feds would only fund a bridge if it were built to their standards and two lanes were one of their mandatory requirements.

In 04 these bridges were 80% ready to be rebuilt but a group of people got them put on the Historical Register and stopped the process. Since the Fed funds were time sensitive we, the tax payers forfeited $189,600 of the design phase funds.

The actual cost of building these bridges today---contingent on the type we use (the Olohena Bridge costing us $4.8 million to build it over a ditch whereas the Acrow type used over the Wailua River would have cost us well under a million dollars) will probably be 5 times more than it would have in 04.

So, my questions to you are: why are we having these duplicate meetings today that we had 8 years ago?; what type of bridges are we proposing to build?; are the Feds still mandating that 2 lanes are used for their 80% funding?; does the county have the funding to do this project with or without the Feds funding?; with safety for school buses and emergency vehicles and statistics listed above, will we ignor them and still build these bridges one lane for historical purposes?

Your answers will be appreciated.

Public Informational Meeting
Puuopae and Opaekaa Bridge Projects
County of Kaua'i, Department of Public Works
December 7, 2011 Meeting Notes

Note: where commenters provided their names during their comments, the names are included. Multiple comments from some commenters have been combined into one paragraph. Approximately 20 residents attended. Sign-in sheet attached.

The project team briefly explained and illustrated the location and physical condition of the Puuopae Bridge, and then discussed the Environmental Assessment process, the potential detour routes, and the historic property review process for both bridges.

A commenter asked which agencies would be in charge of determining a FONSI, and the project team responded that it would be the Kaua'i DPW for Chapter 343 and FHWA for NEPA.

A commenter asked if both bridges were on the National Historic Register, and the project team responded that both were.

Lelan Nishek, Kauai Landscape and Nursery noted that there were meetings some years ago, when funding was available from County and federal government. Many in the community pushed for the project, because the low weight-rating of 5 tons prevents school buses, ambulances and fire trucks, cattle trailers, cement trucks, rubbish trucks and many other work vehicles from crossing. They also felt the bridges were the site of many vehicle accidents and work unsafe for pedestrians, especially children, because of their narrowness and lack of sidewalks. They were in favor of replacing these bridges with two-lane bridges that could be better oriented for sight distance. According to Mr. Nishek, there was a minority of residents who stated that the bridge was historic and should not be altered. Some also felt that retaining one-lane bridges would be a good way to slow down or stop development, as well as calm traffic. Mr. Nishek stated that this group helped put Puuopae on the Historic Register, which would make efforts to replace the bridge more difficult.

Glenn Mickens provided written testimony, and stated that the episode Mr. Nishek referred to was in 2003-2004, and he also recalled efforts in 1996. He was concerned that if the County decided to build a bridge of only one lane, the federal government might decide not to cost-share. The project team responded that there is design flexibility and that the project might still be eligible for federal funding, depending upon the analysis. He stated that one-lane bridges

have 3 times as many accidents as two-lane bridges. He was concerned with the inability of Akita school buses to cross the bridges. He stated that there was really a choice between emphasizing safety or historic value, and that because the safety issues were severe and the historic value of the bridges was very low, it is a no-brainer. He stated that the project team was under-informed. A significant record of public testimony must exist- he had been on an ad hoc committee put together by Mayor Baptiste - and the team needs to review that.

Lou Nishida said he wanted two lanes, 50-ton capacity, and nothing fancy.

A commenter stated that she had seen a child actually hit by a car. Although the child was not seriously harmed, it indicated the unsafe conditions.

A commenter asked if the bridges would have sidewalks and be ADA accessible, to which the project team responded that standards normally require these and they were planned for the project.

Mark Marshall stated that it is ludicrous that severe public safety concerns are trumped by historic site concerns in this case. He has witnessed numerous accidents, and fire and ambulance issues, and believes that blocking this is imperiling safety. The process should be weighted to emphasize public safety. He stated that a one-lane bridge would not stop development. Far from calming traffic, he has observed that people speed across them to avoid being delayed by drivers coming from the opposite side.

Ms. Nishida stated that she was born in the area and graduated from Kapaa High School. Most of her classmates have had to move away for economic reasons and she was lucky enough to return. The hold-up over the bridge is an example of the kind of blocking of progress that depresses the economy and makes life inconvenient and discourages others who are really from the area to return or to continue to be able to live in the area. It costs a lot of money for all the heavy vehicles to take long detours and it is very inconvenient for children, who often stash bicycles in yards near the bridges and then cross them on the other side to avoid having to spend an extra half hour on the bus as it detours around the bridge. This is unsafe for the children, because they then have to cross the narrow bridge.

A commenter stated that the team should determine and explicitly state all relevant design standards in the next meeting. She asked what the issue was with the railing. The project team responded that the bridge railings are substandard and the approach guard rails are too. A one-lane bridge is also generally considered substandard. This commenter stated that the presentation was very unbalanced, in that it did not provide any information on the substantial

historic value of the bridges, and instead focused only on their physical condition. More information on the historic value should be presented at the next meeting. She stated that one-lane, historic bridges help preserve the rural values of the area, which residents cherish and which are explicitly called out for preservation in the General Plan. She stated that residents want to keep the country, country.

A number of commenters raised the possibility of retaining one or both of the bridges as pedestrian facilities while building new, two-lane bridges.

The presentation then focused on the physical condition of Opaekaa Bridge, which is extremely corroded.

A commenter asked when it would collapse.

Glenn Mickens stated that a bridge expert to whom he has shown the bridge said that it was the worst operating bridge he had ever examined. Sandblasting without proper painting may have hastened its corrosion.

A commenter stated that the County had recently dropped the weight rating.

Several commenters asked questions about the history of the bridge. The project team responded with explanation that it was built in Scotland in 1890 for the Wailua River, but then it was cut in two in 1919 and this section brought to Opaekaa.

The project team explained that work was done a few years ago to provide girders that would support the bridge in case of an emergency collapse.

Several commenters requested that the replacement bridge have two lanes.

A commenter stated that he really appreciated one-lane bridges. They calm traffic and make it safer for walkers and bikers.

A commenter stated that he walks this bridge every day and it is anything but safe and calm. Speeding cars, poor visibility on the approaches and the narrow width make it very unsafe. He asked that the bridge have sidewalks.

Mark Marshall stated that his children and many others were afraid to cross such bridges.

A commenter stated that the reality is that these roads are the main arterials for Wailua Homesteads and one-lane bridges are not suitable.

A commenter asked when the projects could be completed. The project team responded that funding would be the critical factor. Several commenters requested that the project be expedited.

A commenter noted that her fire insurance was higher because fire trucks could not cross the bridge.

A commenter stated that another commenter's remarks about Hanalei Bridge being unsafe were in error. Records that list the bridge actually refer to the highway with a mile or so on either side. Hanalei Bridge is quite safe. It is also a source of pride for the community and has helped to stop overdevelopment. The commenter who made the statement about accidents on Hanalei Bridge said that he believed there were accidents on the bridge.

A commenter asked for notice two weeks in advance of the meeting (rather than four days) so that the community can more easily attend.

COMMUNITY MEETING NOTICE

SUBJECT: Opaekaa Bridge
Puuopae Bridge
Kapahi Bridge

DATE: Wednesday, April 11, 2012

PLACE: Kapaa Middle School Cafeteria
4867 Olohena Road
Kapaa, HI 96746

TIMES: 3:30 P.M. – 5:30 P.M. (first meeting)
6:30 P.M. – 8:00 P.M. (repeat meeting)

A presentation by the County of Kauai DPW and design team will be given to the local community and all interested parties regarding the Opaekaa, Puuopae, and Kapahi Bridges. All three bridges are in a condition of advanced deterioration. The presentation will address the structural condition of the bridges and will show various design options being proposed by the design team. The community members will be asked to give their opinions of the options and any other concerns regarding one or all of the bridges.

All public are welcome. This is the second community meetings regarding the above noted bridges.

Any questions, please call Mike Hunnemann at KAI Hawaii, Inc. (808) 791-3980.

Note: This meeting is part of Section 106 consultation.

3:30 PM
Mtg.

REHABILITATION/REPLACEMENT OF THE OPAEKAA, PUUOPAE, AND KAPAHI BRIDGES
ISLAND OF KAUAI, HAWAII
April 11, 2012 COMMUNITY MEETING (SECTION 106 COMPLIANCE)
SIGN-IN SHEET

NAME	PHONE	EMAIL
Michael Byza	597-1182	mike@scshawaii.com
Ian Powell	657-5924	—
Katie Kissling	523-2900	Katie@historichawaii.org
MIKE GUSHARD	692-8026	MICHAEL.J.GUSHARD@HAWAII.GOV
ROSS W. STEPHENSON	497-2233	ROSS.W.STEPHENSON@HAWAII.GOV
Tonia S. May	941-3000	tonia@funghawaii.com
Mike Hunnemann	753-3005	mike@kaihawaii.com
Ron Terry	987-5239	rterry@hawaii.rr.com
J. Phil Takbian	822-4249	Htacbian@yahoo.com
Carol Beardmore	639-4524	willie.cbc@gmail.com
K. VENKATESAN	241-4885	P.W. ENGINEERING COK
K Teshima	241-4995	kteshima@kauai.gov
L Nishida	639-3197	
James Aiu	241-4153	jaiu@kauai.gov
Allan A Smith		
Ray Carpenter	651-4152	

REHABILITATION/REPLACEMENT OF THE OPAEKAA, PUUOPAE, AND KAPAHI BRIDGES
ISLAND OF KAUAI, HAWAII
April 11, 2012 COMMUNITY MEETING (SECTION 106 COMPLIANCE)
SIGN-IN SHEET

NAME	PHONE	EMAIL
PAT GRIFFIN	808 639 1019	patgriffin@hawaiiantel.net
Tommy Noyes	808 639-1018	ThomasNoyes@hawaiiantel.net
Marge Freeman	822-4605	
Randy Blake	212-1406	Rcblake@mac.com
Keith Blake	635-6844	Kblake@me.com
Mike Zins	246-4678	
B.K. Zins	" "	
Ted Delisle	635-5053	Tedchka@hawaii.rr.com
Mark Marshall	651-2484	MMARSHALL@KAUAI.GOV.
Kip Goodwin	822-7646	kgoodwin@hawaiiantel.net
KEN TAYLOR	823-8527	taylork021@hawaii.rr.com
Katherine Muzik	346-6167	kmuzik@gmail.com
Ray Voeck	652-1026	
JEFF WEISS	639 0149	
~~DEREK~~ TSUNEHIRO	223-3141	
Helen Yahnke	822-3988	helenye@hawaii.rr.com

REHABILITATION/REPLACEMENT OF THE OPAEKAA, PUUOPAE, AND KAPAHI BRIDGES
ISLAND OF KAUAI, HAWAII
April 11, 2012 COMMUNITY MEETING
SIGN-IN SHEET

3:30 PM Mtg.

6:30 PM Mtg.

NAME	PHONE	EMAIL
Lou Nishida Jr.	822-5450	
Jack Baird	639-4118	JackABT@gmail.com
Tom & Elsie Kelly	821-0449	
Emory Griffin-Noyes	639-0264	
Gina Caliendo	823-9599	caliendo-hawaii@hawaii.rr.com
MICHAEL FERNANDES	822-3674	
Rayne Regush	651-1318	on File
STANFORD IWAMOTO	634-3523	Stanford.iwamoto@hawaiiantel.net
Kat Horew	645-1672	
Lauren Calhoun	646-248-8822	
BOB FARIAS	652 0628	FARIASR003@HAWAII.RR.COM
SHARRY GLASS	822-7351	
GAIL STEVENS	823-0101	
Andy Bushnell	822-1651	abushnel@hawaii.edu
Bill Chamberlain	651-5905	
Susan Chamberlain	" "	

REHABILITATION/REPLACEMENT OF THE OPAEKAA, PUUOPAE, AND KAPAHI BRIDGES
ISLAND OF KAUAI, HAWAII
April 11, 2012 COMMUNITY MEETING
SIGN-IN SHEET

NAME	PHONE	EMAIL
Kelly Rice Hudson	822 7812	
Gary Hudson		
PAT PHUNT	541-2305	
Nancy Budd	639.1386	
RHEA PALMA	822-0540	
Tommy Noyes	639-1018	thomasNoyes@hawaiiantel.net
Glenn Mueller	822 0998	glennruth2030@gmail.com
Lelon Nishek	639 9500	Lelon@KauaiMuseum.com
ALEX PASWAL	635-0958	

BERNARD P. CARVALHO, JR.
Mayor

NADINE K. NAKAMURA
Managing Director

COUNTY OF KAUA'I

DEPARTMENT OF PUBLIC WORKS

News Release

For Immediate Release: November 12, 2013

LARRY DILL, COUNTY ENGINEER
Tel (808) 241-4996
Fax (808) 241-6604

Last community meeting re. improvements to Eastside bridges set for Nov. 20

The Department of Public Works has scheduled the third and final community meeting regarding improvements to the Kapahi, Opaeka'a and Pu'uopae bridges.

The meeting will be held on Wednesday, Nov. 20, 5:30 p.m., at the Kapa'a Middle School cafeteria.

A presentation will be made on the proposed design for each of the respective bridges.

Attendees will also have the opportunity to provide input on the proposed designs and share concerns they may have regarding the bridges.

In the initial phase of the project, consultant KAI Hawai'i, Inc. completed preliminary studies on the project, including geotechnical studies and land surveying. The data collected along with community input from the first round of meetings were used as the basis for the proposed bridge designs.

Additionally, the project team notified and consulted with Native Hawaiian organizations and Native Hawaiian descendants that may have ancestral lineal or cultural ties to, cultural knowledge or concerns for, or cultural religious attachment to the proposed project area pursuant to Section 106 of the National Historic Preservation Act.

If you need an American Sign Language interpreter, materials in an alternate format or other auxiliary aid support, please contact Mike Hunnemann at Kai Hawai'i, Inc. at 808-791-3980 or mike@kaihawaii.com at least seven days before the event.

For more information about the project, please contact Samy Venkatesan at 241-4885 or kvenkatesan@kauai.gov.

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OPAEKAA, KAPAHI, AND PUUOPAE BRIDGES
COMMUNITY MEETING
NOVEMBER 20, 2013
KAPAA MIDDLE SCHOOL
5:30 PM

SIGN-IN SHEET

	NAME	ADDRESS	EMAIL
1	Beverly Tsang	6369 E Olohena Rd Kapaa	BTWINGE@yahoo.com
	Ron Terry	10 Hina Hilo 96720	rterry@hawaii.rr.com
	Tonia Moy	1833 Kalakaua Ave., Hon 96815	tonia@funghawaii.com
	CHARLES JURY	3375 KOAPAKA ST, HONOLULU, HI 96819	clj@akinaka.com
	Mike Dega	1347 Kapiolani Blvd # 408 HNL HI	mike@scshawaii.com
	Jim Powell	" " " "	JPRT89@hawaiiantel.net
	Allan A. Smith	Lihue, Kauai	Ambg@hawaii.rr.com
2	Charles Milligan	6420 B Opaekaa Rd	Charles_a_milligan@yahoo.com
3	Peggy "	" "	Peggymilligan@juno.com
4	Karen Rupp	6420-A Opaekaa Rd	rupp-press@MSN.COM
5	Larry DM	Lihue Kauai	ldill@kauai.gov
6	Glenn Mueller	5920 Kuiui Pl Kapaa	glennwith2030@gmail.com
7	Mike Hunnemann	275 Kealakou St Honolulu	mike@kaihawaii.com
8	Lee Steinmetz	PO BOX 510231 Kealia 96751	lsteinmetz@kauai.gov
9	KEN TAYLOR		taylork021@hawaii.rr.com
10	Lynn Spegars	PO Box 1977 Kapaa	
11	Randy Blake	PO BOX 1089 Kapaa	rcblake@mac.com

	Name	Address	email
12	Darin Moriki	—	dmoriki@thegardenisland.com
13	Andy Bushnell	6510 Olohena Rd Kapaa	bushnell.andy@gmail.com
14	Stanford Iwamoto	5535 Kula Mai'u St.	Siwamoto@hawaiiantel.net
15	RISA Clemmons	6074 Lokomaikai pl. Kapaa	risArumpai@gmail.com
16	MARK MARKSLAGH	2400 Hoolaulea Dr	MMARKSLAGH@kauai.gov
17	Doug Haigh	6431 Kalama Rd Kapaa	dhaigh@kauai.gov
18	Kip Sharon Goodwin	6294 Q Olohena Rd. Kapaa	kgoodwin@hawaiiantel.net (Mike Degn has) (Tanya has too)
19	PAT GRIFFIN	Box 3213 Lihue	n/a
20	Lou Nishida	1070 Puuopae Rd Kapaa	
21	RAYNE REGUSH	5875 Waipouli Rd KAPAA	rayneregush@aol.com
22	Tommy Noyes	6524 Kalama Road, Kapaa	thomasnoyes@hawaiiantel.net
23	MARY MULHALL	1210 CROSSLEY, KAPAA	MMULHALL@HAWAII.RR.COM
24	SHARRY GLASS	6372 PUUOPAE, KAPAA	
25	Bob ABREW	6562 Kipapa Rd	
26	Nancy Judd	1337 Puuopae Rd Kapaa	njjudd@yahoo.com
27	Mollie & Henry Osborn	6482 Olohena Rd Kapaa	
28	Mary Depte	6335 Waipouli Rd unit B	
29	Lilan Nishida	3-550 Kaumualii Highway Lihue	Lilan@KauaiMuseum.com
30	Lou Nishida Jr.	1010 Puuopae Rd KAPAAHI 96746	
31			
32			
33			
34			

From: Glenn Mickens <glennruth2030@gmail.com>
Subject: **Kauai Bridges**
Date: November 19, 2013 6:23:57 PM HST
To: All Concerned Citizens

My primary concern in this one lane vs two lane bridge issue is keeping the welfare of the driving public paramount over any other reasons, specifically that of the Historical Commission.

I have made the case that there are at least 2 times more SERIOUS accidents on one lane bridges as there are on two lane bridges and I back this statement up with statistics from Alvin Takashita, Highway Division State Engineer, Glenn Okimoto, Director of Transportation and former Chief of Police CK Lum.

Let me read you a short quote from Mr Okimoto regarding the statistics given him from Alvin Takeshita: "This letter is to confirm that the accident data managed by the Department of Transportation is based on official State of Hawaii motor vehicle reports completed and approved by the Kauai Police Department."

Copies of Mr Takeshitas letter along with other supporting documentation have been given to Larry Dill, JoAnn Yukimura, and many other concerned parties.

There is no factual or legitimate reason for not keeping the safety of our drivers the number one priority when rebuilding our one lane bridges. Huge progress had been made in the field of medicine to extend and protect our lives and Doctors are not reverting back to arcane methods for "historical" reasons. Thus if facts show that we can save lives with newer, 2 lane bridges why go back to the more dangerous ones?

One lane bridges were built when there were fewer people on Kauai and fewer vehicles on the roads. But our highway engineers in their

wisdom now build our bridges two lane FOR SAFETY PURPOSES!!

This issue has been on going since 1996 and later 2002-03 and delaying building the newer bridges, as Mayor Baptist wanted to do, has cost the tax payers millions of dollars with nothing positive to show for the waste.

How can anyone using common sense with indisputable facts deny that safety over any other factor is a no brainer as Mike Marshall once said at a meeting?

AKINAKA & ASSOCIATES, LTD.
3375 Koapaka Street, Suite B-206
Honolulu, Hawaii 96819-1947
Phone: (808)836-1900 Fax No: (808)836-8852

MEETING NOTES

A&A JOB NO.: KAI10-03, KAI10-04 & KAI11-02

PROJECT: Rehabilitation/Replacement of the Opaekaa, Puuopae and Kapahi Bridges

DATE/TIME: November 20, 2013 – 5:30 pm

LOCATION: Kapaa Middle School Cafeteria

SUBJECT: Community Meeting #3

REFERENCES: Glenn Mickens Testimonial

DISCUSSION ITEMS:

1. Project Team Presentation
   - A. 5:35pm – Allan Smith
     - i. Called meeting to order
     - ii. Introduction of project and describe the meeting agenda
     - iii. Project background
       - a. Previous meetings
       - b. Project team to present findings
   - B. 5:36pm – Tonia Moy
     - i. Overview of Federal Process
       - a. Section 106 process
     - ii. Recapped community input from previous meetings
     - iii. Informed community that current meeting is intended to complete Section 106 process
     - iv. Presented findings of Traffic Study
       - a. Existing 1-lane bridges provide a service level of "A"
       - b. 1-lane bridge will still provide service level "A" based on projected developments
   - C. 5:42pm – Mike Hunnemann
     - i. Presented Opaekaa findings
       - a. Provided description
       - b. Presented 1-lane bridge design
       - c. Presented Area of Potential Effect (APE) & staging areas
       - d. Section 106 determination
         - (1) Anticipating a determination of "No Adverse Effect" with conditions.
         - (2) Presented conditions to obtain determination.
       - e. Opaekaa Q&A (see comments section below)
   - D. 6:03pm – Mike Hunnemann
     - i. Presented Puuopae findings
       - a. Presented 1-lane bridge design

b. Presented Area of Potential Effect (APE) & staging areas
c. Section 106 determination
(1) Anticipating a determination of "No Adverse Effect" with conditions.
(2) Presented conditions to obtain determination.
d. Puuopae Q&A (see comments section below)

E. 6:13pm – Mike Hunnemann
i. Presented Kapahi findings
a. Presented 1-lane bridge design
b. Presented Area of Potential Effect (APE) & staging areas
c. Section 106 determination
(1) Anticipating a determination of "No Adverse Effect" with conditions.
(2) Presented conditions to obtain determination.
d. Kapahi Q&A (see comments section below)
ii. Presented anticipated design and construction schedules

F. 6:23pm – General Question & Answer Session (see comments section below)

G. 6:54pm – End of Meeting

2. Questions from Community
(NOTE: "C" will indicate "Community Member" and "P" Project Team

A. C – Stated that the change in structural system from steel to concrete could be a significant effect on the bridge.
i. P – Acknowledged, then stated that project team has already met with the SHPD and KHPRC and HHF and they indicated that they would concur with the "no adverse effect with conditions" determination.
ii. C – Asked if FHWA had submitted an official letter requesting determination.
iii. P – No, will be submitted after community meetings complete.
iv. C – Stated that Opaekaa Bridge has an interesting history and whether a plaque describing the bridge's history could be placed at the bridge to mitigate the negative effect.
v. P – Acknowledged request.

B. C – Asked about the thought process on the placement of the "bike sharrows" on the bridges.
i. P – Placement of sharrows not finalized. Intended to alert drivers that bicyclists may also use the bridge.
ii. C – Questioned the use of two sharrows showing travel in opposing directions. Believes it indicates two way traffic on a 1-lane bridge and believes it is confusing. Suggested placing sharrow along centerline of bridge.
iii. P – Acknowledged concern and will take into consideration during the design process.
iv. C – Questioned use of sharrow because it indicates that drivers must share the road with bicyclist and the bridge is not wide enough for a vehicle and bicyclist side-by-side.
v. P – Stated that they believe the use of sharrow indicates that the bicyclist has the right to use the entire lane. Will verify during design process.
vi. C – Asked if there will be signs indicating bike use.
vii. P – Yes, signs can be installed to alert drivers.
viii. C – Reiterated other members comment on placing the sharrow on the centerline

C. C – Will there be signs indicated a 1-lane bridge.
i. P – Yes.

D. C – Mentioned that at a previous meeting a vote was taken and a 2-lane bridge won the vote.

i. P – The vote was not to decide the design
ii. C – Expressed disapproval

E. C - Why is Puuopae steel but Opaekaa concrete?
i. P – Puuopae is shorter so a steel design could be used to better match the existing look.
ii. C – Was the decision to use steel based on the historical aspects even though there are maintenance issues?
iii. P – Yes, steel was used based on the historic characteristics and design considerations.

F. C – Will intersection of Puuopae and Kipapa Rd's grade be fixed? There is an elevation change of 3 to 5-ft that makes it hard to see cars.
i. P – Acknowledged and will verify sight lines and distances during design.

G. C – What is approximate timeline for construction?
i. P – 12-18 months

H. C – Puuopae staging area on state lands that are lower than road with drainage problems, will the grade be fixed
i. P – Staging areas will be on road surface and not on the land in question.
ii. C - Acknowledged

I. C – Are the side railings of Kapahi made of wood?
i. P – No, galvanized steel painted white.

J. C – How often has Kapahi Bridge been washed out?
i. P – As recently as last year the railings were washed out.
ii. C - The wood railings are easily replaced when washed out, how quickly could the steel railings be replaced.
iii. P – Railings will be designed to withstand flood forces, so they will not need be replaced.

K. C – What is the cost of the bridge?
i. P – 1.5 to 2.0 Million Dollars

L. C – Testimony by Glenn Mickens (see attached written testimony)

M. C – If bidding is in FY15, does that mean construction starts same year?
i. P – To date, Kapahi has funding for construction and other two do not. If bid in FY15, Kapahi construction should also begin that year.

N. C – Responded to statement read by Glenn Mickens and stated that most of the community wanted a 1-lane bridge and referred to meetings from 2003. Also stated that the first community meeting, where most of the community wanted a two-lane bridge, had about 11 attendees and was held in the homesteads and she was not aware that the meeting was taking place.

O. Larry Dill – Concurred that most of the community at homestead meeting wanted a 2-lane bridge and in other meetings most wanted 1-lane. Larry also reiterated the federal requirements and process required to obtain federal funding and reiterated traffic study that concluded the 1-lane bridge provides an adequate level of service. He also talked about Consultants being mandated to put in safety features and that the historic review process is required by law.

P. C – Began with disclaimer explain that he works for Public Works but also lives in Kapahi. Talked about Counties plans for "Complete Streets" and that the County is looking at all the island roads and sharing them among bikes and vehicles. Stated he used to be in the 2-lane camp and gave a personal story about his family and emotional connection with 1-lane bridges. Stated that structural solutions look appropriate and asked if a wood-like material could be used on Kapahi so the wood planks would not need to be replaced as they wear.

Q. C – Asked when the draft EA would be published.
i. P – Kapahi anticipated for Feb. 2014 and noted that would be a State EA, not Federal.
ii. C - Asked about CAT-EX

iii. P - Federal representatives not in attendance, so Project Team not sure.

R. C - Asked if traffic calming measures leading the bridges have been looked at. State that cars travel at high speeds leading to bridges.
   i. P – Additional measures can be explored and discussed with the County.

S. C – How wide is Puuopae?
   i. P – 12'-6"
   ii. C – Same as now? Should make it a little wider. Can emergency vehicles fit?
   iii. P – Emergency vehicles can fit.

T. C – Surprised Section 106 prevails over community and that safety is not being addressed. Why not make wider for people? Asked is elevation change between bridge and Kipapa Road will be addressed? If it remains 1-lane, fixing the elevation change will make it safer.
   i. C – Stated that road on Kipapa side has a steep drop-off and guardrails should be installed. State the County is wasting money and should spend money more wisely.

U. C – Pleased that the Section 106 process resulted in what community wanted and overwhelming amount wanted 1-lane bridge. Also stated that Kipapa Rd elevation should be addressed.

V. C – State that 1-lane bridges are safe, drivers are not. In future cars will protect us from ourselves and history should be preserved.

W. C – Will powerpoint be online?
   i. P – Yes
   ii. C – County website
   iii. P – Yes

X. C – Drainage a flood problems at Puuopae should be addressed.

Y. C – Gave story about history of bridge and expressed appreciation for making the bridge safe for emergency vehicles and asked to recognize County for hard work.

Z. C – School bus parking should be looked at for bus stop at Puuopae.
   i. P – Can look at and discuss with County

AA. C – Consultant should consider how children will cross Puuopae during construction because parents drop their kids off at the bridge.

3. 6:54 pm - End of Meeting.

PUUOPAE BRIDGE REPLACEMENT ENVIRONMENTAL ASSESSMENT

TMK ($4^{th.}$): Plat 4-4-02
Kawaihau District, County of Kaua‘i, State of Hawai‘i

Submitted Pursuant to Chapter 343, Hawai‘i Revised Statutes (HRS)
County of Kaua‘i, Department of Public Works

APPENDIX 2
Archaeological Inventory Survey and Section 106 Correspondence

Contents

*Note: Material duplicates certain material from Appendix 1b

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U.S. Department of Transportation
Federal Highway Administration

Hawaii Federal-Aid Division

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

January 15, 2014

In Reply Refer To:
HDA-HI

Mr. William J. Aila, Jr.
Chairperson and State Historic Preservation Officer
State of Hawaii Department of Land and Natural Resources
601 Kamokila Boulevard, Suite 555
Kapolei, HI 96707

Subject: National Historic Preservation Act Section 106 Consultation
Puuopae Bridge Rehabilitation
District of Kawaihau, Island of Kauai, Ahupuaa of South Olohena
Federal-aid Project No. STP-0700(59)
Tax Map Key: (4) 4-4-002

Dear Mr. Aila:

In accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (2006), the Federal Highway Administration (FHWA) requests the State Historic Preservation Officer's concurrence on the effect determination for the proposed improvements. The FHWA is rendering a no adverse effect determination for the subject project.

The FHWA intends to provide funds for the proposed improvements. Therefore, the FHWA has required the State of Hawaii Department of Transportation (HDOT) and County of Kauai to comply with the National Environmental Policy Act, NHPA, and other federal requirements. The FHWA has authorized the HDOT and the County of Kauai to act on behalf of the FHWA regarding the NHPA Section 106 notification and consultation.

Overview of the Undertaking

1. Area of Potential Effects (APE): The APE aerial photograph (see enclosed) shows that this bridge is visible to the general public from the nearby roads and the stream. Therefore the APE includes the area around the bridge and the paved area in County of Kauai right of way. Staging areas are included in the APE. Should the staging area change due to conditions during construction, all interested parties will be notified and given the opportunity to comment. Acreage of APE: 1.1 acres.

2. Description of undertaking and nature of federal involvement: The proposed project will be a bridge rehabilitation project and will be partially funded through the FHWA. Enclosed are the conceptual drawings for the repair project. The following are highlights of this project.
    a. Retain and re-install existing historic end posts behind new guardrail. Repair and coating to follow Preservation Briefs and the Secretary of Interior Standards.
    b. Replacement in-kind of girders, however, will have a wing wall to hide the extra length of girder from exterior view.
    c. Additional girders may be needed, but will be hidden from view.
    d. New deck with embedded transverse concrete beams will use rebars instead of I-beams to resemble the existing deck, but utilizing current technology.
    e. New abutments to be located behind existing abutments and will carry new deck loads.
    f. New deck system strong enough to carry any emergency vehicle of current size/weight.
    g. New crash tested steel railings to resemble the steel or wood railings on the Puuopae Bridge when it was placed on the register will replace the existing W-beams.

3. Steps taken to identify historic properties: The bridge is listed on the Hawaii and National Registers of Historic Places. An Archaeological Inventory Survey (AIS) was also completed to identify any archaeological resources.

4. Photographs of existing conditions: Please see enclosed photos.

Consultation Overview

The County of Kauai consulted with the Department of Land and Natural Resources (DLNR) State Historic Preservation Division (SHPD), Kauai Historic Preservation Review Commission (KHPRC), Historic Hawaii Foundation (HHF), and the surrounding communities through various meetings. Enclosed are minutes from the various meetings to include the following:

- Two community meetings with representatives from the HHF, KHPRC and SHPD attending one or both;
- Two KHPRC presentations; and,
- Two meetings (one via telcon) with representatives from the SHPD, KHPRC, County of Kauai, HHF and the consultants present.

Section 106 consultation letters, dated between December 12, 2011 and January 18, 2012, were sent to the following organizations and individuals:

- Pat Griffin, historian;
- Andy Bushnell, historian;
- Ron Terry of Geometrician, LLC;
- Tonia Moy, Fung Associates, Inc.;
- Allan Smith, community member;
- Kiersten Faulkner, Executive Director of the HHF;

- Jan Tennbrugnengate, reporter;
- Cheryl Lovell-Obatake, community member and previous Kauai/Niihau Island Burial Council Member;
- Spencer Leineweber, of The Heritage Center;
- Clyde Namuo, Director of the Office of Hawaiian Affairs (OHA);
- Dr. Abba G. Lichtenstein, Advisory Board member of the Historic Bridge Foundation;
- Ms. Rayne Regush, Kapaa Community Neighborhood Board;
- Mr. Richard Pezzulo, Chief Operating Officer of the Office of Hawaiian Affairs, and
- Mr. Erik Burton, Operations Director at the Ethnobotany Research and Applications Journal.

In an electronic transmittal (to Cathleen Dagher dated November 7, 2011) Pat Griffin stated that "[b]oth Puuopae and Opaekaa are on the National Register of Historic Places....." and that "...Cultural Surveys did an assessment for Puuopae –some time before 2004..." Ms. Griffin also stated that "...[t]hese bridges, along with the one-lane bridge on Kalama Road (local folks here know it as Yasutake's Bridge--as with Opaekaa, it has parts from the old Wailua River Bridge...[and] are part of a network of passages that tell a strong story about the history of homesteading on Kauai in the early territorial period." Ms. Griffin also recommended Dr. Abba G. Lichtenstein, who submitted plans for the bridges to the Kauai County Department of Public Works during the proposal period around 1993, Andy Bushnell, and Kiersten Faulkner as individuals knowledgeable about the area.

Andrew Bushnell responded via e-mail (dated November 23, 2011) and stated

> "The person who you really need to speak with is Pat Griffin.... Several years ago she did considerable research on both the Puuopae and Opaekaa bridges... At the time that the issue of the bridges came up several years ago, I approached several of the old-timers about the bridge. The only one who had anything to share with me was Sam Hepa Sr. who has since died. He recalled walking from Olohena Road along Puuopae Road on his way to Olohena School. He said that every once in a while he would cross the Puuopae Bridge by climbing the superstructure that used to be part of the bridge but has since been removed. He confirmed that the present bridge is the same bridge that was there in the 1930s when he was growing up."

Kiersten Faulkner, Executive Director of HHF, provided the following comments via e-mail (dated December 9, 2011):

> I assume that you have the National Register nomination forms for both Puuopae and Opaekaa bridges. These are the resource documents that describe the history and significance of the bridges themselves. They also include the research bibliography with additional source materials if you do original research. In addition, the County has drawings and plans related to the bridges. The Wailua Homesteads has a 100-year old history that you can research at the

> Kauai Historical Society. The Garden Island newspaper archives may also be helpful.

In a letter postmarked January 3, 2012, Ms. Dagher received a copy of letter from Barnes Riznik, previous Director Emeritus Grove Farm Museum and professional historian, to Larry Dill, Kauai County Engineer, previously of the Historic American Engineering Board, stating that he and Donald Jackson had physically examined and described Opaekaa Bridge in an historical context and published the results (Jackson and Riznik 1978). Mr. Riznik stated in his January 2012 letter that "... [f]or the first time, in 1978 the Opaekaa Bridge was recognized as historically significant in Hawaii; moreover, the bridge was identified nationally as the only British-made iron bridge in America." Mr. Riznik goes on to say that in the 1990s he "...participated in meetings of the County Public Works Department staff, and its engineering consultants from Honolulu and the Mainland, who considered the Opaekaa Bridge worthy of repair..." Mr. Riznik closed the letter stating that he "...can only hope that the present comprehensive review of the bridge will produce a preservation rehabilitation plan for stabilization --- and continued practical use --- of this surviving historical structure on Kauai."

Ron Terry recommended Allan Smith as an individual from the community knowledgeable about the project area (electronic transmittal from Mr. Terry to Cathleen Dagher dated November 23, 2011).

On February 8, 2011, Scientific Consultant Services (SCS) received an electronic transmittal (via e-mail) from Margery Freeman, a member of the community, stating that:

> The three bridges that are covered by this assessment are near my home on Kauai. There are a number of reasons these bridges should be kept as one lane bridges.
>
> 1) They are historic
> 2) The[y] (sic) slow down traffic
> 3) They are safer tha[n] (sic) having people rush around on wide streets. The studies of their accidents are misleading. Most of those problems happened a mile or two away from the bridge so are not relevant to the bridge.
> 4) There is very little traffic on any of them
> 5) They contribute to keeping our rural life style which is very important to us.
> 6) Especially the Opaekaa [B]ridge is attractive and interesting because of its look and its historic past.

On February 17, 2012, SCS received an electronic transmittal (via e-mail) from Larry LaSota, a member of the community who resides between the Opaekaa and Puuopae Bridges in Wailua Homesteads. Mr. LaSota expressed concerns similar to Ms. Freeman's in that the one-lane bridge systems should not be replaced as they help to slow down traffic. Mr. LaSota further stated that "... [t]hese bridges are perfect the way they are (one lane) and should be kept that way" as replacing the bridges will alter the character of the neighborhood.

On February 21, 2012, SCS received an electronic transmittal (via e-mail) from Rayne Regush, community member. Ms. Regush believes the Puuopae, Opaekaa, and Kapahi Bridges "....maintain the rural agricultural tradition of these communities; provide a touchstone contrasting territorial history and modern times; prompt us to embrace a slower pace of life; provide a rural/country feeling and charming experience; engender friendliness by yielding to oncoming traffic; serve as cultural landmarks of our rural communities; provide a source of community pride; and connect us to earlier times and offers opportunities for education..." Ms. Regush goes on to say that "... [t]he traditional activities that may be impacted are the same activities or intrinsic qualities that are identified in the HDOT's Scenic Byways Program.

- They have scenic qualities which provide a heightened experience. The landscape and bridge-scapes are striking and memorable.

- The natural qualities of the environment (the stream, fish, plants, and wildlife) remain relatively undisturbed by manmade interventions.

- They have historic qualities. The bridges are legacies of the past which are historically significant. The bridges instill an appreciation for the past. They reflect the territorial days of agricultural settlements in these communities and continue to exemplify the tradition of a rural lifestyle today.

- These century old bridges have archeological qualities. And, a strong likelihood of the streams used traditionally for bathing.

- Recreational qualities such as the passive enjoyment of the landscape. As a pedestrian there is the opportunity for nature-watching, quietude and contemplation. Driving on the bridge is a pleasurable recreational experience as well."

Ms. Regush suggested contacting Erik Burton as an individual knowledgeable about traditional lifeways and cultural practices conducted in the area of the three bridges. On February 28, 2012, SCS initiated consultation with Mr. Burton, via e-mail.

On March 3, 2012, SCS received an electronic transmittal (via e-mail) from Mr. Erik Burton, Operations Director at the Ethnobotany Research and Applications Journal, stating:

> As to the Puuopae and Opaekaa bridge areas, I have found no specific written accounts of that area, other than general reports of a lushly farmed upland. The alii did have several sacred bathing ponds, and there are a number of sacred sites (and some scary ones) in the Wailua area – many not with state site numbers. After the industrial agricultural period, much of the area was scraped clean. The gullies and river flatlands are mostly preserved.
>
> The agricultural complexes for Wailua Ahupuaa continue all the way to the base of Waialeale, where the village of Kauhau protects the lua trail up to the Alakai. Considering that Wailua was so developed, and looking at the lay of the land in these areas, my predictive model indicates that there were loi all along the

> Opaekaa Stream. With Wailua's peak population pushing all the way to the base of Waialeale, they surly (sic) cultivated these easy to access and irrigate, gently sloping uplands. We are only at about 370' elevation, so the growing climate here is good for many things.

In addition, on December 14, 15, and 18, 2011, Section 106 notice/advertisement have been included in The Honolulu Star-Advertiser and The Garden Island News; on January 18, 19, and 22, 2012, in The Garden Island News only, and in the December issue of the OHA newspaper, Ka Wai Ola regarding the undertaking. Native Hawaiian organizations and Native Hawaiian descendants with ancestral lineal or cultural ties to, cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area were requested to contact Cathy Dagher of SCS.

Meetings and communications included the following. For more detail, minutes are also enclosed.

- December 7 & 8, 2011: Two community meetings announced in The Garden Island News and flyers posted in the neighborhood. Attended by approximately 28 people at each meeting. Initial reactions by community were concerns that this project had started many years ago and has not been done yet. Safety for the community was of great concern and many expressed the desire for a wider, stronger bridge.

- March 1, 2012: Presentation to the KHPRC to show various design options for bridge. KHPRC preferred one lane bridges.

- April 11, 2012: Two meetings at Kapaa Middle School announced in the Garden Island News were conducted to provide more information to community and to get initial reactions to various design options. Emergency vehicle operators attended, as well as approximately 30 people including two representatives from the SHPD and one from the HHF. Greatest concern for emergency vehicle operators was safety and a bridge that can carry the emergency vehicle weight and size. Though some community members expressed safety concerns of a one-lane bridge and possible accidents, many community members expressed great concern to keep the rural character of the bridge.

- In early 2013 a traffic study was conducted and it was concluded that a one lane bridge is sufficient for any expected increases in population or development of the area.

- July 23, 2013: Combination telcon and meeting with representatives from the HHF, KHPRC, FHWA, Kauai County and HDOT. Design shown was a one lane bridge. Some details were discussed and altered per discussion. The SHPD requested more information.

- August 14, 2013: Telcon with above attendees to discuss effect determinations. Enclosed drawings reflect changes done to the design per the telcon. Minutes of this meeting are also enclosed. A no adverse effect with conditions was generally agreed upon and was further confirmed through email distribution of minutes.

- November 7, 2013: Presentation to the KHPRC was done to summarize the consultation efforts and to request a concurrence with above mentioned direction for a no adverse effect with conditions. KHPRC concurred.

- November 20, 2013: Public meeting at Kapaa Middle School announced in The Garden Island News was conducted to inform the community of the conceptual design chosen.

Historical, Cultural, and Archaeological Background

The place name Puuopae, literally translates to "shrimp hill", an implied stream-fed food resource upland from the coast (Pukui et al. 1974:204). Certainly, Kalama Stream contains water along its length garnered from the abundant rainfall of Mount Waialeale, "the wettest place on earth," with an average of 11,455 mm (451 in) of rain annually (Encarta Geography, online).

The current bridge location does not itself fall into any Land Commission Awards or land grants. However, there are adjacent lands which are demarcated as land grants and land court applications. A majority of these inland claims were associated with streams, where wetland taro was produced and house sites were scattered about the agricultural area.

Historical times for inland South Olohena are most marked by the creation of the Waipouli Homesteads, where Puuopae Bridge is now located. Background research of the area (Spencer Mason Architects 1989) shows 167 lots of Waipouli (called the Kapaa Homesteads 2nd Series) lands were sold by lottery to homesteaders on April 29, 1913. Two individuals, A. Ohai and M. Ferreira, were awarded the parcels on either side of the bridge. At that time, there was little access for the homesteaders to reach their property to build their houses or cultivate, only ox-carts could make the trip; there was also no water availability vis pipes and irrigation (Griffin 2005). In 1913, the Governor also sold water rights to the Makee Sugar Company, forcing the settlers to pay a monthly rate if they choose to use the water from any stream in the area (Griffin 2005). By 1918, the settlers had secured water rights by petitioning the territory board in Honolulu and by 1919, when the Wailua Homesteads opened; several roads were built in the area: Puupilo, Puuopae, and Kamalu (Griffin 2005).

Puuopae Bridge was constructed in 1915, two years after the homestead was opened. By 1917, ninety homesteaders were producing on the Olohena-Waipouli tract of 3,140 acres, and harvested some 31,500 tons of sugar cane worth $197,000 and some pine trees (Griffin 2005). The Makee Sugar Company grew both sugar cane and pineapple in the area, which the Makee train steaming through the homesteads to collect sugar cane from the homesteads and take it to the mill near Kealia.

In 1919, at the mouth of the Wailua River, a new bridge was constructed, the older bridge sections having been removed and "donated" for other small, local bridges in the area. Sections of the Opaekaa Bridge, and presumably parts of the Puuopae Bridge, contain parts of the original Wailua River Bridge. It was during this time period, c. 1920s, that much road building occurred in both the Waipouli and Wailua Homesteads, this including work on Puuopae Bridge (see below; Spencer Mason Architects 1989).

See enclosed AIS for more details.

Summary of Archaeological Sites within the APE

During the AIS of the APE, State Site 50-30-08-9397, Historic-Period Puuopae Bridge, was again re-located. State Site 50-30-08-9397 has been evaluated as significant under Criterion D, for information content, only. The AIS has been completed and no further archaeological work is recommended. The bridge was entered into the State Register of Historic Places in 2004 as Site 30 08 9397 and the National Register of Historic Places as Site 05000536 in 2005. The period of significance is designated as 1925-1949, 1900-1924 and it is listed as a transportation function (road-related). The area of significance attributed to the bridge includes transportation, social history, community planning and development, commerce, and exploration/settlement. The site was considered as significant per Federal standards under Criterion A, associated with events that have made a significant contribution to the broad patterns of history.

No additional significant archaeological sites/historic properties were identified within the project APE.

Effect Determination

Based on our analysis, site observations, and consultation with the SHPD, KHPRC, HHF and other interested parties and individuals, the FHWA has determined no adverse effect with the following conditions.

- The end-posts will be repaired only where necessary, cleaned and coated following Preservation Briefs and Secretary of Interior Standards. Determination will be made by consulting structural design engineer, historic architect, County of Kauai and SHPD representatives. Reflectors shall not be placed on the end-posts.

- Specs will include benchmark site visits by the above personnel to ensure proper follow through.

- Qualified personnel meeting the Secretary of Interiors Standards for historic architect will be included in the review process.

- Above qualified personnel will also be involved in the review of designated submittals by contractor such as shop drawings or request for substitutions, and at key milestones in the construction process.

- The SHPD will review at phases such as 65% design, 100% design and specifications to ensure the above design direction is followed.

Mitigation Policies

Mitigation measures during the construction of the proposed improvements have been and will continue to be implemented to avoid and minimize potential impacts to archaeological, cultural,

and historic resources. The following mitigation measures have been or will be implemented, at a minimum:

- If cultural materials are discovered during construction, all earth-moving activity within and around the immediate discovery area will be diverted until a qualified archaeologist can assess the nature and significance of the find.
- If human remains are discovered, Hawaii Administrative Rules Title 13. Subtitle 13, Chapter 300 states that further disturbances and activities shall cease in any area or nearby area suspected to overlie remains, and SHPD and Police Department will be contacted. The appropriate process would then proceed in conformance with Hawaii Administrative Rules §13-300 Subchapter 4 "Procedures for Property Treatment of Burial Sites and Human Skeletal Remains."

The County of Kauai will prevent the disturbance or taking of any historic property or resource to the extent possible by instituting these mitigation measures and enforcing their implementation by contractors.

If the SHPD objects to the no adverse effect determination with the above conditions for the Puuopae Bridge Rehabilitation, please inform us within 30 days of receipt of this letter. In the absence of a SHPD response by this date, the FHWA will assume the SHPD concurrence with this determination and will proceed with the undertaking.

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

Sincerely yours,

Meesa Otani

Meesa T. Otani
Environmental Engineer

Enclosures

cc: Christine Yamasaki (HDOT), Todd Nishioka (HDOT), Larry Dill (County of Kauai), Michael Gushard (SHPD), Michael Hunnemann (Kai Hawaii, Inc.), Pat Griffin (KHPRC), Kiersten Faulkner (HHF)

COUNTY OF KAUAI
PLANNING DEPARTMENT
4444 RICE STREET, SUITE A473
LIHUE, KAUAI, HAWAII 96766-1326

MEMORANDUM

DATE: November 25, 2013

TO: Michael Hunnemann, Kai Hawai'i Inc.
31 North Pauahi Street, Second Floor
Honolulu, Hawai'i 96817

FROM: Kauai Historic Preservation Review Commission

SUBJECT: Department of Public Works Requesting to present Conceptual Design Plans for Puuopae Stream Bridge, Federal Aid Project No. BR-0700(59)

This is to inform you that the Kauai Historic Preservation Review Commission (KHPRC) met on November 7, 2012 to review and discuss the conceptual design plans for the Rehabilitation/Repair of the Puuopae Stream Bridge as contained in your letter and attachments of September 18, 2013.

Based on the information presented at the meeting, the conceptual design plans were developed based upon previous comments from the KHPRC and comments from the community. In summary, the conceptual design plan on the Puuopae Stream Bridge inlcude retaining the one lane bridge design and retaining the existing 12'-5" width of the bridge, for safety purposes the design includes the use of sharrows along the bridge, installation of tubular steel railing similar to original railing used in the 1980s, A/C overlays at both ends of the bridge, reinstalling existing endpost, duplicate the size and spacing of the concrete beams, extending the length of the steel girders and installing end walls to hide the extended girders.

Following the presentation, the Consultant, in behalf of the Department of Public Works (DPW), requested "no adverse effect" from the KHPRC under the following conditions as represented:

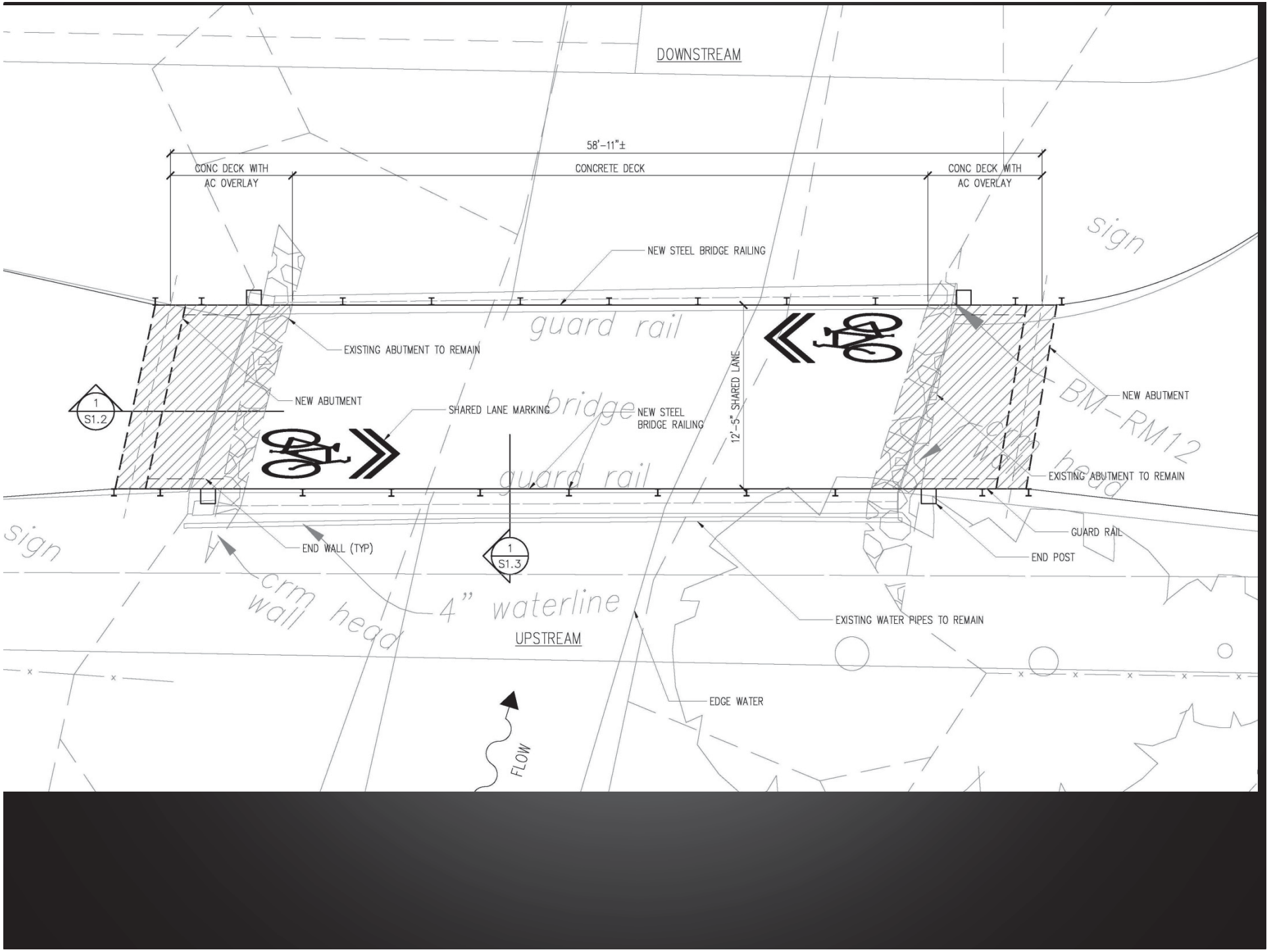
- Preserve the existing end posts
- Duplicate the existing floor beams
- Maintain existing width of the bridge

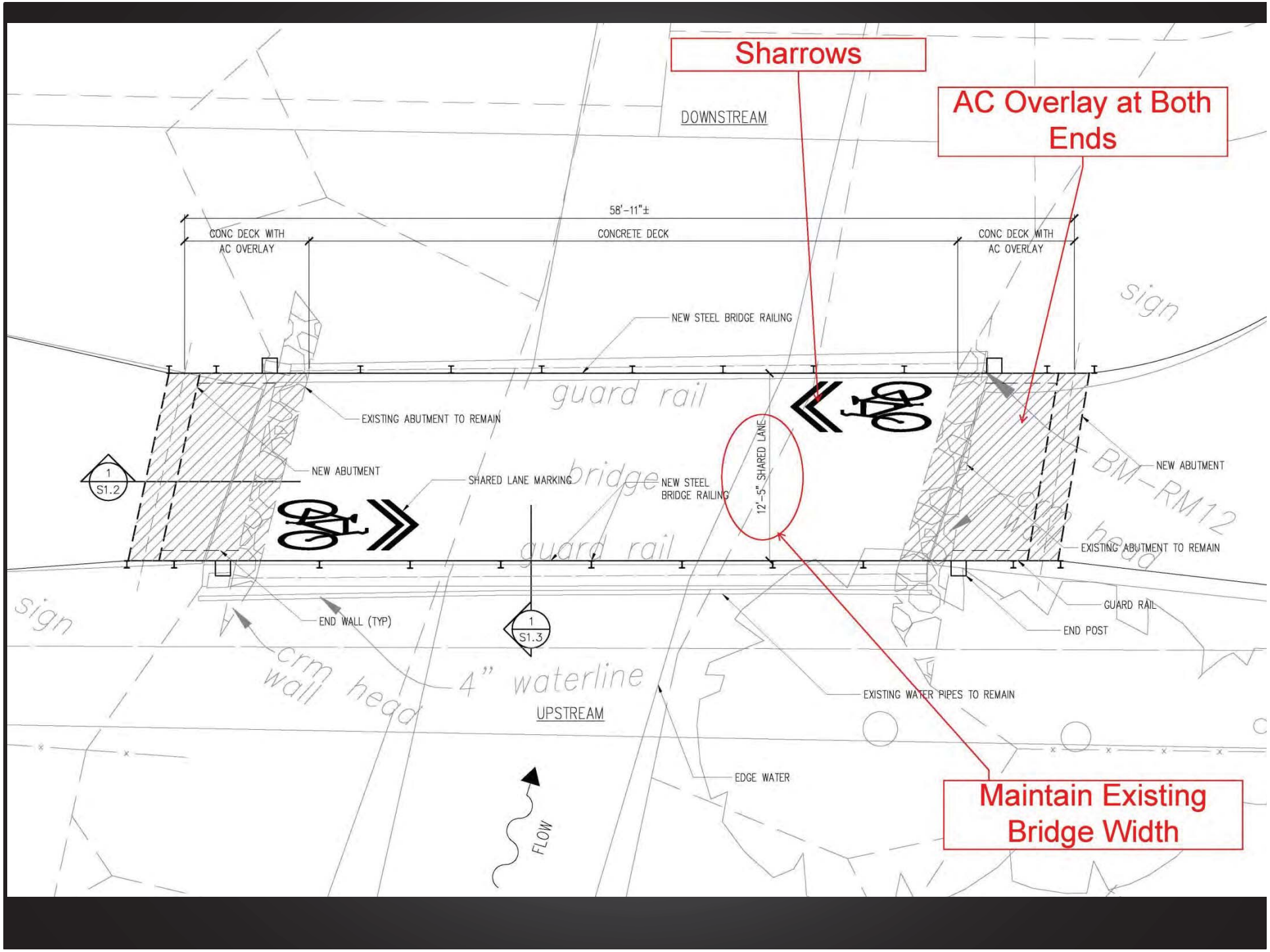
Based on the information and testimony presented, the KHPRC voted to accept the "no adverse effect" of the proposed plans for the Puuopae Stream Bridge.

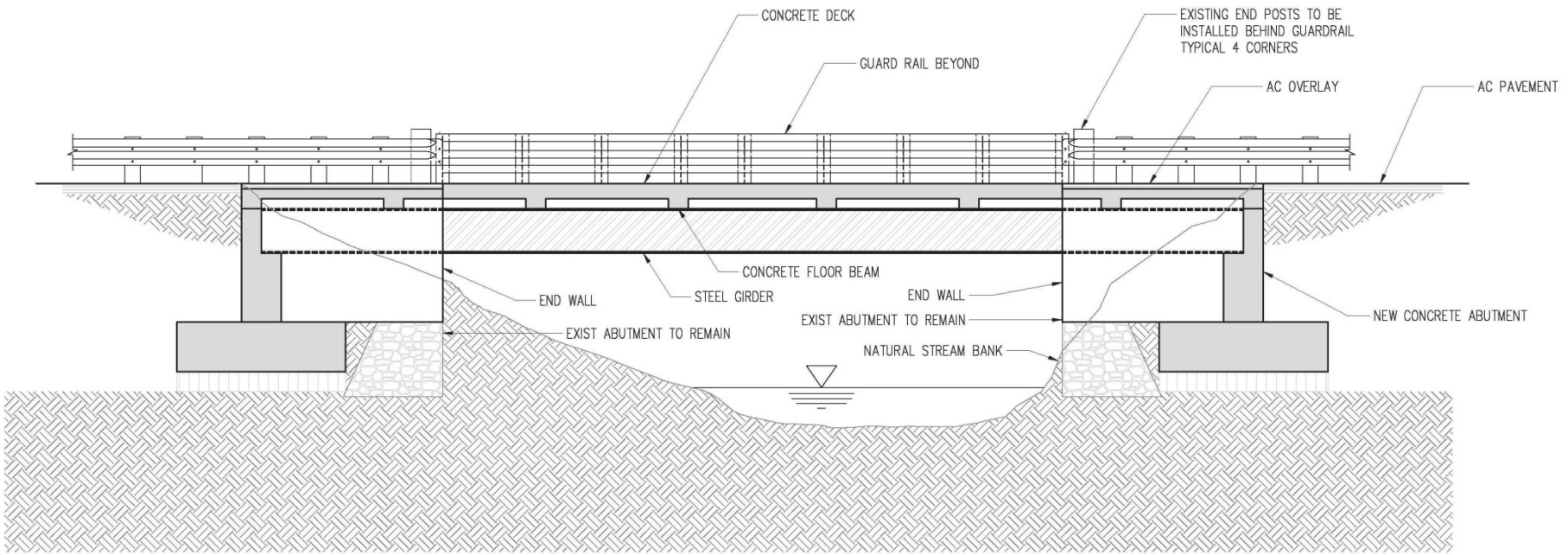
Please feel free to contact us if you have any questions regarding this matter.

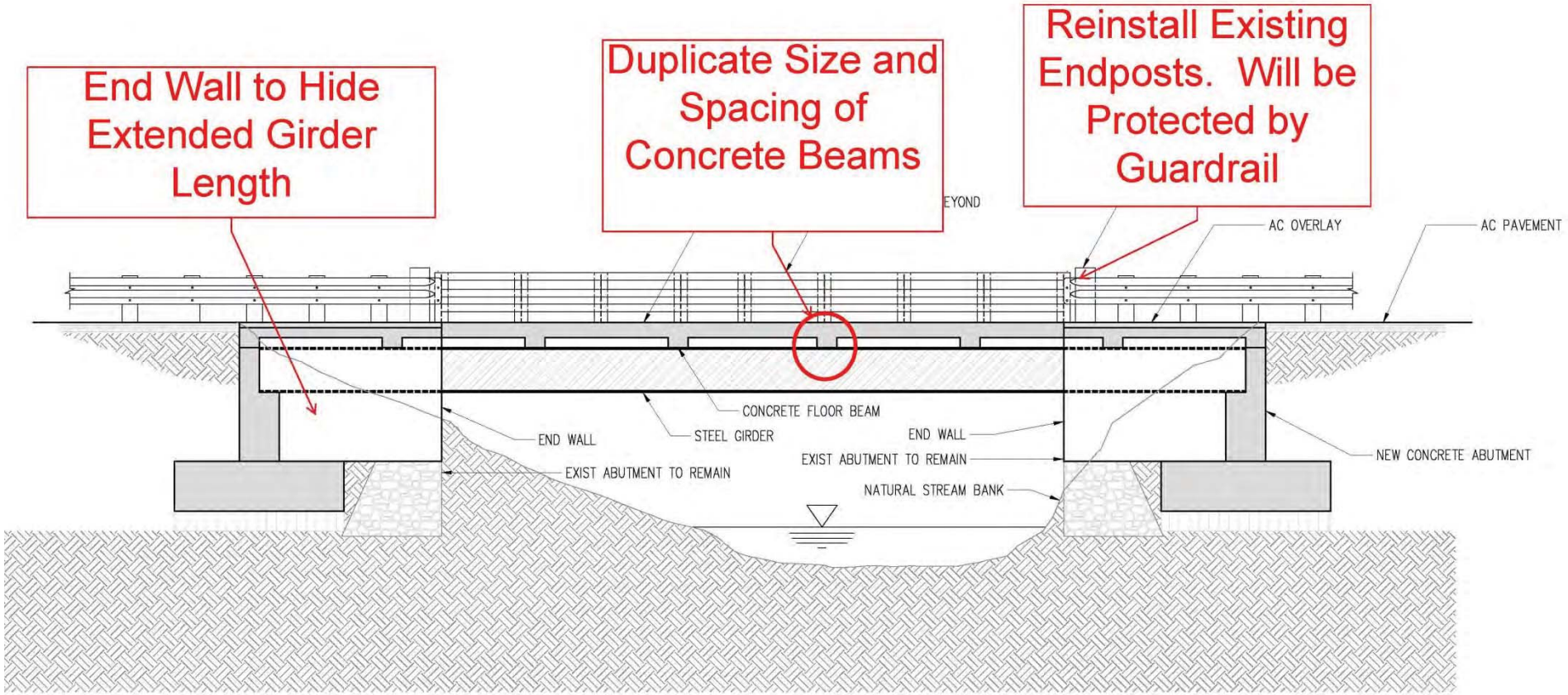
Mahalo.

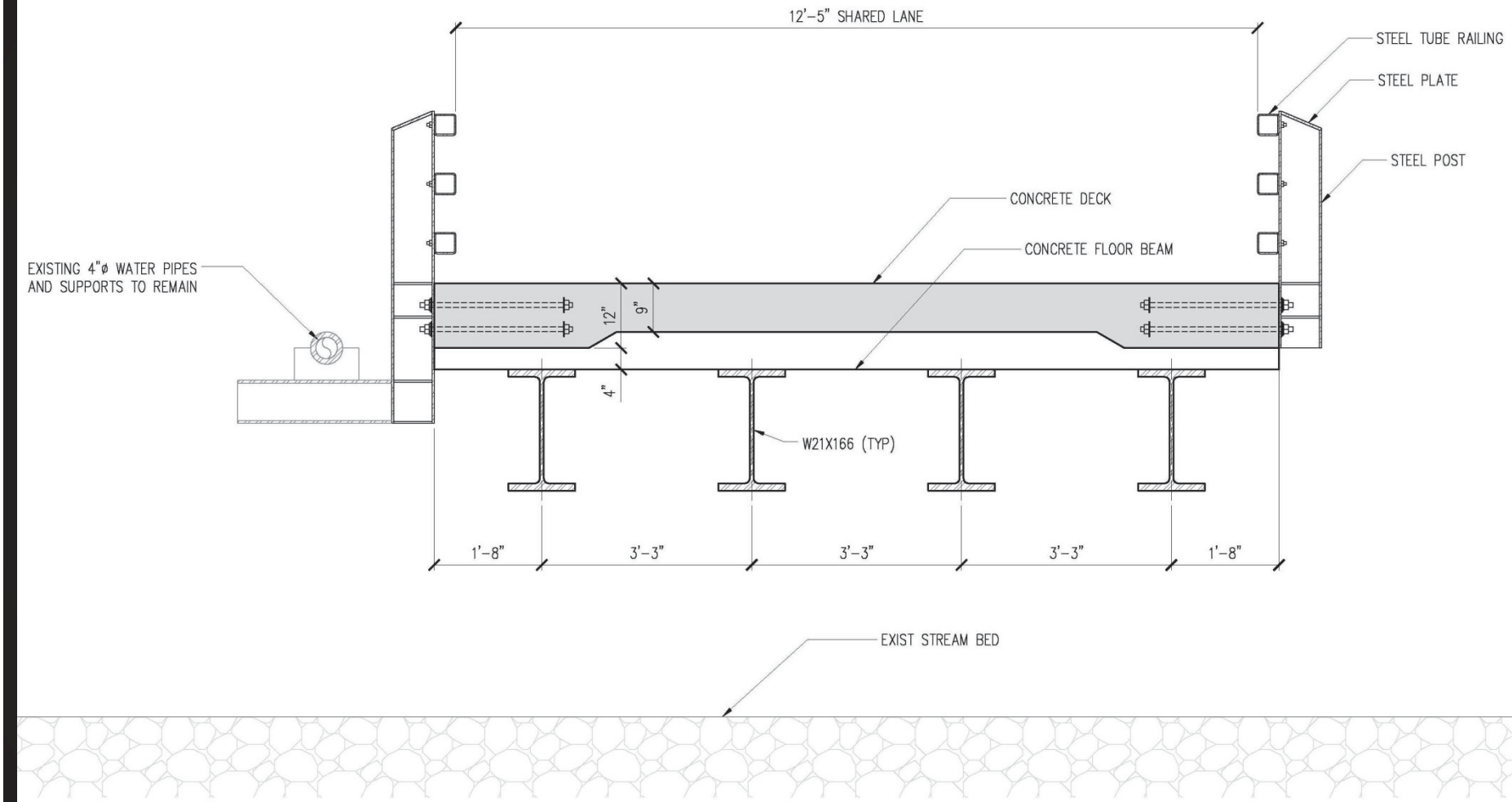
cc: State Historic Preservation Division
Department of Public Works

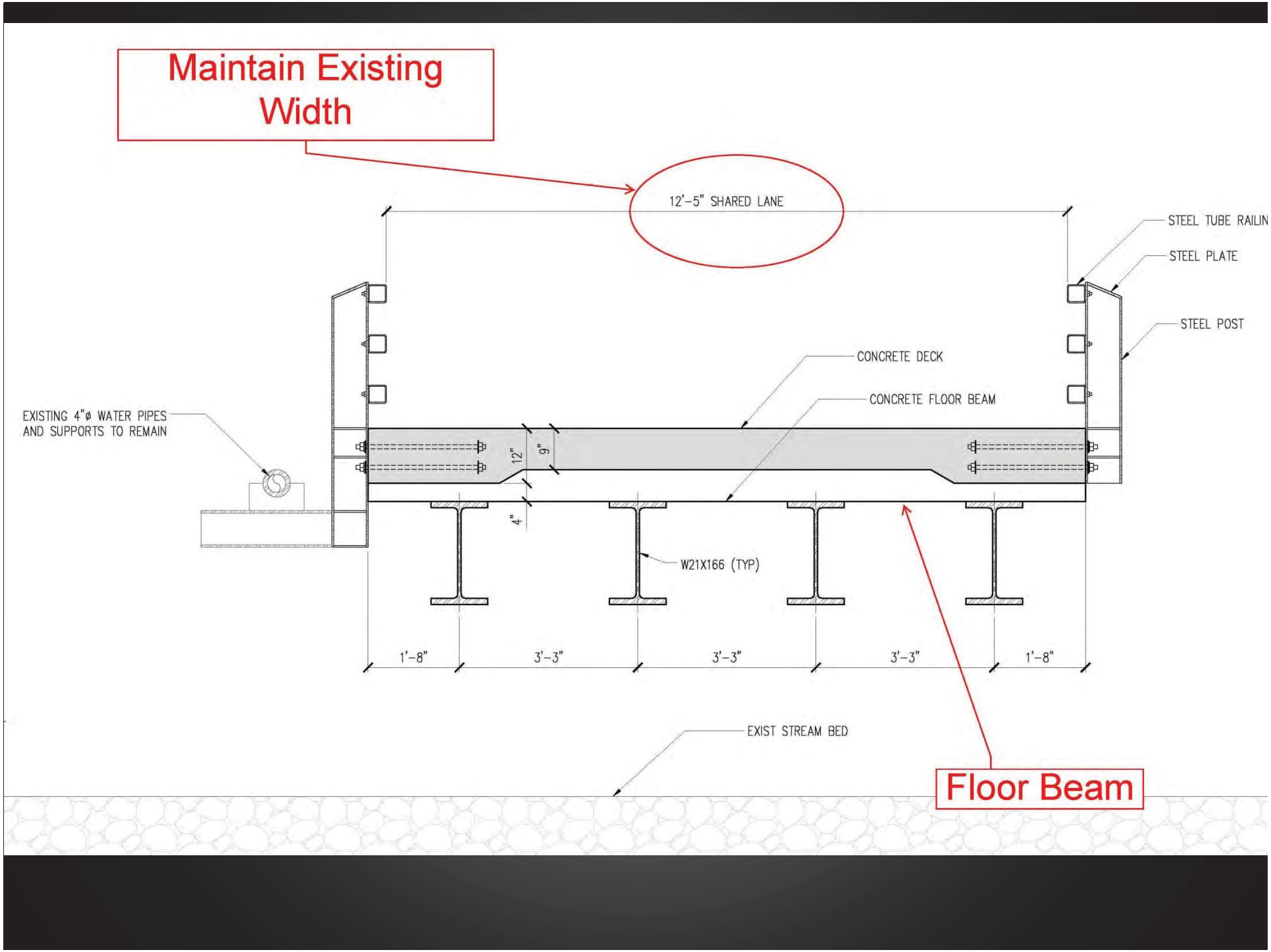

DOWNSTREAM
58'-11"±
CONC DECK WITH AC OVERLAY
CONCRETE DECK
CONC DECK WITH AC OVERLAY
NEW STEEL BRIDGE RAILING
EXISTING ABUTMENT TO REMAIN
NEW ABUTMENT
1 S1.2
SHARED LANE MARKING
NEW STEEL BRIDGE RAILING
12'-5" SHARED LANE
NEW ABUTMENT
EXISTING ABUTMENT TO REMAIN
END WALL (TYP)
1 S1.3
GUARD RAIL
END POST
4" waterline
EXISTING WATER PIPES TO REMAIN
UPSTREAM
EDGE WATER
FLOW
guard rail
bridge
guard rail
sign
crm wall head
BM-RM12
sign

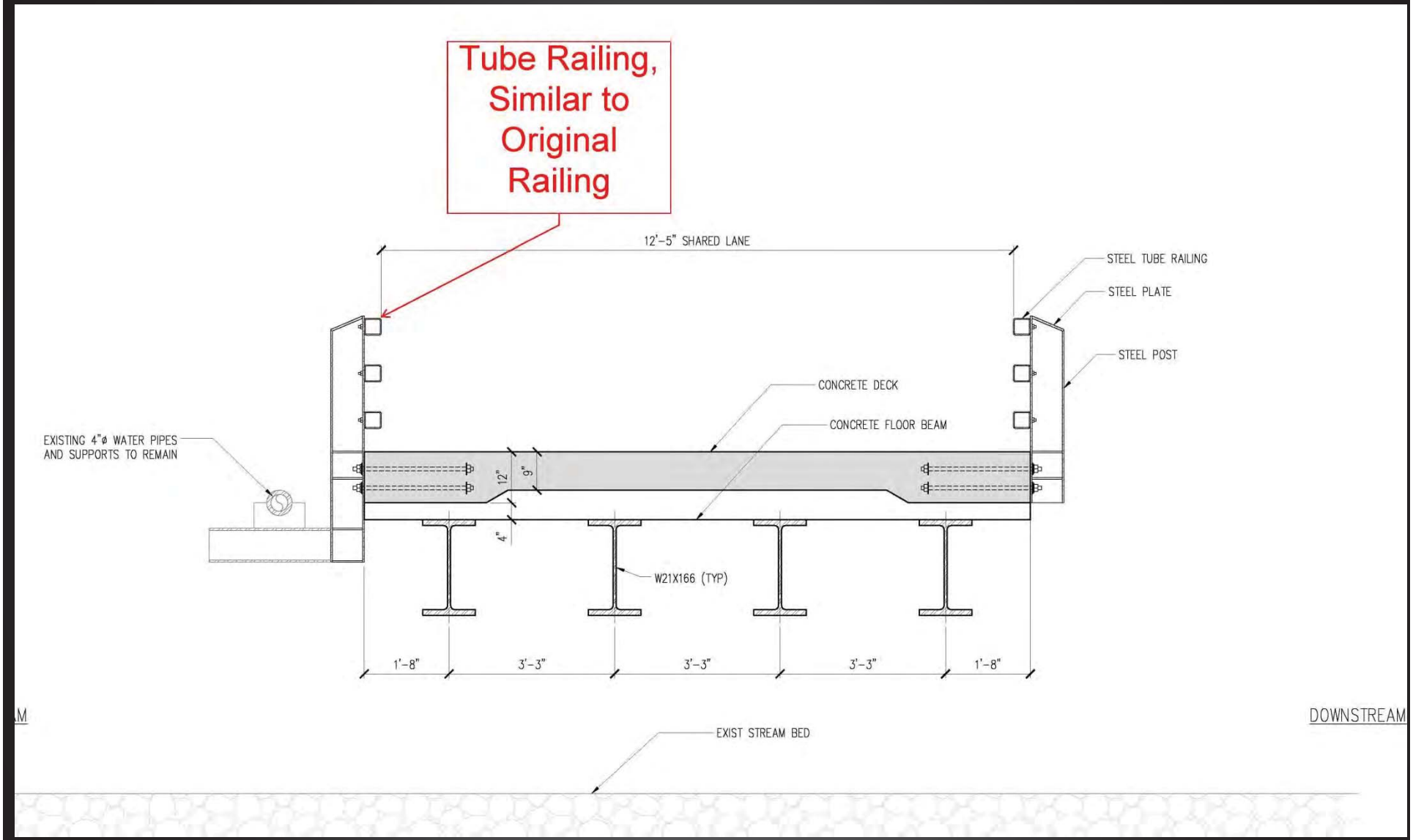

Sharrows
AC Overlay at Both Ends
DOWNSTREAM
58'-11"±
CONC DECK WITH AC OVERLAY
CONCRETE DECK
CONC DECK WITH AC OVERLAY
NEW STEEL BRIDGE RAILING
EXISTING ABUTMENT TO REMAIN
NEW ABUTMENT
SHARED LANE MARKING
NEW STEEL BRIDGE RAILING
12'-5" SHARED LANE
NEW ABUTMENT
EXISTING ABUTMENT TO REMAIN
GUARD RAIL
END POST
END WALL (TYP)
4" waterline
UPSTREAM
EXISTING WATER PIPES TO REMAIN
EDGE WATER
FLOW
Maintain Existing Bridge Width
guard rail
bridge
guard rail
sign
sign
BM-RM12
crm wall head
crm wall head
1 S1.2
1 S1.3


CONCRETE DECK
GUARD RAIL BEYOND
EXISTING END POSTS TO BE INSTALLED BEHIND GUARDRAIL TYPICAL 4 CORNERS
AC OVERLAY
AC PAVEMENT
CONCRETE FLOOR BEAM
STEEL GIRDER
END WALL
EXIST ABUTMENT TO REMAIN
END WALL
EXIST ABUTMENT TO REMAIN
NATURAL STREAM BANK
NEW CONCRETE ABUTMENT

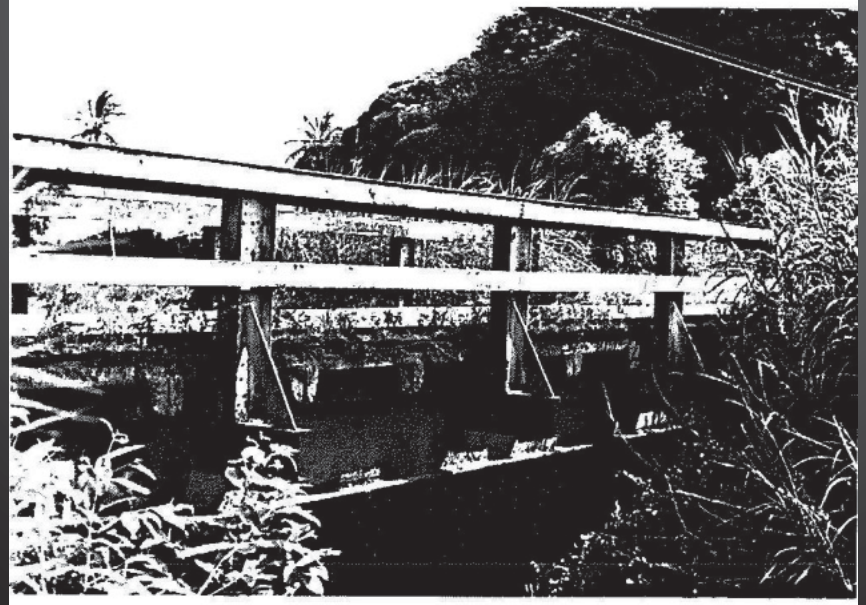

End Wall to Hide Extended Girder Length
Duplicate Size and Spacing of Concrete Beams
Reinstall Existing Endposts. Will be Protected by Guardrail
EYOND
AC OVERLAY
AC PAVEMENT
CONCRETE FLOOR BEAM
STEEL GIRDER
END WALL
EXIST ABUTMENT TO REMAIN
END WALL
EXIST ABUTMENT TO REMAIN
NATURAL STREAM BANK
NEW CONCRETE ABUTMENT


12'-5" SHARED LANE
STEEL TUBE RAILING
STEEL PLATE
STEEL POST
CONCRETE DECK
CONCRETE FLOOR BEAM
EXISTING 4"ø WATER PIPES
AND SUPPORTS TO REMAIN
12"
9"
4"
W21X166 (TYP)
1'-8"
3'-3"
3'-3"
3'-3"
1'-8"
EXIST STREAM BED


Maintain Existing Width
12'-5" SHARED LANE
STEEL TUBE RAILIN
STEEL PLATE
STEEL POST
CONCRETE DECK
CONCRETE FLOOR BEAM
EXISTING 4"ø WATER PIPES AND SUPPORTS TO REMAIN
12"
9"
4"
W21X166 (TYP)
1'-8"
3'-3"
3'-3"
3'-3"
1'-8"
EXIST STREAM BED
Floor Beam


Tube Railing, Similar to Original Railing
12'-5" SHARED LANE
STEEL TUBE RAILING
STEEL PLATE
STEEL POST
CONCRETE DECK
CONCRETE FLOOR BEAM
EXISTING 4"ø WATER PIPES AND SUPPORTS TO REMAIN
12"
9"
4"
W21X166 (TYP)
1'-8"
3'-3"
3'-3"
3'-3"
1'-8"
DOWNSTREAM
EXIST STREAM BED

APPROACH



SIDE ELEVATION

Puuopae Bridge

Metal bridge railing added later

Section Loss in Flange

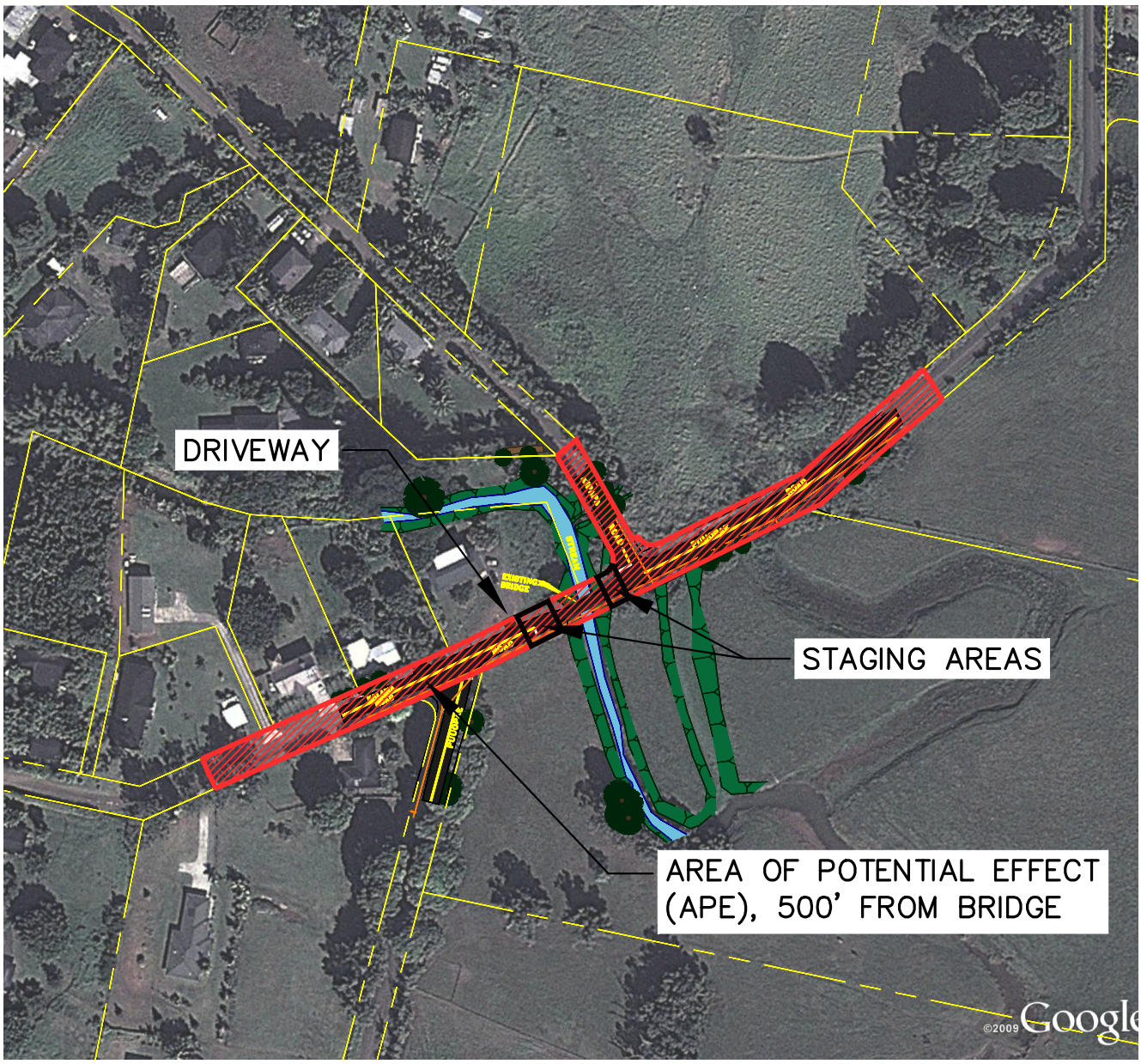
Corrosion at Bearing (Top)

Corrosion at Bearing (Bottom)

Heavy Corrosion

View of Underside of Deck

Settlement of Abutment Causing Deck Slab to be Unsupported



LEGEND

AREA OF POTENTIAL EFFECT (APE), 500' FROM BRIDGE

200' 0 200' 400'

SCALE: 1" = 200'

CREATED: 9/18/2013 CREATED BY: REVISED: SOURCES:	**PUUOPAE STREAM BRIDGE** **AREA OF POTENTIAL EFFECT** SCALE: 1" = 200'			**EXHIBIT** **1**

MEETING MINUTES

By: Tonia Moy
July 24, 2013

Project: Section 106/Chapter 6E consultation for three County of Kauai bridges
Kapahi Bridge
Puuopae Bridge
Opaekaa Bridge

Meeting Date: July 23, 2013

Time: 10:30 am

Location: HDOT conference rooms, Kapolei, Kauai and Honolulu

Attendees: Angie Westfall and Michael Gushard (SHPD); Kiersten Faulkner and Tanya Gumpac-McGuire (HHF); Pat Griffin (KHPRC); Meesa Otani (FHWA); Lee Steinmetz, Wallace Kudo (Kauai County); Tonia Moy (FAI); Ray McCormick and Kuppusamy Venkatesan remained for the first half of the meeting

---

The following items were discussed and confirmed at the meeting. Comments and corrections to this report should be addressed to the report preparer within 3 days from the date of the report or these minutes will be recorded.

Latest drawings of the above three bridges were shared with the meeting attendees (see attached drawings). Attached drawings are updated and clarified with dimensions per request at meeting.

Overall

- Preservation partners believe that designs have come a long way
- The look of the historic resource is more critical than the actual material, i.e. if steel can better resemble wood railings, then will use steel
- SHPD would like more information on each bridge as need to transition from Ross Stephenson

Opaekaa Bridge

Proposed bridge design

- Existing width will be kept
- Existing abutments will be kept
- Existing bridge length will be visually kept
- New abutments outside the existing will be added
- New concrete deck will be supported by new abutments
- Existing sides (visible truss portion) of the bridge will be cleaned and fixed

- Crash tested railings will be added

Comments
- SHPD would like to see elevation drawing from the river side (not only cross section) to determine if crash tested railings have an adverse visual impact. Include the following dimensions
    - Height of existing truss
    - Height of new approach guard rails
    - Height of new guard rails
- Agreed that rather than have the crash tested railings appear integral to the trusses, should have railings be as non-obtrusive as possible. Square tubing preferable to round tubing.
- Some conditions to include in the documents:
    - Ensure cleaning and repair work to original trusses follow the Secretary of Interior Standards and NPS technical briefs
    - Recommend hiring a specialist in steel conservation/preservation to determine how much of the steel really needs replacement vs. how much just needs patching or cleaning
    - Research to find original color of trusses
        - Pat Griffin to check with Barnes Riznik
        - Analyze paint chip if can find on existing

Puuopae Bridge (Kalama Stream Bridge)

Proposed bridge design
- Existing width will be kept
- Existing abutments will be kept
- Existing bridge length will be visually kept
- New abutments outside the existing will be added
- New concrete deck will be supported by new abutments
- Two options were presented
    - A more current engineering concept of a flat concrete slab
    - A replication of the historic deck consisting of I-beam steel encased in concrete
- Existing end posts will be kept
- New steel girders will be added on the inside of the existing steel girders (replacement of the existing girders in kind may be recommended)

Comments
- Questions about period of significance and what is being preserved
    - It was noted that the period of significance on nomination is 1912-1936
    - Also noted is that bridge is significant under Criterion A only
    - However, it was also noted that the current bridge is what was placed on the register, not the truss bridge
- Bridge does not resemble the earlier truss bridge, however it does maintain the original steel girder deck
- Suggestion was made to restore the trusses as a decorative feature to restore to period of significance
- Pat Griffin noted that the railings that were on the bridge from 1958 to 2000 would be the most feasible to restore. See attached photocopy from the 1989 Spencer Mason report that shows the railings at that time.

- Preference is to replace the deck in kind as shown in option 2
- SHPD requested more photos and possibly archival photos to better analyze the changes that have occurred.
- Recommend using same specialist as noted for Opaekaa Bridge to make recommendations on how to treat end posts.

Kapahi Bridge

Proposed bridge design

- Existing width will be kept
- Existing abutments will be kept
- Existing bridge length will be visually kept
- New abutments outside the existing will be added
- New concrete deck will be supported by new abutments
- Utilize stamp concrete to resemble wood planks
- Two options on crash tested railings
    - Timber railing which is more massive in appearance to meet crash testing
    - Steel railings painted white to resemble the existing wood railings
- Project team believes the proposed will be an adverse effect, which will require an MOA and 4F analysis

Comments

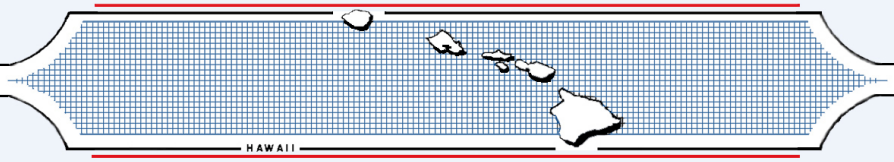
- Wood deck is the preferred material to have the feel and sound of the wood bridge
- Note that frp was designed for Wainiha
- Steel railings are less bulky than the wood railings and are thus preferable
- It was noted that this bridge, more than the other two bridges is a community resource as the stream is heavily used for recreational activities
- It was also noted that City, with State and FHWA may still pursue the concrete deck as it may be the most feasible and prudent alternative

ARCHAEOLOGICAL INVENTORY SURVEY FOR THE PU`U`ŌPAE BRIDGE REPLACEMENT PROJECT, BRIDGE NUMBER 00744011114400, STATE SITE 50-30-08-9397 WAILUA, SOUTH OLOHENA AHUPUA`A, KAWAIHAU DISTRICT, KAUA`I ISLAND, HAWAI`I [TMK: (4) 4-4-002]

Prepared by:
Cathleen A. Dagher, B.A.
and
Michael F. Dega, Ph.D.
July 2014
FINAL

Prepared for:
KAI Hawaii, Inc.
31 South Pauahi Street #2
Honolulu, HI 96817

SCIENTIFIC CONSULTANT SERVICES Inc.



1347 Kapiolani Blvd., Suite 408 Honolulu, Hawai`i 96814

ABSTRACT

At the request of KAI Hawaii, Inc., Scientific Consultant Services, Inc. (SCS), conducted Archaeological Inventory Survey on 1.1-acres of land around the Pu`u`opae Bridge complex in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-4-002]. The study was conducted as a portion of the multidisciplinary study pertaining to the Pu`u`opae Bridge Replacement Project. Archaeological Inventory Survey consisted of historical background and archival research, full pedestrian survey of the project area, documentation, site descriptions, and reporting.

During the Archaeological Inventory Survey, only one site (State Site 50-30-08-9397), Pu`u`opae Bridge, often referred to as Kalama Bridge or Kapaa Homesteads Bridge No. 2, was identified. The bridge was originally constructed in 1915 and carries Pu`u`opae Road over Kalama Stream. The bridge is a single lane structure which measures 48 feet long. The bridge was originally trussed in 1915 with a concrete-encased steel floor, the truss having been removed in 1958. The endposts of the bridge were recycled from demolition of the Wailua River Bridge in 1919. The bridge was listed on the State Register of Historic Places in 2004 as Site 30089397 and on the National Register of Historic Places in 2005 as Site 05000536. The bridge was also classified as a Category 3 bridge, limited historical significance.

State Site 50-30-08-9397 has been evaluated pursuant to National Register of Historic Places and the Hawai`i State Register of Historic Places (HAR§13-198) criteria. The Hawaii State Historic Bridge Inventory and Evaluation (2013) and National Register indicate that the bridge is significant under both Criterion A (events) due to its association with Kapaa Homesteads, and Criterion C (site type) as an example of a steel-truss bridge. These assessments have not changed per this study. The present study constitutes a portion of the Section 106, of the National Historic Preservation Act of 1966 (NHPA), process. No further archaeological work is recommended for the bridge and the surrounding area of potential effect.

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LIST OF FIGURES

INTRODUCTION

At the request of KAI Hawaii, Inc., Scientific Consultant Services (SCS), Inc., conducted Archaeological Inventory Survey (AIS) on and around the Pu`u`opae Bridge complex in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-4-002] (Figures 1 and 2)]. The work was conducted in support of the Pu`u`opae Bridge Replacement Project, which is being undertaken by the State of Hawai`i Department of Transportation (HDOT) and the County of Kaua`i. The Federal Highway Administration (FHWA) intends to provide funds for the proposed improvements, and therefore the project represents a federal undertaking in accordance with 36 CFR 800.16(y).

AIS work consisted of historical background and archival research, full pedestrian survey of the project area, documentation, and reporting. Subsurface testing was not conducted due to the absence of surface historic properties (beyond the bridge itself) and because it was anticipated that the subsurface deposits in proximity to the bridge were disturbed during construction of the roadways and bridge piers. The Area of Potential Effect (APE) for the project consists of 1.1 acres and includes the bridge and arterial road corridors which includes the paved County right-of-way (Figure 3). The rehabilitation work includes retaining and re-installing existing historic end posts behind the new guardrail, repairing and coating following Preservation briefs and the Secretary of Interior Standards, replacing in-kind of girders, except with an added wing wall to conceal the extra length of the girder from exterior view, and installing of additional girders (as needed), a new deck using embedded transverse concrete beams and rebar, new abutments, and new crash-tested railings in place of the existing W-beams.

During the Archaeological Inventory Survey, only one historic property (State Site 50-30-08-9397), the Pu`u`opae Bridge itself, was identified (Figures 4 through 7). No other archaeological features or historic structures were identified in the stream bed or along the immediate banks of the stream. The Pu`u`opae Bridge, a one-lane steel bridge, was originally constructed in 1915 and was listed on the State Register of Historic Places in 2004 as Site 30089397 and the National Register of Historic Places in 2005 as Site No. 05000536 (Griffin 2005). The bridge is in visibly poor condition and was manufactured in somewhat patchwork fashion. The bridge end posts originated from the old Wailua River Bridge (1919), while other portions of the original bridge were replaced by the County in 1958 (Griffin 2005).

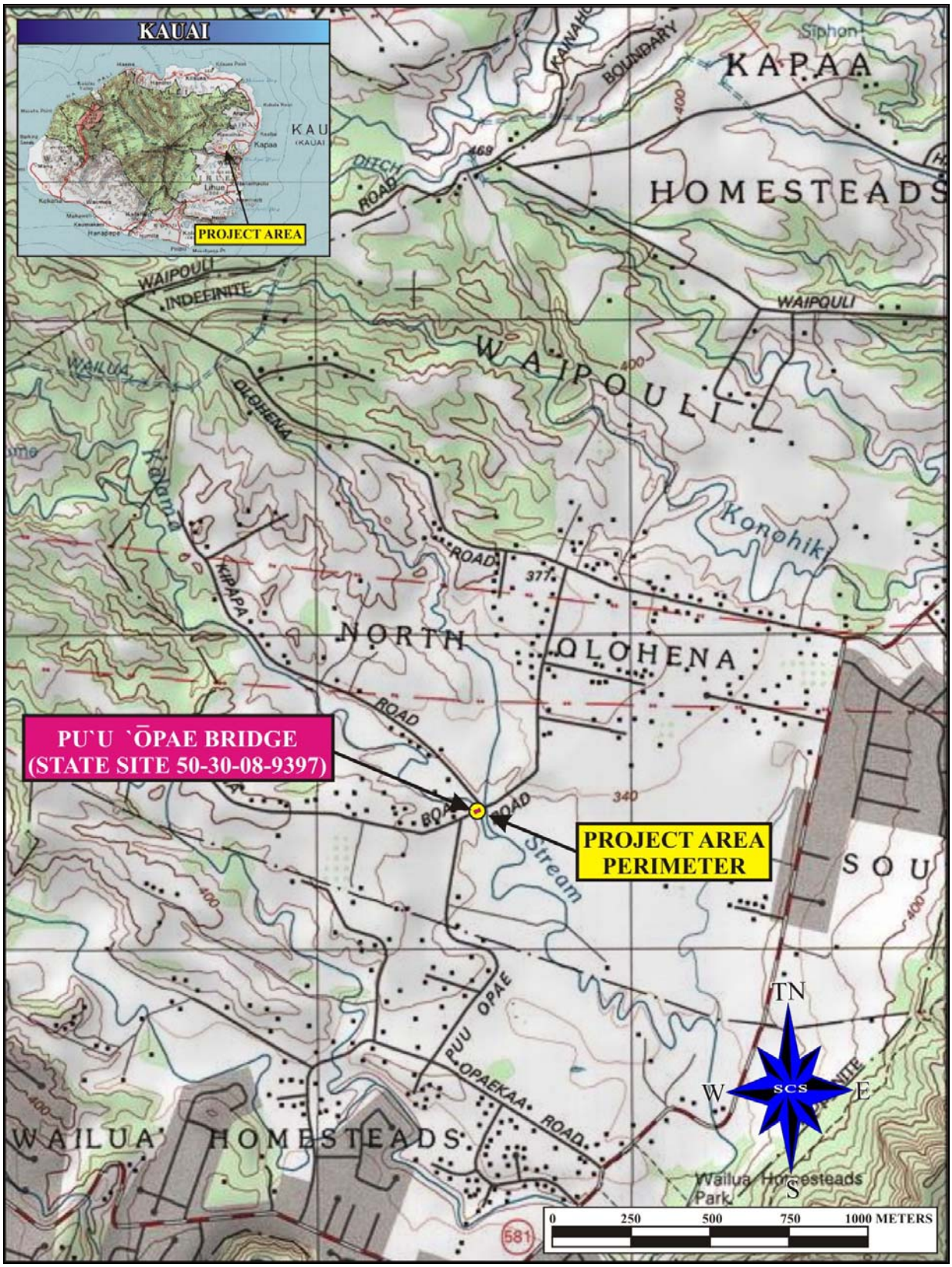


Figure 1: USGS Quadrangle (Kapaa 1996) Map Showing Location of Project Area and State Site 50-30-08-9397.

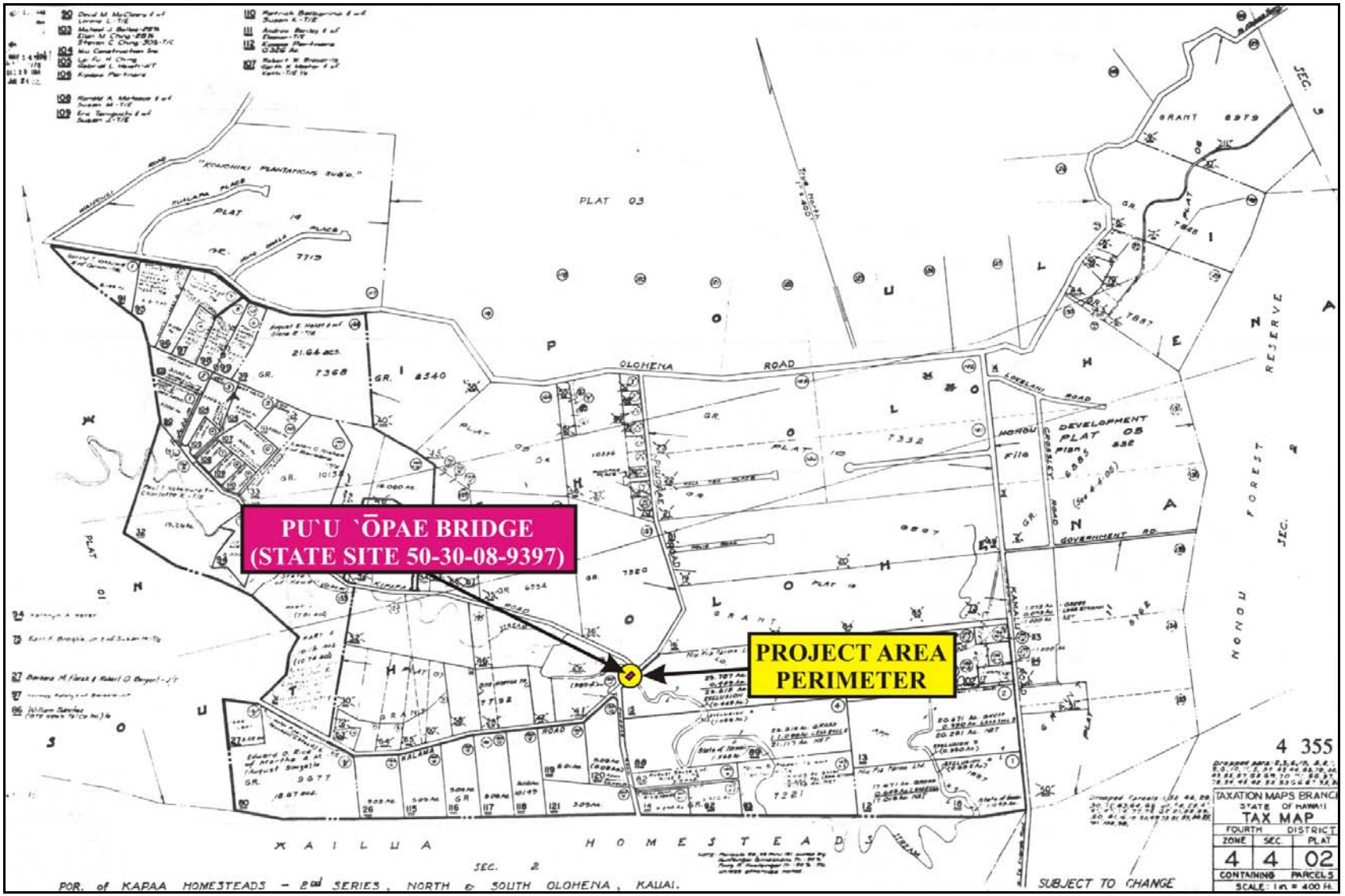


Figure 2: Tax Map Key [TMK: (4) 4-4-002] Showing Location of Project Area and State Site 50-30-08-9397.

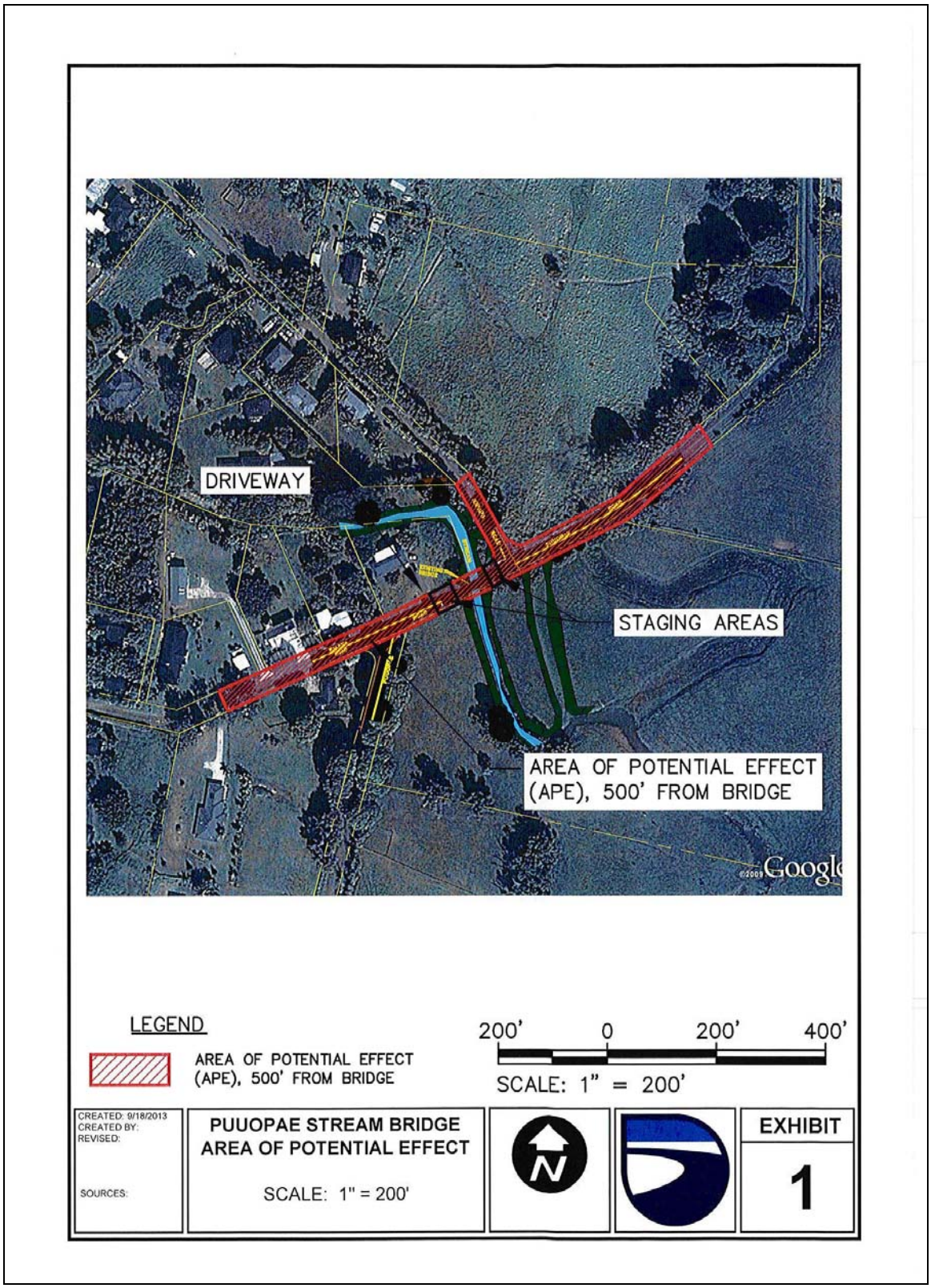


Figure 3: Pu`u`opae Stream Bridge Area of Potential Effect.

Figure 4: Photograph of Pu`u`opae Bridge (State Site 50-30-08-9397). View to South.

Figure 5: Photograph of Pu`u`opae Bridge (State Site 50-30-08-9397) Approach. View to North.

Figure 6: Photograph of Pu`u`opae Bridge (State Site 50-30-08-9397), West Elevation. View to Southeast.

Figure 7: Photograph of Pu`u`opae Bridge (State Site 50-30-08-9397), East Elevation. View to Northeast.

State Site 50-30-08-9397 has been evaluated pursuant to National Register of Historic Places and Hawai`i State Register of Historic Places (HAR§13-198) criteria. The Hawaii State Historic Bridge Inventory and Evaluation (2013) and National Register indicate that the bridge is significant under both Criterion A (events) due to its association with Kapaa Homesteads, and Criterion C (site type) as an example of a steel-truss bridge. This assessment was not altered during the current study.

Fieldwork for this project was conducted on November 2, 2011 by SCS archaeologists James Powell, B.A. and Michael F. Dega, Ph.D., the latter whom also acted as the Principal Investigator for the project. Archaeological Inventory Survey was conducted of the current project area in order to determine the presence/absence of historic properties through systematic pedestrian survey. Subsurface testing was not conducted as no surface sites, besides the bridge, were identified and second, areas around the bridge were not amenable to testing as they occurred on/near residential properties or County road ways. The ultimate goals of the project were to determine if historic properties occurred in the area of potential effects and to provide significance assessments and recommendations to the State Historic Preservation Division (SHPD).

ENVIRONMENTAL SETTING

LOCATION

Kaua`i, the oldest and fourth largest of the eight main Hawaiian Islands (with land area equaling approximately 1,432 square kilometers), was formed from one great shield volcano (Macdonald and Abbott 1970:458-461). At one time, this vast volcano supported the largest caldera in the islands, horizontally extending 15 to 20 kilometers across. Mount Wai`ale`ale, which forms the central hub of the island, extends 1,598 meters above mean sea level (amsl). Topographically, Kaua`i is a product of heavy erosion with broad, deep valleys, and large alluvial plains.

The project area lies in South Olohena Ahupua`a, Kawaihau District, on the eastern flank of Kaua`i, at c. 320 feet amsl. The area surveyed measured close to 1-acre. South Olohena is one of ten *ahupua`a* located in the area known as Puna Moku during traditional times (Handy and Handy 1972:423). South Olohena is the most southern of Kawaihau District's *ahupua`a* and borders Lihue District. The project area and environs occur in the former Kapaa Homesteads 2nd Series rural residential subdivision that was created in 1913. The area is known as the Kapaa Homesteads at present.

Pu`u`opae Bridge crosses Kalama Stream, a west to east tending stream that converges with `Ōpaeka`a Stream about a mile from its origination source. The stream

had only limited flow on the day of fieldwork and measured approximately 12-15 feet wide, a bit wider on the western flank where water had pooled. The bridge runs across Pu`u`opae Road, which spans Kalama Stream. Kīpapa Road is perpendicular to Pu`u`opae Road and parallel to the stream. A small, modern concrete culvert is present slightly upstream from the bridge, adjacent to Kīpapa Road. The northern flanks of the bridge contain existing roads and a residence on either side of Pu`u`opae Road. Beyond the eastern flank of the bridge, pasture lands are present. To the southwestern flank of the bridge is a residence, and western flank bordered by pasture land and residences. The area surveyed for this study and the area of potential effect includes Pu`u`opae Road and its right-of-way and Kīpapa Road and its right-of-way, with two staging areas on Pu`u`opae Road (see Figure 3).

LANDSCAPE MODIFICATIONS AND SOIL REGIMES

The current project area, inclusive of the bridge itself, Kalama Stream, and adjacent land bordering the stream and bridge access points, has undergone numerous modifications in the past. Pasture lands flank several sides of the general bridge area, as well as existing residences. Kalama Stream in this section does not flow rapidly and is overgrown with non-native vegetation. Other vegetation in the area around the bridge all consists of introduced trees, shrubs, and grasses. The banks of the stream have been modified by a) bridge construction and b) road construction. A concrete culvert is present on Kīpapa Road, adjacent to the stream, just upstream from the bridge.

Typical soils encountered in the general project area are associated with the Lihue Series and Hanamaulu Series (Foote *et al.* 1972:Map Sheet 29). The soils of the Lihue Soil Series consist of well-drained soils located in the uplands of Kaua`i Island, and are formed in materials weathered from igneous rock *(*Foote *et al.* 1972:82). The slope ranges from gentle to steep, and elevations extend from around sea level to 800 feet amsl. Rainfall ranges from 40 to 60 inches annually and the mean soil temperature is 73 degrees Fahrenheit. Soils in this series area used for commercial agriculture including, sugarcane, pineapple, pasture, truck crops, orchards, wildlife habitat, and home sites (Foote *et al.* 1972:82). Silty clays dominate the matrices of this series. The Hanamaulu Series also consists mainly of silty clays which are well-drained soils on stream terraces and steep terrace breaks (Foote *et al.* 1972: 39). These soils developed in alluvium washed from upland soils and would define the soils along Kalama Stream. This soil series is generally associated with sugarcane cultivation, pasture, wildlife habitat, and water supply. Natural vegetation consists of buffalo grass, pandanus, glenwood grass, *hau*, and morning glory.

CLIMATE

The project area is relatively wet, with mean annual rainfall ranging from 40 to 120 inches annually (Armstrong 1983; Giambelluca *et al.* 1986). During the pre-Contact (pre-1778) Period, a great amount of fresh water would have been locally available in the numerous streams that drain Mt. Wai`ale`ale. Annual air temperatures in the area vary from approximately 50 to 83 degrees (Armstrong 1983).

PAST POLITICAL BOUNDARIES

Approximately 600 years ago, the Hawaiian population had expanded throughout the Hawaiian Islands to a point where large, political districts could be formed (Lyons 1903; Kamakau 1991; Moffat and Fitzpatrick 1995). At that time, Kaua`i consisted of six districts, or *moku*: East and West Kona, Puna, Ko`olau, Halele`a, and Nāpili. Land was considered to be the property of the king or *ali`i `ai moku* (the leader who controls the island/district), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted; his higher chiefs received large parcels from him, and in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku, ahupua`a, `ili or `ili`āina* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua`a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were, therefore, able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying the needed resources from different environmental zones (Lyons 1875:111). The *`ili* or *`ili `āina* were smaller land divisions next in importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61).

TRADITIONAL AND HISTORIC SETTING

Archaeological settlement pattern data indicates that initial colonization and occupation of the Hawaiian Islands first occurred on the windward shoreline areas around

c. A.D. 900, with populations eventually settling into drier leeward areas at later periods (Kirch 1985). Coastal settlement was still dominant, but populations began exploiting and living in the upland *kula* (plains) zones. Greater population expansion to inland areas did not occur until around the. A.D. 12th century and continued through the 16th century. Large scale or intensive agricultural endeavors were implemented in association with habitation. Coastal lands were used for settlement and taro was cultivated in near-coastal reaches and in the uplands.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys, such as those on Kaua`i, provided ideal conditions for wetland *kalo* (*Colocasia esculenta*)—agriculture that incorporated pond fields (*lo`i*) and irrigation canals *(`auwai*). Other cultigens, such as *kō* (sugarcane, *Saccharum officinaruma*), *mai`a* (banana, *Musa sp*.), and *`uala* (sweet potato, *Ipomoea batatas*) were also grown. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985). Agricultural development on Kaua`i was likely to have begun early (A.D. 1100–1300), during what is known as the Expansion Period (Kirch 1985). Coastal zones were utilized for marine resources, habitation, burials, and ceremonial structures often associated with fishing (Bennett 1931). Often, land sections located in back of the shoreline contained pond fields and dunes that were used for sweet potato production (Handy and Handy 1972; Earle 1978). Trails linked the *makai* (coastal) and *mauka* (upland) sections of the *ahupua`a*, allowing easy access to its resources. Other trails skirted the coast, which made communication between *ahupua`a* possible.

TRADITIONAL SETTING

Kaua`i is the fourth largest and the oldest of the main Hawaiian Islands. It is said that many years ago, the fire goddess Pele and her family briefly stopped on Kaua`i to explore the possibility of finding a permanent home. She dug a deep pit, but it was instantly filled with water, so they left Kaua`i and traveled on, and eventually settled in Halema`uma`u, on the island of Hawai`i, where she resides to this day (Beckwith 1976).

Despite Kaua`i Island's separation from the rest of the Hawaiian archipelago (the channel that separates Kaua`i and Ni`ihau from O`ahu is 63 miles wide), the rich variety of topography and climate has been extremely influential in establishing broad settlement patterns (Bennett 1931:4). The varied ecological division of the island, which contains verdant cliffs, dry and sandy flats, wide river valleys and tracts of fertile soil, provided the opportunities for a wide variety of cultivation.

The place name Pu`u`opae, literally translates to "shrimp hill", an implied stream-fed food resource upland from the coast (Pukui *et al*. 1974:204). Certainly, Kalama Stream contains water along its length garnered from the abundant rainfall of Mount Wai`ale`ale, "the wettest place on earth," with an average of 11,455 mm (451 in) of rain annually (Encarta Geography, online).

Handy and Handy (1972:423) note that the inland portion of Puna District (Kawaihau) contains a number of small streams, such as Kalama Stream, along which small *lo`i* were developed. Bennett (1931:128) states that in the homestead area, many little valleys contain taro terraces. Further, below the mountains, there were extensive flatlands where agricultural terraces irrigated by such streams as Kapahi were located (Bennett 1931:128). The terraces were described as "Single rows of stone mark the divisions with some 2-foot terraces" and designated as Bennett's Site 110 (State Site 50-30-08-110) (Bennett 1931:128). This is also the location of the upper homesteads (Kapaa Homesteads). Bennett's Site 111 (State Site 50-30-08-111), as described by Bennett (1931:128-129) and also occurring in the area (inland and south of Kealia Valley), consisted of a "simple dirt ditch, about 6 feet in width and of varying depths which is traditionally referred to as a Hawaiian ditch."

During the pre-Contact period (prior to 1778), this upper region was marginally settled but contained excellent land for agriculture, it being a product of alluvial deposition from all the streams in the area. Impressive irrigation systems were built on Kaua`i to transport stream water to agricultural fields during traditional times (Handy and Handy 1972; Earle 1978). In 1892, Dole (1916) reported that these ancient agricultural resources of eastern Kaua`i were still functioning, as evident by the extensive ditch irrigation system throughout Wahiawa, Kapa`a, and Kilauea.

Wailua Ahupua`a lies just south of the project area. The Wailua River is the largest navigable river in the state and cuts between two mountains just before the river

enters the sea. During the pre-Contact period, the lower portion of this *ahupua`a*, where Wailua Stream meets the ocean. Wailua Nui Hoano (Great Sacred Wailua), as this area was called, was one of the two most sacred areas in the Hawaiian archipelago and was *kapu* (forbidden) to commoners. It was crucial that all the Kaua`i *ali`i* were birthed at the birthstones which were located in an area of Wailua called Holoholokū. During periods "[w]hen the chiefly class became diminished for some reason, the King selected women of common birth to deliver children at the Birthstones. Legend says such a child would be a chief" (Joesting 1987:5-9). The important role the Birthstones of Holoholukū played during ancient times is exemplified in an ancient chant:

> The child of a chief born at Holoholo-ku is a high chief;
> The child of a commoner born at Holuholu-ku becomes a chief also;
> The child of a high chief born outside of Holoholo-ku is no chief, a commoner he! (Joesting 1987:5–9).

Another measure of importance, at least politically, can be found in the remains of religious features such as *heiau* (ceremonial center). There were approximately nine *heiau* listed in the 1880s between Keālia and Kapa`a, suggesting that this area contained more significance than is presently known (Bushnell *et al.* 2002). Sadly, the location of most of these structures has been lost. Bennett (1931:31) calculated 122 *heiau* on the Island of Kaua`i. No documented *heiau* were recorded in the vicinity of the project area. However, numerous *heiau* were recorded along Wailua River and also in Kapa`a, toward the coastline. Within a radius of approximately one and a half miles from the Wailua River mouth are six important temples and associated sites which have officially been designated a National Historical Landmark (Kirch 1996:16).

HISTORIC SETTING

The first recorded Western contact in the Hawaiian Islands was made in 1778 on the southern coast of Kaua`i (Beaglehole 1967). Waimea, located on the southern side of Kaua`i, was the port of call for many years, leaving the rest of Kaua`i an uncharted territory. Portlock and Dixon visited Waimea in 1786 and in 1787 and John Meares also stopped on his way to Canton in 1787 (Joesting 1987). Captain William Douglas sent two sailors ashore in Waimea to collect sandalwood in 1789, and in 1791, Captain John Kendrick left three men on Ni`ihau to look for pearls and sandalwood. There is no description of the eastern coast until Captain George Vancouver traveled up the coast from Wailua in 1793. As there was no anchorage, he sailed towards Kapa`a, noting that this was: "…the most fertile and pleasant district of the island…" (Joesting 1987).

Much of the knowledge of traditional land use patterns is based on what was recorded at the time of, and shortly after, Western contact. Early records, such as journals kept by travelers and missionaries or Hawaiian traditions that survived long enough to be written down, assist in understanding the past. Protestant missionaries arrived in Hawai`i in April of 1820 and by the end of the year, were settled on Kaua`i. In 1830, as part of the missionary report, a census of individuals living in the *ahupua`a* around the islands was recorded (Schmitt 1973). We are limited to traveler's journals for information concerning descriptions of the general Wailua region.

In 1849, William Patterson Alexander landed at Koloa, Kaua`i where he was to embark over land to the mission houses in Wai`oli:

> May 5. This morning we rose early…A few miles from Wailua, near Kapaa we passed the wreck of a schooner on the beach, which once belonged to Capt. Bernard. It was driven in a gale over the reef, and up on the beach, where it now lies. A few miles further we arrived at Kealia. We had some difficulty in crossing the river at this place, owing to the restiveness of out horses. The country here near the shore was rather uninviting, except the valleys which always contained streams of water….The two peaks of Anahola are quite a landmark to one traveling in this region….[Alexander cited in Kaua`i Historical Society 1991:123].

On his return to Koloa, Alexander traveled back through Keālia:

> …Five miles from Anahola we stopped at Kealia, a picturesque valley containing a beautiful waterfall, to bathe & rest out horses. In leaving the valley, I unfortunately left my spur, & did not think of it till we had ridden nearly a mile. I rode back for it and found it, determined to lose nothing on Kaua`i by carelessness [Alexander cited in Kaua`i Historical Society 1991:129].

Although no people are mentioned, it can be assumed they were there, perhaps more inland, tending to lands worked by their families for generations.

THE MĀHELE

In the 1840s, traditional land tenure shifted drastically with the introduction of private land ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian economy to that of a market economy (Kuykendall 1938 Vol. I: 145; Daws 1968:111; Kelly 1983:45, 1998:4; Kame`eleihiwa 1992:169–70, 176). The Māhele of 1848 divided Hawaiian lands between the king, the chiefs, the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were made available and private ownership was instituted, the *maka`āinana* were able to claim the plots on which they had been cultivating and living, if they had been made aware of the procedures. These claims did not include any previously cultivated but presently fallow land, *`okipū* (on O`ahu), stream fisheries, or many other resources necessary for traditional survival (Kelly 1983; Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent after which they could take possession of the property (Chinen 1961:16).

The current project APE does not itself fall into any LCA's. In researching the Mahele records and previous archival work in the area (Bushnell *et al*. 2004), there was only one LCA awarded for Olohena Ahupua`a (Note: The *ahupua`a* was not divided into North and South Olohena until Historic times). The LCA, 3831, was granted in Olohena Ahupua`a and located inland of Konohiki Stream. The LCA was awarded to Pahuwai, the only one in the *ahupua`a* to receive an award, and consisted of two parcels, one in Olohena `Ili and one in Kuanea `Ili. According to Bushnell *et al*. (2004:17), the award is near the Waipouli boundary, at the flank of the Waialiali marsh. The LCA lists 4 *lo`i* and a house lot.

There is additional information provided from land (boundary) grants and land court applications in Olohena. A majority of these inland claims were associated with streams, where wetland taro was produced. House sites were scattered throughout these agricultural areas (low density). Bushnell *et al*. (2004:14-17) note that the Olohena Ahupua`a is now divided into North and South Olohena as during the *Mahele*, Kiaimoku retained the northern half of Olohena (Grant 3662) while giving up the southern half. This southern area was then awarded to R.P. Spaulding (Grant 5264).

Commercial sugarcane agriculture came to the area during the middle to late 19th century. According to Dorrance and Morgan (2000), for instance, the Kealia Sugar Plantation was in operation from 1869 until 1885. The Makee Sugar Company operated the Kealia Sugar Plantation from 1877 until 1933.

George H. Fairfield, general manager of the Makee Sugar Company, employed the "divide and rule strategy" by hiring a labor force consisting of multinationals which provided for stable work force with little division (Takaki 1983:24). Plantation life for the workers could be very harsh; when it came to production, workers were treated little better than slaves (Takaki 1983:74).

Around this time (1865), William T. Brigham, future curator of the Bishop Museum, toured Kaua`i on horseback, passing through the inland area on his way to Keālia:

> …After riding through several kukui groves, and over pleasant ridges we came to Kealia, the residence of Mr. Krull. Here I lunched at two o'clock. Many kukui trees were covered with dodder. A few miles beyond we passed a Golgotha, and as we turned towards the shore again, saw a curious hole in the ridge [Anahola Mts.] which comes to an abrupt end here. [Brigham in Kaua`i Historical Society 1991:142].

Historical times for inland South Olohena are most marked by the creation of the Waipouli Homesteads, where Pu`u`opae Bridge is now located. Background research of the area (Spencer Mason Architects 1989) shows 167 lots of Waipouli (called the Kapa`a Homesteads 2nd Series) lands were sold by lottery to homesteaders on April 29, 1913. Two individuals, A. Ohai and M. Ferreira, were awarded the parcels of land on either side of the bridge. At that time, there was little access for the homesteaders to reach their property to build their houses or cultivate, only ox-carts could make the trip; there was also no water availability via pipes and irrigation (Griffin 2005). In 1913, the Governor of Hawai`i, Walter F. Frear, also sold water rights to the Makee Sugar Company, forcing the settlers to pay a monthly rate if they choose to use the water from any stream in the area (Griffin 2005). By 1918, the settlers had secured water rights by petitioning the territory board in Honolulu and by 1919, when the Wailua Homesteads opened, several roads were built in the area: Pu`upilo, Pu`u`opae, and Kamalu (Griffin 2005).

Pu`u`opae Bridge was constructed in 1915, two years after the homestead was opened. By 1917, ninety homesteaders were producing on the Olohena-Waipouli tract of 3,140 acres, and harvested some 31,500 tons of sugarcane worth $197,000 and some pine trees (Griffin 2005). The Makee Sugar Company grew both sugarcane and pineapple in the area, with the Makee train steaming through the homesteads to collect sugarcane from the homesteads and take it to the mill near Kealia.

In 1919, at the mouth of the Wailua River, a new bridge was constructed, the older bridge sections having been removed and "donated" for other small, local bridges in the area. Sections of the `Ōpaeka`a Bridge and presumably parts of the Pu`u`opae Bridge contain parts of the original Wailua River Bridge. It was during this time period, ca. 1920s, that much road building occurred in both the Waipouli and Wailua Homesteads, this including work on Pu`u`opae Bridge (see below; Spencer Mason Architects 1989).

By the mid-twentieth century, many of the homesteaders were occupied in fields other than agriculture and the homesteads became more residential in nature. As Spencer Mason (1989) and Griffin (2005) note, the lands adjacent to Pu`u`opae Bridge are some of the only remaining areas zoned as "agriculture" in the area.

As discussed below, work on roads and bridges continued, with ca. 1958 being another time when bridges and roads were improved to their current state.

PREVIOUS ARCHAEOLOGY

Early surveys of Kaua`i Island involved identification of sites in and around the current Pu`u`opae project area, with many more sites identified across the greater Kawaihau District, particularly in Wailua and Kealia. The first surveys by Thrum (1907) and Bennett (1931) led to the identification of a large number of *heiau*, as well as other site types. Bennett (1931:128) states that in the homestead area, many little valleys contain taro terraces (Figure 8). Further, below the mountains, there were extensive flatlands where agricultural terraces irrigated by such streams as Kapahi were located (Bennett 1931:128). The terraces were described as "Single rows of stone mark the divisions with some 2-foot terraces" and designated as Bennett's Site 110 (Bennett 1931:128).

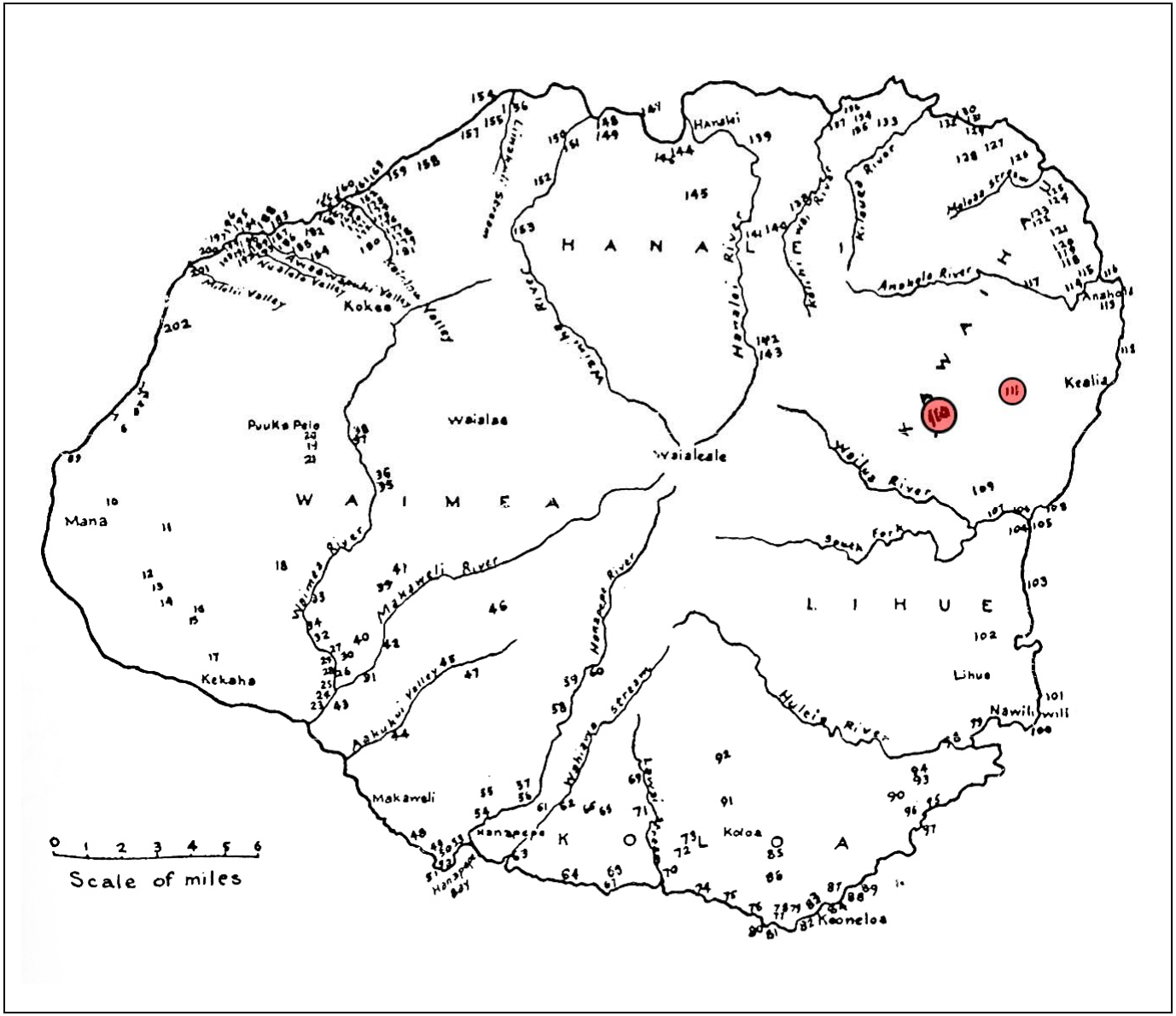


Figure 8: Bennett (1931) Sites Near Project Area.

This is also the location of the upper homesteads (Kapaa Homesteads). Bennett's Site 111 (State Site 50-30-08-111)), as described by Bennett (1931:128-129) and also occurring in the area (inland and south of Kealia Valley), consisted of a "simple dirt ditch, about 6 feet in width and of varying depths which is traditionally referred to as a Hawaiian ditch." Handy and Handy (1972:423) note that the inland portion of Puna District (Kawaihau) contains a number of small streams, such as Kalama Stream, along which small *lo`i* were developed.

Bushnell and Hammatt (1996) conducted an Archaeological Field Reconnaissance of the Pu`u`opae Bridge for Belt Collins Hawaii in 1996 (Figure 9). Many similar historical references were utilized for the present study as resources are limited. The one difference is that the National Register nomination occurred in 2005, nine years after their survey. Survey of the project area was also repetitious to the current study, with only minor changes to the environment. The Field Reconnaissance survey only led to the identification of Pu`u`opae Bridge. The stream bed and river banks were also void of sites. The report provides good historical coverage of the bridge, most of which is presented herein and throughout multiple sources as well. The only conclusion not borne out in the report is that Bushnell and Hammatt (1996:10) state that the present steel girder bridge was built some time after 1931 and likely after 1941, and appears to have been preceded by an older wooden bridge which may have been constructed a few years prior to 1812. This contradicts the historical data wherein the first bridge was built two years after the homesteads were awarded, in 1915 (see below).

Per general area archaeological studies within Kawaihau District, most of the previous archaeological work was conducted along the coastline for residential, commercial, and infrastructural developments. However, multiple studies of the nearby Kealia uplands area have revealed the various site types found in more upland locations, as a similar setting to the Pu`u`opae area (Figure 9).

In 2005, SCS conducted an Archaeological Reconnaissance Survey of 2,008 acres in Keālia Ahupua`a. The report by Tome and Spear (2005) listed a total of 40 newly identified sites. Most of these sites were associated with pre-Contact agriculture and habitation sites, as well as historic; Plantation Era sites (roads, bridges).

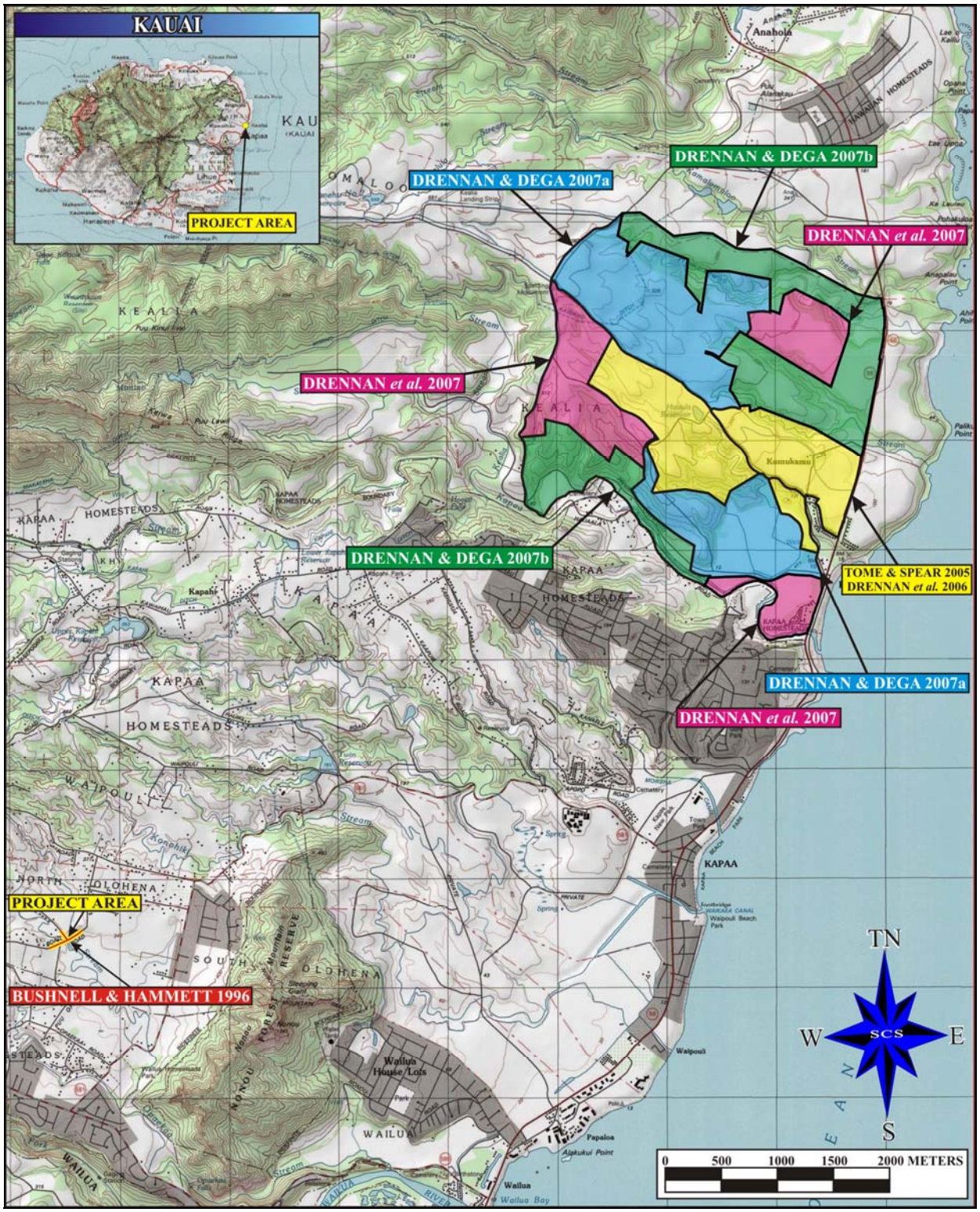


Figure 9: Distribution of Previous Archaeological Studies within and Near the Project Area.

In 2006, SCS conducted a formal Archaeological Inventory Survey of the 2,008-acre Keālia property, which was divided into four Phases (Drennan *et al*. 2006): Makee/Kumukumu Phase I, Makee/Kumukumu Phase II, Makee/Kumukumu Phase III, and Makee/Kumukumu IV. The Phase I Inventory Survey project area included Kumukumu Valley, South Fork, Keālia Valley Finger A, and portions of Makee Valley. During Phase I of the Inventory Survey, a total of 19 sites were identified. These included four sites located outside of the project boundaries: State Site 50-30-08-1136 (a petroglyph panel), State Site 50-30-08-1127 (historic wall), State Site 50-30-08-1125, Feature 1 (historic road), and Feature 2 (historic bridge). Overall, Inventory Survey of the Phase I property led to the identification, recordation, and documentation of 15 new historic sites, comprised of 21 features. Nine of the sites were assessed as being associated with the Plantation Era. One site was interpreted to be of pre-Contact origin and associated with traditional Hawaiian habitation and/or agriculture. The remaining five sites were interpreted as pre-Contact agricultural sites, with use continuing through the Plantation Era.

Phase II of the Archaeological Inventory Survey led to the identification of 30 new archaeological sites comprised of 82 features (Drennan and Dega 2007a), wherein sufficient archaeological information was gained through Inventory Survey and no additional work was recommended for 25 of the sites. Twenty-seven of the features are associated with the Plantation Era on Kaua`i. Three features appear to be pre-Contact and associated with traditional Hawaiian habitation and/or agriculture. Five features have been interpreted as pre-Contact agricultural areas with continuous use through the historical period. Forty-seven features have been interpreted as historic.

The Phase III Survey led to the identification, recordation, and documentation of 19 new archaeological sites, comprised of 93 features (Drennan *et al*. 2007). Fifteen of the features were historic and most were associated with the Plantation Era. Sixty-three features were interpreted as historic and/or Plantation Era. Eleven features were interpreted as Historic/Plantation Era and have continued into modern times. Four features appeared to be part of a pre-Contact/Transitional Period burial site (State Site 50-30-08-7040) which are associated with traditional Hawaiian habitation and/or agriculture.

Finally, Phase IV Inventory Survey of upland Kealia led to the identification, recordation, and documentation of 37 new archaeological sites comprised of 66 features (Drennan and Dega 2007b). Manual test excavations were conducted at five sites and mechanical excavations (N=23 trenches) occurred within six Land Commission Award

(LCA) locations. Thirty-six of the total 66 features are associated with the Plantation Era. Twenty-two features were interpreted as historic. Five features were interpreted as historic and/or Plantation Era. Eleven features were interpreted as historic/Plantation Era and were used into modern times. Two features were pre-Contact and/or historic and associated with traditional Hawaiian habitation and/or agriculture.

EXPECTED FINDINGS

Given the background and archival research completed prior to fieldwork, expectations for identifying any historic properties, other than the bridge itself, were considered minimal. The environment around the bridge footprints has mostly been developed (roads, bridge work, residences) and thus, the landscape has been altered. There was only a remote chance that possible *lo`i* terraces/walls or historic constructions would be identified, these having been previously noted for the area by Handy and Handy (1972) when referring to pre-Contact and early historic taro cultivation.

METHODOLOGY

Archaeological Inventory Survey primarily consisted of archival research, fieldwork, and reporting. Archival research for this project was conducted at the State Historic Preservation Division (Oahu) and the Kaua`i Historic Society/Kaua`i Museum. Fieldwork was conducted on November 2, 2011 by SCS archaeologists J. Powell, B.A. and M. Dega, Ph.D., who also acted as the Principal Investigator for the current project. Fieldwork consisted of 100% pedestrian survey of the entire area of potential effect and photographic documentation of the area. Survey was accomplished by both crew members walking over and under the bridge, along the adjacent streambed, along the stream banks on both sides of the bridge, and along each of the right-of-way areas. Access was relatively easy given the low water flow of the stream. Subsurface testing was not conducted due to the absence of surface historic properties (beyond the bridge itself) and because it was anticipated that the subsurface deposits in proximity to the bridge were disturbed during construction of the roadways and bridge piers.

Archaeological Inventory Survey was conducted of the current project area in order to determine the presence/absence of archaeological features on the ground surface through systematic survey of the project area footprint. The ultimate goal of the current project was to determine if significant archaeological sites were present in the footprint and to provide significance assessments and recommendations to the State Historic Preservation Division (SHPD). As discussed above, only the bridge qualified as an archaeological site. The bridge was photographed and conditionally compared to the

Historic Register nomination form. No other historic properties were identified within the 1-acre project area.

CONSULTATION

In compliance of Section 106 of the National Historic Preservation Act of 1966 (as amended) and the National Environmental Policy Act (NEPA), SCS, as part of the overall project bridge team (Kai Hawaii, Fung and Associates, *et al*.) has conducted multiple, formal consultation through community meetings as well as a formal Cultural Impact Assessment for this project (Dagher and Spear 2012). The latter undertaking included interviews with community individuals knowledgeable about the bridge and general project area. A report documenting the consultation process and results was prepared and submitted under separate cover. The team has also discussed the bridge with the Kaua`i Historic Preservation Review Commission (KHPRC) on three occasions. The results of all these meetings have been included in a Section 106 letter, submitted to the SHPD.

The Section 106 letter, dated January 15, 2014 outlines consultation information and an overview of the undertaking. In brief, the County of Kaua`i (and the team noted above) consulted with the Department of Land and Natural Resources (DLNR), State Historic Preservation Divison (SHPD), Kauai Historic Preservation Review Commission (KHPRC), Historic Hawaii Foundation (HHF), and the surrounding communities through various formal meetings. The minutes of these meetings are available with the Section 106 letter, sent to the SHPD, among other offices. Per the Section 106 consultation letters, dated between December 12, 2011 and January 18, 2012, 15+ individuals and organizations were contacted for comment on this project. The current project undertaking scope, as noted above, is a result of these multiple consultations with the community.

RESULTS

The Historic period Pu`u`opae Bridge (State Site 50-30-08-9397) was the only historic property identified in the project area (see Figures 4 through 7). Given the alluvial nature of the stream banks and adjacent flat environs, this area could have formerly been a good place to cultivate taro, as Handy and Handy (1972:423) had noted for the area. However, no evidence for cultivation was evident. Based on historic records and summaries presented by Spencer Mason Architects (1989), Bushnell and

Hammatt (1996), and the National Register of Historic Places Registration Form (Griffin 2005), the bridge and homestead area have quite an interesting history.

To recapitulate from the above sources, Pu`u`opae Bridge, often called Kalama Bridge and originally known as Kapaa Homesteads Bridge No. 2, carries Pu`u`opae Road over Kalama Stream in the Kapaa Homesteads (Figures 10 and 11). The bridge is a single lane and measures 48 feet long; the bridge was never expanded beyond 48 feet long. While some conflicting data appears in the references, the bridge appears to have been initially constructed in 1915 (Griffin 2005). Pu`u`opae Road was formally constructed in 1912 when the land tracts were subdivided for settlement in c. 1913. The bridge was originally trussed (1915) with a concrete-encased steel floor. The truss was removed in 1958 (Figure 12).

Original materials to manufacture the bridge include a concrete deck, steel girder floor system, and sections of the abutments. The endposts were recycled during demolition of the Wailua River Bridge in 1919. The railings of the bridge have been repaired over time. Additionally, in 1958, two 48-foot I-beams were installed below the concrete and steel girder floor for structural support. To install the I-beams, the headwalls above the stone abutments were broken and repaired with concrete. The trusses were likely removed after the I-beam supports were in place. Bridge railings were replaced in 2000 with galvanized W guardrails, these replacing the older wooden rails. Rusting and vehicle collision damage have adversely affected the bridge's workmanship and original appearance.

The bridge has been considered significant due to its historical association with Kapaa Homesteads development in the early 1900s. According to Spencer Mason Architects (1989), Pu`u`opae Bridge is one of only two of its structural type to have a steel girder floor system in the State bridge inventory, the other being the Eleele Pedestrian Overpass. In general, the bridge is a good example of an early 20th century structure that utilizes materials from another, earlier dated bridge (Wailua River Bridge). The report states that while the bridge is "purely functional and has no artistic characteristics" (*ibid*), the pattern formed by the rivets is interesting as it is one of three bridges on Kaua`i where riveted metal construction is visible (Hanalei River Bridge, `Ōpaeka`a Stream Bridge being the other two). The ratings for this bridge were not high due to the lack of engineering complexity and lack of artistic value (*ibid*). The association with Kapaa Homesteads development is quite important, however.

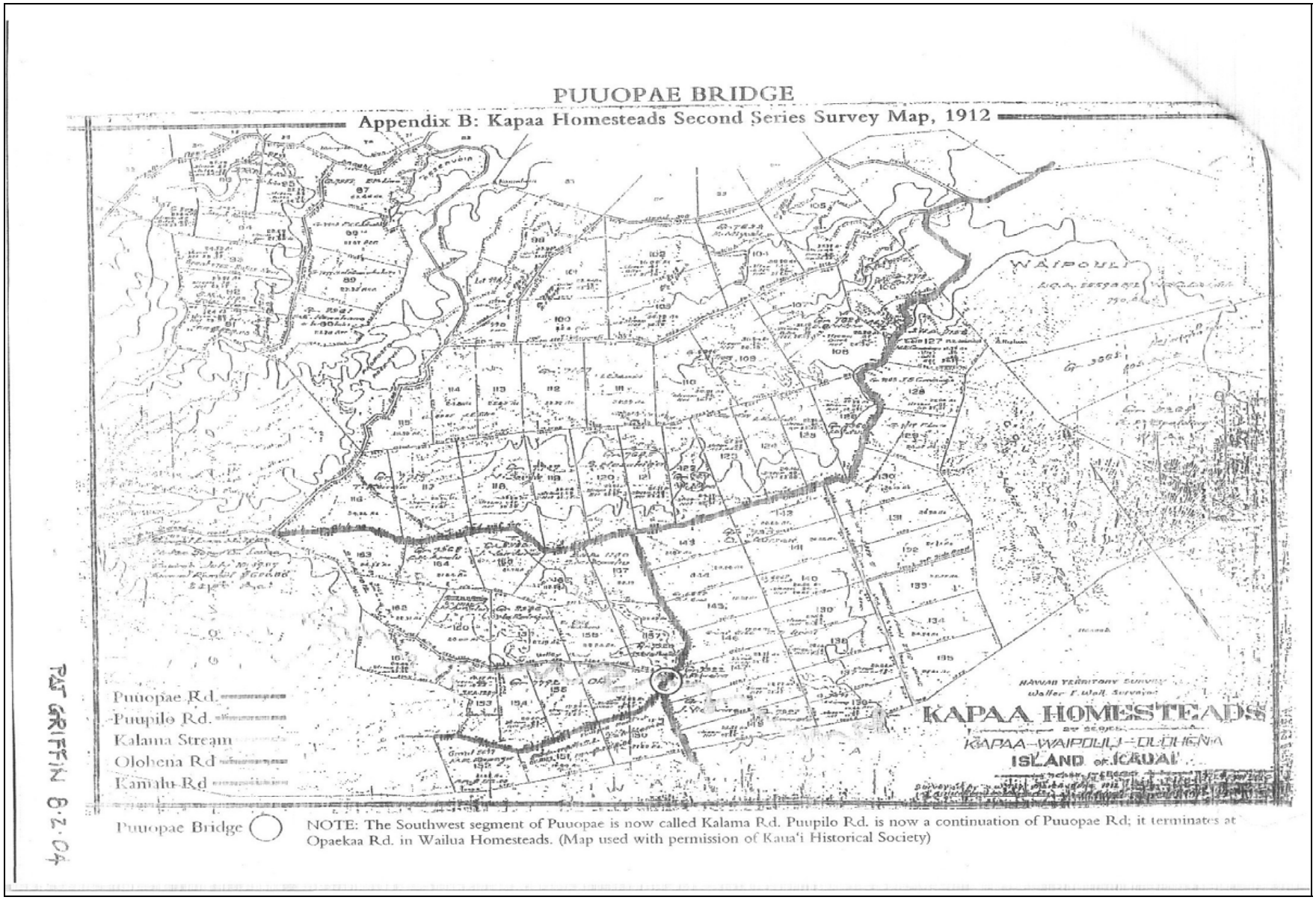
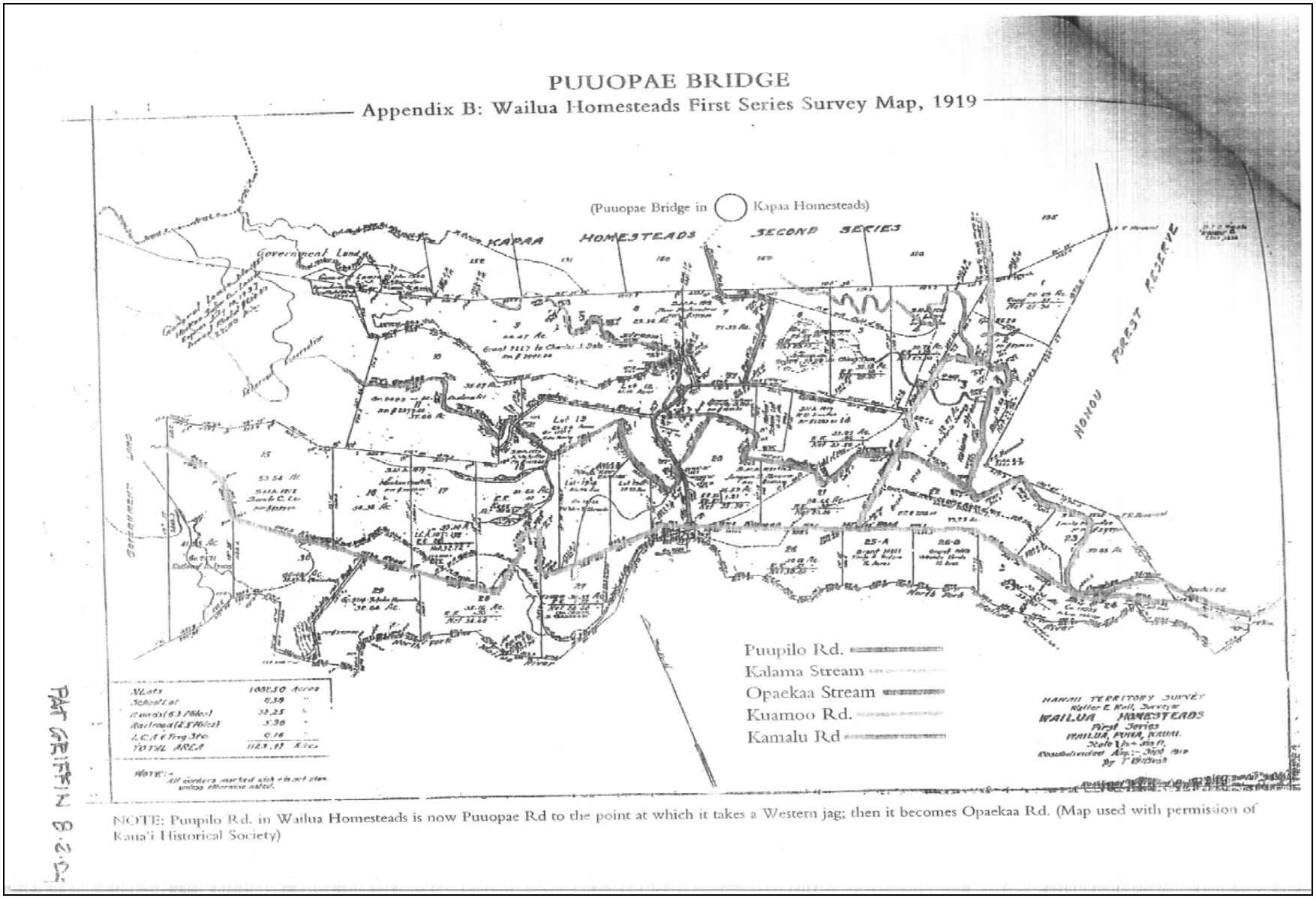


Figure 10: Ca. 1912 Map of Kapaa Homesteads Second Series with Pu`u`opae Bridge Location. Credit P. Griffin (2005) National Register of Historic Places, Registration Form.



NOTE: Puupilo Rd. in Wailua Homesteads is now Puuopae Rd to the point at which it takes a Western jag; then it becomes Opaekaa Rd. (Map used with permission of Kaua'i Historical Society)

Figure 11: 1919 Map of Kapaa Homesteads First Series with Pu`u`opae Bridge Location. Credit P. Griffin (2005) National Register of Historic Places, Registration Form.

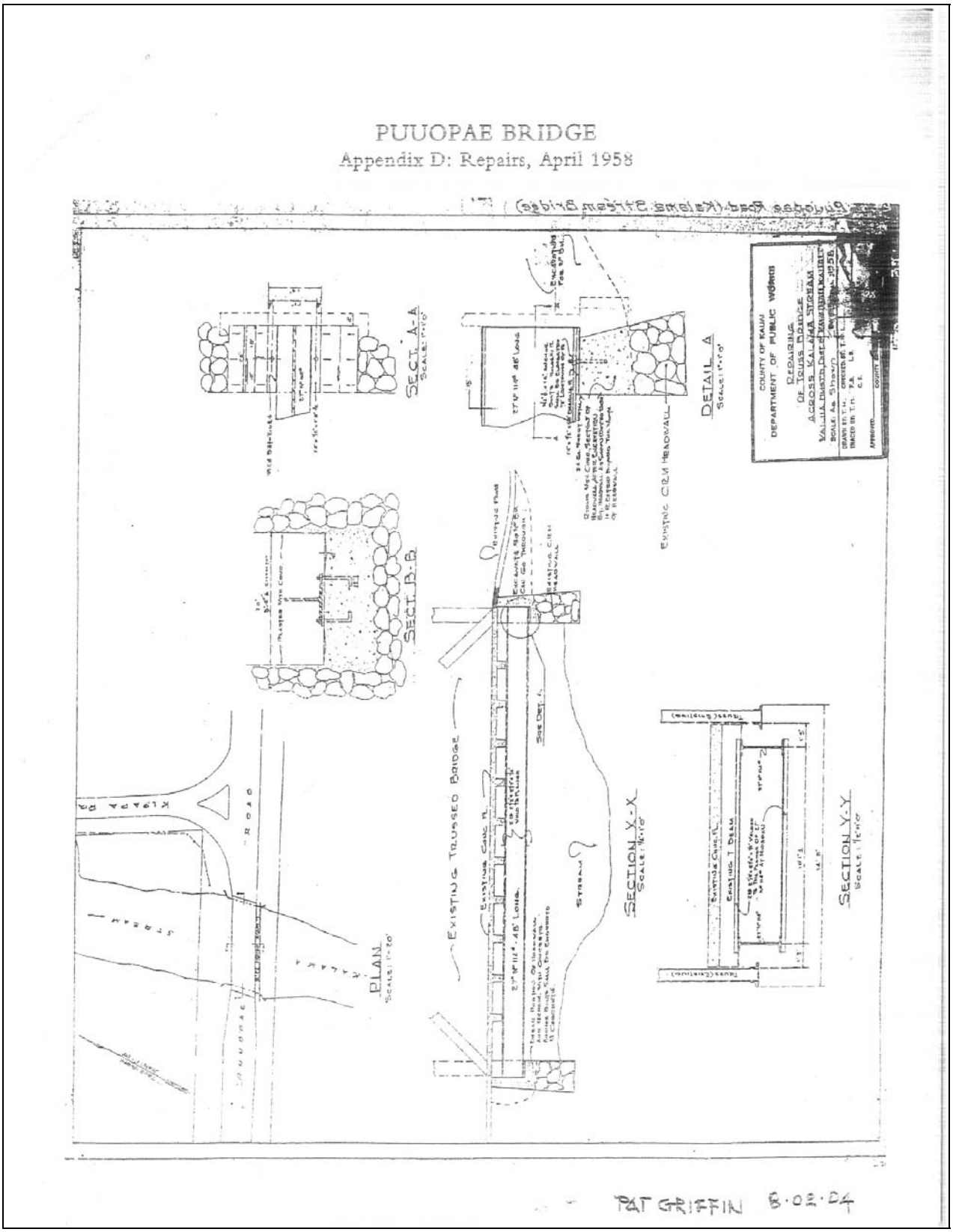


Figure 12: Pu`u`opae Bridge Plans, April 1958. Credit P. Griffin (2005) National Register of Historic Places, Registration Form.

Griffin (2005), in the National Registration form, explains the importance and association of the bridge, especially regarding the homesteaders. To summarize, two years after the Kapaa Homesteads 2nd series was opened to tenancy, the Pu`u`opae Bridge was constructed and provided an integral transportation link that led to the success of the homestead lands. Initially, homesteading was not thought as a highly viable venture by many in the government, most of the homestead lands being controlled at that time (c. 1913) by large businesses and the government. There was opposition to homesteads as some thought this simply a ploy for a land grab, which would remove the lands from the profitable sugarcane industry which the lands were farmed. By 1917, the homesteaders had soundly defeated that argument. Griffin (2005:3) notes that on the Olohena-Waipouli tract, there were ninety homesteaders with 3140 acres who had harvested some 31,500 tons of sugarcane worth an estimated $197,000, a very considerable sum.

The Kapaa Homesteads 2nd series, which was accessed by the bridge, consisted of 81 lots encompassing 17 acres to 41 acres. The lots were sold by lottery on June 28, 1913, with landowners being able to own up to 80 acres of land (original parcel and three adjoining parcels). Homesteaders were required to live and actively cultivate their lands for the first 10 years, with selling and leasing of the lands being forbidden. While homesteaders had finally received land, they had little means to access it. The "roads" were more or less cattle trails accessible mostly by ox carts. To make matters worse, water was unavailable in the homesteads. Available stream water was owned by the Makee Sugar Company, the Governor of Hawai`i, Walter F. Frear, having sold the water rights before the homesteads were opened. Homesteaders would have to pay a monthly rate to use any of the water. Initial homesteading in the area was difficult due to lack of roads and water. However, the homesteaders petitioned the County and government in Honolulu to fix these deficiencies. By 1918, they had formed an association and petitioned for the betterment of the homesteads in Honolulu and at various venues on Kaua`i.

Griffin (2005:4) notes that Pu`u`opae Bridge, and other bridges and roads in the area increased in importance after nearby Wailua Homesteads opened because the Wailua roads did not transverse the land in a typical *mauka-makai* fashion, but rather they were connected to the Kapaa Homestead roads which ran parallel to the slopes, along the base of Nounou Mountain. It was only Olohena Road which allowed homesteaders to meet up with the Belt Road. The Wailua Homesteads themselves were not linked to the Belt

Road until 1936 when `Ōpaeka`a Bridge was constructed and Kuamo`o Road was extended to the coastline.

By 1919, some of the Kapaa Homesteaders were successfully cultivating sugarcane, with many people from surrounding areas filling labor positions on the lands. However, by 1945 homestead cultivation of sugarcane became a difficult venture as sugar prices dropped significantly and small-scale enterprises were difficult to sustain. Griffin (2005:4) states that by the mid-twentieth century mark, many of the Kapaa Homesteaders abandoned the farming lifestyle and took up other occupations. Through time, many of these homestead areas were rezoned for residential use. However, some of the lands adjacent to Pu`u`opae Bridge contain some of the only remaining areas of agricultural lands in the region (Griffin 2005:4).

In all, Pu`u`opae Bridge performed an elevated transportation and communication function for homesteaders from 1915. The bridge itself is one of two bridges on Kaua`i that contain a steel girder floor system (Eleele being the other) and represents a strong relationship with early to mid 20th century land use in the Kapaa homesteads area. As noted in the National Register application (Griffin 2005:7), the bridge is purely a functional structure and has no artistic characteristics.

SIGNIFICANCE ASSESSMENTS

During the current Archaeological Inventory Survey, State Site 50-30-08-9397, Historic-Period Pu`u`opae Bridge, was again re-located. The site has been evaluated for significance pursuant to the National Register of Historic Places, as well as the Hawai`i State Register of Historic Places HAR §13-198 criteria. The five criteria which encompass both the National and Hawai`i registers are classified as follows:

> Criterion a: Site [or structure] is associated with events that have made a significant contribution to the broad patterns of our history;
>
> Criterion b: Site [or structure] is associated with the lives of persons significant to our past;
>
> Criterion c: Site [or structure] is an excellent site type; embodies 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 may lack individual construction;

Criterion d: Site [or structure] has yielded, or has the potential to yield, information important in prehistory or history;

Criterion e: Site has cultural significance; probable religious structures or burials present. (Hawai`i only)

State Site 50-30-08-9397 has been evaluated pursuant to National Register of Historic Places and Hawai`i State Register of Historic Places (HAR§13-198) criteria. The Hawaii State Historic Bridge Inventory and Evaluation (2013) and National Register indicate that the bridge is significant under both Criterion A (events) due to its association with Kapaa Homesteads, and Criterion C (site type) as an example of a steel-truss bridge. This assessment was not altered during the current study.

Archaeological Inventory Survey has been completed and no further archaeological work is recommended. The bridge was entered into the State Register of Historic Places in 2004 as Site 30 08 9397 and the National Register of Historic Places as Site 05000536 in 2005. The period of significance is designated as 1925-1949, 1900-1924 and it is listed as a transportation function (road-related). The area of significance attributed to the bridge includes transportation, social history, community planning and development, commerce, and exploration/settlement. The site was considered as significant per Federal standards under Criterion A, associated with events that have made a significant contribution to the broad patterns of history.

Based on the Spencer Mason architects (1989:217) evaluation, Pu`u`opae Bridge does not have great engineering complexity or artistic value. As such, the ratings for this bridge were not "high" when compared with others. However, the bridge appears to be a good example of the early 20th century-type utilizing materials from an earlier bridge (Wailua River Bridge, 1919) and also has an "interesting" rivet pattern (*ibid*). It is one of three bridges on Kaua`i where metal construction is apparent, the others being S-18 (Hanalei River Bridge) and C-13 (`Ōpaekaa Stream Bridge). While a fairly modest structure, there are those in the community who value the bridge and its contribution to early homesteading in the area.

RECOMMENDATIONS

As stated above, based on the findings of the AIS and the significance evaluations, the AIS has been completed and no further archaeological work is recommended for the current bridge replacement undertaking.

As noted above, community consultation through meetings and a Cultural Impact Assessment have generated much discussion on this undertaking. The current undertaking, listing any alterations and additions to the bridge, are an outgrowth of these meetings and documents. A Section 106 letter has been prepared and submitted to the FHWA and SHPD for comment.

PROJECT EFFECT

As described in the Section 106 letter noted previously, as based upon analysis, site observations, and consultation with the SHPD, KHPRC, HHF, and other interested parties and individuals, the FHWA has determined no adverse effect with the following conditions:

> The end-posts will be repaired only where necessary, cleaned and coated following Preservation Briefs and Secretary of Interior Standards. Determination will be made by consulting structural design engineer, historic architect, County of Kaua`i, and SHPD representatives. Reflectors shall not be placed on the end-posts.
>
> Specs will include benchmark site visits by the above personnel to ensure propr follow through.
>
> Qualified personnel meeting the Secretary of Interior standards for historic architect will be included in the review process.
>
> Above qualified personnel will also be involved in the review of designated submittals by contractor such as shop drawings or request for substitutions, and at key milestones in the construction process.
>
> The SHPD will review at phases, such as 65% design, 100% design, and specifications to ensure the above design direction is followed.

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Meeting notes

A&A JOB NO.: KAI10-03, KAI10-04 & KAI11-02

PROJECT: Rehabilitation/Replacement of the Opaekaa, Puuopae and Kapahi Bridges

DATE/TIME: December 7, 2011 – 5:30 pm

LOCATION: Wailua Homestead Park, Kamalu Rd, Kapaa, HI 96746

SUBJECT: Community Meeting #1

DISCUSSION ITEMS:

PRIOR TO START OF MEETING

- Attendee requested Project Team (PT) explain to audience why community meetings are required.
- Attendee requested PM talk about historic significance of bridge.

START OF MEETING

- PT presented power point presentation
  - Explained PT conducting community meeting for the following reasons:
    - As part of process required to receive federal funding.
    - To receive community concerns/suggestions related to project.
  - Brief history of bridge
    - Year constructed - 1937
    - Year renovated – 1977
    - Bridge materials – Steel girders and timber deck planking
  - Pictures of structural deficiencies observed on bridge members.

- Community questions, comments and suggestions
  - Attendee asked whether bridge girders are part of original construction
    - PT unsure whether girders renovated as part of 1977 work.
    - Attendee stated that if girders replaced as part of 1977 renovation, then bridge may not be considered historic.
    - PT added that according to residences located near the bridge, the original girders remained and deck was replaced.
      - Attendee stated that bridge decks are typically not considered historic since routine maintenance often repaves bridge decks.

- Attendee asked what the bridge's current load rating is and whether structural reports were conducted to determine load ratings.
  - PT stated current load rating is 5 tons
  - PT explained reports conducted in 2007 and 2009 as part of required bridge inspections every two years.
- Attendee asked whether bridge load rating decreased due to corrosion.
  - PT stated that load rating was 7.5 tons in 1990 and decreased to 5 tons in 1998.
- Attendee asked what type of construction would be needed to allow heavier loads to cross the bridge and whether new construction would include 2 lanes.
  - PT explained that these questions are part of PT's next step and current meeting is intended to gather community comments and/or suggestions.
- Attendee stated he has no opinion on whether bridge is one lane or two lane but improved bridge should be able to support emergency vehicles, school buses, etc.
- Attendee explained that bridge has history of being closed during floods and asked what is being considered to fix the problem, such as elevating the bridge or building bridge to withstand flooding.
  - PT explained that all reasonable options will be considered.
- Attendee asked who will make the final decision on bridge layout.
  - PT explained that federal, state, and county will all be involved.
- Attendee questioned how much weight community input will play since federal government would fund 80% of project.
  - PT explained that the community meeting process is a requirement set by the federal government to obtain funding and therefore federal government is very interested in community input.
- Attendees had detailed discussion explaining their understanding of the 106 process and the communities' voice in history and rural characteristics.
  - PT did not comment on discussion between attendees.
- Attendee questioned whether federal government would fund construction of a one lane bridge because previous project was not funded since design was for a one bridge.
  - PT explained that acceptance of one lane bridge will be discussed with the federal government.
  - Another attendee stated that federal government has made a lot of progress toward accepting one lane bridges since last project. Also, mentioned other one lane bridges on Kauai that have been federally funded.
- Attendee asked whether existing bridge is being considered for replacement or reconstruction and if so, he would like to see something other than "a hunk of concrete".
  - PT stated that replacement will be considered as well as multiple bridge materials and designs.
- Attendee quoted statistics regarding one lane bridges having three times more accidents than two lane bridges. Also quoted statistic regarding amount of accidents on project bridge.
  - Another attendee questioned the statistics and requested PT provides statistics on amount of accidents recorded on project bridge.
    - Attendee emphasized that she would like a statistic of accidents actually on the bridge and not a statistic based on a length of road segment.
    - PT acknowledged request.

- Attendee stated that one lane bridges have been identified in county general plan to have important values to community and bridge should keep with rural scale and rural neighborhoods.
- Attendee questioned why Opeakaa, Puuopea and Kapahi bridges chosen and not other bridges in the area whose alignments, in his opinion, are more dangerous.
    - PT explained that the bridge selected for the project has been determined to be structural deficient, whereas other bridges mentioned by attendee have been determined to be functionally deficient. PT then explained that structurally deficient bridges have priority over functionally deficient.
- Attendee questioned why bridge has not been maintained since inspections are done every two years and therefore county would have been aware of its condition.
    - PT acknowledged concern but did not comment on county maintenance.
- Attendee asked whether bridge needs to be on historic registry to be considered historic.
    - PT explained that since the bridge is over 50 years old, its historic significance needs to be explored even if not registered.
- Attendee asked why the county does not just paint the bridge.
    - PT explained that the corrosion to the bridge is too extensive to be fixed by painting.
- Attendee asked if more than one option will be presented to the community.
    - PT explained that multiple options will be presented.
- Attendee asked if PT could inform community if bridge is eligible to be registered as historic at next meeting. Attendee also requested PT share more history of bridge with community at next meeting.
    - PT acknowledged request.
- Attendee asked whether PT will consult with State Historic Preservation Division (SHPD) and/or Kauai Historic Preservation Review Committee (KHPRC) before second community meeting.
    - PT stated that they plan to and are currently trying to get on their agenda.
- Attendee asked when Draft Environmental Assessment (EA) would be published.
    - PT explained current schedule predicts around 3 months however it is dependent on progress of community meetings.
- Attendee asked to clarify whether historical consultant on project team worked for an architecture firm or a structural firm.
    - PT explained that she worked for an architecture firm.
    - Attendee stated that previous project had a historical expert with a background in structural engineering and questioned whether current PT will have someone with these credentials.
        - PT explained that separate consultants are on PT for structural and historical considerations.
        - Another attendee stated that historical consultant on PT had previously worked for SHPD for over 10 years and feels she is very qualified. He also mentioned that SHPD typically uses architects.

END OF MEETING

Meeting notes

PROJECT: Rehabilitation/Replacement of the Opaekaa, Puuopae and Kapahi Bridges

DATE/TIME: December 8, 2011 – 3:30 pm (Kapahi Bridge on agenda only)

LOCATION: Kapaa Middle School Cafeteria

SUBJECT: Community Meeting #1

DISCUSSION ITEMS:

PRIOR TO START OF MEETING

- Attendee requested Project Team (PT) explain to audience why community meetings are required.
- Attendee requested PM talk about historic significance of bridge.

START OF MEETING

- PT presented power point presentation
    - Explained PT conducting community meeting for the following reasons:
        - As part of process required to receive federal funding.
        - To receive community concerns/suggestions related to project.
    - Brief history of bridge
        - Year constructed - 1937
        - Year renovated – 1977
        - Bridge materials – Steel girders and timber deck planking
    - Pictures of structural deficiencies observed on bridge members.

- Community questions, comments and suggestions
    - Attendee asked whether bridge girders are part of original construction
        - PT unsure whether girders renovated as part of 1977 work.
        - Attendee stated that if girders replaced as part of 1977 renovation, then bridge may not be considered historic.
        - PT added that according to residences located near the bridge, the original girders remained and deck was replaced.
            - Attendee stated that bridge decks are typically not considered historic since routine maintenance often repaves bridge decks.
    - Attendee asked what the bridge's current load rating is and whether structural reports were conducted to determine load ratings.
        - PT stated current load rating is 5 tons
        - PT explained reports conducted in 2007 and 2009 as part of required bridge inspections every two years.
    - Attendee asked whether bridge load rating decreased due to corrosion.
        - PT stated that load rating was 7.5 tons in 1990 and decreased to 5 tons in 1998.

- Attendee asked what type of construction would be needed to allow heavier loads to cross the bridge and whether new construction would include 2 lanes.
    - PT explained that these questions are part of PT's next step and current meeting is intended to gather community comments and/or suggestions.
- Attendee stated he has no opinion on whether bridge is one lane or two lane but improved bridge should be able to support emergency vehicles, school buses, etc.
- Attendee explained that bridge has history of being closed during floods and asked what is being considered to fix the problem, such as elevating the bridge or building bridge to withstand flooding.
    - PT explained that all reasonable options will be considered.
- Attendee asked who will make the final decision on bridge layout.
    - PT explained that federal, state, and county will all be involved.
- Attendee questioned how much weight community input will play since federal government would fund 80% of project.
    - PT explained that the community meeting process is a requirement set by the federal government to obtain funding and therefore federal government is very interested in community input.
- Attendees had detailed discussion explaining their understanding of the 106 process and the communities' voice in history and rural characteristics.
    - PT did not comment on discussion between attendees.
- Attendee questioned whether federal government would fund construction of a one lane bridge because previous project was not funded since design was for a one bridge.
    - PT explained that acceptance of one lane bridge will be discussed with the federal government.
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- Attendee quoted statistics regarding one lane bridges having three times more accidents than two lane bridges. Also quoted statistic regarding amount of accidents on project bridge.
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        - Attendee emphasized that she would like a statistic of accidents actually on the bridge and not a statistic based on a length of road segment.
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- Attendee stated that one lane bridges have been identified in county general plan to have important values to community and bridge should keep with rural scale and rural neighborhoods.
- Attendee questioned why Opeakaa, Puuopea and Kapahi bridges chosen and not other bridges in the area whose alignments, in his opinion, are more dangerous.
    - PT explained that the bridge selected for the project has been determined to be structural deficient, whereas other bridges mentioned by attendee have

been determined to be functionally deficient. PT then explained that structurally deficient bridges have priority over functionally deficient.

- Attendee questioned why bridge has not been maintained since inspections are done every two years and therefore county would have been aware of its condition.
  - PT acknowledged concern but did not comment on county maintenance.
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  - PT explained that since the bridge is over 50 years old, its historic significance needs to be explored even if not registered.
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  - PT explained that she worked for an architecture firm.
  - Attendee stated that previous project had a historical expert with a background in structural engineering and questioned whether current PT will have someone with these credentials.
    - PT explained that separate consultants are on PT for structural and historical considerations.
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END OF MEETING

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Meeting notes

A&A JOB NO.: KAI10-03, KAI10-04 & KAI11-02

PROJECT: Rehabilitation/Replacement of the Opaekaa, Puuopae and Kapahi Bridges

DATE/TIME: April 11, 2012 – 3:30 pm

LOCATION: Kapaa Middle School Cafeteria

SUBJECT: Community Meeting #2

REFERENCES: *Puuopae Bridge Replacement/Rehabilitation Opaekaa Bridge Replacement Community Meeting Agenda, Sign-In Sheet*

DISCUSSION ITEMS:

1. Project Team Presentation
   A. 3:30pm – Allan Smith
      i. Called meeting to order
      ii. Introduction of project and describe the meeting agenda
   B. 3:35pm – Tonia Moy
      i. Section 106
   C. 3:43pm – Ron Terry
      i. Early Consultation Letter
   D. 3:44pm – Michael Dega
      i. Opaekaa Bridge History
   E. 3:48pm – Tonia Moy
      i. Opaekaa Bridge key architectural features
   F. 3:50pm – Mike Hunnemann
      i. Opaekaa Bridge design options
   G. 3:59pm – Michael Dega
      i. Puuopae Bridge History
   H. 4:02pm – Tonia Moy
      i. Puuopae Bridge key architectural features
   I. 4:03pm – Mike Hunnemann
      i. Puuopae Bridge design options
   J. 4:07pm – Michael Dega
      i. Kapahi Bridge History
   K. 4:09pm – Tonia Moy
      i. Kapahi Bridge key architectural features
   L. 4:13pm – Mike Hunnemann
      i. Kapahi Bridge design options

2. Comments and suggestions from community
    A. Jack Baird had concern about the multiple supports and floating debris damaging new bridges.
        i. Asked if Project Team worried about extreme high water flows and whether deck will be raised so a 300 year event will flow under it, including trees that will carried with that event.
            a. Mike Hunnemann answered and addressed all three bridges, explained that West Consultants will be determining the 100 year high water mark for all three bridges.
            b. Also explained that due to the close vicinity of Kapahi Bridge to Kahuna Road, the bridge cannot be raised without extensive measures, so the bridge will be designed to withstand flooding.
            c. For Opaekaa and Puuopae, after obtaining results of the hydraulic study, if the bridges are within that high water mark and there is the ability to raise the deck it will be considered.
    B. Ken Taylor asked whether load rating will be the same for both one lane and two lanes.
        i. Mike Hunnemann verified, yes.
            a. Resident had concern about option of parallel bridge because existing bridge already has a lack of maintenance and adding a second bridge would require additional maintenance.
            b. Resident recommends only having one bridge.
    C. Carol Beardmore would like to retain as much of the original bridge as possible and would like 1-lane bridges, believes one-lane bridge has traffic calming effect.
        i. Feels one-lane bridge fits the character of the community.
        ii. Stated that cars speed down toward Puuopae Bridge and the narrow bridge slows them down. She feels a two-lane bridge will allow cars to speed through faster.
        iii. Stated that people are really good about being courteous about stopping and allowing cars and people to cross safely.
        iv. Keep the country, country.
    D. Phil Tacbian concern is for safety and the safety of the people using the bridge.
        i. Recommends two lane bridges because feels it is safer.
        ii. Also states he is for replacing the bridges.
        iii. His family has lived here for four generations and still has four generations residing here.
    E. Marge Freeman would like 1 lane bridge and believes accident data is inaccurate because some of the data taken is from accidents 2 miles away from the bridge.
        i. Mentioned she walks over the bridges and walks down the middle so cars will see her. She said she has never had a problem.
    F. Lou Nishida Jr. stated that he was 5th generation and would like two lane bridge. He appreciates the historic aspect but feels that preserving it as-is compromises safety. County can put in speed humps for traffic calming.
    G. Jeff Weiss from the Fire Department asked to clarify that all options will raise the load rating so that fire trucks can cross.
        i. Mike Hunnemann confirmed, yes.
            a. Follow-up, attendee stated that that was his only concern.
    H. Tommy Noyes works for DOH and encourages people to be more active by walking and biking and states that vehicle speeds are primary factor in automobile pedestrian fatality and the slower the vehicle is traveling the lower the likelihood of a fatality.
        i. Believes 1 lane bridge is natural traffic calming and slows vehicle speeds and therefore safer.

ii. Agrees with bridges being able to carry emergency vehicles and maintain historical integrity.

I. James Aiu feels that 1-lane bridges cause problems because some people do not know it is 1-lane and try to cross at the same time. Mentioned that he has had to stop and reverse off the bridge on a couple of occasions.

J. Katherine Musik in favor of recycling parts.
   i. Will concrete rail be high? Attendee likes to look over bridge when crossing.
      a. Mike explained that rails do not need to be replaced with concrete railings, they can be replaced with metal railings. If they were concrete they would be 2 to 2.5' high and have arch openings.

K. Kip Goodwin likes Option 2 for Opaekaa and Option 1 for Puuopae.
   i. In favor of 1-lane bridge.

L. Jack Baird suggested that any exposed or concrete encased steel be galvanized?
   i. Mike Hunnemann confirmed, yes all steel will be galvanized.

M. Ray Carpenter feels Puuopae should be two lanes because Kalama Road is higher and sight distance is a problem
   i. Bridge should be raised to be same eye level as cars coming off Kalama Road.
   ii. Opaekaa should be Option 2 and stay 1-lane.
   iii. Likes Option 1 for Kapahi, 1-lane.

N. Mark Marshall, civil defense administrator, would like something done about safety.
   i. Concern for personal safety and families' safety and would like to know that emergency vehicles can get to him.
   ii. States traffic calming, rural character and visual aesthetics are important to him but should be weighed along with safety.
   iii. States school buses must take a 3 mile detour.
   iv. People speed over 1-lane bridges and they no longer serve their function.
   v. He is local farmer and has looked at alternative routes in the event these bridges close, stated that it would cost him millions of dollars if bridge closed.
   vi. Traffic calming is an enforcement problem and can be handled in ways other than 1-lane bridges.
   vii. Supports 2-lane bridges.
   viii. Does not feel Kapahi should be relocated.

O. Marge was concerned that the bridge girders are in the water.
   i. Mike Hunnemann clarified that the girders are above the water level.

P. Attendee asked that others not blame two-lane bridges for concerns of speed and safety.

Q. Randy Blake stated that traffic calming is something that engineers design into the roadway to slow traffic down.
   i. Mentioned County does not maintain existing bridges.
   ii. Regardless of posted speed limit, people will drive faster on wider roads.
   iii. Believes bridges should be able to carry emergency vehicles and school buses.
   iv. Asked why the Kapahi offset intersection needs to be addressed.
   v. Likes character of Kapahi wooden deck and opposed to concrete.

R. Ken Taylor felt that realigning Kapahi did not make sense due to the limited amount of residences and limited potential for expansion.

S. Pat Griffin stated that the offset intersection at Kapahi is with a private driveway and asked why should the road be realigned to benefit a private entity?
   i. Presented accident statistics that she stated was from the Police department and listed several locations that were far away from the bridges.
   ii. Regarding sight distance at Puuopae and Kipapa, when the Hau trees are maintained you can see just fine.

iii. Stated that safety and historic preservation are important and recommends keeping bridges and replacing Puuopae guardrails with wood, steel backed rails.

T. Lou Nishida explained that in the past the 1-lane bridge served its function because you would rarely need to stop for oncoming traffic, however due to increase in traffic, he now must yield almost every time he crosses.
   i. When the Kapaa Bypass road is closed, the traffic is worse.
   ii. Recommends two-lane bridge.

U. Attendee stated that since aesthetics is great concern perhaps adding timber over modern supports would be a good option.

V. Keith Blake seconds Pat Griffin
   i. Loves all of the bridges and enjoys driving over both Opeakaa and Puuopae bridge.
   ii. Feels Opeakaa is one of most unique bridges on Kauai and entire state, not only for historic value but also artistic feel.
   iii. In favor of rebuilding bridge, every nut and bolt, and rebuilding will allow history and warmth to be preserved for future generations.
   iv. Feels Puuopae should be "beefed" up for emergency vehicles and the guardrails should be replaced.
   v. Questions necessity of upgrading Kapahi because Kahuna road is already served by a large 4 lane bridge that is out of character for the area. That bridge should be able to carry a fire truck.
   vi. Asked why only focusing on these three bridges? Mentioned that at least two other bridges in the area have been left off and should be talked about.
      a. Mike Hunnemann explained that safety is related to strength and each bridge in State have a sufficiency and load rating and based on these factors is why these three bridges are being discussed.
   vii. Questions necessity of sideway on bridges when approaches have no sidewalks.
      a. Attendee opinion is that bridges should not have sidewalks.

W. Attendee pointed out that pedestrians are not necessarily safer on the bridge because of sidewalks since the approaches do not have wide shoulders or sidewalks and already shares the travel lane with vehicles.
   i. In favor of no sidewalks.

X. Sally (last name unknown), 37 year resident, in favor of 1-lane without sidewalks and preserve as many historic elements as possible.

Y. Mark Marshall, pointed out that ambulance exceeds 5 ton rating.

Z. Helen Yahner, in favor of 1-lane bridges for reasons stated and to preserve sense of history and sense of place.

AA. Carol Beardmore feels sidewalks not necessary and in favor of 1-lane.

BB. Randy Blake sees no point in building sidewalks on these bridges and would rather see tax dollars spend to build pathways in other areas.

CC. Jack would like to emphasis that County needs to maintain the bridges because they would not be in these problem if they maintained them.

3. End of Meeting.

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Meeting notes

A&A JOB NO.: KAI10-03, KAI10-04 & KAI11-02

PROJECT: Rehabilitation/Replacement of the Opaekaa, Puuopae and Kapahi Bridges

DATE/TIME: April 11, 2012 – 6:30 pm

LOCATION: Kapaa Middle School Cafeteria

SUBJECT: Community Meeting #2

REFERENCES: *Puuopae Bridge Replacement/Rehabilitation Opaekaa Bridge Replacement Community Meeting Agenda, Sign-In Sheet, Email dated Dec. 30, 2011 from Alvin Takeshita, Email dated April 28, 2004 from Alvin Takeshita, Email dated October 18, 2004 from KC Lum, Traffic Collisions table provided by Pat Griffin.*

DISCUSSION ITEMS:

1. Project Team Presentation
   A. 6:30pm – AlLan Smith
      i. Called meeting to order
      ii. Introduction of project and describe the meeting agenda
   B. 6:34pm – Tonia Moy
      i. Section 106
   C. 6:40pm – Ron Terry
      i. Early Consultation Letter
   D. 6:41pm – Michael Dega
      i. Opaekaa Bridge History
   E. 6:45pm – Tonia Moy
      i. Opaekaa Bridge key architectural features
   F. 6:47pm – Mike Hunnemann
      i. Opaekaa Bridge design options
   G. 6:56pm – Michael Dega
      i. Puuopae Bridge History
   H. 6:59pm – Tonia Moy
      i. Puuopae Bridge key architectural features
   I. 7:00pm – Mike Hunnemann
      i. Puuopae Bridge design options
   J. 7:05pm – Michael Dega
      i. Kapahi Bridge History
   K. 7:07pm – Tonia Moy
      i. Kapahi Bridge key architectural features
   L. 7:08pm – Mike Hunnemann
      i. Kapahi Bridge design options

2. 7:12pm - Comments and suggestions from community
    A. Gail Stevens asked whether histories of accident rates on the bridges are available.
        i. Mike explained that there are various reports available but they are not specific enough to say exactly how many occurred on each bridge.
        ii. Attendee's main concern is safety and prefers 1-lane bridges for all.
    B. Sharry Glass stated that she is a homeowner on Puuopae Place since 1985, she has been walking the streets since then and is very opposed to a 2-lane bridge. She stated that she was under the impression that when something is put on the historic register, it will be preserved "as is" and if reconstructed it would be exactly the same.
        i. She mentioned that it is obvious from damage that the bridges have not been preserved or maintained.
        ii. Attendee expressed concern that existing bridges have not been maintained so if the bridge is changed, attendee asked whether new bridge will be maintained.
        iii. Attendee would also like bike, pedestrian and horse path because there are many joggers and riders.
    C. Glenn Mickens read email correspondences, see attachments.
        i. Emphasized that his main concern is safety.
        ii. Strong proponent for 2-lane bridges over 1-lane bridges.
        iii. Mentioned previous projects from 2004 that were approximately 80% complete when the project was stopped.
        iv. He emphasized that the delays are costing the community more money.
        v. He states that historical importance should never trump safety.
        vi. He stated that email indicates that 1-lane bridges have 2 times more accidents than 2-lane bridges.
        vii. Per email, he states that 50% of 1-lane bridge accidents occur on Hanalei Bridge.
    D. Emery Griffin-Noyes expressed that Puuopae Bridge played a major role in his childhood and early memories.
        i. He played and rode his bike on Puuopae Bridge and was able to do so because of the 1-lane bridge and lifestyle it provides.
        ii. In favor of preserving bridges as much as possible.
        iii. Believes 1-lane bridges make people slow down.
    E. Bill Chamberlain pointed out that traffic over Hanalei Bridge is much higher than these rural bridges.
        i. Bill asked whether there is a traffic study that would justify 2-lanes. He has lived here for a long time and has never had to wait for more than one car. Will the County factor in the additional cost of a two-lane bridge as related to the extra value that it will give in terms of traffic?
            a. Project Team stated that they do not have any at this time.
    F. Nancy Budd asked to clarify that she was also part of the committee that Glenn Mickens referred to and stated that most people wanted a 1-lane bridge.
        i. Attendee stated that at Puuopae Bridge people drive nice and the 1-lane bridge acts as a traffic calmer.
        ii. Prefers 1-lane bridge and preserving history as much as possible.
        iii. Attendee also noted that she could not tell what the proposed rails would look like from the sketches of the options.
    G. Nancy Budd stated that she part of the 2004 effort and mentioned she has meeting minutes from that time and stated that 1-lane bridges were desired almost unanimously by a show of hands. About 90 people were present. TM: F & G are the same person and saying the same thing?

i. Stated that people slow down and drive nice at Puuopae Bridge and she feels it is traffic calming.
ii. Preference is to maintain existing bridge to honor cultural history.
iii. Feels 1-lane bridges provide the community with a specific feel.
iv. Opposed to ugly metal bridges and would like designs to reflect history.

H. Lauren Calhoun stated that she wanted to piggy back off Emery's comment and that the bridges were a part of her childhood and collective memory.
i. She stated she went away for college and chose to come back to be part of the community.
ii. Attendee prefers preserving history and cultural integrity.

I. Sally Armstrong stated that she lived in the area for over 25 years on Kalama Road and hears drag racing. She is convinced that if the bridges are 2-lanes people will drive faster and put everyone in jeopardy.
i. Prefers 1-lane for safety.

J. Tommy Noyes stated that he works for DOH and promotes walking and biking. He stated that studies show that vehicle speeds are directly related to pedestrian safety. According to attendee at 20mphs chances of survival are good, at 30mph it is worse and at 40mph is almost always fatal. He feels 1-lane bridges have a traffic calming effect which is safer for pedestrians.
i. Attendee clarified that he is in favor of 1-lane for safety.
ii. In favor of preserving cultural integrity.
iii. Advises against sidewalk on bridges because it will make the bridge appear wider and in return increase vehicle speeds. Also no sidewalks or shoulders are available leading up to bridge.

K. Andy Bushnell stated that they keep coming to these community meetings regarding these bridges and always say they want 1-lane but the County does not maintain so they have to do it over and over.
i. Attendee stated he has been driving the roads for over 40 years and that people always stop at the bridges and say hello and talk story.
ii. Stated he has never seen an accident on the bridge.
iii. Attendee feels bridges are historically valuable.

L. Pat Griffin asked to respond to Glenn's statements and stated that in 2004 86 of 90 voted for 1-lane and a total of 4 people were selected for committee he spoke about, one being herself.
i. Attendee presented figures from the Kauai police department of accident reports between March 2007 and March 2012, see attachment.
a. Attendee stated that several accidents listed occurred a mile or more way from the bridge. She stated that there is not enough data to say whether it is a bridge problem.
b. According to her research, there has only been one fatality in the homestead and it was not on the bridge.
c. Bridges should stay historic and 1-lane.

M. Robby Abrew asked if weight limit increase will allow commercial vehicles to cross and result in more commercial vehicle traffic through the neighborhood.
i. Mike responded that the bridge will designed to carry the load of any legal vehicle on the road.
a. Robby asked if the bridge can have restrictions to prevent commercial vehicles from traveling through neighborhood.
(1) Project Team stated that this would need to be discussed with the County.

N. Rayne Regush stated that safety is important and encourages the consultants to do research on accidents and to be specific to accidents on the bridge and not general vicinity.

O. Michael Fernandes stated that his family has been ranching for over 100 years and bridges are critical to cattle operations.
    i. He stated that he sees the significance of history but feels bridge should be 2-lanes so he can get his farm equipment over. He stated that times changed and equipment has changed and the bridges need to change to accommodate.
    ii. He stated that he sees a lot of road rage, at least once every month or every two week.
    iii. He stated that in 1971 a group of high school kids missed the "Yasutaki" (as known locally) Bridge which resulted in 2 of the 3 dying.
    iv. He stated the bridges may have been adequate in the past but bridges should now be 2-lanes while keeping as historic as possible.
    v. 1-lane bridge does not serve the ranchers and farmers.
P. Attendee asked what the bridge widths are now and what the new bridges will be.
    i. Mike stated the widths of the existing bridges and the new bridge will depend on whether 1-lane or 2-lane is constructed. Mike clarified that a standard lane is 12' wide.
        a. Attendee stated he has no opinion on sidewalks.
Q. Kelly Rice Hudson stated that she would like to keep the bridges as close as possible to existing.
    i. Kelly asked to clarify if all options are concrete but would like Kapahi to be wood.
        a. Mike clarified that all the options presented were concrete.
R. Bob Farias explained that he lived near Kapahi Bridge for past 40 years and the single lane is a problem because if you are on the bridge from Kawaihau Road and another car is on Kahuna Road, there is no place to pull over to allow cars to pass since the approach roadways are also only 1-lane.
    i. Attendee feels the bridge should not be 2-lanes unless the approaches are widened.
    ii. Attendee stated that approaches should have pull-offs for passing.
    iii. Most important part of bridges is weight limits, if they remain 1-lane he would like the weight limit increased.
    iv. Feels Kapahi Bridge could stay "as is" because of another new bridge constructed on Kahuna Road.
    v. Building a new bridge will be difficult because of all the existing water pipes.
S. Rayne Regush stated that she is disappointed with the County's press release because it does not mention that the bridges are historic.
    i. Rayne suggested the project team speak to a specific resident, Joe Preige regarding the history of the bridges.
T. Lelan Nishek stated that he looks at Puuopae Bridge and sees nothing historic about it.
    i. Does not care if 1-lane or 2-lane but cares about the wasted money from 2004.
    ii. Attendee stated that the buses let kids off before the bridges and it is not safe.
    iii. Emphasized that something should be done soon.
    iv. Attendee mentioned that the County should be attendance to hear the community comments.
        a. Mike confirmed that two County officials are present in the audience.
U. Gary Hudson stated that safety is number 1 and is in favor of keeping bridge how they are without sidewalk.
    i. Attendee questioned how the truss can be repaired for use in Opaekaa's option 2.
        a. Mike clarified that some materials will need to replaced but the truss will no longer be a structural member and will be only visual.
V. Gail Stevens stated that she has crossed Puuopae Bridge for 25 years, all conditions and all times of day and she has never seen road rage.
W. Sharry Glass noted that based on Glenn's emails, 50% of 1-lane bridge accidents occur on Hanalei Bridge and 1-lane bridges have 2 times more accidents than 2-lane bridges, so if you eliminate the Hanalei accidents, 1-lane vs 2-lane accidents are essentially even.

i. Attendee stated that the road leading to Puuopae bridge is steep and people slow down because of the 1-lane bridge and that won't happen with two lanes.
ii. Mentioned the farmer's statement regarding 2-lanes, she wanted to clarify that 1-lane or 2-lane will allow his farm equipment to cross.

X. Pat Griffin clarified that every option, regardless of 1-lane or 2-lane, will carry 36 tons.
i. Mike clarified that it will be strong enough to carry any legal vehicle.

Y. Michael Fernandes would like bike or horse lane and disagrees that 1-lane bridges are safer.
i. Feels 1-lane bridge is not a consensus and states he has talked with many people in favor of 2-lanes

Z. Attendee asked how long after this information gathering will anything will happen.
i. Mike stated that money is available for two of the bridges.

AA. Pat Phung from FHWA addressed the community and explained the process they are participating in.

BB. Attendee asked if anyone knows what the original rails for Puuopae look like.
i. Tonia clarified that based on nomination for the Historical register, it was once a truss but in 1958 it was changed to a wood railing girder system.
a. Attendee asked whether the design will reflect their history with wood rails or truss.
(1) Tonia asked Emery Griffin if he remembered what railing was in place when he was a child.
(A) Emery did not recall.

CC. Nancy Budd suggested a compromise and placing pedestrian and bike path on outside of bridge.

DD. Nancy Budd stated that it was unfortunate that the 2004 plans were never built but she stated the design was 32' wide and she feels the community can now move forward with something that fits the community.
i. Attendee stated that she feels safer on a single lane bridge.
ii. Attendee stated that the Puuopae bridge approaches need more work.

EE. Lelan Nishek mentioned that part of road shoulder of Puuopae road washed away and the County had fixed it by placing gravel. He feels the shoulder needs to be stabilized.

FF. Glenn Mickens repeated portions of his previously read email and emphasized portions that stated the accident data represents those only on the bridge.
i. Attendee asked for estimate on how long before bridge is constructed.
a. Project Team stated that it is too premature provide an estimate.
ii. Attendee suggested use of ACRO Bridge because it would be much cheaper.
a. Project Team acknowledged suggestion.

GG. Gina Caliendo stated she is for 1-lane, no pedestrian path and remain historic.

HH. Attendee asked whether money is allocated for maintenance.
i. Mike explained that design and construction of these bridges are different funding sources than maintenance. Maintenance will depend on the County.

II. Attendee stated that based on the age of the bridges, they must have been built well to last so long.

JJ. Eve Salomon asked to take a hand vote.
i. Project Team asked not do so and that all the comments are noted and will considered.
ii. She stated she wants 1-lane.

KK. Michael Fernandez stated that he has concerns that all the options have steel and steel maintenance is a nightmare.
i. Mike Hunnemann clarified that all steel will be galvanized.

3. End of Meeting.

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MEETING NOTES

A&A JOB NO.: KAI10-03, KAI10-04 & KAI11-02

PROJECT: Rehabilitation/Replacement of the Opaekaa, Puuopae and Kapahi Bridges

DATE/TIME: November 20, 2013 – 5:30 pm

LOCATION: Kapaa Middle School Cafeteria

SUBJECT: Community Meeting #3

REFERENCES: Glenn Mickens Testimonial

DISCUSSION ITEMS:

1. Project Team Presentation
   - A. 5:35pm – Allan Smith
     - i. Called meeting to order
     - ii. Introduction of project and describe the meeting agenda
     - iii. Project background
       - a. Previous meetings
       - b. Project team to present findings
   - B. 5:36pm – Tonia Moy
     - i. Overview of Federal Process
       - a. Section 106 process
     - ii. Recapped community input from previous meetings
     - iii. Informed community that current meeting is intended to complete Section 106 process
     - iv. Presented findings of Traffic Study
       - a. Existing 1-lane bridges provide a service level of "A"
       - b. 1-lane bridge will still provide service level "A" based on projected developments
   - C. 5:42pm – Mike Hunnemann
     - i. Presented Opaekaa findings
       - a. Provided description
       - b. Presented 1-lane bridge design
       - c. Presented Area of Potential Effect (APE) & staging areas
       - d. Section 106 determination
         - (1) Anticipating a determination of "No Adverse Effect" with conditions.
         - (2) Presented conditions to obtain determination.
       - e. Opaekaa Q&A (see comments section below)
   - D. 6:03pm – Mike Hunnemann
     - i. Presented Puuopae findings
       - a. Presented 1-lane bridge design

b. Presented Area of Potential Effect (APE) & staging areas
c. Section 106 determination
(1) Anticipating a determination of "No Adverse Effect" with conditions.
(2) Presented conditions to obtain determination.
d. Puuopae Q&A (see comments section below)

E. 6:13pm – Mike Hunnemann
i. Presented Kapahi findings
a. Presented 1-lane bridge design
b. Presented Area of Potential Effect (APE) & staging areas
c. Section 106 determination
(1) Anticipating a determination of "No Adverse Effect" with conditions.
(2) Presented conditions to obtain determination.
d. Kapahi Q&A (see comments section below)
ii. Presented anticipated design and construction schedules

F. 6:23pm – General Question & Answer Session (see comments section below)

G. 6:54pm – End of Meeting

2. Questions from Community
(NOTE: "C" will indicate "Community Member" and "P" Project Team

A. C – Stated that the change in structural system from steel to concrete could be a significant effect on the bridge.
i. P – Acknowledged, then stated that project team has already met with the SHPD and KHPRC and HHF and they indicated that they would concur with the "no adverse effect with conditions" determination.
ii. C – Asked if FHWA had submitted an official letter requesting determination.
iii. P – No, will be submitted after community meetings complete.
iv. C – Stated that Opaekaa Bridge has an interesting history and whether a plaque describing the bridge's history could be placed at the bridge to mitigate the negative effect.
v. P – Acknowledged request.

B. C – Asked about the thought process on the placement of the "bike sharrows" on the bridges.
i. P – Placement of sharrows not finalized. Intended to alert drivers that bicyclists may also use the bridge.
ii. C – Questioned the use of two sharrows showing travel in opposing directions. Believes it indicates two way traffic on a 1-lane bridge and believes it is confusing. Suggested placing sharrow along centerline of bridge.
iii. P – Acknowledged concern and will take into consideration during the design process.
iv. C – Questioned use of sharrow because it indicates that drivers must share the road with bicyclist and the bridge is not wide enough for a vehicle and bicyclist side-by-side.
v. P – Stated that they believe the use of sharrow indicates that the bicyclist has the right to use the entire lane. Will verify during design process.
vi. C – Asked if there will be signs indicating bike use.
vii. P – Yes, signs can be installed to alert drivers.
viii. C – Reiterated other members comment on placing the sharrow on the centerline

C. C – Will there be signs indicated a 1-lane bridge.
i. P – Yes.

D. C – Mentioned that at a previous meeting a vote was taken and a 2-lane bridge won the vote.

i. P – The vote was not to decide the design
ii. C – Expressed disapproval

E. C - Why is Puuopae steel but Opaekaa concrete?
   i. P – Puuopae is shorter so a steel design could be used to better match the existing look.
   ii. C – Was the decision to use steel based on the historical aspects even though there are maintenance issues?
   iii. P – Yes, steel was used based on the historic characteristics and design considerations.

F. C – Will intersection of Puuopae and Kipapa Rd's grade be fixed? There is an elevation change of 3 to 5-ft that makes it hard to see cars.
   i. P – Acknowledged and will verify sight lines and distances during design.

G. C – What is approximate timeline for construction?
   i. P – 12-18 months

H. C – Puuopae staging area on state lands that are lower than road with drainage problems, will the grade be fixed
   i. P – Staging areas will be on road surface and not on the land in question.
   ii. C - Acknowledged

I. C – Are the side railings of Kapahi made of wood?
   i. P – No, galvanized steel painted white.

J. C – How often has Kapahi Bridge been washed out?
   i. P – As recently as last year the railings were washed out.
   ii. C - The wood railings are easily replaced when washed out, how quickly could the steel railings be replaced.
   iii. P – Railings will be designed to withstand flood forces, so they will not need be replaced.

K. C – What is the cost of the bridge?
   i. P – 1.5 to 2.0 Million Dollars

L. C – Testimony by Glenn Mickens (see attached written testimony)

M. C – If bidding is in FY15, does that mean construction starts same year?
   i. P – To date, Kapahi has funding for construction and other two do not. If bid in FY15, Kapahi construction should also begin that year.

N. C – Responded to statement read by Glenn Mickens and stated that most of the community wanted a 1-lane bridge and referred to meetings from 2003. Also stated that the first community meeting, where most of the community wanted a two-lane bridge, had about 11 attendees and was held in the homesteads and she was not aware that the meeting was taking place.

O. Larry Dill – Concurred that most of the community at homestead meeting wanted a 2-lane bridge and in other meetings most wanted 1-lane. Larry also reiterated the federal requirements and process required to obtain federal funding and reiterated traffic study that concluded the 1-lane bridge provides an adequate level of service. He also talked about Consultants being mandated to put in safety features and that the historic review process is required by law.

P. C – Began with disclaimer explain that he works for Public Works but also lives in Kapahi. Talked about Counties plans for "Complete Streets" and that the County is looking at all the island roads and sharing them among bikes and vehicles. Stated he used to be in the 2-lane camp and gave a personal story about his family and emotional connection with 1-lane bridges. Stated that structural solutions look appropriate and asked if a wood-like material could be used on Kapahi so the wood planks would not need to be replaced as they wear.

Q. C – Asked when the draft EA would be published.
   i. P – Kapahi anticipated for Feb. 2014 and noted that would be a State EA, not Federal.
   ii. C - Asked about CAT-EX

iii. P - Federal representatives not in attendance, so Project Team not sure.

R. C - Asked if traffic calming measures leading the bridges have been looked at. State that cars travel at high speeds leading to bridges.
   i. P – Additional measures can be explored and discussed with the County.

S. C – How wide is Puuopae?
   i. P – 12'-6"
   ii. C – Same as now? Should make it a little wider. Can emergency vehicles fit?
   iii. P – Emergency vehicles can fit.

T. C – Surprised Section 106 prevails over community and that safety is not being addressed. Why not make wider for people? Asked is elevation change between bridge and Kipapa Road will be addressed? If it remains 1-lane, fixing the elevation change will make it safer.
   i. C – Stated that road on Kipapa side has a steep drop-off and guardrails should be installed. State the County is wasting money and should spend money more wisely.

U. C – Pleased that the Section 106 process resulted in what community wanted and overwhelming amount wanted 1-lane bridge. Also stated that Kipapa Rd elevation should be addressed.

V. C – State that 1-lane bridges are safe, drivers are not. In future cars will protect us from ourselves and history should be preserved.

W. C – Will powerpoint be online?
   i. P – Yes
   ii. C – County website
   iii. P – Yes

X. C – Drainage a flood problems at Puuopae should be addressed.

Y. C – Gave story about history of bridge and expressed appreciation for making the bridge safe for emergency vehicles and asked to recognize County for hard work.

Z. C – School bus parking should be looked at for bus stop at Puuopae.
   i. P – Can look at and discuss with County

AA. C – Consultant should consider how children will cross Puuopae during construction because parents drop their kids off at the bridge.

3. 6:54 pm - End of Meeting.

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SCS Project Number 1680-2 AMP

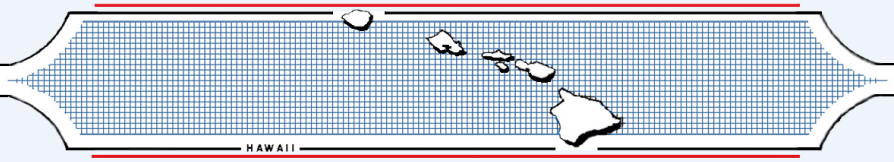
ARCHAEOLOGICAL MONITORING PLAN FOR THE PU`U`ŌPAE BRIDGE REPLACEMENT PROJECT, BRIDGE NUMBER 00744011114400, STATE SITE 50-30-08-9397 WAILUA, SOUTH OLOHENA AHUPUA`A, KAWAIHAU DISTRICT, KAUA`I ISLAND, HAWAI`I [TMK: (4) 4-4-002]

Prepared by:
Michael F. Dega, Ph.D.

Revised September 2015
Draft

Prepared for:
KAI Hawaii, Inc.
31 South Pauahi Street #2
Honolulu, HI 96817

SCIENTIFIC CONSULTANT SERVICES Inc.



1347 Kapiolani Blvd., Suite 408 Honolulu, Hawai`i 96814

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INTRODUCTION

Scientific Consultant Services, Inc. (SCS) has prepared this Archaeological Monitoring Plan (AMP) for the Pu`u`opae Bridge complex in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-4-002] (Figures 1 and 2)]. Monitoring is being conducted in support of the Pu`u`opae Bridge Replacement Project, which is being coordinated and undertaken by the State of Hawai`i Department of Transportation (HDOT) and the County of Kaua`i (landowner). The Federal Highway Administration (FHWA) intends to provide funds for the proposed improvements, and therefore the project represents a federal undertaking (NHPA) in accordance with 36 CFR 800.16(y).

The Area of Potential Effect (APE) for the project consists of 1.1 acres (c. 800 ft on an east-west axis and 300 ft on a north-south axis) and includes the bridge and arterial road corridors which include the paved County right-of-way (Figure 3). The rehabilitation work includes retaining and re-installing existing historic end posts behind the new guardrail, repairing and coating following Preservation briefs and the Secretary of Interior Standards, replacing in-kind of girders, except with an added wing wall to conceal the extra length of the girder from exterior view, and installing of additional girders (as needed), a new deck using embedded transverse concrete beams and rebar, new abutments, and new crash-tested railings in place of the existing W-beams.

Archaeological Inventory Survey (AIS) was recently completed for this project (Dagher and Dega 2014) and accepted by the SHPD on July 22, 2014 (Log No:2014.01964; Doc No:1407MN13). During the Archaeological Inventory Survey, only one historic property (State Site 50-30-08-9397), the Pu`u`opae Bridge itself, was identified (Figures 4 through 7). No other archaeological features or historic structures were identified in the stream bed or along the immediate banks of the stream. The Pu`u`opae Bridge, a one-lane steel bridge, was originally constructed in 1915 and was listed on the State Register of Historic Places in 2004 as Site 30089397 and the National Register of Historic Places in 2005 as Site No. 05000536 (Griffin 2005). The bridge is in visibly poor condition and was manufactured in a somewhat unique fashion. The bridge end posts originated from the old Wailua River Bridge (1919), while other portions of the original bridge were replaced by the County in 1958 (Griffin 2005).

Archaeological monitoring has been recommended during any ground altering work in the project area. The SHPD did not require monitoring for this project. Monitoring was recommended by the client as no subsurface testing was conducted in the project area during the AIS work. Subsurface testing was not conducted due to the absence of surface historic properties (beyond the bridge itself) and because it was anticipated that the subsurface deposits in proximity to the bridge were disturbed

during construction of the roadways and bridge piers. The current archaeological monitoring will protext or document known or anticipated historic properties, per State Historic Preservation Division (SHPD rules and regulations. This Monitoring program will also ensure that if human remains are identified during subsurface work, appropriate and lawful protocol concerning the Inadvertant Discovery of Human Remains (pursuent to 13-300-40a, b, c, HAR) is followed.

This AMP will require the approval of the SHPD prior to the commencement of any ground altering activities in the project area. The following text provides more detailed information on the reasons for monitoring, potential site types to be encountered during excavation, monitoring conventions and methodology for both field and laboratory work, and curation and reporting.

ENVIRONMENTAL SETTING

LOCATION

Kaua`i, the oldest and fourth largest of the eight main Hawaiian Islands (with land area equaling approximately 1,432 square kilometers), was formed from one great shield volcano (Macdonald and Abbott 1970:458-461). At one time, this vast volcano supported the largest caldera in the islands, horizontally extending 15 to 20 kilometers across. Mount Wai`ale`ale, which forms the central hub of the island, extends 1,598 meters above mean sea level (amsl). Topographically, Kaua`i is a product of heavy erosion with broad, deep valleys, and large alluvial plains.

The project area lies in South Olohena Ahupua`a, Kawaihau District, on the eastern flank of Kaua`i, at c. 320 feet amsl. The area surveyed measured close to 1-acre. South Olohena is one of ten *ahupua`a* located in the area known as Puna Moku during traditional times (Handy and Handy 1972:423). South Olohena is the most southern of Kawaihau District's *ahupua`a* and borders Lihue District. The project area and environs occur in the former Kapaa Homesteads 2nd Series rural residential subdivision that was created in 1913. The area is known as the Kapaa Homesteads at present.

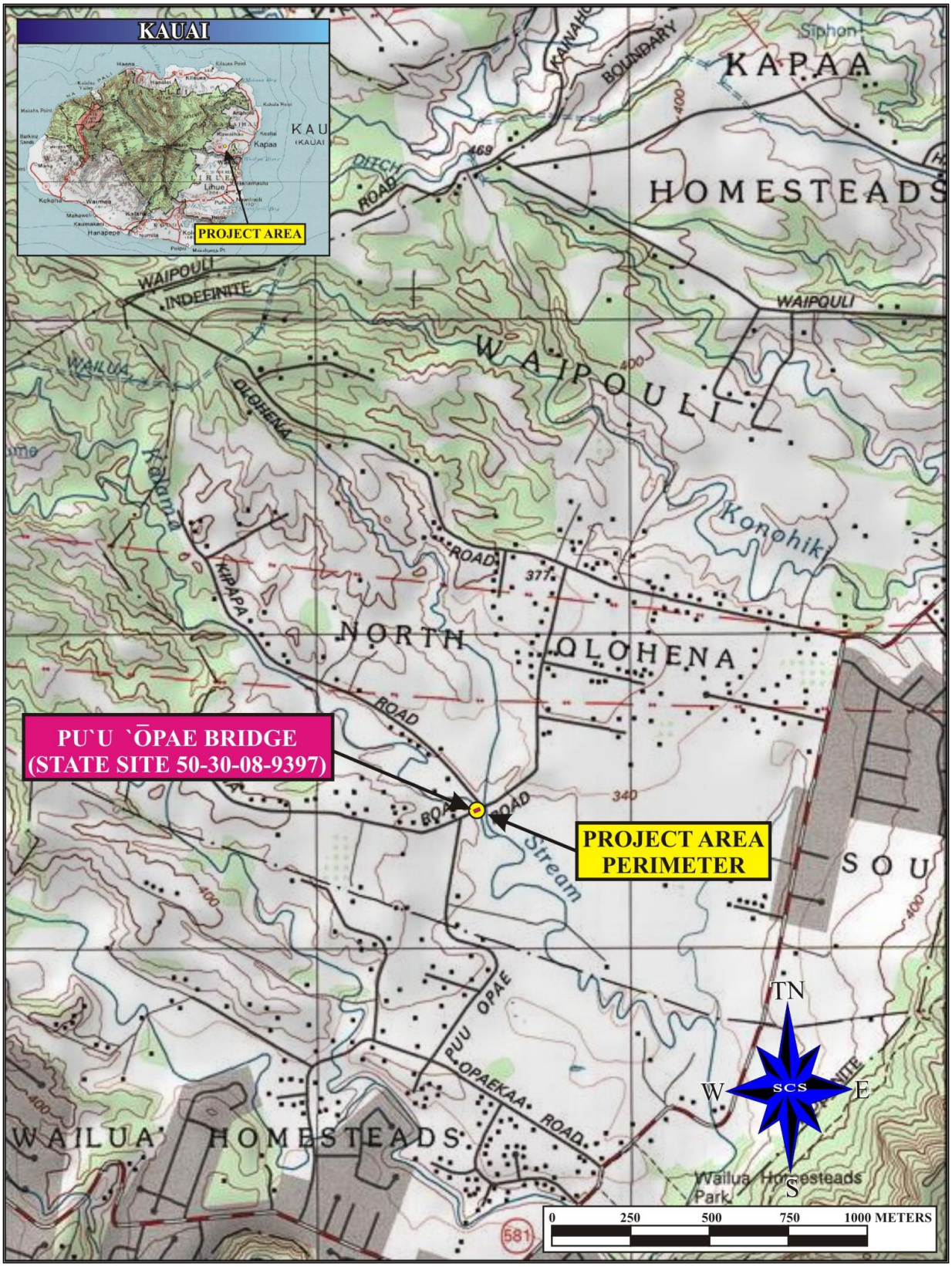


Figure 1: USGS Quadrangle (Kapaa 1996) Map Showing Location of Project Area and State Site 50-30-08-9397.

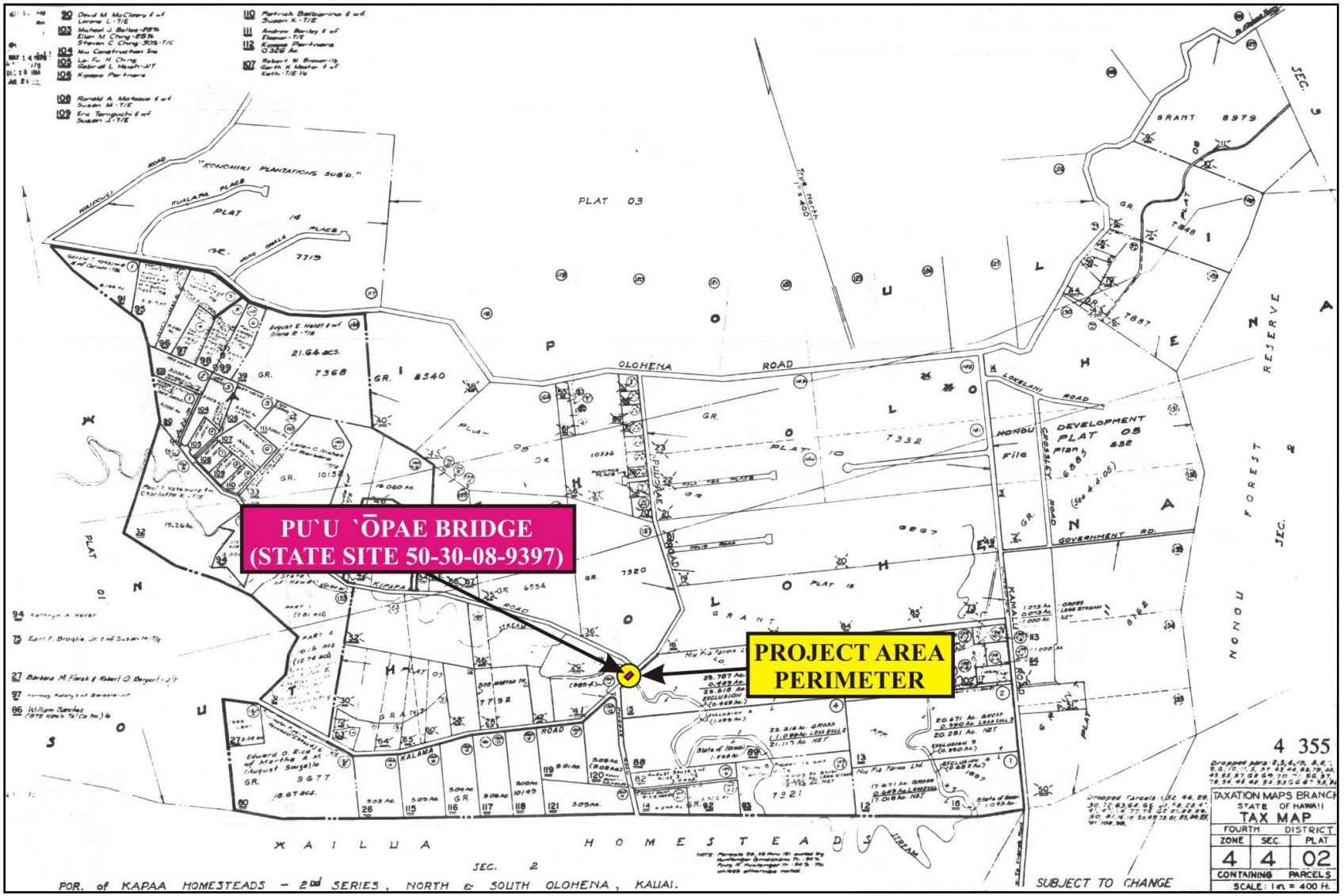


Figure 2: Tax Map Key [TMK: (4) 4-4-002] Showing Location of Project Area and State Site 50-30-08-9397.

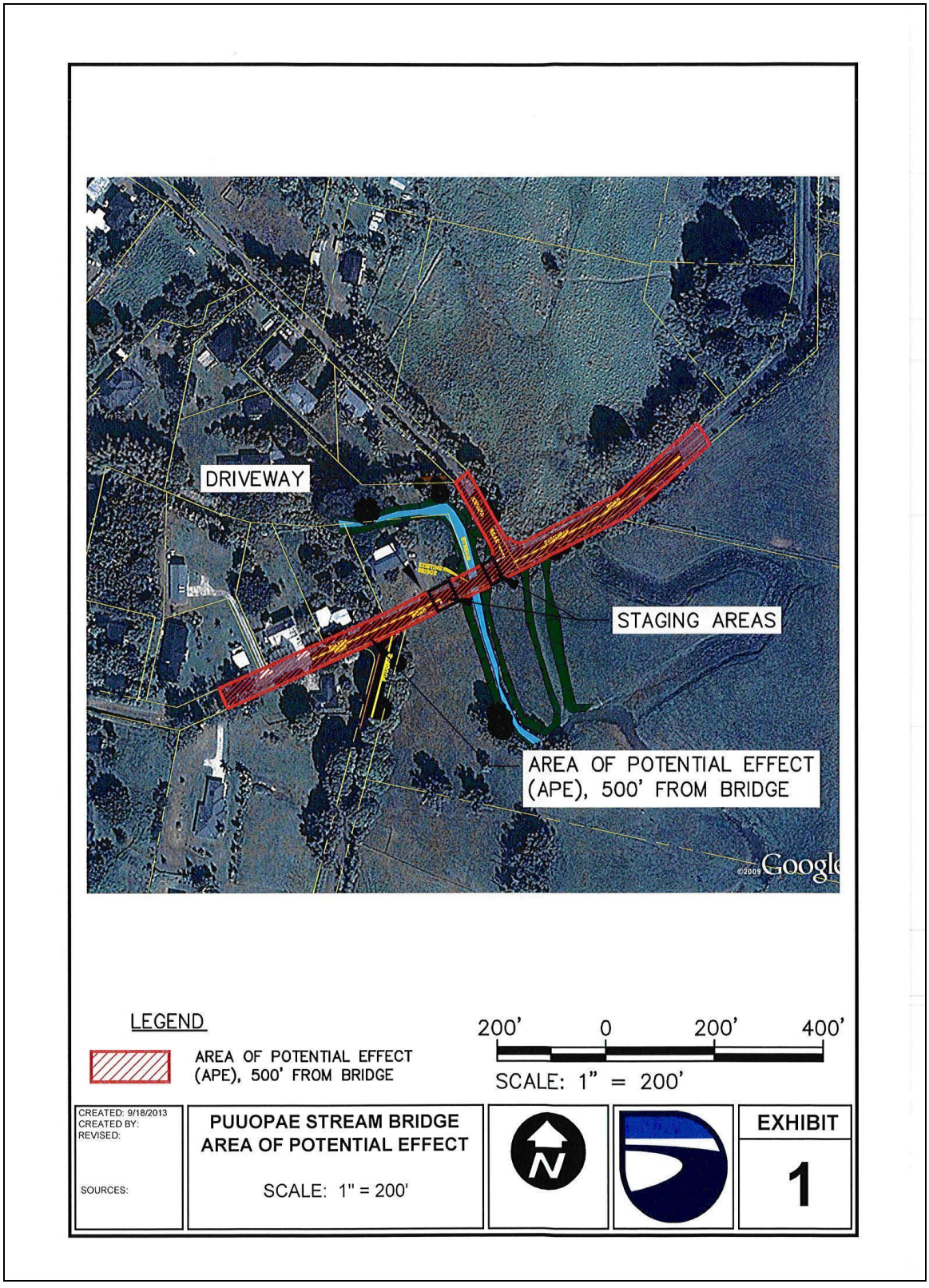


Figure 3: Pu`u`opae Stream Bridge Area of Potential Effect.

Figure 4: Photograph of Pu`u`opae Bridge (State Site 50-30-08-9397). View to South.

Figure 5: Photograph of Pu`u`opae Bridge (State Site 50-30-08-9397) Approach. View to North.

Figure 6: Photograph of Pu`u`opae Bridge (State Site 50-30-08-9397), West Elevation. View to Southeast.

Figure 7: Photograph of Pu`u`opae Bridge (State Site 50-30-08-9397), East Elevation. View to Northeast.

Pu`u`opae Bridge crosses Kalama Stream, a west to east tending stream that converges with `Ōpaeka`a Stream about a mile from its origination source. The stream had only limited flow on the day of fieldwork and measured approximately 12-15 feet wide, a bit wider on the western flank where water had pooled. The bridge runs across Pu`u`opae Road, which spans Kalama Stream. Kīpapa Road is perpendicular to Pu`u`opae Road and parallel to the stream. A small, modern concrete culvert is present slightly upstream from the bridge, adjacent to Kīpapa Road. The northern flanks of the bridge contain existing roads and a residence on either side of Pu`u`opae Road. Beyond the eastern flank of the bridge, pasture lands are present. To the southwestern flank of the bridge is a residence, and western flank bordered by pasture land and residences. The area surveyed for this study and the area of potential effect includes Pu`u`opae Road and its right-of-way and Kīpapa Road and its right-of-way, with two staging areas on Pu`u`opae Road (see Figure 3).

LANDSCAPE MODIFICATION AND SOIL REGIMES

The current project area, inclusive of the bridge itself, Kalama Stream, and adjacent land bordering the stream and bridge access points, has undergone numerous modifications in the past. Pasture lands flank several sides of the general bridge area, as well as existing residences. Kalama Stream in this section does not flow rapidly and is overgrown with non-native vegetation. Other vegetation in the area around the bridge all consists of introduced trees, shrubs, and grasses. The banks of the stream have been modified by a) bridge construction and b) road construction. A concrete culvert is present on Kīpapa Road, adjacent to the stream, just upstream from the bridge.

Typical soils encountered in the project area are associated with the Lihue Series and Hanamaulu Series (Foote *et al.* 1972: Map Sheet 29). The soils of the Lihue Soil Series consist of well-drained soils located in the uplands of Kaua`i Island, and are formed in materials weathered from igneous rock *(*Foote *et al.* 1972:82). The slope ranges from gentle to steep, and elevations extend from around sea level to 800 feet amsl. Rainfall ranges from 40 to 60 inches annually and the mean soil temperature is 73 degrees Fahrenheit. Silty clays dominate the matrices of this series. The Hanamaulu Series also consists mainly of silty clays which are well-drained soils on stream terraces and steep terrace breaks (Foote *et al.* 1972: 39). These soils developed in alluvium washed from upland soils and would define the soils along Kalama Stream. Natural, associated vegetation typically consists of buffalo grass, pandanus, glenwood grass, *hau*, and morning glory.

CLIMATE

The project area is relatively wet, with mean annual rainfall ranging from 40 to 120 inches annually (Armstrong 1983; Giambelluca *et al.* 1986). During the pre-Contact (pre-1778) Period, a great amount of fresh water would have been locally available in the numerous streams that drain Mt. Wai`ale`ale. Annual air temperatures in the area vary from approximately 50 to 83 degrees (Armstrong 1983).

TRADITIONAL AND HISTORIC SETTING

Approximately 600 years ago, the Hawaiian population had expanded throughout the Hawaiian Islands to a point where large, political districts could be formed (Lyons 1903; Kamakau 1991; Moffat and Fitzpatrick 1995). At that time, Kaua`i consisted of six districts, or *moku*: East and West Kona, Puna, Ko`olau, Halele`a, and Nāpili. Land was considered to be the property of the king or *ali`i `ai moku* (the leader who controls the island/district), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted; his higher chiefs received large parcels from him, and in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku, ahupua`a, `ili or `ili`āina* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua`a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were, therefore, able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying the needed resources from different environmental zones (Lyons 1875:111). The *`ili* or *`ili `āina* were smaller land divisions next in importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61).

Archaeological settlement pattern data indicates that initial colonization and occupation of the Hawaiian Islands first occurred on the windward shoreline areas around c. A.D. 900, with populations eventually settling into drier leeward areas at later periods (Kirch 1985). Coastal settlement was still dominant, but populations began exploiting and living in the upland *kula* (plains) zones. Greater population expansion to inland areas

did not occur until around the A.D. 12th century and continued through the 16th century. Large scale or intensive agricultural endeavors were implemented in association with habitation. Coastal lands were used for settlement and taro was cultivated in near-coastal reaches and in the uplands.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys, such as those on Kaua`i, provided ideal conditions for wetland *kalo* (*Colocasia esculenta*)—agriculture that incorporated pond fields (*lo`i*) and irrigation canals *(`auwai*). Other cultigens, such as *kō* (sugarcane, *Saccharum officinaruma*), *mai`a* (banana, *Musa sp*.), and *`uala* (sweet potato, *Ipomoea batatas*) were also grown. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985). Agricultural development on Kaua`i was likely to have begun early (A.D. 1100–1300), during what is known as the Expansion Period (Kirch 1985). Coastal zones were utilized for marine resources, habitation, burials, and ceremonial structures often associated with fishing (Bennett 1931). Often, land sections located in back of the shoreline contained pond fields and dunes that were used for sweet potato production (Handy and Handy 1972; Earle 1978). Trails linked the *makai* (coastal) and *mauka* (upland) sections of the *ahupua`a*, allowing easy access to its resources. Other trails skirted the coast, which made communication between *ahupua`a* possible.

TRADITIONAL SETTING

Kaua`i is the fourth largest and the oldest of the main Hawaiian Islands. It is said that many years ago, the fire goddess Pele and her family briefly stopped on Kaua`i to explore the possibility of finding a permanent home. She dug a deep pit, but it was instantly filled with water, so they left Kaua`i and traveled on, and eventually settled in Halema`uma`u, on the island of Hawai`i, where she resides to this day (Beckwith 1976).

Despite Kaua`i Island's separation from the rest of the Hawaiian archipelago (the channel that separates Kaua`i and Ni`ihau from O`ahu is 63 miles wide), the rich variety of topography and climate has been extremely influential in establishing broad settlement patterns (Bennett 1931:4). The varied ecological division of the island, which contains

verdant cliffs, dry and sandy flats, wide river valleys and tracts of fertile soil, provided the opportunities for a wide variety of cultivation.

The place name Pu`u`opae, literally translates to "shrimp hill", an implied stream-fed food resource upland from the coast (Pukui *et al*. 1974:204). Certainly, Kalama Stream contains water along its length garnered from the abundant rainfall of Mount Wai`ale`ale, "the wettest place on earth," with an average of 11,455 mm (451 in) of rain annually (Encarta Geography, online).

Handy and Handy (1972:423) note that the inland portion of Puna District (Kawaihau) contains a number of small streams, such as Kalama Stream, along which small *lo`i* were developed. Bennett (1931:128) states that in the homestead area, many little valleys contain taro terraces. Further, below the mountains, there were extensive flatlands where agricultural terraces irrigated by such streams as Kapahi were located (Bennett 1931:128). The terraces were described as "Single rows of stone mark the divisions with some 2-foot terraces" and designated as Bennett's Site 110 (State Site 50-30-08-110) (Bennett 1931:128). This is also the location of the upper homesteads (Kapaa Homesteads). Bennett's Site 111 (State Site 50-30-08-111), as described by Bennett (1931:128-129) and also occurring in the area (inland and south of Kealia Valley), consisted of a "simple dirt ditch, about 6 feet in width and of varying depths which is traditionally referred to as a Hawaiian ditch."

During the pre-Contact period (prior to 1778), this upper region was marginally settled but contained excellent land for agriculture, it being a product of alluvial deposition from all the streams in the area. Impressive irrigation systems were built on Kaua`i to transport stream water to agricultural fields during traditional times (Handy and Handy 1972; Earle 1978). In 1892, Dole (1916) reported that these ancient agricultural resources of eastern Kaua`i were still functioning, as evident by the extensive ditch irrigation system throughout Wahiawa, Kapa`a, and Kilauea.

Wailua Ahupua`a lies just south of the project area. The Wailua River is the largest navigable river in the state and cuts between two mountains just before the river enters the sea. During the pre-Contact period, the lower portion of this *ahupua`a*, where Wailua Stream meets the ocean. Wailua Nui Hoano (Great Sacred Wailua), as this area was called, was one of the two most sacred areas in the Hawaiian archipelago and was *kapu* (forbidden) to commoners. It was crucial that all the Kaua`i *ali`i* were birthed at the birthstones which were located in an area of Wailua called Holoholokū. During periods

"[w]hen the chiefly class became diminished for some reason, the King selected women of common birth to deliver children at the Birthstones. Legend says such a child would be a chief" (Joesting 1987:5-9). The important role the Birthstones of Holoholukū played during ancient times is exemplified in an ancient chant:

> The child of a chief born at Holoholo-ku is a high chief;
> The child of a commoner born at Holuholu-ku becomes a chief also;
> The child of a high chief born outside of Holoholo-ku is no chief, a commoner he! (Joesting 1987:5–9).

Another measure of importance, at least politically, can be found in the remains of religious features such as *heiau* (ceremonial center). There were approximately nine *heiau* listed in the 1880s between Keālia and Kapa`a, suggesting that this area contained more significance than is presently known (Bushnell *et al.* 2002). Sadly, the location of most of these structures has been lost. Bennett (1931:31) calculated 122 *heiau* on the Island of Kaua`i. No documented *heiau* were recorded in the vicinity of the project area. However, numerous *heiau* were recorded along Wailua River and also in Kapa`a, toward the coastline. Within a radius of approximately one and a half miles from the Wailua River mouth are six important temples and associated sites which have officially been designated a National Historical Landmark (Kirch 1996:16).

HISTORIC SETTING

The first recorded Western contact in the Hawaiian Islands was made in 1778 on the southern coast of Kaua`i (Beaglehole 1967). Waimea, located on the southern side of Kaua`i, was the port of call for many years, leaving the rest of Kaua`i an uncharted territory. Portlock and Dixon visited Waimea in 1786 and in 1787 and John Meares also stopped on his way to Canton in 1787 (Joesting 1987). Captain William Douglas sent two sailors ashore in Waimea to collect sandalwood in 1789, and in 1791, Captain John Kendrick left three men on Ni`ihau to look for pearls and sandalwood. There is no description of the eastern coast until Captain George Vancouver traveled up the coast from Wailua in 1793. As there was no anchorage, he sailed towards Kapa`a, noting that this was: "…the most fertile and pleasant district of the island…" (Joesting 1987).

Much of the knowledge of traditional land use patterns is based on what was recorded at the time of, and shortly after, Western contact. Early records, such as journals kept by travelers and missionaries or Hawaiian traditions that survived long enough to be written down, assist in understanding the past. Protestant missionaries arrived in Hawai`i in April of 1820 and by the end of the year, were settled on Kaua`i. In

1830, as part of the missionary report, a census of individuals living in the *ahupua`a* around the islands was recorded (Schmitt 1973). We are limited to traveler's journals for information concerning descriptions of the general Wailua region.

In 1849, William Patterson Alexander landed at Koloa, Kaua`i where he was to embark over land to the mission houses in Wai`oli:

> May 5. This morning we rose early…A few miles from Wailua, near Kapaa we passed the wreck of a schooner on the beach, which once belonged to Capt. Bernard. It was driven in a gale over the reef, and up on the beach, where it now lies. A few miles further we arrived at Kealia. We had some difficulty in crossing the river at this place, owing to the restiveness of out horses. The country here near the shore was rather uninviting, except the valleys which always contained streams of water….The two peaks of Anahola are quite a landmark to one traveling in this region….[Alexander cited in Kaua`i Historical Society 1991:123].

On his return to Koloa, Alexander traveled back through Keālia:

> …Five miles from Anahola we stopped at Kealia, a picturesque valley containing a beautiful waterfall, to bathe & rest out horses. In leaving the valley, I unfortunately left my spur, & did not think of it till we had ridden nearly a mile. I rode back for it and found it, determined to lose nothing on Kaua`i by carelessness [Alexander cited in Kaua`i Historical Society 1991:129].

Although no people are mentioned, it can be assumed they were there, perhaps more inland, tending to lands worked by their families for generations.

THE MĀHELE

In the 1840s, traditional land tenure shifted drastically with the introduction of private land ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian economy to that of a market economy (Kuykendall 1938 Vol. I: 145; Daws 1968:111; Kelly 1983:45, 1998:4; Kame`eleihiwa 1992:169–70, 176). The Māhele of 1848 divided Hawaiian lands between the king, the chiefs, the government, and began the process of

private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were made available and private ownership was instituted, the *maka`āinana* were able to claim the plots on which they had been cultivating and living, if they had been made aware of the procedures. These claims did not include any previously cultivated but presently fallow land, *`okipū* (on O`ahu), stream fisheries, or many other resources necessary for traditional survival (Kelly 1983; Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent after which they could take possession of the property (Chinen 1961:16).

The current project APE does not itself fall into any LCA's. In researching the Mahele records and previous archival work in the area (Bushnell *et al*. 2004), there was only one LCA awarded for Olohena Ahupua`a (Note: The *ahupua`a* was not divided into North and South Olohena until Historic times). The LCA, 3831, was granted in Olohena Ahupua`a and located inland of Konohiki Stream. The LCA was awarded to Pahuwai, the only one in the *ahupua`a* to receive an award, and consisted of two parcels, one in Olohena `Ili and one in Kuanea `Ili. According to Bushnell *et al*. (2004:17), the award is near the Waipouli boundary, at the flank of the Waialiali marsh. The LCA lists 4 *lo`i* and a house lot.

There is additional information provided from land (boundary) grants and land court applications in Olohena. A majority of these inland claims were associated with streams, where wetland taro was produced. House sites were scattered throughout these agricultural areas (low density). Bushnell *et al*. (2004:14-17) note that the Olohena Ahupua`a is now divided into North and South Olohena as during the *Mahele*, Kiaimoku retained the northern half of Olohena (Grant 3662) while giving up the southern half. This southern area was then awarded to R.P. Spaulding (Grant 5264).

Commercial sugarcane agriculture came to the area during the middle to late 19th century. According to Dorrance and Morgan (2000), for instance, the Kealia Sugar Plantation was in operation from 1869 until 1885. The Makee Sugar Company operated the Kealia Sugar Plantation from 1877 until 1933.

George H. Fairfield, general manager of the Makee Sugar Company, employed the "divide and rule strategy" by hiring a labor force consisting of multinationals which provided for stable work force with little division (Takaki 1983:24). Plantation life for

the workers could be very harsh; when it came to production, workers were treated little better than slaves (Takaki 1983:74).

Around this time (1865), William T. Brigham, future curator of the Bishop Museum, toured Kaua`i on horseback, passing through the inland area on his way to Keālia:

> …After riding through several kukui groves, and over pleasant ridges we came to Kealia, the residence of Mr. Krull. Here I lunched at two o'clock. Many kukui trees were covered with dodder. A few miles beyond we passed a Golgotha, and as we turned towards the shore again, saw a curious hole in the ridge [Anahola Mts.] which comes to an abrupt end here. [Brigham in Kaua`i Historical Society 1991:142].

Historical times for inland South Olohena are most marked by the creation of the Waipouli Homesteads, where Pu`u`opae Bridge is now located. Background research of the area (Spencer Mason Architects 1989) shows 167 lots of Waipouli (called the Kapa`a Homesteads 2nd Series) lands were sold by lottery to homesteaders on April 29, 1913. Two individuals, A. Ohai and M. Ferreira, were awarded the parcels of land on either side of the bridge. At that time, there was little access for the homesteaders to reach their property to build their houses or cultivate, only ox-carts could make the trip; there was also no water availability via pipes and irrigation (Griffin 2005). In 1913, the Governor of Hawai`i, Walter F. Frear, also sold water rights to the Makee Sugar Company, forcing the settlers to pay a monthly rate if they choose to use the water from any stream in the area (Griffin 2005). By 1918, the settlers had secured water rights by petitioning the territory board in Honolulu and by 1919, when the Wailua Homesteads opened, several roads were built in the area: Pu`upilo, Pu`u`opae, and Kamalu (Griffin 2005).

Pu`u`opae Bridge was constructed in 1915, two years after the homestead was opened. By 1917, ninety homesteaders were producing on the Olohena-Waipouli tract of 3,140 acres, and harvested some 31,500 tons of sugarcane worth $197,000 and some pine trees (Griffin 2005). The Makee Sugar Company grew both sugarcane and pineapple in the area, with the Makee train steaming through the homesteads to collect sugarcane from the homesteads and take it to the mill near Kealia.

In 1919, at the mouth of the Wailua River, a new bridge was constructed, the older bridge sections having been removed and "donated" for other small, local bridges in

the area. Sections of the `Ōpaeka`a Bridge and presumably parts of the Pu`u`opae Bridge contain parts of the original Wailua River Bridge. It was during this time period, ca. 1920s, that much road building occurred in both the Waipouli and Wailua Homesteads, this including work on Pu`u`opae Bridge (see below; Spencer Mason Architects 1989).

By the mid-twentieth century, many of the homesteaders were occupied in fields other than agriculture and the homesteads became more residential in nature. As Spencer Mason (1989) and Griffin (2005) note, the lands adjacent to Pu`u`opae Bridge are some of the only remaining areas zoned as "agriculture" in the area.

As discussed below, work on roads and bridges continued, with ca. 1958 being another time when bridges and roads were improved to their current state.

PREVIOUS ARCHAEOLOGY

Previous work has been conducted in the project area vis Archaeological Inventory Survey (Dagher and Dega 2014), minus testing, and within the greater project area. A summary of the AIS results (Ibid.), focused on the history of the bridge, are presented below, followed by a general summary of archaeological work occurring in the vicinity.

The Historic period Pu`u`opae Bridge (State Site 50-30-08-9397) was the only historic property identified in the project area (see Figures 4 through 7). Given the alluvial nature of the stream banks and adjacent flat environs, this area could have formerly been a good place to cultivate taro, as Handy and Handy (1972:423) had noted for the area. However, no evidence for cultivation was evident. Based on historic records and summaries presented by Spencer Mason Architects (1989), Bushnell and Hammatt (1996), and the National Register of Historic Places Registration Form (Griffin 2005), the bridge and homestead area have quite an interesting history.

To recapitulate from the above sources, Pu`u`opae Bridge, often called Kalama Bridge and originally known as Kapaa Homesteads Bridge No. 2, carries Pu`u`opae Road over Kalama Stream in the Kapaa Homesteads (Figures 8 and 9). The bridge is a single lane and measures 48 feet long; the bridge was never expanded beyond 48 feet long. While some conflicting data appears in the references, the bridge appears to have been initially constructed in 1915 (Griffin 2005). Pu`u`opae Road was formally constructed in 1912 when the land tracts were subdivided for settlement in c. 1913. The bridge was

originally trussed (1915) with a concrete-encased steel floor. The truss was removed in 1958 (Figure 10).

Original materials to manufacture the bridge include a concrete deck, steel girder floor system, and sections of the abutments. The endposts were recycled during demolition of the Wailua River Bridge in 1919. The railings of the bridge have been repaired over time. Additionally, in 1958, two 48-foot I-beams were installed below the concrete and steel girder floor for structural support. To install the I-beams, the headwalls above the stone abutments were broken and repaired with concrete. The trusses were likely removed after the I-beam supports were in place. Bridge railings were replaced in 2000 with galvanized W guardrails, these replacing the older wooden rails. Rusting and vehicle collision damage have adversely affected the bridge's workmanship and original appearance.

The bridge has been considered significant due to its historical association with Kapaa Homesteads development in the early 1900s. According to Spencer Mason Architects (1989), Pu`u`opae Bridge is one of only two of its structural type to have a steel girder floor system in the State bridge inventory, the other being the Eleele Pedestrian Overpass. In general, the bridge is a good example of an early 20th century structure that utilizes materials from another, earlier dated bridge (Wailua River Bridge). The report states that while the bridge is "purely functional and has no artistic characteristics" (*ibid*), the pattern formed by the rivets is interesting as it is one of three bridges on Kaua`i where riveted metal construction is visible (Hanalei River Bridge, `Ōpaeka`a Stream Bridge being the other two). The bridge, however, was thought as not especially significant itself due to the lack of engineering complexity and lack of artistic value (*ibid*). The association with Kapaa Homesteads development is quite important, however.

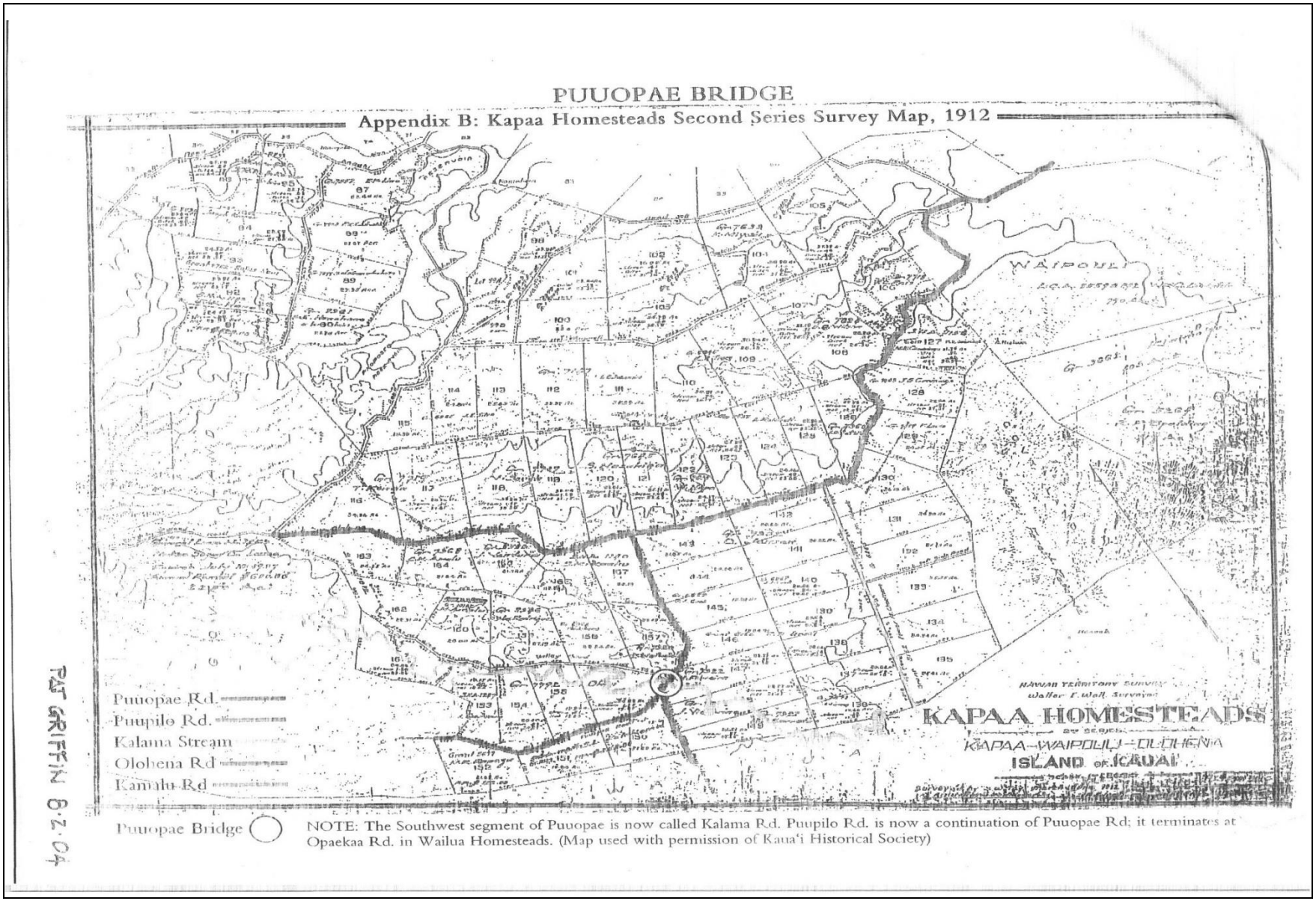
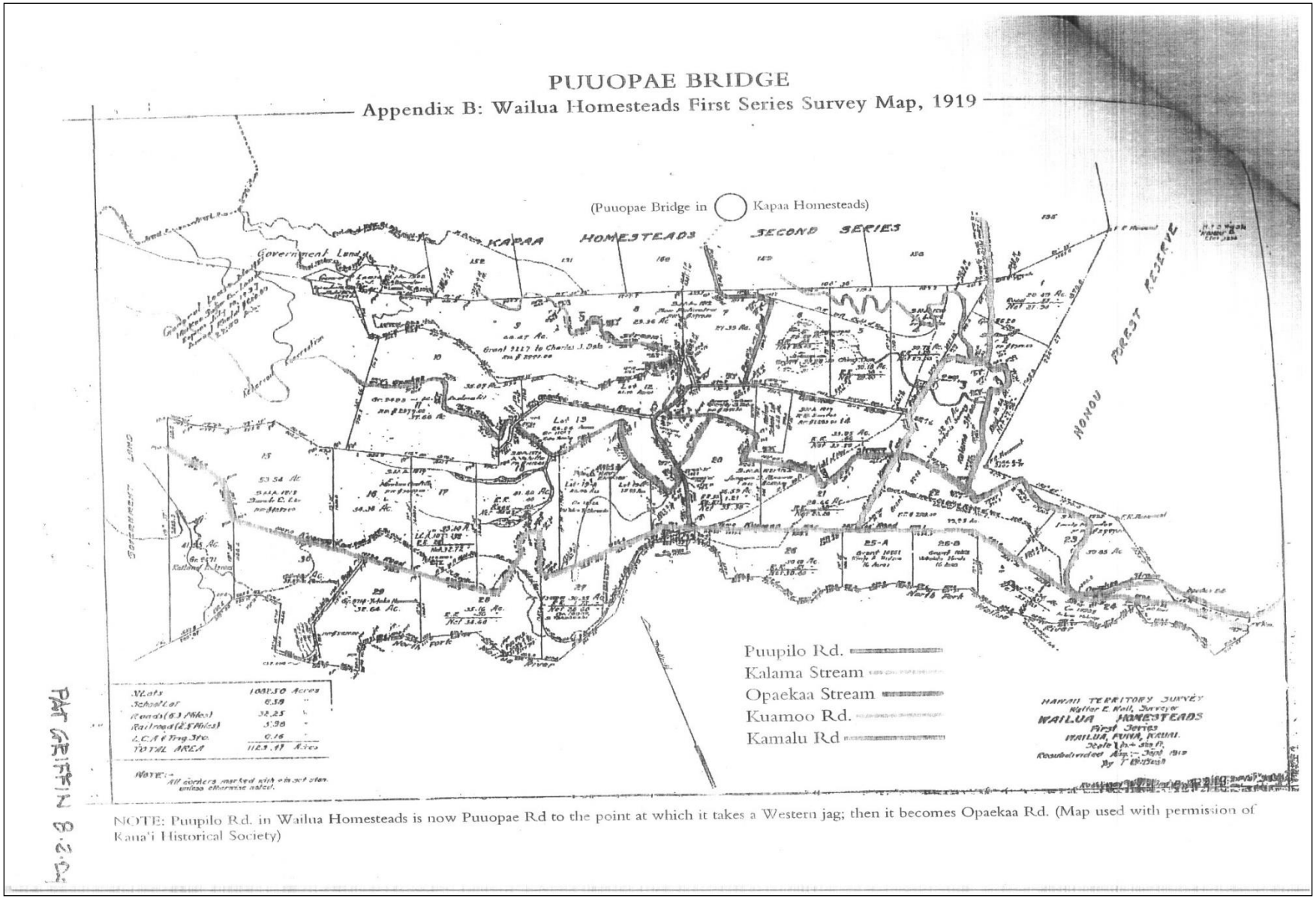


Figure 8. Ca. 1912 Map of Kapaa Homesteads Second Series with Pu`u`opae Bridge Location. Credit P. Griffin (2005) National Register of Historic Places, Registration Form.



NOTE: Puupilo Rd. in Wailua Homesteads is now Puuopae Rd to the point at which it takes a Western jag; then it becomes Opaekaa Rd. (Map used with permission of Kaua'i Historical Society)

Figure 9. 1919 Map of Kapaa Homesteads First Series with Pu`u`opae Bridge Location. Credit P. Griffin (2005) National Register of Historic Places, Registration Form.

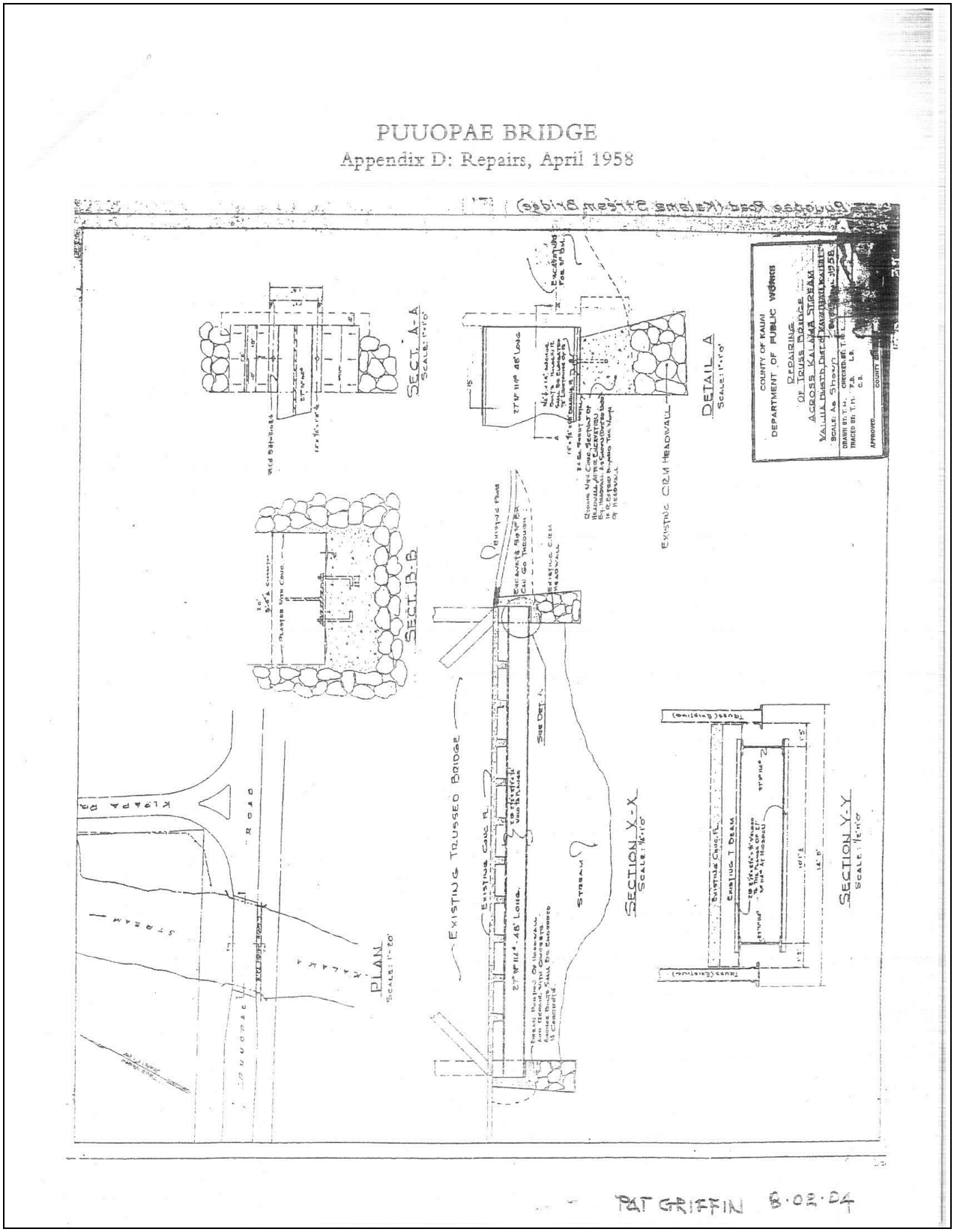


Figure 10. Pu`u`opae Bridge Plans, April 1958. Credit P. Griffin (2005) National Register of Historic Places, Registration Form.

Griffin (2005), in the National Registration form, explains the importance and association of the bridge, especially regarding the homesteaders. To summarize, two years after the Kapaa Homesteads 2nd series was opened to tenancy, the Pu`u`opae Bridge was constructed and provided an integral transportation link that led to the success of the homestead lands. Initially, homesteading was not thought as a highly viable venture by many in the government, most of the homestead lands being controlled at that time (c. 1913) by large businesses and the government. There was opposition to homesteads as some thought this simply a ploy for a land grab, which would remove the lands from the profitable sugarcane industry which the lands were farmed. By 1917, the homesteaders had soundly defeated that argument. Griffin (2005:3) notes that on the Olohena-Waipouli tract, there were ninety homesteaders with 3140 acres who had harvested some 31,500 tons of sugarcane worth an estimated $197,000, a very considerable sum.

The Kapaa Homesteads 2nd series, which was accessed by the bridge, consisted of 81 lots encompassing 17 acres to 41 acres. The lots were sold by lottery on June 28, 1913, with landowners being able to own up to 80 acres of land (original parcel and three adjoining parcels). Homesteaders were required to live and actively cultivate their lands for the first 10 years, with selling and leasing of the lands being forbidden. While homesteaders had finally received land, they had little means to access it. The "roads" were more or less cattle trails accessible mostly by ox carts. To make matters worse, water was unavailable in the homesteads. Available stream water was owned by the Makee Sugar Company, the Governor of Hawai`i, Walter F. Frear, having sold the water rights before the homesteads were opened. Homesteaders would have to pay a monthly rate to use any of the water. Initial homesteading in the area was difficult due to lack of roads and water. However, the homesteaders petitioned the County and government in Honolulu to fix these deficiencies. By 1918, they had formed an association and petitioned for the betterment of the homesteads in Honolulu and at various venues on Kaua`i.

Griffin (2005:4) notes that Pu`u`opae Bridge, and other bridges and roads in the area increased in importance after nearby Wailua Homesteads opened because the Wailua roads did not transverse the land in a typical *mauka-makai* fashion, but rather they were connected to the Kapaa Homestead roads which ran parallel to the slopes, along the base of Nounou Mountain. It was only Olohena Road which allowed homesteaders to meet up with the Belt Road. The Wailua Homesteads themselves were not linked to the Belt

Road until 1936 when `Ōpaeka`a Bridge was constructed and Kuamo`o Road was extended to the coastline.

By 1919, some of the Kapaa Homesteaders were successfully cultivating sugarcane, with many people from surrounding areas filling labor positions on the lands. However, by 1945 homestead cultivation of sugarcane became a difficult venture as sugar prices dropped significantly and small-scale enterprises were difficult to sustain. Griffin (2005:4) states that by the mid-twentieth century mark, many of the Kapaa Homesteaders abandoned the farming lifestyle and took up other occupations. Through time, many of these homestead areas were rezoned for residential use. However, some of the lands adjacent to Pu`u`opae Bridge contain some of the only remaining areas of agricultural lands in the region (Griffin 2005:4).

In all, Pu`u`opae Bridge performed an elevated transportation and communication function for homesteaders from 1915. The bridge itself is one of two bridges on Kaua`i that contain a steel girder floor system (Eleele being the other) and represents a strong relationship with early to mid 20th century land use in the Kapaa homesteads area. As noted in the National Register application (Griffin 2005:7), the bridge is purely a functional structure and has no artistic characteristics.

GENERAL AREA STUDIES

Early surveys of Kaua`i Island involved identification of sites in and around the current Pu`u`opae project area, with many more sites identified across the greater Kawaihau District, particularly in Wailua and Kealia. The first surveys by Thrum (1907) and Bennett (1931) led to the identification of a large number of *heiau*, as well as other site types. Bennett (1931:128) states that in the homestead area, many little valleys contain taro terraces (Figure 11). Further, below the mountains, there were extensive flatlands where agricultural terraces irrigated by such streams as Kapahi were located (Bennett 1931:128). The terraces were described as "Single rows of stone mark the divisions with some 2-foot terraces" and designated as Bennett's Site 110 (Bennett 1931:128).

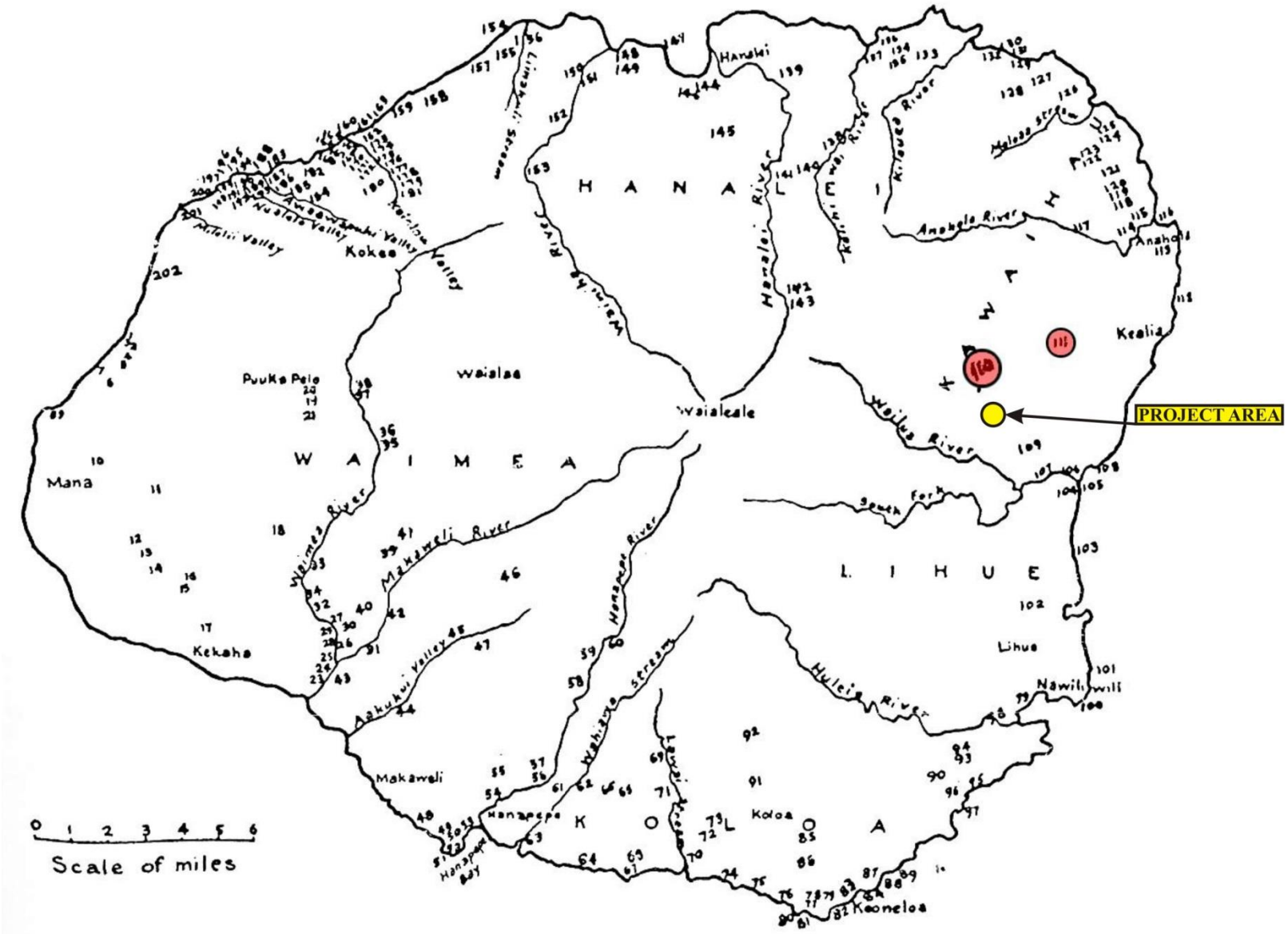


Figure 11. Bennett (1931) Sites Near the Project Area.

This is also the location of the upper homesteads (Kapaa Homesteads). Bennett's Site 111 (State Site 50-30-08-111)), as described by Bennett (1931:128-129) and also occurring in the area (inland and south of Kealia Valley), consisted of a "simple dirt ditch, about 6 feet in width and of varying depths which is traditionally referred to as a Hawaiian ditch." Handy and Handy (1972:423) note that the inland portion of Puna District (Kawaihau) contains a number of small streams, such as Kalama Stream, along which small *lo`i* were developed.

Bushnell and Hammatt (1996) conducted an Archaeological Field Reconnaissance of the Pu`u`opae Bridge for Belt Collins Hawaii in 1996 (Figure 9). Many similar historical references were utilized for the present study as resources are limited. The one difference is that the National Register nomination occurred in 2005, nine years after their survey. Survey of the project area was also repetitious to the current study, with only minor changes to the environment. The Field Reconnaissance survey only led to the identification of Pu`u`opae Bridge. The stream bed and river banks were also void of sites. The report provides good historical coverage of the bridge, most of which is presented herein and throughout multiple sources as well. The only conclusion not borne out in the report is that Bushnell and Hammatt (1996:10) state that the present steel girder bridge was built some time after 1931 and likely after 1941, and appears to have been preceded by an older wooden bridge which may have been constructed a few years prior to 1812. This contradicts the historical data wherein the first bridge was built two years after the homesteads were awarded, in 1915 (see below).

Per general area archaeological studies within Kawaihau District, most of the previous archaeological work was conducted along the coastline for residential, commercial, and infrastructural developments. However, multiple studies of the nearby Kealia uplands area have revealed the various site types found in more upland locations, as a similar setting to the Pu`u`opae area (Figure 12).

In 2005, SCS conducted an Archaeological Reconnaissance Survey of 2,008 acres in Keālia Ahupua`a. The report by Tome and Spear (2005) listed a total of 40 newly identified sites. Most of these sites were associated with pre-Contact agriculture and habitation sites, as well as historic; Plantation Era sites (roads, bridges).

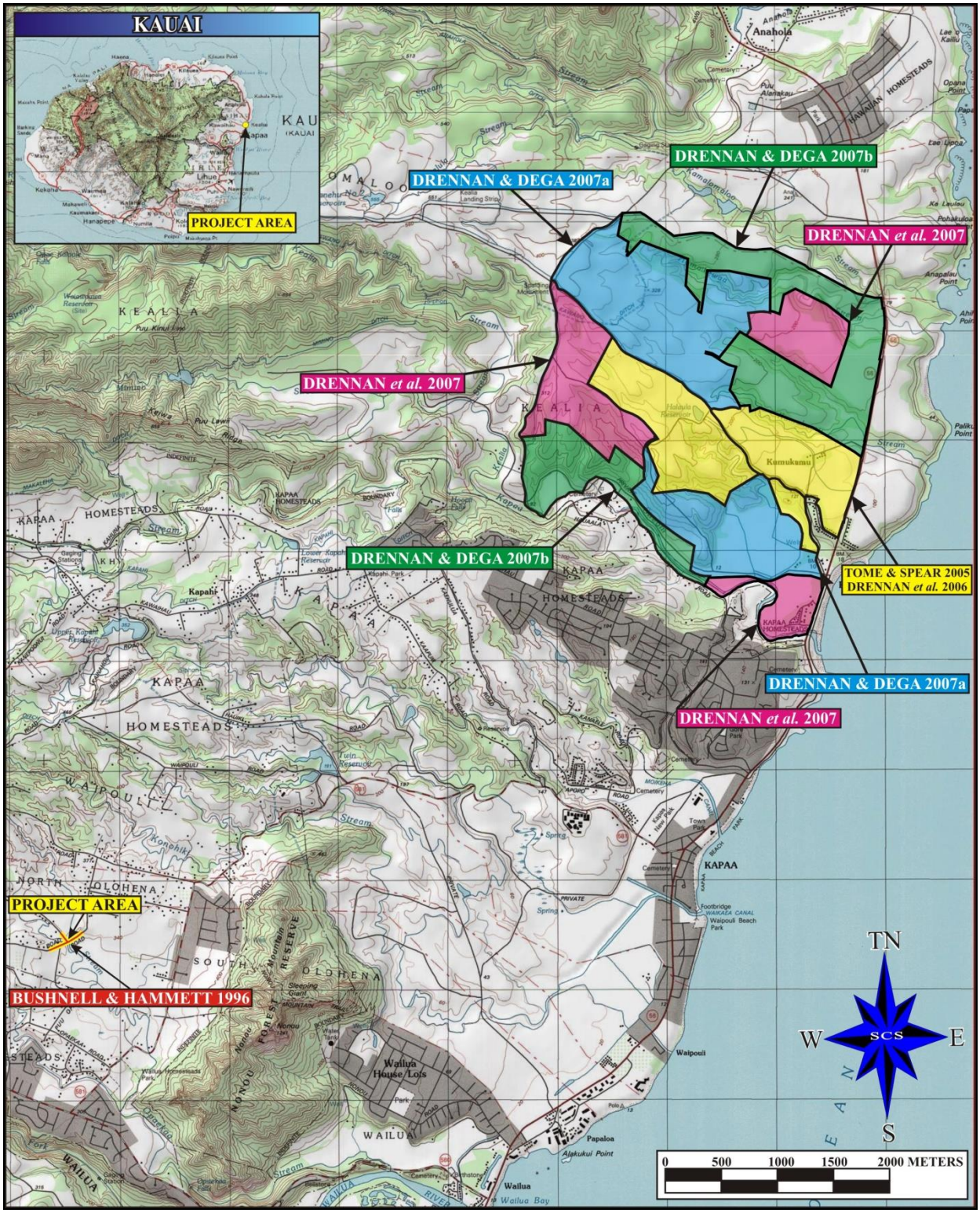


Figure 12. Distribution of Previous Archaeological Studies within and Near the Project Area.

In 2006, SCS conducted a formal Archaeological Inventory Survey of the 2,008-acre Keālia property, which was divided into four Phases (Drennan *et al*. 2006): Makee/Kumukumu Phase I, Makee/Kumukumu Phase II, Makee/Kumukumu Phase III, and Makee/Kumukumu IV. The Phase I Inventory Survey project area included Kumukumu Valley, South Fork, Keālia Valley Finger A, and portions of Makee Valley. During Phase I of the Inventory Survey, a total of 19 sites were identified. These included four sites located outside of the project boundaries: State Site 50-30-08-1136 (a petroglyph panel), State Site 50-30-08-1127 (historic wall), State Site 50-30-08-1125, Feature 1 (historic road), and Feature 2 (historic bridge). Overall, Inventory Survey of the Phase I property led to the identification, recordation, and documentation of 15 new historic sites, comprised of 21 features. Nine of the sites were assessed as being associated with the Plantation Era. One site was interpreted to be of pre-Contact origin and associated with traditional Hawaiian habitation and/or agriculture. The remaining five sites were interpreted as pre-Contact agricultural sites, with use continuing through the Plantation Era.

Phase II of the Archaeological Inventory Survey led to the identification of 30 new archaeological sites comprised of 82 features (Drennan and Dega 2007a), wherein sufficient archaeological information was gained through Inventory Survey and no additional work was recommended for 25 of the sites. Twenty-seven of the features are associated with the Plantation Era on Kaua`i. Three features appear to be pre-Contact and associated with traditional Hawaiian habitation and/or agriculture. Five features have been interpreted as pre-Contact agricultural areas with continuous use through the historical period. Forty-seven features have been interpreted as historic.

The Phase III Survey led to the identification, recordation, and documentation of 19 new archaeological sites, comprised of 93 features (Drennan *et al*. 2007). Fifteen of the features were historic and most were associated with the Plantation Era. Sixty-three features were interpreted as historic and/or Plantation Era. Eleven features were interpreted as Historic/Plantation Era and have continued into modern times. Four features appeared to be part of a pre-Contact/Transitional Period burial site (State Site 50-30-08-7040) which are associated with traditional Hawaiian habitation and/or agriculture.

Finally, Phase IV Inventory Survey of upland Kealia led to the identification, recordation, and documentation of 37 new archaeological sites comprised of 66 features (Drennan and Dega 2007b). Manual test excavations were conducted at five sites and mechanical excavations (N=23 trenches) occurred within six Land Commission Award (LCA) locations. Thirty-six of the total 66 features are associated with the Plantation Era. Twenty-two features were interpreted as

historic. Five features were interpreted as historic and/or Plantation Era. Eleven features were interpreted as historic/Plantation Era and were used into modern times. Two features were pre-Contact and/or historic and associated with traditional Hawaiian habitation and/or agriculture.

EXPECTED FINDINGS

Given the background and archival research completed prior to fieldwork, expectations for identifying any historic properties, other than the bridge itself, were considered minimal. The environment around the bridge footprints has mostly been developed (roads, bridge work, residences) and thus, the landscape has been altered. There was only a remote chance that possible *lo`i* terraces/walls or historic constructions would be identified, these having been previously noted for the area by Handy and Handy (1972) when referring to pre-Contact and early historic taro cultivation.

MONITORING CONVENTIONS AND METHODOLOGY

This AMP has been prepared in accordance with DLNR-SHPD rules governing standards for Archaeological Monitoring (13-279). Archaeological monitors will adhere to the following guidelines during monitoring:

1. A qualified archaeologist familiar with the project area and the results of previous archaeological work conducted in the project area will monitor all ground altering construction activities. If significant deposits or features are identified and additional field personnel are required, the archaeologist will notify the contractor or representatives before additional personnel are brought to the site.

2. One archaeological monitor will be present for each piece of ground altering machinery within both natural and disturbed contexts.

3. If features or cultural deposits are identified during Monitoring, the on-site archaeologist will have the authority to temporarily suspend construction activities at the significant location so that the cultural feature(s) or deposit(s) may be fully evaluated and appropriate treatment of the cultural deposit(s) is conducted. The SHPD will be contacted to establish feature significance and potential mitigation procedures. Treatment activities primarily include documenting the feature/deposit by plotting its location on an overall site map, illustrating a plan view map of the feature/deposit, profiling the deposit in three dimensions, photographing the finds—with the exception of human burials, collecting any artifacts and/or significant soil samples, and triangulating the finds. Construction work and/or back-filling of excavation pits or trenches will only continue in the sample location when all documentation has been completed.

4. Control stratigraphy in association with subsurface cultural deposits will be noted and photographed, particularly those containing significant quantities or qualities of cultural materials. If deemed significant by SHPD and the contracting archaeological firm, these deposits will be sampled.

5. In the unlikely event that human remains are encountered, all work in the immediate area of the find will cease; the area will be secured from further activity until burial protocol has been completed. The SHPD Kaua`i-island archaeologist and SHPD-Kaua`i Island Culture History branch will both be immediately contacted about the inadvertent discovery of human remains on the property. Notification of the inadvertent discovery will also be made to the Kaua`i/Ni`ihau Islands Burial Council by the SHPD or the archaeologist. A determination of the minimum number of individuals (MNI), age(s), and ethnicity of the burial(s) will be ascertained in the field. Rules outlined in Chapter 6e, Section 43 shall be followed. Stratigraphic profiles, site plan view maps, and illustrative documentation of skeletal parts will be recorded to document the burial(s). The burial location will be identified and marked. If a burial is disturbed during trench excavations, materials excavated from the vicinity of the burial(s) will be manually screened through 1/8-inch wire mesh screens to recover any displaced skeletal material. If the remains are to be removed, the work will be in compliance with HRS 6.E-43.6, Procedures Relating to the Inadvertent Discovery of Human Remains after approval from all parties (SHPD, Burial Council).

6. To ensure that contractors and the construction crew are aware of this Archaeological Monitoring Plan and possible site types to be encountered on the parcel, a brief coordination meeting will be held between the construction team and monitoring archaeologist prior to initiation of the project. The construction crew will also be informed as to the possibility that human burials could be encountered and how they should proceed if they observe such remains.

7. The archaeologist will provide all coordination with the contractor, SHPD, and any other group involved in the project. The archaeological firm will coordinate all monitoring and sampling activities with the safety officers to ensure that proper safety regulations and protective measures meet compliance. Close coordination will also be maintained with construction representatives in order to adequately inform personnel of the possibility that open archaeological units or trenches may occur in the project area.

8. As necessary, verbal reports will be made to SHPD and any other agencies as requested. The contracting archaeologist will notify the SHPD vis written document when the work commences.

LABORATORY ANALYSIS

All samples collected during the project, except human remains, will undergo analysis at the SCS laboratory in Honolulu. In the event that human remains are identified, the SHPD will be immediately consulted per their disposition (remain in place or re-locate).

Photographs, illustrations, and all notes accumulated during the project will be curated at the Honolulu laboratory. All retrieved artifact and midden samples will be thoroughly cleaned, sorted, and analyzed. Significant artifacts will be photographed, sketched, and classified (qualitative analysis). All metric measurements and weights will be recorded (quantitative analysis). These data will be presented in tabular form within the final monitoring report. Midden samples will be minimally identified to major class (*e.g*., bivalve, gastropod mollusk, echinoderm, fish, bird, mammal). All data will be clearly recorded on standard laboratory forms, which also include number and weight (as appropriate) of each constituent category. These counts will also be included in the final report.

Should any samples amenable to dating be collected from a significant cultural deposit, they will be prepared in the SCS laboratory and submitted for specialized radiocarbon analysis. While primary emphasis for dating is placed on charcoal samples, we do not preclude the use of other material such as marine shell or nonhuman bone materials. SCS will consult with SHPD and the client if radiocarbon dates are deemed necessary.

All stratigraphic profiles will be drafted for presentation in the final report. Representative plan view sketches showing the location and morphology of identified sites/features/deposits will be compiled and illustrated.

CURATION

The archaeological monitoring firm will curate all recovered materials (except human remains, which would remain on-site in a secure area) until a permanent, more suitable curation center is identified. The land owner may request to curate all recovered cultural materials once analysis has been completed.

REPORTING

An Archaeological Monitoring report documenting the project findings and interpretation, following SHPD guidelines for Archaeological Monitoring reports, will be prepared and submitted 180 days after the completion of fieldwork. This time line is requested to account for any radiocarbon age determinations (typically 30–45 days), if necessary.

If cultural features or deposits are identified during fieldwork, the sites will be evaluated for historical significance and assessed under State and Federal Significance Criteria. The Archaeological Monitoring report will be drafted until accepted by SHPD and will be submitted to both SHPD and to the client.

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January 29, 2016

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United States Department of Transportation
Federal Highway Administration
300 Ala Moana Blvd., Rm 3-306
Honolulu, Hawaii 96850

LOG NO: 2016.00159
DOC NO: 1601MN22
Archaeology
Architecture

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

Dear Ms. Otani and Mr. Fuchigami:

SUBJECT: **Chapter 6E-8 and National Historic Preservation Act (NHPA) Section 106 Review – Archaeological Monitoring Plan for the Puʻuʻōpae Bridge Replacement Project Bridge Number 00744011114400, Federal Aid Project STP -0700 (59) Wailua and South Olohena Ahupuaʻa, Puna Districts, Island of Kauaʻi TMK: (4) 4-4-002**

Thank you for the opportunity to comment on the draft document titled *Archaeological Monitoring Plan for the Puʻuʻōpae Bridge Replacement Project, Bridge Number 00744011114400, State Site 50-30-08-9397, Wailua, South Olohena Ahupuaʻa, Kawaihau District, Kauaʻi Island, Hawaiʻi [TMK: (4) 4-4-002)]* (Dega 2015). We received the original draft plan on January 26, 2015, and requested revisions on July 31, 2015 (Log No. 2015.00329, Doc. No. 1507MN09). We received the revised submittal in September 2015, and apologize for the delayed review.

Due to funding by the Federal Highways Administration (FHWA), the project is subject to the National Historic Preservation Act (NHPA) and requires Section 106 consultation. FHWA delegated Section 106 consultation to the County of Kauaʻi and the State Department of Transportation (HDOT), and requested concurrence with a determination of *no adverse effect* to historic properties in a letter dated January 15, 2014.

The archaeological monitoring plan (AMP) was prepared at the request of KAI Hawaiʻi in support of the Puʻuʻōpae Bridge Replacement Project. The proposed bridge improvements include retaining and re-installing historic end posts behind a new guardrail; repairing and coating following Preservation Briefs and the Secretary of the Interior Standards; replacing girders in-kind, except with an added wing wall to hide the extra length of the girder from exterior view; and installation of new girders (as needed), a new deck using embedded transverse concrete beams and rebar, new abutments, and new crash-tested steel railings in place of the existing W-beams.

The revisions adequately address the issues and concerns raised in our earlier correspondence. The plan meets the requirements specified in Hawaii Administrative Rules (HAR) §13-279-4. **It is accepted by the SHPD**. Please send one hard copy of the document, clearly marked FINAL, along with a text-searchable CD to our Kapolei office.

Please contact Ms. Jessica Puff, Architectural Historian at (808) 692-8023 or at Jessica.L.Puff@hawaii.gov if you have any questions or concerns regarding architectural resources. Please contact Ms. Mary Jane Naone, Kaua‘i Lead Archaeologist, at (808) 271-4940 or at Maryjane.Naone@hawaii.gov for questions regarding archaeological resources or this letter.

Aloha,

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

cc:

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April 8, 2016

Meesa T. Otani, Environmental Engineer
US Department of Transportation
Federal Highway Administration
300 Ala Monana Blvd, Rm 3-306
Box 50206

Honolulu, HI 96850

IN REPLY REFER TO:
LOG: 2014.04723
DOC: 1603JLP04
"no historic properties affected"/
"no historic properties affected"

RE: Section: Section 106 Cultural Resources Management and Chapter 6E-8 Historic Preservation Review
Agency: Federal Highways Administration (FHWA)
Project Name: Puuopae Bridge Rehabilitation project
Location: Ahupuaʻa of South Olohena, District of Kawaihau, Island of Kauaʻi,
TMK: (4) 4-4-002

Dear Ms. Otani:

On October 17, 2014, the State Historic Preservation Division (SHPD) received a submittal from the Federal Highways Administration (FHWA) for the Puuopae Bridge Rehabilitation project (TMK: [4] 4-4-002). Per Section 106 of the National Historic Preservation Act of 1966, as amended, SHPD has reviewed the undertaking and the State Historic Preservation Officer (SHPO) **concurs** with the FHWA's determination of **no adverse effect** for the Puuopae Bridge project. The Puuopae Bridge is listed in the National Register of Historic Places. At the request of Kai Hawaii, Scientific Consultant Services, Inc. prepared an archaeological monitoring plan for the project, which was reviewed and accepted by SHPD on January 29, 2016 (*Log No.2016.00159, Doc No. 1601MN22*).

Per Chapter 6E-8 of Hawaii Revised Statutes, SHPD has reviewed the project and has found that it is unlikely that historic properties will be affected by the proposed project. Therefore, SHPD's determination is **no historic properties affected.**

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

Please contact Mary Jane Naone, Kauai Island Lead Archaeologist, at Maryjane.Naone@hawwai.gov or at (808) 271-4940 for any questions concerning archaeological resources. Please contact Jessica Puff, Architectural Historian, at (808) 692-8023 or at Jessica.L.Puff@hawaii.gov for any changes or concerns regarding this undertaking and for any questions regarding architectural resources or this letter.

Mahalo,

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

In the event that historic resources, including human skeletal remains, cultural layers, cultural deposits, features, artifacts, or sinkholes, lava tubes or lava blisters/bubbles are identified during construction activities, all work should cease in the immediate vicinity of the find, the find should be protected from additional disturbance, and the State Historic Preservation Division should be contacted immediately at (808) 692-8015.

PUUOPAE BRIDGE REPLACEMENT ENVIRONMENTAL ASSESSMENT

TMK (4th.): Plat 4-4-02
Kawaihau District, County of Kaua‘i, State of Hawai‘i

Submitted Pursuant to Chapter 343, Hawai‘i Revised Statutes (HRS)
County of Kaua‘i, Department of Public Works

APPENDIX 3
Water Quality and Biological Report

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AECOS No. 1282

Water quality and biological surveys for Puʻuʻōpae Bridge repair project in Wailua, Kauaʻi.

Prepared by:

AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
Kāneʻohe, Hawaiʻi 96744-3221

December 27, 2011

Water quality and biological surveys for the Puʻuʻōpae Bridge repair project in Wailua, Kauaʻi.

December 27, 2011 | ***Draft*** | *AECOS* No. 1282

Chad Linebaugh, Reginald David[1], and Eric Guinther
AECOS, Inc.
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Kāneʻohe , Hawaiʻi 96744
Phone: (808) 234-7770 Fax: (808) 234-7775 Email: aecos@aecos.com

Introduction

The Puʻuʻōpae Bridge over Kalama Stream—located on the Island of Kauaʻi (Fig 1)—is scheduled for repair work. *AECOS* Inc. was contracted by Kai Hawaii[2] to investigate biological resources and water quality at the proposed project site and in October 2011, *AECOS* biologists surveys of Kalama Stream in the project area. This report details findings of those surveys.

Kalama Stream

Kalama Stream is a tributary to the Wailua River and arises as two small streams on the eastern slope of the Kamoʻohoʻopulu Ridge near Kapukaʻiki and Puʻu ʻŌpae in the Kawaihau district of east Kauaʻi. Both branches are intersected above their confluence by the Wailua Ditch, a water supply flume that flows southwest to the Wailua Reservoir. Kalama Stream flows generally southeast, reaching the Puʻuʻōpae Bridge at about 310-ft (95-m) elevation. The stream continues southeast, turning south of Nounou Mountain (also known as Sleeping Giant) before its confluence with ʻŌpaekaʻa Stream near the 260-ft (80-m) elevation and upstream of ʻŌpaekaʻa Falls. ʻŌpaekaʻa Stream joins the Wailua River a half mile west of its mouth at Wailua Bay.

[1] Rana Biological Consulting, Inc. Kailua-Kona, Hawaiʻi
[2] This document will be incorporated into the Environmental Assessment (EA) for the project and will become part of the public record.

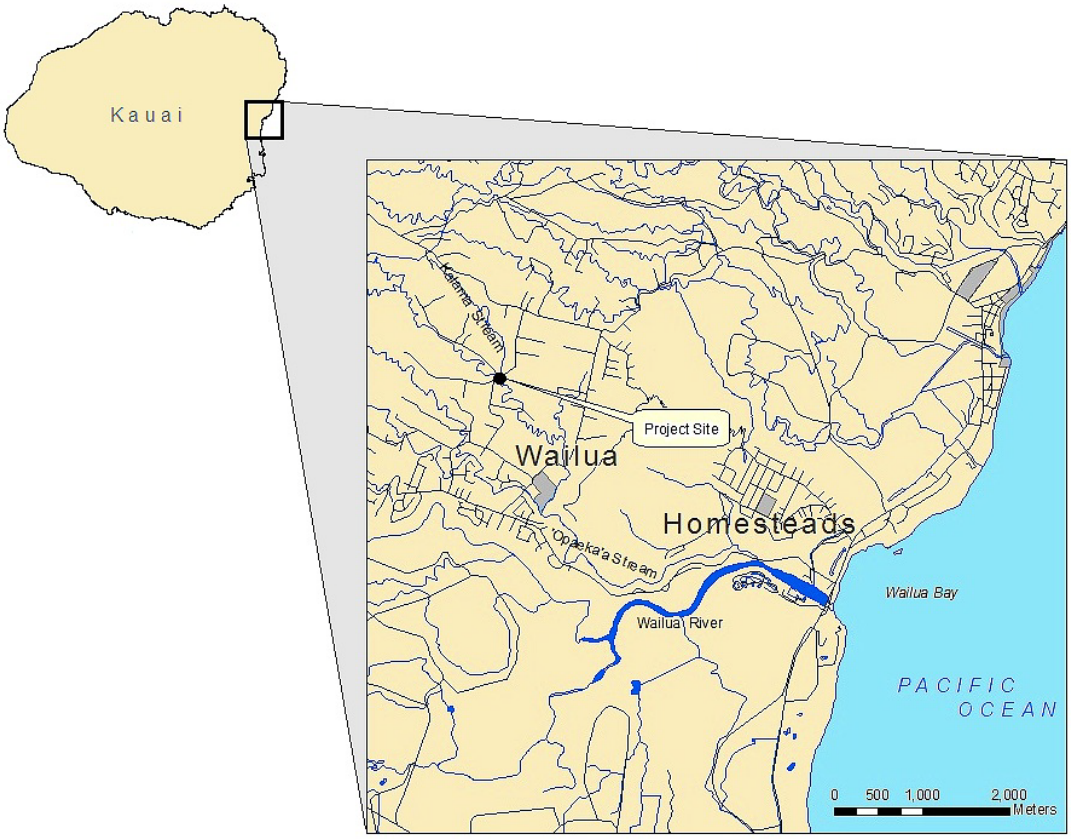

Figure 1. General location of the project on the island of Kauaʻi.

Methods

Water Quality

Field measurements for temperature, dissolved oxygen, and pH were conducted and water samples for analyses comprising conductivity, total suspended solids, turbidity, nitrate-nitrite nitrogen, total nitrogen, and total phosphorus were collected from three stations in Kalama Stream in the project area. All water samples were collected in screw cap-polypropylene bottles on October 20, 2011 and delivered to *AECOS* laboratory in Kāneʻohe, Oʻahu for laboratory analyses (*AECOS* Log No. 27653). Table 1 lists analytical methods and instrumentation used in the analyses.

Table 1. Analytical methods and instruments used for water quality analyses of Kalama Stream waters sampled on October 20, 2011.

Analysis	Method	Reference	Instrument
Conductivity	SM 2510-B	Standard Methods, 20th Edition (1998)	Hydach pH/conductivity meter
Dissolved Oxygen	SM 4500-O G	Standard Methods 20th Edition (1998)	YSI Model 550A Dissolved Oxygen Meter
Nitrate + Nitrite	EPA 353.2 Rev 2.0	USEPA (1993)	Technicon AutoAnalyzer II
pH	SM 4500 H+	Standard Methods 20th Edition (1998)	Hannah pocket pH meter
Temperature	thermister calibrated to NBS. Cert. thermometer SM 2550 B	Standard Methods 20th Edition (1998)	YSI Model 550A Dissolved Oxygen Meter
Total Nitrogen	persulfate digestion/EPA 353.2	Grasshoff et al (1986)/ USEPA (1993)	Technicon AutoAnalyzer II
Total Phosphorus	EPA 365.1 Rev 2.0	USEPA (1993)	Technicon AutoAnalyzer II
Total Suspended Solids	Method 2540 D	Standard Methods 20th Edition (1998)	Mettler H31 balance
Turbidity	EPA 180.1 Rev 2.0	EPA (1993)	Hach 2100N Turbidimeter

Water sampling locations are shown in Fig. 2: Station “Upstream” was located approximately 100 ft (33 m) upstream from the Puʻuʻōpae Bridge crossing Kalama Stream; Station "Bridge" was located beneath the bridge; and Station "Downstream" was located 100 ft (33 m) downstream from the bridge. All water samples were collected from just below the stream surface.

Riparian Vegetation

A survey of vegetation in the immediate area of the Puʻuʻōpae Bridge was conducted (by Guinther) on October 20, 2011; the riparian zone vegetation, both up and downstream from the bridge along Kalama Stream was surveyed (by Linebaugh) on October 21. Vegetation growing on and immediately above the stream banks and on the bridge structure itself was identified using the nomenclature in *Manual for the Flowering Plants of Hawaiʻi: Volumes I and II*

(Wagner et al., 1990) and *Hawai'i's Ferns and Fern Allies* (Palmer, 2003), updated by various published accounts.

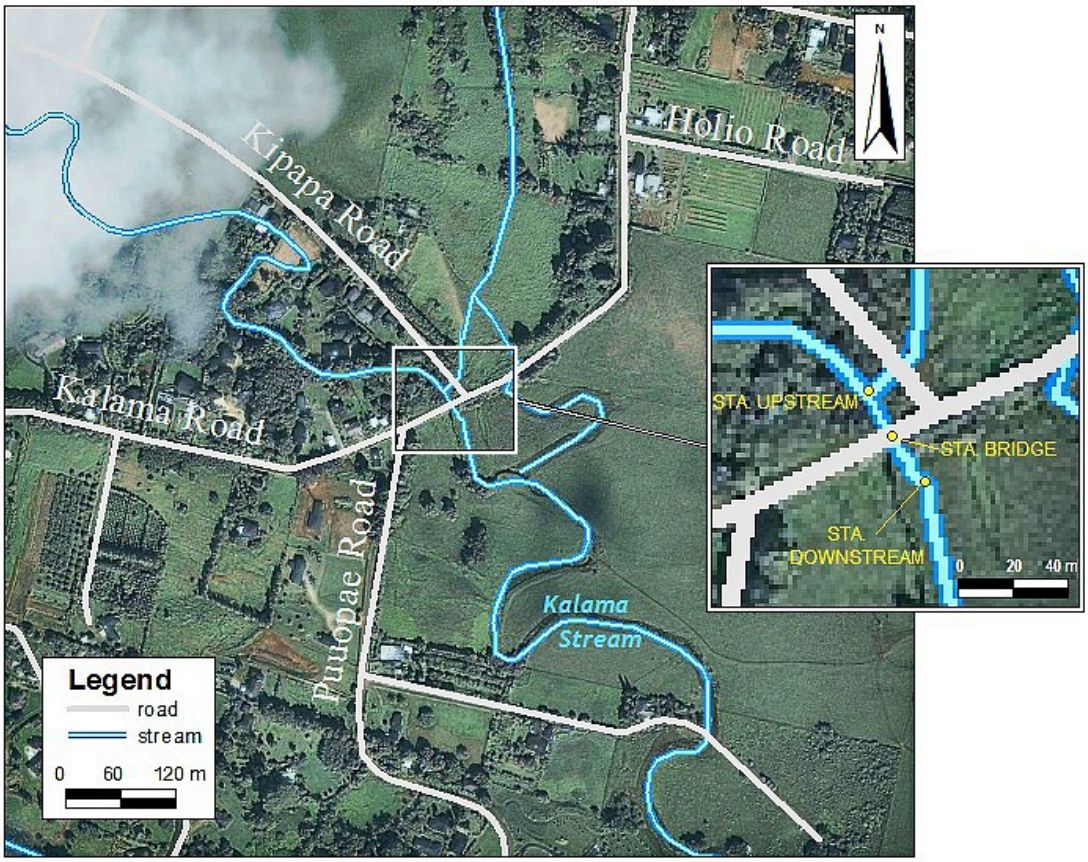

Figure 2. The locations of water quality stations in Kalama Stream near the Kapahi Bridge sampled on October 20, 2011.

Aquatic Biota

Aquatic resources in the stream were identified by visually observing and sampling with hand nets the biota present at three locations in Kalama Stream: On October 20, 2011, the survey extended 100 ft (33 m) upstream and downstream of the Pu'u'ōpae Bridge. On October 21, 2011 the survey was extended to two additional "distant" sites: upstream at about the 400-ft (120-m) elevation and downstream at about the 300-ft (90-m) elevation. Pu'u'ōpae Bridge crosses Kalama Stream at roughly the 310-ft (95-m) elevation.

Avian Survey Methods

A single avian point-count station was situated on the southwest side of the bridge and an 8-minute point-count made. The rest of the site was walked, to provide a better understanding of avian species that use resources within the project area. Field observations were made with the aid of Leica 10 X 42 binoculars and by listening for vocalizations. A running tally was kept of all bird species recorded during the time spent on the site.

Avian phylogenetic order and nomenclature used in this report follow the *AOU Check-List of North American Birds* (American Ornithologists' Union, 1998), and the 42nd through the 52nd supplements to the Check-List (American Ornithologists' Union 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chesser et al., 2009, 2010, 2011).

Mammalian Survey Methods

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*; *ʻōpeʻapeʻa*), all terrestrial mammals currently found on the Island of Kauaʻi are alien species. Most are ubiquitous. The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all vertebrate species observed, heard, or detected by other means within the general project area.

Survey Results

Water Quality

The results from *in situ* measurements and analyses of water samples collected from three stations in Kalama Stream at and near Puʻuʻōpae Bridge are provided in Table 2. During the survey period water flow extended the width of the stream channel beneath the bridge. The stream waters were around 12 in (30 cm) deep and slightly turbid at all stations. Waters in proximity to the project site were only partially saturated with oxygen during the sampling event with DO concentrations ranging from 5.09 to 6.21 mg/l, representing saturations ranging from 59 to 73% at measured temperatures. All stations had pH values near neutral with individual readings ranging from 6.78 to 6.98.

Particulates measured by TSS were low, ranging from 1.0 to 1.6 mg/l at the three stations. Turbidity levels, an indication of cloudiness of the water, ranged from 2.78 to 3.08 ntu, reflecting the turbid brown water observed during sampling. Total nitrogen concentrations were in excess of 200 µgN/l at all

stations. Nitrate-nitrite levels were 39 to 42 µgN/l. Total phosphorus concentrations were very low.

Table 2. Results for *in situ* measurements and conductivity readings from samples collected on October 20, 2011 from three stations in Kalama Stream.

Station	Time	Temp. (°C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (% sat.)	pH --	Conductivity (µmhos/cm)
Upstream	1310	23.4	6.21	73	6.88	124
Bridge	1250	23.3	5.10	60	6.78	118
Downstream	1240	23.1	5.09	59	6.98	118

Table 3. Results for turbidity levels, suspended solids and nutrient concentrations from samples collected on October 20, 2011 from three stations in Kalama Stream.

	TSS (mg/l)	Turbidity (ntu)	Nitrate+ Nitrite (µg N/l)	Total N (µg N/l)	Total P (µg P/l)
Upstream	1.0	2.78	39	247	<4
Bridge	1.0	2.94	37	252	6
Downstream	1.6	3.08	42	207	7

Riparian Vegetation

The vegetation (Table 4) near the Puʻuʻōpae Bridge is mostly naturalized species with wedelia (*Spagneticola trilobata*), *honohono* (*Commelina diffusa*), and Guinea grass (*Panicum maximum*) composing the bulk of plant life beneath the bridge. Wedelia, wood rose (*Merremia tuberosa*), graceful spurge (*Euphorbia hypericifolia*), and hairy horseweed (*Conyza bonariensis*) and scattered small trees cover the upper stream banks in close proximity of the bridge.

Table 4. Checklist of plants observed at and near Puʻuʻōpae Bridge, Wailua.

Family *Genus species*	Common name	STATUS	ABUNDANCE
PTERIDOPHYTES - FERNS & FERN ALLIES			
BLECHNACEAE			
Blechnum appendiculatum Willd.	---	Nat	R
NEPHROLEPIDACEAE			
Nephrolepis sp.	---	---	R
POLYPODIACEAE			
Phlebodium aureum (L.) J. Sm.	*lauaʻe haole*	Nat	R
Phymatosorus grossus (Langsd. & Fisch.) Brownley	*lauaʻe*	Nat	U
FLOWERING PLANTS – DICOTYLEDONS			
ACANTHACEAE			
Blechum pyramidatum (Lam.) Urban	---	Nat	R
Justicia betonica L.	white shrimp plant	Nat	U
Thunbergia fragrans Roxb.	sweet clock-vine	Nat	U
ANACARDIACEAE			
Schinus terebinthifolius Raddi	Christmas berry	Nat	U
ARALIACEAE			
Schefflera actinophyla (Endl.) Harms	octopus tree	Nat	O
ASTERACEAE			
Ageratum houstonianum Mill.	*maile hohono*	Nat	U
Bidens pilosa L.	beggartick	Nat	O
Calyptocarpus vialis Less.	---	Nat	O
Conyza bonariensis (L.) Cronq.	hairy horseweed	Nat	O
Spagneticola trilobata L.	wedelia	Nat	A
Youngia japonica (L.) DC	Oriental hawksbeard	Nat	R
CARICACEAE			
Carica papaya L.	papaya	Nat	R
CONVOLVULACEAE			
Ipomoea obscura (L.) Ker-Gawl.	---	Nat	U
Ipomoea triloba L.	little bell	Nat	O
Merremia tuberosa (L.) Rendle	wood rose; *pilikai*	Nat	C
EUPHORBIACEAE			
Euphorbia hirta L.	garden spurge	Nat	U
Euphorbia hypericifolia L.	graceful spurge	Nat	R

Table 4 (continued).

Family *Genus species*	Common name	STATUS	ABUNDANCE
FABACEAE			
Acacia confusa Merr.	Formosan koa	Nat	R
Canavalia cathartica Thouars	*maunaloa*	Nat	U
Desmanthus pernambucanus (L.) Thellung	slender mimosa	Nat	O
Desmodium incanum DC	Spanish clover	Nat	O
Desmodium tortuosum (Sw.) DC	Florida beggarweed	Nat	O
Leucaena leucocephala (Lam.) deWit	*koa haole*	Nat	U
Mimosa pudica var. *unijuga* (Duchass. & Walp.) Griseb.	sensitive plant	Nat	O
MALVACEAE			
Hibiscus tiliaceus L.	*hau*	**Ind**	A
MELASTOMATACEAE			
Clidemia hirta (L.) D. Don	Koster's curse	Nat	O
MYRTACEAE			
Syzyguim cumini (L.) Skeels	Java plum	Nat	O
ONAGRACEAE			
Ludwigia octovalvis (Jacq.) Raven	primrose willow	Nat	U
OXALIDACEAE			
Oxalis corniculata L.	yellow wood sorrel	**Pol**	R
ROSACEAE			
Rubus rosifolius Sm.	thimbleberry	Nat	R
RUBIACEAE			
Hedyotis corymbosa (L.) Lam.	---	Nat	R
URTICACEAE			
Pilea microphylla (L.) Liemb.	artillery plant	Nat	O
VERBENACEAE			
Stachtarpheta urticifolia (Salisb.) Sims	vervain	Nat	O
Verbena litoralis Kunth	*ōwī*	Nat	U
FLOWERING PLANTS - MONOCOTS			
ARACEAE			
Syngonium podophyllum Schott	nephthytis	Orn	U
COMMELINACEAE			
Commelina diffusa N.L. Burm.	day flower	Nat	C
CYPERACEAE			
Cyperus difformis L.	---	Nat	U
Cyperus halpan L.	---	Nat	R
Fimbristylis dichotoma (L.) Vahl	fimbry	**Ind**	R

Table 4 (continued).

Family *Genus species*	Common name	STATUS	ABUNDANCE
POACEAE (GRAMINEAE)			
Panicum maximum Jacq.	Guinea grass	Nat	C
Paspalum conjugatum Bergius	Hilo grass	Nat	A
Paspalum fimbriatum Kunth	fimbriate paspalum	Nat	O
Sacciolepis indica (L.) Chase	Glenwood grass	Nat	U
Sporobolus sp.	dropseed	Nat	U
ZINGIBERACEAE			
Hedychium flavescens Carey ex Roscoe	yellow ginger	Nat	A

Key to Table 4:

Status = distributional status
- end. = endemic; native to Hawaii and found naturally nowhere else.
- ind. = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
- nat. = naturalized, exotic, plant introduced to the Hawaiian Islands since 1778 and well-established.
- orn. = exotic, ornamental or cultivated; plant not naturalized (not well-established outside of cultivation).
- pol. = Polynesian introduction before 1778.

Abundance = occurrence ratings for plants in survey area.
- R – Rare - only one, two, or three plants seen.
- U - Uncommon - several to a dozen plants observed.
- O - Occasional - found regularly around the site.
- C - Common - considered an important part of the vegetation and observed numerous times.
- A - Abundant - found in large numbers; may be locally dominant.

The roadway shoulders of the bridge are home to an assemblage of ruderal weeds such as beggartick (*Bidens pilosa*), Florida beggarweed (*Desmodium tortuosum*), and Spanish clover (*Desmodium incanum*). Artillery plant (*Pilea microphylla*) and dropseed (*Sporobolus* sp.) grow conspicuously along the verges of the road approaches to the bridge.

A *hau* (*Hibiscus tiliaceus*) thicket shades the stream upstream of the bridge. A few ferns like *lauaʻe* (*Phymatosorus grossus*) grow alongside Koster's curse (*Clidemia hirta*) on the shaded stream banks. Just downstream of the bridge, yellow ginger (*Hedychium flavescens*) and Guinea grass dominate the banks while a few hydrophilic species like primrsoe willow (*Ludwigia octovalvis*) and *Cyperus halpan* grow along the margins of the stream. Further downslope, the stream flows through a pasture where Hilo grass (*Paspalum conjugatum*), Glenwood grass (*Sacciolepis indica*), *Cyperus difformis,* and a fimbry (*Fimbristylis dichotoma*) grow along the stream.

Aquatic Biota

The aquatic biota of Kalama Stream near the proposed project is composed entirely of naturalized (non-native) species (Table 5). Mixed schools of mosquitofish (*Gambusia affinis*) and mollies (*Poecilia* spp.) swim beneath the bridge. Smallmouth bass (*Micropterus dolomieu*), blackchin tilapia (*Sarotherodon melanotheron*), and koi (*Cyprinus carpio*) are also present in lesser numbers. Apple snail (*Pomacea canaliculata*) eggs are visible on emergent vegetation growing in the stream. At both distant locations in Kalama Stream (at the 300 and 400-ft elevations), smallmouth bass, koi, tilapia, and mollies were present in low densities.

Table 5. List of aquatic species observed in Kalama Stream.

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Abundance	Status	ID Code
INVERTEBRATES				
MOLLUSCA,GASTROPODA				
ARCHITAENIOGLOSSA				
AMPULLARIDAE				
Pomacea canaliculata Lamarck	apple snail	R	Nat.	1
ARTHROPODA,INSECTA				
ODONATA				
COENAGRIONIDAE				
Ischnura posita Hagen	fragile forktail	R	Nat.	1
LIBELLULIDAE				
Crocothemis servilia Drury	Chinese dragonfly	R,U,R	Nat.	1
FISHES			--	
CHORDATA,			--	
ACTINOPTERYGII				
CENTRARCHIDAE			--	
Micropterus dolomieu Lacèpede	smallmouth bass	U,U,U	Nat.	1,2,3
CICHLIDAE			--	
Amphilophus labiatus Günther	red devil	R	Nat.	1
Sarotherodon melanotheron Rüppell	blackchin tilapia	R,R,R	Nat.	1,2,3
Cyprinus carpio Linnaeus	koi	U,U,U	Nat.	1,2,3
POECILIIDAE				
Gambusia affinis Baird and Girard	mosquitofish	O,O,O	Nat.	1,2,3
Poecilia spp	indet. mollies	O,O,O	Nat.	1,2,3

Table 5 (continued).

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Abundance	Status	ID Code
	BIRDS			
VERTEBRATA, AVES				
ARDEIDAE				
Bubulcus ibis Linnaeus	Cattle Egret	R	Nat.	1
	MAMMALS			
VERTEBRATA, ARTIODACTYLA				
BOVIDAE				
Bos taurus Linnaeus	domestic cow	R	Nat.	1

Key to Table 5:

Abundance categories:
- R – Rare – only one or two individuals observed.
- U – Uncommon – several to a dozen individuals observed.
- O – Occasional – seen irregularly in small numbers
- C – Common -observed everywhere, although generally not in large numbers.
- A – Abundant – observed in large numbers and widely distributed.

Status categories:
- **End** – Endemic – species found only in Hawaii
- **Ind.** – Indigenous – species found in Hawaii and elsewhere
- Nat. – Naturalized – species introduced to Hawaii intentionally, or accidentally.

Location codes:
- 1 – observed in Kalama or Makaleha Stream from 375 to 1200-ft (ASL)on Oct. 20-21, 2011
- 2 – observed in Kalama Stream or estuary from 0 to 15-ft (ASL) on July 26, 2002 (AECOS, 2002)
- 3 – observed in Kalama Stream lower or estuarine reach on January 17, 2008 (AECOS, 2008)
- 4 – observed in unamed tributary to Kalama located NE of project site at 475-ft (ASL) on November 28, 2007 (AECOS, 2008)
- 5 – reported in Kalama or Makaleha Stream from 400 to 560-ft (ASL) (Paul et al, 2004)
- 6 – reported in Kalama or Makaleha Stream from 575 to905-ft (ASL) (DAR Database, 2011)

Avian Survey Results

Twenty-five individual birds of 10 different species, representing seven separate families were recorded during the point count at Puʻuʻōpae Bridge (Table 6). All of the species detected are alien to the Hawaiian Islands.

Avian diversity and densities were in keeping with the vegetation present on the site, and its location. The most commonly recorded species was Nutmeg Mannikin (*Lonchura punctulata*). No waterbirds or water obligate species were

detected using resources within the stream at the bridge site (see, however, Table 5, reflecting results of the aquatic biologists).

Table 6. Avian species detected at and near the Puʻuʻōpaʻe Bridge, Kauaʻi.

Common Name	Scientific Name	ST	No.
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Red Junglefowl	*Gallus gallus*	A	2
	PELECANIFORMES		
	ARDEIDAE - Herons, Bitterns & Allies		
Cattle Egret	*Bulbucus ibis*	A	7
	COLUMBIFORMES		
	COLUMBIDAE - Pigeons & Doves		
Spotted Dove	*Streptopelia chinensis*	A	3
Zebra Dove	*Geopelia striata*	A	2
	PASSERIFORMES		
	CETTIIDAE - Cettia Warblers & Allies		
Japanese Bush-Warbler	*Cettia diphone*	A	2
	ZOSTEROPIDAE – White-eyes		
Japanese White-eye	*Zosterops japonicus*	A	4
	TURDIDAE – Thrushes		
White-rumped Shama	*Copsychus malabaricus*	A	2
	STURNIDAE - Starlings		
Common Myna	*Acridotheres tristis*	A	4
	CARDINALIDAE - Cardinals Saltators & Allies		
Northern Cardinal	*Cardinalis cardinalis*	A	1
	ICTERIDAE - Blackbirds		
Western Meadowlark	*Sturnella neglecta*	A	6

Table 6 (continued).

Common Name	Scientific Name	ST	No.
	FRINGILLIDAE – Fringilline and Carduline Finches & Allies		
	Carduelinae – Carduline Finches		
House Finch	*Carpodacus mexicanus*	A	3
	ESTRILDIDAE – Estrildid Finches		
	Estrildinae – Estrildine Finches		
Nutmeg Mannikin	*Lonchura punctulata*	A	9

Key to Table 6:
ST = Status
No. = Number of birds counted during point count
A = alien species

Mammalian Survey Results

The only mammal detected during the course of this survey was a domestic cow.

Assessment

Water Quality

Kalama Stream is classified by the State of Hawai'i as a perennial tributary of Wailua River [ID Code: 2-2-008]. The river appears on the Hawai'i Department of Health list of impaired waters in Hawai'i (HDOH, 2008), prepared under Clean Water Act, §303(d). The listing indicates that water quality within the river may not meet all state water quality standards for streams (Table 6). Wailua River is listed as impaired for enterococcus in the wet season, with impairment for all other measured parameters unknown. The Wailua River is not impaired for any measured parameter during the dry season.

During the October 20 water quality survey, Kalama Stream near Pu'u'ōpae Bridge had dissolved oxygen levels below 75% at all stations. Turbidity levels slightly exceeded 2.0 ntu at Sta. Bridge and total suspended solids concentrations were low. Nitrate-nitrite concentrations were above 30 µg N/l at Stas. Upstream and Downstream, but both total nitrogen and total phosphorus concentrations were excellent for Hawaiian Island streams. Values

obtained in our survey cannot be directly compared with the criteria in Table 6 to assesses compliance with the standards, because a comparison requires a representative geometric mean calculated from a minimum of three sampling events.

Table 6. State of Hawai'i water quality criteria for streams for wet (Nov. 1-Apr. 30) and dry (May 1-Oct. 31) seasons from HAR §11-54-05.2(b) (HDOH, 2009).

Parameter	Total Nitrogen (µg N/l)	Nitrate + Nitrite (µg N/l)	Total Phosphorus (µg P/l)	Turbidity (NTU)	Total Suspended Solids (mg/l)
Geometric mean not to exceed given value					
(dry season)	180.0	30.0	30.0	2.0	10.0
(wet season)	250.0	70.0	50.0	5.0	20.0
Not to exceed more than 10% of the time					
(dry season)	380.0	90.0	60.0	5.5	30.0
(wet season)	520.0	180.0	100.0	15.0	50.0
Not to exceed more than 2% of the time					
(dry season)	600.0	170.0	80.0	10.0	55.0
(wet season)	800.0	300.0	150.0	25.0	80.0

- pH – shall not deviate more than 0.5 units from ambient and not be lower than 5.5 nor higher than 8.0.
- Dissolved oxygen – not less than 80% saturation.
- Temperature – shall not vary more than 1 °C from ambient.
- Conductivity – not more than 300 micromhos/cm.

Riparian Plant Resources

No botanical resources of special concern are present here. Only four of the 49 plant species (8%) recorded in the project area are native (or an early Polynesian introduction) to the Hawaiian Islands. The majority are alien plants; introduced species that have become naturalized on Kaua'i. No plant species encountered near the project site is listed as threatened or endangered by the Endangered Species Act (ESA) of 1972 or protected by the State of Hawai'i (USFWS, 2011; HDLNR, 2008).

Aquatic Resources

Aquatic biota observed during the October 2011 survey of Kalama Stream comprised only introduced species. The Wailua River system is host to two species of native *ʻoʻopu* (*Awaous guamensis* and *Sicyopterus stimpsioni*) and a native *ʻōpae* (*Atyoida bisulcata*) that traditionally inhabit the middle reaches of streams in the Hawaiian Islands (Parham et al., 2008). Though no native species were encountered during our survey, it is possible that native *ʻoʻopu* and *ʻōpae* utilize Kalama Stream waters near the project, or at least as passage en route to habitats upstream.

The Wailua River watershed, is home to at least one known population of Newcomb's snail (*Erinna newcombi*), a lymnaeid snail listed as threatened under the Endangered Species Act. Newcomb's snail is restricted to freshwater habitat and probably feeds on algae and vegetation growing on submerged substrata. Eggs are attached to submerged rocks or vegetation and there are no widely dispersing larval stages as the entire life cycle is generally completed within a localized stream segment (USFWS, 2006). Newcomb's snail is not known to be present in the stream near Puʻuʻōpae Bridge and would not be anticipated to be encountered at the site as neither the habitat type or existing water quality at the site are suitable for the species. The distribution of the species is limited to cold, clear waters from 643 to 1299-ft elevation in protected, small, spring fed tributaries, or stream segments with overhanging waterfalls (USFWS, 2006).

Avian Resources

Avian diversity and densities were in keeping with the habitats present in the area. All 11 avian species recorded during our surveys are alien to the Hawaiian Islands.

Although not detected, Hawaiian Petrel (*Pterodroma sandwichensis*) and Newell's Shearwater (*Puffinus auricularis newelli*) have been recorded over-flying the general project area between late April and the middle of December each year (David, 1995, 2011; Morgan et al., 2003, 2004; David and Planning Solutions, 2008). Additionally, the Save Our Shearwaters Program has recovered both species from the general area on an annual basis over the past three decades (Morgan et al., 2003, 2004; David and Planning Solutions, 2008; Save our Shearwater Program, 2011).

The petrel is listed as endangered and the shearwater as threatened under both federal and State of Hawaiʻi endangered species statutes. The primary cause of

mortality in both Hawaiian Petrels and Newell's Shearwaters is thought to be predation by alien mammalian species at the nesting colonies (USFWS, 1983; Simons and Hodges, 1998; Ainley et al., 2001). Collision with man-made structures is the second most significant cause of mortality of these seabird species in Hawai'i. Nocturnally flying seabirds—especially fledglings on their way to sea in the summer and fall—can become disoriented by exterior lighting. Disoriented seabirds may collide with manmade structures and, if not killed outright, dazed or injured birds become targets of opportunity for feral mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al., 1998; Ainley et al., 2001; Hue et al., 2001; Day et al., 2003). There is no suitable nesting habitat for either of these listed seabird species within the general project area.

Mammalian Resources

It is likely that several of the four *Muridae* species: European house mouse (*Mus musculus domesticus*), roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), and Polynesian rat (*Rattus exulans hawaiiensis*) that are known to be established on the Island of Kaua'i occur in the vicinity of the project on a periodic basis. The endangered Hawaiian hoary bat was not detected during the course of this survey. It is highly probable that this species uses resources within the general project area on a seasonal basis, as they are all but ubiquitous in lowland areas on the Island.

Conclusions and Recommendations

None of the botanical (riparian) or aquatic species observed in the project area is listed as threatened or endangered (HDLNR, 1998; USFWS, 2011). Furthermore, the proposed action will not result in modification of any federally designated Critical Habitat, as there is none present on or adjacent to the Pu'u'ōpae Bridge.

A Best Management Practices (BMP) plan should be designed and implemented to minimize adverse environmental impacts to water quality and aquatic biota in the vicinity of the project site during construction.

The potential impact that the proposed action poses to Newell's Shearwaters and Hawaiian Petrels is an increased threat that birds will be downed after becoming disoriented by exterior lighting if required in conjunction with night-time construction activities, and, or the servicing of construction equipment at night. To reduce the potential for interactions between nocturnally flying

seabirds and man-made structures, it is recommended that any external construction lighting be shielded, and that any streetlights proposed as part of this project be shielded as well (Reed et al., 1985; Telfer et al., 1987).

It is unlikely that reconstruction and the continued operation of the bridge over Kalama Stream at this location will result in deleterious impacts to Hawaiian hoary bats as no vegetation suitable for bat roosting would need to be removed as part of the proposed action.

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PUUOPAE BRIDGE REPLACEMENT ENVIRONMENTAL ASSESSMENT

TMK (4th.): Plat 4-4-02
Kawaihau District, County of Kaua‘i, State of Hawai‘i

Submitted Pursuant to Chapter 343, Hawai‘i Revised Statutes (HRS)
County of Kaua‘i, Department of Public Works

APPENDIX 4
Cultural Impact Assessment

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SCS Project Number 1233-CIA-1

A CULTURAL IMPACT ASSESSMENT OF FOR THE PU`U `ŌPAE BRIDGE REPLACEMENT PROJECT, BRIDGE NUMBER 00744011114400, STATE SITE 50-30-08-9397 WAILUA, SOUTH OLOHENA AHUPUA`A, KAWAIHAU DISTRICT, KAUA`I ISLAND, HAWAI`I [TMK: (4) 4-4-002

Prepared by:
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April 2012
DRAFT

Prepared for:
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INTRODUCTION

At the request of KAI Hawaii, Inc., Scientific Consultant Services, Inc. (SCS), prepared a Cultural Impact Assessment (CIA) for approximately 1 acre of land on and around the Pu`u `Ōpae Bridge complex in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-4-002] (Figures 1 and 2). The CIA was conducted in preparation for the Pu`u `Ōpae Bridge Replacement Project. Plan view drawings of the proposed Pu`u `Ōpae Bridge replacement options are presented in Appendix A.

The Constitution of the State of Hawai`i clearly states the duty of the State and its agencies is to preserve, protect, and prevent interference with the traditional and customary rights of Native Hawaiians. Article XII, Section 7 (2000) requires the State to "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua`a* tenants who are descendants of Native Hawaiians who inhabited the Hawaiian Islands prior to 1778." In spite of the establishment of the foreign concept of private ownership and western-style government, Kamehameha III (Kauikeaouli) preserved the peoples traditional right to subsistence. As a result in 1850, the Hawaiian Government confirmed the traditional access rights to Native Hawaiian *ahupua`a* tenants to gather specific natural resources for customary uses from undeveloped private property and waterways under the Hawaiian Revised Statutes (HRS) 7-1. In 1992, the State of Hawai`i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, "native Hawaiian rights…may extend beyond the *ahupua`a* in which a Native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner" (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

Act 50, enacted by the Legislature of the State of Hawai`i (2000) with House Bill (HB) 2895, relating to Environmental Impact Statements, proposes that:

> …there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaii's culture, and traditional and customary rights… [H.B. NO. 2895].

Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs and practices, and resources of Native Hawaiians as well as other ethnic groups. Act 50 also requires state agencies and other developers to assess the effects of proposed land use or shore line developments on the

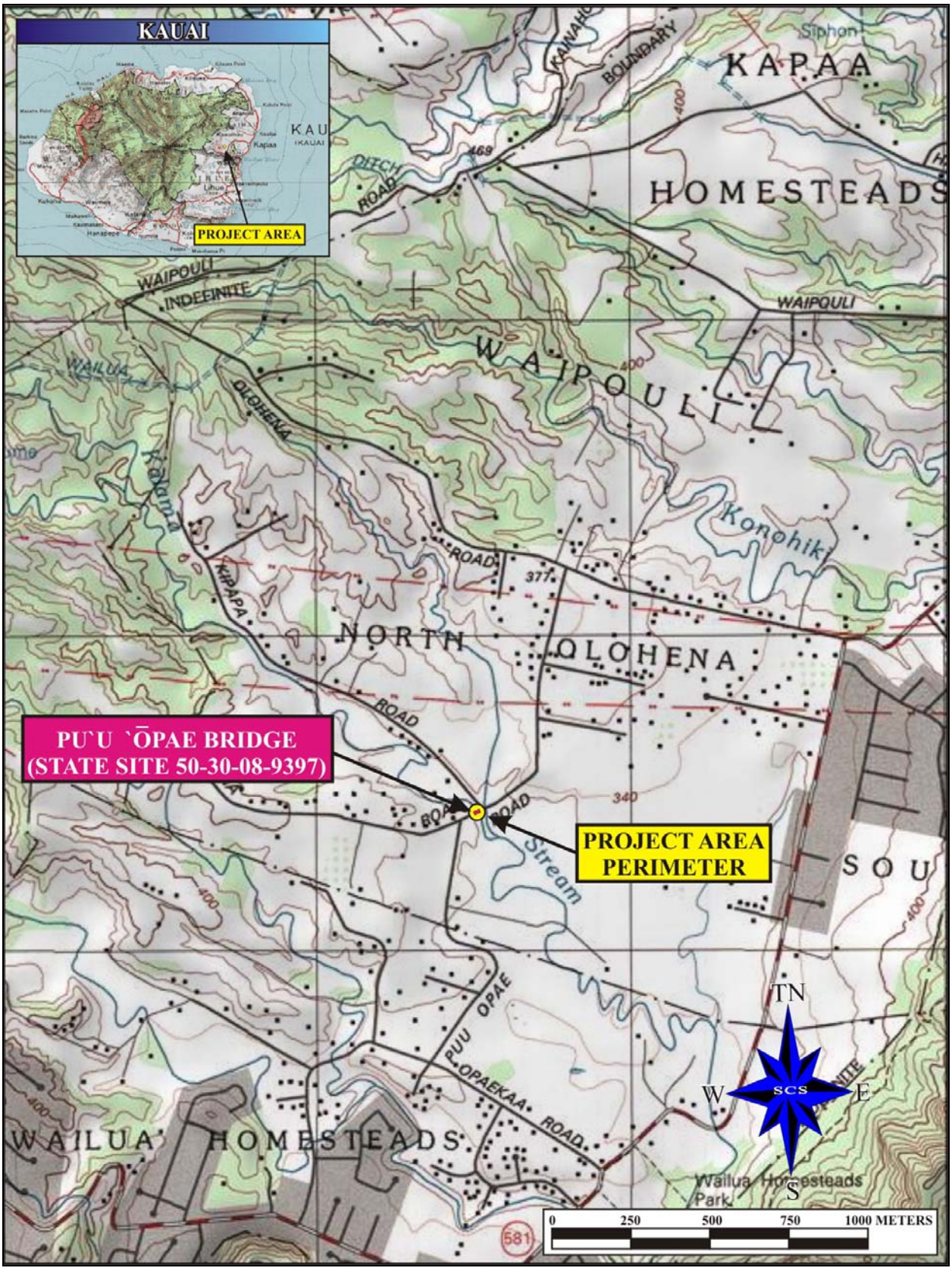


Figure 1: USGS Quadrangle (Kapaa, 1996) Map Showing Location of Project Area.

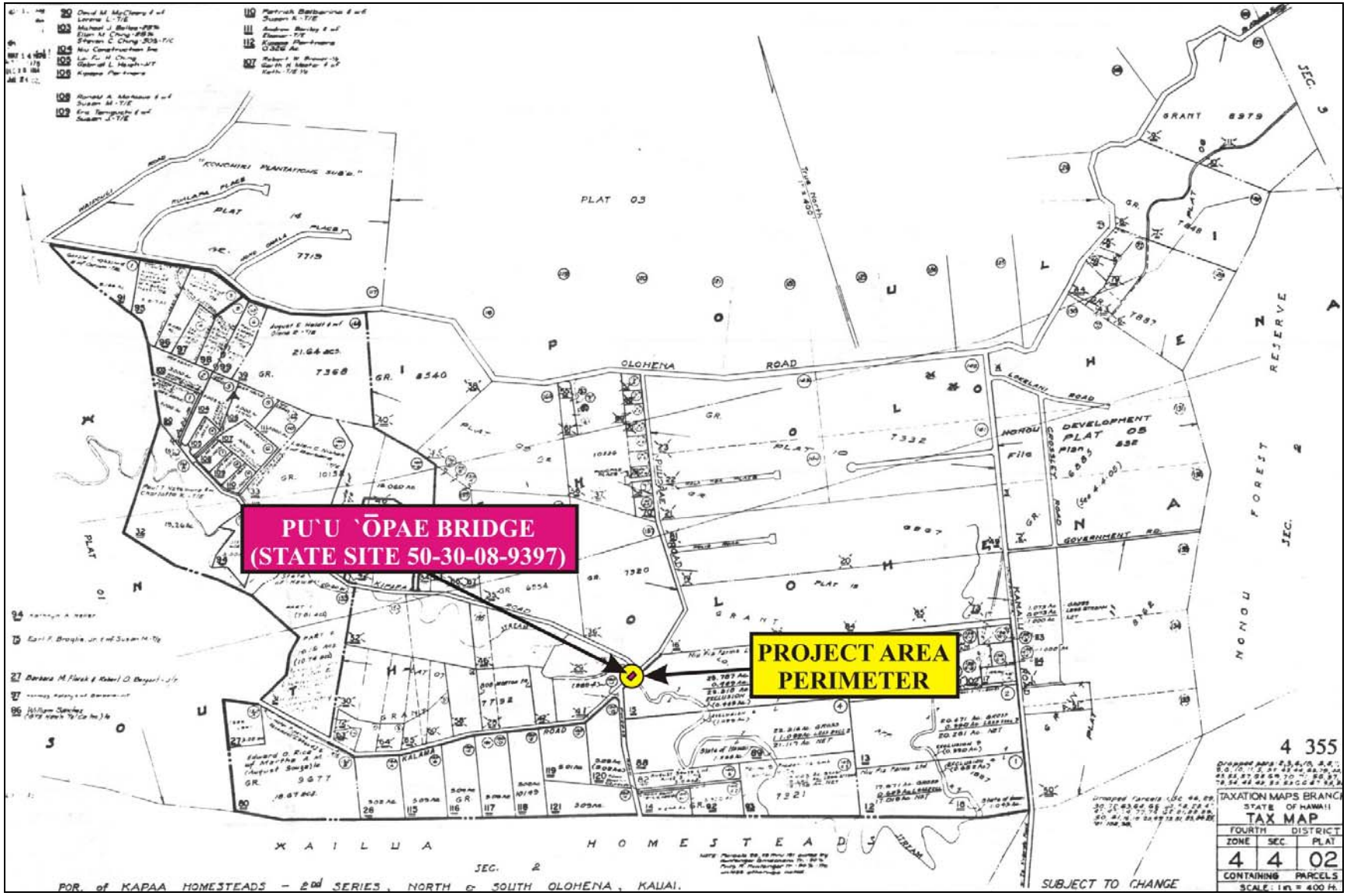


Figure 2: Tax Map Key [TMK: (4) 4-4-002] Showing Location of Project Area.

"cultural practices of the community and State" as part of the HRS Chapter 343 (2001) environmental review process.

It also re-defined the definition of "significant effect" to include "the sum of effects on the quality of the environment including actions impact a natural resource, limit the range of beneficial uses of the environment, that are contrary to the State's environmental policies . . . or adversely affect the economic welfare, social welfare or cultural practices of the community and State" (H.B. 2895, Act 50, 2000). Cultural resources can include a broad range of often overlapping categories, including places, behaviors, values, beliefs, objects, records, stories, etc. (H.B. 2895, Act 50, 2000).

Thus, Act 50 requires that an assessment of cultural practices and the possible impacts of a proposed action be included in Environmental Assessments and Environmental Impact Statements, and to be taken into consideration during the planning process. As defined by the Hawaii State Office of Environmental Quality Control (OEQC), the concept of geographical expansion is recognized by using, as an example, "the broad geographical area, e.g. district or *ahupua`a*" (OEQC 1997). It was decided that the process should identify 'anthropological' cultural practices, rather than 'social' cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice.

Therefore, the purpose of a Cultural Impact Assessment is to identify the possibility of on-going cultural activities and resources within a project area, or its vicinity, and then assessing the potential for impacts on these cultural resources. The CIA is not intended to be a document of in depth archival-historical land research, or a record of oral family histories, unless these records contain information about specific cultural resources that might be impacted by a proposed project.

According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control (OEQC 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religions and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both manmade and natural, which support such cultural beliefs.

The meaning of "traditional" was explained in *National Register Bulletin*:

> Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations', usually orally or through practice. The traditional cultural significance of a historic property then is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices. . . . [Parker and King 1990:1]

METHODOLOGY

This Cultural Impact Assessment was prepared as much as possible in accordance with the suggested methodology and content protocol in the Guidelines for Assessing Cultural Impacts (OEQC 1997). In outlining the "Cultural Impact Assessment Methodology", the OEQC states that:

> "…information may be obtained through scoping, community meetings, ethnographic interviews and oral histories…"

This report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. Copies of the letters of inquiry are presented below in Appendix B; copies of posted legal notices are presented in Appendix C; copies of the second group of letters of inquiry are presented below in Appendix D; and responses to the inquiries are presented in the Response to Inquires section of this document and selected responses are presented in Appendix E. This Cultural Impact Assessment was prepared in accordance with the suggested methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997), whenever possible. The assessment concerning cultural impacts may include, but not be limited to, the following matters:

(1) if consultation is available, 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 of limitations which might have affected the quality of the information obtained;

(2) 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;

(3) if conducted, 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;

(4) biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or being interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area;

(5) a discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken, as well as the particular perspective of the authors, if appropriate, any opposing views, and any other relevant constraints, limitations or biases;

(6) a discussion concerning the cultural resources, practices and beliefs identified, and for the 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;

(7) 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;

(8) an explanation of confidential information that has been withheld from public disclosure in the assessment;

(9) a discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs;

(10) 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, and;

(11) the inclusion of bibliography of references, and attached records of interviews which were allowed to be disclosed.

If on-going cultural activities and/or resources are identified within the project area, assessments of the potential effects on the cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

ARCHIVAL RESEARCH

Archival research focused on a historical documentary study involving both published and unpublished sources. These included legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps, land records, such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts, and previous archaeological reports.

INTERVIEW METHODOLOGY

Interviews are conducted in accordance with Federal and State laws, and guidelines, when knowledgeable individuals are able to identify cultural practices in, or in close proximity to, the project area. If they have knowledge of traditional stories, practices and beliefs associated with a project area or if they know of historical properties within the project area, they are sought out for additional consultation and interviews. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the project area are invited to share their relevant information concerning particular cultural resources. Often people are recommended for their expertise, and indeed, organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs (OHA), historical societies, Island Trail clubs, and Planning Commissions are depended upon for their recommendations of suitable informants. These groups are invited to contribute their input, and suggest further avenues of inquiry, as well as specific individuals to interview. It should be stressed again that this process does not include formal or in-depth ethnographic interviews or oral histories as described in the OEQC's *Guidelines for Assessing Cultural Impacts* (1997). The assessments are intended to identify potential impacts to on-going cultural practices, or resources, within a project area or in its close vicinity.

If knowledgeable individuals are identified, personal interviews are sometimes taped and then transcribed. These draft transcripts are returned to each of the participants for their review and comments. After corrections are made, each individual signs a release form, making the interview available for this study. When telephone interviews occur, a summary of the information is usually sent for correction and approval, or dictated by the informant and then incorporated into the document. If no cultural resource information is forthcoming and no knowledgeable informants are suggested for further inquiry, interviews are not conducted.

PROJECT AREA AND VICINITY

The approximately 1 acre project area lies in South Olohena Ahupua`a, Kawaihau District, on the eastern flank of Kauai Island, at c. 320 feet above mean sea level (amsl). South

Olohena is one of ten *ahupua`a* located in the area known as Puna Moku during traditional times (Handy and Handy 1972:423). South Olohena is the southern- most *ahupua`a* of the Kawaihau District and borders Līhu`e District. The project area and environs occur in the former Kapaa Homesteads 2nd Series that was created in 1913. The area is currently known as the Kapaa Homesteads.

The Pu`u `Ōpae Bridge crosses Kalama Stream, a west to east tending stream that converges with `Ōpaeka`a Stream about a mile from its origination source. The stream had only limited flow on the day of fieldwork and measured approximately 12-15 feet wide, a bit wider on the western flank where water had pooled. The bridge is present on Pu`u `Ōpae Road, which spans Kalama Stream (Figures 3 through 6). Kīpapa Road is perpendicular to Pu`u `Ōpae Road and parallel to the stream (see Figure 4). A small concrete culvert is present slightly upstream from the bridge, adjacent to Kīpapa Road. The northern flanks of the bridge contain existing roads and a residence on either side of Pu`u `Ōpae Road. Beyond eastern flank of the bridge, pasture lands are present. To the southwestern flank of the bridge is a residence, and western flank bordered by pasture land and residences. The area surveyed for this study included lands around all cardinal points of the bridge, up to c. 20 meters (65 feet).

ENVIRONMENTAL SETTING

LOCATION

Kaua`i, the oldest and fourth largest of the eight main Hawaiian Islands (with land area equaling approximately 1,432 square kilometers), was formed from one great shield volcano (Macdonald and Abbott 1970:458-461). At one time, this vast volcano supported the largest caldera in the islands, horizontally extending 15 to 20 kilometers across. Mount Wai`ale`ale, which forms the central hub of the island, extends 1,598 meters above mean sea level (amsl). Topographically, Kaua`i is a product of heavy erosion with broad, deep valleys, and large alluvial plains.

The current project area, inclusive of the bridge itself, Kalama Stream, and adjacent land bordering the stream and bridge access points, has undergone numerous modifications in the past. Pasture lands flank several sides of the general bridge area, as well as existing residences. Kalama Stream in this section does not flow rapidly and is overgrown with non-native vegetation. Other vegetation in the area around the bridge all consists of introduced trees, shrubs, and grasses. The banks of the stream have been modified by a) bridge construction and b) road construction. A concrete culvert is present on Kīpapa Road, adjacent to the stream, just upstream from the bridge.

Figure 3: Photograph of Pu`u `Ōpae Bridge. View to South.

Figure 4: Photograph of Pu`u Ōpae Bridge Approach. View to North.

Figure 5: Photograph of Pu`u Ōpae Bridge, West Elevation. View to Southeast.

Figure 6: Photograph of Pu`u Ōpae Bridge, East Elevation. View to Northeast.

Typical soils encountered in the general project area are associated with the Lihue Series and Hanamaulu Series (Foote *et al.* 1972:29). The soils of the Lihue Soil Series consist of well-drained soils located in the uplands of Kaua`i Island, and are formed in materials weathered from igneous rock (Foote *et al.* 1972:29). The slope ranges from gentle to steep, and elevations extend from around sea level to 800 feet amsl. Rainfall ranges from 40 to 60 inches annually and the mean soil temperature is 73 degrees Fahrenheit. Soils in this series area used for commercial agriculture including, sugarcane, pineapple, pasture, truck crops, orchards, wildlife habitat, and home sites (Foote *et al.* 1972:29). Silty clays dominate the matrices of this series. The Hanamaulu Series also consists mainly of silty clays and are well-drained soils on stream terraces and steep terrace breaks. These soils developed in alluvium washed from upland soils and would define the soils along Kalama Stream. This soil series is generally associated with sugarcane cultivation, pasture, wildlife habitat, and water supply. Natural vegetation consists of buffalo grass, pandanus, glenwoodgrass, *hau*, and morning glory.

CLIMATE

The project area is relatively wet, with mean annual rainfall ranging from 40 to 120 inches annually (Armstrong 1983; Giambelluca *et al.* 1986). During the pre-Contact Period, a great amount of fresh water would have been locally available in the numerous streams that drain Mt. Wai`ale`ale. Annual air temperatures in the area vary from approximately 50 to 83 degrees (Armstrong 1983).

PAST POLITICAL BOUNDARIES

Approximately 600 years ago, the Hawaiian population had expanded throughout the Hawaiian Islands to a point where large, political districts could be formed (Lyons 1903; Kamakau 1991; Moffat and Fitzpatrick 1995). At that time, Kaua`i consisted of six districts, or *moku*: East and West Kona, Puna, Ko`olau, Halele`a, and Nāpili. Land was considered to be the property of the king or *ali`i `ai moku* (the leader who controls the island/district), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted; his higher chiefs received large parcels from him, and in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku, ahupua`a, `ili or `ili`āina* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua`a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were, therefore, able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying the

needed resources from different environmental zones (Lyons 1875:111). The *`ili* or *`ili `āina* were smaller land divisions next in importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61).

TRADITIONAL AND HISTORIC SETTING

Archaeological settlement pattern data indicates that initial colonization and occupation of the Hawaiian Islands first occurred on the windward shoreline areas around c. A.D. 900, with populations eventually settling into drier leeward areas at later periods (Kirch 1985). Coastal settlement was still dominant, but populations began exploiting and living in the upland *kula* (plains) zones. Greater population expansion to inland areas did not occur until around the. A.D. 12th century and continued through the 16th century. Large scale or intensive agricultural endeavors were implemented in association with habitation. Coastal lands were used for settlement and taro was cultivated in near-coastal reaches and in the uplands.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys, such as those on Kaua`i, provided ideal conditions for wetland *kalo* (*Colocasia esculenta*)—agriculture that incorporated pond fields and irrigation canals *(`auwai*). Other cultigens, such as *kō* (sugarcane, *Saccharum officinaruma*), *mai`a* (banana, *Musa sp*.), and *`uala* (sweet potato, *Ipomoea batatas*) were also grown. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985). Agricultural development on Kaua`i was likely to have begun early (A.D. 1100–1300), during what is known as the Expansion Period (Kirch 1985). Coastal zones were utilized for marine resources, habitation, burials, and ceremonial structures often associated with fishing (Bennett 1931). Often, land sections located in back of the shoreline contained pond fields and dunes that were used for sweet potato production (Handy and Handy 1972; Earle 1978). Trails linked the *makai* and *mauka* sections of the *ahupua`a*, allowing easy access to its resources. Other trails skirted the coast, which made communication between *ahupua`a* possible.

TRADITIONAL SETTING

Kaua`i is the fourth largest and the oldest of the main Hawaiian Islands. It is said that many years ago, the fire goddess Pele and her family briefly stopped on Kaua`i to explore the possibility of finding a permanent home. She dug a deep pit, but it was instantly filled with water, so they left Kaua`i and traveled on, and eventually settled in Halema`uma`u, where she resides to this day (Beckwith 1976).

Despite Kaua`i Island's separation from the rest of the Hawaiian archipelago (the channel that separates Kaua`i and Ni`ihau from O`ahu is 63 miles wide), the rich variety of topography and climate has been extremely influential in establishing broad settlement patterns (Bennett 1931:4). The varied ecological division of the island, which contains verdant cliffs, dry and sandy flats, wide river valleys and tracts of fertile soil, provided the opportunities for a wide variety of cultivation.

The place name Pu`u `Ōpae, literally translates to "shrimp hill", an implied stream-fed food resource upland from the coast (Pukui *et al*. 1974:204). Certainly, Kalama Stream contains water along its length garnered from the abundant rainfall of Mount Wai`ale`ale, "the wettest place on earth," with an average of 11,455 mm (451 in) of rain annually (Encarta Geography, online).

Handy and Handy (1972:423) note that the inland portion of Puna District (Kawaihau) contains a number of small streams, such as Kalama Stream, along which small *lo`i* were developed. Bennett (1931:128) states that in the homestead area, many little valleys contain taro terraces. Further, below the mountains, there were extensive flatlands where agricultural terraces irrigated by such streams as Kapahi were located (Bennett 1931:128). The terraces were described as "Single rows of stone mark the divisions with some 2-foot terraces" and designated as Bennett's Site 110, State Site 50-30-08-110, (Bennett 1931:128). This is also the location of the upper homesteads (Kapaa Homesteads). Bennett's Site 111 (State Site 50-30-08-111), as described by Bennett (1931:128-129) and also occurring in the area (inland and south of Kealia Valley), consisted of a "simple dirt ditch, about 6 feet in width and of varying depths which is traditionally referred to as a Hawaiian ditch."

During the pre-Contact period (prior to 1778), this upper region was marginally settled but contained excellent land for agriculture, it being a product of alluvial deposition from all the streams in the area. Impressive irrigation systems were built on Kaua`i to transport stream water to agricultural fields during traditional times (Handy and Handy 1972; Earle 1978). In 1892,

Dole reported that these ancient agricultural resources of eastern Kaua`i were still functioning, as evident by the extensive ditch irrigation system throughout Wahiawa, Kapa`a, and Kīlauea.

Wailua Ahupua`a lies just south of the project area. Wailua River is the largest river in the Hawaiian archipelago and cuts between two mountains just before the river enters the sea. During the pre-Contact period, the lower portion of this *ahupua`a*, where Wailua Stream meets the ocean. Wailua Nui Hoano (Great Sacred Wailua), as this area was called, was one of the two most sacred areas in the Hawaiian archipelago and was *kapu* to commoners. It was crucial that all the Kaua`i *ali`i* were birthed at the Birthstones which were located in an area of Wailua called Holoholokū. During periods "[w]hen the chiefly class became diminished for some reason, the King selected women of common birth to deliver children at the Birthstones. Legend says such a child would be a chief" (Joesting 1987:5–9). The important role the Birthstones of Holoholukū played during ancient times is exemplified in an ancient chant:

> The child of a chief born at Holoholo-ku is a high chief;
> The child of a commoner born at Holuholu-ku becomes a chief also;
> The child of a high chief born outside of Holoholo-ku is no chief, a commoner he! (Joesting 1987:5–9).

Another measure of importance, at least politically, can be found in the remains of religious features such as *heiau*. There were approximately nine *heiau* listed in the 1880s between Keālia and Kapa`a, suggesting that this area contained more significance than is presently known (Bushnell *et al.* 2002). Sadly, the location of most of these structures has been lost. Bennett (1931:31) calculated 122 *heiau* on the Island of Kaua`i. No documented *heiau* were recorded in the vicinity of the project area. However, numerous *heiau* were recorded along Wailua River and also in Kapa`a, toward the coastline. Within a radius of approximately one and a half miles from the Wailua River mouth are six important temples and associated sites which have officially been designated a National Historical Landmark (Kirch 1996:16).

HISTORIC ERA

The first recorded Western contact in the Hawaiian Islands was made in 1778 on the southern coast of Kaua`i (Beaglehole 1967). Waimea was the port of call for many years, leaving the rest of Kaua`i an uncharted territory. Portlock and Dixon visited Waimea in 1786 and in 1787 and John Meares also stopped on his way to Canton in 1787 (Joesting 1987). Captain William Douglas sent two sailors ashore in Waimea to collect sandalwood in 1789, and in 1791, Captain John Kendrick left three men on Ni`ihau to look for pearls and sandalwood. There is no description of the eastern coast until Captain George Vancouver traveled up the coast

from Wailua in 1793. As there was no anchorage, he sailed towards Kapa`a, noting that this was: "…the most fertile and pleasant district of the island…" (Joesting 1987).

Much of the knowledge of traditional land use patterns is based on what was recorded at the time of, and shortly after, Western contact. Early records, such as journals kept by travelers and missionaries or Hawaiian traditions that survived long enough to be written down, assist in understanding the past. Protestant missionaries arrived in Hawai`i in April of 1820 and by the end of the year, were settled on Kaua`i. In 1830, as part of the missionary report, a census of individuals living in the *ahupua`a* around the islands was recorded (Schmitt 1973). We are limited to traveler's journals for information concerning descriptions of the general Wailua region.

In 1849, William Patterson Alexander landed at Koloa, Kauai where he was to embark over land to the mission houses in Wai`oli:

> May 5. This morning we rose early.…A few miles from Wailua, near Kapaa we passed the wreck of a schooner on the beach, which once belonged to Capt. Bernard. It was driven in a gale over the reef, and up on the beach, where it now lies. A few miles further we arrived at Kealia. We had some difficulty in crossing the river at this place, owing to the restiveness of out horses. The country here near the shore was rather uninviting, except the valleys which always contained streams of water….The two peaks of Anahola are quite a landmark to one traveling in this region….[Alexander cited in Kauai Historical Society 1991:123].

On his return to Koloa, Alexander traveled back through Keālia:

> …Five miles from Anahola we stopped at Kealia, a picturesque valley containing a beautiful waterfall, to bathe & rest out horses. In leaving the valley, I unfortunately left my spur, & did not think of it till we had ridden nearly a mile. I rode back for it and found it, determined to lose nothing on Kauai by carelessness [Alexander cited in Kauai Historical Society 1991:129].

Although no people are mentioned, it can be assumed they were there, perhaps more inland, tending to lands worked by their families for generations.

THE MĀHELE

In the 1840s, traditional land tenure shifted drastically with the introduction of private land ownership based on Western law. While it is a complex issue, many scholars believe that in

order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian economy to that of a market economy (Kuykendall 1938, Vol. I: 145; Daws 1968:111; Kelly 1983:45, 1998:4; Kame`eleihiwa 1992:169–70, 176). The Māhele of 1848 divided Hawaiian lands between the king, the chiefs, the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were made available and private ownership was instituted, the *maka`āinana* were able to claim the plots on which they had been cultivating and living, if they had been made aware of the procedures. These claims did not include any previously cultivated but presently fallow land, *`okipū* (on O`ahu), stream fisheries, or many other resources necessary for traditional survival (Kelly 1983; Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent after which they could take possession of the property (Chinen 1961:16).

The current bridge location does not itself fall into any LCA's or land grants. However, there are adjacent lands which are demarcated as land grants and land court applications. A majority of these inland claims were associated with streams, where wetland taro was produced and house sites were scattered about the agricultural area.

Commercial sugarcane agriculture came to the area during the middle to late 19th century. According to Dorrance and Morgan (2000), for instance, the Kealia Sugar Plantation was in operation from 1869 until 1885. The Makee Sugar Company ran from 1877 until 1933.

George H. Fairfield, general manager of the Makee Sugar Company, employed the "divide and rule strategy" by hiring a labor force consisting of multinationals which provided for stable work force with little division (Takaki 1983:24). Plantation life for the workers could be very harsh; when it came to production, workers were treated little better than slaves (Takaki 1983:74).

Around this time (1865), William T. Brigham, future curator of the Bishop Museum, toured Kaua`i on horseback, passing through the inland area on his way to Keālia:

> …After riding through several kukui groves, and over pleasant ridges we came to Kealia, the residence of Mr. Krull. Here I lunched at two o'clock. Many kukui trees were covered with dodder. A few miles beyond we passed a Golgotha, and as we turned towards the shore again, saw a curious hole in the ridge [Anahola Mts] which comes to an abrupt end here. [Brigham in Kauai Historical Society 1991:142].

Historical times for inland South Olohena are most marked by the creation of the Waipouli Homesteads, where Pu`u `Ōpae Bridge is now located. Background research of the area (Spencer Mason Architects 1989) shows 167 lots of Waipouli (called the Kapa`a Homesteads 2nd Series) lands were sold by lottery to homesteaders on April 29, 1913. Two individuals, A. Ohai and M. Ferreira, were awarded the parcels on either side of the bridge. At that time, there was little access for the homesteaders to reach their property to build their houses or cultivate, only ox-carts could make the trip; there was also no water availability vis pipes and irrigation (Griffin 2005). In 1913, the Governor also sold water rights to the Makee Sugar Company, forcing the settlers to pay a monthly rate if they choose to use the water from any stream in the area (Griffin 2005). By 1918, the settlers had secured water rights by petitioning the territory board in Honolulu and by 1919, when the Wailua Homesteads opened, several roads were built in the area: Pu`upilo, Pu`u `Ōpae, and Kamalu (Griffin 2005).

Pu`u `Ōpae Bridge was constructed in 1915, two years after the homestead was opened. By 1917, ninety homesteaders were producing on the Olohena-Waipouli tract of 3,140 acres, and harvested some 31,500 tons of sugar cane worth $197,000 and some pine trees (Griffin 2005). The Makee Sugar Company grew both sugar cane and pineapple in the area, which the Makee train steaming through the homesteads to collect sugar cane from the homesteads and take it to the mill near Kealia.

In 1919, at the mouth of the Wailua River, a new bridge was constructed, the older bridge sections having been removed and "donated" for other small, local bridges in the area. Sections of the `Ōpaeka`a Bridge, and presumably parts of the Pu`u `Ōpae Bridge, contain parts of the original Wailua River Bridge. It was during this time period, c. 1920s, that much road building occurred in both the Waipouli and Wailua Homesteads, this including work on Pu`u `Ōpae Bridge (see below; Spencer Mason Architects 1989).

By the mid-century, many of the homesteaders were occupied in fields other than agriculture and the homesteads became more residential in nature. As Spencer Mason (1989) and Griffin (2005) note, the lands adjacent to Pu`u `Ōpae Bridge are some of the only remaining areas zoned as "agriculture" in the area.

As discussed below, work on roads and bridges continued, with c. 1958 being another time when bridges and roads were improved to their current state.

ARCHAEOLOGY

Previous archaeological investigations have not been conducted in the current project area. Scientific Consultant Services, Inc, recently conducted an Archaeological Inventory Survey on approximately 1 acre on and around the Pu`u `Ōpae Bridge complex in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-4-002] (Dagher and Dega 2012). The study was conducted as a portion of the multidisciplinary study pertaining to the placement of the Pu`u `Ōpae Bridge Replacement Project. During the Archaeological Inventory Survey, only one site, the historic Pu`u `Ōpae Bridge (State Site 50-30-08-9397), often referred to as Kalama Bridge or Kapaa Homesteads Bridge No. 2, was identified.

PU`U `ŌPAE BRIDGE (STATE SITE 50-30-08-9397)

Pu`u `Ōpae Bridge (State Site 50-30-08-9397), often called Kalama Bridge and originally known as Kapaa Homesteads Bridge No. 2, carries Pu`u `Ōpae Road over Kalama Stream in the Kapaa Homesteads (Figures 7 and 8). The bridge was designated as State Inventory of Historic Properties (SIHP) as State Site 50-30-08-9397. Subsequently, Pu`u `Ōpae Bridge was listed on the State Register of Historic Places in 2004 as State Site 30 08 9397 and on the National Register of Historic Places in 2005 as Site 05000536. The State Register of Historic Places is presented in Appendix F and the National Register of Historic Places Nomination Form is presented in Appendix G.

State Site 50-30-08-9397 has been evaluated according to criteria established for the Hawai`i State Register of Historic Places (HAR§13-275-6). Pu`u `Ōpae Bridge has been evaluated according to the established criteria for the Hawai`i State Register of Historic Places §13-275-6 and found to be significant under Criterion D, for information content (Dagher and Dega 2011). The site was considered as significant per Federal standards under Criterion A, associated with events that have made a significant contribution to the broad patterns of history.

The period of significance is designated as 1925-1949, 1900-1924 and it is listed as a transportation function (road-related). The area of significance attributed to the bridge includes transportation, social history, community planning and development, commerce, and exploration/settlement. The site was considered as significant per Federal standards under

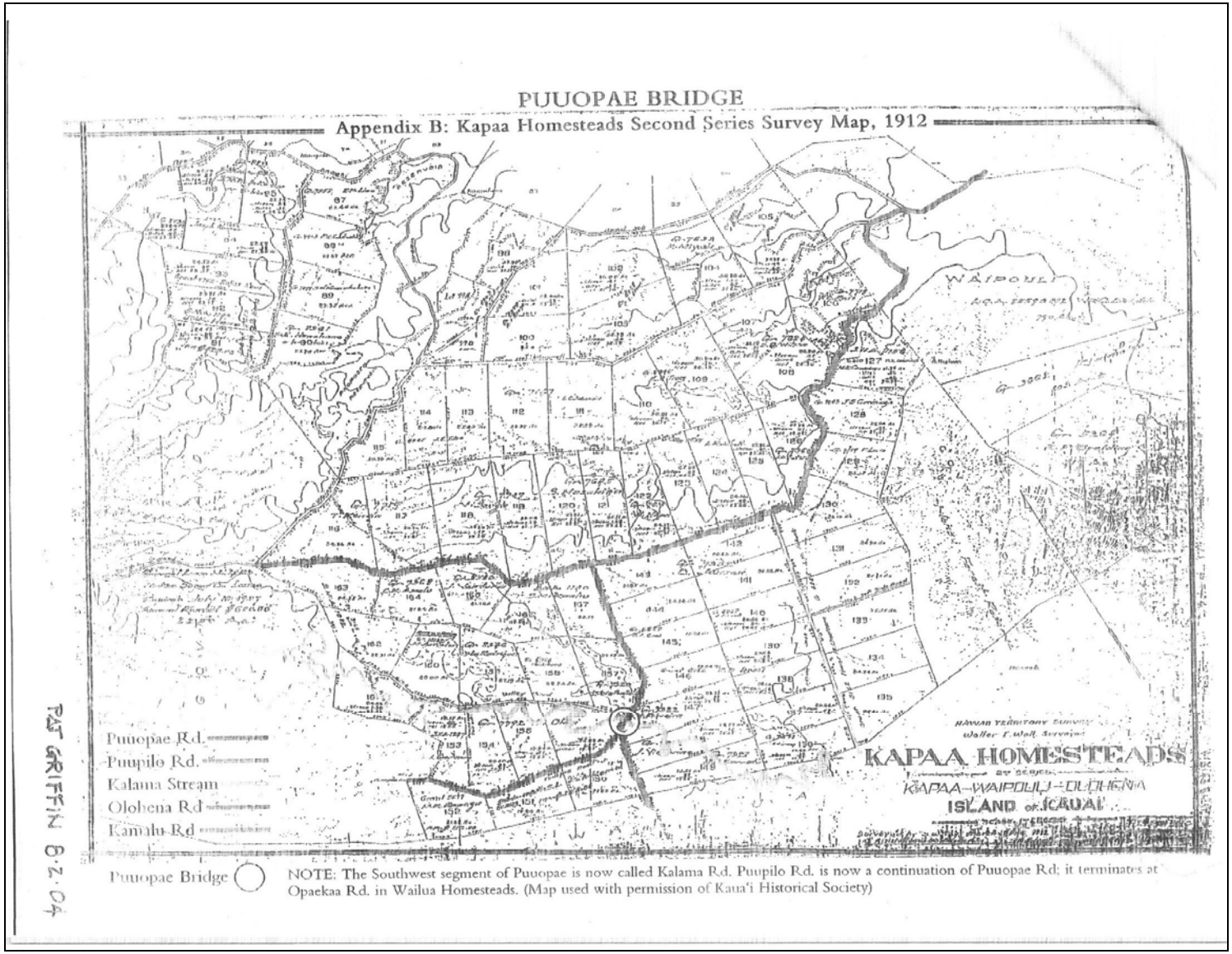
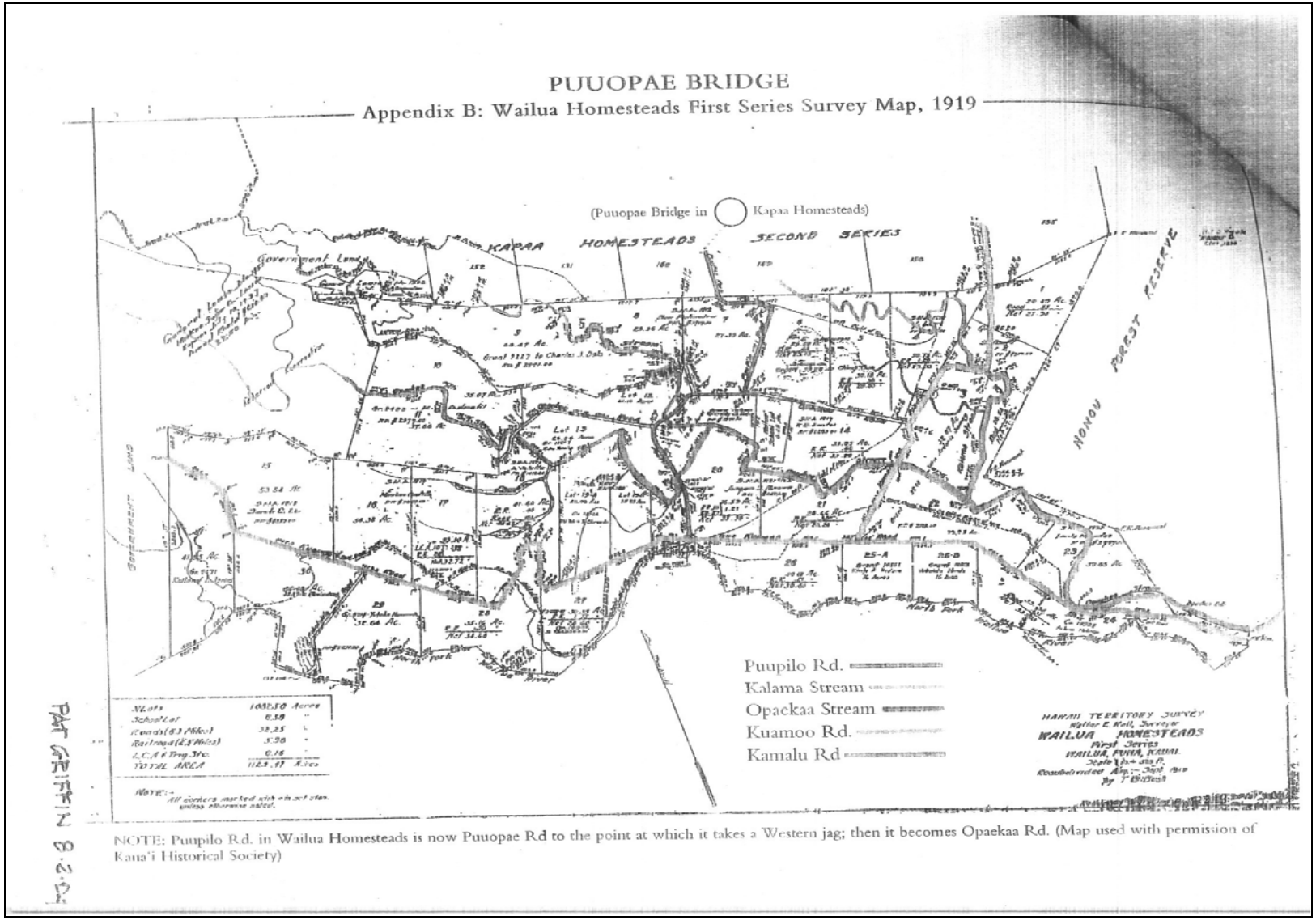


Figure 7: 1912 Map of Kapaa Homesteads Second Series with Pu`u Ōpae Bridge Location. Credit P. Griffin (2005) National Register of Historic Places, Registration Form.



NOTE: Puupilo Rd. in Wailua Homesteads is now Puuopae Rd to the point at which it takes a Western jag; then it becomes Opaekaa Rd. (Map used with permision of Kaua'i Historical Society)

Figure 8: 1919 Map of Kapaa Homesteads First Series with Pu`u `Ōpae Bridge Location. Credit P. Griffin (2005) National Register of Historic Places, Registration Form.

Criterion A, associated with events that have made a significant contribution to the broad patterns of history.

Based on the Spencer Mason architects (1989:217) evaluation, Pu`u `Ōpae Bridge does not have great engineering complexity or artistic value. As such, the ratings for this bridge were not "high" when compared with others. However, the bridge appears to be a good example of the early 20th century type bridge utilizing materials from an earlier bridge (Wailua River Bridge, 1919) and also has an "interesting" rivet pattern (*ibid*). It is one of three bridges on Kauai where metal construction is apparent, the others being S-18 (Hanalei River Bridge) and C-13 (`Ōpaeka`a Stream Bridge). While a fairly modest structure, there are those in the community who value the bridge and its contribution to early homesteading in the area.

The bridge is a single lane and measures 48 feet long; the bridge was never expanded beyond 48 feet long. While some conflicting data appears in the references, the bridge appears to have been initially constructed in 1915 (Griffin 2005). Pu`u `Ōpae Road was formally constructed in 1912 when the land tracts were subdivided for settlement in c. 1913. The bridge was originally trussed (1915) with a concrete-encased steel floor. The truss was removed in 1958 (Figure 9, Griffin personal communication 2012).

Original materials to manufacture the bridge include a concrete deck, steel girder floor system, and sections of the abutments. The endposts were recycled during demolition of the Wailua River Bridge in 1919. The railings of the bridge have been repaired over time. Additionally, in 1958, two 48-foot I-beams were installed below the concrete and steel girder floor for structural support (see Figure 9). To install the I-beams, the headwalls above the stone abutments were broken and repaired with concrete. The trusses were likely removed after the I-beam supports were in place. Bridge railings were replaced in 2000 with galvanized W guardrails, these replacing the older wooden rails. Rusting and collision damage have adversely affected the bridge's workmanship and original appearance.

The bridge has been considered significant due to its historical association with Kapaa Homesteads development in the early 1900s. According to Spencer Mason Architects (1989), Pu`u `Ōpae Bridge is one of only two of its structural type to have a steel girder floor system in the State bridge inventory, the other being the Eleele Pedestrian Overpass. The bridge is a good example of an early 20th century structure that utilizes materials from another, earlier dated bridge (Wailua River Bridge). The report states that while the bridge is "purely functional and has no artistic characteristics" (*ibid*), the pattern formed by the rivets is interesting as it is one of

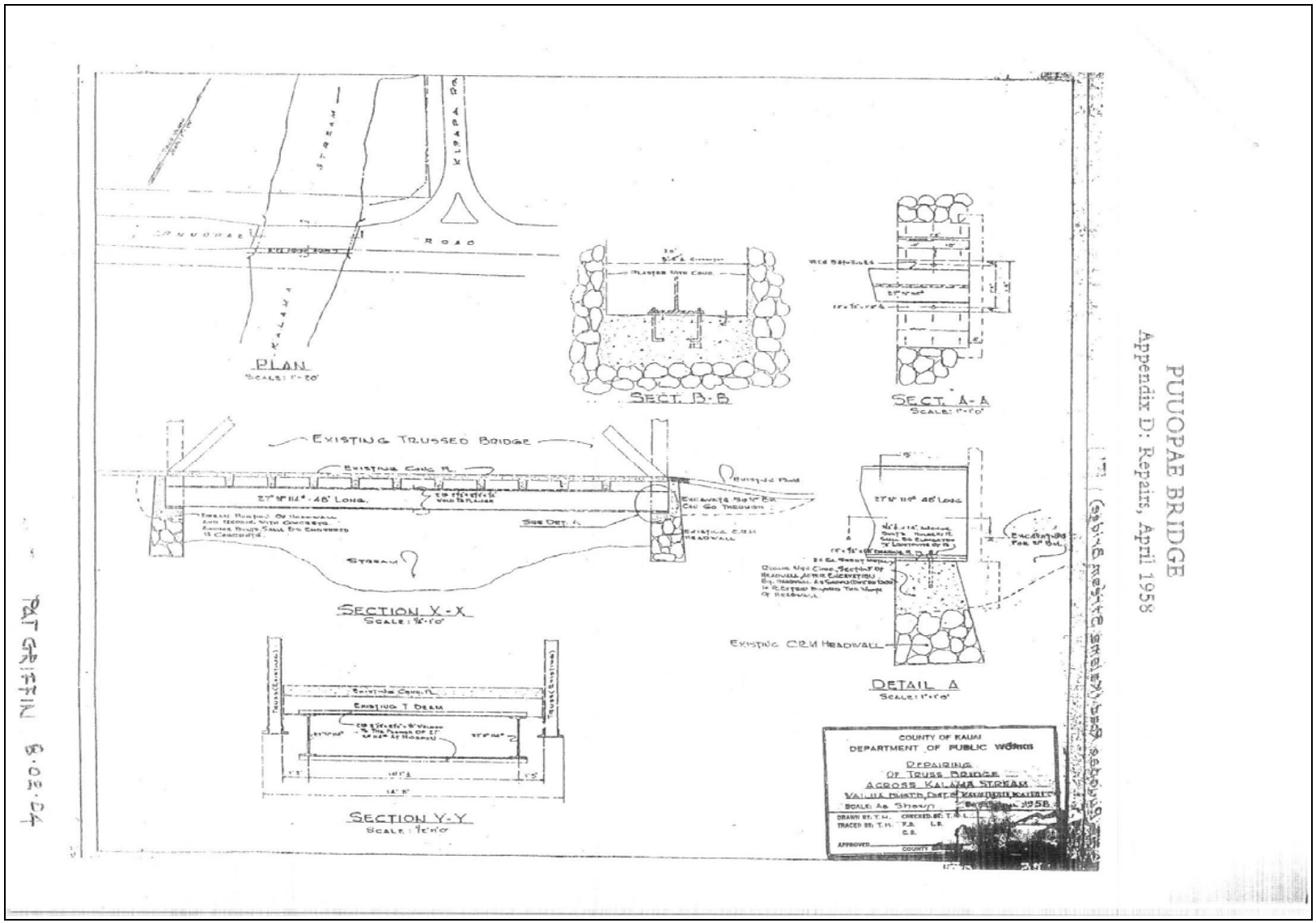


Figure 9: Plan View Drawing (1958) of Pu`u `Ōpae Bridge Repairs.

three bridges on Kauai where riveted metal construction is visible (Hanalei River Bridge, `Ōpaeka`a Stream Bridge being the other two). The ratings for this bridge were not high due to the lack of engineering complexity and lack of artistic value (*ibid*). The association with Kapaa Homesteads development is quite important, however.

Griffin (2005), in the National Registration form, explains the importance and association of the bridge, especially regarding the homesteaders. To summarize, two years after the Kapaa Homesteads 2nd series was opened to tenancy, the Pu`u `Ōpae Bridge was constructed and provided an integral transportation link that led to the success of the homestead lands. Initially, homesteading was not thought as a highly viable venture by many in the government, most of the homestead lands being controlled at that time (c. 1913) by large businesses and the government. There was opposition to homesteads as some thought this simply a ploy for a land grab, which would remove the lands from the profitable sugar cane industry which the lands were farmed. By 1917, the homesteaders had soundly defeated that argument. Griffin (2005:3) notes that on the Olohena-Waipouli tract, there were ninety homesteaders with 3140 acres who had harvested some 31,500 tons of sugar cane worth an estimated $197,000, a very considerable sum.

The Kapaa Homesteads 2nd series, which was accessed by the bridge, consisted of 81 lots encompassing 17 acres to 41 acres. The lots were sold by lottery on June 28, 1913, with landowners being able to own up to 80 acres of land (original parcel and three adjoining parcels). Homesteaders were required to live and actively cultivate their lands for the first 10 years, with selling and leasing of the lands being forbidden. While homesteaders had finally received land, they had little means to access it. The "roads" were more or less cattle trails accessible mostly by ox carts. To make matters worse, water was unavailable in the homesteads. Available stream water was owned by the Makee Sugar Company, the governor having sold the water rights before the homesteads were opened. Homesteaders would have to pay a monthly rate to use any of the water. Initial homesteading in the area was difficult due to lack of roads and water. However, the homesteaders petitioned the County and government in Honolulu to fix these deficiencies. By 1918, they had formed an association and petitioned for the betterment of the homesteads in Honolulu and at various venues on Kauai.

Griffin (2005:4) notes that Pu`u `Ōpae Bridge, and other bridges and roads in the area increased in importance after nearby Wailua Homesteads opened because the Wailua roads did not transverse the land in a typical *mauka-makai* fashion, but rather they were connected to the Kapaa Homestead roads which ran parallel to the slopes, along the base of Nounou Mountain. It was only Olohena Road which allowed homesteaders to meet up with the Belt Road. The

Wailua Homesteads themselves were not linked to the Belt Road until 1936 when `Ōpaeka`a Bridge was constructed and Kuamo`o Road was extended to the coastline.

By 1919, some of the Kapaa Homesteaders were successfully cultivating sugar cane, with many people from surrounding areas filling labor positions on the lands. However, by 1945 homestead cultivation of sugar cane became a difficult venture as sugar prices dropped significantly and small-scale enterprises were difficult to sustain. Griffin (2005:4) states that by the mid-century mark, many of the Kapaa Homesteaders abandoned the farming lifestyle and took up other occupations. Through time, many of these homestead areas were rezoned for residential use. However, some of the lands adjacent to Pu`u `Ōpae Bridge contain some of the only remaining areas of agricultural lands in the region (Griffin 2005:4).

In all, Pu`u `Ōpae Bridge performed an elevated transportation and communication function for homesteaders from 1915. The bridge itself is one of two bridges on Kauai that contain a steel girder floor system (Eleele being the other) and represents a strong relationship with early to mid 20th century land use in the Kapaa homesteads area. As noted in the National Register application (Griffin 2005:7), the bridge is purely a functional structure and has no artistic characteristics.

CONSULTATION

Consultation was conducted via telephone, e-mail, and the U.S. Postal Service. Consultation was sought from Pat Griffin, historian; Andy Bushnell, historian; Ron Terry; Tonia Moy, historic architect of Fung Associates, Inc.; Allan Smith, community member; Kiersten Faulkner, Executive Director of the Hawaii Historic Foundation; Jan Tennbrugnengate, reporter; Cheryl Lovell-Obatake, community member and previous Kaua`i/Ni`ihau Island Burial Council Member; Spencer Leinweber, of Clever Construction; Clyde Nāmu`o, Director of the Office of Hawaiian Affairs (OHA); Dr. Abba G. Lichtenstein, Advisory Board Member of the Historic Bridge Foundation; Ms. Rayne Regush, Kapaa Community Neighborhood Board; Mr. Richard Pezzulo, Chief Operating Officer of the Office of Hawaiian Affairs, and Mr. Erik Burton, Operations Director at the Ethnobotany Research and Applications Journal. Note: On December 30, 2011, Mr. Clyde Nāmu`o resigned his position at the Department of Hawaiian Affairs.

In addition, a Cultural Impact Assessment Notice was published on December 14, 15, and 18, 2011, in *The Honolulu Star-Advertise*r, *The Garden Island*, which published on the same dates on Kaua`i, and the December issue of the OHA newspaper, *Ka Wai Ola* (see Appendix C). At the request of the client, Mike Hunnemann of KAI Hawaii, the legal notice for the *The*

Garden Island, only, was revised and re-posted on January18, 19, and 22, 2012 (see Appendix C).

These notices requested information of cultural resources or activities in the area of the proposed project, stated the TMK number, and where to respond with pertinent information. Based on the responses, an assessment of the potential effects on cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

CULTURAL IMPACT ASSESSMENT INQUIRY RESPONSES

Analysis of the potential effect of the project on cultural resources, practices or beliefs, the potential to isolate cultural resources, maintain practices or beliefs in their original setting, and the potential of the project to introduce elements that may alter the setting in which cultural practices take place is a requirement of the OEQC (No. 10, 1997). As stated earlier, this includes the cultural resources of the different groups comprising the multi-ethnic community of Hawai`i.

As stated above, consultation was sought from Pat Griffin, historian; Andy Bushnell, historian; Ron Terry; Tonia Moy, Fung Associates, Inc.; Allan Smith, community member; Kiersten Faulkner, Executive Director of the Hawaii Historic Foundation; Jan Tennbrugnengate, reporter; Cheryl Lovell-Obatake, community member and previous Kaua`i/Ni`ihau Island Burial Council Member; Spencer Leinweber, of Clever Construction; Clyde Nāmu`o, Director of the Office of Hawaiian Affairs (OHA); and Dr. Abba G. Lichtenstein, Advisory Board Member of the Historic Bridge Foundation; Ms. Rayne Regush, Kapaa Community Neighborhood Board; Mr. Richard Pezzulo, Chief Operating Officer of the Office of Hawaiian Affairs, and to Mr. Erik Burton, Operations Director at the Ethnobotany Research and Applications Journal.

In addition, a Cultural Impact Assessment Notice was published on December 14, 15, and 18, 2011, in *The Honolulu Star-Advertiser, The Garden Island*, which published on the same dates, and December 2011 issue of the OHA newspaper, Ka Wai Ola. Follow-up letters of inquiry were mailed to be above-mentioned individuals and to Mr. Richard Pezzulo, Chief Operating Officer of the Office of Hawaiian Affairs, on January 3, 2012. At the request of Mike Hunnemann, of KAI Hawaii, the legal notice for the *The Garden Island*, only, was revised and re-posted on January18, 19, and 22, 2012 (see Appendix C).

In an electronic transmittal (to Cathleen Dagher dated November 7, 2011) Pat Griffin stated that "[b]oth Puuopae and Opaekaa are on the National Register of Historic Places….." and that "…Cultural Surveys did an assessment for Puuopae –some time before 2004…" Ms. Griffin

also stated that "…[t]hese bridges, along with the one-lane bridge on Kalama Road (local folks here know it as Yasutake's Bridge--as with Opaekaa, it has parts from the old Wailua River Bridge…[and] are part of a network of passages that tell a strong story about the history of homesteading on Kauai in the early territorial period." Ms. Griffin also recommended that Dr. Abba G. Lichtenstein, who submitted plans for the bridges to the Kaua`i County Department of Public Works during the proposal period around 1993, Andy Bushnell and Kiersten Faulkner as individuals knowledgeable about the area.

Andrew Bushnell responded via e-mail (dated November 23, 2011) and stated:

> The person who you really need to speak with is Pat Griffin…. Several years ago she did considerable research on both the Pu`u`opae and `Opaeka`a bridges… At the time that the issue of the bridges came up several years ago, I approached several of the old-timers about the bridge. The only one who had anything to share with me was Sam Hepa Sr. who has since died. He recalled walking from Olohena Road along Pu`u`opae Road on his way to Olohena School. He said that every once in a while he would cross the Pu`u`opae bridge by climbing the superstructure that used to be part of the bridge but has since been removed. He confirmed that the present bridge is the same bridge that was there in the 1930s when he was growing up.

Kiersten Faulkner, Executive Director of the Hawaii Historic Foundation, provided the following comments via e-mail (dated December 9, 2011):

> I assume that you have the National Register nomination forms for both Puuopae and ʻŌpaekaʻa bridges. These are the resource documents that describe the history and significance of the bridges themselves. They also include the research bibliography with additional source materials if you do original research. In addition, the County has drawings and plans related to the bridges. The Wailua Homesteads has a 100-year old history that you can research at the Kauaʻi Historical Society. The Garden Island newspaper archives may also be helpful.

In a letter postmarked January 3, 2012, Ms. Dagher received a copy of letter from Barnes Riznik, previous Director Emeritus Grove Farm Museum and professional historian, to Larry Dill, Kaua`i County Engineer, previously of the Historic American Engineering Board, stating that he and Donald Jackson, had physically examined and described `Ōpaeka`a Bridge in an historical context and published the results (Jackson and Riznik 1978). Mr. Riznik stated in his January 2012 letter that "… [f]or the first time, in 1978 the Opaeka`a Bridge was recognized as

historically significant in Hawaii; moreover, the bridge was identified nationally as the only British-made iron bridge in America." Mr. Riznik goes on to say that in the 1990s he "…participated in meetings of the County Public Works Department staff, and its engineering consultants from Honolulu and the Mainland, who considered the Opaekaa Bridge worthy of repair…" Mr. Riznik closed the letter stating that he "…can only hope that the present comprehensive review of the bridge will produce a preservation rehabilitation plan for stabilization --- and continued practical use --- of this surviving historical structure on Kaua`i."

Ron Terry recommended Allan Smith as an individual from the community knowledge about the project area (electronic transmittal from Mr. Terry to Cathleen Dagher dated November 23, 2011).

On February 8, 2011 SCS received an electronic transmittal (via e-mail) from Margery Freeman, a member of the community, stating that:

> The Three bridges that are covered by this assessment are near my home on Kauai. There are a number of reasons these bridges should be kept as one lane bridges.
>
> 1) They are historic
> 2) The[y] (sic) slow down traffic
> 3) They are safer tha[n] (sic) having people rush around on wide streets The studies of their accidents are misleading. Most of those problems happened a mile or two away from the bridge so are not relevant to the bridge.
> 4) There is very little traffic on any of them
> 5) They contribute to keeping our rural life style which is very important to us.
> 6) Especially the Opaekaa [B]ridge is attractive and interesting because of its look and its historic past.

On February 17, 2012 SCS received an electronic transmittal (via e-mail) from Larry LaSota, a member of the community who resides between the `Ōpaeka`a and Pu`u `Ōpae Bridges in Wailua Homesteads. Mr. LaSota expressed concerns similar to Ms. Freeman's in that the one-lane bridge systems should not be replaced as they help to slow down traffic. Mr. LaSota further stated that "… [t]hese bridges are perfect the way they are (one lane) and should be kept that way" as replacing the bridges will alter the character of the neighborhood.

On February 21, 2012 SCS received an electronic transmittal (via e-mail) from Rayne Regush, community member. Ms. Regush believes the Pu`u `Ōpae, Ōpaeka`a, and Kapahi

Bridges "….maintain the rural agricultural tradition of these communities; provide a touchstone contrasting territorial history and modern times; prompt us to embrace a slower pace of life; provide a rural/country feeling and charming experience; engender friendliness by yielding to oncoming traffic; serve as cultural landmarks of our rural communities; provide a source of community pride; and connect us to earlier times and offers opportunities for education…" .

Ms. Regush goes on to say that "… [t]he traditional activities that may be impacted are the same activities or intrinsic qualities that are identified in the State DOT's Scenic Byways Program.

- They have scenic qualities which provide a heightened experience. The landscape and bridge-scapes are striking and memorable.

- The natural qualities of the environment (the stream, fish, plants and wildlife) remain relatively undisturbed by manmade interventions.

- They have historic qualities. The bridges are legacies of the past which are historically significant. The bridges instill an appreciation for the past. They reflect the territorial days of agricultural settlements in these communities and continue to exemplify the tradition of a rural lifestyle today.

- These century old bridges have archeological qualities. And, a strong likelihood of the streams used traditionally for bathing.

- Recreational qualities such as the passive enjoyment of the landscape. As a pedestrian there is the opportunity for nature-watching, quietude and contemplation. Driving on the bridge is a pleasurable recreational experience as well."

Ms. Regush suggested contacting Erik Burton as an individual knowledgeable about traditional lifeways and cultural practices conducted in the area of the three bridges. On February 28, 2012, SCS initiated consultation with Mr. Burton, via e-mail.

On March 3, 2012 SCS received an electronic transmittal (via e-mail) from Mr. Erik Burton, Operations Director at the Ethnobotany Research and Applications Journal, stating:

> As to the Pu`u `Opae and `Opaeka`a bridge areas, I have found no specific written accounts of that area, other than general reports of a lushly farmed upland. The ali`i did have several sacred bathing ponds, and there are a number of sacred sites (and some scary ones) in the Wailua area – many not with state site numbers. After the industrial agricultural period, much of the area was scraped clean. The gullies and river flatlands are mostly preserved.

> The agricultural complexes for Wailua Ahupua`a continue all the way to the base of Wai`ale`ale, where the village of Ka`uhau protects the lua trail up to the Alakai. Considering that Wailua was so developed, and looking at the lay of the land in these areas, my predictive model indicates that there were lo`i all along the `Opaeka`a Stream. With Wailua's peak population pushing all the way to the base of Wai`ale`ale, they surly (sic) cultivated these easy to access and irrigate, gently sloping uplands. We are only at about 370' elevation, so the growing climate here is good for many things.

SUMMARY

The "level of effort undertaken" to identify potential effect by a project to cultural resources, places or beliefs (OEQC 1997) has not been officially defined and is left up to the investigator. A good faith effort can mean contacting agencies by letter, interviewing people who may be affected by the project or who know its history, research identifying sensitive areas and previous land use, holding meetings in which the public is invited to testify, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential. Sending inquiring letters to organizations concerning development of a piece of property that has already been totally impacted by previous activity and is located in an already developed industrial area may be a "good faith effort". However, when many factors need to be considered, such as in coastal or mountain development, a good faith effort might mean an entirely different level of research activity.

In the case of the current undertaking, letters of inquiry were sent to individuals and organizations that may have knowledge or information pertaining to the collection of cultural resources and/or practices currently , or previously conducted in close proximity to Pu`u `Ōpae Bridge. As stated elsewhere in this document, consultation was sought from Pat Griffin, historian; Andy Bushnell, historian; Ron Terry; Tonia Moy, Fung Associates, Inc.; Allan Smith, community member; Kiersten Faulkner, Executive Director of the Hawaii Historic Foundation; Jan Tennbrugnengate, reporter; Cheryl Lovell-Obatake, community member; Spencer Leinweber, of Clever Construction; Clyde Nāmu`o, Director of the Office of Hawaiian Affairs (OHA); and Dr. Abba G. Lichtenstein, Advisory Board Member of the Historic Bridge Foundation; Ms. Rayne Regush, Kapaa Community Neighborhood Board; and to Mr. Richard Pezzulo, Chief Operating Officer of the Office of Hawaiian Affairs. In addition, a Cultural Impact Assessment Notice was published on December 14, 15, and 18, 2011, in *The Honolulu Star-Advertise*r, *The Garden Island*, which published on the same dates on Kaua`i, and the December issue of the OHA newspaper, *Ka Wai Ola* (see Appendix C). At the request of the client, Mike Hunnemann of KAI Hawaii, the legal notice for the *The Garden Island*, only, was revised and re-posted on January18, 19, and 22, 2012 (see Appendix C).

Historical and cultural source materials were extensively used and can be found listed in the References Cited portion of the report. Such scholars as Samuel Kamakau, Martha Beckwith, Jon J. Chinen, Lilikalā Kame`eleihiwa, R. S. Kuykendall, Marion Kelly, E. S. C. Handy and E.G. Handy, and Mary Kawena Puku`i and Samuel H. Elbert and continue to contribute to our knowledge and understanding of Hawai`i, past and present. The works of these and other authors were consulted and incorporated in the report where appropriate. Land use document research was supplied by the Waihona `Aina 2011 Data base.

CULTURAL ASSESSMENT AND RECOMMENDATIONS

Analysis of the potential effect of the project on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is also a suggested guideline of the OEQC (No. 10, 1997). To our knowledge, the project area has not been used for traditional cultural purposes within recent times. Based on historical research and no additional suggestion for contacts, analysis of the potential effect of the project on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is a requirement of the OEQC (No. 10, 1997). To our knowledge, the project area has not been used for traditional cultural purposes within recent times.

Based on the above research, it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by development activities on the approximately 1 acre of land on and around the Pu`u `Ōpae Bridge complex in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-4-002]. However, based on the Spencer Mason architects (1989:217) evaluation, Pu`u `Ōpae Bridge is a good example of the early 20th century type bridge which utilizes materials from an earlier bridge (Wailua River Bridge, 1919) and has an "interesting" rivet pattern (*ibid*). It is one of three bridges on Kaua`i where metal construction is apparent, the others being S-18 (Hanalei River Bridge) and C-13 (`Ōpaeka`a Stream Bridge). While a fairly modest structure, some members of the community value the bridge and its contribution to early homesteading in the area. In all, Pu`u `Ōpae Bridge performed an elevated transportation and communication function for homesteaders and represents a strong relationship with early to mid 20th century land use in the Kapaa homesteads

area. Pu`u `Ōpae Bridge and the surrounding roads provided an integral transportation link that led to the success of the homestead lands.

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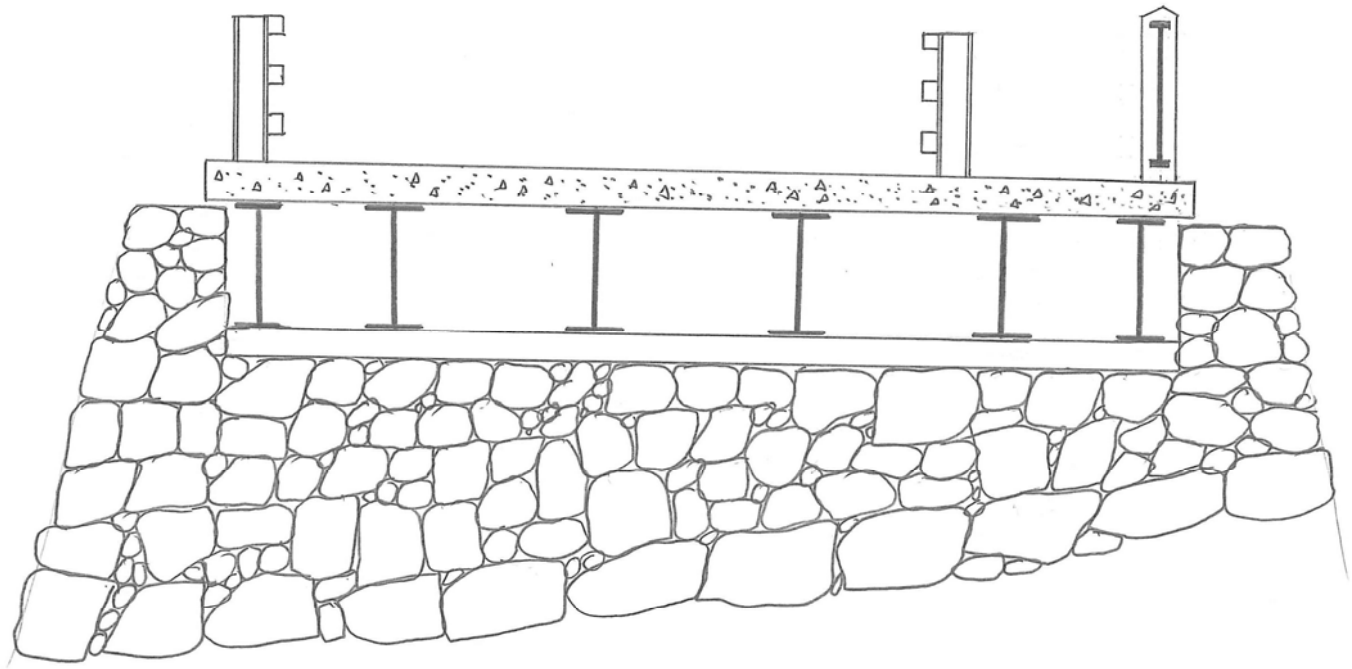
APPENDIX A: PLAN VIEW DRAWINGS OF PU`U `ŌPAE BRIDGE REPLACEMENT OPTIONS



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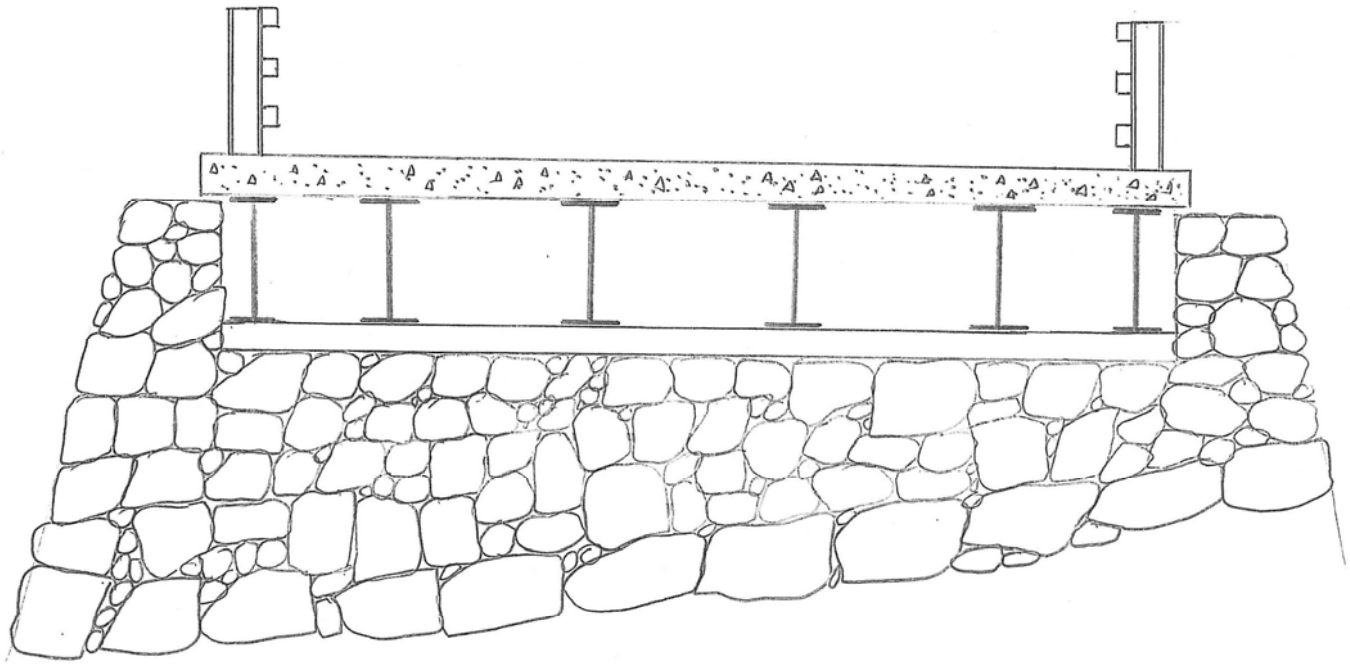

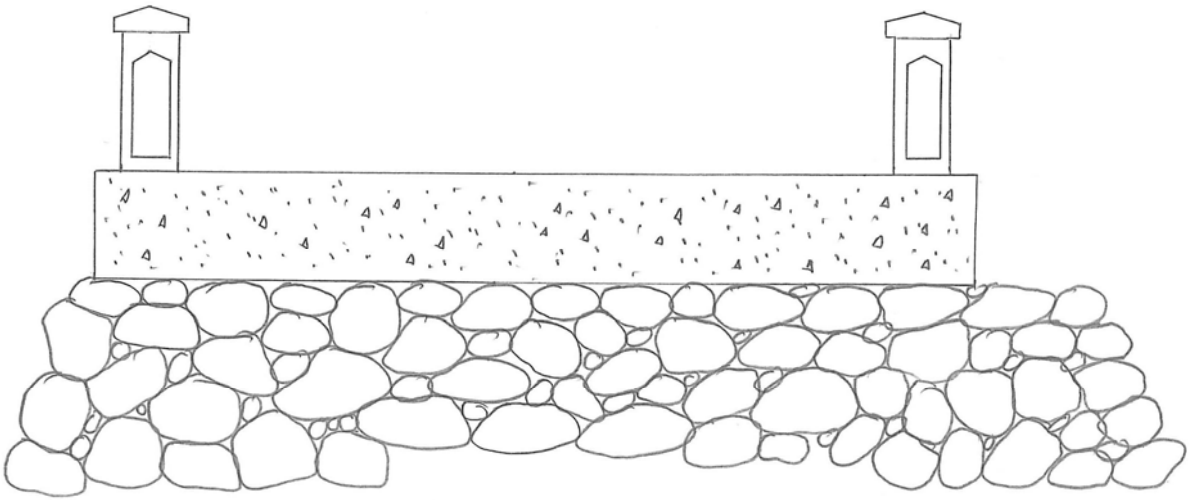

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APPENDIX B: EXAMPLES OF INITIAL LETTER ENQUIRIES

In compliance with the statutory requirements of the Federal National Environmental Policy Act (NEPA), the State of Hawai‘i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai`i Department of Health's Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts as adopted by the Environmental Council, State of Hawai`i on November 19, 1997. Scientific Consultant Services, Inc. (SCS) is in the process of preparing Cultural Impact Assessments (CIA) pertaining to approximately 1 acre of land on or around each of the three historic bridges on the island of Kaua`i. According to documents supplied by KAI Hawaii, Inc., the existing Pu`u `Ōpae Bridge, `Ōpaeka`a Bridge, and Kapahi Bridge are going to be replaced and the surrounding lands may be impacted during construction activities. Archaeological reports of studies conducted in the areas of these bridges can be found on file at the State Historic Preservation Division (SHPD) Office.

The Pu`u `Ōpae Bridge Complex (State Site 50-30-08-9397) is located in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-4-002] (Figures 1 and 2). Pu`u `Ōpae Bridge, often called Kalama Bridge and originally known as Kapaa Homesteads Bridge No. 2, was originally constructed in 1915. The bridge carries Pu`u `Ōpae Road over Kalama Stream in the Kapaa Homesteads. Pu`u `Ōpae Bridge was listed on the State Register of Historic Places in 2004 and on the National Register of Historic Places in 2005 as Site 05000536.

The `Ōpaeka`a Stream Bridge Complex (State Site 50-30-08-9377) is located in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-2-002] (Figures 3 and 4). `Ōpaeka`a Bridge, often referred to as `Ōpaeka`a Stream Bridge #1, was originally constructed in 1919 and carries `Ōpaeka`a Road over `Ōpaeka`a Stream. The bridge was listed on the National Register of Historic Places in 1983 as Site 83000253.

The Kapahi Stream Bridge Complex is located in Kapaa Homestead, Kapa`a Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-6-004] (Figures 5 and 6). The Kapahi Bridge, which carries Kawaihau Road over Moalepe Stream, was constructed in 1937.

According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs…The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man made and natural which support such cultural beliefs…

We are asking you for any information that you or other individuals might contribute to the knowledge of traditional cultural activities, or traditional rights that might be impacted by the replacement of the bridges. The assessment results are dependent on the response and contributions made by individuals and organizations such as yours.

Enclosed are maps showing the proposed project areas. Please contact me at our SCS Honolulu office at (808) 597-1182 with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely yours,

Cathleen Dagher,
Senior Archaeologist
Enclosures (6)
Cc: Cheryl Lovell-Obatake; Clyde Nāmu`o; Jan Tennbrugnengate; Spencer Leinweber; Kiersten Faulkner, Kaliko Santos

Re: Puu Opae Bridge, Opaekaa Bridge, and Kapahi Bridge
FROM:

TO:

Message flagged
Tuesday, February 28, 2012 5:27 PM

Aloha Erik,
Your name and e-mail address were provided by Rayne Regush. I am to preparing the Cultural Impact Assessments for the Puu Opae Bridge, Opaekaa Bridge, and Kapahi Bridge replacement projects and am in the midst of the consulting process. So, I am writing to ask if you have any information pertaining to cultural practices that were conducted in the vicinity of any of the bridges. I am also wondering if you could refer me to other knowledgeable individuals, or groups, who may also have knowledge to share?
Thank you for your help!
Cathleen

Cathleen Dagher
Senior Archaeologist
Scientific Consultant Services, Inc.
711 Kapi`olani Blvd., Suite 975
Honolulu, Hi. 96813
808 597-1182 (office)
808 597-1193 (fax)

APPENDIX C: LEGAL NOTICES

CULTURAL IMPACT ASSESSMENT NOTICE POSTED IN TH E OFFICE OF HAWAIIAN AFFAIRS NEWSLETTER AND THE STAR ADVERTISER NEWSPAPER

Information requested by SCS
Of cultural resources or on-going cultural
activities on or near this parcel near the `Ōpaeka`a Stream Bridge complex in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: 4-2-002].
Please respond within 30 days to SCS
at (808) 597-1182

CULTURAL IMPACT ASSESSMENT NOTICE POSTED IN THE GARDEN ISLE NEWS:

Information requested by Scientific Consultant Services, Inc. (SCS) for
cultural resources or on-going cultural activities on or near the Pu`u `Ōpae Bridge, `Ōpaeka`a Bridge, and Kapahi Bridge in Kawaihau District, Kaua`i Island, Hawai`i. Please respond within 30 days to Scientific Consultant Services, Inc. at (808) 597-1182.

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DATE: 12/8/11
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- [x] **Rose Rosales** (808-529-4825) Email: rrosales@staradvertiser.com

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CULTURAL IMPACT ASSESSMENT NOTICE:
Information requested by SCS Of cultural resources or on-going cultural activities on or near this parcel near the Pu'u 'Opae Bridge Complex in Wailua, South Olohena Ahupua'a, Kawaihau District, Kaua'i Island, Hawai'i [TMK: (4) 4-2-02], Please respond within 30 days to SCS at (808) 597-1182
(SA373415 12/14, 12/15, 12/18/11)

Received Time Dec. 8. 3:32PM

APPENDIX D: EXAMPLES OF FOLLOW-UP LETTERS OF INQUIRIES

This is our follow-up letter to our December 12, 2011 letter which was in compliance with the statutory requirements of the Federal National Environmental Policy Act (NEPA), the State of Hawai‘i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai`i Department of Health's Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts as adopted by the Environmental Council, State of Hawai`i, on November 19, 1997.

Scientific Consultant Services, Inc. (SCS) is in the process of preparing Cultural Impact Assessments (CIA) pertaining to approximately 1 acre of land on or around each of the three historic bridges on the island of Kaua`i. According to documents supplied by KAI Hawaii, Inc., the existing Pu`u `Ōpae Bridge, `Ōpaeka`a Bridge, and Kapahi Bridge are going to be replaced and the surrounding lands may be impacted during construction activities. Archaeological reports of studies conducted in the areas of these bridges can be found on file at the State Historic Preservation Division (SHPD) Office. Please refer to our December 12, 2011 letter for locational maps for the three project areas.

The Pu`u `Ōpae Bridge Complex (State Site 50-30-08-9397) is located in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-4-002]. Pu`u `Ōpae Bridge, often called Kalama Bridge and originally known as Kapaa Homesteads Bridge No. 2, was originally constructed in 1915. The bridge carries Pu`u `Ōpae Road over Kalama Stream in the Kapaa Homesteads. Pu`u `Ōpae Bridge was listed on the State Register of Historic Places in 2004 and on the National Register of Historic Places in 2005 as Site 05000536.

The `Ōpaeka`a Stream Bridge Complex (State Site 50-30-08-9377) is located in Wailua, South Olohena Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-2-002]. `Ōpaeka`a Bridge, often referred to as `Ōpaeka`a Stream Bridge #1, was originally constructed in 1919 and carries `Ōpaeka`a Road over `Ōpaeka`a Stream. The bridge was listed on the National Register of Historic Places in 1983 as Site 83000253.

The Kapahi Stream Bridge Complex (State Site 50-30-08-2157) is located in Kapaa Homestead, Kapa`a Ahupua`a, Kawaihau District, Kaua`i Island, Hawai`i [TMK: (4) 4-6-004]. The Kapahi Bridge, which carries Kawaihau Road over Moalepe Stream, was constructed in 1934.

We are asking you for any information that might contribute to the knowledge of traditional activities, or traditional rights that might be impacted by development of the property. The assessment results are dependent on the response and contributions made by individuals and organizations such as yours.

Please contact me at our SCS Honolulu office at (808) 597-1182; with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely,

Cathleen Dagher
Senior Archaeologist
Cc: Cheryl Lovell-Obatake; Richard Pezzulo; Jan Tennbrugnengate

APPENDIX E: INQUIRY RESPONSES

NATIONAL
TRUST
FOR
HISTORIC
PRESERVATION®

WESTERN OFFICE

July 3, 2008

BY EMAIL

Wallace Kudo
Department of Public Works, Engineering Division
County of Kaua'i
4444 Rice Street, Suite 175
Lihue, Hawaii 96766-1340

Dear Mr. Kudo,

On behalf of the National Trust for Historic Preservation, I am writing to express our grave concerns regarding the proposed replacement of the historic Ōpaeka'a Bridge. We have been advised by local residents that the County may have entered into a contract for work that may lead to the demolition of the bridge.

The purpose of this letter is to urge the County not to make any alterations to this historic bridge without ensuring that all federal environmental and historic preservation requirements have been satisfied. If the County were to alter or demolish the bridge at this stage, it would be in jeopardy of losing its eligibility for all federal funding and permits necessary for the project.

The Ōpaeka'a Bridge may be small, but it is highly significant. The bridge was listed on the National Register of Historic Places in 1983. It is the only known British truss bridge in the United States. World renowned bridge engineer Abba Lichtenstein described it as "perhaps the most important bridge in the state of Hawai'i."[1] If this bridge is demolished, a significant icon of history, engineering, and architecture will be lost forever.

Legal Constraints on the Ōpaeka'a Bridge Replacement Project

The replacement of the Ōpaeka'a Bridge is identified under the current draft of the Statewide Transportation Improvement Program as a project intended for

[1] **Kauai Garden Island News, May 22, 2008**, *Saving 'Opaeka'a and Pu'u'opae bridges.* http://www.kauaiworld.com/articles/2008/05/23/lifestyles/lifestyles05.txt

The Hearst Building, 5 Third Street, Suite 707 San Francisco, CA 94103
P 415.947.0692 F 415.947.0699 E wro@nthp.org WWW.PRESERVATIONNATION.ORG

federal funding.[2] The anticipated allocation for planning and design for the "Opaekaa Bridge Replacement" is $1,000,000 with 80% to be reimbursed to Kaua'i County by the Federal Highway Administration (FHWA).

If the County intends to rely on federal funding, federal laws require compliance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4332(2)(C), Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f; 36 C.F.R. Part 800, and Section 4(f) of the Department of Transportation Act, 49 U.S.C. § 303(c); 23 C.F.R. Part 774. We have not been able to confirm that any of these environmental and historic preservation requirements have been met. Compliance with these laws is required prior to any allocation from FHWA for activities related to bridge replacement.

You should also be aware that any alteration or demolition of the bridge prior to approval from FHWA would constitute "anticipatory demolition" under Section 110(k) of the National Historic Preservation Act, 16 U.S.C. § 470(h)-2(k); 36 C.F.R. § 800.9(c). Violation of Section 110(k) would prohibit the FHWA and other federal agencies from authorizing any funding or permits for this project. This penalty is imposed because the preemptive destruction of an historic structure forecloses the opportunity for the Advisory Council on Historic Preservation to comment on the project in any meaningful way. 36 C.F.R. § 800.9(b). Section 110(k) provides this strict remedy to discourage such action. It states:

> [E]ach federal agency shall ensure that the agency will not grant a loan, loan guarantee, permit, license, or other assistance to an applicant who, with intent to avoid the requirements of section 106, has intentionally significantly adversely affected a historic property to which the grant would relate, or having legal power to prevent it, allowed such significant adverse effect to occur . . . .

16 U.S.C. § 470h-2(k); *see* 36 C.F.R. § 800.9(c) (emphasis added).

In this case, if the City were to allow the alteration or demolition of the historic Ōpaeka'a Bridge, FHWA and other federal agencies would be required to deny applications for any federal funds or any permits for this project. In addition, we

---

[2] **Hawaii Department of Transportation, June 2, 2008,** *Draft Statewide Transportation Improvement Program, Revision #4, FY 2008 thru FY 2013*, p. 27. http://hawaii.gov/dot/highways/STIP/080602%2008-13%20STIP%20Draft%20Revision%20%234%20after%20OSRs.pdf/view

believe Section 110(k) would prohibit any future federal funding for permits relating to the site.

Additionally, Section 4(f) is likely to prohibit replacement of the historic Bridge, unless the County can demonstrate that there is "no feasible and prudent alternative" to its demolition. 49 U.S.C. § 303(c); 23 C.F.R. Part 774. To our knowledge, no such showing has been made. If such documents exist, please provide us a copy.

Interests of the National Trust for Historic Preservation

The National Trust for Historic Preservation was chartered by Congress in 1949 to promote the historic preservation policy of the United States, and to facilitate public participation in historic preservation. 16 U.S.C. § 468. In addition to its headquarters in Washington, D.C., the National Trust has nine regional and field offices, including a Western Office in San Francisco which is specifically responsive to Hawaii preservation concerns. With the strong support of our 285,000 members nationwide, the National Trust works to protect significant historic sites, to strengthen and revitalize communities, and to advocate historic preservation as a fundamental value in programs and policies at all levels of government. The President of the National Trust has also been designated by Congress as a member of the Advisory Council on Historic Preservation, the independent federal agency responsible for assisting other agencies to implement Section 106 of the National Historic Preservation Act. *Id.* § 470i(a)(8).

Thank you for considering the views of the National Trust on this important issue. We trust that you will take the mandates of Section 106 of the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act seriously, and we appreciate the opportunity to outline our understanding of the relevant legal constraints that apply to this project. We would be happy to discuss this matter with you in more detail.

Sincerely,

Brian R. Turner

Brian R. Turner, Esq.
Law Fellow, Western Office

cc:

Pat V. Phung, FHWA
Mary Ann Naber, Federal Preservation Officer, FHWA
Carol Legard, ACHP
Steven Kyono, HI DOT
Mayor's Office, County of Kaua'i
Dennis Alkire, Kaua'i Planning Department
Astrid Liverman, SHPD
Puaalaokalani Aiu, SHPD
Mary Requilman, Kaua'i Historical Society
Kiersten Faulkner, Historic Hawaii Foundation
Pat L. Griffin
Lani Ma'a Lapilio, NTHP Advisor
Millicent M.Y.H. Kim, NTHP Advisor
Kitty Henderson, Historic Bridge Foundation
Elizabeth Merritt, Deputy General Counsel, NTHP
Dr. Abba G. Lichtenstein

Aloha Cathleen,

Please accept my comments for the Cultural Impact Assessment (CIA) pertaining to the three historic one-lane bridges in the Kawaihau District of Kauai -- Puuopae Bridge, Opaekaa Bridge and Kapahi Bridge. These bridges:

- maintain the rural agricultural tradition of these communities
- provide a touchstone contrasting territorial history and modern times
- prompt us to embrace a slower pace of life
- provide a rural/country feeling and charming experience
- engender friendliness by yielding to oncoming traffic
- serve as cultural landmarks of our rural communities
- provide a source of community pride
- connect us to earlier times and offers opportunities for education

Pre-historian Erik Burton offered a brief comment to me by email. He wrote: In my opinion, the Wailua uplands were extensively farmed in old times, including all along Opaekaa stream. Sacred swimming pools for alii etc. You may wish to contact him at eburton@restorekauai.org

The traditional activities that may be impacted are the same activities or **intrinsic qualities** that are identified in the **State DOT's Scenic Byways Program.**

- They have **scenic qualities** which provide a heightened experience. The landscape and bridge-scapes are striking and memorable.
- The **natural qualities** of the environment (the stream, fish, plants and wildlife) remain relatively undisturbed by manmade interventions.
- They have **historic qualities.** The bridges are legacies of the past which are historically significant. The bridges instill an appreciation for the past. They reflect the territorial days of agricultural settlements in these communities and continue to exemplify the tradition of a rural lifestyle today.
- These century old bridges have **archeological qualities.** And, a strong likelihood of the streams used traditionally for bathing.
- **Recreational qualities** such as the passive enjoyment of the landscape. As a pedestrian there is the opportunity for nature-watching, quietude and contemplation. Driving on the bridge is a pleasurable recreational experience as well.

These **intrinsic qualities** that characterize the State DOT's Scenic Byways Program and which these 1-lane bridges exemplify, are in jeopardy of being lost if the

County replaces them without following historic preservation standards, or if they are replaced with 2-lane structures.

Mahalo,
Rayne

A Journal of Plants, People, and Applied Research
Ethnobotany Research & Applications

Ancient Kaua`i Mapping Project: Using GIS to locate and map ancient Hawaiian agricultural landscapes on Kaua`i

Erik Burton

Research

Abstract

GIS tools are used to develop a predictive model for identifying the primary agricultural complexes on Kaua`i, and to conduct a systematic aerial survey for transported landscapes. Comparisons are made to historical records, and place names are matched to elements of the ancient agricultural landscape. Results are recorded in a series of layers enabling spatial analysis and 3D visualization of the data in its environment. The resulting GIS layers and master model allows custom data views to be created by enabling selected layers, so that desired aspects of the agricultural landscape can be visualized. The resulting layers are discussed as individuals and also how they interact to provide a view of the ancient integrated agricultural landscape. Conclusions about the predictive model for agricultural complexes, the ethnobotanical surveys and the historical records are discussed.

Mo'olelo ho'opokole

Ua hana GIS **no ke kukulu kumu alaka`i e wanana i na wahi mala `ai ma** Kaua`i, **a e alaka`i i ke kilo mokulele no na `aina loli `ia. Ua ho`okuku `ia me na palapala mo`aukala, a ua ho`olikelike `ia na inoa wahi me na mea `awe`awe`a o na mala kahiko. Ua kukulu i na lalani papa** GIS **i mea e wehewehe, a he ho`ike** 3D **i ua `ikepili nei. Hiki ke koho i na papa makemake `ia e ho`ike ai. He `olelo kuka ko ia nei no na papa kekahi i kekahi, a me ko lakou hana pu `ana ma ka `aina kahiko. Ua ho`oholo i hopena no ke kumu alaka`i wanana no na mala kahiko, na kilo kalailau, me na palapala mo`aukala.**

Introduction

Study Location

Kaua`i is the westernmost (Figure 1) of the main Hawaiian Islands, nearly circular in form and approximately 25 miles by 35 miles. Its central massif, Wai`ale`ale, captures legendary amounts of rainfall as its peak of just over 5,000 feet punctures the trade wind (Ramage & Schroeder 1999) powered cloud layer passing overhead, forming the dominant weather pattern on Kaua`i. Like the other Hawaiian Islands, Kaua`i is generally wet on the north and east sides, dryer on the west and south sides.

Background

Ancient Hawaiian Agriculture

Ancient Hawaiians were master agriculturists (Handy *et al.* 1991) who developed and recognized hundreds of variet-

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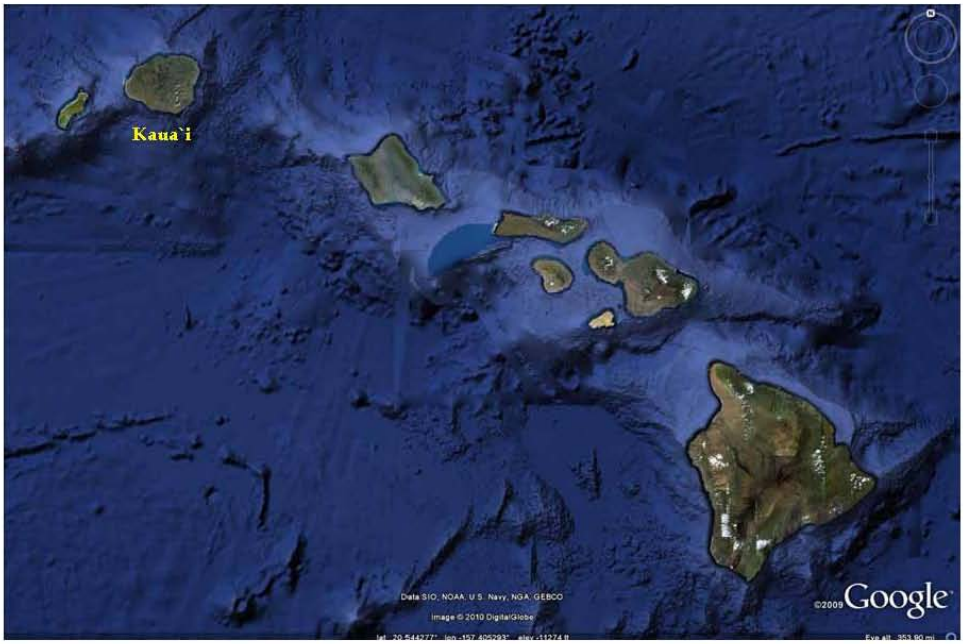


Figure 1. Hawaiian Islands with Kaua`i as the westernmost of the major islands. Image generated with Google Earth.

ies of taro (*Colocasia esculenta* (L.) Schott), **`uala** (sweet potatoes, *Ipomoea batatas* (L.) Lam.), and **mai`a** (banana hybrids, *Musa acuminata* x *balbisiana* Colla). Their agricultural practices were highly adapted for each particular microclimate, with appropriate cultivars used for a particular area or production requirement. Hawaiians were also distinguished for having extensive **lo`i** (pond field irrigation systems) that could produce immense quantities of taro (Handy et al. 1991).

Kaua`i is ideal for taro production with its long, well watered valleys (Ladefoged *et al.* 2009). Pond field irrigation systems are best suited for islands with lots of bottom land that can be reached by irrigation ditches. Kaua`i, as the oldest of the main Hawaiian Islands, is ideally suited for this type of agricultural development, as it possesses many long valleys with gentle slopes (Kirch & Rallu 2007, Ladefoged *et al.* 2009).

A review of the old maps stored in the Kauai Historical Society (KHS 2009), and online with the David Rumsey map collection (Rumsey 2009), produced few maps of inland agricultural complexes. The earliest and most detailed maps were created by the sugar plantations and focused on their coastal land holdings, while the interiors are marked unexplored and don't reflect even a rudimentary understanding of the topography.

After contact with European peoples, the Hawaiian population began declining precipitously and ultimately fell by perhaps as much as over 80% (Kamakau 1992, Kirch & Rallu 2007). The resulting cultural collapse, along with newly introduced foreign goods and customs, ultimately created something of a disconnect with the ways and knowledge of the people of old. By the time detailed maps were first being made (1840s), knowledge of the abandoned upland agricultural systems had mostly been lost to history.

The interior of Kaua`i is mostly preserved from the impacts of development and industrial agriculture, with over 60% of the island classified as conservation land (The State of Hawai`i Data Book 2004). By looking at Kaua`i in Google Earth it is evident that, due to the remoteness of much of its interior terrain, most of this conservation land was not utilized by modern agriculture or ranching, preserving it much as it was when abandoned by the ancient Hawaiians. Remnants of transported landscapes are still to be seen in these well preserved areas, along with earthen and rock walls that supported the agricultural infrastructure (Burton, personal hikes). A wide range of preservation levels exist, from sites completely overgrown in **hau** (*Hibiscus tiliaceus* L.) or bamboo (some of which is the ancient introduced **`ohe**, *Schizostachyum glaucifoli-*

um (Rupr.) Munro), to places that look like they could have been abandoned just a few decades ago.

Pressures from a variety of sources including cattle ranching, industrial agriculture, feral pigs, goats and even illegal campers have led to the degradation of many readily accessible sites. Some plants left over from ancient Hawaiian agroforestry practices have become invasive and are growing unchecked (Figure 5), suffocating agricultural complexes, agroforestry remnants and native plant communities. Of these plants, **hau** and **`ohe** are the worst as they both form dense, difficult to penetrate thickets that allow for little else to grow under their canopies.

Historical records on the subject of inland agriculture are a bit vague. Handy et al. (1991) indicate that they would expect agricultural complexes to be found in a number of upland valley sites. In Ladefoged *et al.* (2009) a predictive model is presented that estimates which lands are best suited for pond field and dryland farming based on "climate, hydrology, topography, substrate age, and soil fertility". The efficiency of labor used for production of wetland taro compared to dryland agriculture is also explored.

Since terms about GIS and Hawaiian agricultural practices vary in their use, Table 1 is provided to indicate how they have been defined within this document.

Plants from Transported Landscapes

When the ancient Polynesians colonized Hawai`i, they brought their favorite plants (Abbott 1992) and began transforming previously untouched lands to meet their needs. Plants that still grow where they were planted long ago, and are visible in aerial imagery, include **`ohe**, **mai`a**, **hau**, **kukui** and Hawaiian **tī**. Although mango's were introduced in historic times, Hawaiians planted them on the lands that they were still using, and many remain today in lands that are now considered forest. Geo-referenced aerial photographs are studied in detail to map each of these residual transported landscapes:

`ohe

Schizostachyum glaucifolium is the Hawaiian **`ohe** (St. John 1978), and is a clumping variety (Figures 2, 3) that goes to seed once every 30 years. This species can occasionally form dense groves and appear to be a running variety (White 2003) as it has also reproduced by seed. It has extremely thin walls and long internodes, often used

Table 1. Definitions for technical terms used in this document.

Agricultural Complex
Hawaiians created a series of pondfield agricultural systems (similar to rice paddies) that were fed by a primary ditch pulling water from the stream and feeding a series of smaller ditches which in their turn supply the individual **lo`i** (agricultural pondfield). At the end of a system, the primary ditch typically returns the remaining water back to the river with each systems design adapting to local conditions.
Ancient Hawaiian Land Divisions and Tenure
Under the Ancient Hawaiians system of holding land, the king owned the island and allowed his subjects to use the land. Kauai was divided into five **moku** (districts) named Hale`lea, Ko`olau, Puna, Kona and Napali. These **moku** were further divided into **ahupua`a** (valley or watershed) which were individually managed by a **konohiki** (kings land agent) who allotted land to inhabitants (Kirch 1985) and ensured that the agricultural systems functioned productively.
Geographical Information Systems (GIS)
GIS programs allow users to navigate and view geographic information overlaid on a virtual globe of the world. Spatial analysis can be performed and custom maps can be created with a variety of data layers. Two GIS applications were used for this project: Google Earth (Google Earth) and Pictometry (Pictometry International Corporation).
Google Earth
Designed for use by a variety of skill levels, Google provides a GIS application that allows users with very little or no previous GIS experience to view and explore GIS layers while "flying" through a 3D landscape. The imagery resolution for Kauai is adequate to identify larger trees but not smaller plants such as bananas and tī. Custom data sets (layers) are easy to create and share.
Pictometry
Although the imagery available from Google Earth is useful, Pictometry has a much higher resolution package of 6-inch pixel geo-referenced aerial oblique imagery. Although it was developed primarily for Urban Planners, Pictometry provides up to 12 different views of a given area which makes it useful for conducting surveys of an ancient agricultural landscape. The extensive database of 15 Mb JPEG images are geo-referenced to the pixel, allowing users to measure and locate objects in the images with a variety of different tools including location, area, height, distance, elevation and bearing.

Figure 2. Clump of *Schizostachyum glaucifolium* (Rupr.) Munro in upper Wailua ahupua`a, Kaua`i, Hawaiian Islands. (The same clump is shown in Figure 2.) Photo by Erik Burton.

Figure 3. Clump of *Schizostachyum glaucifolium* (Rupr.) Munro in upper Wailua ahupua`a, Kaua`i, Hawaiian Islands. (The same clump is shown in Figure 2.) Photo courtesy of Pictometry International Corp.

as a water container. According to Handy *et al*. (1991), this variety was too soft for use in construction but was made into rattles for hula performances (**pu`ili**) & nose flutes (**`ohe-hano-ihu**). Perhaps its most important use was for a quick and sharp knife. According to McClatchey (2010), Polynesians still recognize that this is among its most important qualities.

Lundstrom (2010) says that *S. glaucifolium* was used for musical instruments, tattoo needles, surgical scalpels and water containers. It will not root and grow from nodal cuttings but occasionally produces some seed. It does not flower gregariously and die, as many other bamboos do.

Another bamboo that I am seeing in enough quantity to merit mentioning is a thin, spreading taxa that forms massive and dense clumps (Figures 4, 5).

Mai`a

Musa acuminata x *balbisiana* hybrids are visible in Pictometry imagery, and I have found a number of them on my hikes. At least 80 varieties were planted (Handy et al. 1991) in old times for food and other purposes. Today about 40 variety names survive with fewer than 30 of them actually located (Kepler 2008).

All of these varieties (except for two) are seedless (Handy 1940, Kepler 2008) and rely up human intervention for es-

Figure 4. Thin spreading bamboo in Makaleha, Kaua`i, Hawaiian Islands. Photo by Kristar Burton.

Figure 5. Thin spreading bamboo in Wailua, Kaua`i, Hawaiian Islands. Photo courtesy of Pictometry International Corp.

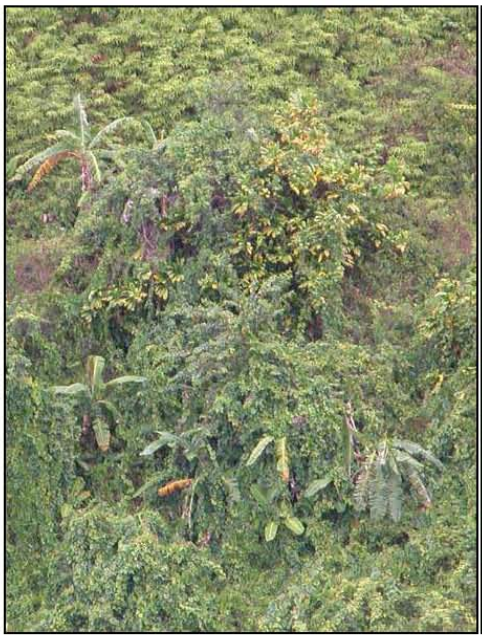


Figure 6a. **Iholena** bananas (*Musa acuminata* x *balbisiana* Colla) on the side of a hill in Wailua, Kaua`i, Hawaiian Islands. Photo by Erik Burton.

Figure 6b. **Iholena lele** bananas (*Musa acuminata* x *balbisiana* Colla) in Kaua`i, Hawaiian Islands. Photo by Erik Burton.

tablishment of new plantings. Plants seen in the Kaua`i backcountry today (Figure 6a) are descendents of these ancient plantings.

Each of these varieties was selected because they had a unique feature or desirable trait. Some of these varieties were eaten raw while others were cooked before eating. In addition to roasting in an **imu** (underground oven) or on hot coals, a pudding-like dish called **piepiele** (Abbott 1992) was made from mashed ripe **iholena lele** bananas (Figure 6b) which were mixed with coconut cream, wrapped in **tī** leaves and steamed in the **imu**.

Traditional Hawaiian bananas are under assault today (Kepler 2008) as pigs are uprooting mature plants to eat the corms, banana bunchy top virus (Bunchy top 2006) has spread to most inhabited parts of Kaua`i and I have found corm borers infesting wild clumps – even in the remote interior. An effort to preserve and identify these unusual varieties has been started at the National Tropical Botanical Gardens (Limahuli). Identifying the varieties that are growing in the most remote parts of the island has proven to be a challenge, as some do not match any of the historical descriptions.

Hau

Another plant of many uses, **hau** (*H. tiliaceus*) was never left alone to grow out of control in ancient times. Instead, it was constantly harvested for its multitude of uses (Handy *et al*. 1991) including bark for rope, flowers for medicine, wood for starting fires and fishing net floats, skirts for hula, and booms for outrigger canoes.

Today the **hau** trees (Figure 7) are growing out of control and are consuming vast areas that were previously used for Hawaiian agriculture. Like running bamboo, **hau** spreads (Figure 8) and swallows up whatever other plants or agricultural structures are in the way. Left unchecked to grow at will, it will continue to transform the landscape of Kaua`i's remote areas.

As it stands today, reaching many of these remote areas is made difficult by the challenge presented in getting through dense stands of **hau** – often leaving me wondering "**hau**" the heck to get through or around it. As local Kaua`i lore has it, **hau** leaves even roughly resemble the island of Kaua`i including its major rivers and valleys (Wichman n.d.).

Figure 7. **Hau** (*Hibiscus tiliaceus* L.) bush and flowers in Kaua`i, Hawaiian Islands. Photo by Erik Burton.

Figure 8. Extensive **hau** (*Hibiscus tiliaceus* L.) coverage in Keahua valley, Wailua, Kaua`i, Hawaiian Islands. Photo by Erik Burton.

Figure 9a. Common mangos (*Mangifera indica* L.) on a trail in Wailua, Kaua`i, Hawaiian Islands. Photo by Erik Burton.

Mango

With the early western explorers came many food plants new to the Hawaiians including mango trees. The common mango (*Mangifera indica* L.) (Figure 9a) was planted by the Hawaiians near their agricultural sites (Figure 9b) and these trees can still be seen today.

According to Morton (1987), "The earliest record of the mango in Hawai`i is the introduction of several small plants from Manila in 1824. Three plants were brought from Chile in 1825. In 1899, grafted trees of a number of Indian varieties, including **pairi**, were imported. Seedlings became widely distributed over the six major islands. In 1930, the Haden variety was introduced from Florida and became established in commercial plantations. The local industry began to develop seriously after the importation of a series of monoembryonic cultivars from Florida. But Hawaiian mangos are currently prohibited from entry into mainland U.S.A., Australia, Japan and some other countries, because of the prevalence of the mango seed weevil in the islands."

Many magnificent specimens of these mango trees remain today (Figure 9b) in both accessible and somewhat remote places. People are still harvesting and enjoying the fruit of these trees (Figure 9a), a gift from the past that just keeps on giving. Although mango trees were not introduced by Polynesian settlers, they were planted by Hawaiians during the early contact period. Further research is needed to determine the variety(s) or cultivar(s) of these plantings.

Hawaiian tī

Cordyline fruticosa (L.) A. Chev., (Figure 10) does not produce seed in Hawaii as it does not appear to produce viable pollen (Yen 1987). All plants have been propagated through vegetative cuttings such as a fly wisk discarded along the route of an ancient trail. Others were planted to consecrate special areas or around a home, planted in upland gardens (Kepler 1998) for util-

Figure 9b. Common mangos (*Mangifera indica* L.) in flower on a Kaua`i hillside, Hawaiian Islands. Photo by Erik Burton.

ity purposes, emergency food and in more recent times, **okolehao** (alcohol) production.

An indeterminately growing plant of 1,000 years and 1,000 uses (McClatchey 2010), **tī** was treasured by the Hawaiians for its many uses including medicinal, food containers for serving or steaming food in the **imu** (ground oven), leaves for weaving just about everything and even thatching houses. **Tī** was even used as a famine food or for a welcome treat (Abbott 1992), by slow baking the huge starchy roots until they turned into a sweet sugary mass.

During the U.S. era of alcohol prohibition, **tī** was planted for **okolehao** production. **Okolehao** (iron bottom) is a form of alcohol based on the sugar produced by baking the **tī** root (Abott 1992). Different stories account for the name "iron bottom" including the idea that you need one to be able to drink the strong drink that was produced. Another explanation is that some of the iron try-pots from the whaling ships were combined with an old gun barrel to create a still (Fornander 1916-1917).

Oddly enough, the aerial signature for **tī** plants is a yellow circle (Figure 11) as the dying leaves stand out from the surrounding green foliage.

Historical Records

The Great Mahele (historic land division) preserved a remarkable amount of place names for features associated with agricultural complexes, and related places claimed by Hawaiians during the years of 1848 to 1849. These records have recently been posted online (Ulukau 2011).

Figure 10. Hawaiian **tī** (*Cordyline fruticosa* (L.) A. Chev.) in Kaua`i, Hawaiian Islands. Photo by Erik Burton.

Figure 11. Hawaiian **tī** (*Cordyline fruticosa* (L.) A. Chev.) in Lumaha`i valley, Kaua`i, Hawaiian Islands. Photo courtesy of Pictometry International Corp.

Before 1848, all lands on an island were held by the **Ali`i `ai Moku** (lit. chief who eats the island) and apportioned to commoners through a **konohiki** who directed an entire **ahupua`a**. Whenever a new **Ali`i `ai Moku** would assume rule over an island, a **mahele** (division) was held and lands could be re-divided according to the new chief's wishes. The Great Mahele (Moffat & Fitzpatrick 1995) of 1848 transformed this ancient land tenure practice into our modern system of land ownership, effecting dramatic change to the Hawaiian lifestyle. After the Great Mahele, konohiki were no longer needed and so many found themselves destitute that a special act was passed to help them acquire some land.

In addition to the Great Mahele records, many old maps exist that have a number of agricultural features outlined and named. Most of these are maps of sugar cane and pineapple field systems in the early 1900's.

The Kauai Historical Society has extensive records on file including the unpublished work of Fred Wichman who collected so many place names for Kaua`i.

Summary

Hawaiians heavily modified their agricultural landscape to maximize production of food and other resources for a particular **ahupua`a**. Modern agriculture has greatly impacted these ancient systems in the more accessible areas; however, vast portions of the interior of Kaua`i appear to be largely untouched since they were abandoned by the ancient Hawaiians.

Easy to use GIS tools with decent imagery present us with an opportunity to record these ancient sites before they completely disappear. Using GIS tools to model their abandoned agricultural systems can provide a view into the extent of landscape modification for agricultural production during an ancient time of peak population.

Objectives

Building on the history presented above I set out in this project to achieve three objectives:

1. Develop a method of identifying the primary agricultural complexes within an **ahupua`a**.
2. Conduct a GIS based aerial survey of an **ahupua`a** detailing the location of plants from transported landscapes.
3. Develop a GIS model of information from the historical archives that can be used to compare with the results from Objectives 1 & 2.

Methods

Using GIS to visually analyze an ancient agricultural landscape requires the creation of data sets that are represented as GIS layers. For the three GIS layers being discussed, Agricultural Complexes, Transported Landscapes and Historical Records, the tools are the same but the approach is significantly different.

GIS Applications Used

For this project, I used two GIS applications: Google Earth, and Pictometry International's Electronic Field Study. Google Earth was used to house the GIS layers and visualize their relationship to the landscape. It was also used to create some of the GIS layers. Pictometry's Electronic Field Study was used to locate the transported landscapes, and analyze the agricultural complexes.

I used the freely available version of Google Earth, (Google Earth 2010) which, at the time of this paper, is in version 6.0.3.2197. In order to view the Google Earth imagery as clearly as possible, I used a large, high quality monitor in a darkened room. I also increased the resolution of the imagery being delivered from the Google Earth servers, by going into the menu under Tools, Options, and then increased the Terrain Quality to maximum by sliding the selection bar all the way to the right.

Google Earth has pulled together a variety of satellite images to "quilt" together their imagery database. These images have a varying degree of resolution depending on what you are viewing at the moment. Their imagery is delivered from their central servers and is subject to change at any time. The imagery quality available for Kaua`i during the time of this study was sufficient to identify larger trees, but not shrubs and smaller plants such as **tī**. (But for example, the imagery available for San Jose, California is sufficient to identify shrubs and smaller plants.)

Pictometry International Corporation's Electronic Field Study, version 2.7, Production release 1, Revision 14 (Pictometry 2010) was also used. It's database of 44,000 Geo-referenced images of Kaua`i average 6-inchs per pixel, and allow me to systematically survey an **ahupua`a**, obtaining coordinates for trees and other objects in the landscape. Using the application, you can also determine the boundaries of an agricultural complex, measure the height of a cliff, and view an area from a variety of different angles. Electronic Field Study was designed for Urban Planners, and the Pictometry staff indicated that this project is the first time they have heard of their application being used for landscape surveys.

GPS Tools Used

A portable GPS unit (Garmin 60 CSX) was used for field visits to record locations of plants and other features. Data from the GPS unit was downloaded into the Garmin Map Source (Garmin 2010)(software version 6.14.1) application, reorganized, and then imported into Google Earth.

Figure 12a. Author's conception of an agricultural complex. Image generated with Google Earth.

Method for Identifying Agricultural Complexes

For the purposes of developing this GIS layer, I have defined an agricultural complex (Figure 12a), as a gently sloping or level area of land along a river or stream, that can be irrigated by an **`auwai** (irrigation ditch), and containing remnants of transported landscapes.

To locate agricultural complexes, it is helpful to try and think like an ancient Hawaiian engineer. Handy *et al.* (1991) describe the construction and operation of **`auwai**, along with some of the protocols associated with their communal use.

When constructing these new irrigated agricultural complexes, the ancient Hawaiians put considerable work into bringing water in as high as was practicable, maximizing the farmable area. The layout of each complex is different, yet they share some essential elements. Most are supplied by a primary **`auwai** that uses a dam to pull water from the stream. This water is used to supply the small ditches and **lo`i** that make up the complex.

To locate the ancient agricultural complexes of an **ahupua`a**, I begin at the coast where the river or stream enters the ocean. There are usually some broad flat lands here and a **muliwai** (brackish pond) where the river or stream enters the ocean. As these lands are at the lowest elevation, they are some of the easiest to reach with an **`auwai**.

After locating a candidate flatland along the river with Google Earth, I look for evidence of disturbances to the native landscape, including elements of transported landscapes, such as **kukui** trees (*Aleurites moluccana* (L.) Willd.), whose oily nuts were burned for light. Next, I consult the Electronic Field Study imagery to see if there are any visual indications of the boundary of the complex. In many cases, you can see level, irrigable land running up to the base of a cliff, or to an abrupt bank in the hill.

With a general idea of the complex outline, I then conduct an elevation survey using Google Earth and the Electronic Field Study. In Google Earth, you can determine the elevation of an area by placing the cursor over it. The elevation will be displayed at the bottom of the screen, and change dynamically as you move the cursor around. With this tool, I determine the elevation of the river, just **mauka** (toward the center of Kaua`i) of the complex by moving the cursor from one side of the river to the other, noting the minimum elevation of the water level.

Figure 12b. **`auwai** elevation measurement. Image generated with Google Earth.

This gives you a beginning elevation for the water intake. Electronic Field Study also has an elevation tool; however, it measures canopy height. Google Earth's elevation tool measures terrain height, which provides a more accurate indication of a potential irrigation intake elevation.

With the intake elevation as a starting point, I use the Google Earth line tool to mark out the boundary of irrigable land, assuming a 2 foot drop for every 100 feet. This line (Figure 12b) provides an idealized view of the primary **`auwai**, and marks the boundary of the agricultural complex.

Using Electronic Field Study's Area tool, I measure the complex three times, recording the average in the spreadsheet. In Google Earth, I use the Add Polygon tool to make an outline of the complex, and record the area measurement in the Description field. As the imagery in Google Earth is a little off of alignment, I rely upon elevation to guide drawing the boundaries of the complex. Although this is not as accurate as a ground survey would be, it is sufficient to provide valuable insight into the extent and nature of the ancient agricultural landscape. This process is continued up the **ahupua`a** (Figure 13), following each branch of the river and its streams until the indicators stop.

Figure 13. Agricultural complexes in Lumaha`i ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Method for conducting aerial surveys of transported landscapes

While I have noticed the indicator plants in the forest for some time, GIS provides the opportunity to record their locations. Pictometry is used to systematically explore an **ahupua`a**, from the valley floor to the top of the ridges (Figure 14), looking for remnants of ancient plantings. Coordinates for each tree or cluster of plants was recorded in Google Earth.

The following plants were included in the surveys: bamboo, bananas, **hau**, mango and **tī**. In order to determine what a plant looks like from the air, I start with one that I have already seen from the ground and take a look at it with Google Earth and then in Electronic Field Study to determine its aerial signature.

In Google Earth, **kukui** trees are so easily seen, and plentiful, that I don't bother marking them. Some of the other transported landscapes can be glimpsed with Google Earth, but are much more visible in the Electronic Field Study imagery.

Beginning at the ocean, I use Electronic Field Study to systematically inspect the **ahupua`a**, including each of the side drainages, for the transported landscapes previ-

Figure 14. Bananas (*Musa acuminata* x *balbisiana* Colla), **tī** (*Cordyline fruticosa* (L.) A. Chev.) and mangos (*Mangifera indica* L.) in Wainiha ahupua`a, Kaua`i, Hawaiian Islands. Picture courtesty of Pictometry International Corp.

ously listed. As most areas have images available from each direction as well as directly overhead, great care is taken to determine the optimum viewing angle, as lighting can make things appear and disappear.

Once the ideal viewing angle is determined, the area or side drainage is explored from that angle, and the targeted species locations are systematically recorded, each in their own folder, and represented by a custom icon. This process is continued until the entire **ahupua`a** is explored.

Historical Reconciliation using GIS layers

Historical records were consulted for descriptions of ancient or historical agricultural systems. Further place names information was obtained from old maps, and especially from the unpublished manuscripts of Fred Wichman, that are on file at the Kauai Historical Society.

Using Google Earth, Tax Maps were converted into a layer using the Add Image Overlay tool. By temporarily making a Tax Map semi-transparent, I am able to align it with the Google Earth imagery. This is done for all of the Tax Maps for the **ahupua`a**, and the image overlays are stored in their own folder.

One at a time, each of the Tax Maps is turned on, and any relevant features are traced with Google Earth Polygons or Lines. Hawaiian Land Claim Award parcel outlines, and old irrigation ditches are the main focus. When the Tax Map overlay is turned off, the drawing shapes remain, and each are placed in their appropriate folder.

Land Claim records from the Great Mahele were consulted (Ulukau 2011), and information for each Land Claim was entered under an envelope icon (Figure 15) which was placed in the related parcel outline. This was done for each Land Claim Award in the **ahupua`a**. Place Names mentioned in the Land Claim Awards (Figure 16), but not recorded elsewhere, were located and added to the Google Earth layer.

Results

The GIS layers are all combined to create a master GIS model for an **ahupua`a**. This allows a researcher to eas-

Figure 15. Hawaiian land claim award (LCA #10562.1 - Opu's moo kalo called Kamakapili & a large Loko adjoining called "Keaweloko") outlined in Ha`ena ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

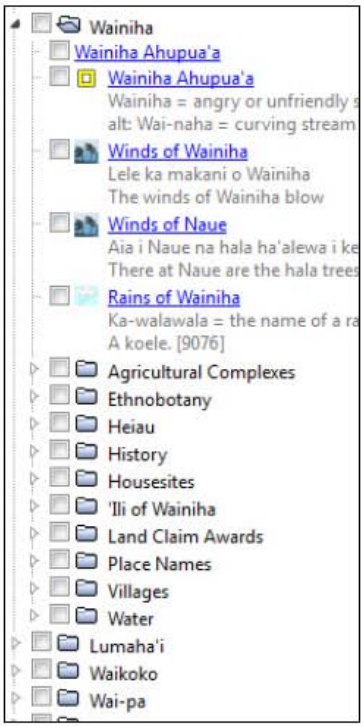
Figure 16 (above). Place names in Ha`ena ahupua`a, Kaua`i, Hawaiian Islands: **A**) Wa-wai-kapu Pali; **B**) Konohiki's pasture; **C**) Moo Kalo Maninihuanui; **D**) Sand hills back of beach; **E**) Kawaikapu pali; **F**) Kahau pali; **G**) Moo kalo called Keokeaihu; **H**) Pu`u-o-Ni`ihau; **I**) Pohaku-loa; **J**) Koie; **K**) Loi called Malupo; **L**) School - Grant #41:8; **M**) Aio's lois; **N**) Nakeu's lois; **O**) Kaluahonu; **P**) Lalaole's Koele moo; **Q**) Nuuanu land; **R**) Kalaelehua's lois; **S**) Moo kalo "Peekauai"; **T**) Loi "Koia"; **U**) Makahoa; **V**) Lae's land; **W**) Koele "Kapalaa"; **X**) Davida's loi "Pahole"; **Y**) Kiliili moo Piimoku's lois; **Z**) Na Anawaiakanaka; **AA**) moo Kapuakaiki/ Kapuakaloiki; **BB**) Awana's lo`i; **CC**) moo "Kaahaolono"Kunihi's lois. Image generated with Google Earth.

Figure 17 (right). Main GIS model with layers organized into folders. Screen capture from Google Earth.

ily access data for a particular **ahupua`a** (Figure 17) and selectively enable the data to be visualized. By selectively enabling the data layers, a custom view of the ancient agricultural landscape can be created. This allows the data to be viewed from many angles in 3D, revealing things that were previously only understood by people who lived in an area for a lifetime.

A few notes on data accuracy

The **ahupua`a** boundary outlines were obtained from the State of Hawaii GIS website and reflect the state of the boundaries around the time of the Great Mahele (1848). These **ahupua`a** boundaries changed over time with increases or decreases in populations, changing political leadership and other factors. These GIS layers are not considered to be accurate by modern surveyor's standards, but can still serve to help us understand the ancient Hawaiian agricultural environment. The data layers produced from this study are only aerial surveys, detailed ground surveys are required to obtain a truly accurate view of what remains on the ground.



Results are presented for three general classes of layers: agricultural complexes, aerial ethnobotanical surveys for plants from transported landscapes, and historical reconciliation using GIS layers.

Agricultural complexes

Figures 18 and 19 illustrate examples of agricultural complexes from Kaua`i.

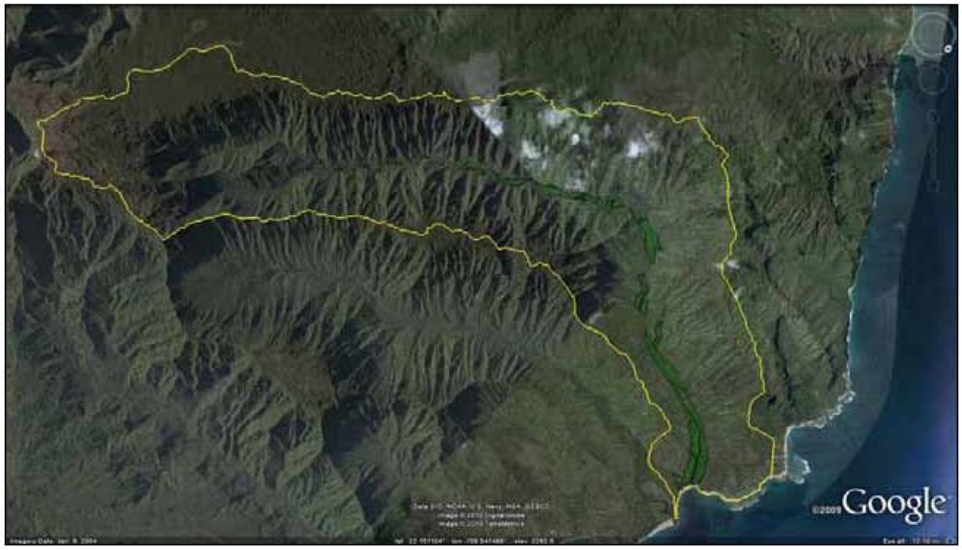


Figure 18. Agricultural complexes in Wainiha ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Figure 19. Agricultural complexes in Lumaha`i ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Aerial ethnobotanical surveys for plants from transported landscapes

Results for each of the plants included in the survey (bamboo, bananas, **hau**, mangos and **tī**) are illustrated in Figures 20 through 24.

Figure 20. Survey results for bamboo (*Schizostachyum glaucifolium* (Rupr.) Munro) in Ha`ena ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Figure 21. Survey results for bananas (*Musa acuminata* x *balbisiana* Colla.) in Ha`ena ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Figure 22. Survey results for **hau** (*Hibiscus tiliaceus* L.) in Ha`ena ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Figure 23. Survey results for mango trees (*Mangifera indica* L.) in Ha`ena ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Figure 24. Survey results for Hawaiian **tī** (*Cordyline fruticosa* (L.) A. Chev.) in Ha`ena ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Figure 25. Historical data, place names and land claim awards in Wainiha ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Historical Reconciliation using GIS layers

An example of mapping of historical results about sites is illustrated in Figure 25.

Combined Layers

Examples of combined data layers are presented in Figures 26 and 27.

Figure 26. All layers displayed for Wainiha and Ha`ena ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Figure 27. All layers displayed for Wainiha ahupua`a drainages, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Discussion

Many times while doing this work I will get "chicken skin" when working on particularly interesting places, and in these moments I am transported (in my imagination) back in time to when these places were full of people and activity. I can almost see the farmers working in their plots, children jumping into their favorite swimming holes, women pounding out **kapa** (bark cloth), people on the trails bringing mountain products to trade with their family at the seashore, and enjoying special places discovered during a lifetime. To experience these places and not be moved would be unusual. As lovely as these remote places are today in their overgrown state (Figure 28), what wonders there must have been to see during the main times of occupation.

In taking a look at the data produced by these surveys, it is easy to be overwhelmed by a cloud of icons and shapes projected over a moving 3D image of Kauai. GIS tools allow you to turn on these layers individually or all at once and view them from just about any angle. This kind of dynamic visualization can be helpful in developing an understanding of the layout and spatial relationships of the agricultural landscape.

A discussion follows of each of the three focuses of this study: agricultural complexes, ethnobotanical surveys and historical records.

Agricultural Complexes

The number of agricultural complexes predicted by this GIS model point to a time of large populations. The model is actually a bit conservative, as it does not attempt to account for the many minor taro patches formed in the side drainages seen during my field visits. By outlining all of the main agricultural complexes within an **ahupua`a** (Figures 18, 19), the extent of development begins to take shape. The complexes certainly do form the "slowly ascending stairway of steps, broad in the tread and low in the rise" as mentioned in Handy *et al*. (1991). Google Earth allows you to "fly" up the valley, viewing each complex as it sits in its unique area of riverbed geography. The data from the historical layers coordinate nicely with the terrace areas (Figure 29) in the lower portion of Ha`ena ahupua`a.

Figure 28. Kawi valley in Wailua ahupua`a, Kaua`i, Hawaiian Islands. **TI** (*Cordyline fruticosa* (L.) A. Chev.) covers the twin-peaked hill while **ho`i** (*Dioscorea bulbifera* L.) smothers **mai`a** (*Musa acuminata* x *balbisiana* Colla) plants and **kukui** (*Aleurites moluccana* (L.) Willd.) trees. An old agricultural complex is present in the meadow by the stream. Everything you need for a nice upland garden area. Photo by Erik Burton.

Figure 29. Agricultural complexes in Ha`ena ahupua`a, Kaua`i, Hawaiian Islands, with land claim awards and place names layers. Image generated with Google Earth.

With all layers enabled (Figure 27) a view of a very busy ancient agricultural landscape is presented. Primary agricultural complexes by the main river, side drainages filled with **tī**, mango, bananas, **kukui** and hau bush. It is easy to see a group, perhaps a family unit, farming some **lo`i** fed by the main **`auwai** for the agricultural complex as well as utilizing a side drainage for all their forest resources. Instead of heading to the very back of the valley to collect needed forest plants, they simply farmed the nearest side drainage. In the case of a larger drainage, its own side drainages may have been allocated to certain groups or members within the family. On Kaua`i`s wet north shore (the area of focused study for this project) most of these side drainages have year round streams and would have been quite productive as evidenced by the quantities of plants remaining (Figure 27).

The agricultural complex prediction maps developed from this study match up nicely with the maps provided by Ladefoged *et al.* (2009) which were based on "climate, hydrology, topography, substrate age, and soil fertility". Neither of our models account for the many minor terraces constructed in the side drainages that I have seen during my hikes. Apparently, just about everywhere conditions were ideal, **lo`i** were constructed and taro was planted.

Aerial surveys for plants from transported landscapes.

This was one of the more interesting sets of layers to create as it had the most direct contact with the people of old without any human point of view filtering the raw data. The Pictometry package was very helpful as you can easily view the same area from many different viewpoints, using the different lighting conditions to reveal otherwise hidden plants, like tī and banana, tucked into ravines and under the tree canopy.

It was surprising to see just how many of these Hawaiian introduced plants were still growing in these drainages. After intensively studying hundreds of pictures, patterns begin to emerge that demonstrate a willful intent indicating human intervention, such as in the case of **tī** plants consistently situated at the very tops of drainages and along ridges.

`ohe

Finding 46 clumps of **`ohe** just in the **ahupua`a** of Lumaha`i was impressive. **`ohe** was used for so many things that it is easy to see why so many clumps were planted - such a useful resource should be close at hand! The groves of thin green **`ohe** (Figure 30) that have eaten up big parts of the side drainages and the valley floor need to be identified. Growing unchecked, they are consuming large areas and erasing possible evidence of ancient planting practices.

What is this thin stalked variety planted in these different areas and what was it used for? Ground truthing these different varieties would provide some interesting data for

Figure 30. This spreading bamboo in a Wainiha ahupua`a drainage threatens to consume ancient plantings on Kaua`i, Hawaiian Islands. Photo by Erik Burton.

comparing to the descriptions of "Hawaiian bamboo" (Abbott 1992, Handy *et al.* 1991).

Mai`a

What was most notable from the study results for **mai`a**, was the lack of plants considering the other planting activity. During my field visits, I would often find 2 to 3 times as many plants as were visible in the aerial imagery. Many of these others are hidden under the forest canopy or in other inconspicuous areas. Pressures on banana plants that could account for their low numbers include feral pigs who knock the plants down to eat the starchy corms and corm borers. Banana bunchy top virus is established on Kauai but so far seems to be sticking to the coastal areas which are impacted by people.

Identifying which varieties are planted in these areas could provide insight into their intended purpose. Certain plant cultivars had symbolic importance to the ancient Hawaiians and were sometimes planted for what they represented (Abbott 1992) instead of for food or utility purposes.

Hau

Ever since the Hawaiians stopped living in the old ways, **hau** has been on the run with nobody to check its growth (Figure 31). Usually a much trimmed clump near the side

Figure 31. **Hau** (*Hibiscus tiliaceus* L.) smothering **kukui** (*Aleurites moluccana* (L.) Willd.) trees on Kaua`i, Hawaiian Islands. Photo courtesy of Pictometry International.

of a river (Handy *et al.* 1991), **hau** is now left alone to grow (Figure 32) out of control. Although it is not currently considered an invasive species, it is probably just a matter of time.

The groves identified from the GIS surveys extend far inland and closely track the agricultural complexes identified in the surveys. This is especially true in Lumaha`i where they cover almost every agricultural complex (Figure 33) extending into the furthest upland reaches of the **ahupua`a**.

Mango Trees

The data from the surveys show mango trees planted primarily in the lower parts of the valley where the majority of Land Claims were awarded (Figure 34). As mango trees were introduced with the coming of Westerners, perhaps this grouping of trees in the lower valley reflects the greatly reduced populations that had moved down to prime lands in the lower valley.

Locally these mangos are referred to as the "common mango", they all seem to flower around the same time (January-March) and can primarily be found near old habitation sites near the coast. I would expect that ground truthing would show the bulk of these trees to be the same variety with just a few near the coast being other cultivars planted in more recent times. As it stands now, the fruit of many of these trees are still harvested and enjoyed by locals and visitors alike as they grace many a park trail (Figure 35).

Figure 32. **Hau** (*Hibiscus tiliaceus* L.) covering an agricultural complex in Lumaha`i ahupua`a, Kaua`i, Hawaiian Islands. Photo courtesy of Pictometry International.

Figure 33. **Hau** (*Hibiscus tiliaceus* L.) in dark green and agricultural complexes in light green show the close association between the two in Lumaha`i ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Most of these trees are now over 150 years old and have developed large trunks and high canopies. It can be a bit frightening hiking in old mango groves when the ripe fruit are falling silently from great heights. Although not as big and dangerous as a falling coconut, you still don't want to have one bonk you on the head.

Hawaiian **Tī**

Tī is the most populous of the plants mapped in these surveys. After intensively studying hundreds of high resolution photos of side drainages filled with Hawaiian introduced plants, I am left marveling most at the **tī**. For exam-

Figure 34. Mango trees (*Mangifera indica* L.) and land claim awards in lower Wainiha ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Figure 35. Mature mango trees (*Mangifera indica* L.) line a section of old road in laim awards in lower Wailua, Kaua`i, Hawaiian Islands. Photo by Erik Burton.

ple, some side drainages had a few **tī** plants in the lower and mid sections yet had remarkable concentrations of them right near the very top including a few planted right at the highest point (Figure 36). The pattern varies with some side drainages having very few **tī** plants and some that have a few at the very top with no dense concentrations.

The plantings seem to follow a very conscious pattern and are often grouped with other Hawaiian introduced plants like **kukui** trees, bamboo (Figure 37) and bananas.

When considering the **tī** plant's presence in these patterns, I had difficulty coming to terms with the possibility that each and every plant was put there by humans and is still growing exactly where it was planted. Perhaps it is just Mother Nature and her violent storms that have uprooted **tī** plants, broken them into little bits and scattered them in tight groups at the tops of drainages where they sprout and form the plants we see today? If it was Mother Nature doing this, I would expect to see a more general disbursement and not tight groupings of plants in a predictable pattern. There are more examples on Kaua`i of intentionally planted groups of **tī** in unusual places. An example is Figure 28, showing two peaks and the saddle between covered in **tī**. In upper Wailua ahupua`a is a ridge (Figure 38) with a large patch overlooking an overgrown agricultural complex. During my hikes in the field, I have found **tī** marking old trails and planted on sheer rocky cliffs (Figure 39) next to waterfalls. If these **tī** plants

Figure 36. **Tī** (*Cordyline fruticosa* (L.) A. Chev.) plantings show up with dying yellow leaves at the top of a drainage in Lumaha`i ahupua`a scattered among **kukui** trees (*Aleurites moluccana* (L.) Willd.), Kaua`i, Hawaiian Islands. Image generated with Google Earth.

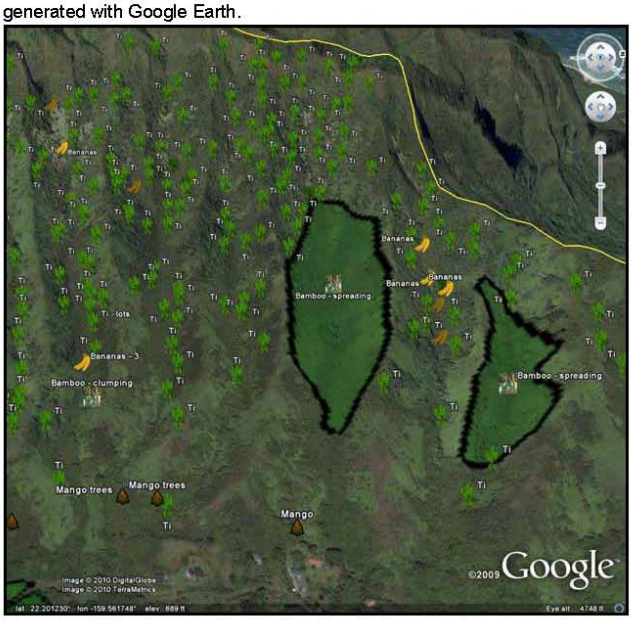


Figure 37. Side drainages in Wainiha, Kaua`i, Hawaiian Islands, planted with **tī** (*Cordyline fruticosa* (L.) A. Chev.) bananas (*Musa acuminata* x *balbisiana* Colla), **kukui** (*Aleurites moluccana* (L.) Willd.), mangos (*Mangifera indica* L.) and bamboo. Image generated with Google Earth.

were not planted by Mother Nature but instead were put there by a human hand, what was their purpose?

Assuming, as Bennett (1931) says, just as they did not build houses on land that could be used for taro production, the large populations of old must have had **kula** lands elsewhere for planting the other plants needed for everyday life. In looking at the geography around the agricultural terraces, the only other land is the side drainages where all the Hawaiian introduced plants were found! Supposing that these drainages (Figure 29c) were the **kula** lands for people during the ancient times of high populations, how were they apportioned?

Agricultural activity greatly benefits from the presence of water and most of these side drainages have perennial streams. Considering how methodical the Hawaiians were in dividing up other lands, it seems logical that individual side drainages would be worked by a specific group of people, perhaps an extended family or working group. If this was the case,

Figure 38. **Tī** (*Cordyline fruticosa* (L.) A. Chev.) plants cover part of a ridge in Wailua ahupua`a, Kaua`i, Hawaiian Islands. Photo by Erik Rohlffs.

the plantings up in the higher parts of the drainage could be accounted for in several ways.

Perhaps population pressures justified planting all parts of the drainage and as populations declined, later generations harvested the easier to reach plants, not replanting as there was so much to pull from.

Another possibility that comes to mind is the spiritual role of **tī** in accompanying prayers and sanctifying an area (Abbott 1992). Is it possible that each year, a **tī** plant was taken to the top of the drainage and planted as part of a prayer to the gods for successful harvests that year? After many years the plants would accumulate at the top of the drainage with a few especially brave souls taking their plant(s) to the uppermost reachable part of the drainage, getting it that much closer to the gods. This idea does account for this planting pattern being present in the minor drainages that lack prodigious quantities of **tī** but still have a few strategically placed plants at the very top. Some of the large drainages have several (Figure 40) branches that are themselves quite large and have **tī** going to their tops. Could these also have been held by separate family groups and represent their individual prayers?

Another idea is that these plants could have been planted to demonstrate bravery. A flag rots over time whereas a **tī** plant is both long lasting and easy to see.

If you consider the ancient lifestyle pattern of living near your taro patch and periodically heading up into the mountains to tend your gardens and collect forest resources, it would have been quite a monumental trek for these people to have to proceeded to the upper valley of the larger **ahupua`a** like Wainiha which is twelve miles long. Heading up the side drainages for these resources would have been much more convenient.

Considering that **tī** was used for so many things, including just about every spiritual function, and that it needs human intervention to create new plantings, further research could provide some interesting insights into ancient agricultural practices.

Figure 39. **Tī** (*Cordyline fruticosa* (L.) A. Chev.) planted on sheer rocky cliffs next to a waterfall in Makaleha, Kaua`i, Hawaiian Islands. For scale, the top of the falls is about 60 feet up from the stream bed. Photo by Erik Burton.

Historical Reconciliation using GIS layers

Working with these GIS layers was very interesting as a number of the identified agricultural complexes situated in the lower parts of the valley had names preserved during the Great Mahele. Some of these from the finished historical data layer are described as follows:

One interesting example is the very long (Figure 41) agricultural complex that runs along Powerhouse road in lower Wainiha. From the Kauai Historical Society's collection of place names (Fred Wichman) comes the name Ka-pa-loa, the long fence or alternatively Ka-pa-lo`i, the elongated food bowl. Considering the shape of the agricultural complex, my bet is on the name Ka-pa-lo`i as the complex is certainly elongated and would have produced much taro.

The names of a few side drainages emerged from the Land Claim documents that do not appear on the old

Figure 40. **Tī** (*Cordyline fruticosa* (L.) A. Chev.) and **kukui** (*Aleurites moluccana* (L.) Willd.) plants in branching drainages in lower Wainiha ahupua`a, Kaua`i, Hawaiian Islands. Photo courtesy of Pictometry International Corp.

maps. One example of a drainage name is: `ai-kahi, place of food (Figure 42). Some tidbits from the Land Claim Award testimonies reveal interesting things about daily life at the time of the Great Mahele including that orange trees were a much valued asset as they could be sold to California buyers – one of the few cash crops for individual farmers at the time. The Land Claim records detail several battles with the **konohiki** of the **ahupua`a** who is trying to claim the trees of one of the inhabitants. These were no laughing matters. Shortly after the Great Mahele process was completed, **konohiki** lost their jobs and many had to depend on the charity of their former charges.

Names of individual taro patches, groups of patches and agricultural complexes came out of the Land Claim Awards and were able to be generally located on the map – many of these not appearing on any other maps such as names for side streams, pasture lands, cliffs and minor irrigation ditches.

Conclusions

At the beginning of this paper I posed three objectives and will now address if they were achieved and what was learned.

Figure 41. Ka-pa-loa, the long fence; or alternatively, ka-pa-lo`i, the elongated food bowl. An agricultural complex in lower Wainiha ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

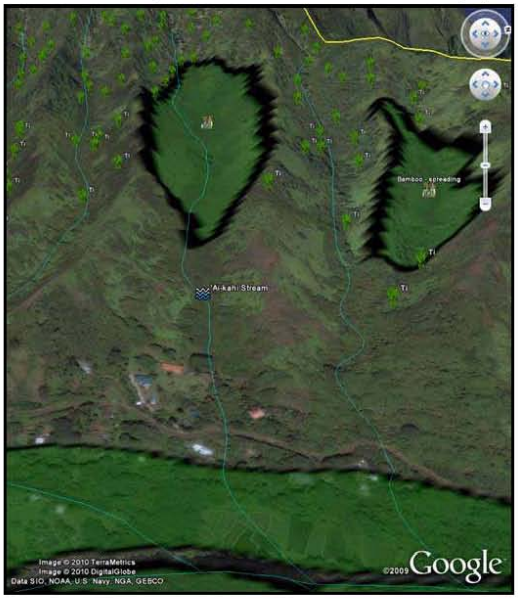


Figure 42. Ka-pa-loa, the long fence; or alternatively, ka-pa-lo`i, the elongated food bowl. An agricultural complex in lower Wainiha ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

1. Develop a GIS model to predict the location and extent of Agricultural Complexes within an ahupua`a.

Based on my hikes to a sample of the predicted areas, the model for agricultural complexes is preliminarily accurate and the resulting GIS model can be used to predict the presence of abandoned agricultural complexes. The outlining of all of these complexes to the most inland extent of the **ahupua`a** provide a good idea of how far inland an **ahupua`a** was developed for agricultural production.

Note: When Pictometry completes imaging the island of Kaua`i, agricultural complex area measurements can be completed for each **ahupua`a** on Kaua`i.

2. Conduct a GIS based aerial survey of an ahupua`a detailing the location of plants from transported landscapes.

The plant surveys are labor intensive but provide a fantastic view of ancient Hawaiian planting practices that is otherwise unavailable. These side drainages were an important source of the valuable materials needed for everyday life. Being able to view these detailed plant surveys with the other layers provides a valuable view of the ancient agricultural landscape of an **ahupua`a**.

3. Develop a GIS model of information from the historical archives that can be used to compare with the results from Objectives 1 & 2.

The confusing amount of information contained in the old records was much easier to understand once it was rendered into GIS layers and viewed with the other layers. Names of individual **lo`i**, **`auwai**, **loko** (fishponds) and **kula** lands began matching up with features identified in the other layers. Combining these layers and viewing them in a 3D terrain model (Google Earth) helps an overall picture of ancient land use patterns (Figure 43) begins to emerge.

These new layers were added to my master GIS model (Figure 44) which consists of a variety of other layers shedding light on ancient Kaua`i.

Figure 43. All layers for Ha`ena ahupua`a, Kaua`i, Hawaiian Islands. Image generated with Google Earth.

Acknowledgements

I would like to recognize the Hawaiian people for their achievements in maximizing sustainable agriculture in a variety of environments and conditions. We have much to learn from the people of old and their descendents.

Randy Wichman provided countless hours of consulting and direction to help improve my understanding of Kaua`i's ancient cultural landscape. His personal knowledge of ancient Kaua`i is not only singularly remarkable, his willingness to share and open demeanor suite him well for his role in leading the Kauai Historical Society.

My thanks also go out to Angela Kepler and Frank Rust for inspiring me about the wonderful group of bananas found in Hawai'i and their potential to tell us about the past. Her pictures of wild banana plants and old mountain gardens inspired me.

Kawika Winter provided invaluable advice and insights into plants, planting practices and help with what is **pono**. He is a remarkably tolerant and patient sounding board for my crazy ideas.

Will McClatchey encouraged me to write this paper. "A scientist is somebody who shares information". Not only is his level of knowledge and passion for the subject remarkable, his enthusiasm is infectious.

Fred Wichman's wonderful books of Kaua`i legends were my initial inspiration to begin GIS mapping of ancient Kaua`i. His unpublished masterwork of Kaua`i place names kept at the Kauai Historical Society is an amazing resource for anybody interested in ancient Kaua`i.

My sincere thanks to those who hike Kaua`i's remote interior and share amazing photos with me, their contributions have materially contributed to this project.

My gratitude also goes out to all those who have collected and preserved the fragments of Hawaiian history that we do have.

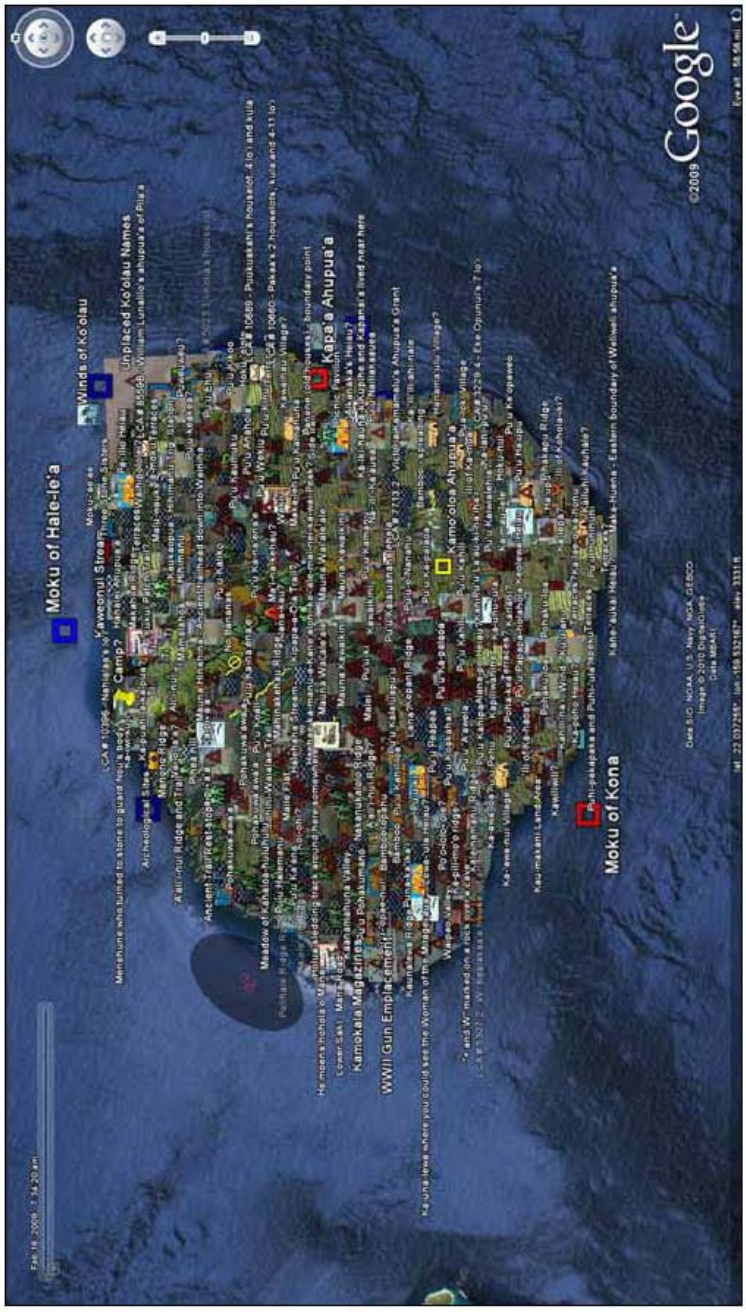


Figure 44. Ancient Kaua'i Mapping Project - all layers. Image generated with Google Earth.

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Subject: RE: Puu Opae Bridge, Opaekaa Bridge, and Kapahi Bridge

From: Erik Burton (eburton@restorekauai.org)

To: catdagher@yahoo.com;

Date: Saturday, March 3, 2012 6:27 AM

Aloha Cathleen,

My reply did not go through, so I am trying again.

As to the Puu 'Opae and 'Opaeka'a bridge areas, I have found no specific written accounts of that area, other than general reports of a lushly farmed upland. The ali'i did have several sacred bathing ponds, and there are a number of sacred sites (and some scary ones) in the Wailua area – many not with state site numbers. After the industrial ag. period, much of the area was scraped clean. The gullies and river flatlands are mostly preserved.

The agricultural complexes for Wailua Ahupua'a continue all the way to the base of Wai'ale'ale, where the village of Ka'uhau protects the lua trail up to the Alakai. Considering that Wailua was so developed, and looking at the lay of the land in these areas, my predictive model indicates that there were lo'i all along the 'opaeka'a stream. With Wailua's peak population pushing all the way to the base of Wai'ale'ale, they surly cultivated these easy to access and irrigate, gently sloping uplands. We are only at about 370' elevation, so the growing climate here is good for many things.

Attached is a copy of my paper describing the predictive model.

If you need somebody on Kauai to do some outreach work to the local Hawaiian community, our non-profit (Restore Kauai) was created and led by a Hawaiian man from Anahola. One of our kuleana is to help with land-use issues, and to help ensure that what is left is left alone. We have looked, and continue to look, at each ahupua'a as a system, and to understand how it worked at peak population.

Malama pono,

Erik Burton

Operations Director

Print

Subject: **Opaeka'a and Pu'uopae Bridges**
From: **Larry LaSota <larryonkauai@gmail.com>**
Sent: **Friday, February 17, 2012 5:25:26 PM**
To: **cathy@scshawaii.com**

I live between the Opaeka'a and Pu'uopae bridges in Wailua Homesteads. Please, if for no other reason than that the one lane system helps to slow down traffic, they should be saved. Same is true for the Kamalu Rd. in the homesteads. These bridges are perfect the way they are (one lane) and should be kept that way.
Just look what has happened in Kilauea where the Kolo Rd bridge was turned from one into two lanes and now everyone now flies by.
Please, leave these bridges as one lane. Don't let the slower pace and charactor of the neighborhood get turned into a speed zone

--
Larry LaSota
larryonkauai@gmail.com

747 Main Street B-2
Osterville, MA 02655
January 3, 2012

Mr. Larry Dill, County Engineer
Department of Public Works
County of Kauai
4444 Rice Street
Lihue, HI 96766

Opaekaa Bridge

Dear Mr. Dill,

Nearly thirty-five years ago, Donald Jackson and I published the research article, "Kauai's Opaekaa Bridge: The Only Known British Truss Bridge in the United States," examining the bridge physically and describing it historically. Jackson was on the staff of the Historic American Engineering Record (HAER), and I was Director of Grove Farm museum and a professional historian.

For the first time, in 1978, the Opaekaa Bridge was recognized as historically significant in Hawaii; moreover, the bridge was identified nationally as the only British-made iron bridge in America. I can recall Pila Kikuchi, the Kauai archeologist and a member of the State Historical Preservation Board, telling me that he never had known of the bridge's importance in American industrial archaeology until he read my article.

Twenty years ago, I participated in meetings of the County Public Works Department staff, and its engineering consultants from Honolulu and the Mainland, who considered the Opaekaa Bridge worthy of repair and who developed several plans for its rehabilitation and preservation.

No action was taken by the County on those recommendations, I understand. It is hard to be forgiving about the County's neglect and

lack of care since 1992; I can only hope that the present comprehensive review of the future of the bridge by the County and State will produce a preservation rehabilitation plan for stabilization---and continued practical use---of this surviving historical structure on Kauai.

Sincerely,

Barnes Riznik
Director Emeritus
Grove Farm Museum

The Honorable Bernard Carvalho
Mayor of the County of Kauai
4444 Rice Street, Suite 235
Lihue, HI 96766

✓ Cathleen Dagher, Senior Archeologist
Scientific Consultant Services, Inc.
711 Kapiolani Blvd., Suite 975
Honolulu, HI 96813

Mike Hunneman, Vice President
Kai Hawaii, Inc.
31 N. Pauahi St. 2nd Floor Attn: Tonia Moy, Fung Associates
Honolulu, HI 96817

Kauai Historic Preservation Commission
Kauai Planning Department
4444 Rice Street,
Lihue, HI 96766

Robert Schleck, Director
Grove Farm Museum

Print

Subject: **FW:**
From: **Bob Spear <bob@scshawaii.com>**
Sent: **Wednesday, February 08, 2012 5:29:36 PM**
To: **cathy@scshawaii.com**

-----Original Message-----
From: mfreeman5@hawaii.rr.com [mailto:mfreeman5@hawaii.rr.com]
Sent: Wednesday, February 08, 2012 2:25 PM
To: scs@scshawaii.com
Subject:

To: Scientific Consultant Services
@ scs@scshawaii.com

From:
Margery Freeman
6448 Kaahele St.
Kapaa, HI 96746
(808)822-4605

Subject: Cultural Impact Assessment.

Ms. Cathleen Dagher,

The Three bridges that are covered by this assessment are near my home on Kauai. There are a number of reasons these bridges should be kept as one lane bridges.

1) They are historic
2) The slow down traffic
3) They are safer that having people rush around on wide streets
The studies of their accidents are misleading. Most of those problems happened a mile or two

away from the bridge so are NOT relevant to the bridge.
4) There is very little traffic on any of them
5) They contribute to keeping our rural life style which is VERY important to us.
6) Especially the Opaekaa bridge is attractive and interesting because of its look and its historic past.

Please strengthen these 3 bridges and keep them one lane.

Sincerely,
Margery Freeman

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

February 1, 2012

HRD11/6055

Cathleen Dagher, Senior Archaeologist
Scientific Consultant Services, Inc.
711 Kapi'olani Boulevard, Suite 975
Honolulu, Hawai'i 96813

Re: Pre-Cultural Impact Assessment Consultation
Bridge Replacements
Island of Kaua'i

Aloha e Cathleen Dagher,

The Office of Hawaiian Affairs (OHA) is in receipt of your December 12, 2011 and January 3, 2012 letters requesting comments ahead of a cultural impact assessment (CIA) which will be prepared to support the replacement of three existing bridges (the project) on the Island of Kaua'i: Pu'u 'Ōpae Bridge, 'Ōpaeka'a Bridge and the Kapahi Bridge (bridges).

The statement in your letter *that archaeological reports of studies conducted in the areas of these bridges can be found on file at the State Historic Preservation Division (SHPD) Office* seems to imply that it is our responsibility to go to the SHPD office to review these reports to determine whether there are historic properties of significance to the Hawaiian people identified within the project. If this is indeed what you are suggesting, OHA finds this to be unacceptable. In traditional Hawaiian thinking, archaeological resources are cultural resources and thus, we believe it is your responsibility to provide a summary of identified cultural sites within or in the vicinity of the project area to consulting parties.

The reference in your letter to applicability of the requirements of the National Environmental Policy Act (NEPA) indicates that there is a federal nexus to this project and we request specific clarification what this federal nexus is. If the requirements of the NEPA are applicable to this project, then we would expect that the requirements of the National Historic Preservation Act (NHPA) are also applicable. Section 106 of the NHPA requires that the 'lead federal agency" initiate consultation with interested parties, including Native Hawaiian Organizations and that a "good faith effort" to identify historic properties within the project area be completed.[1] Our ability to assess whether such a"good faith effort" has indeed been completed is dependant on the information within the "archaeological reports" on file with the SHPD being summarized and provided to OHA and other consulting parties.

[1] See NHPA implementing regulations 36 CFR §800.2-4.

If U.S. Department of Transportation involvement in this project provides the federal nexus and 'trigger" for applicable federal statutes and regulations, then the requirements of the U.S. Department of Transportation Act, including a Section 4(f) evaluation will also be applicable. We note that your letter confirms that the Pu'u 'Ōpae Bridge and 'Ōpaeka'a Bridge are both listed on the National Register of Historic Places (NRHP). While OHA does not assign significance to these NHRP listed historic properties, we do encourage you to initiate consultation with organizations that do.

Thank you for the opportunity to provide comments at this early stage. We look forward to receiving our requested clarifications. Should you have any questions or concerns, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Richard Pezzulo
Interim Chief Executive Officer

RP:kl

C: OHA, Kaua'i Community Outreach Coordinator

APPENDIX F: NATIONAL AND STATE REGISTER OF HISTORIC PLACES

National and State Register of Historic Places

SITE NUMBER	SITE NAME	TAX MAP KEY	HAWAI'I REGISTER	NATIONAL REGISTER
30 08 9397	Pu'u'opae Bridge	4-4-002	9/18/2004	5/25/2005
30 09 24	Burial Caves	1-9-01:20	6/3/1981	
30 09 25	Taro Terraces	1-5-01:02	6/3/1981	
30 09 26	Kikiaola (Kiki-a-'ola) (Menehune Ditch)	1-5-01:02 1-6-01:28,45	9/14/1984	11/16/1984
30 09 40	Lewaula Heiau	1-5-01:01	6/3/1981	
30 09 49	Hanapepe Salt Pans	1-8-08:43	9/30/1988	
30 09 50	Hanapepe Complex 50	1-8-08:01,84	9/30/1988	
30 09 3037	Burial Caves	1-9-01:20	6/3/1981	
30 09 3169	Wahiawa Petroglyphs	2-2-01:07	9/30/1988	
30 09 9313	Charles Gay House	1-6-01:29	9/14/1984	11/1/1984
30 09 9389	HANAPEPE TOWN LOTS			
30 09 9389	Hanapepe Lot No. 11B	1-9-05:53	8/31/1991	
30 09 9389	Obatake's, Lot No.21A	1-9-05:41	8/31/1991	
30 09 9389	Hanapepe Lot No.18	1-9-04:08	8/31/1991	10/13/1993
30 09 9389	Hanapepe Lot No.49	1-9-11:08	8/31/1991	
30 10 3071	Lawa'i Lava Tubes 3071	2-6-03:03	9/30/1988	
30 10 3072	Lawa'i Lava Tubes 3072	2-6-03:03	9/30/1988	
30 10 3075	Koloa Lava Tubes 3075	2-6-04:38	9/30/1988	
30 10 9302	Old Sugar Mill of Koloa	2-8-06:01		12/29/62 1966 NHL
30 10 9391	Kalaheo School Campus	2-3-02:05	8/31/1991	
30 11 501	Menehune Fishpond	3-2-01:01		3/14/1973
30 11 9301	Grove Farm	3-6-01:02	8/9/1971	6/25/1974
30 11 9301	Boundary Increase	3-6-01:10	7/24/1978	12/8/1978
30 11 9301	Kaipu Camp	3-6-01:17	7/24/1978	12/8/1978
30 11 9339	Kilohana (Gaylord P. Wilcox House)	3-4-05:01 (portion)	9/1/1993	
30 11 9342	Lihu'e Post Office	3-6-05:10		11/28/1989
30 11 9344	Kauai Museum	3-6-05:05	2/17/1979	5/31/1979
30 11 9351	Lihu'e Civic Center Historic District	3-6-05: 01,02,03	9/21/1981	12/17/1981
30 11 9381	Grove Farm Company Locomotives	3-3-02:15	6/2/1979	9/19/1979

APPENDIX G: PU`U `ŌPAE BRIDGE NATIONAL REGISTER OF HISTORIC PLACES NOMINATION FORM

NPS FORM 10-900
(REV. AUG. 2002)

OMB NO. 1024-0018
(EXPIRES JAN. 2005)

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 Pu'u'ōpae Bridge

other names/site number Kalama Stream Bridge, Kapaa Homesteads Bridge #2

2. Location

street & number Pu'u'ōpae Rd., between Kalama & Kīpapa Rds. ☐ not for publication

city or town Kapa'a ☐ vicinity

state Hawai'i code HI county Kaua'i code 007 zip code 96746

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, 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 of certifying official — Date 4/7/05

State or Federal Agency or Tribal government

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Signature of certifying official — Date

State or Federal Agency or Tribal government

4. National Park Service Certification

I hereby certify that this property is:
☑ entered in the National Register
☐ See continuation sheet.
☐ determined eligible for the National Register
☐ See continuation sheet.
☐ determined not eligible for the National Register
☐ removed from the National Register
☐ other (explain): _____

Signature of Keeper — Date of Action

Edson Beall 5/25/05

5. Classification

Ownership of Property
(Check as many boxes as apply)

- ☐ private
- ☒ public-local
- ☐ public-State
- ☐ public-Federal

Category of Property
(Check only one box)

- ☐ building(s)
- ☐ district
- ☐ site
- ☒ structure
- ☐ object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
		buildings
		sites
One bridge		structures
		objects
		Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register

0

6. Function or Use

Historic Functions
(Enter categories from instructions)

Transportation: road-related

Current Functions
(Enter categories from instructions)

Transportation: road-related

7. Description

Architectural Classification
(Enter categories from instructions)

No style

Materials
(Enter categories from instructions)

foundation Concrete-encased steel
walls
roof
other Masonry (abutments)

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

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.
- [ ] **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.)

- [ ] **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.

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

Areas of Significance
(Enter categories from instructions)

___ Social history
___ Exploration/settlement
___ Community planning and development
___ Transportation
___ Commerce

Period of Significance

___ 1915--1936

Significant Dates

___ N/A

Significant Person
(Complete if Criterion B is marked above)

___ N/A

Cultural Affiliation

___ Undefined

Architect/Builder

_ Moragne, Joseph H., County Engineer and
_ Road Supervisor

9. Major Bibliographical References

Bibliography (Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)
See Continuation Sheets, page 14.

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 Natl 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
- [ ] Other State agency
- [ ] Federal agency
- [X] Local government Kaua'i County
- [X] University *Garden Island* microfilm
- [ ] Other

Name of repository:
County Clerk's office; Kaua'i Community College

10. Geographical Data

Acreage of Property ___ Less than one acre _____

UTM References
(Place additional UTM references on a continuation sheet) North American Datum, 1983; USGS Kapaa Quadrangle, 1996

	Zone	Easting	Northing		Zone	Easting	Northing
1	/4/N/	/4/6/1/5/1/1/	/2/4/4/0/4/3/9/	3	/__/__/	/__/__/__/__/__/	/__/__/__/__/__/
2	/__/__/	/__/__/__/__/__/	/__/__/__/__/__/	4	/__/__/	/__/__/__/__/__/	/__/__/__/__/__/

☐ See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title _____ Patricia L Griffin _____

organization _____ date _____August 9, 2004 _____

street & number _____ 6524 Kalama Rd. _____ telephone _____ 808.639.1019 _____

city or town _____ Kapa'a _____ state __ HI __ zip code _____ 96746 _____

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 _____ County of Kaua'i, ATTN: The Honorable Bryan Baptiste, Mayor _____

street & number _____ 4444 Rice St., Suite 235 _____ telephone _____ 808.241.6300 _____

city or town _____ Līhu'e_____ state __ HI __ zip code _____ 96766 _____

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section _ 7 _ Page _ 1 of 10 _ Name of property _ Pu'u'ōpae Bridge _ County and State _ Kaua'i, Hawai'i

Narrative Description

(Describe the historic and current condition of the property on one or more continuation sheets.)

Pu'u'ōpae Bridge is a one lane, 48-foot long, single span structure that carries Pu'u'ōpae Road over Kalama Stream (a small stream approximately three feet deep and 12 feet wide) in the Kapa'a Homesteads 2nd Series. The height of the soffit of the bridge over the stream is about 11 feet. Built in 1915, it is the earliest bridge included in the *Historic Bridge Inventory: Island of Kauai* to be constructed beyond the island's circumferential Belt Road, in Kaua'i's homesteading lands.

Location. The bridge is in its original location. The placement of Pu'u'ōpae Road is shown on the Hawai'i Territory Survey map of "Kapaa Homesteads 2nd Series: Kapaa–Waipouli–Olohena, Island of Kauai," created in 1912 when the tract was subdivided in preparation for its settlement the following year. (See detail on Continuation Sheet, Section 10, Page 3.)

Design. Pu'u'ōpae Bridge was originally trussed, as evidenced by a small sketch included in correspondence regarding the construction of the bridge in 1915. The truss was removed in 1958, but the bridge's original, concrete-encased steel floor remains in place. According to the Spencer Mason *Historic Bridge Inventory: Island of Kauai,* "only this bridge and the 'Ele'ele Pedestrian Overpass [on the West side of Kaua'i] are classified as having steel girder floor systems on the State Bridge Inventory,"[1] and the Pu'u'ōpae Bridge predates 'Ele'ele by almost a quarter of a century. Pu'u'ōpae Bridge has been neither widened nor extended.

Setting. The setting has not changed substantially. Three houses have been built in the vicinity, on Kalama Road southwest of the bridge, but they have not altered the rural character of the area, which is defined by pastoral and agricultural lands sweeping from the east side of the bridge to the foot of Nounou (Sleeping Giant) Mountain in the distance.

Materials. The concrete deck, steel girder floor system and sections of the abutments are original materials. The endposts may be recycled parts of the nineteenth century Wailua River Bridge that was dismantled in 1919 and used for roads and bridges in the area. (See "Age," below.)

An archæological survey of the bridge in 1996 provided the following description:

> Remnants of a wooden form, probably used in the building of the deck were visible. The decks and steel girders were both encased in concrete and on the underside of the bridge, the concrete deck was imprinted with the grain of wood, left by the wooden form. A few of the original wood

Narrative Description, Continued

> pieces used in the form were found on both ends of the bridge adjacent to the abutments still attached to the underside of the deck. The steel soffits, railing supports and railing all seem to be part of one pre-engineered unit. At either end of the bridge on both sides of the abutments and adjacent to the railing are large pieces of steel which have been cut…[2]

Workmanship. The bridge is not in its original condition. Repair data located in the Kaua'i County Engineering office indicates that in 1958, two 48 foot I-beams were installed beneath the concrete and steel girder floor system for structural support. In order to imbed the I-beams, the headwalls above the stone abutments were broken and then repaired with concrete. While the plans indicate that the truss was still in place at the start of the project, it was probably removed after the I-beam support system was in place. (See detail on Continuation Sheet, Section 7, Page 5.) The railings were replaced in 2000, and galvanized W guardrails were substituted for the previous wood guardrails.

Feeling. There is a historic feeling to this bridge because of its narrow width, as well as its location in the back-country, still-agricultural/pastoral lands of Kapaa Homesteads 2nd Series.

Age. Written correspondence between the Territory of Hawai'i's Superintendent of Public Works, Charles R. Forbes, and Kauai County's Road Supervisor and Engineer, Joseph H. Moragne, establishes the bridge's period of construction as being between March and July 1915. An agreement for the Territory to pay the county $800 to construct the bridge and the county to build it was approved by the Kauai Board of Supervisors on April 7, 1915.[3] At the June 8, 1915 meeting of the Board of Supervisors, Moragne reported that construction was in progress; it had been completed by the time of the August report.[4] (See Continuation Sheet, Section 7, pages 6-10.)

2. The end posts have the same dimensions and riveted construction as the top chords and western end posts of the 'Ōpaeka'a Road Bridge.[5] It is known that when the 1890, Scottish-made Wailua Bridge was replaced in 1919, parts of the old bridge were "disposed along the side of the road awaiting removal to some needy spot where they may serve for small bridge trusses, coverings for culverts, etc. Some of them will probably be used on the homestead roads."[6] 'Ōpaeka'a Road Bridge, one mile from the Pu'u'ōpae Bridge, was constructed from parts of the dismantled bridge. The County Road Supervisor's activities report of May 1920, eight months

Narrative Description, Continued

after Wailua Bridge was dismantled, notes that small bridge repairs had been completed in the area: Since the end posts on Pu'u'ōpae Bridge are so similar to the 'Ōpaeka'a Road Bridge top chords and western end posts, they may also have come from the old Wailua Bridge.[7] (Usable parts from the old bridge were still available as late as 1925, when chords from it were put into use as stringers in construction of the Kalama Bridge on Kamalu Rd., near the border between Wailua and Kapa'a Homesteads.)

Artistic Value. The *Historic Bridge Inventory: Island of Kauai* characterizes the bridge as "functional," with little in the way of artistic details. However, it notes, the pattern formed by the rivets is unusual: "It is one of only three bridges on Kaua'i where riveted metal construction is visible."[8] The other two are 'Ōpaeka'a Road Bridge (National Register of Historic Places Site No. 30-08-9377) and the Hanalei River Bridge (National Register of Historic Places Site No. 30-03-736).

Narrative Description, Continued

NOTES

1. Spencer Mason Architects, *Historic Bridge Inventory: Island of Kauai,* (Honolulu: Prepared for the State of Hawaii Department of Transportation Highways Division in cooperation with the U. S. Department of Transportation Federal Highway Administration, 1989), p. 217.

2. Tina Bushnell and Hallett H. Hammatt, "Archaeological Investigation of Pu'uopae (Kalama) Bridge in Wailua Homesteads, South Olohena, Ahupua'a Puna District, Kauai, Hawaii," (Study prepared by Cultural Surveys Hawaii, Inc. for Belt Collins and Associates, December 1996), p. 5.

3. "Blueprints showing data of the proposed Kapaa Homesteads Bridge #2 (Puuopae Rd) + com. Regarding agreement same to be constructed by Kauai County," records of the Kauai County Board of Supervisors, P.1150, April 7, 1915.

4. Some of the road names in the homesteads—including Pu'u'ōpae, Pu'upilo and Kalama—have, confusingly, changed since they were constructed. Pu'u'ōpae Rd. was originally U-shaped. It led south from Olohena then, after Kalama stream, climbed uphill on what is now called Kalama Rd. The section to the southwest that is now the continuation of Pu'u'ōpae was originally named Pu'upilo. In the two Board of Supervisors reports, Moragne mis-located the bridge on Pu'upilo, which intersected with the Pu'u'ōpae U about 40 yards from the bridge.

5. Spencer Mason Architects, p. 216.

6. "Wailua Bridge Finished," *The Garden Island*, September 23, 1919, p 1.

7. "Board of Supervisors Meet," *The Garden Island*, July 8, 1920, p. 4.

8. Spencer Mason Architects, p. 217.

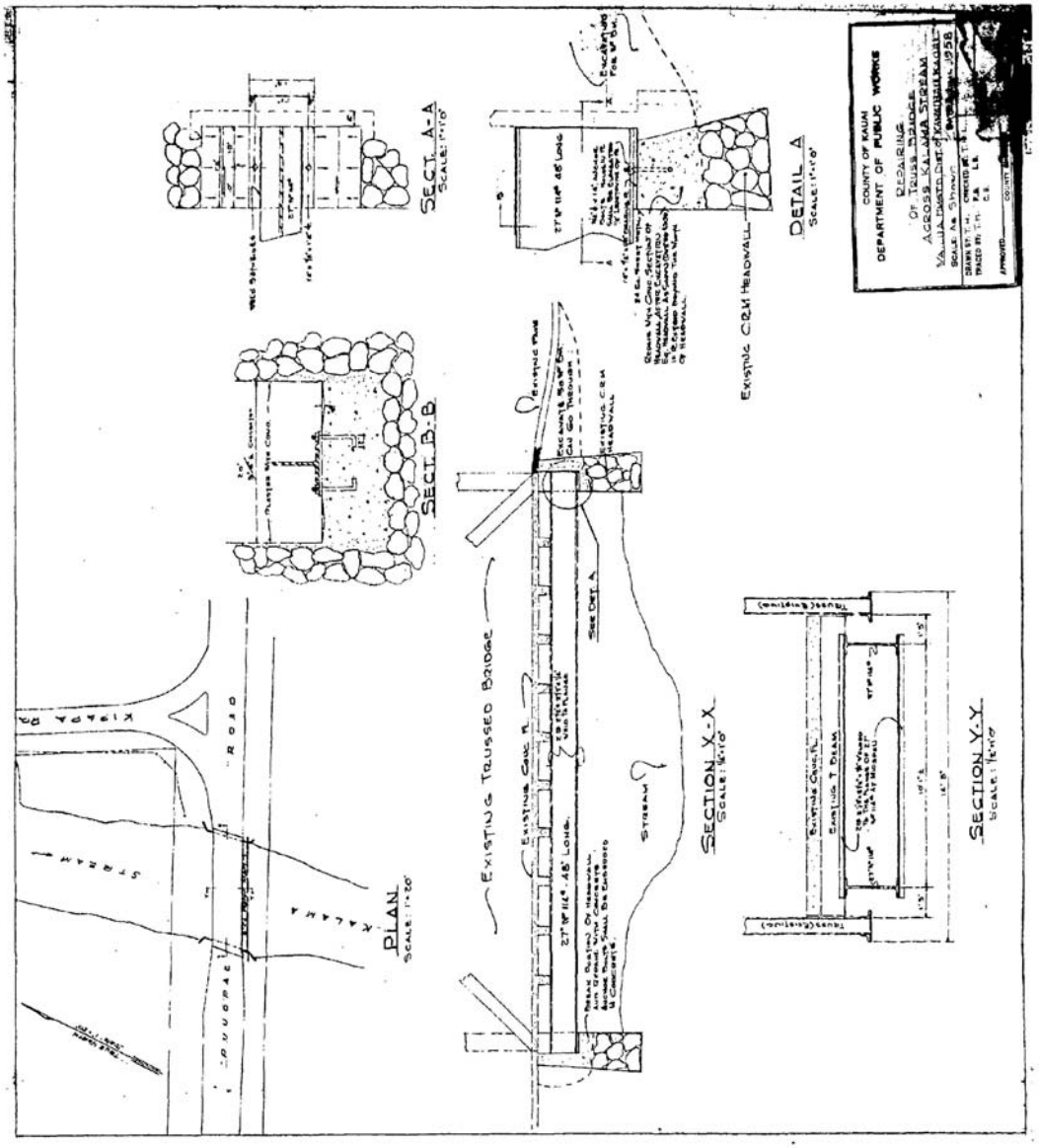
United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section _ 7 _ Page _ 5 of 10 _ Name of property _ Pu'u'ōpae Bridge _ County and State _ Kaua'i, Hawai'i

Narrative Description, Continued

Kaua'i County Department of Public Works. "Repairing of Truss Bridge Across Kalama Stream, Wailua Hmstd, Dist. of Kawaihau, Kauai." 1958.

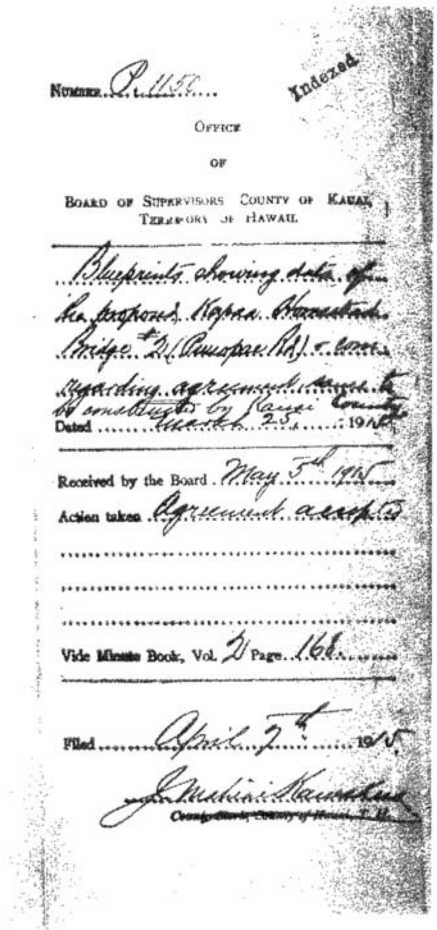


United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Narrative Description, Continued

Kaua'i County Board of Supervisors records, P1150



Number P. 1150

Indexed

OFFICE
OF
BOARD OF SUPERVISORS COUNTY OF KAUAI,
TERRITORY OF HAWAII.

Blueprints showing data of the proposed Kapaa Homestead Bridge #2 (Puuopae Rd) & corr. regarding agreement same to be constructed by Kauai County

Dated March 25 1915

Received by the Board May 5th 1915

Action taken Agreement accepted

Vide Minute Book, Vol. 2 Page 168

Filed April 7th 1915

J. Mahiai Kaneakua
County Clerk, County of Kauai, T. H.

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Narrative Description, Continued

Kaua'i County Board of Supervisors records, P1150

CHAS. R. FORBES
~~J. W. CALDWELL~~
ASSOCIATE MEMBER A.S.C.E.
SUPERINTENDENT

Transcribed

TERRITORY OF HAWAII
DEPARTMENT OF PUBLIC WORKS
HONOLULU, T. H.

March 25, 1915

Mr. J. H. Moragne,
Lihue, Kauai.

Dear Sir:

KAPAA HOMESTEAD BRIDGE, NO. 2.

Replying to your letter of March 19th, I beg to submit herewith two blueprints of Plan No. 2219, showing some data regarding this proposed bridge. I also inclose an agreement showing that the Land Commissioner has set aside the sum of $800.00; the work to be done under my direction.

I therefore turn over to you the expenditure of this fund, such expenditure to be made in connection with the county work on this bridge. This amount will be turned over to the County on the final completion and acceptance of the work.

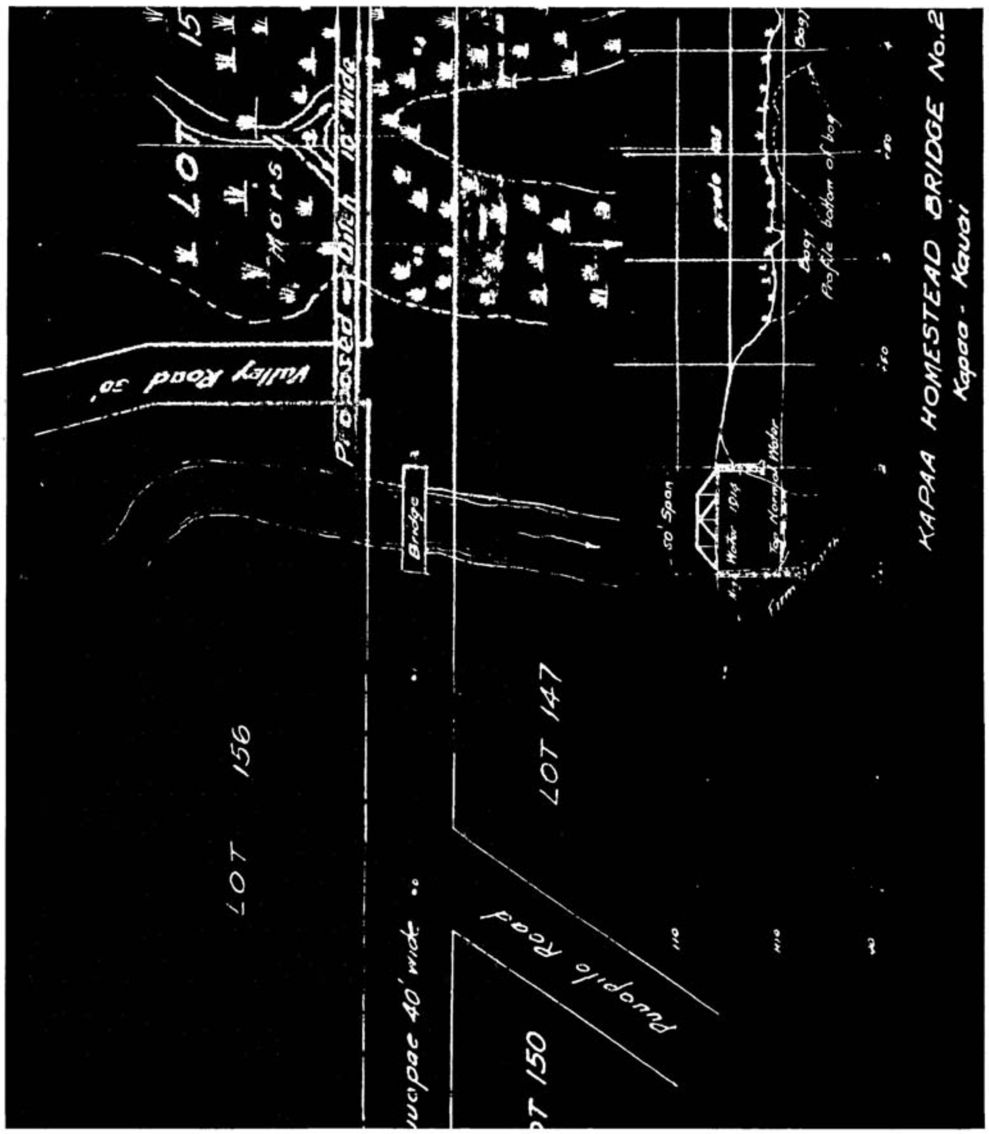
Very truly yours,
Charles R. Forbes [signature]
Superintendent of Public Works

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Narrative Description, Continued

Kaua'i County Board of Supervisors records, P1150



Narrative Description, Continued

Kaua'i County Board of Supervisors records, P1150

Transcribed

A G R E E M E N T

By the authority vested in me by Section 376, Revised Laws, 1915, I hereby agree to set aside the sum of Eight Hundred Dollars ($800.00) to be paid to the County of Kauai for the construction of a Bridge over the Puuopae Road and just above the junction of this road with Valley Road, providing this work is performed under the direction of the Superintendent of Public Works and is finally accepted by him.

Joshua D. Tucker [signature]
Commissioner of Public Lands.

.....March 25.....1915.

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section _ 7 _ Page _ 10 of 10 _ Name of property _ Pu'u'ōpae Bridge _ County and State_ Kaua'i, Hawai'i

Narrative Description, Concluded

Kaua'i County Board of Supervisors records, P1150

Transcribed

OFFICE OF
COUNTY CLERK, COUNTY OF KAUAI.
TERRITORY OF HAWAII.

Lihue, April 10, 1915

Charles R. Forbes, Esq.,
Superintendent, Public Works,
Honolulu, Hawaii.

Dear Sir :-

I beg to notify you that your offer under date of March 25th.last addressed to Mr. J.H. Morange [sic] our County Road Supervisor, of Eight Hundred Dollars ($800.00) for the construction by the County of Kauai of a bridge, known as the Kapaa Homestead Bridge No. 2, the work to be performed under your direction, was duly received by the Honorable Board of Supervisors of the County of Kauai at its last regular monthly business meeting held here on the 7th inst., and that the same has been accepted by the said Board.

Very respectfully yours,

[unsigned]

County Clerk, County of Kauai.
By

Clerk.

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section _ 8 _ Page _ 1 of 6 _ Name of property _ Pu'u'ōpae Bridge _ County and State _ Kaua'i, Hawai'i

Narrative Statement of Significance

(Explain the significance of the property on one or more continuation sheets.)

The construction of Pu'u'ōpae Bridge in 1915, two years after the Kapa'a Homesteads 2nd Series was opened, provided an important transportation conduit that contributed to the successful development of the homesteading lands on the east side of Kauai.

When Hawai'i became a territory of the United States in 1900, land ownership beyond that of the government's significant holdings was highly concentrated in the hands of a few large business interests and the individuals who controlled them. To encourage further settlement of family farmers in the islands, the government opened tracts of territorial land in Kapa'a, Kalāheo and elsewhere in Hawai'i.

The sale of public land as a strategy to increase Hawai'i's population of small, independent farmers was controversial. Most of the early territorial governors supported big sugar interests and showed "little faith in homesteading,"[9] Some governors were openly hostile to the movement: Lucius Pinkham (governor from November 29, 1913 to June 22, 1918) was reported as stating that he was "against the government lands being taken up by homesteaders. Homesteading is not a success; will never be a success and you know it damned well….All the cane lands of the government should remain in the ownership of the government and be leased to the sugar plantation."[10] Critics charged that the government had diminished the chances for homesteading success after it traded its fertile lands to plantations in exchange for unproductive tracts not viable for farming and transferred vital water rights to them as well.[11]

The dominant planter and business interests of the time were less than supportive of the homesteading philosophy themselves. Skeptics of their motives toward homesteaders accused the special interests of a land-grabbing scheme by which they advanced money to "marginal homesteaders" with the goal of becoming "the ultimate owners of every homestead the owner of which is so unfortunate as to be so easily gulled into the trap."[12] The possibility of gaining title to homesteaders' lands aside, sugar plantations were in a position to profit from cane-growing homesteaders through their monopoly of the milling and marketing processes, occasionally setting fees "so onesided and inequitable" that homesteaders across the territory protested.[13]

Despite the formidable opposition, some of Kaua'i's homesteading tracts began to show promise. In 1917 the chairman of the Chamber of Commerce Homestead Committee, E. W. Broadbent, reported that "the wisdom of the Homestead policy had been abundantly justified. On the Olohena-Waipouli tract there are ninety Homesteaders with 3140 acres who harvested this season 31,500 tons of cane, worth $197,000, besides a considerable value in pines." [14]

The Olohena-Waipouli tract that Broadbent referenced was also known as Kapa'a Homesteads 2nd Series. It included 81 lots ranging in size from 17.27 acres to 41.32 acres. The lots were sold by

Narrative Statement of Significance, Continued

lottery at the court house in Līhu'e on Saturday, June 28, 1913. Lottery winners were allowed up to three adjoining parcels, with a maximum of 80 acres. In an attempt to prevent abuse of the program by unscrupulous land speculators, winners were required to live on their property for given percentages of the first 10 years and to actively cultivate their lands. To sell or lease their property was restricted.

Although roads were indicated on the 1912 territorial survey map of the tract, they did not, in fact, exist when the Kapa'a lottery winners sought to move onto and begin farming their land. But the homesteaders were not a group to wait passively in the face of government inactivity. In August 1913, barely a month after the lottery, several of the new homesteaders petitioned the county for roads to "be constructed as soon as practicable for, unless the said roads, particularly 'Olohena', 'Puuopae', and 'Puupilo', are built, leveled, or ruts filled, it will be as it is now hard work for the homesteaders to bring their lumber for building purposes and their effects to their lands."[15] The Board of Supervisors referred the matter to County Engineer and Road Supervisor Joseph H. Moragne for action, but a letter to *The Garden Island* six months later indicated that no discernable progress had been made: "As for roads, there are none, there are cattle trails all over this country and these were followed by oxcarts in hauling firewood from the mountains and there is nothing else in the way of roads there today." [16]

Water, too, was unavailable in Kapa'a Homesteads. In December 1913 the homesteaders petitioned the Supervisors "for water pipes to be laid for their use."[17] The same *Garden Island* letter that complained of the lack of roads described the situation:

> It is true that some of the lots have streams passing through them, but the water all belongs to the Makee Sugar Co., the Governor having sold the water rights to the Company before the tract was opened, the settlers having no right to use the water in any stream, even for household purposes, and they have been so notified by the company, unless they pay a monthly rate. [18]

Makee was in a potentially advantageous position with regard to the Kapa'a homesteaders for other reasons as well. Although many envisioned pineapple as the primary crop for the area, others championed sugar cane (ultimately both would be grown). Both Makee and Lihue Plantation competed to build a railroad into the homesteads—a struggle that Makee eventually won—to collect the farmers' cane and mill it at the company's factory.[19]

The Kapa'a homesteaders continued their efforts throughout the 1910s to advance their positions. One or more of them appeared several times before the Board of Supervisors to urge the county to build or repair roads in the area, especially Olohena Rd., which provided the lifeline between the homesteads and the Belt Road. Several joined to form an association in 1918 to

Narrative Statement of Significance, Continued

"further the interests of the Kapaa homesteaders," and the group successfully secured water for irrigation after sending a delegation to meet with territorial officials in Honolulu. Some homesteaders became active in the Kauai Chamber of Commerce as another forum in which they could seek to redress grievances.

Their achievement in convincing the local and territorial governments to build and maintain roads and bridges in the area was significant. The experience with Kapa'a undoubtedly helped convince officials that roads should be put in place before new homesteading lands in the adjoining Wailua 1st series were lotteried "so that homesteaders may drive up to their prospective front doors just as soon as they have selected the lots."[20]

Kapa'a Homesteads roads and bridges increased in importance after the Wailua Homesteads were opened, because Wailua roads did not flow towards the ocean. Instead, they were connected to the Kapa'a Homesteads roads—Pu'upilo, Pu'u'ōpae and Kamalu (which ran parallel to Pu'u'ōpae along the foot of Nounou Mountain). Olohena funneled both sets of homesteaders from their *mauka* lands to the Belt Road. Wailua Homesteads was not directly linked to the Belt Road until 1936, when Depression-era federal funding constructed the 'Ōpaeka'a Stream Bridge and extended Kuamo'o Road to the ocean. As a result, this network—including Pu'u'ōpae Bridge—remained important throughout the homesteading era.[21]

By the time the 31 lots in adjacent Wailua Homesteads 1st Series were lotteried in December 1919, at least some of the Kapa'a Homesteaders were farming successfully: *The Garden Island* reported in January of that year that Kapa'a homesteader E. M. Cheatham was employing 40 men to harvest his cane and that of his neighbors. But those were the glory days. During the next decade the dropping prices paid for sugar made small-scale cane growing increasingly unprofitable. By 1945 the Land Laws Revision Commission review of homesteading in Hawai'i reported that lot owners had "become landlords to corporate agricultural operators."[22] Its final report to the governor on December 31, 1946 declared that

> in Honolaa, the majority of the homesteads patented suitable for cane are cultivated to cane by the adjoining plantation, either under lease or planting contract….A similar situation exists at Kapaa, Kauai, where the majority of the homesteads patented suitable for pineapples are cultivated to pineapples by the Hawaiian Fruit Packers, Ltd., or Hawaiian Canneries Co.[23]

Many of the Kapa'a homesteaders turned to occupations other than farming. To name but three examples, Elmer Cheatham moved to Makaweli to run a store; his brother-in-law Rolland Israel (who had been optimistic enough about the future of homesteading that he added to his Kapa'a holdings by buying a lot in the Wailua tract when it was opened in 1919) became Game Warden;

Narrative Statement of Significance, Continued

C. K. Amalu served as a judge. Gradually, much of the Wailua and Kapa'a Homesteads was rezoned for residential use. Today, the "bowl" of land adjacent to Pu'u'ōpae Bridge, bordered by Pu'u'ōpae, 'Ōpaeka'a, Kamalu and Olohena roads contains some of the only remaining area of significant agricultural acreage (nearly 400 acres) in the region.

Persons. In the early territorial period, homesteading lands were released by the government in an attempt to increase settlement opportunities for small, independent farmers, especially Hawaiians "who kept up constant pressure through their political leaders to recapture Hawaii's lands for themselves," and recruits whom "Americanizers," hoped would increase the percentage of Anglo Saxons in Hawai'i and strengthen the psychological bonds with the United States.[24] One of the requirements of the lottery winners in Kapa'a Homesteads 2nd Series was that they be American citizens or declare their intention of becoming one.

An example of the Americanizers' intent is evidenced by the reception E. M. Cheatham received when he moved to the Homesteads. Cheatham, who had been employed as manager of B. F. Ehlers & Company (predecessor to Liberty House department store, now Macy's) before acquiring his homesteading lands in Kapa'a, was described by the *Garden Island* as "a real good citizen of the capital city…a live-wire of the Honolulu Ad. Club and an important figure in other organizations at Honolulu."[25] Three months later, under the headline "Homesteaders of the Right Kind," he was described as a man with "business ability, capital and those things that make for good citizenship."[26]

The history of the Kapa'a Homesteads, however, is not the product of a single Great Man who shaped the area but the collective story of a group of settlers who struggled to make a life as independent farmers for themselves and their families. The names of the 1913 Kapa'a Homesteads lottery winners hints at a predominance of the Hawaiian and Caucasian settlers who bought into the homesteading idea, but people from other backgrounds were represented as well: Lino, Contrades, Kauai, Hanohano, Kaui, Kainoa, Kelekoma, Booge, French, Miyashi, Souza, Reis, Wilson, Tracy, Johonnot, Silva, Konda, Nasahiga, Hepa, Reichelt, Soto, Cummings, Louis, Achuck, Cheatham, Livesey, Israel, Cook, Jensen, Ferreira, Victorino, Barreta, Rapoza, Aroong, Ohai, Waiwaiole, Mailehuna, Rodrigues, Amalu, Kaiu, Ventura, Kikaahu.[27]

The actual designer of the bridge has not been established, although Joseph Moragne, who was responsible for much of the early territorial roadwork and bridge design, is definitely associated with its erection through his position as county road supervisor and engineer as well as his correspondence with Charles Forbes about the construction of the bridge.

Narrative Statement of Significance, Continued

Summary. The Pu'u'ōpae Bridge is unusual because of its historical links to the development of the Kapa'a Homesteads, and the direct involvement of that community in pressuring the government to provide adequate stream crossings and roads in the area; its concrete-encased steel girder floor system; and its probable use of recycled parts from the 19th century Wailua Bridge. It remains a valuable historical resource for interpreting the too-little understood, non-plantation-related development of Territorial Hawai'i.

NOTES

9. Robert H. Horwitz et al., *Public Land Policy in Hawaii: An Historical Analysis* (Honolulu: Legislative Reference Bureau, University of Hawaii, 1969), p. 26.

10. "Mr. Pinkham and Homesteading," *The Garden Island*, April 4, 1917, p. 1.

11. "The People Heard at Meeting of the Chamber of Commerce," *The Garden Island*, October 9, 1917, p 1.

12. "Land Law Question," *The Garden Island*, February 25, 1913, p 1.

13. "Some Difference of Opinion Between Homesteaders and Planters," *The Garden Island*, August 13, 1918, p 1. Also, "Homesteaders to Get Consessions," *The Garden Island*, August 27, 1918.

14. "The People Heard at Meeting of the Chamber of Commerce," *The Garden Island*, October 9, 1917, p 1.

15. "Petition from Kapaa for construction of homestead roads in Kapaa mauka," records of the Kauai County Board of Supervisors, P895, August 6, 1913.

16. "Public Lands Question," *The Garden Island*, January 20, 1914, p 4.

17. "Petition from Kapaa homesteaders for pipes to be laid at the homestead for their use," records of the Kauai County Board of Supervisors, P940 and 940a, December 10, 1913.

18. "Public Lands Question," *The Garden Island*, January 20, 1914, p 4.

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section _ 8 _ Page _ 6 of 6 _ Name of property _ Pu'u'ōpae Bridge _ County and State _ Kaua'i, Hawai'i

Narrative Statement of Significance, Concluded

19. Several articles and editorials between 1914 and 1916 in *The Garden Island* address the two plantations' competition to build a railroad in the homesteads. They include: "Right of Way at Waipouli Tract, April 14, 1914, p. 1; "Makee Sugar Co. Will Build Road to Waipouli," November 17, 1914, p. 1; "Waipouli R. R. Is Now Assured," February 16, 1915, p. 1; "Mr. Forbes Over Proposed Road," March 9, 1915, p. 1; "Kauai Homesteading Threatened," April 4, 1916, p. 8.

20. "The Wailua Homesteads," *The Garden Island*, September 23, 1919, p. 1.

21. Spencer Mason Architects, *Historic Bridge Inventory: Island of Kauai,* p. 128.

22. George W. Luter, *Report on Homesteading in Hawaii: 1839-1961,* (Honolulu, Department of Land and Natural Resources, 1961), p. 20.

23. Ibid, p. 21.

24. Lawrence H. Fuchs, *Hawaii Pono: A Social History* (New York: Harcourt Brace Jovanovich, 1961), p. 251ff.

25. "To Settle On Kauai," *The Garden Island*, January 13, 1914, p. 1.

26. "Homesteaders of the Right Kind," *The Garden Island*, March 31, 1914, p. 1.

27. The names of the lot owners are included on the map of the "Hawaii Territory Survey, Walter E. Wall Surveyor, Kapaa Homesteads 2nd Series, Kapaa–Waipouli–Olohena, Island of Kauai, HTS Plat 3016, Surveyed by S. W. Tay, March–June, 1912," which is located in the Kaua'i Historical Society archives.

United States Department of the Interior
National Park Service

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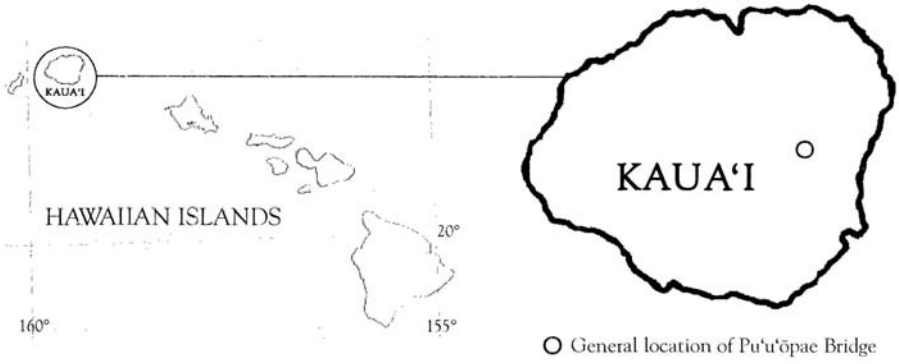
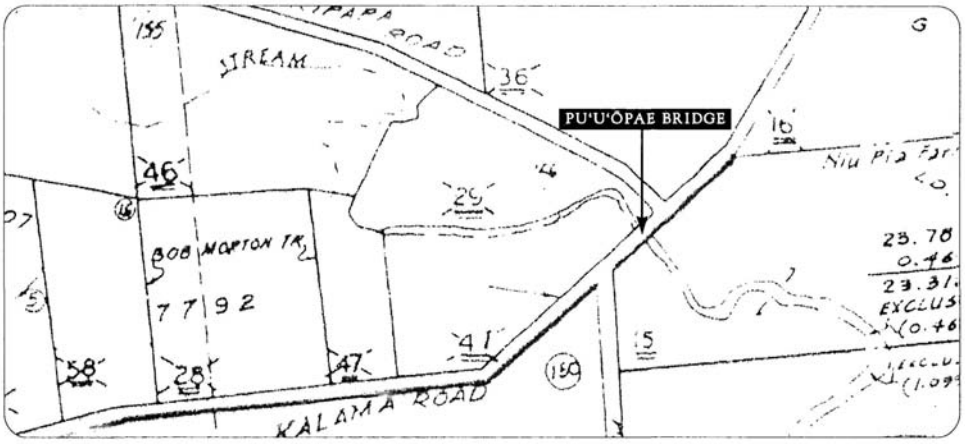
Geographical Data

Verbal Boundary Description. Pu'u'ōpae Bridge is located in the *ahupua'a* of South Olohena in the Kawaihau District on the East side of the island of Kaua'i, Tax Map Key 4-4-002. The nominated property boundary encompasses only the bridge, its abutments and the ground upon which they stand, approximately 49 feet in length from endpost to endpost and 25.5 feet in width.

Boundary Justification. The nominated property consists exclusively of the bridge.





Above: Tax Maps Branch, State of Hawaii, Tax Map, Fourth District, 4-4-02 detail, Scale: 1" - 200'

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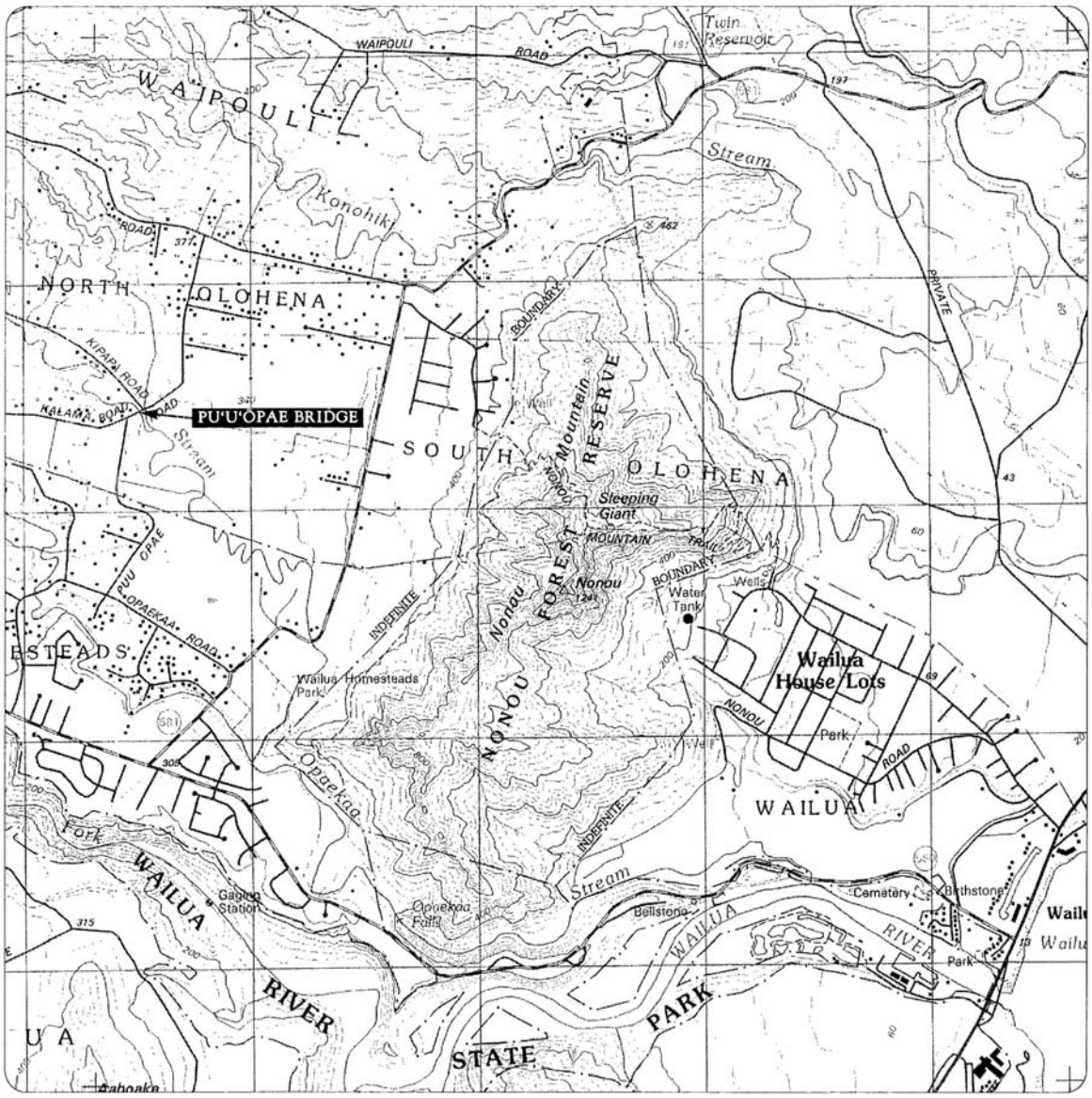
Geographical Data

Detail of USGS Map, Kapaa Quandrangle, Hawaii-Kauai Co., 7.5-Minute Series (full map is enclosed).



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Geographical Data

Map detail: Hawaii Territory Survey: Kapaa Homesteads 2nd Series. HTS Plat 3016. 1912

Pu'u'ōpae Bridge ◯ Olohena Rd. ——— Pu'u'ōpae Rd. ———
Kalama Stream ~~~ Kamalu Rd. ~~~ Pu'upilo Rd. ~~~

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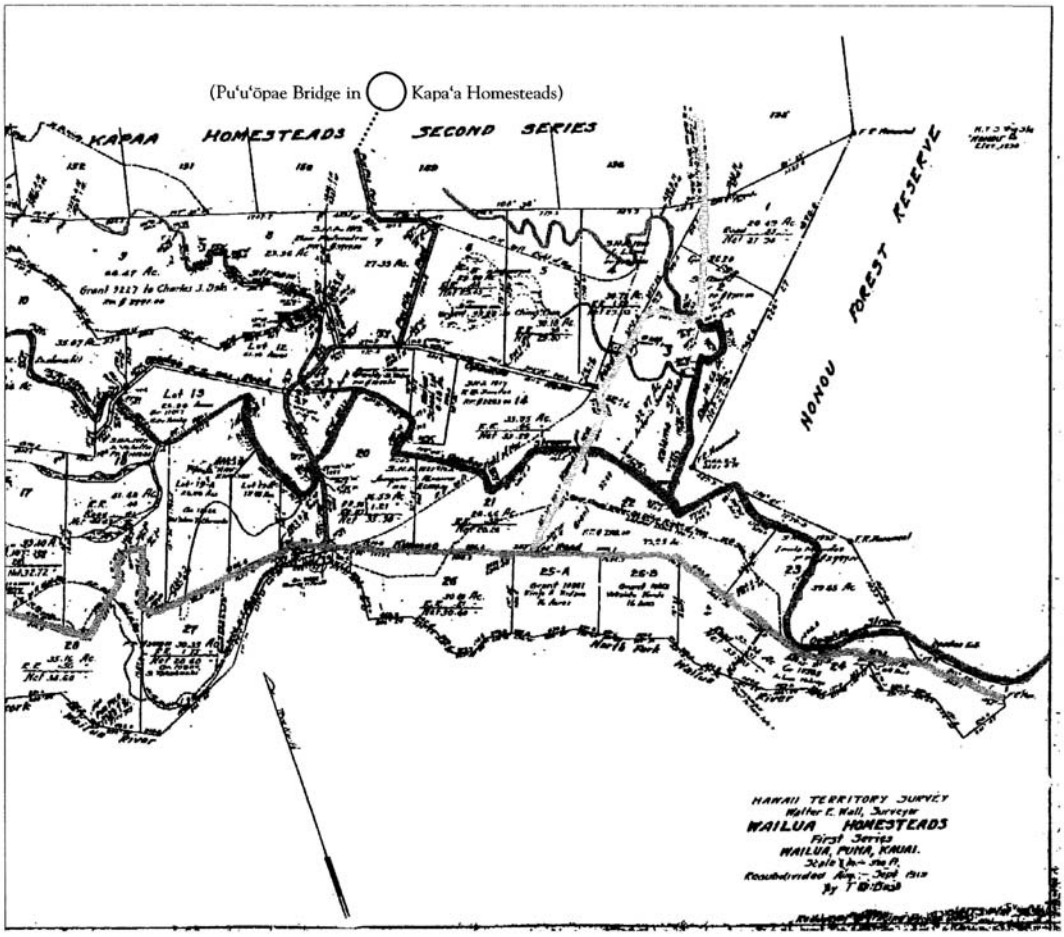
Geographical Data

Map detail: Hawaii Territory Survey: Wailua Homesteads First Series, HTS Plat 3033. 1919



Pu'u'ōpae Bridge ◯ Kuamo'o Rd. 'Ōpaeka'a Stream
Kalama Stream Kamalu Rd. Pu'upilo Rd.

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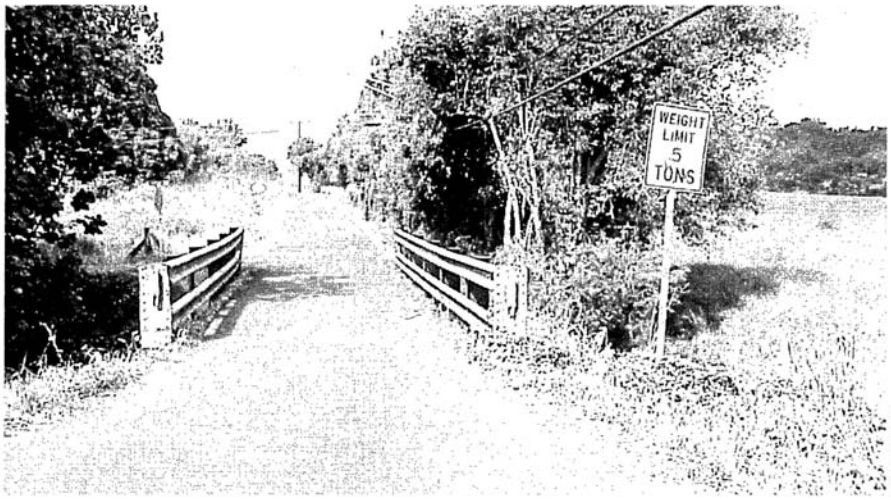
Additional Documentation Pg _ 1 of 3 _ Name of property Pu'u'ōpae Bridge _ County /State _ Kaua'i, Hawai'i

Photographs

Digital photos have been electronically transmitted to Hawai'i SHPD at its request.
All digital image data and negatives are located at the office of the nomination preparer.



Approach to Pu'u'ōpae Bridge from Southwest

View of the bridge from Northwest side

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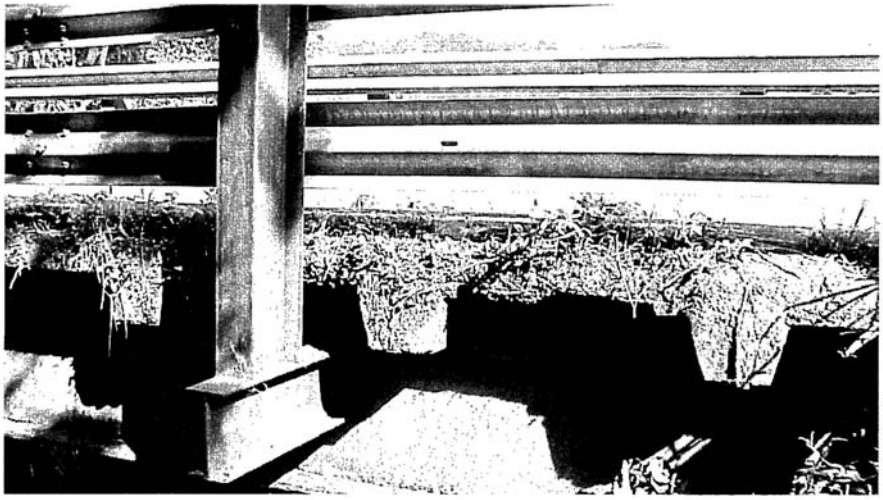
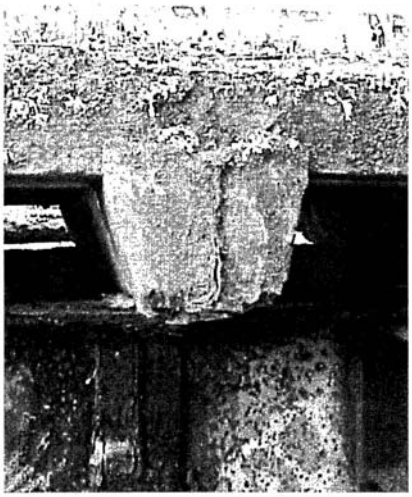
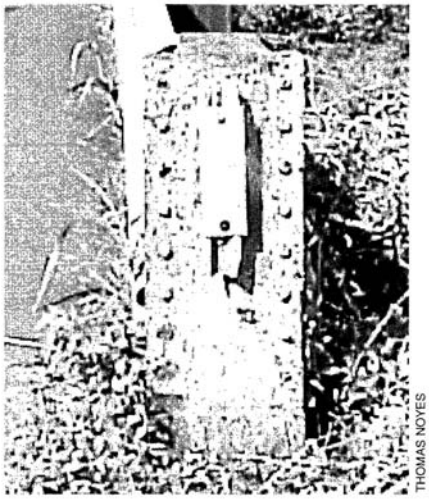
Photographs



View from side, showing girder floor system



Detail: Girder



Detail: Endpost

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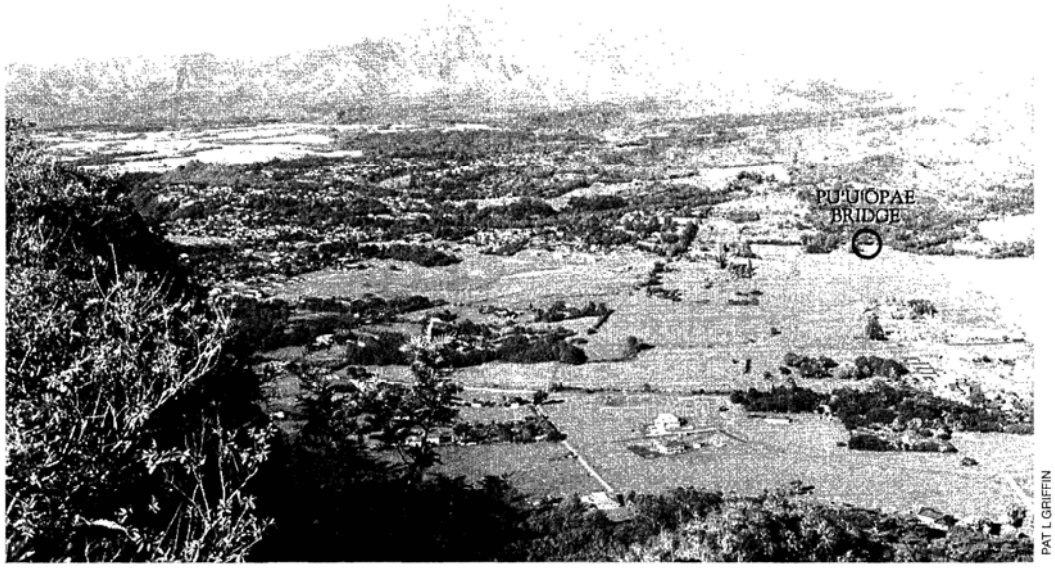
Photographs

View East, towards Nounou, from bridge



View West, of Kapa'a and Wailua Homesteads from Nounou Mountain (Mt. Wai'ale'ale in distance)

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