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COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
200 SOUTH HIGH STREET
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June 10, 2015

RECEIVED
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OFC. OF ENVIRONMENTAL QUALITY CONTROL

Ms. Jessica Wooley
Director
Office of Environmental Quality Control
Department of Health
State of Hawaii
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

SUBJECT: MODIFICATION TO THE IAO STREAM FLOOD CONTROL PROJECT
WAILUKU, MAUI, HAWAII
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Ms. Wooley:

The County of Maui, Department of Public Works (DPW) transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact for the subject project for publication in the next available edition of the Environmental Notice. Electronic and hard copies of these documents have been submitted under separate cover by the Honolulu District, U.S. Army Corps of Engineers, Civil and Public Works Branch on behalf of DPW.

Should you have any questions on this matter, please contact our Engineering Division at (808) 270-7745.

Sincerely,

for DAVID C. GOODE
Director of Public Works

DG/CY/KO (ED15-636)
S:\ENG\DESIGN\CIP\2006\06-55 IAO STREAM FLOOD CONTROL\B CORRESPONDENCE\LETTERS\2015-06-10 OEQC DRAFT EA.DOC

AGENCY ACTIONS
SECTION 343-5(B), HRS
PUBLICATION FORM (FEBRUARY 2013 REVISION)

Project Name:	Modification to the ʻĪao Stream Flood Control Project
Island:	Maui
District:	Wailuku
TMK:	(2)3-4-020:044, 045, 046; (2)3-4-030:002; (2)3-4-030:020; (2)3-4-030:888; (2)3-4-031:001, 008, 015, 016, 017, 023, 019; (2)3-4-032:001, 003, 005, 047, 048
Permits:	Clean Water Act (CWA), Section 404(b)(1) and Section 401 Water Quality Certification (WQC), Coastal Zone Management Federal Consistency review, Stream Channel Alteration Permit, and National Pollutant Discharge Elimination System (NPDES) Permit (to be submitted by the contractor prior to construction activities)
Proposing/Determination Agency:	County of Maui Department of Public Works Engineering Division 200 South High Street, 4th Floor Wailuku, HI 96797 Ms. Kristi Ono, Civil Engineer IV (808) 270-7745 Kristi.Ono@co.maui.hi.us
Accepting Authority: *(for EIS submittals only)*	Same as above
Consultant:	GSI Pacific, Inc. 181 South Kukui Street Honolulu, HI 96813 Sonia Shjegstad 808-833-2225 ext. 1006 sshjegstad@gsisg.com

Status (check one only):

✓DEA-AFNSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day comment period ensues upon publication in the periodic bulletin.
__FEA-FONSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the proposing agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov). NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may

	send both the summary and PDF to oeqchawaii@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The accepting authority simultaneously transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the proposing agency. No comment period ensues upon publication in the periodic bulletin.
__Section 11-200-27 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 not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page)**:**

The United States Army Corps of Engineers (USACE) is proposing to implement engineering designs to address existing flood hazards and provide the authorized level of reduced flood risk along ʻĪao Stream, Wailuku, Maui, Hawaiʻi. Implementation of the Proposed Action is needed to restore the reliability of the existing flood control strucutures and to protect the health and well-being of the Wailuku Community. The Proposed Action consists of features intended to reconnect the main channel with the floodplain to reduce damaging flows along the main channel and right bank levees. The reconnection would be accomplished by lowering a portion of the left bank, grading the overflow area, and construcing a diversion wall to force flood flows to enter the existing floodplain on the left bank. A portion of the left bank would be raised downstream to contain the overflow within the floodplain. Further downstream, the left bank would be lowered to allow the return of the overflow into the main channel. The Proposed Action also includes bank stabilization and reconstruction of the existing revetment to prevent further erosion of the stream bank. An Environmental Assessment (EA) has been prepared to give systematic consideration to the environmental, social, and economic consequences of the proposed project.

U.S. Army Corps of Engineers
Honolulu District

DRAFT ENVIRONMENTAL ASSESSMENT
FOR
MODIFICATION TO THE ʻĪAO STREAM FLOOD CONTROL PROJECT
WAILUKU, ISLAND OF MAUI, HAWAIʻI
CONTRACT NO. W9128A-14-P-005

June 2015

Draft Environmental Assessment
for
Modification to the ʻĪao Stream Flood Control Project
Wailuku, Island of Maui, Hawaiʻi

Contract No. W9128A-14-P-005

Pursuant to:

National Environmental Policy Act, 40 CFR 1500-1508; ER 200-2-2, and Chapter 343, Hawaiʻi Revised Statutes

Prepared By:

GSI Pacific, Inc.
181 S. Kukui Street
Honolulu, HI 96813

Prepared For:

U.S. Army Corps of Engineers
Honolulu District

June 2015

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FIGURES

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APPENDICES

ACRONYMS AND ABBREVIATIONS

%	percent
<	less than
≤	less than or equal to
°F	degrees Fahrenheit
ADAAG	Americans with Disabilities Act of 1990 Accessible Guidelines
AECOS	AECOS, Inc.
AIS	archaeological inventory survey
ALISH	Agricultural Lands of Importance to the State of Hawaiʻi
AMP	Archaeological Monitoring Plan
BEA	Bureau of Economic Analysis
bgs	below ground surface
BMP	best management practice
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CCA	crustose coralline algae
CDP	census designated place
CDUA	Conservation District Use Application
CEQ	Council on Environmental Quality
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CESQG	Conditionally Exempt Small Quantity Generator
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
chl α	chlorophyll alpha
CIA	Cultural Impact Assessment
Cl	chloride
CO	carbon monoxide
CO_2	carbon dioxide
COM	County of Maui
CRAMP	Coral Reef Assessment and Monitoring Program
CRED	Coral Reef Ecosystem Division
CRM	concrete rubble masonry

CWA	Clean Water Act
CWRM	Commission on Water Resource Management
CY	cubic yard(s)
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Plan
DAR	Division of Aquatic Resources
dB(A)	decibel (A-weighted scale)
DBEDT	Department of Business, Economic Development and Tourism
DFW	Division of Forestry and Wildlife
DLNR	Department of Land and Natural Resources
DNL	day-night sound level
DOE	Department of Education, State of Hawaiʻi
DOH	Department of Health, State of Hawaiʻi
EA	Environmental Assessment
EAB	Expected Annual Benefits
EAD	expected annual damage
EALs	environmental action levels
EDR	Engineering Documentation Report
EDR	Environmental Data Resources, Inc.
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency, United States
ER	Engineering Regulation
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FICON	Federal Interagency Committee on Noise
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
fps	feet per second
ft	feet
FWCA	Fish and Wildlife Coordination Act
FY	fiscal year
GDM	General Design Memorandum
GHGs	greenhouse gases

HAR	Hawaiʻi Administrative Rules
HDOA	Hawaiʻi Department of Agriculture
HDOT	Hawaiʻi Department of Transportation
HECO	Hawaiian Electric Company
HELCO	Hawaiian Electric Light Company
HRS	Hawaiʻi Revised Statutes
HUD	United States department of Housing and Urban Development
Idb	ʻĪao cobbly silty clay
IcB	ʻĪao clay
IIFS	interim instream flow standard
kg	kilogram
L	liter
LEERD	land, easements, rights-of-way, relocation, and disposal areas
LEPDA	least environmentally damaging practicable alternative
LUC	Land Use Commission
m	meter
MBTA	Migratory Bird Treaty Act
MECO	Maui Electric Company
mg	milligram
mgd	million gallons per day
Mg/hr	metric tons per hour
mg/kg	milligrams per kilogram
MPD	Maui Police Department
mph	miles per hour
MSFCMRA	Magnuson-Stevens Fishery Conservation and Management Reauthorization Act
MUTCD	Manual on Uniform Traffic Control Devices
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NH_4	ammonium
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO	nitric oxide
NO_2	nitric dioxide
NOx	nitric oxides

NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
ns	not specified
O_3	ozone
O&M	operation and maintenance
OCCL	Office of Conservation and Coastal Lands
OEQC	State of Hawaiʻi Office of Environmental Quality Control
OHA	Office of Hawaiian Affairs
OSHA	United States Occupational Safety and Health Administration
PAL	Planning Aid Letter
Pb	lead
PCB	polychlorinated biphenyls
PCSI	Pacific Consulting Services, Inc.
PDT	Project Delivery Team
PL	Public Law
PM	particulate matter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PtA	Pulehu cobbly clay loam
PUC	Public Utilities Commission
PZUE	Puʻuone sand
RCC	roller compacted concrete
RCRA	Resource Conservation and Recovery Act
ROM	rough order of magnitude
RS	River Station
SCS	Scientific Consulting Services
SCS/CRMS	Scientific Consultant Services/Cultural Resource Management Services
SHPD	State Historic Preservation Division
SHPO	State of Hawaiʻi Historic Preservation Officer
SHWS	State Hazardous Waste Site
SIP	State Implementation Plan
SMA	special management area

SO_2	sulfur dioxide
SOEST	School of Ocean and Earth Science and Technology
SPAM	Stream Protection and Management
SPF	Standard Project Flood
SPS	Standard Project Storm
SRP	Social Research Pacific
TCP	traditional cultural practices
TMK	Tax Map Key
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	volatile organic compounds
WQC	water quality certification
WRDA	Water Resources Development Act

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1.0 INTRODUCTION

1.1 SCOPE AND AUTHORITY

The United States Army Corps of Engineers (USACE) is proposing to implement engineering designs to address existing flood hazards and provide the authorized level of reduced flood risk along ‘Īao Stream, Wailuku, Maui, Hawai‘i. A joint National Environmental Policy Act (NEPA) and Hawai‘i Revised Statues (HRS) Chapter 343 compliant Environmental Assessment (EA) is being prepared for the Proposed Action, following a Draft EA previously released in March 2009 (USACE, 2009). The Proposed Action is authorized under Section 203 of the Flood Control Act of 1968 (Public Law [PL] 90-483), which authorizes works of improvement for the control of destructive floodwaters. The County of Maui (COM), Department of Public Works is the non-Federal sponsor and the requesting agency for concurrent compliance with HRS Chapter 343.

The Draft EA (2009) analyzed several alternatives to satisfy the project purpose and need. Because of public and agency concerns over potential significant impacts under the alternative that was recommended in the 2009 Draft EA, including direct, indirect, and cumulative impacts, associated with impairment of groundwater recharge, sediment loading impacts to native aquatic species and habitats, and other issues, in 2010, the USACE decided to prepare an Environmental Impact Statement (EIS).

During the EIS alternative screening process, a new alternative measure (the Preferred Alternative addressed within this document) that addressed the project purpose and need, and did not require significant disturbance or modification to the existing stream alignment, was identified. Since this Preferred Alternative was anticipated to have minimal impacts to the existing condition of the stream and the environment surrounding the stream, in 2013, the USACE decided to re-scope the project from an EIS to an EA. This EA evaluates potential environmental impacts that may exist as a result of implementing the Proposed Action and whether a Finding of No Significant Impact (FONSI) determination can be made. The FONSI determination decision will be made following consideration of agency and public comments and after they have been addressed.

1.2 PROJECT LOCATION AND BACKGROUND

<u>Project Location</u>

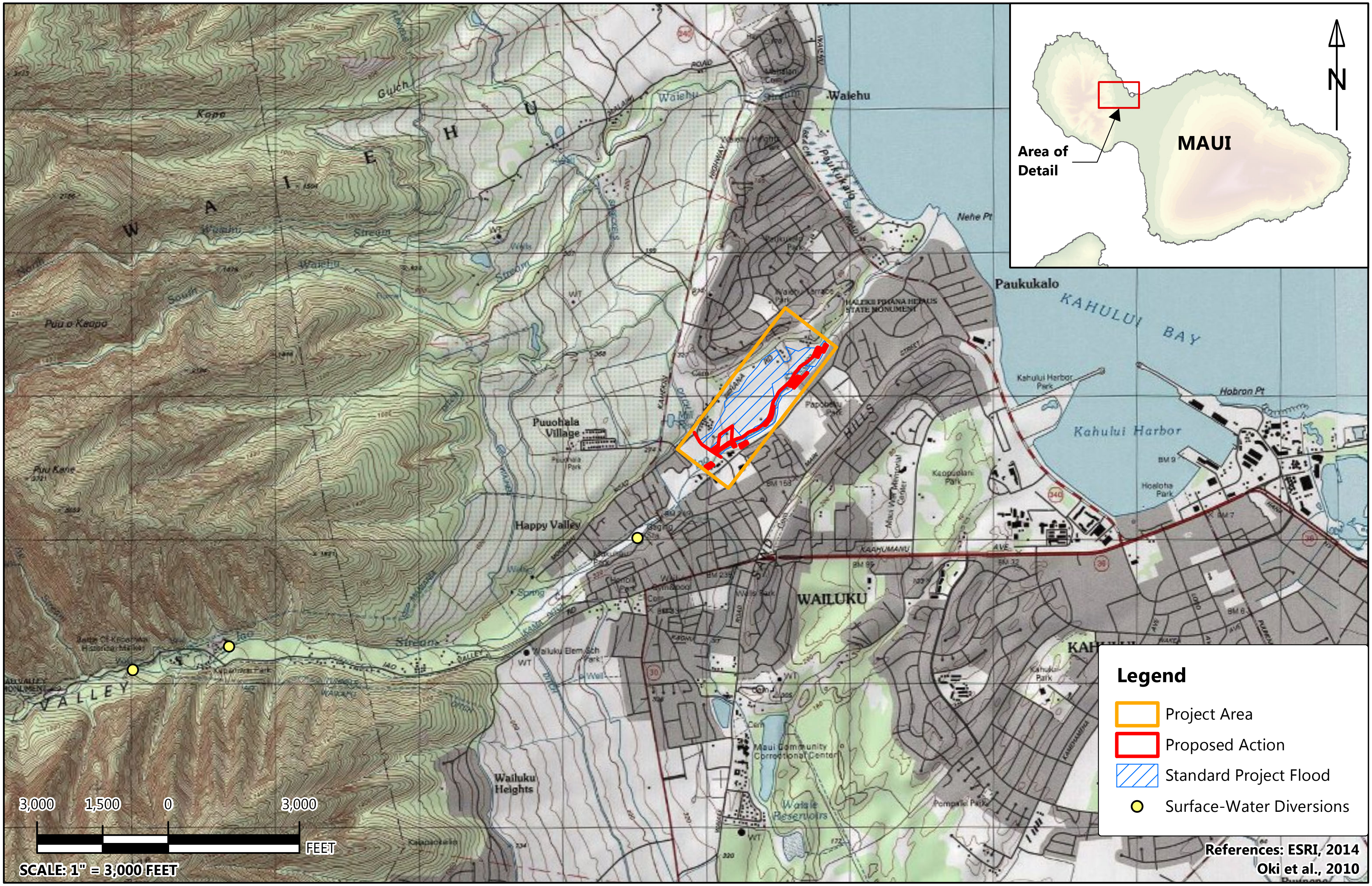
‘Īao Stream is located within the Nā Wai ‘Ehā Watershed in Wailuku, Maui. The ‘Īao Stream drainage basin is a 10 square mile area that begins at the boundary between the Lahaina and Wailuku Judicial districts and extends from the crests of the Kahoolewa and Kapilau Ridges to the Pacific Ocean (Figure

1-1). The basin is 8 miles long and averages 1.25 miles in width. It is characterized by two major topographic features: a coastal plain that extends about 3 miles inland, and ʻĪao Valley, the largest valley in West Maui, which extends from the coastal plain to the summit of Puʻu Kukui at an elevation of 5,800 feet (ft) above sea level.

ʻĪao Stream is about 12,000 ft in length from an upstream sediment basin to its outlet into Kahului Bay, and about 30 percent (%) is lined with existing concrete channels. The remaining portions of the stream are an alluvial channel where the stabilization problems occur. Levees are situated on the right bank to protect the town of Wailuku. For more than a century, stream flow had been intermittent below the ʻĪao intake due to three diversion structures which redirected the water to agricultural areas (Figure 1-1). Downstream of these agricultural diversion structures, stream flow had been absent 80 to 90% of the time, punctuated by infrequent high flows following intense rainfall events when stream discharge volume was sufficient to overtop the agricultural diversion structures (USFWS, 2006b). High water flows into the channelized portion of ʻĪao Stream occurred only during periods of prolonged intense rainfall. In April 2014, an interim instream flow standard (IIFS) was established following an Order and Agreement issued by the Commission on Water Resource Management. Pursuant to that April 2014 Settlement Agreement, the Wailuku Water Company began the release of 10 million gallons of water per day into ʻĪao Stream on October 13, 2014.

The stream drains a steep valley with flows at the upstream limit conveyed into an existing debris basin and flood control system which was constructed between 1977 and 1981. This flood control system consists of the debris basin located 2.5 miles upstream from the stream mouth, a 3,500-ft long channel downstream from the debris basin, a drop structure with a 22-ft vertical drop, levees along the left and right bank, flood plain management along 6,950 ft of the left bank, and stream realignment for a 1,730-ft reach to the shoreline. In the flood plain management reach, levees are located on the right stream bank and are offset up to 80 ft beyond the existing stream bank (Figure 1-2).

The existing stream channel has a relatively narrow width of 40 to 60 ft and is boulder-lined. The channel has an average slope of 2.6%. This steep stream channel results in critical and supercritical flows in the stream. Average channel velocity through the unlined portion of the stream varies between 8 and 32 ft per second (fps) with an average velocity in excess of 20 fps during annual floods. These high velocities have eroded the channel bed and caused severe undermining of the existing levees. The original flood control project was designed to provide protection against a Standard Project Flood (SPF) (i.e., a flood event based on estimates under the most severe combination of meteorological and hydrologic conditions



ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT

PROJECT LOCATION MAP
WAILUKU, MAUI, HAWAIʻI

FIGURE 1-1

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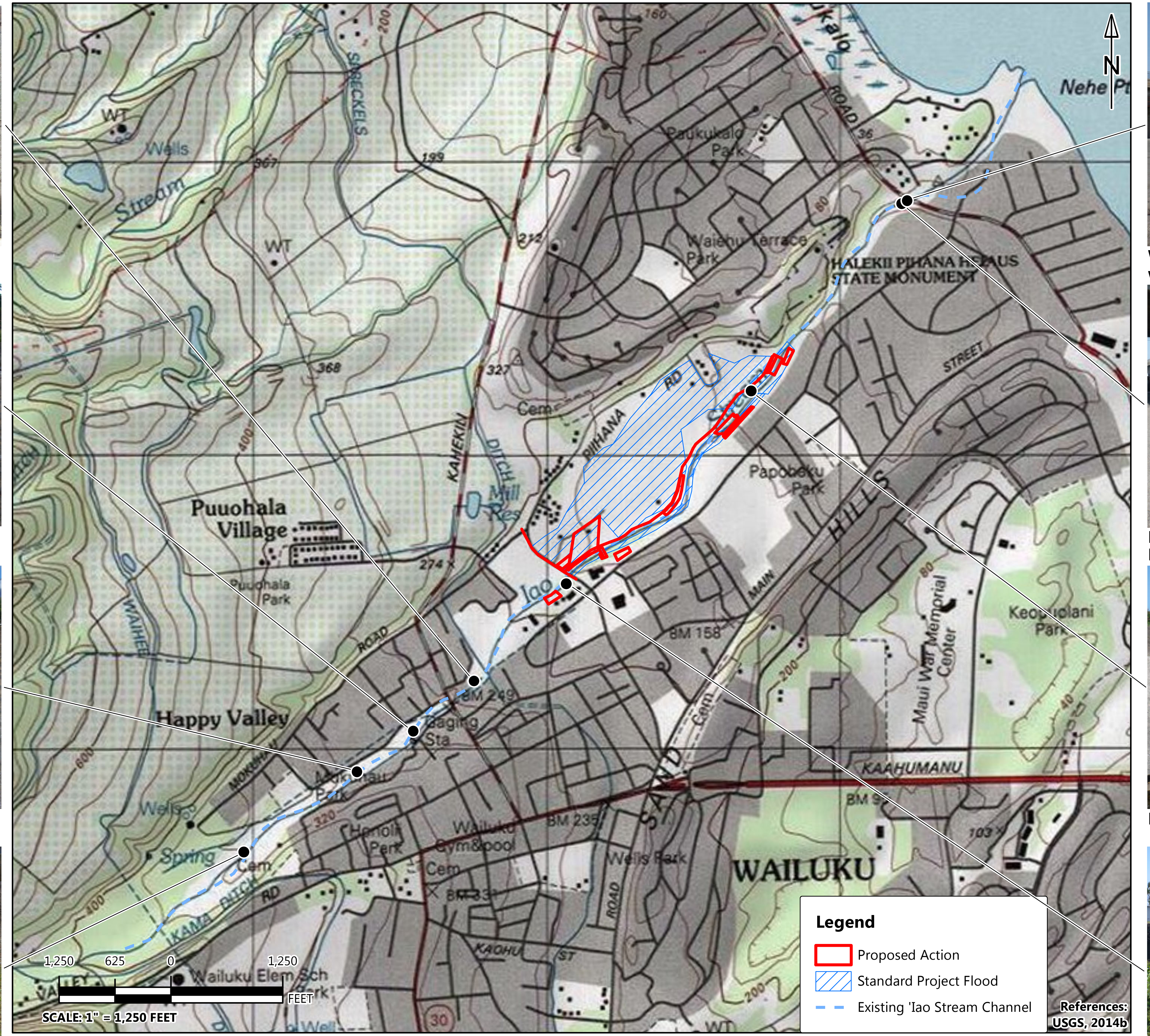
Vertical drop structure (picture taken prior to flow restoration).

Drop structure and diversion feature (picture taken prior to flow restoration).

Low-flow stream channel (picture taken prior to flow restoration).

Spring draining into debris basin (picture taken prior to flow restoration).



Waiehu Beach Road crossing, facing west.

Low-flow channel beneath Waiehu Beach Road.

Eroded bank toe at river station 54+00.

Looking upstream from Imi Kala Bridge.

ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT

EXISTING FLOOD CONTROL STRUCTURES
WAILUKU, MAUI, HAWAIʻI

FIGURE 1-2

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which are reasonably characteristic of the project site); however, the 33-year old flood control system no longer has the ability to provide its original level of protection to the town of Wailuku.

Implementation of the Proposed Action would occur within the approximately 0.4-mile stretch of the stream between slightly downstream of Waena Street (River Station [RS] 42+30) and upstream of Imi Kala Street (RS 83+25), approximately 1.4 miles upstream from the shoreline. The area is characterized by extensive residential development on the right bank and an existing natural flood plain on the left bank, and is located upstream of existing residential and urban development associated with the town of Wailuku.

<u>Project Background</u>

The 1981 flood control project was authorized by the Flood Control Act of 1968 and was implemented after a NEPA-compliant EIS was completed with identified mitigation measures following approval of the EIS' Record of Decision (USACE, 1975). During the construction phase in January 1980, a flood occurred that caused extensive erosion of the sacrificial berm and undermined portions of the completed levees. To address this damage, the streamside slope of the levees was extended with a concrete riprap slope lining into the streambed. Considered to be a state-of-the-art design at the time, the toe of the cutoff walls was imbedded 5 ft in depth.

Shortly after project completion, stream flows caused erosion of the stream bottom along an approximately 7,000-ft reach between the concrete channel and Waiehu Beach Road. The project levee was undermined with scour depths extending to a maximum of 6 ft below the existing boulder concrete slope lining. In July 1982, USACE Honolulu District requested that corrective work be approved to extend the boulder concrete slope protection from the damaged portion to a minimum of 5 ft below the eroded stream bottom. The Office of the Chief of Engineers granted approval for this work in January 1983. The corrective work was completed in November 1983 under the Productive Employment Appropriation Act of 1983 and authorized under Section 205 of the Flood Control Act of 1948, PL 80-858, as amended. The stream channel has since eroded as much as 6 to 8 ft below the 1983 repair. The USACE subsequently decided to conduct a reconnaissance study to investigate solutions to the recurring problems that are slowly undermining areas of the levee. In March 1995, a report was submitted by USACE recommending modification to ʻĪao Stream to replace the existing levee system with a trapezoidal concrete-lined channel (7,200 ft long).

A slope stability analysis was performed in 1997 to determine the stability of two areas identified as possible locations of levee failure. Stability analysis indicated instability could occur after flood waters recede at RS 40+00, assuming that the 1996 slope geometry would be further eroded to steepen the slope and deepen the stream bottom. If a SPF occurred prior to any repairs, flood waters would be able to pass through this portion of the levee, further erode it, and enter adjacent housing areas.

The existing stream channel has a relatively narrow width of 40 to 60 ft, is boulder lined. Levees with a surface of grouted riprap are interspersed along the right bank. The channel has an average slope of 2.6%. This steep stream channel results in critical and supercritical flows in the stream. The average channel velocity through the unlined portion of the stream varies between 8 and 32 fps with an average velocity in excess of 20 fps during annual floods. These high velocities have eroded the channel bed and caused severe undermining of the existing levees.

'Īao Stream is in danger of reverting to a flood hazard zone due to deterioration/scour of the right bank and undermining of the levee toe resulting from changes in the streambed dynamic and upstream watershed use/development that have occurred during the past 30 years. In order to preserve the reliability of the existing flood control systems, additional structures are needed to protect the Wailuku community.

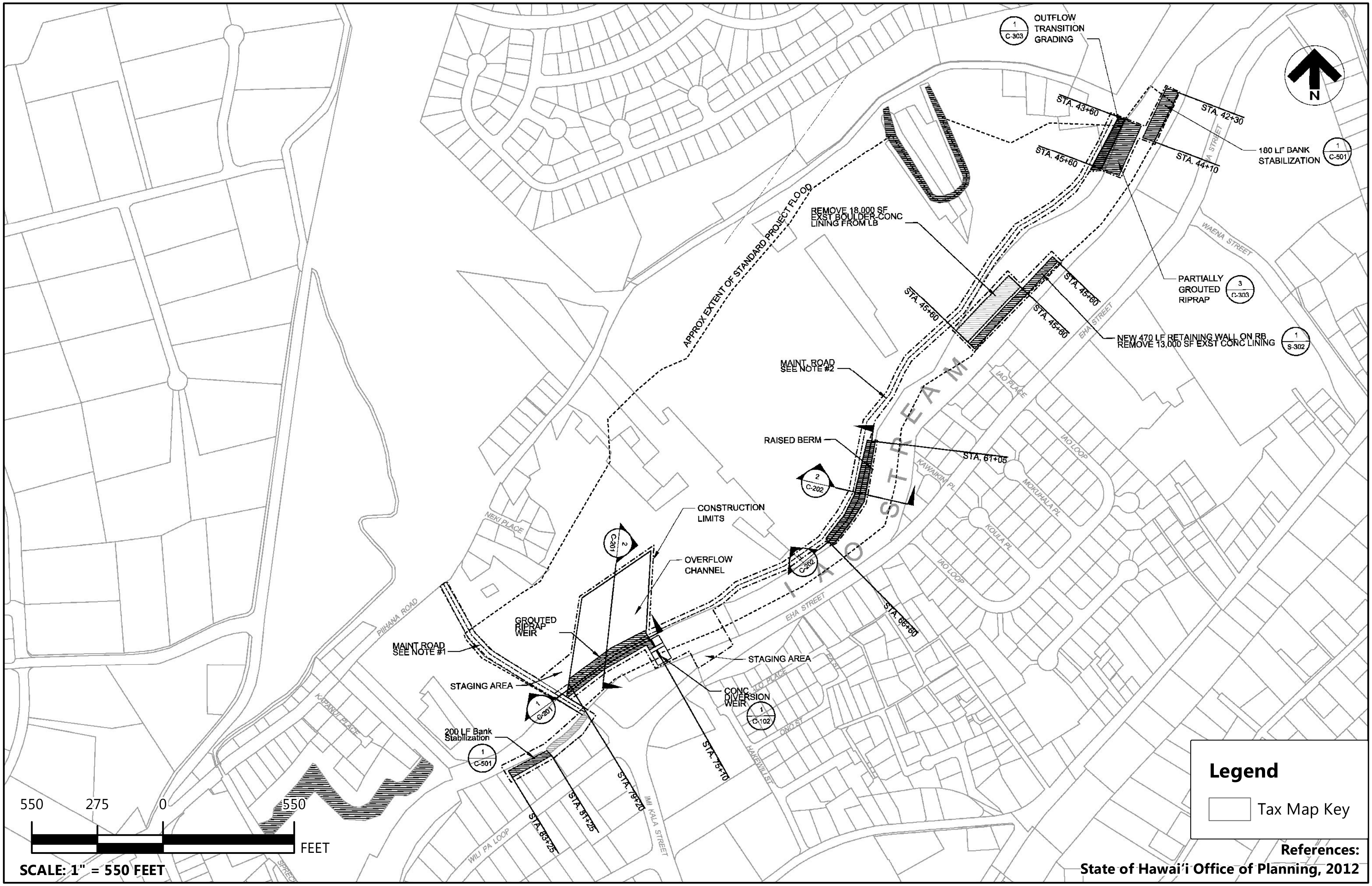
1.3 OVERVIEW OF THE PROPOSED ACTION

The Proposed Action consists of features intended to reconnect the main channel with the floodplain to reduce damaging flows along the main channel and right bank levees (Figure 1-3). The reconnection would be accomplished by lowering the left bank, grading the overflow area to disperse flow into the floodplain, and constricting the main channel with a concrete diversion wall to force flood flows to leave the main channel and enter the existing floodplain on the left bank of the stream. A portion of the left bank would be raised further downstream to contain the overflow within the floodplain. Even further downstream, the left bank would be lowered to allow the return of the overflow into the main channel. The Proposed Action would also include bank stabilization along the right bank upstream of the proposed overflow channel and downstream of the outflow return location to prevent further erosion in these areas. Further, the existing revetment between the overflow channel and outflow return location would be reconstructed as part of the Proposed Action.

1.4 PURPOSE AND NEED FOR ACTION

<u>Purpose</u>

The purpose of the Proposed Action is to address ongoing flood hazards caused by long-term damage to the existing flood control structures suffered during repeated floods since their original construction in 1981 and to provide the authorized level of reduced flood risk to the town of Wailuku. The USACE is authorized to implement flood damage reduction improvements to 'Īao Stream that meet or exceed the



ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT

PROPOSED ACTION
WAILUKU, MAUI, HAWAI'I

FIGURE 1-3

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SPF requirements to protect the existing Wailuku community. The SPF of 26,500 cubic feet per second (cfs) at the stream mouth was a 220-year event according to the peak discharge frequency computations presented in the 1976 General Design Memorandum (GDM) (USACE, 1976). A new comparison, using updated frequency analysis based on 62 years of record at United States Geological Survey (USGS) gage 16607000 and the 2012 Federal Emergency Management Agency (FEMA) discharge frequency magnitudes (FEMA, 2012) considers the SPF peak discharge of 26,500 cfs to be closer to a 0.1% chance (or 1,000-year recurrence interval frequency) event. The Proposed Action is designed to slow the stream flow during flood events by diverting flow to the existing floodplain and by allowing the stream waters to be redirected downstream in a controlled manner.

Need

Repeated flooding of ‘Īao Stream has resulted in undermining of the existing floodplain levees in several locations along the stream. High stream flows have resulted in downcutting (i.e., downward/vertical erosion) of the natural streambed and erosion of the base of the east bank levee structure. Several residential and commercial structures along the right bank are in danger of being undercut if streambank erosion continues, as is the heiau along the lower reach of the left bank. The Proposed Action is needed to protect the many adjoining residences and commercial properties from flood damage during major storm events.

Certification that levees can withstand a 100-year frequency flood is required by FEMA; if not certified, this flood protection infrastructure is not deemed viable to protect property or lives from 100-year flood events. A government agency responsible for levee construction or a Registered Professional Engineer must provide this certification. In their present condition, the 33-year old flood control structures cannot be certified as providing 100-year flood protection. The ‘Īao Stream Flood Control Project has prevented an estimated $49.6 million in flood damage as of the federal fiscal year (FY) 2013. The flood control system has instilled a sense of security in the growing community of Wailuku; however, ‘Īao Stream is in danger of reverting to a flood hazard zone due to deterioration/scour of the right bank and undermining of the levee toe resulting from changes in the streambed dynamic and upstream watershed use/development that have occurred during the past 30 years. A failure in the deteriorating levees would cause flood waters to inundate the ‘Īao Stream drainage basin and loss of life and extensive property damage would be inevitable. Implementation of the Proposed Action is needed to restore the reliability of the existing project and to protect the health and well-being of the Wailuku Community. Implementation of the Proposed Action would prevent further streambed erosion, thereby eliminating the risk of levee failure and the associated loss of life and property damage that could result.

1.5 REGULATORY FRAMEWORK

In planning and implementing the Proposed Action, the USACE must comply with all applicable environmental regulations and executive orders (EOs). These regulations and EOs include, but are not limited to the following:

- NEPA
- HRS Chapter 343
- Hawai'i Administrative Rules (HAR) Title 11-200
- Clean Air Act (CAA)
- Clean Water Act (CWA)
- Coastal Zone Management Act (CZMA)
- Endangered Species Act (ESA)
- Fish and Wildlife Coordination Act (FWCA)
- National Historic Preservation Act (NHPA), EO 13089 (*Protection of Coral Reefs*)
- EO 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*)
- EO 13045 (*Protection of Children from Environmental Health Risks and Safety Risks*).

Key provisions of these regulations and EOs are discussed throughout the subsequent sections, and in detail in Section 4 of this EA.

1.6 PUBLIC INVOLVEMENT AND AGENCY CONSULTATION

This environmental review will include public involvement and agency consultation, as required by NEPA and HRS 343. Public participation will include an opportunity for public review and comment on this EA. The availability of this draft EA will be announced in the State of Hawai'i Office of Environmental Quality Control (OEQC) Environmental Notice publication during the required 30-day public review period. Comments received on the Draft EA (2009) as well as comments received during the EIS screening process are included in Appendix A. Applicable comments were addressed as part of this EA analysis.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This section provides the approach used in selecting the Proposed Action and its alternatives; a description of the No Action Alternative; identification of alternatives considered but eliminated from further analysis; a detailed description of the Proposed Action; selection of the Preferred Alternative; and a comparison of environmental consequences. The alternatives analyzed in this document in accordance with NEPA and HRS Chapter 343 are the result of agency and internal scoping input. All alternatives considered must meet the purpose and need for the Proposed Action.

2.1 APPROACH TO IDENTIFICATION OF ALTERNATIVE / LEDPA CONSIDERATION

The USACE proposes to address increased flood hazards at ‘Īao Stream and provide an authorized level of reduced flood risk to the Wailuku community. An array of structural and non-structural alternatives that would best meet the project purpose and need in a feasible and effective manner was considered as part of the alternatives analysis process.

Code of Federal Regulations (CFR) Title 40, Part 230.10; Restrictions on Discharge outline provisions to comply with Section 404 (b)(1) guidelines of the CWA. The regulation states that “dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern.” Under Section 404 (b)(1) of the CWA, the USACE may only permit discharges of dredged or fill material into waters of the United States that represent the least environmentally damaging practicable alternative (LEDPA), as long as the alternative does not have other significant adverse environmental consequences. Therefore, as part of the project alternative screening process, alternatives were analyzed to identify the LEDPA in accordance with 40 CFR Part 230.10(a). Under these guidelines the USACE requires that the LEDPA is considered for implementation as the Proposed Action.

Since the Proposed Action would include work in a stream that could result in potential discharge of fill and/or dredge material into an aquatic ecosystem, provisions of Section 404 (b)(1) of the CWA would apply. Therefore a Section 404 (b)(1) analysis has been prepared for the Proposed Action and is included as Appendix B. Engineering Regulation (ER) 1105-2-100, Appendix C was also used as guidance in preparing the Section 404(b)(1) evaluation for the Proposed Action, as well as in screening project alternatives to determine the LEDPA.

The following alternatives were considered during the initial alternative formulation process:

- Alternative A - No Action
- Alternative B - Removal of Flood Control Improvements
- Alternative C - Roller Compacted Concrete (RCC) and Grouted Boulder Invert Channel
- Alternative D - Dual Stilling and Sedimentation Basins
- Alternative E - RCC Channel with Grade Control Structures
- Other Alternatives
- Alternative F (Proposed Action) - Floodplain Reconnection

These alternatives were screened against four decision criteria, including completeness, effectiveness, acceptability, and efficiency, to determine which alternative would best meet the purpose and need of the project. Each decision criteria was specifically defined in terms of appropriate metrics to measure how well (i.e., *high*, *medium*, or *low*, or in some cases, *yes* or *no*) each alternative meets each criteria. A memorandum describing the steps used during the initial alternatives formulation process and descriptions of each screening criteria used, as well as a complete matrix table that shows the rating of each alternative under each criterion is included in Appendix C. The following sections include a description of each alternative considered and criteria used to determine whether the alternative meets the project purpose and need.

2.2 NO ACTION ALTERNATIVE

The No Action Alternative (Alternative A) is to not construct any additional flood control structures at ‘Īao Stream. Continuing severe erosion would likely result from implementation of the No Action Alternative, contributing to levee deterioration and ultimate failure in multiple locations, which would eventually lead to flooding of the ‘Īao Stream drainage basin. Failure of the existing flood control structures could cause loss of life and extensive property damage. Council on Environmental Quality (CEQ) regulation 40 CFR Section 1502.14(d) requires an alternatives analysis to include a No Action Alternative. Therefore, although this alternative would not meet the project purpose and need, it is discussed throughout the document to provide the reader with a perspective of the “without-project” scenario.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANLAYSIS

As part of the NEPA and HRS Chapter 343 process, all potential alternatives must be evaluated. For alternatives to be considered reasonable, they must be affordable, implementable, meet the project purpose and need, and meet the established alternative selection criteria. Alternatives considered but eliminated as viable alternatives are described below.

Alternative B - Removal of Flood Control Improvements

Implementation of this alternative would include removal of all existing man-made improvements to the existing channel, including levees, concrete channels, flood walls, and drop structures, and returning the stream to its original natural state. With no flood protection levees in place, the ʻĪao Stream floodplain would re-encompass community of Wailuku. Rather than relying on physical flood control infrastructure for flood protection, a state-of-the-art flood warning system would be used in advance of floods. Implementation of this alternative would require relocation of residents from the redefined flood-prone areas of Wailuku. Although this alternative does not meet the project purpose and need from an engineering perspective since it would not provide any protection against flood damage, there is expressed public support for this alternative due to its perceived environmental benefits. Removal of all man-made structures would improve the aesthetics of the stream as well as increase the potential for groundwater recharge and possibly restore habitats within the stream. Despite its public support, this alternative was eliminated from further consideration due to the high risk of loss of life and increased frequency of flood damage to the urbanized areas surrounding the stream.

Alternative C - Roller Compacted Concrete (RCC) and Boulder Invert Channel

Implementation of this alternative would include lining the unlined portion of ʻĪao Stream using RCC, and was designed for SPF protection with a peak design discharge of 27,500 cfs downstream of RS 84+42 (0.5 miles upstream from the stream mouth) and 26,000 cfs downstream of RS 92+02. Typical stream stabilization improvements would consist of boulders in the main channel low-flow section with RCC stream bank protection in order to replicate a more natural stream bed. Design elements would be included into existing and planned channel segments to facilitate the movement of native fish and other aquatic organisms. Total project length extends from RS 22+00 to the debris basin (2.5 miles upstream from the shore).

Design elements would include:

- Modification to the existing drop structure between RS 96+74.21 and 97+23.21 to a new stepped drop structure to eliminate the dangerous 22-ft vertical drop and improve passage of in-stream fish (ʻ*o*ʻ*opu*) and other aquatic organisms.
- Modification to the existing low flow concrete channels with small blocks to break up high velocity flows and to facilitate fish passage.
- Adding hydraulic improvements to the concrete channel between RS 92+02 and 95+41 including baffle blocks and a weir within the existing concrete channel to more evenly distribute flow.

- Incorporating RCC side slopes and an approximately 15-ft wide and 20-inch deep grouted boulder invert channel that would mainly follow the alignment of the existing stream between RS 22+00 and 92+02 (approximately 7,200 ft long). The median base width range would vary from 40 to 60 ft.
- Stream realignment and widening between RS76+02 and 85+30. The channel would be realigned to the north on the left bank to avoid existing structures to the right bank and be widened to reduce water surface profile at the ʻImi Kālā Street Bridge. As a result of the channel widening, the 10-year flood (i.e., the low flow condition of 7,200 cfs) would be contained within the channel but floods greater than 7,200 cfs and up to the SPF of 27,500 cfs would spread out on the existing left bank flood plain area.
- Construction of a low flow boulder channel within the RCC portion. The approximately 15-ft wide low flow channel would use boulders embedded in concrete to replicate a more natural streambed substrate. Retrofit design elements would also be included to facilitate the movement of native organisms through the modified channel area. These elements include a step structure at the 22-ft vertical drop (RS 97+23), widening existing low-flow channel areas, installing low-flow channel segments in existing flat-bottomed cement channel segments and in the center of the existing debris basin, blocks along the sloped portions of the existing channel to provide a resting place for climbing organisms, and an alignment along the vegetated portions of the left bank to provide shade and reduce water temperatures. These mitigation measures were proposed as compensation for unavoidable impacts, and were agreed to by the United States Fish and Wildlife Service (USFWS).
- Incorporation of right bank levee raises. The existing right bank levee would be raised at RS 45+37 to 48+85 by 4.5 ft using a concrete rubble masonry (CRM) wall on top of the existing earth levee and up to 0.7 ft at RS 25+62 to 26+46.

Alternative C was considered to achieve the project purpose and need and was considered to be feasible from an engineering and cost perspective. In addition, this alternative was initially considered to be the "environmental alternative" because it would minimize negative environmental impacts to the project area by: 1) utilizing the original floodplain along the left bank of the project for flood flows greater than 7,200 cfs and as a result keeping this area in open space; and 2) incorporating a boulder lined low-flow channel that would simulate a natural stream thereby creating a less severe stream environment than one that is strictly concrete lined. The low-flow channel was also designed to facilitate upstream and downstream migration of aquatic organisms. This alternative was recommended as the "Preferred

Alternative" in the March 2009 Draft EA (USACE, 2009); however, in spite of the discussions between the United States Fish and Wildlife Service (USFWS) and the USACE, and subsequent incorporation of additional mitigation measures, it was determined that Alternative C would result in unavoidable environmental impacts, including elimination or significant reduction in the potential for groundwater recharge and increase in the potential for upstream sedimentation to be transported to the ocean due to the concrete lining of the stream channel. Therefore, this alternative was eliminated from further consideration.

Alternative D - Dual Stilling and Sedimentation Basins

Implementation of this alternative would involve construction of two large stilling basins designed to dissipate the energy of large floods. The stilling basins would further act as debris traps as well as potential habitat and recreational areas. This alternative would also include realigning the stream channel where the natural alignment of the stream causes excessive erosion at the existing levee toe. This alternative was considered effective in meeting the project purpose and need by temporarily retaining stream waters during large storm events, thereby reducing stream velocity, which in turn would reduce erosion downstream of the stilling basins. This alternative was also considered beneficial from an ecological standpoint since temporary storage of stream waters at the stilling basins would facilitate aquatic organism passage, allow sediment and debris to settle out, as well as allow groundwater recharge. However, due to its high implementation cost (specifically associated with real estate acquisition and operation and maintenance [O&M]), this alternative was determined to be infeasible and eliminated from further consideration.

Alternative E - RCC Channel with Grade Control Structures

This alternative expands on Alternative C (RCC and Boulder Invert Channel) by adding small grade control structures within lined portions of the stream that would slow stream velocities and provide habitat within the stream channel. In addition, the channel would be realigned to avoid areas that cause erosion at the levee toe and banks. As with Alternative C, this alternative was considered effective in meeting the project purpose and need, and was considered environmentally beneficial by incorporating a low-flow channel designed to facilitate upstream and downstream migration of aquatic organisms. The addition of the small grade control structures was intended to decrease the stream velocity thereby reducing the potential for upstream sedimentation to be transported to the ocean. However, environmental concerns including a high level of channel hardening and reduction in potential for groundwater recharge remained. Therefore, this alternative was eliminated from further consideration.

Other Alternatives

The following three alternatives were initially carried forward from an earlier project development phase (USACE, 2009), but were eliminated from further consideration because they did not meet the project purpose and need.

Trapezoidal Concrete-Lined Channel

This alternative consists of a trapezoidal, concrete-lined channel with a 40-ft bottom width, 90-ft top width and interior splitter walls at channel curves. The new channel would mainly follow the existing stream alignment from RS 22+00 (0.5 miles upstream from the stream mouth) to 92+02 (1.8 miles upstream from the stream mouth), for a distance of 7,200 ft. The channel would also be realigned to the north between RS 76+40 to 86+60 (an approximate 950-ft length extending east and west of the ʻImi Kālā Street Bridge) to avoid affecting structures that have been constructed on the right bank. All design flows up to the SPF would be contained within the channel, thereby eliminating the need for the existing floodplain on the left bank and making the land available for development.

This alternative was considered to achieve the project purpose and need, and feasible from an engineering and economic perspective. However, this alternative would result in the most changes to the existing habitat of the native stream fauna. Proposed changes in stream alignment and smooth concrete channelization (70% conversion) was considered to adversely affect existing natural habitat as well as alter stream flow, so that native amphidromous species may not survive. Due to the adverse environmental impacts and objections by public and resource agencies with regard to the conversion of a natural stream bottom to a concrete-lined invert, this alternative was eliminated from further consideration.

Rectangular and Compound Channel

This alternative consists of a rectangular and compound, concrete-lined channel with a 20-ft bottom width and 145-ft top width between RS 22+00 and 92+02 for a distance of approximately 7,200 ft. Improvements would include a straightened alignment and a shallow 55-ft wide grass-lined channel adjacent on the left bank (to contain up to the SPF). Although effective in addressing flood control concerns, negative environmental impacts include destruction of the existing stream habitat due to straightening of the natural channel alignment and concrete lining of the stream, which will likely generate strong objections from the public and resource agencies. This alternative was eliminated from further consideration due to environmental concerns and economic viability.

Levee Toe Reconstruction

Rebuilding and extending toe protection was tried at ʻĪao Stream after a storm in January 1980 and after a storm in 1981. ʻĪao Stream has continued to erode adjacent to the toe protection works and is now 8 to 10 ft below the last toe protection repair that was completed in November 1983. The toe continues to erode because the cutoff wall at the levee toe is a fixed hard point in a moveable boulder and gravel bed stream. Although COM continues to fill areas adjacent to the toe cutoff wall after flood events by placing boulders against the eroding levee toe, the fixes are temporary because the work is not effective for low frequency events (USACE, 2008). No flood events larger than a 4% flood have occurred in the ʻĪao Stream since project construction. Floods larger than the 4% flood would likely have enough force and duration to erode the stream near the toe of the cutoff wall causing undermining and consequential levee slope failure.

Installation of sheetpile cutoff walls to a depth sufficient to provide adequate toe protection and levee stability was not considered feasible due to the alluvial fill that comprises the streambed and physical characteristics of the areas below the levee toe (i.e., presence of boulders), which would preclude the ability to drive sheetpile to depth. Further, topographic characteristics of the area restrict the accessibility of heavy equipment (such as pile-drivers) along the right bank of the stream, where toe protection is needed. Therefore, levee toe protection with a cutoff wall is not considered a viable solution for ʻĪao Stream flood control. This alternative was therefore eliminated from further consideration.

2.4 ALTERNATIVE F - PROPOSED ACTION

This alternative consists of features that would reconnect the main channel with the existing floodplain on the left bank to reduce damaging flows along the main channel and right bank levees (Figure 1-3; refer Appendix D for the engineering drawings). The reconnection would be accomplished by lowering the left bank approximately 5 to 9 ft between RS 78+99 and 75+10 (an approximate length of 417 ft along the left bank) and grading the overflow area to disperse flow into the floodplain. Following grading, revegetation (in the form of grass) would be provided throughout the approximately 116,060-squrare foot overflow channel to prevent erosion during diversion of stream waters. The stream would be constricted by a concrete diversion wall, located within the channel at RS 75+10, downstream and at the base of the overflow channel section. The diversion wall would be approximately 18-ft high with a 15-ft wide opening to allow for fish passage and some flow to remain in the channel. The invert of this structure would be at or below the existing stream bed elevation and low flow through the opening would be controlled by the natural riffles and pools formed by the existing boulder stream bed both up and downstream of the diversion wall. This design incorporates public and agency concerns regarding biological resources in the stream, including input provided by USFWS regarding biological function of the stream. This alternative also incorporates designs that minimize channel hardening within the stream, which in turn minimizes potential impacts to groundwater recharge, which was also a principal concern raised during preparation of the Draft EA released in March 2009 (USACE, 2009).

Constriction of the stream would force flood flows to leave the main channel and enter the existing designated floodplain area on the left bank of ʻĪao Stream. Flood flows entering the floodplain at the overflow channel would spread out and follow the natural topographic gradient until reentering the main channel downstream at the outflow section. This alternative design replicates, to the extent practical, the natural hydrological pattern of an alluvial floodplain that existed within the area prior to modern development. Potential erosion within the floodplain during diversion of flood waters is expected to be minimized by existing vegetation within the floodplain. Transport of sediments to the main channel may occur during a flood event as great as an SPF; however, the proposed diversion would reduce erosion and associated sedimentation in the main channel resulting in overall reduction in sediment transportation to downstream areas, including Kahului Bay. Section 3.5.3 includes the results of the sedimentation study conducted for the Proposed Action.

The left bank between RS 66+60 and 61+05 (approximately 473 linear ft along the bank) would be raised by an earthen berm, up to approximately 6 ft, to contain the overflow within the floodplain. Further downstream, between RS 45+60 and 43+60, the left bank would be lowered to allow the return of the overflow into the main channel. At two locations, from RS 83+25 to 81+25 and RS 44+10 to 42+30, slope revetment is necessary to protect the bank from eroding under conditions of high stream velocities. These locations would be stabilized with boulder concrete slope lining or "shotcrete" to accommodate the steep bank slopes and protect the bank from erosion.

In addition, from RS 55+50 to 51+90, approximately 290 linear ft of revetment along the left bank would be removed entirely and restored to a natural earth embankment typical of upstream and downstream conditions. Along the right bank, from RS 55+10 to 50+25 (approximately 470 linear ft), the concrete toe berm that has severely eroded would be removed and replaced with a concrete retaining wall to provide support to the existing embankment and prevent further erosion of the bank toe.

Other features of this alternative include construction of a permanent 15-ft wide gravel road along the stream on the left bank between RS 75+10 and 43+60. This road would be used for future O&M activities. Site access during construction activities would be from Piihana Road along an existing road ending at RS 79+00. This road would also be used for future O&M activities.

This alternative would divert high-velocity and high-volume flood flows into the existing left-bank floodplain thereby reducing (but not eliminating) the main channel flow in the approximately 3,200-ft long reach of the stream. Hydraulic modeling used to assess the efficiency of this alternatives' design shows that in conjunction with natural overflow into the left bank upstream, the overflow channel and diversion weir adequately divert enough stream flow during an SPF event to restrict the flow downstream to less than the 10-year frequency event discharge. This would result in a reduced risk of flooding during high-flow/flood events to authorized levels.

Diversion of stream waters would also reduce erosion of the stream banks, which would prevent further damage to the existing flood control systems and increase its reliability. Finally, under these improvements, required certification of the levee system could occur to verify that this flood protection system would be viable to protect property and lives from 100-year flood events.

During the alternatives formulation process in the past, project design features intended to minimize environmental disturbance such as adding structural features within the stream to facilitate aquatic organism passage or creating shaded areas to reduce water temperatures for aquatic species present in the stream were considered. Previous design alternatives included modification or disturbance to a larger section of the stream reach (as compared to the current Proposed Action) which would have resulted in unavoidable adverse impacts to biological resources; as such, those impacts required measures to mitigate impacts to biological resources and also included opportunities to construct design features that would support native aquatic species habitat function within the modified portions of the stream.

On September 17, 2014, the Project Delivery Team (PDT) met with resource agencies (USFWS, United States Environmental Protection Agency [EPA], National Marine Fisheries Service [NMFS], State of Hawaiʻi Division of Aquatic Resources [DAR], and COM) to provide an overview of the current Proposed Action. The team explained to the resource agencies that mitigation measures would not be required since channel hardening within the stream is no longer being proposed and since no significant impacts to biological resources are anticipated. The resource agencies concurred with this determination and expressed support on the Proposed Action. The meeting minutes from this meeting are included in Appendix E.

In April 2014, the Commission on Water Resource Management issued an order establishing an IIFS, the minimum required flow, of 10 million gallons per day (mgd) (approximately 15.5 cfs) for ʻĪao Stream near Kepaniwai Park, approximately 2.8 miles upstream of the project site; further, the order stipulates that a minimum flow of 5 mgd be maintained at the mouth of the stream, less than 1 mile downstream of the project site. It was also ordered that no water may be diverted at the Waiheʼe/Spreckels Ditch intake located upstream of the proposed project area, except when the stream flow is adequate to satisfy the IIFS of 5 mgd (approximately 7.7 cfs) at the mouth of ‘Īao Stream (Osher, 2014). The IIFS was implemented in October 2014. The proposed 15-ft wide opening in the diversion wall would not impact the ability for an IIFS of greater than 5 mgd to remain in the channel through the project area and downstream to the stream mouth. Further, the Proposed Action is designed to disperse approximately 21,800 cfs of the total SPF peak discharge (27,500 cfs) across the floodplain, which would accommodate the IIFS and provide adequate protection against SPF events following implementation of the IIFS.

A detailed description of the Preferred Alternative including documentation of the hydraulic modeling used to assess the efficiency of the proposed structures and cost estimates is included in the Engineering Documentation Report (EDR) prepared for the project.

2.5 SELECTION OF PREFERRED ALTERNATIVE

After comparing each alternative against the established selection criteria identified in Section 2.1, the USACE selected Alternative F as its LEDPA/Preferred Alternative. This alternative was considered the LEDPA/Preferred Alternative because it meets the project purpose and need by offering adequate flood protection to the currently built environment without requiring significant disturbance or modification to the existing stream alignment. Since this alternative would not involve hardening of the existing channel, impacts to the surrounding environment are expected to be minimal and the LEDPA. Flood waters would be dispersed into the natural floodplain where sediment and other entrained constituents would be able to settle out instead of being directly channeled downstream and into the nearshore marine environment.

In addition, of the alternatives considered, Alternative F was considered the most economically feasible and beneficial alternative. Determination of whether the considered alternatives offered net benefits were based on the estimated benefits and rough order of magnitude (ROM) costs. The benefits analysis was based primarily on structural damages prevented. Structural damages generally started to occur at a 1% Annual Chance Exceedance event; therefore, there were not a significant amount of benefits incurred for smaller flood events. Since all of the alternatives had the same effect (i.e., in providing protection against floods greater than 1% Annual Chance Exceedance events), the benefits were assumed to be constant among all alternatives considered. The ROM costs for Alternatives B through E were significantly higher than Alternative F; thus, Alternative F was considered to offer the greatest net benefit. The major elements of the Preferred Alternative are included in Table 2-1.

Table 2-1: Preferred Alternative Construction Details

Element	Description
Overflow Channel	• Lower the left bank by approximately 5 to 9 ft between RS 79+20 and 75+12 (approximate length of 437 ft). • Placement of grouted riprap along the lowered left bank for bank protection. • Grade and provide grassing throughout the approximately 116, 060-square foot overflow channel on the left bank. • An approximately 18-ft high concrete diversion weir downstream of the overflow channel.
Raised Berm	Placement of an approximately 6-ft high (maximum height) earthen berm on the left bank between RS 66+60 and 61+05 (approximately 473 linear ft).
Floodplain Outflow	• Lower the left bank between RS 45+60 and 43+60 (up to 6 ft). • Placement of partially grouted riprap on the left bank for protection against erosion during the return of the overflow to the main channel.
Slope Revetment	• Placement of boulder concrete slope lining or "shotcrete" on the right bank between RS 83+25 and 81+25 (approximately 200 linear ft). • Removal of revetment along the left bank between RS 55+00 and 51+90 (approximately 290 linear ft) and restoration to natural earth embankment typical of upstream and downstream conditions. • Removal of existing concrete toe berm between RS 55+00 and 50+25 (approximately 470 linear ft) and replacement with a concrete retaining wall. • Placement of boulder concrete slope lining or "shotcrete" on the right bank between RS 44+10 and 42+30 (approximately 180 linear ft).
Grading required	The existing grade within the overflow channel would be evened out to create a flat surface.
Total impervious surface	Approximately 38,650 square feet or 0.9 acres; approximately 8,500 square feet for bank stabilization (shotcrete), 6,000 square feet for the concrete diversion wall and related invert (concrete), and 24,150 square feet for the overflow weir (grouted riprap).
Staging areas	Two staging areas at the overflow channel location: one on the right bank (near Eha Street and Imi Kala Street) and one on the left bank near the Imi Kala Bridge.
Site Access	• From Piihana Road along an existing 15-ft wide, 750-ft long gravel road. • A permanent 15-ft wide gravel O&M road will be constructed along the stream between RS 75+10 and 43+60.

Element	Description
Best management practices (BMPs) to be included during construction	Use of silt fences; concrete structures would be constructed in halves by temporarily diverting the stream to one side of the channel. While one side is constructed, the other side would be used for stream flow to accommodate the IIFS of 10 mgd.
Types of construction equipment to be used	Excavator, front-end loader, and dump trucks.
Location of disposal of debris and excavated materials	• Excavated soil removed to create the overflow channel will be tested and reused to construct the raised berm downstream. • Any excess excavated material will be tested and disposed of at the Maui Demolition and Construction Landfill (approximately 6 miles from project site) in Mā‘alaea, Maui.
Construction duration	Approximately 21.32 months.
O&M	• Clearing the overflow channel and diversion weir once every five years • Grass cutting at the diversion weir, new berm, and access/O&M road six times per year.

2.6 COMPARISON OF ENVIRONMENTAL CONSEQUENCES

Table 2-2 summarizes the alternatives effects on each resource based on the impact analysis described in Section 3, Affected Environment and Environmental Impacts, of this EA.

Table 2-2: Summary of Potential Impacts

Resource Issue	Preferred Alternative	No Action Alternative
Geology, Soil, and Topography	Short-term: Grading activities needed to construct the overflow channel would have minor impacts to site soil. Long-term: No impacts/minor change in topography due to construction of the overflow channel system and bank stabilization.	Short- and Long-Term: Continued erosion of the stream bank and increase in soil loss during high flow events.
Climate, Air Quality, Greenhouse Gases (GHGs)	Short-term: Temporary increase in fugitive dust and vehicle emissions during construction activities. Long-term: No impacts.	No impacts.
Noise	Short-term: Temporary increase in noise levels from construction equipment and vehicles. Long-term: No impacts.	No impacts.
Water Resources	Short-term: Less than significant impacts during construction. Implementation of best management practices (BMPs) would prevent runoff from entering stream waters during construction activities. Long-term: Beneficial impacts to water quality due to decrease in erosion and sediment transport.	Short- and Long-Term: Continued transportation of sediment and debris in stream waters. Adverse impacts on water quality in nearshore waters in Kahului Bay.
Biological Resources	Short-term: Less than significant impacts during construction due to temporary displacement of widespread common species. Long-term: No long-term loss of species or habitats is anticipated. Decrease in sedimentation would have beneficial impacts to the marine species in nearshore waters of Kahului Bay.	Short- and Long-Term: Continued negative impacts to the nearshore marine habitat due to sedimentation.

Resource Issue	**Preferred Alternative**	**No Action Alternative**
Historical and Cultural Resources	Short- and Long-Term: No impacts are anticipated; archaeological monitoring to be conducted during ground-disturbing activities.	Short- and Long-Term: Adverse impacts to the Halekiʻi-Piʻihana Heiau located along the stream bank located in a high erosion area.
Land Use	Short-term: Less than significant impacts during construction activities. Long-term: Beneficial impacts due to reduced flood risk.	Short- and Long-Term: Adverse impacts to residential/commercial areas along the stream bank due to the current inadequate flood control measures.
Visual/Aesthetics	Short-term: Less than significant impacts during construction activities. Long-term: Less than significant.	No impacts.
Recreational resources	Short- and Long-Term: No impacts.	No impacts.
Socioeconomics	Short-term: Beneficial impacts by creating temporary employment opportunities during the construction period. Long-term: Beneficial impacts due to decreased flood risk.	Short- and Long-Term: Adverse impacts from extensive damage to residential and commercial properties due to inadequate flood control.
Public Infrastructure and Utilities	Short-term: No impacts. Long-term: Beneficial impacts by preventing flooding and damage to public infrastructure.	No impacts to public infrastructure; however, undermining of the existing flood control system would continue.
Traffic and Circulation	Short-term: Less than significant impacts during the construction period. Long-term: Less than significant impacts during maintenance of flood control structures. Beneficial impacts by preventing traffic/circulation inhibitors during potential flooding.	No impacts.
Solid and Hazardous Material and Wastes	Short-term: Less than significant impacts during construction activities. Long-term: Less than significant impacts from maintenance activities.	No impacts.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

The environmental, social, and economic setting of the project site and the probable impacts of the No Action Alternative and the Proposed Action - Preferred Alternative are described in this section of the EA. Impacts may apply to the full range of natural, aesthetic, historic, cultural, and economic resources. The following subsections define key terms used throughout Section 3.

Impacts

Direct Impacts are caused by the action and occur at the same time and place.

Indirect Impacts are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect impacts may include growth inducing impacts and other impacts related to induced changes in the pattern of land use, population density or growth rate, and related effects on air, water and other natural systems, including ecosystems.

Beneficial Impacts are those that would produce favorable outcomes and add value to the environment.

Adverse Impacts are those that would produce detrimental effects and cause harm to the environment.

Cumulative impacts are impacts on the environment which result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Impacts include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, social, or health, whether direct, indirect, or cumulative. Impacts may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial (40 CFR 1508.8).

Significance of Environmental Impacts

A "significant effect" is defined by HRS Chapter 343 as "the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the State's environmental policies or long-term environmental goals as established by law, or adversely affect the economic welfare, social welfare, or cultural practices of the community and State."

According to the CEQ regulations (40 CFR 1500-1508), the determination of a significant impact is a function of both context and intensity.

Context: This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of a Proposed Action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

Intensity: This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

1. Impacts that may be both beneficial and adverse. A significant impact may exist even if the Federal agency believes that on balance the effect will be beneficial.
2. The degree to which the Proposed Action affects public health or safety.
3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.
5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment (40 CFR 1508.27).

To determine significance, the severity of the impact must be examined in terms of the type, quality and sensitivity of the resource involved; the location of the proposed project; the duration of the effect (short or long-term) and other consideration of context. Significance of the impact will vary with the setting of the Proposed Action and the surrounding area (including residential, industrial, commercial, and natural sites).

3.1 GEOLOGICAL RESOURCES

3.1.1 Definition of Resource

Geological resources typically consist of surface and subsurface materials and their inherent properties. Principal geologic factors affecting the ability to support structural development are seismic properties (i.e., potential for subsurface shifting, faulting, or crustal disturbance), soil stability, and topography.

The term *soil*, in general, refers to unconsolidated materials overlying bedrock or other parent material. Soils play a critical role in both the natural and human environment. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the ability for the ground to support man-made structures and facilities. Soils typically are described in terms of their complex type, slope, physical characteristics, and relative compatibility or constraining properties with regard to particular construction activities and types of land use.

Topography is the change in elevation over the surface of a land area. An area's topography is influenced by many factors, including human activity, underlying geologic material, seismic activity, climatic conditions, and erosion. A discussion of topography typically encompasses a description of surface elevations, slope, and distinct physiographic features (e.g., mountains), and their influence on human activities.

Natural hazards prone to the area include earthquakes, tsunamis, and volcanic activity. Earthquakes typically result from release of energy from the earth's crust and manifest themselves by shaking and sometimes displacement of the ground which can result in property damage. Earthquakes can also trigger landslides and occasionally volcanic activity. When the epicenter of a large earthquake is located offshore, the seabed may be displaced sufficiently to cause a tsunami. A *tsunami* is a series of water waves caused by the displacement of a large volume of a body of water. Great wave heights can be generated by large events; although the impact of tsunamis is limited to coastal areas, their destructive power can be enormous. *Volcanology* addresses evaluation of activities associated with volcanoes (including eruptions, lava flow, magma) and related geological phenomena.

3.1.2 Regulatory Setting

The Revised Ordnances of Honolulu 14-14 describes proper permitting and inspection procedures necessary for grading, soil erosion, and sediment control during earthwork activities. All work, including excavation and fill work, shall be in accordance with current construction standards and all local, state, and federal regulations.

3.1.3 Existing Conditions

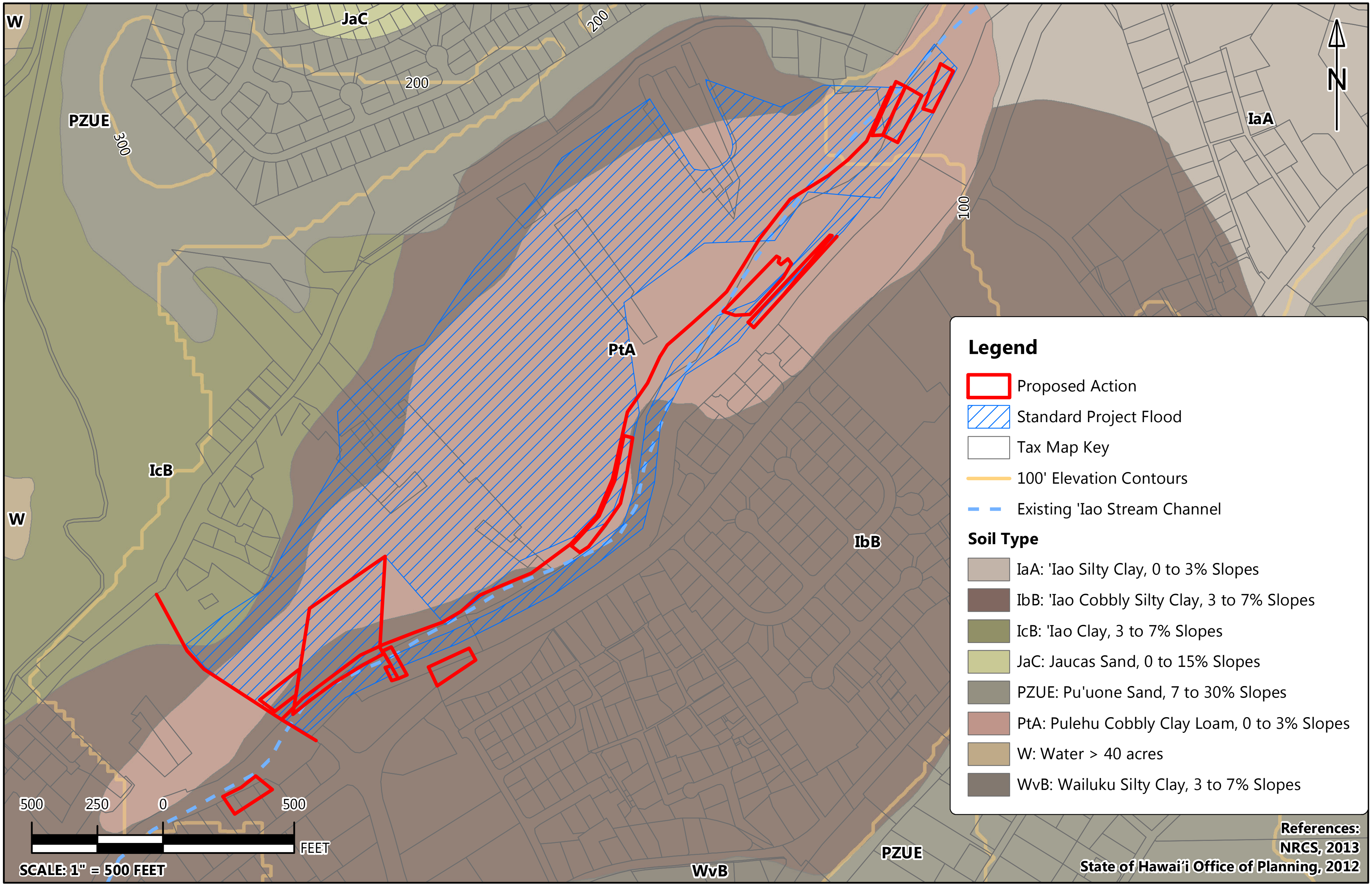
Geology

The Hawaiian Archipelago is a chain of seamounts and islands in the North Pacific extending 1,616 miles west by northwest from the largest Island of Hawai‘i. Igneous rocks are the dominant rock type and consist of basaltic flows, caldera and dike complexes, and pyroclastics. The Island of Maui, the second largest of the Hawaiian Islands, was formed by the intersection of two shield volcanoes, East Maui (Haleakalā) and West Maui (Mauna Kahalawai or the West Maui Mountains), linked by the narrow isthmus of overlapping lava flow events. The older, smaller, and more eroded volcanic center constitutes West Maui, while East Maui is the product of Haleakalā, a younger, much larger, and less dissected volcanic shield (Hazlett and Hyndman, 1996; Stearns, 1985). West Maui rises 5,788 ft above sea level and is 18 miles long and 15 miles wide. Thin flows of pāhoehoe lava formed the young shield of West Maui, completed around 1.3 million years ago. The lavas that erupted during this main stage of growth are known as the Wailuku basalts. Rift zones were developed that trend north and south of the caldera at the summit of West Maui.

Topography and Soils

Soils in the area of Wailuku generally retain a high organic matter content, and are composed of clay, silt, and sand, mixed with varying degrees of gravel, cobble, and boulders. Major soil types underlying the area of the Proposed Action and SPF floodplain include ‘Īao cobbly silty clay (Idb), ‘Īao clay (IcB), Pulehu cobbly clay loam (PtA), and the Pu‘uone sand (PZUE) (Figure 3-1).

The Proposed Action would require earthwork activities only in the ‘Īao cobbly silty clay and the Pulehu cobbly clay loam. The ‘Īao cobbly silty clay is present on alluvial fans and valley fill areas, has an erosion hazard of slight to medium, and a medium degree of runoff. The Pulehu cobbly clay loam is



	ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT	FIGURE 3-1
	SOILS MAP WAILUKU, MAUI, HAWAI'I	

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present on alluvial fans and basins, has a slight erosion hazard, and a slow degree of runoff (NRCS, 1972).

Earthquakes

In Hawaiʻi, earthquakes are generally linked to volcanic activity and occur thousands of times annually; the vast majority of which are at a very small magnitude. On Maui, the USGS classifies the island as within seismic zone 2B, indicating that ground accelerations of 20% the acceleration due to gravity are likely to occur at a probability of 10% in a 50 year exposure time (USGS, 2001).

Tsunamis

A tsunami is a series of great waves, typically the result of a violent displacement of the seafloor. Tsunamis are characterized by high speeds (up to 560 miles per hour), long wave lengths (up to 120 miles), and long periods between successive wave crests (up to several hours). Tsunamis have the potential to inundate the coastline, causing severe property damage and/or loss of life. Located in the middle of the Pacific Ocean, Hawaiʻi is susceptible to tsunamis from earthquakes and tsunamis generated in the Pacific Rim. The Proposed Action is outside the limits of the tsunami evacuation zone; however, downstream portions of ʻĪao Stream are within the tsunami evacuation zone (Figure 3-2).

Volcanology

The East Maui Volcano, also known as Haleakalā, is the only active volcano in Hawaiʻi outside of the Big Island; however, it is generally considered to be dormant. The last eruption occurred in the late 1700s, and Haleakalā is in the post-shield volcanic stage (USGS, 2003).

3.1.4 Approach to Analysis

Determination of the significance of potential impacts to geological and soil resources is based on 1) the importance of the resource (i.e., commercial, ecological, and/or scientific); 2) the proportion of the resource that would be affected relative to its occurrence in the region; and 3) the susceptibility for deleterious effects on the resource due to the Proposed Action. Impacts to geological and soil resources are significant if the physical structure, chemical composition, or visual aesthetic character are adversely affected over a relatively large area.

3.1.5 Potential Impacts and Mitigation

No Action

Under the No Action Alternative, no construction or change in ground surface is expected. Although no significant impacts to soil, topography, or geologic resources are expected to result from implementation of the No Action Alternative as it pertains to construction, soil erosion of stream banks would continue to occur, undermining existing flood control levees and contributing to nearshore sedimentation downstream of the project site.

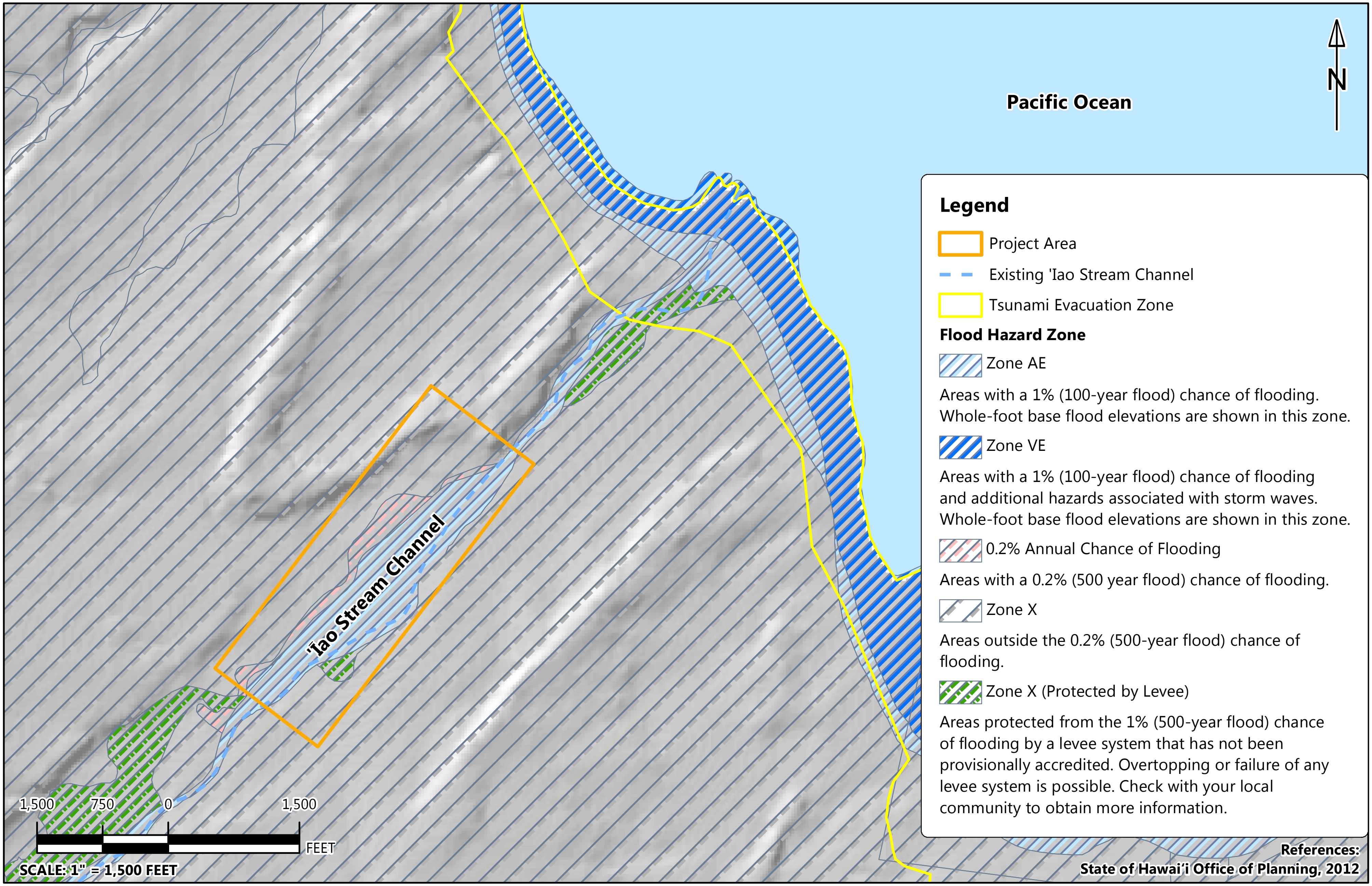
Proposed Action

Implementation of the Proposed Action would have less than significant short-term impacts on affected soils within the project area during the construction period. Minor topographic alterations at the project site would be necessary in order to construct the proposed overflow channel system. Excavated soil to construct the overflow channel would be tested and reused to construct the raised berm downstream. Any excess soils would be tested and either be reused elsewhere on the island or would be trucked to an appropriate on-island landfill and properly disposed. As part of project development, BMPs addressing soil and erosion control (e.g., silt fencing, tarping/covering, surface revegetation, etc.) would be implemented to minimize/eliminate soil migration from the proposed construction area.

There are no anticipated significant long-term impacts to site soils, geology or topography during the operation of the Proposed Action. The proposed overflow channel system would retain sediment and debris entrained in flood waters, and would result in a long-term decrease in downstream sedimentation and debris deposit. Routine monitoring and maintenance (e.g., clearing the system of collected sediment and debris) would ensure that the channel system continues to function as designed.

Given the shallow depth of excavation for grading activities, lack of sensitive geological resources, and implementation of soil-control BMPs, no significant impacts to geology, soils, or topography are anticipated.

The Preferred Alternative would not result in change to the natural hazards boundaries of floods and tsunamis, and would not significantly affect the generation of a natural hazard. Construction activities proposed under the Preferred Alternative have the potential to be impacted by flooding events. A limited amount of ground surface is expected to be exposed temporarily during ground disturbing activities, which may increase the potential for runoff during flooding events. Adverse impacts during flooding events would be minimized by both temporary and permanent erosion and sedimentation control measures, such as silt fences or grass block pavers, in and around the areas where ground surface is



ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED 'ĪAO STREAM FLOOD CONTROL PROJECT

FLOOD AND TSUNAMI HAZARD MAP
WAILUKU, MAUI, HAWAI'I

FIGURE 3-2

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exposed. If a natural hazard occurs during construction activities, all site work would cease until it can be resumed safely.

3.2 CLIMATE, AIR QUALITY, AND GREENHOUSE GASES

3.2.1 Definition of Resource

Climate

Climate is defined as long-term atmospheric patterns that characterize a region or location, and includes measures of temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count, and other meteorological variables. Knowing the climate of an area enables the predictability of short-term weather phenomena; however, only the weather can specify actual short-term atmospheric conditions. Some geographic regions with great topographic variations over relatively short distances (e.g., slope steepness, aspect, etc.) have micro-climates that are distinct to small areas (e.g., canyons, leeward vs. windward, hilltops, basins, etc.).

Air Quality

Air quality at a given location is a function of several factors, including the quantity and type of pollutants emitted locally and regionally, as well as the dispersion rates of these pollutants. Primary factors affecting pollutant dispersion are wind speed and direction, atmospheric stability, temperature, the presence or absence of inversions, and topography. Air quality is affected by stationary sources (e.g., industrial development) and mobile sources (e.g., motor vehicles).

Air quality at a given location is determined by the concentration of various pollutants in the atmosphere. National Ambient Air Quality Standards (NAAQS) are established by the EPA for criteria pollutants, including: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to (≤) ten microns in diameter (PM_{10}) and ≤2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). NAAQS represent maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect public health and welfare.

Ozone (O_3). The majority of ground-level (or terrestrial) O_3 is formed as a result of complex photochemical reactions in the atmosphere involving volatile organic compounds (VOC), nitrogen oxides (NO_x), and oxygen. O_3 is a highly reactive gas that damages lung tissue, reduces pulmonary function, and sensitizes the lung to other irritants. Although *stratospheric* O_3 shields the earth from damaging ultraviolet radiation, *terrestrial* O_3 is a highly damaging air pollutant and is the primary source of smog.

Carbon Monoxide (CO). CO is a colorless, odorless, and poisonous gas produced by incomplete burning of carbon in fuel. The health threat from CO is most serious for those who suffer from cardiovascular disease, particularly those with angina and peripheral vascular disease.

Nitrogen Dioxide (NO_2). NO_2 is a highly reactive gas that can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections. Repeated exposure to high concentrations of NO_2 may cause acute respiratory disease in children. Because NO_2 is a key precursor in the formation of O_3 or smog, control of NO_2 emissions is an important component of overall pollution reduction strategies. The two primary sources of NO_2 in the United States are fuel combustion and transportation.

Sulfur Dioxide (SO_2). In Hawai‘i, the main source of SO_2 is vog (i.e., volcanic smog) from volcanic eruptions. When volcanoes are active, SO_2 is released and reacts with sunlight, which transforms the sulfur gases and water molecules to sulfuric acid, creating the volcanic haze. SO_2 is also emitted from stationary source coal and oil combustion, steel mills, refineries, pulp and paper mills, and from nonferrous smelters, although these are less of a factor in Hawai‘i. High concentrations of SO_2 may aggravate existing respiratory and cardiovascular disease; asthmatics and those with emphysema or bronchitis are the most sensitive to SO_2 exposure. SO_2 also contributes to acid rain, which can lead to the acidification of lakes and streams and damage trees.

Particulate Matter (PM_{10} and $PM_{2.5}$). Particulate matter (PM) is a mixture of tiny particles that vary greatly in shape, size, and chemical composition, and can be comprised of metals, soot, soil, and dust. PM_{10} includes larger, coarse particles, whereas $PM_{2.5}$ includes smaller, fine particles. Sources of coarse particles include crushing or grinding operations, and dust from paved or unpaved roads. Sources of fine particles include vog, all types of combustion activities (e.g., motor vehicles, power plants, wood burning) and certain industrial processes. Salt spray from the ocean is also a contributing factor because it holds significant amounts of PM.

Exposure to PM_{10} and $PM_{2.5}$ levels exceeding current standards can result in increased respiratory and cardiac-related respiratory illness. Short-term effects from PM may include headaches, breathing difficulties, eye irritation, and sore throat. The EPA has concluded that $PM_{2.5}$ is more likely to contribute to health problems than PM_{10}.

Airborne Lead (Pb). Airborne Pb can be inhaled directly or ingested indirectly by consuming Pb-contaminated food, water, or non-food materials such as dust or soil. Fetuses, infants, and children are most sensitive to Pb exposure. Pb has been identified as a factor in high blood pressure and heart disease. Exposure to Pb has declined dramatically in the last 10 years as a result of the reduction of Pb in gasoline and paint, and the elimination of Pb from soldered cans.

Greenhouse Gases (GHGs)

GHGs trap heat in the earth’s atmosphere, affecting climate change and contributing to global warming. Both naturally occurring and anthropogenic (man-made) GHGs include: water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO), and O_3. According to guidance from the CEQ during an analysis of direct effects, it is appropriate to: (1) quantify cumulative emissions over the life of the project, (2) discuss measures to reduce GHG emissions, including consideration of reasonable alternatives, and (3) qualitatively discuss the link between such GHG emissions and climate change.

However, it is not currently useful for NEPA analysis to attempt to link specific climatological changes, or the environmental impacts thereof, to the particular project or emissions, as such direct linkage is difficult to isolate and to understand. The estimated level of GHG emissions can serve as a reasonable proxy for assessing potential climate change impact and provides decision makers and the public with useful information for a reasoned choice among alternatives (CEQ, 2010).

3.2.2 Regulatory Setting

The Clean Air Act Amendments (CAAA) of 1990 place most of the responsibility to achieve compliance with NAAQS on individual states. The State of Hawai‘i Department of Health (DOH) Clean Air Branch is responsible for air pollution control in the state. The primary services of the branch include: 1) Engineering, which includes engineering analysis and permitting; 2) Monitoring, which performs monitoring and investigations; and 3) Enforcement, in which federal and state air pollution control laws and regulations are enforced.

The EPA requires each state to prepare a State Implementation Plan (SIP). A SIP is a compilation of goals, strategies, schedules, and enforcement actions that will lead the state into compliance with all NAAQS for CO, PM_{10}, $PM_{2.5}$, SO_2, NO_2, and O_3 to thus reach *attainment* status. Areas not in compliance with a standard can be declared *nonattainment* areas by EPA or the appropriate state or local agency. There can be lenience for Exceptional Events, which are defined as “unusual or naturally occurring events that can affect air quality but are not reasonably controllable using techniques that tribal state, or local air agencies may implement in order to attain and maintain the NAAQS” (EPA, 2013). An example of an Exceptional Event is a volcanic eruption, which affects air quality by causing exceedances of NAAQS and cannot be controlled by human intervention.

3.2.3 Existing Conditions

The average annual temperature in Wailuku on the island of Maui, Hawai'i, is 74.8 degrees Fahrenheit (°F). The annual average total precipitation of the area is 27 inches (Climatemps, 2013). The months of the year with the most rainfall occur from November through February.

The prevailing winds on Maui (known as trade winds) are from the east-northeast, with a mean wind speed of 10.6 miles per hour. The trade winds prevail approximately nine months of the year. Trade winds blow vog from the island of Hawai'i's volcanoes, as well as other air contaminants, to the southwest. During the winter months, winds tend to be less predictable; there are longer periods of light and variable winds and occurrences of strong southerly, or "Kona" winds, associated with weather fronts and storms. In addition, when trade winds are absent for prolonged periods, vog travels up the island chain and can affect air health by increasing levels of airborne SO_2 and $PM_{2.5}$. Although both of these pollutants are regulated by the EPA, Hawai'i's advisories for volcanic SO_2 and $PM_{2.5}$ have been customized for local conditions.

Air monitoring stations in communities near the volcano record regular exceedances of the NAAQS for SO_2 and occasional exceedances of the NAAQS for $PM_{2.5}$. The EPA considers the volcano a natural, uncontrollable event, and therefore the state requests exclusion from these NAAQS exceedances for attainment/non-attainment determination (DOH, 2013). Shorter exposure time intervals have also been adopted due to variable wind conditions, which can cause volcanic gas concentrations to change rapidly (USGS, 2014).

'Īao Stream is located in EPA attainment zones for CO, NO_2, O_3, $PM_{2.5}$, PM_{10}, and Pb (EPA, 2014b). In 2012, Hawai'i was in attainment with NAAQS annual averages of PM_{10}, $PM_{2.5}$, O_3, CO, and SO_2, based on three year averages of annual mean values from 12 air quality stations (four on Oahu, one on Maui, and seven on Hawai'i Island) that represent the state of Hawai'i. The air quality station positioned closest to the project area is located approximately 11 miles southeast from Wailuku in Kihei. The Kihei air quality station is the lone air monitoring station on the island of Maui and only measures $PM_{2.5}$ levels. The annual averages of $PM_{2.5}$ from this air quality station from 2008-2012 were approximately one-third of their respective State (HAR 11-59) and Federal (40 CFR Part 50) Standards (DOH, 2013).

3.2.4 Approach to Analysis

The 1990 Amendments to the CAA require that Federal agency activities conform to the SIP with respect to achieving and maintaining attainment of NAAQS and to addressing air quality impacts. The EPA *General Conformity Rule* requires that a conformity analysis be performed, which demonstrates that a proposed action does not: 1) cause or contribute to any violation of any NAAQS in the area; 2) interfere with provisions in the SIP for maintenance or attainment of any NAAQS; 3) increase the frequency or severity of any existing violation of any NAAQS; or 4) delay timely attainment of any NAAQS, any interim emission reduction goals, or other milestones included in the SIP. Provisions in the *General Conformity Rule* allow for exemptions from performing a conformity determination only if total emissions of individual nonattainment area pollutants resulting from the proposed action fall below *de minimis* threshold values.

3.2.5 Potential Impacts and Mitigation

No Action

Under the No Action alternative, the overflow channel system would not be constructed. The project area would remain unchanged from current conditions. No construction activity would occur, hence no ground disturbance, fugitive dust, or vehicular emissions would be generated. No impacts to air quality or climate would occur under implementation of the No Action Alternative.

Proposed Action

The Proposed Action would result in less than significant short-term impacts to air quality arising from construction activities. Ground disturbance could generate fugitive dust (e.g., PM) and the use of construction equipment (e.g., backhoes, dump trucks, transportation vehicles) and personal vehicles to access the project area could lead to temporary increases in vehicular airborne pollutant concentrations (e.g., CO concentrations).

These impacts would be temporary, and applicable BMPs, including covering and/or watering stockpiled soil, would be implemented. To reduce vehicle and equipment emissions, carpooling and ensuring that equipment is functioning properly should be included in regular construction work practices.

The CEQ suggests the emission indicator of 25,000 metric tons of CO_2-equivalent per year to determine if a federal agency should conduct a GHG emission study on a proposed action (CEQ, 2010). It is not anticipated that the short-term construction emissions associated with implementation of the Proposed Action would produce GHG emissions at or above the CEQ standard, or emissions at or above NAAQS standards. The operation of the proposed diversion channel and concrete diversion weir would not result in any ongoing airborne emissions. With the exception of possible emissions from maintenance vehicles, all activity associated with the Proposed Action would be passive (e.g., natural debris collection and settling of sediment) and no mechanization (e.g., petroleum burning engines, generators, or other emission sources) would be utilized. Therefore, no long-term impacts to air quality from the operation of the Proposed Action would be expected.

Since the Proposed Action is designed to provide protection up to the SPF level, the impacts of climate change are considered insignificant to the project design level. The SPF magnitudes were based on a Standard Project Storm (SPS) of 26 inches of rain in 24 hours. Data from National Oceanic and Atmospheric Administration (NOAA) Atlas 14 indicates 1,000-year recurrence interval rainfall of 20.8 inches in over 24 hours at a location adjacent to the centroid of the drainage basin (NOAA, 2014). There is no consensus on future changes to rainfall intensities in Hawai'i, and it is not expected that the 1,000-year rainfall event would increase by 5 inches (in 24 hours) or by 24% in any future climate change scenarios; therefore, future climate change is not anticipated to impact the Proposed Action.

The lowest range of elevation for the Proposed Action is approximately 70 to 90 ft above mean sea level. The tidal backwater effects of the Pacific Ocean to 'Īao Stream only extend to approximately 10 ft above mean sea level, which is approximately 1,000 ft downstream of the Waiehu Beach Road Bridge at the very downstream end of the proposed project area. Sea level change would not impact the Proposed Action due to its distance from the ocean.

3.3 NOISE

3.3.1 Definition of Resource

Noise is generally defined as unwanted sound. Noise can be any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Human responses to noise vary depending on the type and characteristics of the noise, distance between the noise source and receptor, receptor sensitivity, and time of day.

Determination of noise levels are based on: 1) sound pressure level generated (decibels [dB] scale); 2) distance of listener from source of noise; 3) attenuating and propagating effects of the medium between the source and the listener; and 4) period of exposure.

An A-weighted sound level, measured in dBA, is one measurement of noise. The human ear can perceive sound over a range of frequencies, which varies for individuals. In using the A-weighted scale for measurement, only the frequencies heard by most listeners are considered. This gives a more accurate representation of the perception of noise. The noise measure in a residential area, similar to conditions within the project area, is estimated at approximately 70 dBA. Normal conversational speech at a distance of five to ten feet is approximately 70 dBA. The decibel scale is logarithmic, so, for example, sound at 90 dBA would be perceived to be twice as loud as sound at 80 dBA.

Passenger vehicles, motorcycles, and trucks use the roads in the vicinity of the project area. Noise levels generated by vehicles vary based on a number of factors including vehicle type, speed, and level of maintenance. Intensity of noise is attenuated with distance. Some estimates of noise levels from vehicles are listed in Table 3-1.

Table 3-1: Typical Noise Sources

Source	Distance (ft)	Noise Level (dBA)
Automobile, 40 mph	50	72
Automobile Horn	10	95
Light Automobile Traffic	100	50
Truck, 40 mph	50	84
Heavy Truck or Motorcycle	25	90

mph = miles per hour
Source: Cavanaugh and Tocci, 1998.

3.3.2 Regulatory Setting

State of Hawai'i HAR Title 11, Chapter 46 Community Noise Control sets permissible noise levels in order to provide for the prevention, control, and abatement of noise pollution in the State. The regulation creates noise districts based on land use that dictate acceptable noise levels. The project area is located in a conservation/open space area within the vicinity of residential use - the closest residences are 50 ft from the project site. Therefore, the project area is in a Class A zoning district, as defined by HAR 11-46 as "all areas equivalent to lands zoned residential, conservation, preservation, public space, open space, or similar type." The maximum permissible sound level in a Class A district is 55 dBA from 7:00am-10:00pm and 45 dBA from 10:00pm-7:00am (DOH, 1969).

The EPA has identified a range of yearly day-night sound level (DNL) standards that are sufficient to protect public health and welfare from the effects of environmental noise (EPA, 1977). The EPA has established a goal to reduce exterior environmental noise to a DNL not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to a DNL not exceeding 55 dBA. Additionally, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

The U.S. Occupational Safety and Health Administration (OSHA) has established acceptable noise levels for workers. Table 3-2 shows permissible noise levels for varying exposure times.

Table 3-2: OSHA Permissible Noise Exposures

Duration per day-hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Source: OSHA, 2012

The Noise Control Act of 1972 (42 United States Code [U.S.C.] 4901 to 4918) established a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. To accomplish this, the Act establishes a means for the coordination of Federal research and activities in noise control, authorizes the establishment of Federal noise emissions standards for products distributed in commerce, and provides information to the public respecting the noise emission and noise reduction characteristics of such products (42 U.S.C. 4901). The Act authorizes and directs that Federal agencies, to the fullest extent consistent with their authority under Federal laws administered by them, carry out the programs within their control in such a manner as to further the policy declared in 42 U.S.C. 4901.

Federal workplace standards for protection from hearing loss allow a time-weighted average level of 90 dBA over an 8-hour period, or 85 dBA averaged over a 16-hour period. Noise annoyance is defined by the EPA as any negative subjective reaction on the part of an individual or group (EPA, 1977). For community noise annoyance thresholds, a day-night average of 65 dBA has been established by the U.S. Department of Housing and Urban Development (HUD) as eligibility for federally guaranteed home loans (FICON, 1992).

3.3.3 Existing Conditions

The project area is located in open conservation land in the suburban town of Wailuku. The noise environment in Wailuku town is characteristic of a suburban environment; the setting is dominated by vehicular and residential noise. The project area is not affected by airfield noise. The closest airfield to the project area is Kahului Airport, which is 5 miles east of the center of Wailuku.

3.3.4 Approach to Analysis

Noise impact analyses address potential changes to existing noise environments that would result from implementation of a proposed action. Potential changes in the noise environment can be beneficial (e.g., if they reduce the number of sensitive receptors exposed to unacceptable noise levels), negligible (e.g., if the total area exposed to unacceptable noise levels is essentially unchanged), or adverse (e.g., if they result in increased exposure to unacceptable noise levels).

3.3.5 Potential Impacts and Mitigation

No Action

Under the No Action Alternative, the overflow channel system would not be constructed. No construction activity – or accompanying noise associated with the use of construction equipment – would occur. The project area would remain unchanged, and there would be no impacts to noise within the area.

Proposed Action

Under the Proposed Action, short-term noise impacts associated with construction activities would occur. The sensitive receptors closest in proximity to the project area are residences located within 50 ft of the construction site. Construction-related noise, estimated to last for most of the duration of the construction period (approximately 21 months), would be generated from equipment and vehicles. However, noise exposure from construction activities would not be continuous at any one location throughout the entire construction process and BMPs would be implemented to reduce or eliminate noise. Buffer zones between construction activities and residential areas would be created, and construction work would be limited to the hours between 7:30am and 3:30pm on weekdays.

In addition, sound barriers, mufflers, and other structures may be erected to reduce noise levels if they exceed Federal and State standards. Heavy truck and equipment staging areas will be located as far from noise sensitive properties as possible. As a result, short-term impacts from construction activities would be less than significant to the surrounding environment.

Upon completion, the Proposed Action would not be a source of any significant long-term noise generation. The only noise generated from the Proposed Action in the long-term would be from maintenance vehicles infrequently visiting the area, estimated at six times per year for grass cutting at the diversion weir, new berm, and access road and once every five years to clear the overflow channel and diversion weir of accumulated debris. However, the noise type and levels would be consistent with those already present in the Wailuku suburban environment. Therefore, long-term noise impacts are expected to be less than significant.

3.4 WATER RESOURCES

3.4.1 Definition of Resource

Water resources analyzed in this study encompass surface water, groundwater, floodplains, and wetlands. Surface water resources include lakes, rivers, and streams and are important for a variety of reasons including ecological, economic, recreational, aesthetic, and human health. Groundwater comprises subsurface water resources and is an essential resource in many areas as it is used for potable water, agricultural irrigation, and industrial applications. Floodplains are belts of low, level ground present on one or both sides of a stream channel and are subject to either periodic or infrequent inundation by floodwater.

The USACE defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Coastal wetlands are important to the ecosystem and provide a critical interface between terrestrial and marine habitats. They also provide various functions such as buffering the coastline, capturing sediment, and retaining and transforming nutrients (Bruland, 2008).

3.4.2 Regulatory Setting

The segment of the ‘Īao Stream discussed in this EA is classified as “Class 2 inland waters” by the State of Hawai‘i. The objective of Class 2 waters is “to protect their use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation” (HAR §11-54-3(b)(2)). Kahului Bay is classified as “Class A marine waters” by the State of Hawai‘i. It is the objective of Class A waters "that their use for recreational purposes and aesthetic enjoyment be protected" (HAR §11-54-3(c)(2). Further, uses must be compatible with the protection and propagation of fish, shellfish, and wildlife; and strict water quality standards have been set for the protection of these uses in Class A marine waters.

The CWA of 1977 (PL 95-217) expanded provisions related to pollutant discharges and applies regulatory and non-regulatory tools to reduce point source and non-point source pollution, in addition to setting standards for water quality. Section 303(d) of the CWA requires states to maintain a list of water bodies that do not meet, or are not expected to meet state water quality standards. States must obtain and review all readily available surface water quality data to compare against state standards, and then make a decision on the level of impairment for each water body. The listing applies to both point and non-point sources of pollution, and must include a listing of pollutants for which applicable standards are exceeded.

Section 404(b)(1) of the CWA is "to restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material." Consistent with the Section 404(b)(1) guidelines, adverse impacts to wetlands, streams and other special aquatic sites must be avoided or minimized to the full extent practicable. Any unavoidable impacts must be mitigated consistent with USACE regulations and policies.

EO 11988, *Floodplain Management,* requires the responsible Federal agency to evaluate the proposed action with respect to floodplain management and related controls. Development within the regulatory floodplain is not allowed unless proper provisions to minimize or eliminate flood damages are implemented.

EO 11990, *Protection of Wetlands*, aims to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. To meet these objectives, this EO requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided.

3.4.3 Existing Conditions

Groundwater

The Proposed Action is located in the 'Īao aquifer system of the Wailuku aquifer sector (Figure 3-3). An upper and lower aquifer underlie the Proposed Action, classified as 60102116 (22211)/60102121 (21113). The upper aquifer is basal (i.e., fresh water in contact with seawater), unconfined, has a sedimentary lithology, has a potential use for development, is ecologically important, of a low salinity (i.e., between 250-1,000 milligrams (mg) chloride (Cl^-)/liter (L)), is irreplaceable, and has a high vulnerability to contamination. The lower aquifer is basal, confined, and has a flank basalt lithology. Further, the lower aquifer has a potential use for development, has a drinking water utility, is of a fresh salinity (i.e., less than (<) 250 mg Cl^-/L), is irreplaceable, and has a low vulnerability to contamination (Mink and Lau, 1990).

Surface Water

The ʻĪao Stream begins in the upper elevations of the ʻĪao Valley and flows eastward towards the Pacific Ocean, discharging into Kahului Bay. The ʻĪao watershed is subject to intermittent, high intensity rainfall, causing runoff from drainage basins for North and South Waiehu Streams.

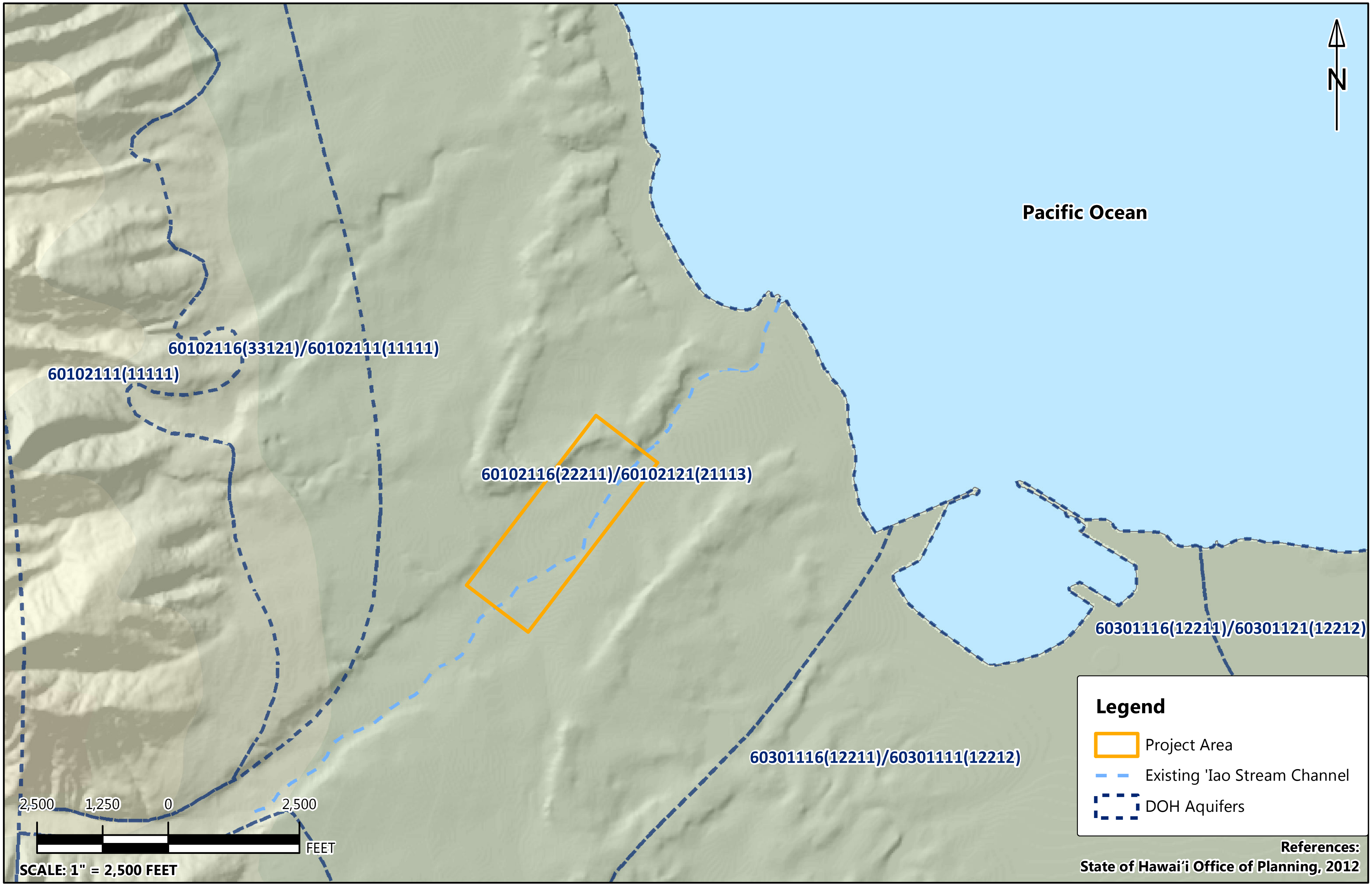
ʻĪao Stream is about 12,000 ft in length from the sediment basin to the outlet into Kahului Bay, and about 30% is lined with existing concrete channels. The remaining portions of the stream are an alluvial channel where the stabilization problems occur. Levees are situated on the right bank to protect the town of Wailuku. Stream waters were historically diverted to agricultural areas via three diversion structures located below the ʻĪao intake. Downstream of the diversions, stream flow in the past was absent 80 to 90% of the time, punctuated by infrequent high flows following intense rainfall events when stream discharge volume is sufficient to overtop the water diversion structures (USFWS, 2006b). On October 13, 2014, Wailuku Water Company began releasing 10 mgd of water into ʻIao Stream pursuant to the April 2014 Settlement Agreement in the Na Wai ʻEha Contested Case (see Section 3.14). According to recent observations made by COM, there is continuous flow of water through the section of the proposed project area.

Water Quality

ʻĪao Stream and the receiving waters of Kahului Bay are listed on the DOH list of impaired waters Category 3 and 5; the Total Daily Maximum Load (TMDL) Priority is listed as Medium (DOH, 2014). ʻĪao Stream is designated as "impaired" based on the visual observations made between 2001 and 2004 indicating Hawaiʻi water quality standards for turbidity and trash were not met; Kahului Bay is listed based on data collected from harbor waters that did not meet Hawaiʻi water quality standards for turbidity, chlorophyll α (chl α), and ammonium (NH_4).

Floodplains

According to FEMA records, the project area is located within *Zone AE*, *0.2% Annual Chance of Flooding*, *Zone X*, and *Zone X (Protected by Levee)* (Figure 3-2). Zone AE is defined as "areas with a 1%



ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT

AQUIFER MAP
WAILUKU, MAUI, HAWAI'I

FIGURE 3-3

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(100-year flood) chance of flooding.” The zone designated as the 0.2% Annual Chance of Flooding corresponds to the areas of 500-year flooding. Zone X designates areas outside of the 0.2% annual chance floodplain; Zone X (Protected by Levee) delineates areas that are “protected from the 1%-annual-chance or greater flood hazard by a levee system that has not been provisionally accredited” (FEMA, 2009a; FEMA, 2009b).

Wetlands

According to the *National Wetlands Inventory* (USFWS, 2006a), the Proposed Action occurs within and near areas designated as a freshwater emergent wetland (Figure 3-4), further classified as palustrine (i.e., nontidal wetlands dominated by emergents), and persistent (i.e., vegetation remains standing at least until the beginning of the next growing system).

3.4.4 Approach to Analysis

Impacts to water quality under the proposed alternative(s) were considered significant if the proposed alternative(s) would cause functional or chemical change to groundwater resources; or create significant sedimentation, pollution/runoff into surface water bodies, including any significant water body flow alteration. Impacts would be considered significant if they resulted in alteration, or incongruent development of a floodplain or wetland area. Significant impacts would occur if the proposed alternative(s) would result in non-compliance with applicable regulations and policies relating to water resources.

3.4.5 Potential Impacts and Mitigation

No Action

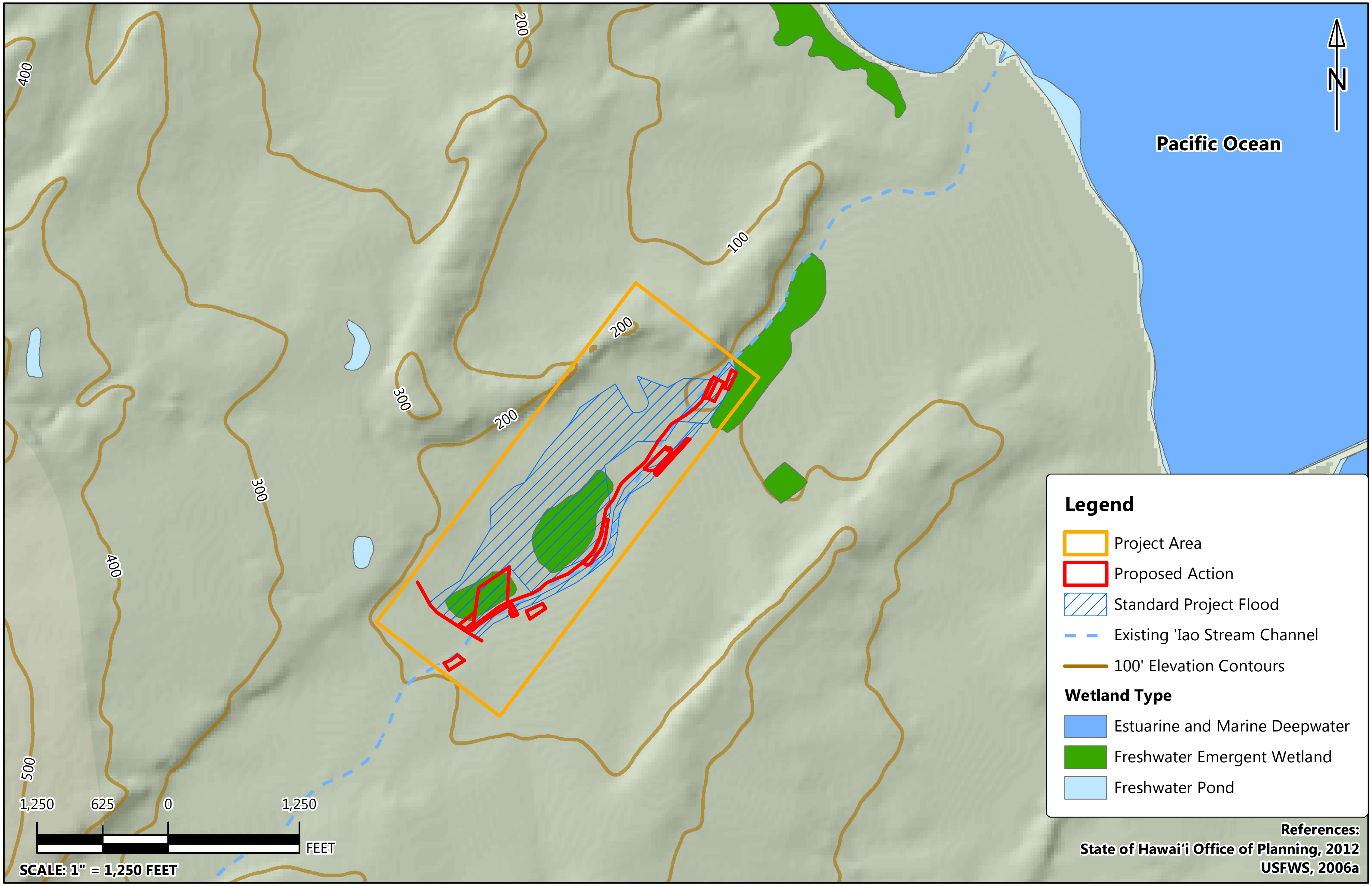
Under the No Action Alternative, the project area would remain unchanged and there would be no change to the current existing condition of the water resources within or in the vicinity of the project area. There would be continued adverse impacts to the water quality of ‘Īao Stream as well as nearshore waters in Kahului Bay due to continued erosion of the stream bank during storm events. Since there would be no reduction in sediment deposited into stream waters, there would be no improvement to water quality in the affected aquatic environment.

Proposed Action

Under the Proposed Action, there would be no anticipated impacts to groundwater. Given the estimated depth to groundwater of approximately 160 ft below ground surface (bgs) (USGS, 2011), and the shallow depth of planned surface grading, groundwater is not anticipated to be encountered. The existing floodplain would remain unlined, allowing for continued natural groundwater recharge.

There would be less than significant impacts to surface water hydrology during the construction period. The stream flow would be slightly altered during construction/grading activities. However, BMPs that adhere to State and Federal regulations would be implemented to minimize sediment discharges and alterations of stream flow. Once the diversion channel features are in place, during high-volume stream flow (i.e., during a flood event) the velocity of the water is expected to slightly decrease while flowing through the designated floodplain, as well as through the channelized portion of the stream. This would have the effect of reducing further erosion of the channel during such events and reduce sediment and nutrient loads entering Kahului Bay. The proposed 15-ft wide opening in the diversion wall would not impact the ability for an IIFS of greater than 5 mgd to remain in the channel through the project area and downstream to the stream mouth.

According to the hydraulic model for the Proposed Action (included as Appendix D of the EDR), flood events greater than the 10-year frequency event will overtop the Imi Kala Street bridge. Under existing conditions modeled, this bridge is theoretically overtopped during flood events greater than the 25-year frequency event. Downstream of Imi Kala Street bridge, additional flow would be diverted into the floodplain by the proposed overflow channel and diversion weir. In conjunction with natural overflow into the left bank upstream, the overflow channel and diversion weir would adequately divert enough flow during an SPF event to reduce the flow within the main channel downstream to less than the 10-year frequency event discharge. Table 3-3 includes the final predicted discharge values naturally overflowing into the floodplain, diverted by the overflow channel and diversion weir, and remaining in the channel for various flood frequency events.



ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT

WETLANDS MAP
WAILUKU, MAUI, HAWAI'I

FIGURE 3-4

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Table 3-3: Steady Flow Approximation Model for 'Īao Stream

Percent Chance Exceedance	Frequency Event	Original Flow (cfs)	Floodplain Flows		Remaining Flow (cfs)
			Overflow at Imi Kala (cfs)	Diverted Flow (cfs)	
50%	2-year	3,300	0	550	2,750
20%	5-year	4,400	0	1,330	3,070
10%	10-year	6,100	0	2,620	3,480
4%	25-year	8,500	1,030	3,740	3,740
2%	50-year	11,000	1,370	4,960	4,670
1%	100-year	13,800	1,440	7,520	4,840
0.5%	200-year	16,000	2,400	8,320	5,280
0.2%	500-year	20,600	3,800	11,130	5,670
--	SPF	27,500	7,000	14,720	5,780

There would be less than significant impacts to surface water quality during the construction period. The Proposed Action would include soil excavation and stockpiling during grading activities. BMPs employed during construction (e.g., silt fencing, tarping/covering exposed and stockpiled soils, surface revegetation, etc.) would minimize/eliminate stormwater flow from the proposed construction site, and any associated degradation of water quality. The USACE would monitor the marine water quality at the mouth of the stream before, during, and after construction to assure water quality standards are not exceeded. BMPs will be strictly adhered to during construction.

The Proposed Action would be completed in accordance with State and Federal regulations, including Section 404 (b)(1) of the CWA, which would further minimize any impacts to water quality in 'Īao Stream channel and Kahului Bay. The 404 (b)(1) evaluation for the Proposed Action is included in Appendix B. In addition, since the Proposed Action may generate discharges to State waters during construction, a Section 401 Water Quality Certification (WQC) would be required. A National Pollutant Discharge Elimination System (NPDES) permit may also be required if any discharge of pollutants to surface waters are anticipated during construction activities. These permits are addressed in detail in Section 4.

Although the floodplain and surrounding area is thought to have been historically used in agriculture production, it is not suspected to introduce significant concentrations of contaminants into the floodwaters since it has been unused for more than two decades and therefore any initial contamination is thought to have undergone natural attenuation (HDOA, 2003). Implementation of the Proposed Action would not result in changes to the current classification of ʻĪao Stream as "Class 2 inland waters" by the State of Hawaiʻi.

The Proposed Action would not significantly alter the existing floodplain and would be implemented in order to reduce flood risk within ʻĪao Valley downstream of the proposed overflow (diversion) channel system. Therefore, the Proposed Action would have beneficial effects to flood patterns within the existing environment.

The Proposed Action would have less than significant impacts on wetlands. According to the *National Wetlands Inventory* (USFWS, 2006a), potential pockets of wetlands are present within the project area; however, none were identified during biological or stream surveys conducted along the stream (AECOS, 2012 and USFWS, 2006b; 2011a). A survey would be conducted prior to the start of construction activities to document the presence or absence of wetlands within the proposed construction area. Work practices during construction activities would be modified as needed to avoid or minimize any impacts to any identified wetlands.

3.5 BIOLOGICAL RESOURCES

3.5.1 Definition of Resource

Biological resources include native or naturalized plants and animals and the habitats in which they occur. Sensitive biological resources are defined as those plants and animal species listed as threatened or endangered, or proposed as such, by USFWS, the NMFS, the State of Hawaiʻi Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DFW), or the State of Hawaiʻi DAR.

3.5.2 Regulatory Setting

The ESA was created in order to protect and recover imperiled species and the ecosystems upon which they depend. The ESA grants USFWS primary responsibility for terrestrial and freshwater organisms and NMFS primary responsibility for marine wildlife (USFWS 2013a).

The FWCA provides the basic authority for the USFWS's involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features and requires Federal agencies that construct, license, or permit water resource development projects to first consult with USFWS, NMFS, and State fish and wildlife agencies (e.g., DLNR, DFW, and DAR) regarding the impacts on fish and wildlife resources and measures to mitigate these impacts (USFWS, 2013b). USACE has been coordinating with USFWS per FWCA since conceptual design development began on the project design evaluated in the 2009 DEA;

further, it was key input from USFWS and their concerns regarding potential impacts to biological resources in the project area that served as the impetus for the project reevaluation and redesign, and ultimate development of Alternative F, the Preferred Alternative.

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSFCMRA) mandates the use of annual catch limits and accountability measures to end overfishing, provides for widespread market-based fishery management through limited access privilege programs, and calls for increased international cooperation. The MSFCMRA grants NMFS responsibility to implement both regional and national Congressionally-mandated deadlines.

EO 13089, *Coral Reef Protection* was enacted to preserve and protect the biodiversity, health, heritage, and ecological, social, and economic values of U.S. coral reef ecosystems and the marine environment. An interagency task force, the U.S. Coral Reef Task Force, was created in order to fulfill the EO’s protection efforts. The task force works with State, territorial, commonwealth, and local government agencies, nongovernmental organizations, the scientific community, and commercial interests to develop and implement measures to restore damaged coral reefs and to mitigate further coral reef degradation (EPA, 2012).

3.5.3 Existing Conditions

A Revised Draft FWCA Report (USFWS, 2006b) was prepared by the USFWS during the preparation of the Draft EA (2009) to describe existing conditions and assess potential resource impacts associated with the previous ‘Īao Stream Flood Control Project. Sufficient documentation and information was available to characterize the existing biological resources conditions, thus a survey was not conducted for terrestrial and riparian biological resources within the project area. A review of previous reports prepared for the ‘Īao Stream area was conducted to determine the presence of the individual terrestrial vegetation and wildlife species in the project area and the general vicinity.

<u>Terrestrial Flora</u>

Table 3-4 lists the terrestrial flora observed in and around the project area. Additional riparian and terrestrial vegetation in and around the project area can be characterized as coastal dry forest and consists of at least nine plants species: Bermuda grass (*Cynodon*), bristly foxtail (*Setaria verticillata* L.), finger grass (*Chloris* L.), *kiawe* (*Prosopis pallida*), klu (*Acacia farnesiana* L.), lantana or *lakana* (*Lantana camara* L.), *koa haole* (*Leucaena leucocephala*), sand bur (*Cenchrus* L.; endemic), and natal red top (*Rhynchely trum repens* Wild.) (SCS/CRMS, Inc., 2003).

Table 3-4: Vegetation Observed in the Project Vicinity

Vegetation		
Sub-Region	**Scientific name**	**Common Name**
Coastal Lowlands	Not specified (ns) *Prosopsis pallida*	sugarcane *kiawe*
'Īao Valley entrance	*Persea americana* *Aleurites moluccana* *Eugenia cuminii* *Samanea saman* *Melia azedarach* *Mangifera indica* *Psidium guajava*	avocado *kukui* java plum monkeypod pride of India mango guava
Higher valley slopes	*Casuarina equisetifolia* *Leucaena sp.*	ironwood *koa haole*

ns = not specified
Source: SCS/CRMS, Inc., 2003

On April 4, 2012, AECOS, Inc. (AECOS) performed a botanical survey along the stream banks and stream channel of 'Īao Stream (Appendix F). Sixty species of ferns and flowering plants as well as (11 trees and shrubs were identified. With a few exceptions, all of these plants are non-native species and most are common weedy species that have established in highly disturbed banks and sand/mud bars that form in the concrete channel. Four native or early Polynesian introduced species were noted. These included two trees observed near the stream (*kukui* and *hau*), a sedge (*Fimbristylis cymosa*), and a wood sorrel (*'ihi'ai* or *Oxalis corniculata*). These are common widespread species in the Hawaiian Islands. All of the plant species observed within the project area were widespread species. Appendix F includes a full list of plant species observed during the survey.

Terrestrial Wildlife Species

Table 3-5 lists the terrestrial wildlife species observed in and around the project area. Additional terrestrial wildlife species observed in the vicinity of the project area include introduced species such as cats, mice, rates, and mongoose. Game animals such as wild goats, pigs, and deer have been reported to occur in the forest reserve area, a mile upstream of the project site.

Table 3-5: Wildlife Observed in the Project Vicinity

Wildlife		
Sub-Region	**Scientific name**	**Common Name**
Drainage basin	*Hemignathus virens*	*amakihi*
	Himatione sanguinea	*apapane*
	Cardinalis cardinalis	Kentucky cardinal
	Carpodacus mexicanus	house finch
	Passer domesticus	house sparrow
	Mimus polyglottos	mockingbird
	Acridotheres tristis	mynah
	Leiothrix lutea	red-billed leiothrix
	Zosterops japonicas	white eye
	Pluvialis fulva	pacific golden plover
	Arenaria interpres	ruddy turnstone
Upland	ns	barr doves
	Streptopelia chinensis	lace necked doves
	Phasianus colchicus	pheasants
	ns	Franklin partridge
Lowland area and seashore marsh south of the project area	*Nycticorax nycticorax and*	black-crowned night
	Ardeidae	herons
	Ardea alba	egrets
	Himantopus himantopus	Hawaiian stilt

ns = not specified
Source: SCS/CRMS, Inc., 2003

Aquatic Biota

During the preparation of the Draft EA (2009), USFWS personnel conducted a habitat characterization assessment of the 'Īao Stream in the vicinity of the 'Imi Kālā Street Bridge (USFWS, 2006b). Based on an assessment of nine factors, the stream was assessed to have a total score of 83 out of 135 points, or a score of 61.5%. According to the grading matrix, this score puts 'Īao Stream in the category having habitat that is partially supportive of aquatic life.

Aquatic species are sensitive to any modifications of the stream as they have an amphidromous life cycle. Native and indigenous freshwater gobies such as *Lentipes concolor*, *Sicyopterus stimpsoni*, and *Awaous guamensis* were observed in ‘Īao Stream (Way, 1996). Along with the atyid shrimp and neritid snail, these stream-dwelling fauna require streams which flow continuously as eggs and larvae are washed into the ocean. Juveniles subsequently migrate back into ‘Īao Stream and ‘Īao Valley to mature, reproduce and spawn, although the project area itself is used for migration only, not breeding.

Three significant agricultural water diversion features, located upstream from or within the channelized portion of the stream, conveyed a significant amount of water away from the stream in the past for consumptive use, primarily sugarcane and other agricultural crops. This historic lack of continuous stream flow has been detrimental to populations of native organisms, due to stranding and desiccation of organisms during upstream and downstream migration (USFWS, 2006b). Recent changes to land use patterns in the vicinity of the stream have included the conversion of former sugarcane lands to other crops, as well as to commercial and residential real estate. The replacement crops require only a small fraction of the water required by sugarcane, yet the existing diversion infrastructure was maintained with no change to the amount of water diverted from the stream. Following implementation of the IIFS for ‘Īao Stream in October 2014 following the settlement of the Na Wai ‘Eha Contested Case, continuous flow has been restored to the stream, which is anticipated to facilitate upstream migration of the aquatic species and provide adequate level of stream flow required to maintain natural populations in the stream.

The FWCA report (USFWS, 2006b) identified the lower ‘Īao Stream as belonging to Resource Category 2 (habitat to be impacted is of high value for selected evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section) due to the severe degradation of stream habitat across the north shore Maui landscape and statewide. The marine waters adjacent to the mouth of ‘Īao Stream at Waiehu are also considered to be Resource Category 2 due to the presence of coral reef habitat throughout the area. The USFWS resource goal for Category 2 habitat is no net loss of in-kind habitat values. If losses are unavoidable, mitigation measures must be recommended to immediately rectify, reduce, or eliminate those losses (USFWS, 2006b).

An aquatic biota survey was conducted by AECOS, accompanied by a DAR biologist, on April 4, 2012. A full listing of aquatic species identified at ‘Īao Stream, which also includes earlier observations made by AECOS (2011), USFWS (2011a), and species reported in the Hawai‘i Watershed Atlas (DAR, 2008), is included in Appendix F.

Typical estuarine fishes such as mullet (*Mugil cephalus*), *‘āholehole* (*Kuhlia xenura*), *kūpīpī* (*Abudefduf sordidus*), and dusky frillgoby (*Bathygobius fuscus*) inhabit the estuarine reach located downstream of the project area. Two endemic amphidromous mollusks, *hīhīwai* (*Neritina granosa*) and *hapawai* (*Neritina vespertina*), also inhabit the estuarine reach of the stream. These two species are amphidromous animals that require stream flow for reproductive success and still attempted to migrate upstream even though the stream had been diverted for over 100 years and flow was interrupted throughout the middle reach. *Hīhīwai* also inhabit the lower and middle reaches of the stream, but migration is slower and the historical diversions within the stream have made it nearly impossible for juvenile snails to migrate past the flood control channel. DAR implements a program to collect *hīhīwai* from the estuary and release them within the stream at ʻĪao Valley State Monument where continuous stream flow is present.

Three native amphidromous *ʻoʻopu* or gobies (*Awaous guamensis*, *Sicyopterus stimpsoni*, and *Lentipes concolor*) were found in the middle and upper reach of the stream (in a plunge pool upstream from Mokuhau Park and in ʻĪao Valley State Monument) during the survey. In addition, two other *ʻoʻopu* species, *Stenogobius hawaiiensis* and *Eleotris sandwicensis*, have been reported from the stream (DAR, 2008), though seemingly erroneously from the upper reach because these fishes are typically found in the estuary and lower reaches of streams. *ʻOʻopu* species reported for the middle and upper reach of the stream are in low densities, and far greater densities of peociliid fishes (top-minnows) are present in the same reach of the stream (DAR, 2008).

The endemic *ʻōpae kalaʻole* (*Atyoida bisulcata*), has also been reported from the upper reach of the stream in high densities. Additionally, three endemic damselflies (*Megalagrion blackburni*, *M. hawaiiense*, and *M. nigrohamatum*) are listed in the Hawaiʼi Watershed Atlas as present in the stream (DAR, 2008).

According to recent observations made by DAR, species previously observed prior to implementation of the IIFS in October 2014 continue to be present within the stream; further, the enhanced flow has enabled additional species to occur in the stream. The presence of species such as the Pacific prawn (*Macrobrachium lar*) and *ʻopae ʻoehaʻa* (*Macrobrachium grandimanus)* in the lower stream appears to indicate that stream flow has been more consistent following implementation of the IIFS. In addition, the endemic species, *pipiwai (Theodoxus cariosus)* has been observed along with the *hīhīwai* and *hapawai*. As the stream continues to experience more frequent continuous flow to the ocean, the number of each species currently present in the stream is expected to increase over time.

Marine Species

Field surveys of marine ecosystems and species were not included in the Revised Draft FWCA report (USFWS, 2006b) due to limited funds, logistics, and time constraints. The report did note the presence of coral reefs in the coastal ecosystem adjacent to the mouth of the ʻĪao Stream. The near shore coastal environment in Kahului Bay is also noted to support sport fisheries for jacks (*Carangidae*) including *Caranx melampygus* and *C. ignobilis* (called *omilu* or *ulua* as adults and *papio* as juveniles); *Selar crumenopthalmus* (called *akule* as adults and *halalu* as juveniles); and goatfish *(Mullidae)* such as *Mullodichthys vanicolensis* (called *weke* as adults and *oama* as juveniles).

Following the preparation of the Revised Draft FWCA report (USACE, 2006), a Phase I marine habitat characterization survey of the marine coastal area within the vicinity of the mouth of 'Īao Stream was conducted as an addendum (Appendix G). The evaluation methodology of the survey consisted of reviewing existing information, as well as conducting a survey using snorkeling and scuba gear to directly observe the coral reef community around the mouth of 'Īao Stream.

Existing information was collected from literature searches and through government agencies conducting work within the region. The majority of the existing data was collected from the latter, which included the Coral Reef Assessment and Monitoring Program (CRAMP), DAR Habitat and Fish Assessments, NOAA Coral Reef Ecosystem Division (CRED) surveys, NOAA's Shallow-Water Benthic Habitat Maps, Lidar imagery, and sea turtle disease and nesting. Information on sea turtles was also collected by direct communication with DAR and from unpublished data. These resources provide general information on habitat structure/classification, coral types, and percent coral cover within the vicinity of the mouth of 'Īao Stream as well as some offshore locations where survey has been conducted.

The marine survey was concentrated within 500 to 700 meters (m) (545 to 765 yards) of the mouth of 'Īao Stream, extending an additional 1,000 m (1095 yards) to the northwest and 450 m (490 yards) to the southeast. Three distinct reef areas were present within the survey area: an inshore reef, surf zone, and spur-and groove reef. The Phase I survey was not able to map resources within the surf zone due to high swells.

The inshore reef area consisted of a shallow bay immediately west of the mouth of 'Īao Stream. This area was fairly homogenous in habitat type, dominated by filamentous turf algae growing over small boulders and cobble. Coral was scarce (less than 10 % cover) and scattered across the area. Macroalgae were present but not in high abundance or biomass, varying from less than to greater than 10% coverage depending on the area. Macro-invertebrates as well as a few surgeon fish were observed during the survey.

The benthos throughout the inshore reef area was covered with a fine layer of dark colored sediment, likely originating from the terrestrial environment. A semi-permanent turbid plume located perpendicular to shore in the central section of the shallow bay was observed during the survey. This plume in which visibility was low may represent the transport of suspended sediment out of the bay where waters from both ʻĪao Stream and the adjacent Waiehu Stream enter and mix with marine waters. This plume can also be seen in Google imagery, and correlates with the area in the NOAA Benthic Habitat maps where habitat designation is unknown due to high turbidity that obscures satellite interpretation.

The spur-and-groove reef area was located immediately offshore of the ʻĪao Stream mouth outside of the surf zone and extended north-northwest and south-southeast along the coastline. The area consisted of ridges (spur) of carbonate structure and intervening sand channels (grooves) oriented parallel to the dominant wave-approach direction and perpendicular to shore. The habitat type within the area was fairly homogenous and dominated by coral with most of the area having approximately 10% to 80% coral cover.

Several coral species were observed during the survey. This included *M. patula*, *M. flabellata*, *P.stellata*, *Cyphastrea ocellina*, and *Leptoseris incrustans*. Although not observed during the survey, other corals including *Cyphastrea agassizi*, *Porites pukoensis*, and *Montipora dilitata*, may be present in the area. Crustose coralline algae (CCA) were observed mostly in encrusting form, and less commonly in discrete foliose form. CCA, macroalgae, and filamentous turf algae were present across all ridges. Macroalgae cover in the area was generally sparse, occasionally present in less than 10% cover. Minvertebrates as well as several families of fishes were observed. In particular, lobsters of significant size (near terminal size) were observed on multiple occasions. Fine sediment (a mix of terrestrially derived fines and carbonate derived sand) was present in the area, with better visibility southward and more turbid in waters northward.

The FWCA addendum report concluded that the spur-and groove area located in the immediate vicinity of ʻĪao Stream has a high abundance of coral by Hawaiʻi standards. The average coral cover in the Main Hawaiian Islands is approximately 22% according to the CRAMP. The area was observed to have generally low water visibility and signs of sedimentation. Since further increase in sedimentation and turbidity may contribute to coral reef decline within the area, USFWS gave recommendations to evaluate potential risk of increased sedimentation transport to nearshore areas during the alternatives formulation process.

Threatened & Endangered Species

None of the plant species recorded during the botanical survey conducted by AECOS is listed as endangered or threatened, or proposed for inclusion as a listed species by federal or state agencies. A portion of the upper watershed has been designated as critical habitat for at least 45 threatened or endangered species of plants; however, this designated area is not within or in the vicinity of the boundary of the project area (Figure 3-5).

No aquatic species protected by the state, or federally listed endangered or threatened species were observed in 'Īao Stream during the aquatic biota survey conducted by AECOS (2012). The endangered Green Sea Turtles (*Chelonia mydas*) were sighted offshore during the Phase I marine habitat characterization survey conducted within the vicinity of the mouth of 'Īao Stream (USFWS, 2011b). These species are also known to nest on beaches in close proximity to 'Īao Stream.

3.5.4 Approach to Analysis

Determination of the significance of potential impacts to biological resources is based on 1) the importance (i.e., legal, commercial, recreation, ecological, or scientific) of the resource; 2) the proportion of the resource that would be affected relative to its occurrence in the region; 3) the sensitivity of the resource to proposed activities; and 4) the duration of ecological ramifications.

As defined under ER 1105-2-100 *Planning Guidance Notebook* C-3.d.(4)(a), the significance/importance of ecological resources are determined based upon their monetary and non-monetary values. Monetary value is based upon the contribution the resources makes to the Nation's economy; non-monetary value is based upon technical, institutional, and public recognition of the ecological, cultural, and aesthetic attributes of resources within the affected area.

Impacts to biological resources are significant if species or habitats of concern are adversely affected over relatively large areas, or if disturbances cause reductions in population size or distribution. Potential physical impacts such as habitat loss, noise, and impacts to water quality were evaluated to assess potential impacts to biological resources resulting from the Proposed Action.

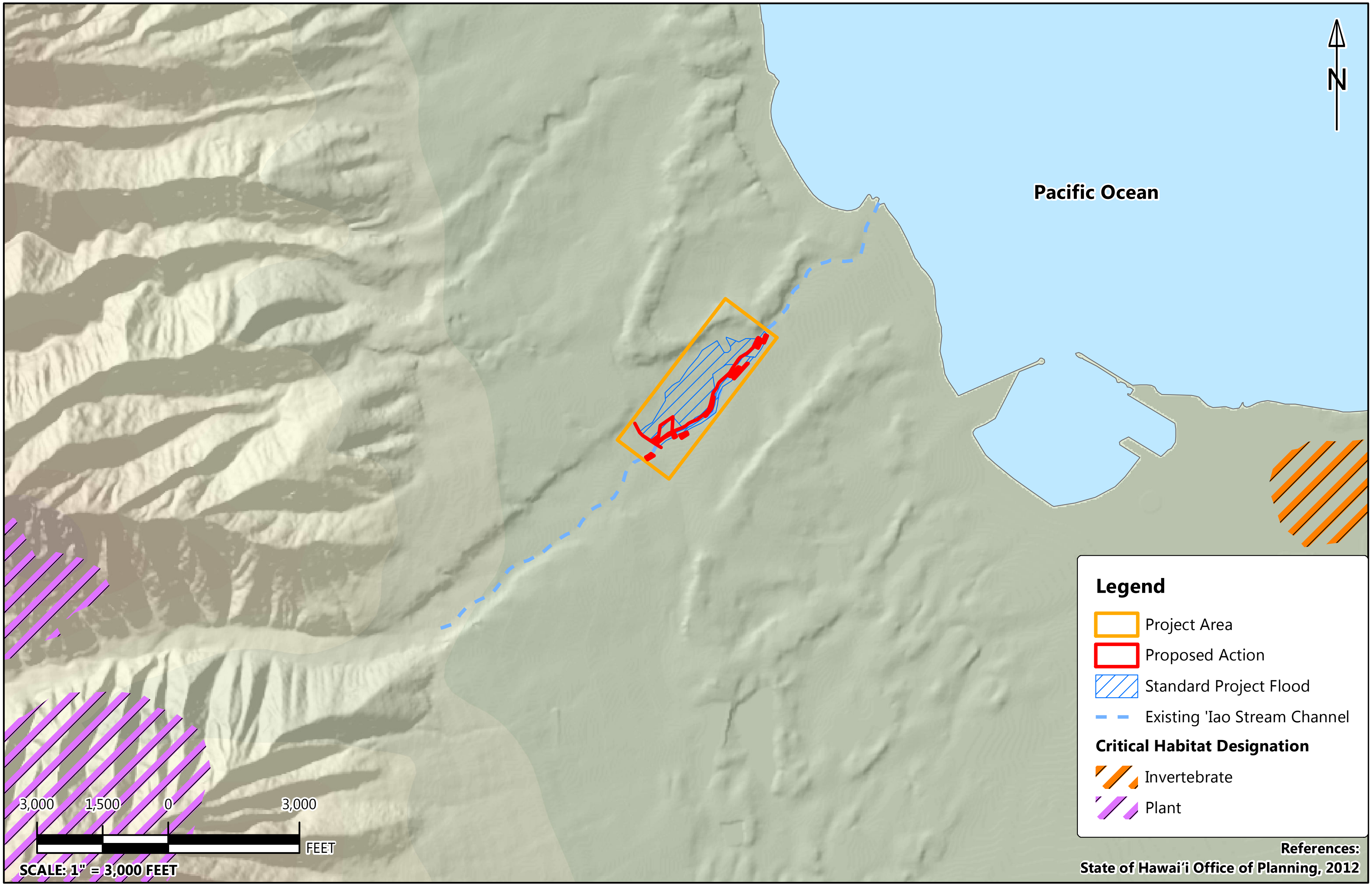
3.5.5 Potential Impacts and Mitigation

<u>No Action</u>

Under the No Action Alternative, the project area would remain unchanged and there would be no change to the current existing condition of the biological resources within or in the vicinity of the project area. There would be continued adverse impacts to the downstream marine ecosystem caused by sediment runoff originating from erosion of the stream bank upstream during storm events. Biological resources within the marine habitat within the vicinity of the stream mouth would continue to be impacted from sedimentation suspended in runoff waters.

<u>Proposed Action</u>

Implementation of the Proposed Action would result in less than significant short-term impacts on biological resources within the project area during the construction period. The two staging areas



ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT

CRITICAL HABITAT MAP
WAILUKU, MAUI, HAWAI'I

FIGURE 3-5

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required for the construction of the overflow channel system as well as grading activities required for the construction of the overflow channel may result in temporary loss of vegetation and habitat for terrestrial species during the construction period. However, no threatened or endangered species, or critical habitat for any threatened or endangered species, occur within the project area, and terrestrial species that are known to occur in the project area are mostly widespread common species.

In addition, displaced terrestrial flora and fauna would be expected to return to the project area following completion of construction activities; therefore, the loss or disturbance of habitat within the project area during construction activities would be less than significant short-term impacts. No irrevocable loss of habitat, ongoing takes, or direct mortality of threatened or endangered species would occur due to the O&M of the proposed overflow channel system.

Temporary increase in stream or marine sedimentation may occur as a result of construction activities. BMPs including silt fencing, wetting bare soil, covering soil, and post construction re-vegetation would be utilized to limit adverse impacts on the stream and marine habitat. Concrete structures within the stream would be constructed in halves in order to avoid impediment of stream flow. The Proposed Action would also comply with Section 404 (b)(1) of the CWA, which regulates dredge and fill material deposited into U.S. waters. As a result, short-term impacts on biological resources due to stream or marine sedimentation would be considered less than significant.

Construction of the 15-ft wide gravel maintenance road along the stream channel would result in loss of vegetation along the proposed stretch of the road; however, the terrestrial species that are known to occur within the area are mostly widespread common species, thus no significant adverse impacts to the biological resources within the area is expected. In the long-term, the Proposed Action is expected to have beneficial impacts on the biological resources within the stream and the nearshore marine environment. The overflow channel system would divert high-velocity and high-volume flood flows into the existing left-bank floodplain thereby reducing the main channel flow in the approximately 3,200-ft long reach of the stream. This would result in reduced erosion of the stream banks within the main channel, allowing for less sediment to be directly transported to the stream mouth and into the nearshore marine environment. Improved water clarity and reduced sedimentation would have positive impacts on the coral species as well as the marine invertebrate species supported by the coral reef.

In addition, the overflow channel system would allow flood waters to be dispersed into the natural floodplain where sediment and other entrained constituents would be able to settle out instead of being directly channeled downstream and into the nearshore marine environment. A sedimentation study was conducted to assess the potential changes in sediment loads associated with the Proposed Action

(Appendix H). The study focused on sediment loads resulting from channel erosion within the stream section from immediately upstream of the proposed overflow channel to the point where the diverted water reenters the main stream channel. The rate of sediment loss from this stream section without diversion is estimated at 1,044 metric tons per hour (Mg/hr) during a SPF flow event.

The study shows that diversion of stream waters at the overflow channel section alone would result in a reduced sediment loading rate of 288 Mg/hr or an estimated 72% reduction in total sediment lost during a SPF event. Bank stabilization included in the Proposed Action is expected to further reduce total sediment losses from the main stream channel.

In order to estimate the sediment yield from the overflow channel/floodplain during a SPF event, the same method used to estimate sediment loads resulting from erosion within the main channel was utilized with modifications to account for reductions in erosion potential due to the presence of vegetative cover within the overflow channel/floodplain. The majority of the floodplain is currently vegetated due to its use as pasture land and small agriculture production. The overflow channel would be grassed following grading of the area for erosion control. The rate of sediment loss originating from within the overflow channel area and floodplain during a SPF event for the current condition is estimated at 97 Mg/hr. Although diversion of flood waters would result in transport of sediment from the floodplain into the main channel to some extent, implementation of the Proposed Action would result in overall reduction in sediment load downstream of the proposed project area. The Proposed Action is expected to have a beneficial impact in respect to mitigating the suspended sediment load entering Kahului Bay.

Decrease in sedimentation and turbidity is expected to improve water clarity and the current condition of reef habitats within the nearshore environment. Improved water quality may also have positive impacts on the green sea turtles that nest on beaches within the vicinity of the mouth of ʻĪao Stream.

The USFWS raised concerns regarding potential impacts to the endangered Hawaiian Stilts from the potential of "attractive nuisance" of ponding floodwaters within the floodplain during flood events. The length of time that floodwaters would remain in the floodplain is dependent upon the magnitude of the storm event; however, is not expected to be greater than nine hours. Based on this estimation, ponding floodwaters in the floodplain may temporarily attract the Hawaiian Stilts but would not create a permanent nesting or foraging ground that would otherwise may potentially have impacts on the population distribution of the species.

Considering that flood events large enough to create ponding in the floodplain would be sporadic, impacts to Hawaiian Stilts are anticipated to be less than significant. According to the April 2014 Planning Aid Letter (PAL) provided to the USACE by the USFWS (included as Appendix I), the Service concurs with this determination; however, consultation is yet to be finalized. Once consultation with USFWS is complete, documentation will be included in the final EA.

Per ER 1105-2-100, *Planning Guidance Notebook* C-3.d.(3)(l), it is USACE's policy to "demonstrate that damages to significant ecological resources have been avoided or minimized to the extent practicable; that unavoidable damages to these resources have been compensated to the extent justified; and, that restoration opportunities for significant ecological resources have been given appropriate consideration during the project planning phase." ER 1105-2-100, C-3.e. states that USACE must "ensure that project-caused adverse impacts to ecological resources have been avoided or minimized to the extent practicable, and that remaining, unavoidable impacts have been compensated to the extent justified. The recommended plan and the NED plan, if not one in the same, shall contain sufficient mitigation to ensure that either plan selected will not have more than negligible adverse impacts on ecological resources (Section 906(d), Water Resources Development Act [WRDA] 1986).

Native and indigenous freshwater gobies as well as shrimp and snail observed in 'Īao Stream are becoming increasingly rare and are ecologically and culturally significant to the region. These aquatic species require continuous flow of the stream to complete their reproductive life cycle. Any impediment to stream water flow would adversely impact the survival of these species.

The Proposed Action would not impact the ability for an IIFS of greater than 5 mgd to remain in the channel through the project area and downstream to the stream mouth and has been designed to facilitate fish passage by incorporating a 15-ft wide opening in the diversion wall. The invert of the diversion wall would be at or below the existing stream bed elevation to allow for the stream to flow continuously during low-flow conditions. Flow velocity through the opening would be controlled by the natural riffles and pools formed by the existing boulder stream bed both up and downstream of the diversion wall. Additionally, fully grouted riprap was selected as the best revetment type for the lateral overflow weir to accommodate high stream velocities and increased levels of turbulence resulting from changes in the stream flow direction. This type of revetment would conform to the existing stream bed and is anticipated to provide sufficient rugosity for migrating organisms to grasp and rest.

The Proposed Action would result in less than significant short-term impacts on biological resources during the construction period and would not result in significant direct, indirect, or cumulative impacts to the existing biological resources within and in the vicinity of the project area. Since the Proposed Action has been designed to avoid any adverse impacts to the existing biological resources within the stream, mitigation measures are not required as part of the proposed project.

During the alternatives formulation process in the past, project design features intended to minimize environmental disturbance such as adding structural features within the stream to facilitate aquatic organism passage or creating shaded areas to provide reduced water temperatures for aquatic species were considered. Previous design alternatives included modification or disturbance to a larger section of the stream reach (as compared to the current Proposed Action) which would have resulted in unavoidable adverse impacts to biological resources; as such, those impacts required measures to mitigate impacts to biological resources and also included opportunities to construct design features that would support native aquatic species habitat function within the modified portions of the stream.

During a recent coordination meeting with the resource agencies (USFWS, EPA, NMFS, DAR, and COM) on September 17, 2014, USACE provided an overview of the Proposed Action and explained that mitigation measures would not be required since no channel hardening within the stream would be conducted and no significant impacts to biological resources would be anticipated. The resource agencies concurred with this determination and expressed support on the Proposed Action. The meeting minutes from this meeting are included in Appendix E.

3.6 HISTORICAL AND CULTURAL RESOURCES

3.6.1 Definition of Resource

Cultural resources represent and document activities, accomplishments, and traditions of previous civilizations, and link current and former inhabitants of an area. Depending on their conditions and historic uses, these resources may provide insight to living conditions in previous civilizations and may retain cultural and religious significance to modern groups.

Archaeological resources comprise areas where prehistoric or historic activity measurably altered the earth or deposits of physical remains (e.g., arrowheads, bottles). Architectural resources include standing buildings, districts, bridges, dams, and other structures of historic or aesthetic significance. Architectural resources generally must be more than 50 years old to be considered for inclusion in the National Register of Historic Places (NRHP), an inventory of culturally significant resources identified in the U.S.; however, more recent structures, such as Cold War-era resources, may warrant protection if they have the potential to gain significance in the future. Traditional cultural resources can include archaeological resources, structures, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other groups consider essential for the persistence of traditional culture.

3.6.2 Regulatory Setting

Several Federal laws and regulations have been established to manage cultural resources, including the NHPA of 1966, the Archaeological and Historic Preservation Act (1974), and the Archaeological Resource Protection Act (1979). In order for a cultural resource to be considered significant, it must meet one or more of the following criteria for inclusion on the NRHP:

"The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design setting, materials, workmanship, feeling, and association and: (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives or persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history" (CFR, Title 36, Part 60:4; 2004).

The DLNR State Historic Preservation Division (SHPD) works to preserve and sustain historical and cultural resources through three branches: History and Culture, Archaeology, and Architecture. The SHPD maintains the statewide inventory of Historic Properties and reviews development projects in order to lessen the effects of change on Hawaiʻi's historical and cultural assets. Administrative rules pertaining to historic preservation in Hawaiʻi can be found in HAR chapters 197-198, 275-284, and 300. Statutes pertaining to historic preservation in Hawaiʻi are found in HRS chapter 6E.

Traditional cultural practices acknowledged in the State of Hawaiʻi include rights of access and gathering. Traditional gathering rights have been codified in HRS 1-1 and 7-1, Article 12-7 of the Constitution of the State of Hawaiʻi, and affirmed in various legal decisions. In order to exercise traditional gathering rights in the State of Hawaiʻi, an individual must establish the following: he/she must qualify as "native Hawaiian"; he/she must establish that their claimed right is protected as a customary or traditional native Hawaiian practice; AND he/she must prove that the exercise of that right will occur on undeveloped or "less than fully developed property" (SOEST, 2014).

Articles IX and XII of the State Constitution of Hawaiʻi (Chapter 343, HRS) require government agencies to promote and preserve cultural beliefs, practices, and resources of native Hawaiian and other ethnic groups. The "Guidelines for Assessing Cultural Impacts", adopted by the Environmental Council of the State of Hawaiʻi (1997), identifies the protocol for conducting cultural assessments.

3.6.3 Existing Conditions

Regional and Local History

During the pre-Contact and early post-Contact periods ʻĪao Valley and the greater Wailuku area was a political and ceremonial center (Cordy 1981, 1996; Kirch 1985, as cited in PCSI, 2014). ʻĪao Valley and the surrounding area were home to many chiefs and a large population, making Wailuku a "chiefly center". The literal translation of ʻĪao is "cloud supreme" and was once a sacred burial place for chiefs. Numerous heiau were once present in the area, which indicates ʻĪao Valley was of ceremonial importance during the pre-Contact period. During the early historic period several famous battles were fought from the coast to the valley. Land Commission Awards granted in the mid-nineteenth century in lower ʻĪao Valley indicate a substantial population was once present in the area and that the land was agriculturally very important.

Background research on land use history indicates that the project area contained *loʻi* (taro) patches during the pre-Contact and early historic periods. Over a century of sugarcane farming in the area has undoubtedly impacted remnant evidence of traditional *lo'i* and associated pre-Contact or early historic sites. The potential for encountering human burials or habitation sites is considered low due to previous disturbance by sugarcane agriculture, in addition to natural events that altered the landscape, such as the flood of 1916. Potential for other pre-Contact or early historic features associated with traditional agriculture is also considered low. However, if such features are extant in subsurface layers, they may be evidenced by stone and earthen terraces, alignments, walls, and *ʻauwai*. Associated artifacts may include lithic artifacts such as basalt cores, adzes, flakes, or poi pounders.

Based on historic information, the project area may contain evidence of temporary, small scale habitations associated with *loʻi* or sugarcane fields. Evidence of traditional camps may be lithic artifacts (adzes, flakes, etc.), faunal remains, and charcoal associated with imu (traditional underground oven). Historic period camp sites may additionally include historic artifacts (metal, ceramic, and glass assemblages).

Archaeology

Numerous archaeological investigations have been conducted in ʻĪao Valley. Previous work has included archaeological assessments, archaeological surface survey, archaeological inventory survey, archaeological subsurface testing, and archaeological monitoring (PCSI, 2014). A few of these projects were carried out within or near the current project area. The following section focuses on projects conducted in the immediate vicinity of the project area in order to compare previous findings of land use.

In 1998, Scientific Consulting Services, Inc. (SCS) conducted an archaeological reconnaissance survey and limited subsurface testing for the 'Īao Stream Flood Control Project (Burgett and Spear, 2003). The reconnaissance survey that included the current project area revealed only one site (SIHP No. 50-50-04-4755) located in the vicinity but outside of the boundaries of the proposed overflow channel (Figure 3-6). The site comprises three features: a concrete foundation with concrete troughs, a soil-filled terrace and retaining wall, and wall remnant. These features were interpreted as a small historic habitation complex-activity area. The excavation of three test units at the site revealed historic and recent materials (modern debris). Historic materials were possibly associated with a post-Contact (late nineteenth or early twentieth century) agricultural site. According to local informants, the area of the find was formerly a piggery. Architectural and surface remains were minimal.

This site was initially assessed as significant under Criterion D, due to its potential to yield information important to research on the history in the area, but based on the information obtained from recordings and excavations at the site during the survey, the site was deemed to be no longer significant. No further work was considered necessary or recommended for the site (Burgett and Spear, 2003).

An archaeological inventory survey was carried out in 2004 by SCS for the proposed Imi Kala Street and Neki Place Extensions (Tome and Dega 2004). Eleven test trenches were excavated at various locations in the general project area, but outside the boundaries of the Proposed Action. The testing revealed that evidence of former *lo'i* is extant in the lower valley. Four archaeological sites were documented (Figure 3-6), one of which, Spreckels Ditch (SIHP No. 50-50-04-1508), was previously recorded. SIHP No. 50-50-04-5564 is the historic bridge constructed for Wailuku's sugarcane industry; SIHP No. 50-50-04-5565 is former lo'i used during the pre-Contact and early post-Contact periods; and SIHP No.50-50-04-5566 is a small, concrete-lined irrigation ditch constructed by the sugarcane industry and utilized by the more recent macadamia nut industry. A radiocarbon dated soil sample containing organic material yielded a calibrated date range of 1180 to 1290 AD (at 2 sigma) and 1231 to 1272 AD (at 1 sigma). No other traditional archaeological sites or features were identified.

A limited archaeological inventory survey (AIS) was conducted by Pacific Consulting Services, Inc. (PCSI) in May 2014 to determine the presence/absence of significant cultural deposits within the project area. The AIS employed a parquet-style configuration of ten 20m-long and 1.2m-wide trenches distributed systematically across the proposed overflow channel area where ground-disturbing activities are being proposed.

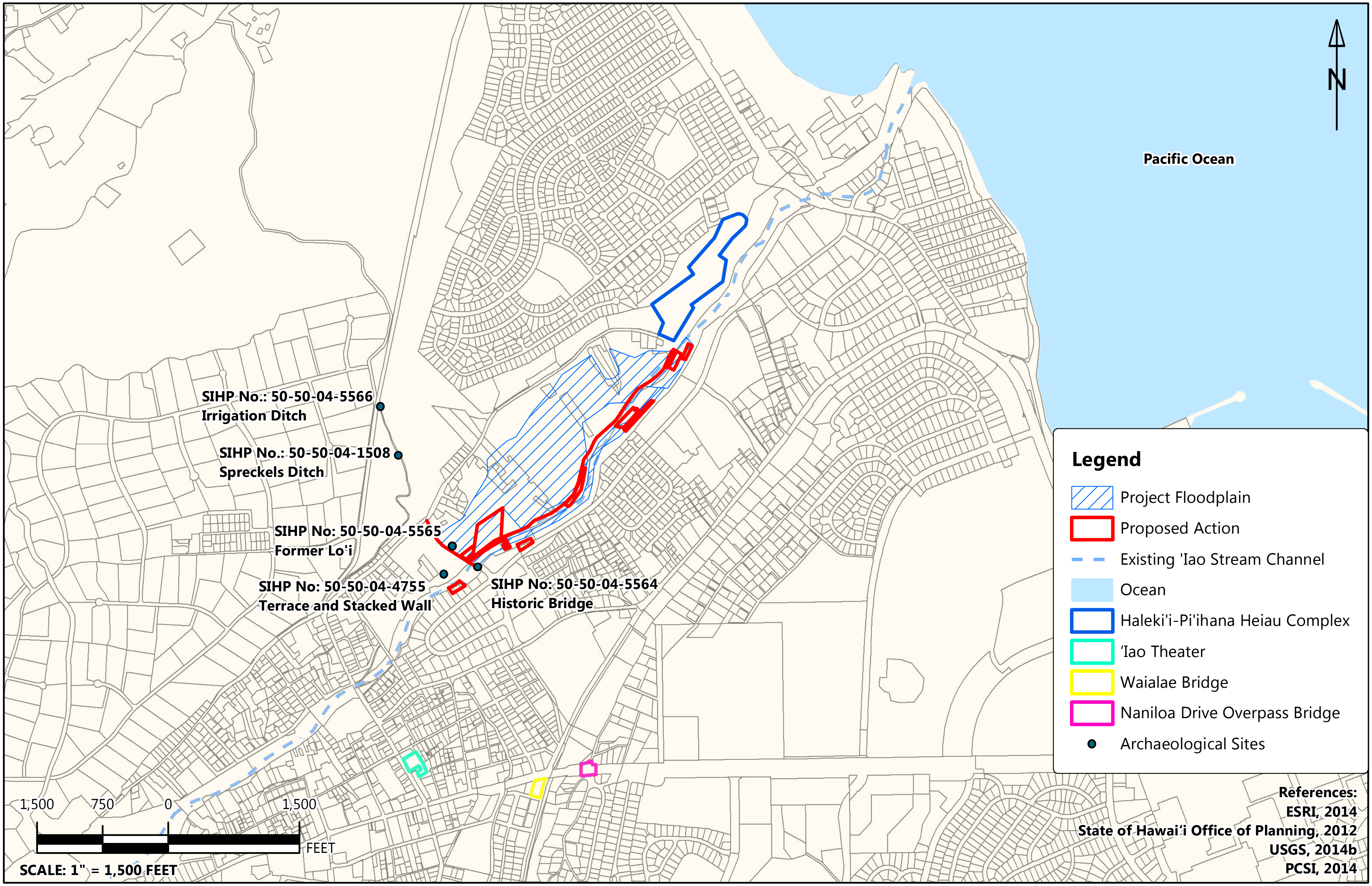
The subsurface survey yielded no definitive evidence of pre-Contact/early post-Contact *lo'i* in the area, nor was there evidence of temporary pre-Contact occupation associated with *lo'i* or post-Contact occupation associated with sugar cane cultivation. There was no sign of subsurface features (pits, post molds, fire features, etc.) at the base of the sugar cane plow zone, or associated with layers below the plow zone. There were no buried *loʻi* walls present and no evidence of decomposing taro corms in any of the subsurface layers. The AIS report that includes the detailed results of the subsurface testing and soil analysis is included as Appendix J.

Section 106 Coordination and Consultation

Initial cultural resources coordination and consultation with the State of Hawaiʻi Historic Preservation Officer (SHPO) was based on the earlier suite of alternatives evaluated in the Draft EA (2009), and included the assumption that construction efforts would be confined to the existing stream channel. Based on that initial suite of alternatives, no effects on historic properties or significant cultural resources were anticipated. The USACE summarized this finding of "no effect" in letters to the SHPO and Office of Hawaiian Affairs (OHA), as well as the County of Maui Cultural Resources Commission, the Central Maui Hawaiian Civic Club, and the President of the Association of Hawaiian Civic Clubs. The SHPO was contacted initially in 1996 and responded with concurrence in a letter to the USACE (Appendix E). A second set of letters was sent to both SHPO and OHA in 2005, and a response was received from OHA requesting that archeological level survey work be conducted in the project area. The third round of letters was sent to SHPO, OHA, the County of Maui Cultural Resources Commission, the Central Maui Hawaiian Civic Club, and the President of the Association of Hawaiian Civic Clubs in 2007, requesting Section 106 consultation. The EA process was halted in 2009, however, and the consultation process was similarly halted.

The Proposed Action involves ground-disturbing activities outside of the existing stream channel, and thus the prior assumptions and results of consultation are no longer entirely applicable to this EA. USACE reinitiated scoping with the SHPO in late 2013. USACE staff met with the Maui SHPD during the week of December 2, 2013 to describe the Proposed Action and continued consultation with a site visit. SHPD noted concerns that a historical Native Hawaiian loʻi may be present within the affected portion of the project area.

It was decided during the meeting that a reconnaissance level AIS would be completed within the portion of the left bank overflow channel where ground-disturbing activities would take place during construction, but that no surveys would be required within the floodplain where stream waters would be diverted to until returning to the main channel downstream. The preliminary findings of the AIS conducted in May 2014 were forwarded to SHPD via email in June 2014 (Appendix E). The formal



ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT

HISTORICAL AND CULTURAL RESOURCES MAP
WAILUKU, MAUI, HAWAI'I

FIGURE 3-6

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Section 106 consultation process will be initiated with submittal of the AIS for SHPD review and comment. This draft EA will be updated with Section 106 consultation letters as they become available.

Historic/Cultural Resources

A total of 31 properties and historic districts are listed on the NRHP for Maui County. Of the 31 listed properties, two are located within 0.5 miles of the project area (Figure 3-6). The two properties located within 0.5 miles of the project area are the ʻĪao Theater and the Waialae Bridge. The ʻĪao Theater is located approximately 0.42 miles from the project area on North Market Street and the Waialae Bridge is located approximately 0.48 miles from the project area on Waialae Road (SHPD, 2014).

The Hawaiʻi Register of Historic Places formally recognizes districts, sites, structures, buildings and objects and their significance in Hawaiʻi's history, architecture, archaeology, engineering and culture. A total of 64 properties and historic districts are listed on the Hawaiʻi Register of Historic Places for Maui County. Three of the 64 properties are located within 0.5 miles of the project area (Figure 3-6). Both the ʻĪao Theater and Waialae Bridge are included on the Hawaiʻi Register of Historic Places. In addition, the Naniloa Drive Overpass Bridge is located approximately 0.49 miles of the project area on Naniloa Drive (SHPD, 2014)."

An oral history survey was conducted in November of 2003 by Social Research Pacific, Inc. (SRP), to obtain information regarding properties of cultural and historical significance from Hawaiian *kūpuna,* Hawaiian elders, that live on Maui. Along with interviews, information about traditional cultural properties (TCPs) was gathered from written and archival sources and incorporated in a Cultural Impact Assessment (CIA) in accordance with National Park Service guidance (Parker and King, 1995). Based on the research and interviews incorporated into the CIA, there are no known TCPs within the immediate vicinity of the project area, and traditional land uses of the project area have been discontinued. Area residents responded during interviews and at the public meeting with concerns about erosion, channelization of the stream, and impacts to native stream biota. The full report is provided in Appendix K, and key points are presented in more detail below.

The ʻĪao Valley, as with the remainder of the Wailuku ahupuaʻa, has unique significance to native Hawaiian culture. Changes in land ownership, military presence, sugar cane farming, and general urbanization have over time, however, dramatically altered the land uses within ʻĪao Valley. Remnants of old buildings and traditional land uses are being phased out by the influx of urban growth in the valley. Traditional practices had been discontinued even before the rise of sugar cane farming in the project location.

Even with the substantial change to this cultural landscape, vestiges of its highly significant past do remain and the Wailuku region retains its traditional significance. Oral history from Hawaiian *küpuna* indicates there are three known TCPs in the vicinity of the project area but not within the boundaries of the Proposed Action:

- Halekiʻi-Piʻihana *heiau* complex (Figure 3-6).
- Fresh water spring (listed as *Waiola* by the Commission on Water Resource Management [CWRM]), located on the Sevilla property.
- Burials along the sand dunes and at Mahalani Cemetery (Piʻihana side). The burials within the sand dunes are well known and recorded.

Possible cultural impacts were assessed using a questionnaire-based survey for existing residents within the project area. Thirty-two residents of the project area were surveyed. The majority of individuals interviewed have not witnessed severe floods, and expressed more concern over erosion than flood control. Although most of the interviewees rarely use the stream for recreational and/or social purposes, the community's concern is concentrated around social and recreational values of the ʻĪao Stream, including a concern that the proposed flood control measures will only lead to more inefficient water flow to further promote degradation of the natural stream.

The CIA also noted that the Halekiʻi-Piʻihana Heiau State Monument lies along the bank of the ʻĪao Stream, near the downstream limits of the project. Specifically, the report noted that continued erosion of the stream bank could lead to the land beneath the heiau being compromised.

The USACE sent a copy of the CIA to OHA summarizing the cultural study conducted for the project and including a "no adverse effect" determination. The OHA responded in a letter dated October 30, 2007 (Appendix E), that included an appreciation for the number of sources consulted in preparation of the CIS, but noted their concerns about the presence of numerous culturally significant sites and native Hawaiian practices in the vicinity of the project. These concerns are addressed in the Section 106 consultation letter sent to OHA in November 2007 as well as in this draft EA, a copy of which will be forwarded to OHA for their review.

3.6.4 Approach to Analysis

Cultural resources are subject to review under both Federal and State laws and regulations. Section 106 of the NHPA empowers the Advisory Council on Historic Preservation to comment on Federally initiated, licensed, or permitted projects affecting cultural sites listed or eligible for inclusion on the NRHP.

Once cultural resources have been identified, significance evaluation is the process by which resources are assessed relative to significance criteria for scientific or historic research, for the general public, and for traditional cultural groups. Only cultural resources determined to be significant (i.e., eligible for the NRHP) are protected under the NHPA.

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Direct impacts may occur by 1) physically altering, damaging, or destroying all or part of a resource; 2) altering the characteristics of the surrounding environment that contribute to resource significance; 3) introducing visual, audible, or atmospheric elements that are out of character with the property or alter its setting; or 4) neglecting the resource to the extent that it is deteriorated or destroyed.

Identifying the locations of proposed actions and determining the exact locations of cultural resources that could be affected can assess direct impacts. Indirect impacts primarily result from the effects of project-induced population increases and the resultant need to develop new housing areas, utilities services, and other support functions necessary to accommodate population growth. These activities and the subsequent use of the facilities can disturb or destroy cultural resources.

3.6.5 Potential Impacts and Mitigation

<u>No Action</u>

Under the No Action Alternative, the overflow channel system would not be constructed. The project area would remain unchanged from current conditions and there would be no direct impacts to any potential archaeological, historic, or cultural resources within the project area. Under the No Action Alternative, there could be indirect adverse impacts to cultural resources outside of the project area. The Halekiʻi-Piʻihana Heiau State Monument lies along the bank of the ʻĪao Stream, near the downstream limits of the project. The location of this *heiau* has been identified as a potentially high erosion area, and inadequate flood control measures may compromise the land on which the *heiau* is situated.

<u>Proposed Action</u>

Implementation of the Proposed Action would have less than significant short-term impacts on historic and cultural resources within the project area during the construction period. Archaeological and cultural resources have been encountered in ʻĪao Valley during prior investigations, but at this time no such resources are known to exist within the project area.

Although no evidence of pre-Contact use of the project area was found during the subsurface AIS conducted in May 2014, background and archival documentation indicate that pre-Contact or early historic *loʻi* agriculture occurred in the general region; therefore, archaeological monitoring by a qualified archaeologist should be conducted during ground disturbing activities to ensure proper treatment of any possible subsurface historical, cultural, and/or archaeological resources encountered. If required, an Archaeological Monitoring Plan (AMP) shall be completed prior to the start of construction activities by a qualified archaeologist and submitted to the SHPD for review and comment before its finalization.

Implementation of the Proposed Action is not anticipated to have short- or long-term adverse effects on historic properties because no historic properties are located within or adjacent to the project area. In addition, implementation of the Proposed Action is not anticipated to have short- or long-term adverse impacts on traditional or cultural practices at the project site. Based on written history, oral information from Hawaiian *kūpuna*, and a questionnaire-based survey, no immediate/direct changes are foreseen to known TCPs. The Proposed Action would not exacerbate any of the other main concerns raised by area residents: stream channelization or destruction of native stream habitat, and it would prevent increased erosion. Public access to the project area would remain unchanged.

Once developed, the operation and maintenance of the Proposed Action would require clearing the overflow channel and diversion weir once every five years and grass cutting at the diversion weir, new berm, and access road six times a year. These activities are infrequent, cover a minimal footprint, do not involve ground-disturbing activities, and thus would not result in any irrevocable loss of historic or cultural resources. As a result, long-term impacts on historic or cultural resources would be less than significant.

3.7 LAND USE

3.7.1 Definition of Resource

Land use is comprised of natural conditions or human-modified activities occurring at a particular location. Human-modified land use categories include residential, commercial, industrial, transportation, communications and utilities, agricultural, institutional, recreational, and other developed use areas. Management plans and zoning regulations determine the type and extent of land use allowable in specific areas and are often intended to protect specially designated or environmentally sensitive areas.

3.7.2 Regulatory Setting

The CZMA requires direct Federal activities and development projects to be consistent with approved state coastal programs to the maximum extent practicable. Also, Federally-permitted, licensed, or assisted activities occurring in, or affecting, the State's coastal zone must be in agreement with the Hawaiʻi Coastal Zone Management (CZM) Program's objectives and policies. Federal agencies cannot act without regard for, or in conflict with, State policies and related resource management programs that have been officially incorporated into State CZM programs (15 CFR 930).

The State Land Use Law (HRS Chapter 205) established a framework of land use management and regulation in which all lands in the State of Hawaiʻi are classified into one of four land use districts. The Land Use Commission (LUC) was established by the State legislature in order to administer the land use law.

The Maui County Planning Department offers technical advice to the Mayor, County Council, and commissions; proposes zoning legislation; drafts updates to the General Plan, Maui Island Plan, and Community Plans; presents reports and recommendations on development proposals; and oversees programs on cultural resources, census and geographic information, flood plain permits, and other special projects and permits (Maui County, 2014a).

According to the 2002 Wailuku-Kahului Community Plan, land use decisions for the Wailuku-Kahului district should be made with the intent to promote an attractive, well-planned community with a mixture of compatible land uses in appropriate areas to accommodate the future needs of residents and visitors. Those needs shall be met in a manner that provides for the social and economic well-being of residents and the preservation and enhancement of the region's environmental resources and traditional towns and villages (Maui County Council, 2002).

3.7.3 Existing Conditions

<u>Land Use</u>

The ʻĪao Stream Flood Control Project is located within the Nā Wai ʻEhā Watershed on the north side of the island of Maui. The ʻĪao Stream drainage basin is a 10 square mile area that begins at the boundary between the Lahaina and Wailuku Judicial districts and extends along the crests of the Kahoolewa and Kapilau Ridges to the Pacific Ocean. Land use activities surrounding the project area include residential, commercial, and public lands designated as either Urban or Agricultural, according to the State LUC district classifications. Residences are located immediately on the right bank of the stream where the raised berm is proposed to be constructed on the left bank of the stream. The closest residences to the proposed overflow channel system section are located approximately 250 ft to the southeast on the right bank of the stream. The floodplain on the left bank including the area where the overflow channel would be constructed was cleared of illegal tenants and encroachments by the County of Maui in 2013. The floodplain is currently covered with vegetation with no existing structures. None of the surrounding parcels are designated as Conservation land use districts (Maui County, 2014b).

Zoning

Under the Proposed Action, construction activities would involve eight parcels of land. In addition, 13 parcels of land totaling approximately 153 acres would be included within the designated floodplain. All land, easements, rights-of-way, relocation, and disposal areas (LERRD) required for the Proposed Action is included in the Real Estate Plan (included as Appendix E of the EDR). The parcels within and surrounding the project area are designated as Urban or Agricultural, according to the State LUC district classifications (Figure 3-7). The project area does not include any Agricultural Lands of Importance to the State of Hawaiʻi (ALISH). The land parcel zoning information of the parcels located within the proposed construction area and designated floodplain are summarized in Table 3-5.

Coastal Zone Consistency

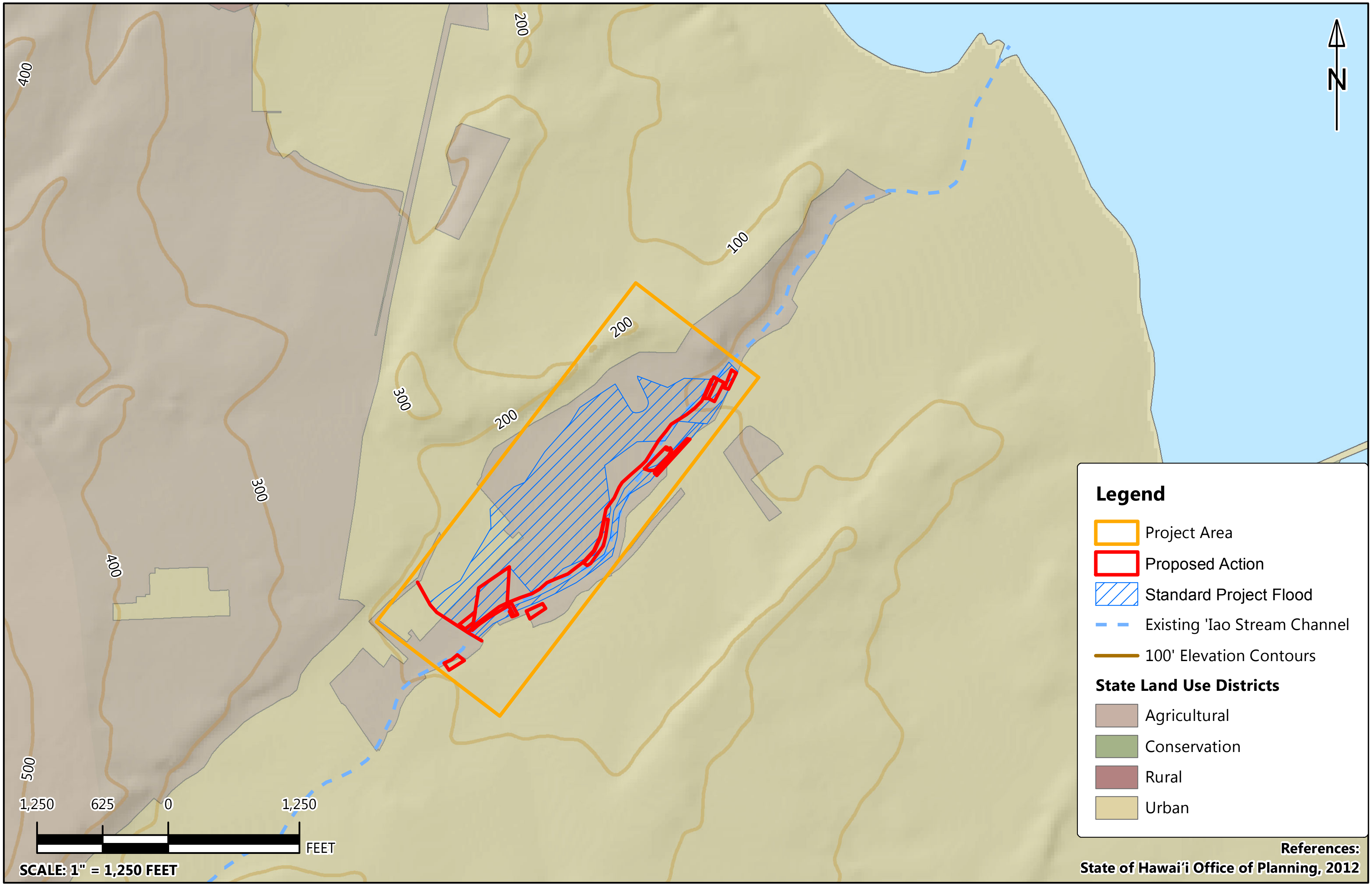
The entire island of Maui falls within the coastal zone, and is therefore under the jurisdiction of the CZM Program, which was established in compliance with the CZMA. The program is administered by the State of Hawaiʻi Office of Planning and is intended to provide for the effective management, beneficial use, protection, and development of the coastal zone (HRS 205A).

Tsunami Hazard Zones

The project area is located outside of the tsunami evacuation zone as determined by Maui County Department of Planning (Maui County, 2014b).

3.7.4 Approach to Analysis

Significance of potential land use impacts is based on the level of land use sensitivity in areas affected by a proposed action. In general, land use impacts would be significant if they would: 1) be inconsistent or noncompliant with applicable land use plans or policies; 2) preclude the viability of existing land use; 3) preclude continued use or occupation of an area; or 4) be incompatible with adjacent or vicinity land use to the extent that public health or safety is threatened.



ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT

STATE LAND USE DISTRICTS MAP
WAILUKU, MAUI, HAWAI'I

FIGURE
3-7

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Table 3-6: Land Parcel Information

Tax Map Key (TMK) Number	Feature	Parcel Area (acres)	State Land Use District	Maui County Zoning Designation	Fee Owner	Lessee
(2) 3-4-032:001	Overflow Channel/ Maintenance Road/ Staging Area	100.0 acres	Urban and Agricultural	County's R-2 Residential District; County's Agricultural District; County's PD Project District	RCFC Piihana LLC	-
(2) 3-4-031:001	Raised Berm/ Floodplain Outflow/ Maintenance Road	46.97 acres	Agricultural	County's Agricultural District	Lindsey, Noenoe Marks; Haller, Michele Lee; Haller, Stephen Daniel	-
(2) 3-4-030:888	Concrete Diversion Weir/ Floodplain Outflow/ Slope Revetment/ Bank Stabilization	unknown	Agricultural	-	Maui County	-
(2) 3-4-030:020	Staging Area	2.91 acres	Agricultural	County's R-2 Residential District	KLD Holdings LLC	-

Tax Map Key (TMK) Number	Feature	Parcel Area (acres)	State Land Use District	Maui County Zoning Designation	Fee Owner	Lessee
(2) 3-4-030:002	Floodplain Outflow/ Maintenance Road	6.36 acres	Agricultural	-	Haller, Michele Lee; Sera, Sadao; Kishaba, Mildred; Lindsey, Noenoe Mark; Haller, Stephen Daniel; Kishaba, Richard R.; Kaailau, Kanae; Victor, Joseph Aiona; Sera, Agnes Mitsuko	-
(2) 3-4-020:044	Bank Stabilization	0.31 acres	Urban	County's M-1 Light Industrial	Laborers International	-
(2) 3-4-020:045	Bank Stabilization	0.30 acres	Urban	County's M-1 Light Industrial	Parker Plaza	-
(2) 3-4-020:046	Bank Stabilization	0.25 acres	Urban	County's M-1 Light Industrial	Cerizo	-
(2) 3-4-032:048	Designated Floodplain	0.26 acres	Urban	County's Agricultural District	Mukai, Tamio Trust; Suzuki, Clayton S.; Kaailau, Kanae; Gibo, Claire Trust; Mukai, Ruth Chiyoko Trust	-

Tax Map Key (TMK) Number	Feature	Parcel Area (acres)	State Land Use District	Maui County Zoning Designation	Fee Owner	Lessee
(2) 3-4-032:003	Designated Floodplain	1 acre	Urban	County's Agricultural District	Cockett, Winifred L 2006 Trust; Cockett, Gordon W 2006 Trust; Tom Sun, Mary; Cockett, Gordon; Tom Sun, Francis M	-
(2) 3-4-032:005	Designated Floodplain	0.09 acres	Urban	County's Agricultural District	Wailuku Agribusiness Co., Inc.	-
(2) 3-4-032:047	Designated Floodplain	0.90 acres	Urban	County's Agricultural District	Gibo, Claire C. Trust; Mukai, Ruth Chyoko Revoc LVG TR; Kaailau, Kanae; Mukai, Tamio Revoc Living Trust; Suzuki, Clayton S.	-
(2) 3-4-031:016	Designated Floodplain	0.375 acres	Agricultural	County's Agricultural District	Correia, Antonia G.; Joao, Marjorie Ann; Correia, Joseph Sylvester Jr.; Correia, Raynold; Correia, Abel M.	

Tax Map Key (TMK) Number	Feature	Parcel Area (acres)	State Land Use District	Maui County Zoning Designation	Fee Owner	Lessee
(2) 3-4-031:017	Designated Floodplain	1.14 acres	Agricultural	County's Agricultural District	Joao-Silva, Marjorie Ann; Correia, Joseph Sylvester Jr.; Correia, Raynold; Correia, Antonia; Correia, Abel M	
(2) 3-4-031:019	Designated Floodplain	0.54 acres	Agricultural	-	County of Maui	
(2) 3-4-031:008	Designated Floodplain	0.65 acres	Agricultural	County's Interim District	Cockett, Gordon W. Trust; Cockett, Winifred L. Trust	
(2) 3-4-031:015	Designated Floodplain	0.67 acres	Agricultural	County's Agricultural District	Masters, David R.	
(2) 3-4-031:023	Designated Floodplain	0.43 acres	Agricultural	-	County of Maui	

Source: Maui County, 2014b

3.7.5 Potential Impacts and Mitigation

No Action

Under the No Action Alternative, the overflow channel system would not be constructed. The project area would remain unchanged from current conditions and there would be no changes to current land use within or surrounding the project area. There could be indirect adverse impacts to the residential and commercial areas located along the stream bank due to the inadequate flood control measures that currently exist.

Proposed Action

The Proposed Action would involve eight parcels of land (Figure 3-8). The first parcel (TMK [2] 3-4-032:001) is privately owned and contains a mix of agricultural and undeveloped land uses. The overflow channel would be located on approximately 116,060 square feet of area within this parcel. The portion in which the overflow channel would be located contains undeveloped land that is currently not in use. Therefore, no curtailment of beneficial use would take place due to construction activities. In addition, neither of the parcels located within the proposed construction area for the overflow channel are considered special access areas such as a beach, park, or scenic vista.

Additionally, the maintenance road and the temporary staging area would be located within the first parcel as part of the Proposed Action. The maintenance road within this parcel would connect Pi‘ihana Street to the overflow channel and would continue along the west bank following the stream eventually reaching the floodplain outflow downstream. The temporary staging area would be located adjacent to the overflow channel in the undeveloped area and would be present throughout the construction period (approximately 21 months). Due to the private ownership of the parcel, a perpetual channel improvement easement, a perpetual road easement, and a temporary work area easement would be acquired by the county as part of the Proposed Action.

The second parcel (TMK [2] 3-4-031:001) is privately owned and contains mostly unused cropland adjacent to the stream. The site maintenance road, raised berm, and a portion of the floodplain outflow would be constructed in the parcel. Due to the private ownership of the parcel, a perpetual road easement, flood protection levee easement, and channel improvement easement would need to be acquired by the county as part of the Proposed Action.

The third parcel (TMK [2] 3-4-030:888) is owned by the county and contains the entirety of the channelized portion of the ‘Īao Stream flood control system. The concrete diversion weir as well as bank stabilization features, slope revetment modification, and a portion of the floodplain outflow would be located within this parcel. Currently there is no public access to the channelized portion of the ʻĪao Stream flood control system. Public access is restricted due to safety concerns arising from the periodic flooding of the stream channel.

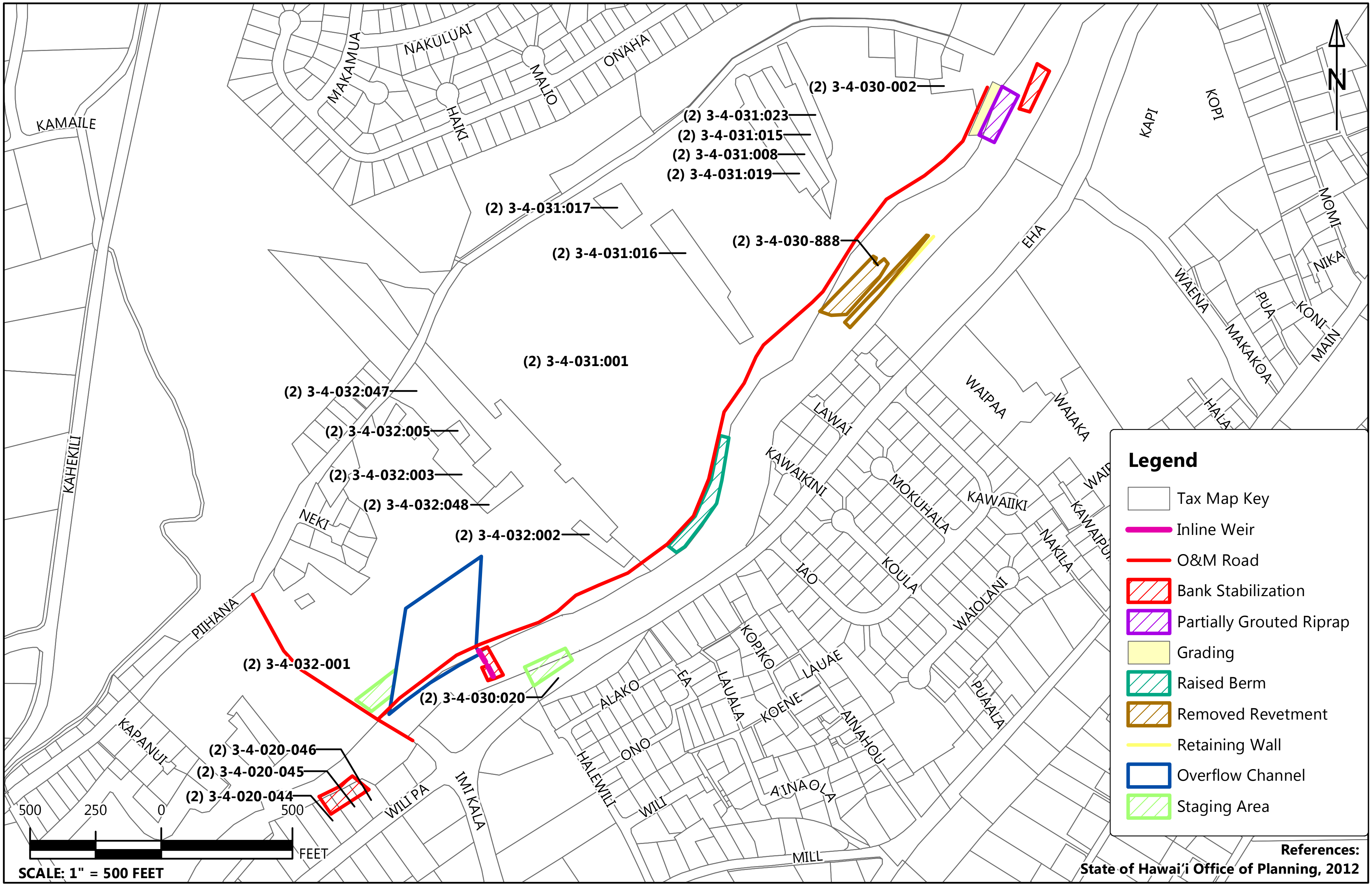
The fourth parcel (TMK [2] 3-4-030:020) is privately owned where the second staging area on the right bank of the overflow channel section would be located. Due to the private ownership of the parcel, a temporary work area easement would need to be acquired by the county as part of the Proposed Action.

The fifth parcel (TMK [2] 3-4-030:002) is privately owned and contains currently fallow cropland. The floodplain outflow and maintenance road would be located on this parcel. Due to the private ownership of the parcel, a perpetual channel improvement easement and road easement would need to be acquired by the county as part of the Proposed Action.

The sixth, seventh and eighth parcels (TMK [2] 3-4-020:044, TMK [2] 3-4-020:045, and TMK [2] 3-4-020:046) are privately owned and located within the Millyard Industrial Park. The three parcels are improved with buildings but they are on the level upland above the stream. The proposed bank stabilization work would occur on the stream bank on land that has no utility to the ownerships. Due to the private ownership of the parcels, perpetual bank protection easements would need to be acquired by the county as part of the Proposed Action.

In addition to the proposed construction area, there are 13 privately owned parcels located within the designated floodplain. The parcels located within the designated floodplain contain a mix of undeveloped and agricultural land uses. Agricultural land located within the designated floodplain would be inundated during SPF events. However, all 13 parcels located within the designated floodplain have an existing flowage easement in place that was acquired by the county as part of the original flood control project. Further, lands that are currently used for agricultural purposes would not be taken out of cultivation. As a result, agricultural and undeveloped land use within the floodplain would not be significantly affected by construction of the overflow channel.

All permits and easements necessary for the Proposed Action would be acquired in accordance with federal, state, and local laws and regulations prior to construction activities. Therefore, all improvements related to the Proposed Action would be consistent with current land use and would not result in the long-term curtailment of beneficial land use in any of the parcels involved. Short-term impacts to land use due to construction activities under the Proposed Action are considered less than significant. In the long-term, the Proposed Action would have a beneficial impact on land use as it would help to reduce flood risk for properties currently affected by floodwaters from ʻĪao Stream.



ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT

TMK MAP
WAILUKU, MAUI, HAWAI'I

FIGURE 3-8

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The Proposed Action is consistent with the goals, objectives, and policies of the Maui Island Plan (Maui County General Plan 2030) since it would not result in significant impacts to or changes in the current characteristics or identity of the affected area, including population distribution, heritage resources, economic and housing development, and infrastructure and public facilities. The Proposed Action would reduce the risk of flooding in the community of Wailuku and provide protection of life and property, which would benefit the economy and quality of life on the island, which is consistent with the objectives of the Maui Island Plan. Additionally, the Proposed Action would not result in expansion of the current urban areas in Wailuku, development of housing on vacant or underutilized agricultural lands, or curtail the use of rural/agricultural lands identified within the proposed project area. The Proposed Action would not have any significant impacts on the Urban, Small Town, or Rural Growth Boundaries outlined in the Directed Growth Plan which is the backbone of the Maui Island Plan.

The Wailuku-Kahului Community Plan includes a general description of the Wailuku-Kahului region and identifies the major problems and opportunities specific to the region. The plan identifies "the balancing of urban development and agricultural/open space uses" as a "major challenge for long-range planning of the region." The Proposed Action would be consistent with the current land use in the area; therefore, would not have significant impacts on the balance between urban development and agricultural/open space uses. In addition, the Proposed Action would not be in conflict with the goals, objectives, policies, and implementing actions identified in the plan since it would not result in significant changes to the existing social, economic, or environmental conditions within the area and would provide beneficial impacts to the community of Wailuku by providing reduced flood risks.

Once developed, the Proposed Action would be considered compatible, consistent and not in conflict with any of the objectives of the CZM program. Development of the proposed overflow channel system would not impact coastal recreation opportunities; impede economic uses; increase coastal hazards; or conflict with development within the coastal zone. The Proposed Action would require the acquisition of permits and licenses under Section 404 of the CWA. Section 404 permits are included in the lists of Federal agency, Federal license or permit, and Federal financial assistance activities that are subject to federal consistency review by the State of Hawaiʻi. Therefore, a federal consistency determination would be prepared in accordance with the requirements of applicable subparts of 15 CFR Part 930.

3.8 VISUAL AESTHETICS

3.8.1 Definition of Resource

Visual resources are defined as the natural and manufactured features that comprise the aesthetic qualities of an area. These features form the overall impressions that an observer receives of an area or its landscape character. Landforms, water surfaces, vegetation, and manufactured features are considered characteristic of an area if they are inherent to the structure and function of a landscape.

3.8.2 Regulatory Setting

According to the 2002 Wailuku-Kahului Community Plan, the visual appearance of the district is a major concern due to its role as the civic center and gateway to the island of Maui. Directives to improve visual aesthetics in the district include more aggressive litter control and enforcement; better maintenance of public park facilities, particularly those along the shoreline; enhancement of the streetscape along major public roads with tree planting; and in general, greater emphasis on the maintenance and upkeep of public areas (Maui County Council, 2002).

3.8.3 Existing Conditions

The project area is located within the Wailuku-Kahului district. The Wailuku-Kahului district is considered the industrial and financial center of Maui County with an urban core contained within an agricultural and open space landscape. According to the 2002 Wailuku-Kahului Community Plan, lands in the agricultural and conservation districts comprised over 90% of the total undeveloped lands in the district, and a substantial amount of the lands within the district were still used for agricultural production. Agricultural lands were believed to provide a buffer for urban development and to enhance the visual character of the region. The Community Plan noted that the balancing of urban development with agricultural/open space uses was a major challenge for the long-range planning of the district (Maui County Council, 2002).

The project area is located along the ʻĪao Stream approximately 1.4 miles from the shoreline within the channelized lower reaches of ʻĪao Stream constructed during the 1981 ʻĪao Stream Flood Control Project. Due to the upstream diversion of water from the stream for agricultural uses in the past, in addition to the intermittent nature of the stream itself, the length of the stream located within the project area had historically been absent of water approximately 90% of the year. However, following implementation of the IIFS for ʻĪao Stream mandated following the recent settlement of the Na Wai ʻEha Contested Case, continuous flow through the section of the stream within the project area has been restored. Riparian or terrestrial vegetation in and around the project area can be characterized as coastal dry forest. Vegetation surrounding the project area consists largely of non-native, weedy species that have established themselves in the highly disturbed banks and sand/mud bars that form in the concrete channel.

A mix of residential housing and commercial units surrounds the project area to the east and south. Agricultural and undeveloped lands surround the project area to the west and north. Residential properties along the east bank of the ʻĪao Stream makai of Imi Kala Street are separated from the stream by Eha Street. Commercial properties located along the east bank of the ʻĪao Stream mauka of Imi Kala Street are adjacent to the bank of the stream. Agricultural and undeveloped parcels located along the west bank of the ʻĪao Stream are adjacent to the bank of the stream. The project area is visible from surrounding parcels and roadways.

3.8.4 Approach to Analysis

Determination of the significance of impacts to visual resources is based on the level of visual sensitivity in the area. Visual sensitivity is defined as the degree of public interest in a visual resource and concern over adverse changes in the quality of that resource. In general, an impact to a visual resource is significant if implementation of the proposed action would result in substantial alterations to an existing sensitive visual setting.

3.8.5 Potential Impacts and Mitigation

No Action

Under the No Action Alternative, the overflow channel system and bank stabilization features would not be constructed. There would be no change to visual and aesthetic resources at the project site. Therefore, there would be no impact to visual and aesthetic resources under this alternative.

Proposed Action

Under the Proposed Action, short-term, less than significant impacts to visual and aesthetic resources within the project area during construction activities are expected to occur. These impacts would be due to the presence of construction equipment within and around the project area. The Wailuku-Kahului district is considered the industrial and financial center of Maui County with an urban core contained within an agricultural and open space landscape. The project area itself is surrounded by a mix of residential housing and commercial land uses on the east bank of the channelized stream. Agricultural and undeveloped land uses are located on the west bank of the channelized stream.

The presence of construction equipment would be limited to the proposed construction area and staging areas located adjacent to the commercial and residential parcels on the east bank and undeveloped land on the west bank of the channelized stream. Construction activities associated with the Proposed Action would not cause a significant disturbance to the surrounding visual environment and would be temporary. Additionally, construction equipment would not be placed in a special use area such as a park, beach, or scenic vista. As a result, short-term impacts to visual and aesthetic resources within the project area are considered to be less than significant.

The Proposed Action is expected to have less than significant long-term impacts to visual and aesthetic resources. Once construction is completed, the presence of the overflow channel and other proposed features along ‘Īao Stream would represent a small permanent visual change in the area. With the exception of a 6-ft tall (maximum height) earthen berm along the west bank of the ‘Īao Stream, the overflow channel and other proposed features under the Proposed Action would be completed at grade. As a result, the proposed features would blend in to the existing environment as a low-lying public water management feature and would not adversely contrast with the mix of residential, urban, and agricultural aesthetic of the project area. In addition, the Proposed Action would be compatible with the Wailuku-Kahului Community Plan which calls for the balancing of urban development with agricultural/open space uses.

Construction activities would take place on parcels of land currently developed as a channelized stream or on undeveloped lands. The undeveloped and agricultural parcels to be located within the designated floodplain would maintain their current agricultural/open space aesthetic. Therefore, the balance of urban development and agricultural/open space uses would be maintained within the surrounding project area. In addition, the overflow channel and other proposed features would be constructed largely of rock and concrete and would not be a new source of light or glare for nearby properties. As a result, long-term impacts to visual and aesthetic resources due to the operation of the Proposed Action are considered less than significant.

3.9 RECREATIONAL / RESOURCE USE

3.9.1 Definition of Resource

Recreation is comprised of terrestrial- and water-based activities associated with the local population or visitors to the island. Recreation may consist of aquatic activities such as swimming, windsurfing, surfing, fishing, jet skiing, kayaking, snorkeling, scuba diving, and water skiing. Terrestrial recreational activities may consist of shopping, indoor shooting ranges, restaurants, hiking trails, biking, jogging, and golfing. Resource use includes any commitment of natural resources such as aggregate for concrete and petroleum products to fuel construction equipment needed to construct the Proposed Action, as well as to operate and maintain it.

3.9.2 Regulatory Setting

The Maui County Department of Parks and Recreation operates and maintains the County's numerous parks, recreation areas and recreational service programs for the residents of Maui County. The Department also coordinates with other County departments on enforcement of rules and regulations for parks and recreation facilities and their use, and countywide beautification. The parks located within the project area are managed by the Recreation and Support Division, Central District (Maui County, 2014c).

3.9.3 Existing Conditions

Proposed Project Site

Under the Proposed Action, construction activities would take place on land currently developed as a flood control system and undeveloped land currently not in use. Public access to the flood control system is already not allowed due to pre-existing safety concerns. As a result, it is unlikely that recreational use currently takes place at the proposed construction area.

In addition, 13 parcels of land would be included within the designated floodplain. The 13 parcels of land to be included in the designated flood plain contain a mix of undeveloped and agricultural land uses. These land uses would be maintained under the Proposed Action.

Surrounding Area

The 2002 Wailuku-Kahului Community Plan details the goals and objectives concerning recreational and community facilities within the region. According to the Community Plan, the growth of Maui's population over time has increased the demands on existing recreational and community facilities in the region. The Community Plan calls for the development and maintenance of an efficient and responsive system of public services which promotes a safe, healthy and enjoyable lifestyle, accommodates the needs of the young, elderly, disabled, and disadvantaged persons, and offers opportunities for self-improvement and community well-being (Maui County Council, 2002).

There are multiple Department of Parks and Recreation facilities located in the Central District. Papohaku Park is located on Waena Street, approximately 0.7 miles east of the project area. Papohaku Park provides a softball field, a basketball court, parking, and restrooms. Honolii Park is located approximately 0.9 miles southwest of the project area. Honolii Park provides parking and a picnic area with tables and benches.

Keopuolani Park is located on Kanaloa Avenue, approximately 1.6 miles southeast of the project area. Keopuolani Park is the largest park in the Maui County parks system. The park is adjacent to the Maui Arts and Cultural Center and the War Memorial Complex. Keopuolani Park provides a track and field venue, amphitheater, gymnasium, aquatics arena, three baseball fields, two soccer fields, a skate park, locker room facilities, picnic areas, parking, and public restrooms (Maui County, 2014d).

The annual Maui County Fair is located at the War Memorial Complex situated on Kanaloa Avenue adjacent to Keopuolani Park. The fair features multi-cultural food, entertainment, horticulture, bonsai, livestock, homemaking, photo and art exhibits, and competitions. The Maui County Fair was started in 1916 and has a mission of giving back to the community while upholding the traditions of Maui. The 2014 Maui County Fair will be held from 2 October to 5 October (Maui Fair, 2013).

The Maui Ocean Center is located on Maalaea Road, approximately 7.6 miles south of the project area. Maui Ocean Center was opened in March 1998 and averages over 400,000 visitors annually. The center provides interactive displays, outdoor touch pools, and an acrylic tunnel through a 750,000 gallon exhibit containing 2,000 fishes. The center is open 365 days a year from 9:00 am to 5:00 pm (Maui Ocean Center, 2013).

The Streamside Trail at the ‘Īao Valley State Park is located 3.8 miles west of the project area. The trail crosses the upper reaches of ‘Īao Stream and winds through a tropical forest, small waterfalls, and natural pools (Trails.com, 2014a).

The mouth of ‘Īao Stream empties into Kahului Bay, approximately 1.4 miles east of the project area. Kanaha Beach Park is located within Kahului Bay, approximately 4.7 miles east of the project area. The park is a popular area for picnics due to its large grassy area and long strip of white sand beach. The steady trade winds that frequent the area make the park a popular windsurfing beach (Trails.com, 2014b). In addition to windsurfing, Kanaha Beach and Kahului Bay provide a large number of recreational activities including kiteboarding, surfing, fishing, diving, swimming, paddling, kayaking, and camping.

3.9.4 Approach to Analysis

The significance of potential impacts on recreational activities and resource due to the Proposed Action will be assessed. The significance of potential impacts will be determined by considering the direct effects of the proposed action on the beneficial use of recreational activities and natural resources.

Substantial secondary impacts such as population changes or effects on public facilities will also be considered.

3.9.5 Potential Impacts and Mitigation

No Action

Under the No Action Alternative, the overflow channel system would not be constructed. There would be no use of additional recreational areas or resources. Therefore, there would be no impact to recreational or resource use within the project area.

Proposed Action

Under the Proposed Action, no impacts to short-term recreational use in the project area are expected. Construction activities would be restricted to the proposed construction area and staging areas located adjacent to the commercial and residential parcels on the right bank and undeveloped land on the left bank of the channelized stream. Public access to the existing flood control system is already not allowed due to pre-existing safety concerns. Construction activities located on the west bank of the ‘Īao Stream would take place on undeveloped land currently not in use. As a result, no recreational activities are believed to take place within the proposed construction area.

The terrestrial- or water-based recreational activities located closest to the project area are Papohaku Park, the ‘Īao Valley State Park Streamside Trail, and Kanaha Beach Park. None of these recreational activities are located adjacent to the project area and no impacts to recreational use of these sites are expected as a result of construction activities. As a result, short-term recreational use in the project area is not considered to be impacted by construction activities.

The Proposed Action is not expected to have any direct long-term impacts on recreational uses within the project area since lands located within the proposed construction area are not utilized for recreational use. Proposed construction activities would take place on parcels of land currently developed as a flood control system and undeveloped land that are not currently in use. Undeveloped and agricultural parcels to be located within the designated floodplain would maintain their current agricultural / open space aesthetic. No beneficial use of recreational areas would be curtailed. As a result, the Proposed Action is not considered to have direct long-term impacts on recreational use within the project area.

Less than significant impacts to short-term resource use in the project area are expected due to construction activities. The Proposed Action would require the commitment of natural resources such as aggregate for concrete, rock for riprap, and petroleum products to fuel construction equipment. However, the amount of resources needed to complete the proposed overflow channel system would not represent a significant commitment of resources in the project area. Therefore, short-term impacts on resource use in the project area due to construction activities would be considered less than significant.

Less than significant long-term impacts to resource use in the project area are also expected. The overflow channel would need to be cleared regularly of debris. Additional maintenance activities would be limited to minor repair of the overflow channel and other features due to regular wear or acute flooding events. However, these maintenance activities would not represent a significant impact on resource use in the project area. As a result, long-term impacts to resource use would be considered less than significant.

3.10 SOCIOECONOMICS

3.10.1 Definition of Resource

Socioeconomics are defined as the basic attributes and resources associated with the human environment, particularly population and economic activity. Human population is affected by regional birth and death rates as well as net in- or outmigration. Economic activity typically comprises employment, personal income, and industrial growth. Impacts on these fundamental socioeconomic indicators can also influence other components such as housing availability and public services provision.

Socioeconomic data in this section are presented at the County, State, and national levels to analyze baseline socioeconomic conditions in the context of regional, State, and national trends. Data have been collected from previously published documents issued by Federal, State, and local agencies and from State and national databases (e.g., U.S. Bureau of Economic Analysis [BEA] Regional Economic Information System).

3.10.2 Regulatory Setting

In 1994, EO 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations, was issued to focus attention of Federal agencies on human health and environmental conditions in minority and low income communities and to ensure that disproportionately high and adverse human health or environmental effects on these communities are identified and addressed.

Because children may suffer disproportionately from environmental health risks and safety risks, EO 13045, Protection of Children from Environmental Health and Safety Risks, was introduced in 1997 to prioritize the identification and assessment of environmental health risks and safety risks that may affect children and to ensure that Federal agencies' policies, programs, activities, and standards address environmental health risks and safety risks to children.

3.10.3 Existing Conditions

Social Factors and Community Identity

According to the 2010 census, the total population of Wailuku census designated place (CDP) is estimated at 15,313, which comprises 9.9% of the total population of Maui County, estimated at 154,834 (U.S. Census Bureau, 2014). The median age of Wailuku CDP is 40.8 years old with 23.5% of the total population being under 18 years old and 14.4% over 65 years old.

Socioeconomics

The median household annual income for Wailuku CDP was $69,281 for the years 2008 to 2012, slightly higher than the mean household income for the State of Hawaiʻi, which was at $67,492 for the same time period (U.S. Census Bureau, 2014). Wailuku is the county seat and commercial center of Maui County, where numerous family businesses, many of which have been in operation for generations, are located. Many of the historical and cultural attractions in the town, including Kaʻahumanu Church, the Bailey House, Pihana Kalani Heiau, and the ʻĪao Theater, built in 1927, make Wailuku one of the main tourist destinations on the island. Because of its natural beauty and historical significance, ʻĪao Valley is also a popular tourist attraction. The project area, located upstream of Wailuku town, is characterized by concentrated residential houses.

Environmental Justice

To comply with EO 12898, ethnicity and poverty status in the vicinity of the project area were examined and compared to regional, State, and national data to determine if any minority or low-income communities could potentially be disproportionately affected by implementation of the Proposed Action.

For the years 2008-2012, the percentage of population in Wailuku CDP below the poverty level was 10.1%, which is lower than the Maui County (10.3%), State of Hawaiʻi (10.8%), and national (14.9%) percentages (U.S. Census Bureau, 2014).

The percentage of minority residents in Wailuku CDP (79% in year 2010) is comparable to the percentage of minority residents for Maui County (64.1% in year 2012) and State of Hawaiʻi (73.9% in year 2012) but significantly greater than the nation (22.1% in year 2012) (U.S. Census Bureau, 2014).

Protection of Children

To comply with EO 13045, the number of children under age 18 in the vicinity of the project area was examined and compared to County, State, and national levels. Additionally, locations where populations of children may be concentrated (e.g., child care centers, schools, and parks) were determined to address potentially disproportionate health and safety risks to children that may result from implementation of the Proposed Action.

There are approximately 3,599 children under the age of 18 in Wailuku CDP, comprising 23.5% of the overall population. This is comparable to 23.1% for Maui County, 22.3% for the State of Hawaiʻi, and 24% for the nation (U.S. Census Bureau, 2014).

The State of Hawaiʻi Department of Education (DOE) has a total of eight school districts and 320 public schools statewide. Children living in the vicinity of project area attend schools in the Baldwin-Kekaulike-Maui Complex, including Wailuku Elementary School, ʻĪao Intermediate School, and Baldwin High School (DOE, 2014). Wailuku Hongwanji Mission, a day care center, and the War Memorial Stadium complex, the largest sports and recreational facility in the Maui Parks system, are also located in the vicinity of the project area.

3.10.4 Approach to Analysis

Significance of population and expenditure impacts are assessed in terms of their direct effects on the local economy and related effects on other socioeconomic resources (e.g., housing). The magnitude of potential impacts varies depending on the location of a proposed action; for example, an action that creates 20 employment positions may be unnoticed in an urban area, but may have significant impacts in a more rural region. If potential socioeconomic impacts would result in substantial shifts in population trends, or adversely affect regional spending and earning patterns, they would be significant.

3.10.5 Potential Impacts and Mitigation

No Action

Under the No Action Alternative, the overflow channel system would not be constructed. There would be no change to the existing conditions at the project site. There would be no significant impacts to the regional population structure or social characteristics; however, extensive damage to residential and commercial properties is expected under the No Action Alternative. According to the economic analysis prepared for the project (included as Appendix F of the EDR), the total expected annual damage (EAD) under the No Action Alternative is $1,432,440. This estimate is based on the structure inventory composed of all residential, commercial, and public buildings within the 0.2% exceedance probability floodplain of ʻĪao Stream.

Proposed Action

The Proposed Action is expected to have a short-term beneficial impact to the local economy by creating temporary employment opportunities and materials spending during the construction phase of the project. O&M required for the structures built under the Proposed Action is also expected to create additional employment opportunities, contributing to the local economy.

The demographics of the project area do not comprise disproportionately high concentrations of minority or low-income populations. Construction activities are expected to be contained within the project area and would not disproportionately affect any specific racial, ethnic, or socioeconomic group living within the vicinity of the project area. In addition, because of their temporary nature, construction activities associated with the Proposed Action are not expected to result in any significant impacts to the local housing or demographics in the long-term.

Construction activities are not expected to increase the hazard or risk to children in the project area since the construction area would be fenced and inaccessible to the public. In addition, none of the off-site areas where significant concentration of children may gather would be impacted by project activities.

Once completed, the Proposed Action is expected to result in long-term beneficial socioeconomic impacts. Residences currently affected by increased flood hazards due to the potential of failure of the existing flood control structures would be beneficially impacted since they would have less adverse economic impacts from flood risk and flooding. The Proposed Action is expected to reduce the total EAD to $350, resulting in an Expected Annual Benefits (EAB) of $1,432,090. In addition, the implementation of the Proposed Action could have the indirect effect of potentially increasing property values in and around the project area as a result of the reduced flood risk.

No short- or long-term adverse impacts under EO 12898 or EO 13045 are anticipated under the Proposed Action.

3.11 PUBLIC INFRASTRUCTURE AND UTILITIES

3.11.1 Definition of Resource

Public infrastructure and utilities comprise functional services provided to a facility by public agencies or by a facility to the community. Such services may include police and fire protection, water and solid waste service, sanitary sewer and wastewater treatment, and recreational facilities. Utilities include infrastructure services that support facility operations, including electricity, natural gas, or telecommunications. On-site utility production, such as power generation or wastewater treatment, occurs at some facilities.

3.11.2 Regulatory Setting

The State of Hawai‘i Public Utilities Commission (PUC) regulates all franchised or certificated public service companies operating in the State. Franchised or certified public service companies operating under PUC regulation include:

- electric providers;
- telecommunication providers;
- motor and water carriers; and
- privately owned water and sewage treatment utilities.

The PUC’s primary purpose is to ensure that regulated companies efficiently and safely provide their customers with adequate and reliable services at just and reasonable rates, while providing regulated companies with a fair opportunity to earn a reasonable rate of return.

3.11.3 Existing Conditions

Hawaiian Electric Company (HECO) and its subsidiaries, Hawai‘i Electric Light Company (HELCO) and Maui Electric Company (MECO), provide electricity for 95% of Hawai‘i’s residents. MECO serves the island of Maui and, as a result, the project area receives its electrical service from MECO (HECO, 2013).

Water resource and distribution systems for the project area are managed by the Maui County Department of Water Supply. The Department of Water Supply provides water to approximately 35,700 services on Maui and Molokai. According to the 2002 Wailuku-Kahului Community Plan, the growth of Maui’s population has increased demands on water in the region, threatening the sustainability of the region’s water (Maui County Council, 2002).

Sewer services for Maui County are directed and overseen by the Maui County Department of Environmental Management Wastewater Reclamation division. The Wastewater Reclamation division is composed of the Administration and Operation elements. The Operations element is responsible for the management, operation, installation, maintenance, and repair of all Maui County wastewater and pumping facilities (Maui County, 2014e).

The Maui Police Department (MPD) serves as the primary law enforcement agency for Maui County, which includes the islands of Maui, Molokai, and Lanai. Maui County is divided into six police districts and the project area is located within District I Wailuku (Maui Police Department, 2012).

The Department of Fire and Public Safety provides emergency and non-emergency services for the islands of Maui, Molokai, Lanai, and Kahoolawe and the surrounding waters. The Department has 14 fire stations throughout the County of Maui. There are 10 fire stations on the island of Maui, three fire stations on the island of Molokai, and one fire station on the island of Lanai. Wailuku Fire Station is located on Kinipopo Street, approximately 0.6 miles south of the project area (Maui County, 2014f).

According to the 2002 Wailuku-Kahului Community Plan, projected future growth of the region is expected to pose challenges to the existing public infrastructure. The challenges include improving and expanding the roadway system network; locating and delivering new sources of potable water; wastewater treatment and methods of effluent disposal; and public and private partnerships for the development and financing of public infrastructure (Maui County Council, 2002).

Under the Proposed Action, construction activities would take place on land currently developed as a flood control system and undeveloped land that is currently not in use. With the exception of the flood control system there are no known utilities present at the proposed construction area.

The 'Īao Stream Flood Control Project was originally completed in 1981. The project was authorized under Section 203, Flood Control Act of 1968, as amended. The original improvements included a debris basin, diversion levees, and channel improvements along the lower 2.5-mile portion of the 'Īao Stream (USACE, 2014).

In addition, 13 parcels of land would be included within the designated floodplain. The 13 parcels of land to be included in the designated flood plain contain a mix of undeveloped and agricultural land uses. These land uses would be maintained under the Proposed Action. Building permits for the different parcels indicate that electric, water, and sewer utilities may be present within parcels located in the designated floodplain.

3.11.4 Approach to Analysis

Significance of public services or utilities systems impacts are assessed in terms of their direct effects on the public service or utility providers. The magnitude of potential impacts varies depending on the location of a proposed action; for example, an action that alters existing utility systems infrastructure may be unnoticed in an urban area but may have significant impacts in a more rural region. If potential public service and utility systems impacts would result in substantial shifts in the amount of services provided, or substantial changes to the utility systems infrastructure, the action would be significant.

3.11.5 Potential Impacts and Mitigation

No Action

Under the No Action Alternative, the overflow channel system would not be constructed. There would be no change to public infrastructure and the existing demand on public services and utilities in the project area would remain the same. Therefore, there would be no impact to public infrastructure and utilities, with the exception of flood control infrastructure. Under implementation of the No Action Alternative, undermining of the existing flood control system – and its ability to protect lives and property from flood events – would continue.

Proposed Action

Under the Proposed Action, no short-term impacts on public services or utilities systems are expected during construction activities. The proposed construction area includes parcels of land currently developed as a flood control system or undeveloped land currently not in use. With the exception of the flood control system there are no known utilities present at the proposed construction area.

Construction work would be completed in approximately 21 months and would be conducted during no or low flow periods. In addition, construction of the concrete structures would take place in halves in order to avoid impediment of stream flow. Therefore, during construction the existing flood control system would continue to operate/function as it currently does and no change to the existing functionality of the flood control system would occur in the short-term. As a result, there would be no short-term impacts on public services or utility systems due to construction activities.

Once completed, the operation and maintenance of the overflow channel system would not require the use of any public services or utilities. The overflow channel would need to be cleared regularly of debris. Additional maintenance activities would be limited to minor repair of the overflow channel and other features due to regular wear or acute flooding events. However, these maintenance activities would not represent a significant impact on public services in the project area. Further, the Proposed Action is designed to address periodic flooding that causes damage to private property and public infrastructure located adjacent to the channelized portion of the 'Īao Stream. As a result, the long-term impacts of the Proposed Action on public infrastructure and utilities are considered beneficial.

3.12 TRAFFIC AND CIRCULATION

3.12.1 Definition of Resource

Traffic and circulation refer to the movement of vehicles throughout a road or highway network. Primary roads are principal arterials, such as major interstates, designed to move traffic and not necessarily to provide access to all adjacent areas. Secondary roads are arterials, such as rural routes and major surface streets, provide access to residential and commercial areas, hospitals, and schools.

3.12.2 Regulatory Setting

State of Hawaiʻi Department of Transportation's (HDOT) Highway Manual for Sustainable Landscape Maintenance, Chapter 4, Section 645: Work Zone Traffic Control describes the following procedures for:

- Furnishing, installing, maintaining, and subsequently removing work zone traffic control devices and personnel. Work zone traffic control shall include providing flaggers and police officers.
- Keeping roads for public traffic open and in passable condition; providing and maintaining temporary access crossings for trails, businesses, parking lots, garages, residences, farms, parks, and other driveways; taking necessary work precautions for the protection, safety, and convenience of the public; should pedestrian facilities exist, taking necessary measures for the safe and accessible passage, with route information and Americans with Disabilities Act of 1990 Accessible Guidelines (ADAAG) compliance, for pedestrians traveling through or near work zone.
- Taking safety and precautionary measures, such as illuminating roadway obstructions during hours of darkness, in accordance with HRS Chapter 286; Title 19, Subtitle 5, Chapters 127, 128, and HAR 129; Manual on Uniform Traffic Control Devices (MUTCD).

Regulations for necessary signs, barricades, traffic delineators, cones, lane closures, advisory signs, and advertisement needed for construction activity shutdowns described in HDOT Section 645 would be adhered to if needed, and a Traffic Control Plan (TCP) would be drafted if construction work extends into the public roadway.

3.12.3 Existing Conditions

The portion of ʻĪao Stream within the project area runs approximately parallel with Eha Street to the southeast, Kaae Road to the northwest near the mouth of the stream, and is crossed near its mouth by Highway Route 340 (also known as Kahekili Highway). The auxiliary roads nearest to the project area, from upstream to downstream, are Imi Kala Street (which crosses ‘Īao Stream), Halewii Street, Alako Street, Ea Street, Kopili Street, ‘Īao Loop, Kawaikini Place, Lawai Place, and ‘Īao Place. All are part of a residential roadway network with normal residential traffic flow.

Kahekili Highway is not a major highway on Maui. It is a dangerous 28-mile stretch of road following an ancient Hawaiian footpath. The highway narrows to one lane, with poorly paved roads, hairpin curves, and few guardrails. Currently, a Kahelikili Highway Resurfacing Project is in effect to repair roadway deficiencies. The County of Maui Department of Public Works, Highways Division announced on January 2, 2014 that the first phase of work on the Kahekili Highway Resurfacing Project was complete and that Phase Two of the resurfacing project began on January 6, 2014. During Phase Two work, a portion of the highway will be closed between milepost 11, Nobriga’s corral, and milepost 13.4, east of Kaukini gallery. This is approximately 12 miles northwest of the project area.

The closures will occur from 7:30 am–4:30 pm Monday through Friday, excluding County holidays. Closures from the resurfacing project may cause increased traffic in the area surrounding the project area until the completion of the resurfacing project, which was scheduled for April 30, 2014 (City and County of Maui, 2014). At the terminus of the resurfacing project, traffic and circulation in the area are expected to return to baseline conditions.

3.12.4 Approach to Analysis

Potential impacts to traffic and circulation patterns are assessed with respect to anticipated disruption or improvement of current transportation patterns and systems, deterioration or improvement of existing levels of service, and changes in existing levels of transportation safety. Beneficial or adverse impacts may arise from physical changes to circulation (e.g., closing, rerouting, or creating roads), construction activity, introduction of construction-related traffic on local roads, or changes in daily or peak-hour traffic volumes created by installation workforce and population changes. Adverse impacts on roadway capacities would be significant if roads with no history of exceeding capacity were forced to operate at or above their full design capacity.

3.12.5 Potential Impacts and Mitigation

<u>No Action</u>

Under the No Action Alternative, the overflow channel system would not be constructed, and no short-term construction vehicular traffic would be generated. The project area would remain unchanged, and there would be no impacts to traffic and circulation in the area.

Proposed Action

Implementation of the Proposed Action would result in less than significant, short-term impacts to traffic and circulation during the construction period. These impacts would be less than significant, provided that HDOT construction traffic control measures, such as a TCP, would be implemented as necessary. All construction activity would occur in the streambed area. Therefore, no disruption to traffic patterns requiring traffic management planning associated with the Proposed Action is anticipated. Furthermore, negligible direct impacts to local roads resulting from additional vehicle trips to and from the project site by construction workers and contractors as well as by haul trucks required to dispose of excavated material or import material to the project site would occur during the construction phase. The number of haul trips required to dispose of the soil excavated to construct the overflow channel is estimated to be 390 trips using a 20-cubic yard (CY) dump truck. Although some of the excavated soil removed to create the overflow channel would be reused to construct the raised berm downstream, any excess material would be disposed of at the Maui Demolition and Construction Landfill in Mā'alaea (approximately 6 miles from the project site). In addition, 10 haul trips would be required to import topsoil material for the raised berm. The estimated haul trips to mobilize/demobilize equipment to and from the site are estimated to be 10 trips each. Haul trips to transport material and equipment to and from the site would be distributed over the timeframe of the construction period and would be temporary; therefore, no significant direct impacts to the local roadway traffic are anticipated.

Indirect impacts may include decreased parking availability on Eha Street, Kawaikini Place, Lawai Place, 'Īao Place, or other residential streets in the near proximity of the project area, due to construction worker and contractor parking. If possible, the number of parked vehicles would be reduced through the implementation of vanpooling. Direct and indirect short-term impacts would be less than significant.

Upon completion, the Proposed Action is not expected to generate any additional traffic and would have no long-term impacts on traffic or parking. The only long-term effects on traffic and circulation would be from periodic visits from maintenance vehicles commuting to and from the project site to clear debris from the proposed diversion channel. Traffic and circulation inhibitors, caused by potential flooding, may even be decreased with the implementation of the Proposed Action, as the Proposed Action is designed to decrease flood hazards. The overall long-term effect on traffic and circulation in the area would be considered less than significant.

3.13 SOILD AND HAZARDOUS MATERIAL AND WASTES

3.13.1 Definition of Resource

Solid Materials are defined as substances that do not have strong physical properties of ignitability, corrosivity, reactivity, or toxicity. *Solid Wastes* are defined as solid waste that does not pose a substantial present or potential hazard to human health or to the environment.

Hazardous materials are defined as substances with strong physical properties of ignitability, corrosivity, reactivity, or toxicity, which may cause an increase in mortality, serious irreversible illness, incapacitating reversible illness, or pose a substantial threat to human health or to the environment. *Hazardous wastes* are defined as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes that pose a substantial present or potential hazard to human health or to the environment. Examples of hazardous wastes include toxic or hazardous substances such as polychlorinated biphenyls (PCBs), asbestos, pesticides, and radiation sources.

Issues associated with hazardous materials and wastes typically center on underground storage tanks, aboveground storage tanks, and the storage, transport, and use of pesticides and fuel. When such resources are improperly used, they can threaten the health and well-being of wildlife species, botanical habitats, soil systems, water resources, and people.

3.13.2 Regulatory Setting

Solid Waste management regulations are specified in HAR 11-58.1, with the intent to:

- prevent pollution of the drinking water supply or waters of the State;
- prevent air pollution;
- prevent the spread of disease and the creation of nuisances;
- protect the public health and safety;
- conserve natural resources; and
- preserve and enhance the beauty and quality of the environment.

Hazardous Waste Management regulations are specified in EPA State-specific Universal Waste Regulations and in CFR Title 40, Chapter 1.

3.13.3 Existing Conditions

There are six sites within a 0.25-mile radius of the project area that have been identified as possible environmental risk sites by Federal and State databases, according to an Environmental Data Resources, Inc. (EDR) Radius Map analysis performed on April 16, 2014 (Appendix L). There is one EDR Exclusive Historic Dry Cleaners site (Maui's Quality Dry Cleaning), one Resource Conservation and Recovery Act (RCRA) Conditionally Exempt Small Quantity Generators (CESQG) site (Browning-Ferris Industries), one State Hazardous Waste Site (SHWS) (Wailuku Sugar Company Pesticide Mixing Area), and three EDR Exclusive Historical Auto Station sites (Big Al's Auto Service, Auto Tech, and Maui Automotive Center).

Maui's Quality Dry Cleaning is the sole site within a 0.25 mile radius of the project area that is classified as an EDR Exclusive Historic Dry Cleaners Site. Sites on this list may pose environmental concerns, but no environmentally concerning incidences have occurred at this site to date. Maui's Quality Dry Cleaning is located 0.2 miles south of the project area at 210 Imi Kala Street.

There is one SHWS within a 0.25 mile radius of the project area. SHWS records are the states' equivalent to Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database in Envirofacts. Wailuku Sugar Company Pesticide Mixing Area is located at 250 Imi Kala Street, approximately 400 ft southwest from the project area. In 2011, a Removal Action Report identified two of four decision units that had minimal concentrations (563 and 767 milligrams per kilogram [mg/kg]) of petroleum hydrocarbon as motor oil exceeding residential use environmental action levels (EALs) of 500 mg/kg for gross contamination. However, there were no signs of soil staining or petroleum odor, and the case was closed with a No Further Action Letter stating Unrestricted Residential Use. Another No further Action Letter was written in March 2013 to identify potential pesticide and metal contamination. It was concluded that "soils did not pose a threat to human health or the environment based on three factors: the low concentrations relative to our unrestricted action levels, the small area impacted, and the presence of clean soils above and below the impacted soils". The site is now classified as non-hazardous.

Browning-Ferris Industries is classified as a CESQG and is located at 280 Imi Kala Street, approximately 0.1 miles west of the project area. CESQGs are defined as entities that generate less than 100 kilograms (kg) of hazardous waste, or less than 1 kg of acutely hazardous waste per month. No violations have been found at this site.

There are three EDR Exclusive Historical Auto Stations located within a 0.25 mile radius of the project area. Big Al's Auto Service is located at 395 Neki Place, approximately 0.1 miles northwest in relation to the project area. Auto Tech is located approximately 0.2 miles to the south at 1720 Wili Pa Loop, and Maui Automotive Center is 0.2 miles south-southeast of the project area at 1726 Mill Street. Although all three sites pose potential risks in EDR's opinion, there have been no environmentally threatening incidences reported to date (EDR, 2014).

3.13.4 Approach to Analysis

Numerous local, Federal, and State laws from regulate the storage, handling, disposal, and transportation of hazardous materials and wastes; the primary purpose of these laws is to protect human health and the environment. The significance of potential impacts associated with hazardous substances is based on their toxicity, reactivity, ignitability, and corrosivity. Impacts associated with hazardous materials and wastes would be significant if the storage, use, transportation, or disposal of hazardous substances substantially increased the human health risk or environmental exposure.

3.13.5 Potential Impacts and Mitigation

<u>No Action</u>

Under the No Action Alternative, the overflow channel system would not be constructed, thus temporary use of construction equipment would not occur. The project area would remain unchanged, and there would be no hazardous materials used and no solid or hazardous wastes generated in the area. As a result, there would be no impacts to hazardous materials and wastes at the project site.

<u>Proposed Action</u>

Solid Waste

The Proposed Action would require infrequent solid waste disposal to clear the overflow channel and diversion weir, in accordance with applicable regulations. In the short-term, during the construction of the Proposed Action, there may be solid waste generated from vegetation clearance in the project area. The contractor would be responsible for such solid waste disposal. Implementation of the Proposed Action is expected to have a less than significant impact on solid waste in the affected environment.

Hazardous Wastes

During construction of the Proposed Action, there may be the potential of petroleum spillage associated with construction vehicles and equipment. To minimize this hazard, all applicable County of Maui Spill and Prevention Control BMPs would be implemented to ensure that accidental releases are minimized and contained. For example, vehicles and equipment would be regularly inspected for leaks and performance, and maintained accordingly. In the long-term, there is potential for petroleum spillage from maintenance vehicles that may be brought in to maintain the overflow channel and other proposed features under the Proposed Action. All applicable County of Maui Spill and Prevention Control BMPs (County of Maui, 2014) would be implemented to avoid and minimize potential releases from such vehicles as well. Implementation of the Proposed Action is expected to have a less than significant impact on hazardous materials and wastes.

3.14 CUMULATIVE IMPACTS

Cumulative impacts on environmental resources result from incremental impacts of the Proposed Action that, when combined with other past, present, and reasonably foreseeable future projects in an affected area, may collectively cause more substantial adverse impacts. Cumulative impacts can result from minor, but collectively substantial, actions undertaken over a period of time by various agencies (Federal, State, or local) or persons. In accordance with NEPA and the CEQ memorandum of "Guidance on the Consideration of Past Actions in Cumulative Effects Analysis," a discussion of cumulative impacts resulting from projects which are proposed, under construction, recently completed, or anticipated to be implemented in the near future is required.

Past Actions

The original 1981 'Īao Stream Flood Control Project was implemented after a NEPA-compliant EIS was completed with identified mitigation measures following interagency concurrence and approval of that EIS' Record of Decision. The completed project consists of a debris basin located 2.5 miles upstream from the stream mouth, channel improvements extending 3,500 ft downstream from the debris basin, levees along the right bank, levees and floodplain management along the left bank for 6,950 ft of natural stream; and stream realignment with channel improvements for a reach of 1,730 ft that extends to the downstream limit of the project located near the shoreline.

A flood occurred during the construction phase in January 1980 that caused extensive erosion of the sacrificial berm and undermined portions of the completed levees. As a result, the streamside slope of the levees was extended with a concrete riprap slope lining into the streambed. As provided in the project design document (USACE 1976), the toe of the cutoff walls was embedded 5 ft in depth.

Shortly after project completion, stream flows caused erosion of the stream bottom along an approximately 7,000-ft reach between the concrete channel and the Waiehu Beach Road. The erosion undermined the project levee with scour depths extending to a maximum of 6 ft below the existing boulder concrete slope lining. Corrective work to address this issue was completed in November 1983 under the Productive Employment Appropriation Act of 1983 and authorized under Section 205 of the

Flood Control Act of 1948 (Public Law 80-858), as amended. The stream channel has since eroded as much as 6 to 8 ft below the 1983 repair.

Although being successful in preventing an estimated $49.6 million in flood damage (as of FY 2013) since its original construction, numerous large storm events have caused progressive damage to the existing flood control structures and subsequent changes to the stream dynamic. In addition, numerous activities have occurred within the streambed during the past 30 years, including ongoing upstream water diversion for agricultural uses, changes in the streambed dynamic due to natural processes, and upstream watershed use/development. Rapid expansion of urban development particularly within the lower watershed as well as agricultural expansion throughout the watershed has most likely caused extensive changes in the current dynamic of the ʻĪao stream as compared to conditions at the time of the original construction of the flood control structures.

The Proposed Action is designed to divert flood waters to the existing natural floodplain on the left bank thereby reducing flows within the main channel. This is expected to reduce the rate of erosion of the existing levees and stream bank downstream. The Proposed Action would reduce the possibility of further damage to the existing flood control structures and would not cause additional erosion or damages to the existing flood control structures or subsequent changes to the stream dynamic. No additional concrete channel lining or change in the alignment of the stream are proposed under the Proposed Action; therefore, no changes to the dynamic of ʻĪao Stream in addition to those caused by the construction of flood control structures in the past are anticipated. Additionally, the Proposed Action is intended to restore the original function of the existing floodplain on the left bank, and no changes to the stream dynamic in addition to those that have occurred in the past due to rapid urban and agricultural expansion throughout the watershed are anticipated as a result of implementation of the Proposed Action. Since the Proposed Action would not cause additional adverse environmental impacts to the stream, it would not contribute incrementally, as past actions have, to further deterioration of stream functions; therefore, would not cause significant adverse cumulative impacts.

Present Actions

In April 2014, the Commission on Water Resource Management issued an order establishing an IIFS, the minimum required flow, of 10 mgd (approximately 15.5 cfs) for ʻĪao Stream near Kepaniwai Park. Additionally, no water may be diverted at the Waihe'e/Spreckels Ditch intake located upstream of the proposed project area, except when the stream flow is adequate to satisfy the IIFS of 5 mgd (approximately 7.7 cfs) at the mouth of ʻĪao Stream (Osher, 2014). The IIFS was implemented in October 2014 following this court order. As discussed earlier in Section 2.4, the proposed 15-ft wide opening in the diversion wall would not impact the ability for an IIFS of greater than 5 mgd to remain in the channel through the project area and downstream to the stream mouth. In addition, the Proposed Action is designed to disperse approximately 21,800 cfs of the total SPF peak discharge (27,500 cfs) across the floodplain, which would accommodate the IIFS and provide adequate protection against SPF events following implementation of the IIFS. In conjunction with natural overflow into the left bank upstream, the diversion wall and lateral overflow weir would adequately divert enough flow during an SPF event to restrict the flow downstream of the diversion wall to less than a 10-year frequency event discharge. The diversion wall would have a 15-ft wide opening to preserve low flow conditions within the channel for fish passage. The Proposed Action would not impede the stream flow following implementation of the IIFS, and would not cause significant adverse cumulative impacts associated with the IIFS.

<u>Future Actions</u>

There are no major public infrastructure or development projects planned within proximity to the project area at this time. There are various small private residential construction and renovation projects that are ongoing within the surrounding residential, commercial, and agricultural parcels. These projects are subject to Maui County zoning and permitting regulations, including the Maui County Rules for the Design of Storm Water Treatment Best Management Practices (Maui County, 2014g). As a result, these projects would not represent significant incremental impacts that would contribute to adverse cumulative impacts.

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4.0 REGULATORY REQUIREMENTS

While this EA has been prepared pursuant to NEPA, the document also addresses and discusses several laws, regulations, and Executive Orders. Some of these authorities pertain directly to USACE management of water resource development projects, while others establish regulatory compliance standards for environmental resources or provide guidance for planning for management of environmental resources. Reliance on these authorities results in effective project management and sound environmental stewardship. This section summarizes those statutory authorities that could apply to the Proposed Action and were considered during the NEPA process. Required permits are identified where applicable.

4.1 CLEAN WATER ACT

The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the U.S. and regulating quality standards for surface waters. Section 404 of the Federal CWA prohibits the discharge of dredged or fill material into waters of the U.S. without authorization from the USACE.

Since the Proposed Action would include work in a stream that could result in potential discharge of fill and/or dredge material into an aquatic ecosystem, provisions of Section 404 (b)(1) of the CWA would apply. Therefore a 404 (b)(1) analysis has been prepared for the Proposed Action and is included as Appendix B of this EA.

Discharge of pollutants into surface waters of the U.S. are controlled under the NPDES program, pursuant to Section 402 of the Clean Water Act. This program is administered by the DOH under HAR Title 11, Chapter 55 Water Pollution Control (October 29, 1992). This chapter requires submission of a NPDES application or a Notice of Intent (NOI) for NPDES General Permit coverage, for discharges of regulated pollutants, or for substantially altering the quality of any discharge, or for substantially increasing the quantity of discharge.

Since the Proposed Action would include the construction of an overflow channel that would retain sediment and particulates conveyed in the main channel stream flow, it would not include a point source discharge of pollutants, and an NPDES permit would not be applicable under Section 402 of the CWA. However, the NPDES program requires construction site operators to obtain coverage under a NPDES permit for clearing, grading, and excavating activities that disturb an area of 1 acre or more to prevent any discharges associated with construction activities from entering the stream. Since the Proposed Action involves disturbance to an area greater than 1 acre, an NPDES permit would need to be obtained prior to the start of construction activities. The NPDES permit application process would be initiated during the design phase of the project.

The Federal Clean Water Act and HRS Chapter 342D, along with their supporting rules (HAR Title 11, Chapter 54), require that a WQC be obtained to support federal permits or approvals for which proposed construction or operation may result in discharges to State waters (e.g., Section 404 permit from the USACE). Since the proposed project may generate discharges to State waters during construction, a Section 401 WQC would be required. DOH, the state approving agency, would only issue a conditional WQC during the design phase. The final WQC would be issued to the contractor, upon receipt of acceptable BMPs. The application would be filed with the Clean Water Branch of the DOH at least 180 days before the date the WQC is needed (i.e., start of construction). As part of the application package, the EA will be forwarded to DOH for their review and concurrence, whereupon a letter of concurrence with the Proposed Action pending review and approval of the final WQC application will be provided by DOH. The letter of concurrence will identify critical project issues related to water quality that need to be addressed as input to the design phase of the project. During construction of the Proposed Action, BMPs to minimize or eliminate discharges to State waters would strictly be implemented to avoid any adverse impacts to water quality.

4.2 CLEAN AIR ACT

The Federal CAA (42 U.S.C. 7401) requires the adoption of national ambient air quality standards to protect public health, safety, and welfare from known or anticipated effects of air pollution. The CAA places most of the responsibility to achieve compliance with NAAQS on individual states. To this end, EPA requires each state to prepare a SIP. A SIP is a compilation of goals, strategies, schedules, and enforcement actions that will lead the state into compliance with all NAAQS.

Areas not in compliance with a standard can be declared *nonattainment* areas by EPA or the appropriate state or local agency. In order to reach *attainment*, NAAQS may not be exceeded more than once per year. A *nonattainment* area can reach *attainment* when NAAQS have been met for a period of ten consecutive years. During this time period, the area is in *transitional attainment*, also termed *maintenance*.

Under the CAA, a conformity analysis is used to determine if a Federal action would result in the generation of air emissions that would exceed conformity threshold levels of pollutants for which an air basin that is designated as a *nonattainment* or *maintenance* area under the NAAQS, or if emissions from the action are deemed regionally significant. A conformity analysis must demonstrate that the project emissions would conform, and thus would not degrade air quality in the impacted air basin. A conformity analysis would not be required for the Proposed Action since the island of Maui is in attainment for all criteria pollutants, and emissions from project development would not be considered regionally significant.

4.3 COASTAL ZONE MANAGEMENT ACT

The CZMA of 1972, as amended (16 U.S.C. 1451 et seq.), is administered in Hawaiʻi by the State of Hawaiʻi Office of Planning. Federal consistency is the CZMA requirement where Federal agency activities that have reasonably foreseeable effects on any land or water use or natural resource of the coastal zone (also referred to as coastal uses or resources and coastal effects) must be consistent to the maximum extent practicable with the enforceable policies of a State's Federally approved coastal management program. The CZM program objectives and policies are to provide coastal recreational opportunities; preserve and protect historic, scenic and coastal ecosystem resources; provide economic uses; reduce coastal hazards; improve public awareness in coastal zone management; and manage development within the coastal zone. In accordance with CZMA, USACE is submitting the application for federal consistency review with the State Office of Planning.

The entire State of Hawaiʻi is located within the coastal zone. The Proposed Action is located more than 0.7 miles inland from the coastline and is intended to reduce flood water flow within the main channel during storm events and subsequently reduce downstream / coastal sedimentation. Implementation of the Proposed Action would not have any adverse impacts on coastal resources or the use of coastal resources; rather it would result in beneficial impacts to the coastal resources. Formal consultation with the State of Hawaiʻi Office of Planning will be conducted within the provisions outlined in 15 CFR 930.39-Federal Consistency with Approved Coastal Management Programs, as well as the guidelines established in HRS, Chapter 205A-Coastal Zone Management. Through the CZM Program promulgated by HRS Chapter 205A, each County is required to establish a special management area (SMA) and shoreline setbacks within which permits are required for development. The proposed construction area is not located within the SMA, as defined by the State of Hawaiʻi (Figure 4-1). Therefore, it is not anticipated that a SMA permit would be necessary for the Proposed Action.

4.4 ENDANGERED SPECIES ACT

Section 7 of the ESA of 1973 ESA requires Federal agencies to ensure, in consultation with USFWS and NMFS, that actions they fund, authorize, or carry out will not jeopardize the continued existence of any species listed as threatened or endangered under the ESA ("listed species") or result in the destruction or adverse modification of any habitat of such species that has been designated as critical ("critical habitat").

The USFWS has jurisdiction over endangered and threatened terrestrial flora, fauna, and birds in the State of Hawai‘i. NOAA, through the NMFS, has jurisdiction over marine mammals, turtles (while in water), fish, and coral species.

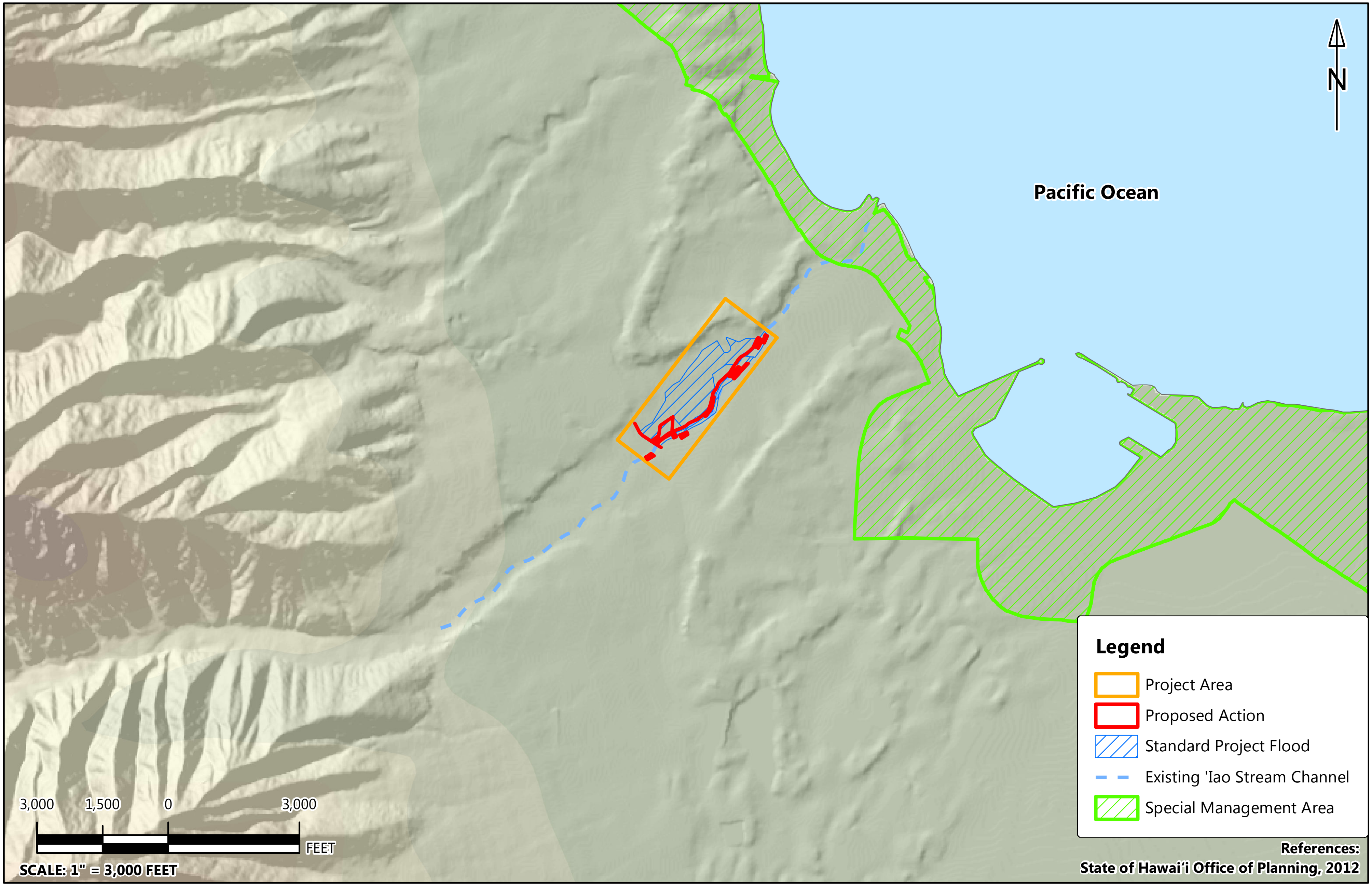
Consultation with USFWS has been ongoing throughout the project planning process. Since there are no known state or federally listed endangered or threatened biota and their respective critical habitats within the project area, no significant impacts to threatened or endangered species as a result of implementation of the Proposed Action are anticipated. A coordination and consultation letter under Section 7 of the ESA of 1973, as amended will be sent to USFWS. Once concurrence on the Proposed Action is obtained, such documentation will be included in this EA.

4.5 MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (MBTA) (U.S.C. 703–711) makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations. The migratory bird species protected by the Act are listed in 50 CFR 10.13. Since the Proposed Action would only include limited short-term disturbance of the affected environment during the construction period, and since close coordination with the USFWS would assure that the Proposed Action would not result in significant adverse impact to any migratory bird habitat, the Proposed Action would comply with the provisions of the MBTA.

4.6 FISH AND WILDLIFE COORDINATION ACT

The FWCA and its amendments require Federal agencies to consult with and give equal consideration to other water resources development programs regarding the fish and wildlife impacts of projects that propose to impound, divert, channel, or otherwise alter a body of water. Subsection 2(h) of FWCA exempts surface water impoundments less than 10 acres. However, the surface water impoundment area under the Proposed Action would be greater than 10 acres. As a result, the Proposed Action would need to comply with the FWCA. Coordination with USFWS, NMFS, and DAR has been ongoing throughout the project planning process, including issuance of a PAL by USFWS to USACE. Coordination has been conducted to ensure that the Proposed Action would not adversely impact important fish and wildlife habitat identified within the intermittent stream. During a recent coordination meeting with the resource agencies (USFWS, NMFS, and DAR) on September 17, 2014, the agencies agreed that the Proposed Action would not adversely impact the existing fish and wildlife habitat within and in the vicinity of the



ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ʻĪAO STREAM FLOOD CONTROL PROJECT

SPECIAL MANAGEMENT AREA MAP
WAILUKU, MAUI, HAWAI'I

FIGURE 4-1

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project area and that the Proposed Action is a preferred alternative as compared to other alternatives considered in the past. Documentation of this concurrence is included in Appendix E of this EA.

4.7 NATIONAL HISTORIC PRESERVATION ACT

Section 106 of the NHPA seeks to accommodate historic preservation concerns with the needs of Federal endeavors through consultation among the agency official, SHPD, and other parties with an interest in the effects of the project on cultural, archaeological and historic resources and properties. The purpose of consultation is to seek comments and input on significant cultural, archaeological and historic resources and properties potentially affected by project implementation, and seek ways to avoid or minimize any adverse effects on significant resources.

USACE staff met with SHPD, Maui during the week of December 2, 2013 to describe the Proposed Action and conduct a site visit. SHPD noted concerns that an historical Native Hawaiian loʻi may be present within an affected portion of the project area. It was decided during the meeting that a reconnaissance-level AIS would be completed within the portion of the left bank floodplain where ground-disturbing activities would take place during construction, but that no surveys would be required in the area where the diverted water leaves the floodplain and returns to the channel.

The AIS determined that no historical resources were present in the project area; therefore, implementation of the Proposed Action would not adversely affect historic properties or any other historical resources. USACE forwarded the End-of-Field report to SHPD in June 2014 to notify them that no historical resources were found during the AIS; therefore, there will be no effect to historic properties. The formal Section 106 consultation process for the current proposed action will be initiated with submittal of the AIS for SHPD and consulting party review. Updated Section 106 consultation letters will be included in this EA as they become available. Copies of all correspondence documenting the Section 106 consultation conducted to date are included in Appendix E.

4.8 EO 11988 – FLOODPLAIN MANAGEMENT

EO 11988 requires Federal agencies to avoid to the extent possible the long-and short-term adverse impacts associated with the occupancy and modification of flood plains, and to avoid direct and indirect support of floodplain development wherever 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 flood plains in carrying out its responsibilities” for the following actions:

- acquiring, managing, and disposing of Federal lands and facilities;
- providing Federally-undertaken, financed, or assisted construction and improvements; and
- conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities (FEMA, 2014).

According to FEMA records, the project area is located within Flood Zone AE, 0.2% Chance of Flooding, Zone X, and Zone X (Protected by Levee). Flood Zone AE is defined as “the flood insurance rate zone that corresponds to the 100-year floodplains.” The zone designated as the 0.2% Chance of Flooding corresponds to the areas of 500-year flooding. Zone X designates areas outside of the 0.2% annual chance floodplain; Zone X (Protected by Levee) delineates areas that are “protected from the 1%-annual-chance or greater flood hazard by a levee system that has not been provisionally accredited” (FEMA, 2009a; FEMA, 2009b).

The Proposed Action would include construction in an area prone to flooding. However, the Proposed Action consists of an overflow channel and other features designed to reconnect the main channel with the floodplain that would be consistent with current land use as a flood control system. Further, the Proposed Action would divert high-velocity and high-volume flood flows into the existing left-bank floodplain thereby reducing the main channel flow in the approximately 3,200-ft long reach of the stream. This would result in a reduced risk of flooding during high-flow/flood events. Diversion of stream waters would also reduce erosion of the stream banks, which would prevent further damage to the existing flood control systems and increase its reliability. Therefore the Proposed Action would be in compliance with EO 11988.

4.9 EO 11990 – PROTECTION OF WETLANDS

EO 11990 states that each Federal agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for: (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

The Proposed Action occurs within and near areas designated as a freshwater emergent wetland, further classified as palustrine and persistent (USFWS, 2006a). Part of the project area would be cleared of vegetation and graded in order to construct the overflow (diversion) channel system. However, since the existing palustrine wetland within the project area does not include any critical wetland habitat, and since the existing wetland flora and fauna would return following the construction period, there would be no significant long term impacts to wetlands. Further, since the Proposed Action would not adversely impact the existing stream function, the Proposed Action would comply with EO 11990.

4.10 EO 12898 – ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS

EO 12898 states that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental impacts of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Northern Mariana Islands." The Proposed Action would include a public infrastructure project that would not result in any unacceptable adverse human health or environmental impacts to either the general population at large or specifically to minority populations or low-income populations.

4.11 EO 13045 – PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH AND SAFETY RISKS

EO 13045 applies to economically significant rules under EO 12866 that concern an environmental health or safety risk that EPA has reason to believe may disproportionately affect children. Environmental health risks or safety risks refer to risks to health or to safety that are attributable to products or substances that the child is likely to come in contact with or ingest (such as the air we breathe, the food we eat, the water we drink or use for recreation, the soil we live on, and the products we use or are exposed to) (EPA, 2014). During the construction period of the Proposed Action, access to the construction site would be restricted to the general public as a safety measure. Further, no locations of concentration of children (e.g., schools, playgrounds, daycare centers) are located near the project area; therefore, the Proposed Action is not expected to disproportionately affect the health and safety of children.

4.12 EO 13089 – PROTECTION OF CORAL REEFS

EO 13089 states that "all Federal agencies whose actions may affect U.S. coral reef ecosystems shall: (a) identify their actions that may affect U.S. coral reef ecosystems; (b) use their programs and authorities to protect and enhance the conditions of such ecosystems; and (c) to the extent permitted by law, ensure that any actions they authorize, fund or carry out will not degrade the conditions of such ecosystems."

The Proposed Action consists of an overflow channel and other features designed to divert high-velocity and high-volume flood flows into the existing left-bank floodplain thereby reducing the main channel flow in the approximately 3,200-ft long reach of the stream. This would result in a reduced risk of flooding during high-flow/flood events. Diversion of stream waters would also reduce erosion of the stream banks, allowing for less sediment to be directly transported to the stream mouth and into the nearshore marine environment. Improved water clarity and reduced sedimentation would have positive impacts on the coral species as well as the marine invertebrate species supported by the coral reef.

There would be no projected adverse impacts to coral reef ecosystems under the Proposed Action since the construction activities would adhere to applicable BMPs and regulations, such as the CWA. Therefore, since the Proposed Action may enhance the conditions of coral reef ecosystems, its implementation would be compliant with EO 13089.

4.13 STATE CONSERVATION DISTRICT USE

Since 1964, the Board of Land and Natural Resources has adopted and administered land use regulations for the Conservation District pursuant to the State Land Use Law (Act 187) of 1961. Act 187 defined Conservation as meaning the protection of watersheds and water supplies; preserving scenic areas; providing park lands, wilderness and beach reserves; conserving endemic plants, fish, and wildlife; preventing floods and soil erosion; forestry; and other related activities.

DLNR, Office of Conservation and Coastal Lands (OCCL) requires that a Conservation District Use Application (CDUA) be filed to apply for land use(s) within the State of Hawaii Conservation District. All land uses, pursuant to Title 13 Chapter 5, HAR, must be an identified land use and require that a CDUA be filed with the Department and approved by the Board of Land and Natural Resources prior to its initiation. These rules and regulations identify land uses that may be allowed by discretionary permit as well as impose fines for violations. An application is not considered accepted for processing until the Department has found it complete. The Proposed Action does not occur within the State of Hawaii Conservation District (Figure 3-7). Therefore, it is not anticipated that a CDUA would be necessary for the Proposed Action.

4.14 STREAM CHANNEL ALTERATION PERMIT

Pursuant to Chapter 174C Hawaii Revised Statutes, and Chapter 13-169 HAR, the DLNR Commission on Water Resource Management's Stream Protection and Management (SPAM) Branch requires a permit for any temporary or permanent activity within the stream bed or banks that may: 1) Obstruct, diminish, destroy, modify, or relocate a stream channel; 2) Change the direction of the flow of water in a stream channel; or 3) Remove any material or structure from a stream channel. Since the Proposed Action requires work to be conducted within the stream channel, a Stream Channel Alteration Permit would be required; however, such in-stream activity would be temporary in nature. Once short-term construction activities are completed, no other in-stream disturbance is anticipated. Further, long-term stream dynamics would mirror natural stream channel dynamics and floodplain / flood conditions.

4.15 FARMLAND PROTECTION POLICY ACT

The purpose of the Farmland Protection Policy Act (FPPA) (7 U.S.C. 4201 et seq., implementing regulations 7 CFR Part 658, of the Agriculture and Food Act of 1981, as amended) "is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure that Federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland." The Proposed Action does not include any activities, including new construction or acquisition of undeveloped land, which could potentially convert one land use to another. Land use within the affected area would remain unchanged; therefore, the Proposed Action is in compliance with the FPPA.

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5.0 AGENCIES AND ORGANIZATIONS CONSULTED

The following is a list of agencies and organizations to which the Draft EA previously released in March 2009 (USACE, 2009) were sent. This draft EA will be sent to these parties for review during the required 30-day public review period. Comments received on this draft EA will be addressed and included in the final EA.

Table 5-1: List of Agencies and Organizations Consulted

	Consulted Agency or Organization
Federal Agencies	EPA - Pacific Islands Contact Office
	USFWS
	USGS Hawai'i Water Science Center
	United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)
	NMFS - Pacific Islands Regional Office
State Agencies	Department of Accounting and Genera l Services
	DAR
	Department of Agriculture
	Department of Business, Economic Development and Tourism (DBEDT)
	DBEDT Hawaii Housing Finance and Development Corporation
	Department of Defense
	Department of Education
	Department of Hawaiian Home Lands , Hawaiian Homes Commission
	Department of Health
	Department of Human Services
	Department of Labor and Industrial Relations
	DLNR
	DLNR State Historic Preservation Division
	Department of Transportation
	Commission on Water Resource Management
	OEQC
	Office of Hawaiian Affairs
	Office of Planning, Hawaii CZM Program
	University of Hawai'i Environmental Center
County of Maui	Department of Environmental Management
	Department of Fire and Public Safety
	Department of Housing and Human Concerns
	Department of Parks & Recreation
	Department of Planning
	Department of Public Works
	Department of Transportation
	Department of Water Supply
	Maui County Cultural Resource Commission
	Maui County Council
	Office of Economic Development
	Police Department
Utilities	Hawaiian Telecom

Utilities (continued)	Hawaiian Electric Company
	Oceanic Time Warner
Libraries	Kahului Public Library
	Wailuku Public Library
	Maui Community College Library
	Hawaii Legislative Reference Bureau
	Hawaii State Library
	University of Hawaiʻi at Manoa Library
Organizations/Individuals	Aquanimity Now
	Earthjustice
	Greenways Maui
	Hui O Nā Wai ʻEhā
	Hui Pono Ike Kanawai
	Kuleana Kuʻikahi LLC
	Linsey's LLC
	Maui Culture and Arts Center
	Maui Tomorrow Foundation
	North Shore at Waiehu, LLC
	Sierra Club Hawaii Chapter
	Sierra Club Maui
	The Civic Clubs Maui Council
	Wailuku Community Association
	Wailuku Main Street Association
	West Maui Watershed Partnership
Elected Officials	State Representative (District 8) - Joseph M. Souki
	State Representative (District 9) - Justin H. Woodson
	State Senator (District 5) - Gilbert S.C. Keith-Agaran
	State Senator (District 6) - Rosalyn H. Baker
News Media	The Maui News
	Maui Coastal Land Trust

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Appendix A*:*

Comment Letters and Responses

REVIEW COMMENT	PROJECT: DOCUMENT:	Iao Stream Flood Control Project Draft Environmental Assessment	LOCATION:	Wailuku, Maui, Hawaii
	DATE: REVIEWER: PHONE:	March-April 2009 Various	Document Developed By:	GSI Pacific, Inc. USACE

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
Department of Business, Economic Development & Tourism: Office of Planning	03.30.09	The proposal to modify the flood control channel must be submitted for CZM federal consistency review, as required under the CZM Act of 1972, Section 307(c).	Concur. The project team will comply with CZM federal consistency requirements.	
State of Hawaii: Department of Hawaiian Home Lands	03.25.09	No Comment	Thank you for your review.	
State of Hawaii Department of Land and Natural Resources: Div. of Forestry & Wildlife	03.19.09	No Comment	Thank you for your review.	
State of Hawaii Department of Land and Natural Resources: Land Division – Maui District	03.19.09	No Comment	Thank you for your review.	
State of Hawaii Department of Land and Natural Resources: Engineering Division	03.19.09	Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zones A5, A6 and B. The National Flood Insurance Program does regulate developments within these flood zones as indicated in bold letters below.	Comment noted.	

REVIEW COMMENT	PROJECT: DOCUMENT:	Iao Stream Flood Control Project Draft Environmental Assessment	LOCATION:	Wailuku, Maui, Hawaii
	DATE: REVIEWER: PHONE:	March-April 2009 Various	Document Developed By:	GSI Pacific, Inc. USACE

Reviewer Company Name	**Date**	**COMMENTS**	**RESPONSES (Contractor)**	**Back check by:**
State of Hawaii Department of Land and Natural Resources: Engineering Division	03.19.09	Please note that the project site must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken.	Concur, thank you for providing guidance.	
State of Hawaii Department of Land and Natural Resources: Engineering Division	03.19.09	Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards.	Concur, thank you for providing guidance.	
State of Hawaii Department of Land and Natural Resources: Engineering Division	03.19.09	Project must comply with Federal E.O. 11988	Concur, thank you for providing guidance.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(vii) ACRONYMS AND ABBREVIATIONS DAR Division of Aquatic Resources	Revision has been made to acronym list.	

REVIEW COMMENT	PROJECT: Iao Stream Flood Control Project DOCUMENT: Draft Environmental Assessment	LOCATION: Wailuku, Maui, Hawaii
	DATE: March-April 2009 REVIEWER: Various PHONE:	Document Developed By: GSI Pacific, Inc. USACE

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(ES-2) Although I did mention that the shading does cool water in the concrete channel, I am unclear of the vegetated stream banks and what would be planted for shading? The morning sun is blocked by the concrete walls in the flood stream project for part of the day. "Large" boulders placed in the low flow channel could provide "similar shading" without the need for planting overhanging vegetation or full channel modifications.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(ES-3) The proposed straightening of the stream may not totally address the erosion from high water conditions. The stream naturally curves and may still result in eroded areas where flow is "constricted." Since water is absent 90% of the time, how will more groundwater be facilitated during low flow?	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(ES-3) Erosion is a natural process and the eroded banks appear to be the result of the large volume of water constricted in certain locations during heavy flooding.	Comment noted.	

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	DATE: REVIEWER: PHONE:	March-April 2009 Various	Document Developed By:	GSI Pacific, Inc. USACE

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(ES-8) The additional traffic over the Imi Kala Bridge will greatly impact the usual Post Office traffic.	Comment noted.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(ES-8) Please describe and fully explain "project failure"	"Project failure" refers to the case in which the original flood control project can no longer provide the adequate protection against flooding as it was originally intended to. Section 1.2 (Project Location and Background) and Section 1.4 (Purpose and Need for Action) of the EA describes the current state of the existing flood control structures and the need for action to avoid potential "failure" of the structures.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(1-2) I cannot take all the credit for stream recruitment. During the late 1980s, there was sufficient rainfall and recruitment to make 'o'opu (fish) and opae (shrimp) common throughout the State Park. A certain level of flow is needed to maintain natural stream populations. The increase in reproduction usually coincides with rainy season. However, reproduction can occur throughout the year with consistent rains.	Concur. The requirement of stream flow to maintain natural stream populations has been added to Section 3.5.3 (Biological Resources; Existing Conditions) of the EA.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(1-2) The low rainfall and drought have helped to magnify how critical stream flow is necessary for healthy stream ecosystem and watershed. My continued collection of post larvae is to document that recruitment will need continuous stream flow.	Concur, as noted above.	

REVIEW COMMENT	PROJECT: DOCUMENT:	Iao Stream Flood Control Project Draft Environmental Assessment	LOCATION:	Wailuku, Maui, Hawaii
	DATE: REVIEWER: PHONE:	March-April 2009 Various	Document Developed By:	GSI Pacific, Inc. USACE

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	<u>Waiehu Beach Road (Sta 22+00)</u> I collected post larvae stream animals (shrimp, fish, prawn) migrating upstream in the concrete run. When stream flow stops, pools form and the animals survive for another one to four days. The animals must survive the increasing water temperature that can exceed 90 degrees F. during the summer. The water eventually dries killing the stream animals. In intermittent stream a stream canopy or vegetation helps to cool the water temperature.	Comment noted.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	<u>22-foot drop structure at Station 97+23</u> I am not in support of a new stepped drop structure. The "lack of flowing water" rather than the sheer drop prohibits migration. Ordinarily, the first waterfall in a stream helps keep invasive species and poor climbers from inhabiting upstream locations.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	<u>22-foot drop structure at Station 97+23</u> I strongly recommend hydraulic improvements. Could a weir or some other structure be used to pool water? Deeper depths would allow water to slow. Water could flow over a lip which could also help aerate the lower stream.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	

REVIEW COMMENT	PROJECT: Iao Stream Flood Control Project DOCUMENT: Draft Environmental Assessment	LOCATION: Wailuku, Maui, Hawaii
	DATE: March-April 2009 REVIEWER: Various PHONE:	Document Developed By: GSI Pacific, Inc. USACE

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	<u>22-foot drop structure at Station 97+23</u> Could a waterfall or boulder transition zone be made to flow into the low flow channel that was built on the left (downstream) side?	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	<u>22-foot drop structure at Station 97+23</u> I do not consider the “low flow” channel “ideal.” The “low flow channel” would be functional if water and stream flow were both present.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(1-12) Alternative III (Please describe the boulders in the main channel low flow section. I would like to see much “larger” boulders placed or imbedded in the concrete channel. I am not against the proposed levee.)	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	

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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(1-12) Alternative III Instead of baffle blocks, it seems the large boulders that are being removed from the stream by tractors should be moved to certain locations.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(2-1) (Station 40+00) As described previously, could one or more weirs be made to slow down the water flowing in this area? Can water depth be increased with a natural pool? This might also create an area that would deposit substrate with increased flows. In my discussion with taro farmers, they would redirect water with the placement of boulders or rocks to prevent erosion in irrigation ditches.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	

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	DATE: REVIEWER: PHONE:	March-April 2009 Various	Document Developed By:	GSI Pacific, Inc. USACE

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(3-14) Groundwater recharge basin and diversion levee Is the negative impact introduced species? Introduced species will never be eradicated and will continue to flow downstream with flooding. Gupples, swordtails, toads, and apple snails have been found from the State Park to the ocean. The intermittent stream and lack of flow is the biggest impediment for maintaining a healthy stream.	The negative impacts were mentioned during the 3/31/08 site visit, specifically: Backwater will create habitat for undesirable species, as well as remove important low stream flows from the low flow channel. In addition, the small dam will make it more difficult for aquatic migration during low flows. Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would not include construction of the structures that have raised concerns mentioned in this comment. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(3-14) Groundwater recharge basin and diversion levee I suggest that the back of the debris basin be reviewed. The waterfall and stream flowing into the debris basin should be duplicated. If the rocks and boulders could be allowed to remain in the basin, it would provide needed stream habitat.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(3-14) Groundwater recharge basin and diversion levee Although, I would love to see the pavement trail for public use, it does not appear to be necessary for the stream to flow naturally to the ocean (Figure 3-7).	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	

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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(3-25) The County of Maui has been placing boulders against the eroding levee toe. I would suggest larger boulder be placed upstream to redirect and dissipate flow away from the levee toe.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(5-5) Fresh water spring on Sevilla property. If flow is restored to lower Iao Stream, the natural stream areas currently proposed for full channelization may help to restore flow to this spring is the future. If channelized, we may not know what level of flow was needed for such springs to flow to the ocean. Once flow is restored, a period of time may be needed for the stream to become saturated and natural springs to re-appear downstream.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(5-5) The location of the heiau was determined by the rocks deposited by the natural stream. If kalo were being raised throughout the watershed, wetlands and flooding would be better understood. Flood plains would also be clearly known and development would not be allowed to occur in those areas.	Comment noted.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(5-7) Iao Streaam attractions is recognized by visitors to the Kepaniwai County and Iao State Parks. Many people may not know that the dry stream next to the heiau is the same stream they photographed in the valley by the Needle.	Comment noted.	

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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(5-8) Do three diversion features exist? Is there a Kama ditch diversion? I've only found two diversions and came across what might be concrete remnants of the Kama ditch diversion above the debris basin.	According to Hui O Nā Wai 'Ehā and Maui Tomorrow Foundation, Inc.'s petition to amend interim instream flow standards [IIFS] (dated June 25, 2004), "Two smaller ditches, the Maniania Ditch and the Iao-Waikapu Ditch, carry about 18 Mgal/d from diversions in the Iao Stream and from tunnels driven in the Iao Stream valley. A third small ditch, the Kama Ditch, diverts water from Iao Stream at a lower elevation than the shared diversion of the Maniania and Iao-Waikapu Ditches." Although diversion of stream waters is no longer in place following implementation of the IIFS in October 2014, mention of the three diversion features from which water was historically diverted will be left as is in the EA.	
State of Hawaii Department of Land and Natural Resources: Div. of Aquatic Resources – Skippy Hau	03.19.09	(5-27) Stream animals have survived the conditions in the flood control project. Although not optimal, I strongly recommend that as much of the stream as possible, be kept natural. I do not believe total concrete channelization is necessary.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii: Department of Defense – Office of the Director of Civil Defense	04.14.09	No Comment	Thank you for your review.	
State of Hawaii: Department of Transportation	04.17.09	The proposed subject modification to the existing 1981 Iao Stream Flood Control project will not adversely impact DOT State highway facilities.	Comment noted.	

REVIEW COMMENT	**PROJECT:** Iao Stream Flood Control Project **DOCUMENT:** Draft Environmental Assessment	**LOCATION:** Wailuku, Maui, Hawaii
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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii: Department of Transportation	04.17.09	A permit is required from the DOT Highway Division Maui District Office, at telephone number (808) 873-3538, for the transport of oversized equipment/overweight loads within the State highway facilities and for all work done within the State Highway right-of-way.	Thank you for providing guidance, the project team will make sure to comply with all applicable DOT Highways regulations.	
County of Maui: Department of Parks & Recreation	04.15.09	No Comment	Thank you for your review.	
County of Maui: Department of Public Works	04.16.09	No Comment	Thank you for your review.	
NOAA: Pacific Islands Regional Office - Danielle Jayewardene Ph.D. - Coral Reef Ecologist	04.22.09	We are concerned that the proposed RCC lining of 7,200 ft of the stream (alternative III)will significantly increase the in-stream flow and decrease the filtration function of the current non-channelized stream bed and banks, and that this will result in an increase in pollutants, nutrients, debris, and sediment entering the marine environment.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	

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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
NOAA: Pacific Islands Regional Office - Danielle Jayewardene Ph.D. - Coral Reef Ecologist	04.22.09	While we understand that the proposed Alternative III is preferable to channelizing the system as proposed in Alternatives I and II, and that Alternatives V and VI would have serious negative impact to the Wailuku community during flood events, we question the lack of a proposed alternative which would improve flood control while keeping intact the more natural stream system (e.g. by maintaining the stream bed in its natural condition, stabilizing banks with structures other than concrete, creating riparian buffers, increasing the function of natural vegetated flood plains etc).	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
NOAA: Pacific Islands Regional Office - Danielle Jayewardene Ph.D. - Coral Reef Ecologist	04.22.09	We understand that this project is well on its way, but hope that there is justification for not exploring a more environmentally sound alternative. We recommend that such an alternative, which encompasses an impact assessment to also the marine environment, be fully investigated in future stream modification projects.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
Wailuku Main Street Association	04.22.09	Will submit comments at a later time.	Comment noted.	
DLNR - Div. of State Parks	04.23.09	No comment	Thank you for your review.	
DLNR - Commission on Water Resource Management	04.27.09	No comment	Thank you for your review.	

REVIEW COMMENT	**PROJECT:** Iao Stream Flood Control Project **DOCUMENT:** Draft Environmental Assessment	**LOCATION:** Wailuku, Maui, Hawaii
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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii – Department of Health	04.22.09	1) Any project and its potential impacts to State waters must meet the following criteria: a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected. b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State water. c. Water quality criteria (HAR, Section 11-54-4 through (11-54-8)	Thank you for providing guidance. The project team will make sure to comply with all applicable state and federal regulations.	

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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii – Department of Health	04.22.09	2) You are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharge of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). For the following types of discharge into Class A or Class 2 State waters, you may apply for NPDES general permit coverage by submitting a Notice of Intent (NOI) from: a. Storm water associated with industrial activities, as defined in Title 40, Code of Feral Regulations (CRF), Section 122.26 (b)(14)(i) through 122.26(b)(14)(ix) and 122.26(b)(14)(xi). b. Storm water associated with construction activities, including excavation, grading, clearing, demolition, uprooting of vegetation, equipment staging, and storage areas that results in the disturbance of equal or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. An NPDES permit is required before the start of the construction activates. c. Hydrotesting water. d. Construction dewatering effluent.	Thank you for providing guidance. The project team will make sure to comply with all applicable state and federal regulations.	
State of Hawaii – Department of Health	04.22.09	3) For types of waste water discharges not covered by an NPDES general permit or discharges to Class AA or 1 State waters, you may need an NPDES individual permit.	Thank you for providing guidance. The project team will make sure to comply with all applicable state and federal regulations.	

REVIEW COMMENT	PROJECT: DOCUMENT:	Iao Stream Flood Control Project Draft Environmental Assessment	LOCATION:	Wailuku, Maui, Hawaii
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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
State of Hawaii – Department of Health	04.22.09	4) You must also submit a copy of the NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the CWB that SHPD has or is in the process of evaluating your project.	Thank you for providing guidance. The project team will make sure to comply with all applicable state and federal regulations.	
State of Hawaii – Department of Health	04.22.09	5) Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)] Paragraph 401 (a)(1), a Section 401 Water Quality Certification (WQC) is required for "any applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters.." The term "discharge" is defined in CWA, Subsection 502(16), 502912), and 502(6); Title 40, CRF, Section 122.2; and HAR, Chapter 11-54	Thank you for providing guidance. The project team will make sure to comply with all applicable state and federal regulations.	
State of Hawaii – Department of Health	04.22.09	6) Please note that all discharge related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 Water Quality Certification are required, must comply with the Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.	Thank you for providing guidance. The project team will make sure to comply with all applicable state and federal regulations.	

REVIEW COMMENT	**PROJECT:** Iao Stream Flood Control Project **DOCUMENT:** Draft Environmental Assessment	**LOCATION:** Wailuku, Maui, Hawaii
	DATE: March-April 2009 **REVIEWER:** Various **PHONE:**	**Document Developed By:** GSI Pacific, Inc. USACE

Reviewer Company Name	**Date**	**COMMENTS**	**RESPONSES (Contractor)**	**Back check by:**
State of Hawaii – Department of Health	04.22.09	7) The Iao Stream is identified as Category 3 water in the CWA, Section 303(d) list of impaired water bodies in Chapter IV of the 2006 State of Hawaii Water Quality Monitoring and Assessment Report and the Total Daily Maximum Load (TMDL) Priority is listed as Medium.	Comment noted. Updated information from the 2014 Water Quality and Assessment Report has been added to the EA.	
State of Hawaii – Office of Hawaiian Affairs	04.22.09	Besides being indicative of poor urban planning, OHA notes that this situation has required the application to propose to essentially destroy some 70% of the remaining natural alluvial stream channel, which will potentially create one of the longest channelized streambeds in the state.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii – Office of Hawaiian Affairs	04.22.09	Further, OHA is unconvinced of the proposition that the applicant can convert 7,200 feet of natural stream bed to a roller compacted concrete lined channel (DEA, page 1-2) and somehow create a fake stream that, "Not only will the aquatic fauna have an environment in which to survive, but the stream itself appear more natural and aesthetically pleasing". (DEA, page ES-12)	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii – Office of Hawaiian Affairs	04.22.09	Further, we point out that this project will inevitably have drastic consequences for and on the existing habitats, stream flow, groundwater recharge, sediment discharge and the ecologic systems that are a part of this stream.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment.	
State of Hawaii –	04.22.09	For example, some native species such as opae	The new design alternative (Alternative F) no longer	

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Office of Hawaiian Affairs		oeha'a and o'opu-akupa, which are listed specifically under that State Water Code 174C-101, may not survive. (DEA, page 3-27) Coral reefs such as those in Kahului Bay and wetlands, which are also given additional legal protections, will also be negatively affected by this proposal. OHA urges that the applicant must at least verify and jurisdictionally delineate the wetlands in the assessed and recommendation made. (See DEA, page ES-5)	proposes lining of the natural streambed; therefore, adverse impacts to the native species in the stream are no longer anticipated. The IIFS implemented in October 2014 is anticipated to facilitate upstream migration of the aquatic species that have an amphidromous life cycle. Alternative F incorporates designs to allow for the IIFS of up to 10 million gallons per day (mgd) to remain in the channel and to facilitate fish passage in the stream. In addition, diversion of stream waters at the overflow channel section would allow flood waters to be dispersed into the natural floodplain where sediment and other entrained constituents would be able to settle out instead of being directly channeled downstream and into the nearshore marine environment. Reduction of stream flow in the main channel during large storm events would decrease erosion of the stream banks and further reduce suspended sediment load entering Kahului Bay. Decrease in sedimentation and turbidity is expected to improve water clarity and the current condition of reef habitats within the nearshore environment. According to the U.S. Fish and Wildlife Service's *National Wetlands Inventory*, potential pockets of wetlands are present within the project area; however, none have been identified during biological or stream surveys conducted along the stream. A survey would be conducted prior to the start of the proposed construction activities to document the presence or absence of wetlands within the area.	

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			Work practices during construction activities would be modified as needed to avoid or minimize any impacts to any identified wetlands.	
State of Hawaii – Office of Hawaiian Affairs	04.22.09	Generally, OHA wishes to see stormwater as a resource to be captured and conserved rather than a nuisance to be channeled and drained away.	Concur. The entire watershed is a receptacle to capture and conserve rainfall and stormwater, and we agree that this is critical to replenishing aquifers. The new design alternative (Alternative F) no longer includes channel hardening of the natural streambed; thereby eliminating concerns regarding reduction in groundwater recharge. Rather than channeling away stormwater, Alternative F would allow stormwater to spread out in the existing floodplain allowing natural groundwater recharge.	
State of Hawaii – Office of Hawaiian Affairs	04.22.09	Furthermore, because this is a flood plain it is not unexpected and quite natural that flooding will occur here. As such, we are unconvinced that these improvements will prevent future flood events or even offer probable benefits that outweigh the clear irreversible and negative impacts that this project contains.	The project team understands that some degree of flooding is natural. Following additional alternative screening analysis, a new design alternative was developed that would prevent loss of life and property as a result of extreme flood events but involve significantly less disturbance to the existing environment, compared to the previously selected alternative. Smaller, more routine flood events would be contained by the channel and the natural floodplain that will remain on the left bank.	

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State of Hawaii – Office of Hawaiian Affairs	04.22.09	Further, we are unconvinced of the adequacy and implementation of the proposed mitigations, For example, the preferred alternative often relies on mitigation measures to facilitate the movement of aquatic organisms though modified channels. However, on page ES-4 the DEA states that these mitigations measures are "currently under discussion" and page 3-25 states that they "have been proposed" and "accepted". However, it is not clear what this means and yet these conditional measures are presented factually throughout the rest of this document. (See pages ES-8 and 3-25, for example.) This must be clarified. The adequacy of this review is compromised when mitigations that the applicant relies upon for their preferred alternative are not presented well.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
State of Hawaii – Office of Hawaiian Affairs	04.22.09	Additionally, OHA points out that while the proposed action probably will reduce the increased sedimentation that results from high water or storm events, it will generally increase the discharge of sediments into the nearshore area under normal conditions. This must be addressed in this environmental document so that reviewers can assess the overall benefits and negative impacts of this proposal and make a determination as to whether or how to proceed.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	

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State of Hawaii – Office of Hawaiian Affairs	04.22.09	OHA also notes that the applicants states that a National Historic Preservation Act Section 106 consultation was initiated by the U.S. Army Engineer District. However, our agency has no record of receiving this invitation and as such, does not recognize the initiation of the 106 process. This communicated to the applicant in a cultural impacts assessment comment letter on October 27, 2007.	The preliminary findings of the Archaeological Inventory Survey (AIS) conducted in May 2014 were forwarded to the State Historic Preservation Division (SHPD) via email in June 2014. The formal Section 106 consultation process will be initiated with submittal of the draft AIS for SHPD review and comment. The draft EA will be updated with Section 106 consultation letters as they become available.	
State of Hawaii – Office of Hawaiian Affairs	04.22.09	Additionally, we point out that negative reactions from the community and project criticism are not to be considered "cultural impacts"….OHA knows that there are numerous lo'i, heiau, and other culturally significant sites in the area as well as constitutionally protected Native Hawaii rights being practiced in the area. Therefore, the cultural impacts statement should address these concerns.	Section 3.6, Historical and Cultural Resources, includes discussion of the existing cultural resources within and in the vicinity of the proposed project area and evaluates whether any potential impacts are anticipated under the Proposed Action.	
U.S. Fish and Wildlife Service	04.29.09	*Anticipated Impacts:* Trust resources that will be impacted by the modified project include over a mile of natural stream and riparian habitat for several species of native, amphidromous stream fish and invertebrates from project construction. An unknown portion of the nearshore environment (including coral reefs) will be impacted from high volume and velocity flood flows directed to the ocean via the channelized stream.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	

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U.S. Fish and Wildlife Service	04.29.09	*Project Alternatives:* A CWA Section 404(b)(1) Analysis has not been provided, nor is the least environmentally damaging practical alternative (LEDPA) identified.	The CWA Section 404(b)(1) analysis is included as Appendix B. The EA has been revised to identify the LEDPA.	
U.S. Fish and Wildlife Service	04.29.09	*Project Alternatives:* Three of the five alternatives currently under consideration in the Draft EA for the modified project involve placement of concrete lining over 7,200 linear feet (ft) of stream channel that is currently natural substrate. One alternative (V), evaluated but not supported by the USACE involves removal of all existing 2,500 ft of existing concrete flood control structures (installed in segments during the previous project both up- and downstream of the proposed project area) to facilitate a watershed scale ecological restoration of Iao Stream. Should any of the first three alternatives be implemented, the existing 2,500 ft of previously hardened stream would be expanded by an additional 7,200 ft of concrete channel. This would result in 9,700 ft of continuous channelized stream, the longest in Hawaii. Ecological restoration of the stream is not considered a viable option due to flood risk to human safety and property that has been developed in the floodplain.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	

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U.S. Fish and Wildlife Service	04.29.09	*FWS Recommendations:* The 2006 Revised Draft FWCA report recommendations acknowledge project requirements for flood control and provide conditional recommendations for project alternatives with prescribed mitigation measures, including enhanced stream flow. Subsequent to the report and based on site visits with USACOE and Hawaii DAR personnel, FWS offered additional technical assistance with developing mitigation in the form of structural design features that will help native stream fauna survive.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). We appreciate continued USFWS guidance and support of this project.	
U.S. Fish and Wildlife Service	04.29.09	*FWS Recommendations:* The USACE Honolulu Engineer District prepared a Draft Environmental Assessment (DEA) in March 2009, with a public review period open until April 30th, 2009. FWS recommendations from the 2006 report, as well as design modifications and mitigation measures developed and recommended based on FWS, USACE, and DAR site visits, were clearly considered in the alternatives analysis of the EA. However, FWS continues to believe that anticipated project impacts need further evaluation and will have substantial unacceptable impacts to the aquatic environment that could be resolved through further inter-agency coordination and technical assistance.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). We appreciate continued USFWS guidance and support of this project.	

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U.S. Fish and Wildlife Service	04.29.09	***Discussion***: The USACE construes the FWS 2006 recommendations as support for recommended Alternative III (USACE preferred alternative). They seeks our agreement that the design is environmentally acceptable with integration of a grouted boulder, low-flow channel and other stream bed and structural retro-fits to the previously installed concrete channels, to mimic the natural habitat of Iao Stream and to facilitate up and downstream migration of native organisms.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). We appreciate continued USFWS guidance and support of this project.	
U.S. Fish and Wildlife Service	04.29.09	***Discussion:*** A three year time period has elapsed between the submittal of recommendations in the 2006 FWCA report and the USACE development of the DEA. Over this interim period, additional information has been gathered including public concerns expressed at the informational meeting held in Wailuku, Maui on April 16, 2009, and some broader perspectives and concerns expressed by new FWS personnel assigned to the project.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). We appreciate continued USFWS guidance and support of this project.	

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U.S. Fish and Wildlife Service	04.29.09	***Discussion:*** Because of our unresolved concerns about impacts of the proposed project on trust resources, an inter-agency discussion and coordination effort is recommended prior to completion of the Final EA. This discussion is needed to consider updated policy and views of the resource agencies, including the USACE, EPA, NOAA and Hawaii DAR and to consider other technical approaches to developing more holistic mitigation and a project design that also is more sensitive to broader watershed concerns such as floodplain function, groundwater recharge, and protection of coral reef from land based sources of pollution.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). We appreciate continued guidance and support from USFWS, USEPA, NOAA, and Hawaii DAR for this project. The consultation will be documented in the EA.	
U.S. Fish and Wildlife Service	04.29.09	Applicability of Executive Order 11988 (Floodplain Management). Federal action agencies are required to discourage development in floodplains. Implementation of this flood control project could encourage further development in hazardous, flood-prone areas	The intent of the Proposed Action is to reconnect the main channel with the floodplain to reduce damaging flows along the main channel and right bank levees. The Proposed Action is not anticipated to encourage development within the floodplain.	
U.S. Fish and Wildlife Service	04.29.09	Applicability of Executive Order 13089 (Protection of Coral Reefs). Sec. 2. Policy. (a) All Federal Agencies whose actions may affect U.S. coral reef ecosystems; (b) utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and (c) to the extent permitted by law, ensure that any actions they authorize, fund, or carry out will not degrade the conditions of such ecosystems	Concur. Please refer to Section 4.12 of the EA for a discussion of E.O. 13089.	

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U.S. Fish and Wildlife Service	04.29.09	Resource agencies evolving perspectives. Perspectives on ecosystem and watershed approaches to restoring stream and riparian habitat function to maintain native species are now linked to the protection of shoreline and nearshore marine resources including coral reefs. The 2006 FWCA report noted that impacts to the marine environment from sediment, urban runoff and freshwater pulses from the flood controls were considered secondary in nature as the focus of the analysis of effects at the time was limited to the footprint within the stream. The stated purpose of the project in the DEA is to redirect flood flows directly to the ocean, and therefore, these impacts should be considered as being primary and need to be more carefully evaluated.	Comment noted. Thank you.	
U.S. Fish and Wildlife Service	04.29.09	Federal agency responsibility to evaluate the effects of climate change on authorized activities: Need to address through modeling or other data analysis, the projected effects of climate change on flooding and stream flow at this site, from extreme draught to more frequent or intensified flooding. Address the flow limited situation in the current structure and the fact that engineered design modifications to accommodate native stream species with conservation flows, or to protect from flooding.	Discussion of the impacts of climate change has been added to the EA (see Section 3.2.5 Climate, Air Quality, and Greenhouse Gases; Potential Impacts and Mitigation).	

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		The proposed baffle blocks, construction of weirs, low flow channel and a graduated drop structure, are all moot with minimal or inadequate flows to support native aquatic species passage. The USACE acknowledges that partially restored stream flow for the low-flow design elements of Alternative III would function to enhance passage of native stream fauna. Therefore, we support the USACE's good faith integration of these design features. However, the features themselves are not adequate to mitigate comprehensively for impacts to aquatic resources at various life history stages under a range of flow conditions. Additional modeling and natural habitat replacement may be needed.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). We appreciate continued USFWS guidance and support of this project.	
U.S. Fish and Wildlife Service	04.29.09	Additional design features. Consideration should be given to inclusion of bioengineered/fish-friendly approach to stream bank stabilization and erosion control, trash racks or interceptors, sediment retention features, treatment of floodwaters, and possible screening at diversion points to prevent fish entrainment, among other potential features.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). We appreciate continued USFWS guidance and support of this project.	

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U.S. Fish and Wildlife Service	04.29.09	<u>Pending court cases to restore stream flow</u>: There is also new knowledge that stream flow restoration is being adjudicated and under discussion by County, State and Federal Resource Agencies, community groups and private entities that hold licenses for diversions of Iao Stream water. If the stream is completely channelized for flood control, this could adversely affect allocations of restored flow to the stream.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). We appreciate continued USFWS guidance and support of this project.	
U.S. Fish and Wildlife Service	04.29.09	<u>Implementation of the April 10, 2008, Final Rule for Compensatory Mitigation for Losses of Aquatic Resources</u>: In addition to the proposed engineering modifications to the project, structural or design features that are flow-limited do not specifically provide any natural habitat values for native fish and wildlife resources. It is important to identify opportunities for in-stream, riparian, upper and lower watershed habitat enhancements or protection to provide a better replacement of ecological function, consistent with the April 2008 Mitigation Rule.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). We appreciate continued USFWS guidance and support of this project.	

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U.S. Fish and Wildlife Service	04.29.09	Project Operation and Maintenance. The USACE makes the case that volunteer vegetation that colonizes or establishes itself in the channel or banks will be allowed to remain to provide shade (cooling) for the low-flow channel. It will be important for the USACE to work closely with the local project sponsor to ensure that maintenance of the flood control does not preclude development of overhanging vegetation on the channel walls and establishment on the channel bed to provide shading of the low—flow channel.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). We appreciate continued USFWS guidance and support of this project.	
U.S. Fish and Wildlife Service	04.29.09	Project consistency with concurrent ahupua'a watershed conservation planning. The West Maui Watershed Partnership has expressed substantial concern for protection of coral reefs from land-based sources of pollution and also for impacts of this project on ground water recharge. The proposed design appears inadequate to protect coral reefs and to compensate for anticipated reductions of groundwater. It is important that the USACE re-evaluate how to effectively accommodate these concerns.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). Please refer to Appendix F, for our CZMA evaluation report.	

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County of Maui - Department of Environmental Management – Solid Waste Division	05.12.09	None	Thank you for your review.	
County of Maui - Department of Environmental Management – Wastewater Reclamation Division	05.12.09	Access to all existing sewer improvements will need to be provided for maintenance.	Comment noted.	
County of Maui - Department of Environmental Management – Wastewater Reclamation Division	05.12.09	Any manhole within anticipated flood areas will need to be sealed to the satisfaction of the Wastewater Reclamation Division in order to prevent water infiltration.	Comment noted.	
County of Maui - Department of Planning	5.13.09	The applicant is asked to review the proposed project and associated mitigation alternatives for consistency with the Draft Maui Island Plan 2030.	Comment noted.	
County of Maui - Department of Planning	5.13.09	The Department requests that the Applicant address any inconsistencies with the Maui Island Plan relative to preferred mitigation alternative;	Comment noted.	
County of Maui - Department of Planning	5.13.09	Any proposed actions should take into consideration that the area is culturally significant, and is likely to contain burial grounds and other traditional cultural properties;	Section 3.6, Historical and Cultural Resources, includes discussion of the existing cultural resources within and in the vicinity of the proposed project area and evaluates whether any potential impacts are anticipated under the Preferred Alternative.	

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County of Maui - Department of Planning	5.13.09	The area is also known to be rich in archaeological sites, including terraced landscapes and loi, and is proximate to Maui Island's two (2) most significant heiau. Please identify these archaeological sites and provide mitigation alternatives to preserve all archaeological sites;	Section 3.6, Historical and Cultural Resources, includes discussion of the existing cultural resources within and in the vicinity of the proposed project area and evaluates whether any potential impacts are anticipated under the Preferred Alternative.	
County of Maui - Department of Planning	5.13.09	Provide mitigation alternative analysis in order to minimize the expected increased sedimentation that may occur as a result of the proposed project, including the transport of sediment from the existing channel into near-shore coastal waters;	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
County of Maui - Department of Planning	5.13.09	The Department is forwarding the application to the Cultural Resources Commission (CRC) for review and comment. The Department requests an additional four (4) weeks for receipt of comments from a CRC meeting scheduled for June 4, 2009	Comment noted.	

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County of Maui - Department of Planning	5.13.09	The Department asks that a representative from your agency be present at the June 4, 2009 CRC meeting to explain the proposed project and receive comments directly from the CRC. The emphasis of the discussion will be on preservation of cultural resources.	The Corps was unable to attend the meeting; however, Joe Krueger, County of Maui, attended the meeting as a representative and provided an overview of the proposed project. Responses to the comments received during the meeting were provided by the Corps following the meeting. Any additional comments on the current EA that evaluates the new design alternative (Alternative F; the preferred alternative), if any, will be addressed following the 30-day public review period.	
County of Maui - Department of Water Supply	5.08.09	3.1 Technical We understand that the existing flood control structure can not certified as 100-year flood protection in its current condition. Although the recommended alternative will harden 7,200 feet of stream channel, raised levees, and remove 70% of the remaining natural alluvial concrete channel, inclusion of a low flow channel along a vegetated stream bank, and provision of other low flow design elements to facilitate migration of native aquatic species.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	

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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
County of Maui - Department of Water Supply	5.08.09	4.4 Oceanography, Hydrology and flooding: Anticipated impacts to groundwater recharge from the project should be quantified. USGS has measured the loss of stream flow to groundwater in Iao Stream. Above the concrete lining an estimated 3.6 mgd is contributed from the stream to groundwater, while a contribution of 1.9 mgd is estimated at or blow the concrete lining.	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates the concern expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
County of Maui - Department of Water Supply	5.08.09	The State Commission on Water Resource Management (CWRM) has proposed an amended interim instream flow standard (IIFS) for Iao Stream of 13 mgd below the Iao-Waikapu and Iao-Maniania ditches, 8 mgd below the Spreckles ditch diversion and 6.7 mgd at the mouth.	The current status of stream flow restoration will be addressed in the EA.	
County of Maui - Department of Water Supply	5.08.09	The reciprocal impacts of the proposed flood control project and the proposed restoration of stream flow should be discussed in the EA.	The current status of stream flow restoration will be addressed in the EA.	
County of Maui - Department of Water Supply	5.08.09	Will the project be able to provide for flood control protection without jeopardizing the Commission's objective of increased and adequate stream flow for native migratory species?	Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	

REVIEW COMMENT	**PROJECT:** Iao Stream Flood Control Project **DOCUMENT:** Draft Environmental Assessment	**LOCATION:** Wailuku, Maui, Hawaii
	DATE: March-April 2009 **REVIEWER:** Various **PHONE:**	**Document Developed By:** GSI Pacific, Inc. USACE

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
County of Maui - Department of Water Supply	5.08.09	How are such concerns accounted for in the project design?	Please see response above.	
County of Maui - Department of Water Supply	5.08.09	For instance, how is the optimal number of weepholes in the lining determined?	The new design alternative (Alternative F; the preferred alternative) no longer proposes lining of the natural streambed; therefore, this comment is no longer applicable.	

REVIEW COMMENT	PROJECT:	F02-011 Iao Stream Flood Control Project	LOCATION:	Wailuku, Maui, Hawaii
	DOCUMENT:	Public Information Meeting comments		
	DATE:	April 16, 2009	Document Developed By:	GSI Pacific, Inc. USACE
	REVIEWER:	Various		
	PHONE:			

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
Maui Tomorrow Foundation, Inc.	04.21.09	Rivers and streams themselves can serve as flood management	Comments noted. Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates concerns expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
Maui Tomorrow Foundation, Inc.	04.21.09	Wetland areas act as giant sponges, soaking up flood waters as well as filtering water and adding to ground water supplies		
Maui Tomorrow Foundation, Inc.	04.21.09	Flood management measures constructed in the past have reduced the natural live storage capacity of rivers and stream channels by cutting off meanders, leading to increased flow velocities		
Maui Tomorrow Foundation, Inc.	04.21.09	Increased impervious cover in urban watersheds alters stream hydrology and degrades stream habitat, water quality and aquatic diversity		
Maui Tomorrow Foundation, Inc.	04.21.09	Sustainable growth principles have led to recent efforts to restore natural stream functions. These efforts include breaching or setting back levees; restoring meanders; and restoring vegetated banks and wetlands		
Maui Tomorrow Foundation, Inc.	04.21.09	Maui Tomorrow Foundation would ask for a combination of Alternatives IV and V to be considered for the Iao Stream Flood Control Project		

REVIEW COMMENT	PROJECT: DOCUMENT:	F02-011 Iao Stream Flood Control Project Public Information Meeting comments	LOCATION:	Wailuku, Maui, Hawaii
	DATE: REVIEWER: PHONE:	April 16, 2009 Various	Document Developed By:	GSI Pacific, Inc. USACE

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
Hui O' Na Eha: John V. Duey - President	04.16.09	First of all the hearing officer in our petition to amend the IIFS in the Na Wai Eha streams has released his finding, In his decision and order his recommendations to the full board is 13MGD should be in Iao below WWC intake, 8MGD should be below HC&S intake and 6.7MGD should be at the mouth. This will surly effect stream life. Water should be released to the other streams also, not just Iao, but we are talking about Iao here.	Comment noted.	
Hui O' Na Eha: John V. Duey - President	04.16.09	HC&S intakes in Iao Stream should be closed, at least the low flow channel should go around it at present larva being washed down stream go into the intake and into spreckles ditch.	In response to ruling to restore stream flow, this has been taken care of by HC&S in 2014.	
Hui O' Na Eha: John V. Duey - President	04.16.09	I/we are in favor of Alt. #5 removing flood control improvements. Mainly the floor the sides can remain. There is talk in the draft, and I read it cover to cover, about protection. Who told Iao Parkside and others to build next to the river? Now we are suppose to pay to protect their property. Nature is nature.	Comment noted.	

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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
Hui O' Na Eha: John V. Duey - President	04.16.09	According to the Hawaii Stream Assessment done in 1990 out of the 376 perennial streams in Hawaii only 44 streams state wide where "candidates for stream protection" 9 of which are on Maui and all 4 of the streams in Na Wai Eha where designated as "blue ribbon resources". Putting more cement in Iao even with rocks in it would degrade Iao.	Comments noted. Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates concerns expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
Hui O' Na Eha: John V. Duey - President	04.16.09	Dr. Delwyn Oki, of USGS in his written testimony to the hearings officer in the CCH dated 9/14/07 at paragraphs 61 thru 64 states the following ----------------go to his report		
Hui O' Na Eha: John V. Duey - President	04.16.09	So bottom line is this, by covering and additional 7,200' of the river bottom we would lose 1.38MGD of water to the Iao aquifer that is already being stretched to very near its limit of its S.Y. of 20MGD.		
Hui O' Na Eha: John V. Duey - President	04.16.09	And further by going with Alt. 5 removal of channel as I count it 5,230' of existing concrete we would add 2.2MGD to the aquifer using the 'flow –restoration amounts' by Dr. Oki of 2.2MGD of loss per mile. These are facts I don't make up figures.		
Hui O' Na Eha: John V. Duey - President	04.16.09	By doing Alt #3 as recommend Iao would become the longest length of cemented stream in the state. This would be nothing to be proud of.		

<table>
<tr><td>REVIEW COMMENT</td><td>PROJECT:
DOCUMENT:</td><td>F02-011 Iao Stream Flood Control Project
Public Information Meeting comments</td><td>LOCATION:</td><td>Wailuku, Maui, Hawaii</td></tr>
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PHONE:</td><td>April 16, 2009
Various</td><td>Document Developed By:</td><td>GSI Pacific, Inc.
USACE</td></tr>
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<tr><th>Reviewer Company Name</th><th>Date</th><th>COMMENTS</th><th>RESPONSES (Contractor)</th><th>Back check by:</th></tr>
<tr><td>Hui O’ Na Eha: John V. Duey - President</td><td>04.16.09</td><td>John Ford of SWCA environmental consultants testified on June 2008 page 44 of his report “it is our firms belief that the channelized section of streams the primary factor preventing recruitment of native amphidromous species in Iao Stream”</td><td>Comment noted.</td><td></td></tr>
<tr><td>Earthjustice: Isaac H. Moriwake – Attorney for Na Wai Eha</td><td>04.22.09</td><td>As further explained below, the Hui has serious concerns about this proposal to channelize most of the remaining natural streambed in lower Iao Stream, and the failure of the DEA to adequately examine the rationale for the project and its potential environmental and cultural impacts. The Hui respectfully urges that a full Environmental Impact Statement (EIS) be conducted to better address these problems.</td><td rowspan="2">Comments noted. Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates concerns expressed in this comment.

An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).</td><td></td></tr>
<tr><td>Earthjustice: Isaac H. Moriwake – Attorney for Na Wai Eha</td><td>04.22.09</td><td>The DEA should include discussion of the modern shift towards avoiding and even undoing channelization, identify examples where alternatives to channelization were acknowledged and pursed, and seriously contemplate whether such alternatives would be appropriate in this case.</td><td></td></tr>
</table>

REVIEW COMMENT	PROJECT: DOCUMENT:	F02-011 Iao Stream Flood Control Project Public Information Meeting comments	LOCATION:	Wailuku, Maui, Hawaii
	DATE: REVIEWER: PHONE:	April 16, 2009 Various	Document Developed By:	GSI Pacific, Inc. USACE

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
Earthjustice: Isaac H. Moriwake – Attorney for Na Wai Eha	04.22.09	Along related lines, the DEA appears to foreclose better alternatives for the environment by defining the "purpose' of this project so narrowly as to leave channelizing the entire streambed as the only option. For example, the DEA fails to consider, or disqualifies at the outset, alternatives such as remedial repairs or reconfiguration of the existing structure or retention of the natural streambed bottom, simply by declaring that other alternatives will not meet the project's predetermined purpose. The law does not allow such a "fait accompli" to circumvent full environmental analysis and disclosure.	Comments noted. Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates concerns expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
Earthjustice: Isaac H. Moriwake – Attorney for Na Wai Eha	04.22.09	The DEA estimates the economic value of protecting this flood-prone land; it also should analyze both the economic and the priceless, non-economic value of a healthy, functioning stream system.		

REVIEW COMMENT	PROJECT: F02-011 Iao Stream Flood Control Project DOCUMENT: Public Information Meeting comments	LOCATION: Wailuku, Maui, Hawaii
	DATE: April 16, 2009 REVIEWER: Various PHONE:	Document Developed By: GSI Pacific, Inc. USACE

Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
Earthjustice: Isaac H. Moriwake – Attorney for Na Wai Eha	04.22.09	The DEA repeatedly suggests that the U.S. Fish & Wildlife Service (USFWS) has approved the preferred alternative. Review of the documents, however, indicate that value habitat demanding a no net loss policy, expressed concerns regarding the proposed project, and recommended that any further channelization of Iao Stream be the <u>last</u> alternative.	During preparation of the EA for the new design alternative (Alternative F; the preferred alternative), USACE continued coordination with the USFWS; during a coordination meeting with the resource agencies (USFWS, EPA, NMFS, DAR, and COM) on September 17, 2014, USACE provided an overview of the new preferred alternative and explained that no significant impacts to biological resources are anticipated. The resource agencies concurred with this determination and expressed support on the proposed action. The meeting minutes from this meeting are included in Appendix E of the current EA.	

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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
Earthjustice: Isaac H. Moriwake – Attorney for Na Wai Eha	04.22.09	USFWS also recommended numerous specific measures necessary to mitigate (but not offset or eliminate) the potential impacts, including efforts to engage and cooperate with state authorities regarding the need for flow restoration. Yet, the DEA is far from clear to what extent, if any, these mitigation measures will actually be implemented. For example, USFWS recommended that the low-flow channel be located to maximize vegetative shade and cooling of flows for migrating native stream life. The DEA mentions this mitigation measure and relies on it to minimize the potential harm, but provides no indication or assurance of any follow through. Rather, the DEA simply states that the low-flow channel would be aligned close to the stream bank "where possible" and that vegetation "could grow" among the grouted boulders of the low-flow channel. The DEA cannot dismiss potential impacts by relying on such indefinite plans.	Please see response above.	

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Reviewer Company Name	**Date**	**COMMENTS**	**RESPONSES (Contractor)**	**Back check by:**
Earthjustice: Isaac H. Moriwake – Attorney for Na Wai Eha	04.22.09	The DEA does not engage in any substantive analysis of impacts to wetlands, but rather only notes the presence of emergent wetlands on USFWS maps and states that they "may or may not be present." …… Channelizing the remaining natural streambed in the lower Iao Stream would all but eliminated this recharge from the stream, potentially affecting the surrounding wetlands. The DEA does not address this impact at all.	Comments noted. Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates concerns expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
Earthjustice: Isaac H. Moriwake – Attorney for Na Wai Eha	04.22.09	In discussing impacts on water quality, the DEA recognizes that both Iao Stream and its receiving waters of Kahului Bay are listed as impaired under the federal Clean Water Act, but proceeds to mention only the impact of natural stream bank erosion on sediment pollution. …… The DEA should consider the water quality impact of the proposed channelization in relation to the natural streambed.		

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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
Earthjustice: Isaac H. Moriwake – Attorney for Na Wai Eha	04.22.09	The DEA on numerous occasions appears to cite the current lack of consistent flow in Iao Stream as a way to rationalize the proposed project and its potential impacts. While the negative impact of the lack of flows can be taken as a given in analyzing the project's impacts. …… Indeed, rather than diminishing the project's potential impacts because of the lack off flows, USFWS recommends that flow restoration be pursued as part of the necessary mitigation of the project's potential impacts.	Comment noted. The current EA which assesses the new design alternative (Alternative F) takes into consideration the current stream condition following implementation of the IIFS in October 2014.	
Earthjustice: Isaac H. Moriwake – Attorney for Na Wai Eha	04.22.09	In the end, the various shortfalls of the DEA highlights the more fundamental problems – namely that a full EIS is necessary in this case to better analyze the rationale for the proposed project and its potential significant environmental effects. …… Preparation of a full EIS will enable more deliberate and thoughtful analysis of the wisdom of further, widescale elimination of natural stream habitat in this day and age.	Comment noted. Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates concerns expressed in this comment. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	

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<tr><th>Reviewer Company Name</th><th>Date</th><th>COMMENTS</th><th>RESPONSES (Contractor)</th><th>Back check by:</th></tr>
<tr><td>David W. Ivy consultant to North Shore at Waiehu, LLC</td><td>04.29.09</td><td>North Shore at Waiehu, LLC endorses Alternative V, the removal of the previous flood control measures and the return of the Iao Stream to its previous condition as a natural stream.</td><td rowspan="2">Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. An EA is now being prepared in order to assess the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).</td><td></td></tr>
<tr><td>David W. Ivy consultant to North Shore at Waiehu, LLC</td><td>04.29.09</td><td>We believe that the return of water to these streams will enhance the value of the lands along these waters in many ways. The economic values of free flowing natural streams must be considered in evaluating this project.</td><td></td></tr>
<tr><td>David W. Ivy consultant to North Shore at Waiehu, LLC</td><td>04.29.09</td><td>How much damage will be caused by a project that will inevitably dump thousands of tons of silt and debris onto the reef and into near shore waters? This project will increase the velocity of run-off in a way that will destroy this reef area forever.</td><td>Please see response above. As documented in the current EA, the new preferred alternative would result in overall reduction of sediment transport to the nearshore waters.</td><td></td></tr>
<tr><td>David W. Ivy consultant to North Shore at Waiehu, LLC</td><td>04.29.09</td><td>What is the cultural value of a river restored to support Hawaiian cultural practices on the north bank of the river in the present flood zone instead of development? The owner of this land (88 acres), Vernon Lindsay, has stated his support for Alternative V. Is the value of sedimentation in the flood plane being adequately addressed in the EA as this will certainly have a negative impact on the value of his land for farming?</td><td>Comments noted. Following the receipt of comments and conducting additional alternative screening analysis, a new design alternative was developed that would involve significantly less disturbance to the existing environment, as compared to the previously selected alternative. The new design alternative alleviates concerns expressed in this comment.
An EA is now being prepared in order to assess</td><td></td></tr>
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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
David W. Ivy consultant to North Shore at Waiehu, LLC	04.29.09	Ancient Hawaiian spiritual values are based upon the flow of water from the mountain to the sea. What is the spiritual value of restoration of a natural balance in this river valley?	the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative).	
David W. Ivy consultant to North Shore at Waiehu, LLC	04.29.09	In recent years we have seen a dangerous lowering of the levels of water in the Iao Aquifer. This project threatens to diminish the capacity of the river to replenish the aquifer. What is the economic value of a healthy and sustainable fresh water resource like the Iao?		
David W. Ivy consultant to North Shore at Waiehu, LLC	04.29.09	We respectfully urge the ACE and the County to consider stream restoration in conjunction with the removal of the existing channels to provide a solution that meets the project goals. We believe that a natural stream restoration project is not being adequately investigated as an alternative to channelization. Is a hybrid plan of reconstruction or reinforcement of critical portions of the levees in conjunction with stream restoration being considered as a viable solution?	The current EA assesses the potential environmental, social and economic effects associated with the new design alternative (Alternative F; the preferred alternative). The new design alternative (Alternative F) takes into consideration the current stream condition following implementation of the IIFS in October 2014.	
David W. Ivy consultant to North Shore at Waiehu, LLC	04.29.09	The County of Maui in its Wailuku-Kahului Community Plan has indicated that this area is to be preserved as a green belt area from the Iao Valley to the sea. We encourage the ACE to include this impact on the Community Plan in the EA and the EIS.	The Wailuku-Kahului Community Plan has been reviewed and evaluation of the impacts of the preferred alternative on the Community Plan will be included in the EA.	

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Reviewer Company Name	Date	COMMENTS	RESPONSES (Contractor)	Back check by:
David W. Ivy consultant to North Shore at Waiehu, LLC	04.29.09	We would like to know if this project would be subject to SMA review and approval. Through the SMA process the public would have the opportunity to participate in the decision-making process. The cultural, social, environmental, ecological, recreational and spiritual values of this river are very important to this community. We feel that the community deserves the right to participate in a decision that will affect a valuable natural resource for generations to come.	Since the new design alternative (Alternative F) is not within the SMA, as defined by the state of Hawaii, it is not subject to the SMA process. The EA process provides opportunities for the public to participate in the decision-making process by holding public meetings where the public has an opportunity to voice their opinions as well as 30-day public review periods for the draft and final EAs.	

Appendix B:

Section 404(B)(1) Evaluation

SECTION 404(B)(1) EVALUATION

ENVIRONMENTAL ASSESSMENT FOR ‘ĪAO STREAM

FLOOD CONTROL PROJECT

WAILUKU, ISLAND OF MAUI, HAWAI‘I

I. PROJECT DESCRIPTION

A. Background – The United States Army Corps of Engineers (USACE) is proposing to implement engineering designs to address existing flood hazards and provide the authorized level of reduced flood risk along ‘Īao Stream, Wailuku, Maui, Hawai‘i. A joint National Environmental Policy Act (NEPA) and Hawai‘i Revised Statues (HRS) Chapter 343 compliant Environmental Assessment (EA) is being prepared for the Proposed Action, following a Draft EA previously released in March 2009 (USACE, 2009) for the same action. The Proposed Action is authorized under Section 203 of the Flood Control Act of 1968 (Public Law [PL] 90-483), which authorizes works of improvement for the control of destructive floodwaters. The County of Maui (COM), Department of Public Works is the non-Federal sponsor and the requesting agency for concurrent compliance with HRS Chapter 343.

‘Īao Stream is located within the Nā Wai ‘Ehā Watershed in the town of Wailuku and flows into Kahului Bay. The stream is about 12,000 feet (ft) in length from the upstream sediment basin to its outlet into Kahului Bay, and about 30 percent (%) is lined with existing concrete channels. The remaining portions of the stream are an alluvial channel where the stabilization problems occur. Levees are situated on the right bank to protect the town of Wailuku.

For more than a century, stream flow had been intermittent below the ‘Īao intake due to three diversion structures which redirected the water to agricultural areas. Downstream of these agricultural diversion structures, stream flow had been absent 80 to 90% of the time, punctuated by infrequent high flows following intense rainfall events when stream discharge volume was sufficient to overtop the agricultural diversion structures (USFWS, 2006). High water flows into the channelized portion of ‘Īao Stream occurred only during periods of prolonged intense rainfall. In April 2014, an interim instream flow standard (IIFS) was established following an Order and Agreement issued by the Commission on Water Resource Management. Pursuant to that April 2014 Settlement Agreement, the Wailuku Water Company began the release of 10 million gallons of water per day into ‘Īao Stream on October 13, 2014.

High water flows into the channelized portion of ‘Īao Stream occur only during periods of prolonged intense rainfall. The existing stream channel has a relatively narrow width of 40 to 60 ft, is boulder-lined, and has an average slope of 2.6%. This steep stream channel results in critical and supercritical flows in the stream. When flow occurs, average channel velocity through the unlined portion of the stream varies between 8 and 32 ft per second (fps) with an average velocity in excess of 20 fps during annual floods. These high velocities have eroded the channel bed and caused severe undermining of the existing levees.

Implementation of the Proposed Action would occur within the approximately 0.4-mile stretch of the stream between slightly downstream of Waena Street (river station 42+30) and upstream of Imi Kala Street (river station 83+25), approximately 1.4 miles upstream from the shoreline. The segment is classified as having "Class 2 inland waters" by the State of Hawaiʻi, while Kahului Bay is classified as "Class A marine waters". The area is characterized by extensive residential development on the right bank and an existing natural flood plain on the left bank, and is located upstream of existing residential and urban development associated with the town of Wailuku.

The ʻĪao Stream drainage basin is a 10 square mile area that begins at the boundary between the Lahaina and Wailuku Judicial districts and extends along the crests of the Kahoʻolewa and Kapilau Ridges to the Pacific Ocean. The basin is eight miles long and averages 1.25 miles in width. It is characterized by two major topographic features: a coastal plain that extends about three miles inland, and ʻĪao Valley, the largest valley in West Maui, which extends from the coastal plain to the summit of Puʻu Kukui at an elevation of 5,800 ft above sea level.

The stream drains a steep valley with flows at the upstream limit conveyed into an existing debris basin and flood control system which was constructed between 1977 and 1981. This flood control system consists of the debris basin located 2.5 miles upstream from the stream mouth, a 3,500-ft long channel downstream from the debris basin, a drop structure with a 22-ft vertical drop, levees along the left and right bank, flood plain management along 6,950 ft of the left bank, and stream realignment for a 1,730-ft reach to the shoreline. In the flood plain management reach, levees are located on the right stream bank and are offset up to 80 ft beyond the existing stream bank.

The 33-year old flood control system no longer provides adequate levels of reduced flood risk to the town of Wailuku. Repeated floods in the area have caused high stream flows, undermining the existing flood plain levees in several locations along the stream. High stream flows have resulted in downcutting of the natural streambed and erosion of the base of the east bank levee structure. Several residential and commercial structures along the right bank are in danger of being undercut if streambank erosion continues, as is the heiau along the lower reach of the left bank.

A number of possible management measure alternatives that address these increased flood hazards and provide the authorized level of reduced flood risk to the Wailuku community were analyzed. The measures also aimed to reduce further streambed erosion and to withstand a 100-yr frequency flood; all in compliance with numerous environmental regulations and executive orders (EO), which are identified and discussed in further detail in the EA. These measures included both non-structural and structural flood damage reduction measures/alternatives that would best meet the project purpose and need in a feasible and effective manner.

The alternatives went through an initial screening that used the following criteria: Utilization of Floodplain, Real Estate Requirements/Acquisition, Increases Erosion and Sediment Transport, Facilitates Aquatic Organism Passage, Reduces Potential for Groundwater Recharge, Level of Channel Hardening, Operation and Maintenance (O&M) Requirements/Ease of Maintenance, Implementation Cost, and Net Benefits. Based on the screening measures, the following alternatives were selected to be evaluated:

Alternative A – No Action;

Alternative B – Removal of Flood Control Improvements;

Alternative C – Roller Compacted Concrete (RCC) and Grouted Boulder Invert Channel;

Alternative D – Dual Stilling and Sedimentation Basins;

Alternative E – RCC with Grade Control Structures;

Alternative F (Proposed Action) – Floodplain Reconnection

Other Alternatives

This array of alternatives was compared against four decision criteria ratings of effectiveness, acceptability, efficiency, and completeness to determine the alternative that would best meet the purpose and need of the project. Each decision criteria was specifically defined in terms of appropriate metrics to measure how well (high, medium, or low, or in other cases, yes or no) each alternative met each criteria. A memorandum describing the logistics behind the selection of the initial alternatives formulation process, descriptions of each screening criteria used, as well as a complete matrix table showing the rating of each alternative under each criterion, is included in Appendix C of the EA. Based on the criteria matrix, Alternative F was selected as the Proposed Action.

Alternative F consists of features that would reconnect the main channel with the existing floodplain on the left bank to reduce damaging flows along the main channel and right bank levees (Figure 1-3 of the EA; refer Appendix D of the EA for the engineering drawings). The reconnection would be accomplished by lowering the left bank approximately 5 to 9 ft between river stations 78+99 and 75+10 (an approximate length of 437 ft along the left bank) and grading the overflow area to disperse flow into the floodplain. The stream would be constricted by a concrete diversion wall, located within the channel at river station 75+10, downstream and at the base of the overflow channel section. The diversion wall would be approximately 18-ft high with a 15-ft wide opening to allow for fish passage and some flow to remain in the channel. The invert of this structure will be at or below the existing stream bed elevation and low flow through the opening will be controlled by the natural riffles and pools formed by the existing boulder stream bed both up and downstream of the diversion wall. Constriction of the stream would force flood flows to leave the main channel and enter the existing designated floodplain area on the left bank of ‘Īao Stream.

Flood flows entering the floodplain at the overflow channel would spread out and follow the natural topographic gradient until reentering the main channel downstream at the outflow section. The left bank between river stations 66+60 and 61+05 (approximately 473 linear ft along the bank) would be raised by an earthen berm, up to approximately 6 ft high, to contain the overflow within the floodplain. Further downstream, between river station 45+60 and 43+60, the left bank would be lowered to allow the return of the overflow into the main channel. The left bank between RS 66+60 and 61+05 (approximately 473 linear ft along the bank) would be raised by an earthen berm, up to approximately 6 ft, to contain the overflow within the floodplain. Further downstream, between RS 45+60 and 43+60, the left bank would be lowered to allow the return of the overflow into the main channel.

At two locations, from RS 83+25 to 81+25 and RS 44+10 to 42+30, slope revetment is necessary to protect the bank from eroding under conditions of high stream velocities. These locations would be stabilized with boulder concrete slope lining or “shotcrete” to accommodate the steep bank slopes and protect the bank from erosion. In addition, from RS 55+50 to 51+90, approximately 290 linear ft of revetment along the left bank would be removed entirely and restored to a natural earth embankment typical of upstream and downstream conditions. Along the right bank, from RS 55+10 to 50+25 (approximately 470 linear ft), the concrete toe berm that has severely eroded would be removed and replaced with a concrete retaining wall to provide support to the existing embankment and prevent further erosion of the bank toe.

Other features of this alternative include construction of a permanent 15-ft wide gravel road along the stream on the left bank between RS 75+10 and 43+60. This road would be used for future O&M activities. Site access during construction activities would be from Piihana Road along an existing road ending at RS 79+00. This road would also be used for future O&M activities.

The major elements of the Preferred Alternative are included in Table 1.

Table 1: Preferred Alternative Construction Details

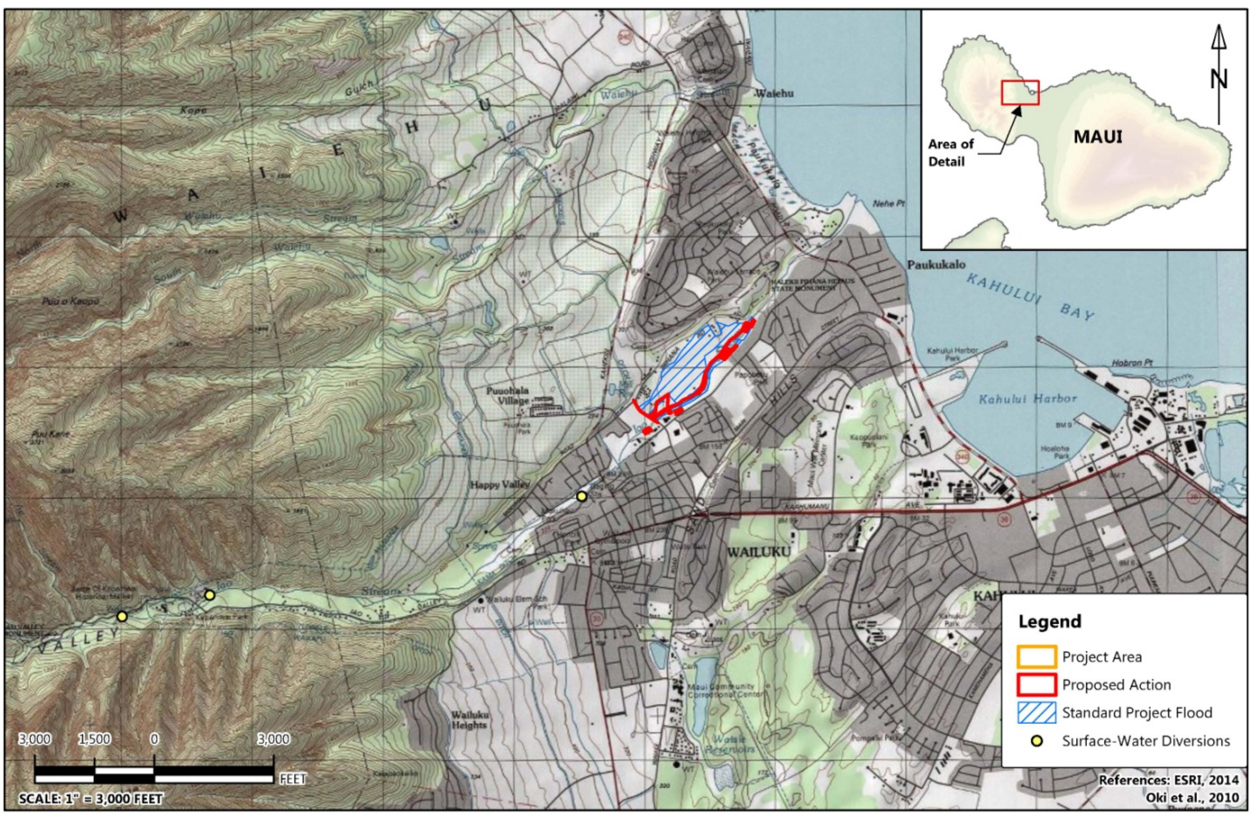
Element	Description
Overflow Channel	• Lower the left bank by approximately 5 to 9 ft between RS 79+20 and 75+12 (approximate length of 437 ft). • Placement of grouted riprap along the lowered left bank for bank protection. • Grade and provide grassing throughout the approximately 116, 060-square foot overflow channel on the left bank. • An approximately 18-ft high concrete diversion weir downstream of the overflow channel.
Raised Berm	Placement of an approximately 6-ft high (maximum height) earthen berm on the left bank between RS 66+60 and 61+05 (approximately 473 linear ft).
Floodplain Outflow	• Lower the left bank between RS 45+60 and 43+60 (up to 6 ft). • Placement of partially grouted riprap on the left bank for protection against erosion during the return of the overflow to the main channel.

Element	Description
Slope Revetment	• Placement of boulder concrete slope lining or “shotcrete” on the right bank between RS 83+25 and 81+25 (approximately 200 linear ft). • Removal of revetment along the left bank between RS 55+00 and 51+90 (approximately 290 linear ft) and restoration to natural earth embankment typical of upstream and downstream conditions. • Removal of existing concrete toe berm between RS 55+00 and 50+25 (approximately 470 linear ft) and replacement with a concrete retaining wall. • Placement of boulder concrete slope lining or “shotcrete” on the right bank between RS 44+10 and 42+30 (approximately 180 linear ft).
Grading required	The existing grade within the overflow channel would be evened out to create a flat surface.
Total impervious surface	Approximately 38,650 square feet or 0.9 acres; approximately 8,500 square feet for bank stabilization (shotcrete), 6,000 square feet for the concrete diversion wall and related invert (concrete), and 24,150 square feet for the overflow weir (grouted riprap).
Staging areas	Two staging areas at the overflow channel location: one on the right bank (near Eha Street and Imi Kala Street) and one on the left bank near the Imi Kala Bridge.
Site Access	• From Piihana Road along an existing 15-ft wide, 750-ft long gravel road. • A permanent 15-ft wide gravel O&M road will be constructed along the stream between RS 75+10 and 43+60.
Best management practices (BMPs) to be included during construction	Use of silt fences; concrete structures would be constructed in halves by temporarily diverting the stream to one side of the channel. While one side is constructed, the other side would be used for stream flow to accommodate the IIFS of 10 mgd.
Types of construction equipment to be used	Excavator, front-end loader, and dump trucks.
Location of disposal of debris and excavated materials	• Excavated soil removed to create the overflow channel will be tested and reused to construct the raised berm downstream. • Any excess excavated material will be tested and disposed of at the Maui Demolition and Construction Landfill (approximately 6 miles from project site) in Māʻalaea, Maui.
Construction duration	Approximately 21.32 months.
O&M	• Clearing the overflow channel and diversion weir once every five years • Grass cutting at the diversion weir, new berm, and access/O&M road six times per year.

This alternative would divert high-velocity and high-volume flood flows into the existing left-bank floodplain thereby reducing the main channel flow in the approximately 3,200 ft long reach of the stream. This would result in a reduced risk of flooding during high-flow/flood events to authorized levels. Diversion of stream waters would also reduce erosion of the stream banks, which would prevent further damage to the existing flood control systems and increase their reliability.

B. Location – The project area affected by the Proposed Action is the Nā Wai ‘Ehā Watershed in Wailuku, Maui (Figure 1). The ‘Īao Stream drainage basin is a 10 square mile area that begins at the boundary between the Lahaina and Wailuku Judicial districts and extends along the crests of the Kahoolewa and Kapilau Ridges to the Pacific Ocean. The basin is eight miles long and averages 1.25 miles in width. The proposed fill activities would occur within the approximately 0.4-mile stretch of the stream between slightly downstream of Waena Street (river station 43+60) and upstream of Imi Kala Street (river station 83+25), approximately 1.4 miles upstream from the shoreline. The area is characterized by extensive residential development on the right bank and an existing natural flood plain on the left bank, and is located upstream of existing residential and urban development associated with the town of Wailuku.

Figure 1: Project Area Map



C. General Description – This evaluation addresses the effects that would result from the placement of fill in waters of the United States in conjunction with the construction of an overflow channel system that involves work within and on the banks of ‘Īao Stream. The

Proposed Action consists of features intended to reconnect the main channel with the floodplain to reduce damaging flows along the main channel and right bank levees. The reconnection would be accomplished by lowering the left bank, grading the overflow area to disperse flow into the floodplain, and constricting the main channel with a concrete diversion wall to force flood flows to leave the main channel and enter the existing floodplain on the left bank of the stream. A portion of the left bank would be raised further downstream to contain the overflow within the floodplain. Even further downstream, the left bank would be lowered to allow the return of the overflow into the main channel. The Proposed Action would also include bank stabilization upstream of the proposed overflow channel along the right bank to prevent further erosion in the area.

D. Authority and Purpose – The Proposed Action is authorized under Section 203 of the Flood Control Act of 1968 (Public Law 90-483), which authorizes works of improvement for the control of destructive floodwaters.

The purpose of the Proposed Action is to address increased flood hazards from ʻĪao Stream caused by damages to the existing flood control structures and to provide the authorized level of reduced flood risk to the town of Wailuku.

E. General Description of Dredged or Fill Material

1. General Characteristics of Material – Three types of revetment are utilized in the design of the Proposed Action: partially grouted riprap, fully grouted riprap, and shotcrete. Partially grouted riprap was included at the floodplain outflow to protect the bank against erosion during the return of the overflow to the main channel. At the lateral overflow weir, a stronger revetment of fully grouted riprap was required to accommodate the high stream velocities and the increased levels of turbulence resulting from changes in flow direction. At the riverbend upstream of the Imi Kala Street Bridge, boulder concrete slope lining or "shotcrete" was the chosen revetment to accommodate the steep bank slopes.

2. Quantity of Material – The quantity of material needed is not known at this time. More detailed construction plans will be developed by the USACE.

3. Source of Material – All stone would be clean and reasonably free from soil, quarry fines, and would contain no refuse. Materials would be obtained from approved pits/quarries in the project vicinity and would be free of chemical contaminants.

F. Description of Proposed Discharge Sites – No discharge sites are anticipated at the proposed project site. Excavated soil will be reused to create the desired topography of the stream, and the excess will be transported off-site and disposed into a landfill.

1. Location – Maui Demolitions and Construction Landfill (approximately 0.5 miles from the proposed project site) in Māʻalaea, Maui.

2. Size – 14.8 acres

3. Type of Site/Type of Habitat – Construction and demolitions landfill/NA

4. Timing and Duration – Construction duration of the proposed project is approximately 15.3 months.

G. <u>Description of Disposal Method –</u> Material would be moved and placed mechanically. Backhoes, dump trucks, and other suited heavy machinery would be used to deliver and place rock materials and other fill materials during construction. Riprap would generally be placed in a systematic manner to ensure a continuous uniform layer of well-graded stone. Stone placed underwater would not be cast across the surface of the water.

II. FACTUAL DETERMINATIONS

A. <u>Physical Substrate Determinations</u>

1. Substrate Elevation and Slope – Substrate would be excavated before placement and aggregate filter layer(s) to ensure that existing substrate grade is maintained. Riprap placed on slopes for erosion protection would follow the existing contour. An exception to this armoring technique would be at areas of significant water depth in existing channels, where armoring would be placed directly over existing grade to avoid dredging below the water surface elevation. The areas where different armoring placement strategies are utilized will be determined through newly constructed hydraulic structures; the substrate will consist of concrete at the locations of the hydraulic structures.

2. Sediment Type – Soils in the area of Wailuku retain a high organic matter content, and are composed of clay, silt, and sand, mixed with varying degrees of gravel, cobble, and boulders. Major soil types underlying the proposed project area and standard project flood area include ‘Īao cobbly silty clay (Idb), ‘Īao clay (IcB), Pulehu cobbly clay loam (PtA), and the Pu‘uone sand (PZUE).

3. Dredged/Fill Material Movement – Excavated soil removed to create the overflow channel will be used to construct the raised berm downstream. Any excess excavated material will be disposed of at the Maui Demolition and Construction Landfill (approximately 0.5 miles from project site) in Mā‘alaea, Maui.

4. Actions Take to Minimize Impacts – Standard construction procedures in compliance with Federal and State requirements, and standard BMPs identified via a Storm Water Pollution Prevention Plan would be employed during construction (e.g., silt fencing, tarping/covering exposed and stockpiled soils, surface revegetation, etc.). These measures are expected to minimize/eliminate stormwater flow from the proposed construction site, as well as any association of degradation of water quality. Work would be done during no or low flow periods to limit downstream sedimentation. Construction sequencing would be used to minimize impacts. Temporary erosion prevention and sedimentation control measures would be used project-wide and shall be operated and maintained in accordance with necessary permit(s).

B. Water Circulation, Fluctuation, and Salinity Determinations

1. General Water Chemistry – The use of clean fill material would reduce any significant impacts on water chemistry during project construction. Some minor, short-term decreases in water clarity are expected from the proposed fill activities. No significant impacts on water color, odor, dissolved oxygen, temperature, or nutrient levels are anticipated in the long-term.

2. Water Circulation, Fluctuation, and Salinity Determination –

   a. Current Patterns and Flow – ʻĪao Stream is an intermittent stream characterized by short periods of high flows during rain events, followed by prolonged periods of low-flow and/or dry conditions that persist approximately 90% of the year.

   b. Velocity – When flow occurs, average channel velocity through the unlined portion of the stream varies between 8 and 32 fps with an average velocity in excess of 20 fps during annual floods. With the implementation of the Proposed Action, the velocity of the water in the main stream channel is expected to decrease when it flows out through the overflow channel and into the flood plain.

   c. Sedimentation Patterns – The Proposed Action may decrease sedimentation, as the lower main channel flow and right bank armoring upstream are designed to decrease erosion, thus decreasing the amount of sediment and nutrient loads released into the stream and entering Kahului Bay.

3. Actions Taken to Minimize Impact – Standard construction procedures in compliance with Federal and State requirements would be used. Standard BMPs identified in a Storm Water Pollution Prevention Plan would be employed during construction (e.g., silt fencing, tarping/covering exposed and stockpiled soils, surface revegetation, etc.) to minimize/eliminate stormwater flow from the proposed construction site, and any associated degradation of water quality.

C. Suspended Particulate/Turbidity Determination

1. Suspended Particulates and Turbidity – Turbidity and the concentration of suspended solids would be expected to increase temporarily during construction of the Proposed Action. However, increases would be relatively minor and restricted to a relatively localized area. No long-term adverse impacts on water quality are expected; in contrast, the reduced erosion from the Proposed Action would decrease turbidity in the stream.

2. Effects on Chemical and Physical Properties of the Water Column – Some minor short-term impacts on light penetration and aquatic organisms would occur during riprap

placement due to increased turbidity. However, these effects would be rapidly dissipated upon project completion. No effects are expected on toxic metal concentrations, pathogens, or the aesthetics of the water column.

3. Actions Taken to Minimize Impacts – Impacts would be minimized by requiring BMPs be implemented to limit the extent of turbidity plumes, such as silt curtains, to be followed during construction.

D. Contaminant Determinations - The use of clean, quarry-run rock riprap for construction would not introduce contaminants into the aquatic system. Neither the materials used nor the placement method would cause relocation or increases of contaminants in the aquatic system.

E. Aquatic Ecosystem and Organism Determinations

1. Effects on Benthos – The Proposed Action is to expected have an overall positive effect on the benthos community downstream of the proposed project area by diverting stream flows and allowing suspended solids to settle out prior to the return of the stream waters to the main channel; there by improving the water quality downstream. Impacts on water quality would be minimized during construction activities to prevent effects on benthos downstream. No long-term effects on benthos are anticipated as a result of the implementation of the Proposed Action.

2. Effects on Fish – As ʻĪao Stream is intermittent, effects on fish would only be of concern when water is flowing through the stream. Short-term increases in turbidity and suspended solids during construction, as well as general noise and disturbance may temporarily displace fish occupying the vicinity of the construction areas. In the long-term, however, reduced turbidity, sedimentation, and velocity flow would be advantageous for fish. The Proposed Action also avoids effects on fish by incorporating a 15-ft wide opening in the diversion wall to allow for fish passage and some flow to remain in the channel.

3. Effects on Aquatic Food Web – Due to the temporal nature of the proposed construction activities, no long-term effects on aquatic food web are anticipated neither as a result of construction activities nor following completion of the Proposed Action.

4. Effects on Special Aquatic Sites – Potential pockets of freshwater emergent wetlands exist within the proposed project area. A biological survey would be conducted prior to the start of construction activities to confirm that there are no wetlands present within the proposed construction area. Work practices during construction activities would be modified as needed to minimize potential impacts to any existing wetlands. No significant long-term impacts to wetlands are anticipated since the existing wetland flora and fauna (if any are identified) would return following completion of construction activities.

5. Threatened or Endangered Species – In April 2012, a total of 60 species of ferns and flowering plants were recorded as growing in the stream channel and along the stream banks,

while another 11 species of trees and shrubs were noted as growing nearby. Most of the plants recorded were non-native species, along with four common native or early Polynesian introduced species. The two early Polynesian-introduced species noted were the *kukui* tree (*Aleurites moluccana*) and the wood sorrel (*Oxalis corniculata*), and the two indigenous plant species noted were the sedge *Fimbristylis cymosa*) and the *hau* tree (*Hibiscus tiliaceus*). No endangered or threatened plant species were observed (USFWS, 2011a).

The 2012 Aquatic Biota Survey observed typical non-native estuarine fish, five endemic fish species (including three native amphidromous *ʻoʻopu* or gobies: *Awaous guamensis, Sicyopterus stimpsoni,* and *Lentipes concolor*), and six indigenous fish species. In addition, two indigenous species of algae, numerous endemic species of damselflies (*Megalagrion blackburni*, *M. hawaiiense*, and *M. nigrohamatum*), and two endemic aquatic amphidromous mollusks (*hīhīwai* [*Neritina granosa*] and *hapawai* [*Neritina vespertina*]) were recorded. No endangered or threatened aquatic biota were observed (AECOS, 2012).

Since no known threatened or endangered species, or critical habitat for any threatened or endangered species, occur within the project area; no significant impacts are anticipated.

Hawaiian Stilts are known to occur in the vicinity of the proposed project area; however, considering that the stream is dry most of the time and that flood events large enough to create ponding in the floodplain would be sporadic, impacts to Hawaiian Stilts are anticipated to be less than significant.

6. Other Wildlife – No other wildlife of concern are anticipated to be impacted by the Proposed Action.

7. Actions Taken to Minimize Impacts – Construction/grading activities would be conducted as much as possible during periods of low to no stream flow. However, if construction is necessary during periods of stream flow, BMPs adhering to Federal and State regulations that would minimize sediment discharges and alterations of stream flow would be instituted.

There may be less than significant impacts to surface water quality during the construction period. The Proposed Action would include soil excavation and stockpiling during grading activities. BMPs strictly employed during construction (e.g., silt fencing, tarping/covering exposed and stockpiled soils, surface revegetation, etc.) would minimize/eliminate stormwater flow from the proposed construction site, and any associated degradation of water quality.

Concrete structures will be constructed in halves in order to avoid impediment of stream flow, even though the stream is usually dry. The USACE will monitor the marine water quality at the mouth of the stream before, during, and after construction to assure water quality standards are not exceeded. The Proposed Action would be completed in accordance with state and Federal regulations, including Section 404 (b)(1) of the Clean Water Act (CWA), which would further minimize any impacts to water quality in ʻĪao Stream and Kahului Bay.

F. Proposed Disposal Site Determinations

1. Mixing Zone Determination – The proposed fill activities would have minimal mixing zones. The fill material used for the project would be large and relatively clean so that very little exposed material could be suspended in the water column.

2. Determination of Compliance with Applicable Water Quality Standards - The fill materials used for this project would be obtained from approved quarries in the project area or excavated on-site. The area does not have a history of contamination, which should ensure that State water quality standards would not be violated because of project-related activities.

3. Potential Effects on Human Use Characteristics – The Proposed Action would provide the Wailuku community with increased flood protection without adversely affecting the stream. Land use activities surrounding the project site include residential, commercial, and public lands designated as either urban or agricultural. These uses would remain unchanged and may even be enhanced by decreased flooding and flood risk after the implementation of the Proposed Action. The proposed construction activities are not anticipated to have any potential adverse effects on human use of the project area or the surrounding areas.

G. Determination of Cumulative Effects on the Aquatic Ecosystem – No cumulative effects on the aquatic ecosystem of ʻĪao Stream is anticipated as a result of the Proposed Action.

H. Determination of Secondary Effects on the Aquatic Ecosystem – There could be beneficial secondary effects to coral and other organisms in Kahului Bay downstream of the proposed project area. The proposed overflow channel system would allow flood waters to be dispersed into the natural floodplain where sediment and other entrained constituents would be able to settle out instead of being directly channeled downstream and into the nearshore marine environment. Decrease in erosion within the main channel due to diversion of stream waters during large storm events is expected to further reduce the amount of sedimentation within the stream as well as in Kahului Bay. Decrease in sedimentation and turbidity is expected to improve water clarity and the current condition of reef habitats within the nearshore environment. Improved water quality may also have positive impacts on the green sea turtles that nest on beaches within the vicinity of the mouth of ʻĪao Stream.

III. FINDING OF COMPLIANCE WITH RESTRICTIONS ON DISCHARGE

The proposed fill activities associated with the Proposed Action - Floodplain Reconnection, Limited Upstream Bank Armoring and Channel Constriction, would comply with Section 404(b)(1) guidelines of the Clean Water Act, as amended. No significant adaptations of the guidelines were made for this evaluation. Other structural alternatives considered to reduce the flood risk to Wailuku included no action, removal of flood control improvements, roller compacted concrete and grouted boulder invert channel, dual stilling and sedimentation basins, and rectangular and compound channel with grade control structures. Other alternatives were not selected because they were prohibitively more costly, were significantly less effective in reducing flood risk and reducing debris, had extensive environmental impacts that would have been logistically very difficult to mitigate, required high operations and maintenance, or did not meet the overall project purpose of reducing flood risk.

The proposed fill activities would comply with all State water quality standards, Section 307 of the Clean Water Act, and the Endangered Species Act of 1973, as amended. The proposed fill activities would not have significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife would not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity, and stability and on recreational, aesthetic, and economic values would not occur.

To minimize the potential for adverse impacts, the fill would be placed during periods of low to no water levels. Since the Proposed Action would result in few adverse effects, no additional measures to minimize impacts would be required.

On the basis of evaluation, I have determined that the Proposed Action complies with the requirements of the 404(b)(1) guidelines for the discharge of fill material.

Prepared by: GSI Pacific, Inc.
Date: October 3, 2014 (updated June 10, 2015)

References:

AECOS, 2012. *Water quality and biological surveys for the ʻĪao Stream Flood Control Project, Wailuku, Maui.* 18, June 2012.

USACE, 2009. *Draft Environmental Assessment, ʻĪao Stream Flood Control Project, Wailuku, Maui, Hawaiʻi.* March, 2009.

USFWS, 2006. *Revised Draft Fish and Wildlife Coordination Act Report for the ʻĪao Stream Flood Control Project, Maui, Hawai'i.* U.S. Department of the Interior. November. Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu Engineering District.

USFWS, 2011a. *Draft Fish and Wildlife Coordination Act Report; Phase I Supplemental Stream Survey ʻĪao Stream Flood Control Project Wailuku, Maui, HI.* July 2011.

USFWS, 2011b. *Final Fish and Wildlife Coordination Act Report Addendum; Phase 1 Marine Habitat Characterization ʻĪao Stream Flood Control Project Wailuku, Maui, HI.* December 2011.

Appendix C:

Alternatives Screening Matrix

CEPOH-PP-C January 2014

MEMORANDUM FOR RECORD

SUBJECT: A meeting for Iao Stream Flood Control Project Alternatives Screening

1. A meeting was held for the Iao Stream Flood Control Project on 5 November 2013 at 0900 at Bldg 230, Room 318 Conference Room. The following people were in attendance:

Name	Discipline	Office	Phone
Jarrett Hara		CEPOH-EC-T	835-4149
Tracy Kazunaga		CEPOH-EC-S	835-4330
Michael Sakai		CEPOH-PP-R	835-4052
Colette Sakoda		Environet	833-2225 ext. 1004
Lance Shiroma		CEPOH-EC-T	835-4152
Sonia Shjegstad		Environet	833-2225 ext. 1006
Kanalei Shun		CEPOH-PP-E	835-4097
Jessica Wiggs		CEPOH-EC-T	835-4155
Michael Wong		CEPOH-EC-T	835-4138
Max Solmssen		Environet	833-2225 ext. 1012
Nani Shimabuku		CEPOH	835-4030

2. The purpose of the meeting was to conduct the alternatives screening to identify a range of reasonable and prudent alternatives, using the results of the screening to identify a subset of alternatives retained for a full evaluation. The screening was conducted by applying the project screening criteria to each alternative and using the metrics established for each of the criteria to assign potential impacts. This memo presents a brief background of the project purpose and need, applicable regulations and policies considered, and a summary of the alternatives screening exercise.

3. **Purpose and Need.** The purpose of the proposed Iao Stream Flood Control Project is to correct deficiencies associated with the existing Flood Control Project components that were constructed in 1981. Frequent repairs have proved to be costly, both financially and environmentally, and do not adequately address the long-term problems of erosion, sedimentation, and aquatic species degradation. The purpose of this project aims to help preserve the existing watershed and the natural ecosystem within and surrounding the Iao Stream. The preferred alternative has been planned in order to create an aquatic environment that would work to maintain the natural stream and flood plain function, while providing the necessary level of flood control.

4. Modifications to the 1981 Flood Control Project are needed to prevent further property damage resulting from undermining of stream bank and levee locations, and to protect Wailuku town from flood damage. In addition, levee certification that the completed project can withstand a 100-year frequency flood is required by the Federal Emergency Management Agency (FEMA) by February 2009; otherwise, the area protected by the

project will revert to a flood hazard area in Fall 2009. A government agency responsible for levee construction or a Registered Professional Engineer must provide this certification. In its present condition, the project cannot be certified as providing 100-year flood protection because the project is deficient.

5. NEPA. The Council on Environmental Quality regulations (Title 40, Code of Federal Regulations (CFR) §1502.14) for implementing the National Environmental Policy Act of 1969 (NEPA) requires that federal agencies perform the following tasks:

    a. Rigorously explore and objectively evaluate all reasonable alternatives and, for alternatives that were eliminated from detailed study, briefly discuss the reasons for their having been eliminated;

    b. Devote substantial treatment to each alternative considered in detail, including the Proposed Action, so that reviewers may evaluate their comparative merits;

    c. Include reasonable alternatives not within the jurisdiction of the agency; and

    d. Include the No Action alternative.

6. USACE SMART Planning Policy Overview. overview of? or Define the ACOE guidelines being used for Iao Stream..an abbreviated SMART planning policy?

    In February 2012, USACE implemented a SMART planning strategy (MG Walsh Memo 8 February 2012) to its Civil Works planning studies by establishing a disciplined, methodical approach to alternatives formulation and analysis which would yield focused, collaborative and efficient decision making throughout its project development and execution process. SMART is defined as Specific, Measurable, Attainable, Risk-informed, and Timely. Because of the advanced progress of the Iao Stream project, the Project Development Team (PDT) was authorized to apply an abbreviated but effective project alternatives analysis methodology to facilitate decision-making for this project.

7. Identification and Screening of Alternatives. The screening of alternatives involved four key steps. These steps are presented in detail in the following section.

    a. <u>Step 1</u>. Identify All Possible Alternatives.

        i. *Alternative A*: No Action

        ii. *Alternative B*: Removal of Flood Control Improvements; unlined channel remains

        iii. *Alternative C*: Roller Compacted Concrete (RCC) and Grouted Boulder Invert Channel following existing alignment, RCC channel and low-flow channel replace existing channel

iv. *Alternative D*: Dual Stilling and Sedimentation Basins; RCC channel and low-flow channel replace existing stream features: 50:50 hardened and pseudo-natural with design features mimicking natural stream components.

v. *Alternative E*: RCC Channel with Grade Control Structures; RCC channel replacing existing stream features: fully lined, but includes a low-flow channel and some pools.

vi. *Alternative F*: Overflow Section, limited upstream bank armoring and Channel Constriction; retains existing project features.

vii. *Other Alternatives Considered, but Eliminated*: Three alternatives from an earlier project development phase were screened using the same evaluation measures. The alternatives were:

1. Rectangular and Compound Channel;
2. Levee Toe Reconstruction, retains existing project features;
3. Trapezoidal Concrete-lined Channel.

viii. By applying the evaluation criteria to these 3 alternatives, it was concluded by the PDT that they did not meet the project purpose and need.

b. Step 2: Establish and define decision criteria required to ensure an alternative is meeting the purpose and need. Each of the decision criteria (attached) were specifically defined in terms of appropriate metrics to measure how well (high, medium, low, or in other cases, yes or no) an alternative meets each criteria. PDT members used Best Professional Judgment to clearly define the metrics.

c. Step 3: Conduct a rigorous screening of the alternatives using environmentally sound and operationally workable decision criteria for various aspects including completeness, effectiveness, acceptability and efficiency.

i. Completeness.

Technical Feasibility was defined as the ability to meet the project purpose and need. Possible metrics were yes or no; yes is preferred. Of the alternatives considered, Alternatives A and B measured no, while the remaining alternatives measured yes.

Life Safety was defined as the level of life safety risk reduction. Possible metrics were yes or no; yes is preferred. Of the alternatives considered, Alternatives A and B measured no, while the remaining alternatives under consideration measured yes.

ii. Effectiveness.

Meets SPF level of protection (within 20%) was defined as the ability of the alternative to meet the SPF. Possible metrics were yes or no; yes is preferred. Of the alternatives considered, Alternatives A and B measured no, while the remaining alternatives considered measured yes.

Utilization of the floodplain was defined as the ability of the alternative to retain the floodplain as a restricted area, where urbanized development is not allowed. Possible metrics were yes or no; yes is preferred. Of the alternatives considered, Alternative B measured no, while the remaining alternatives considered measured yes.

iii. Acceptability. Real Estate Requirements/Acquisition was defined as the relative magnitude of acres required to implement the alternative (e.g., channel alignment/staging area/access road construction). Possible metrics were low, medium, and high; low is preferred. Of the alternatives considered, Alternatives A and B measured low, Alternatives C and F measured medium and Alternatives D and E measured high.

Increases erosion and sediment transport was defined as the relative magnitude of the sedimentation impacts directly relatable to the alternative. Possible metrics were high, medium, and low; low is preferred. Of the alternatives considered, Alternatives D and F, which include measures to stabilize the channel and also include a significant amount of natural stream bottom to trap sediments, measured low. Alternatives A, C and E either provide incomplete fixes to the current problem of erosion and/or fully line the channel and thereby increase the potential for upstream sedimentation to be transported to the ocean. Therefore these alternatives measured medium. The remaining alternative B, which would lead to additional erosion with no sediment entrapment features, measured high.

Facilitates aquatic organism passage was defined as whether or not the alternative avoids additional impacts to the passage of aquatic organisms in the stream. Possible metrics were yes or no; yes is preferred. All of the alternatives considered would avoid additional impacts to the passage of aquatic organisms, and thus measure yes.

Reduces potential for groundwater recharge was defined as the relative magnitude of any reduction in groundwater recharge directly relatable to the alternative. Possible metrics were high, medium, and low; low is preferred. Of the alternatives considered, Alternative B, which removes all flood control improvements, measured low. Alternatives A, D, E, F, all include some degree of unlined channel bottom, and thus measured medium. Alternative C, the rectangular and compound channel and the trapezoidal concrete-lined channel, which fully line the stream, all measured high.

iv. Efficiency.

Level of channel hardening was defined as the total percentage of channel hardened. Possible metrics were high, medium and low; low is preferred. Of the alternatives considered, Alternative B was low, Alternatives A, D and F were medium, and Alternatives C and E were high.

O&M Requirements / Ease of Maintenance was defined as the relative magnitude of anticipated O&M costs directly relatable to the implemented alternative. Possible metrics were high, medium, and low; low is preferred. Of the alternatives considered, Alternatives C, D and E would all reduce the frequency and magnitude of channel maintenance required, and thus measured low. Alternatives A and F would require some channel maintenance, equivalent to the current expenditure, and thus measured medium. Alternative B, which would remove all flood control improvements and require an increased level of channel maintenance, measured high.

Implementation cost was defined as the relative magnitude of total project cost. Possible metrics were high, medium and low; low is preferred. Of the alternatives considered, Alternative F measured low. Alternatives B, C, D, and E all measured high. The remaining alternatives were not screened for this decision criteria, either because they represented the no action (A) or because the alternatives were removed from consideration due to technical inadequacies earlier on the screening process.

Net benefits were defined as the difference between the annualized benefits and costs. Possible metrics were yes or no; yes is preferred. Of the alternatives considered, only Alternative F offered positive net benefits.

d. <u>Step 4</u>: Arrive at a Final Array of Alternatives while eliminating those that did not meet the decision criteria. The Alternatives Matrix (attached) provides an overview of the proposed alternatives and analyses of each alternative by evaluation criteria. Based on the alternatives screening exercise, the alternatives retained for the final array include Alternative A and Alternative F. The remaining alternatives were dropped from consideration for not adequately meeting one or more of the other decision criteria.

e. <u>Step 5</u>: Findings, Conclusions, arrival at the Tentatively Selected Plan (TSP): All project alternatives under final consideration were run through a rigorous screening process that rated each alternative based on the criteria established for the alternative selection process (Step 3). The TSP was then selected based on its feasibility to be implemented and lack of disturbance to the existing environment. The TSP for the project was Alternative F: Overflow Section, limited upstream bank armoring and Channel Constriction; retains existing project features. Alternative F offers adequate flood protection to the existing built environment while only affecting a small portion of the existing stream channel where the overflow section and limited armoring would occur. Alternative F would channel flood waters from the main channel onto the designated flood plain where flood waters would be able to be dispersed into the natural flood plain. Flow velocity would be reduced in the main channel during flood events as a result of Alternative F, and sediment and other entrained constituents would be able to settle out into the natural flood plain area instead of being directly channeled downstream and into the near shore marine environment.

Ms. Nani Shimabuku
Project Manager

Iao Stream Flood Control Project
Screening Criteria for Alternatives to
Identify Tentatively Selected Plan
6 November 2013
Revised 13 November 2013

Decision Criteria	Metrics	PDT Assignments
Completeness		
1. Technical Feasibility	Yes/No. *Does it meet the purpose and need?*	Michael/Jessica
2. Life Safety (Flood Risk)	Yes/No. *Does the alternative reduce life safety risk?*	Lance
Effectiveness		
3. Meets SPF Level of Flood Protection (within 20%)	Yes/No. *Does the alternative provide the Standard Project Flood level of protection?*	Michael/Jessica
4. Utilization of Floodplain	Yes/No. *Does the floodplain remain a restricted floodplain, where urbanized development is not allowed?*	Michael/Jessica
Acceptability		
5. Real Estate Requirements/ Acquisition	High/Medium/Low. *Number of acres needed for channel alignment/staging area/access road. Amount of land acquisition.* • High = *A Lot (>5 acres)* • Medium = *Some (3.1-4.9 acres)* • Low = *Little to None (<3 acres)*	Mike
6. Increases Erosion & Sediment Transport (Sedimentation Impacts)	High/Medium/Low. *Increases erosion and/or transport of sediment.* • High = *Significant Increase* • Medium = *Little to Moderate Increase* • Low = *Reduction in Sediment*	Environet
7. Facilitates Aquatic Organism Passage	Yes/No. *Does it avoid additional impacts to aquatic organism passage?*	Michael/Jessica Environet
8. Reduces Potential for Groundwater Recharge	High/Medium/Low. *Extent of exist channel improvements removed to allow for groundwater recharge* : • High = *Significant Reduction in Recharge*	Environet

*Low and Yes are preferred.

Decision Criteria	Metrics	PDT Assignments
	• Medium = *Allows Some Recharge* • Low = *Increases Recharge*	
Efficiency		
9. Level of Channel Hardening	High/Medium/Low. *Total percentage of channel hardening.* • High = *Greater than 70%* • Medium = *20% to 70%* • Low = *Less than 20%*	Michael/Jessica Environet
10. O&M Requirements/ Ease of Maintenance	High/Medium/Low. *Rough Order Magnitude O&M costs based on BPJ.* • High = *Increases Annual Costs* • Medium = *Same as Current* • Low = *Reduces Annual Costs*	PDT Michael/Jessica
11. Implementation Cost (real estate and environmental costs not included)	High/Medium/Low. *Total Project Costs.* • *High = greater than $30M* • *Medium = $10M-$30M* • *Low = less than $10M*	Tracy
12. Net Benefits	Yes/No. *Is there a positive net benefit?* *Net Benefits = Annualized Benefits – Annualized Costs*	Lance

*Low and Yes are preferred.

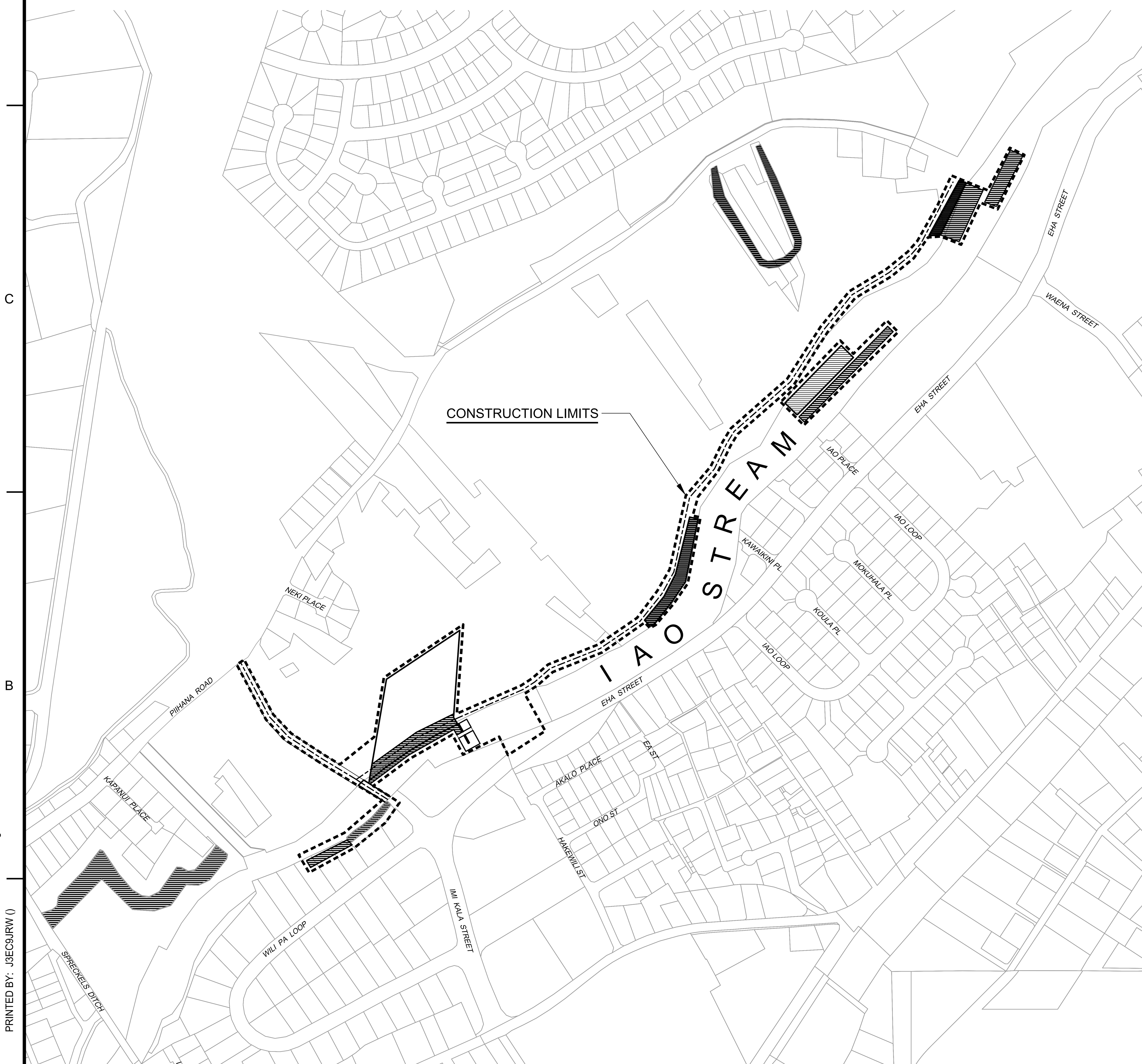
Iao Stream Flood Control Project, Wailuku, Maui, Hawaii
Matrix of the Proposed Alternatives for a Draft Environmental Assessment

		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternatives Removed from Consideration		
Description of Alternative		No Action (retains existing project features)	Removal of Flood Control Improvements (unlined channel remains)	Roller Compacted Concrete (RCC) and Grouted Boulder Invert Channel Following Existing Alignment (RCC channel and low-flow channel replace existing channel)	Dual Stilling and Sedimentation Basins (RCC low-flow channel replaces existing stream features: 50:50 hardened and pseudo-natural, with design features mimic natural stream components)	RCC Channel with Grade Control Structures (RCC channel and low-flow channel replace existing stream features: fully lined, but includes a low-flow channel and some pools)	Floodplain Reconnection, Limited Upstream Bank Armoring and Channel Constriction (retains existing project features)	Rectangular and Compound Channel	Levee Toe Reconstruction (retains existing project features)	Trapezoidal Concrete-Lined Channel
Technical Feasibility (*Yes/No*)	**Completeness**	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Life Safety (Flood Risk) (*Yes/No*)		No	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Meets SPF Level of Flood Protection (within 20%) (*Yes/No*)	**Effectiveness**	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Utilization of Floodplain (*Yes/No*)		Yes	No	Yes	Yes	Yes	Yes	No	Yes	No
Real Estate Requirements/Acquisition (*High, Medium, Low*)	**Acceptablility**	Low	Low	Medium	High	High	Medium	Medium	Low	Medium
Increases Erosion and Sediment Transport (Sedimentation Impacts) (*High, Medium, Low*)		Medium	High	Medium	Low	Medium	Low	High	Medium	High
Facilitates Aquatic Organism Passage (*Yes, No*)		Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Reduces Potential for Groundwater Recharge (*High, Medium, Low*)		Medium	Low	High	Medium	Medium	Medium	High	Medium	High
Level of Channel Hardening (*High, Medium, Low*)	**Efficiency**	Medium (45%)	Low (0%)	High (100%)	Medium (50%)	High (90%)	Medium (45%)	High (100%)	Medium (45%)	High (100%)
O&M Requirements/Ease of Maintenance (*High, Medium, Low*)		Medium	High	Low	Low	Low	Medium	Low	Medium	Low
Implementation Cost (real estate and environmental not included) (*High, Medium, Low*)		N/A	High	High	High	High	Low	N/A	N/A	N/A
Net Benefits (*Yes, No*)		N/A	No	No	No	No	Yes	N/A	N/A	N/A

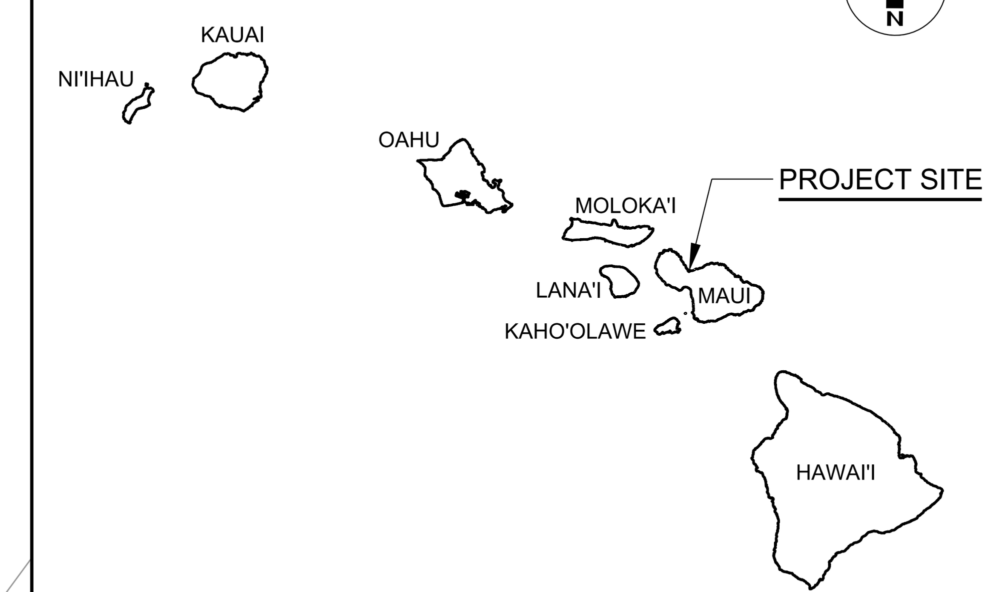
Appendix D:

Engineering Drawings

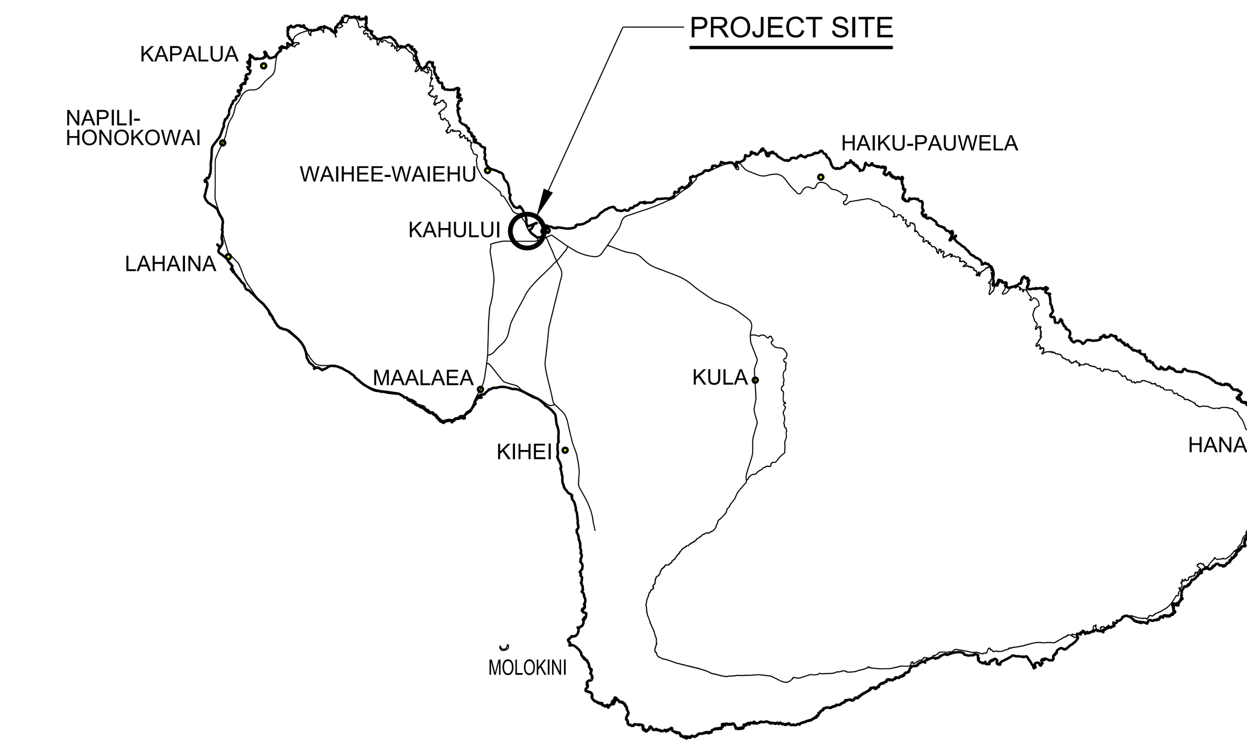
IAO STREAM
FLOOD CONTROL PROJECT
WAILUKU, MAUI, HI



3 GENERAL SITE PLAN
1" = 300'



1 LOCATION MAP
NOT TO SCALE



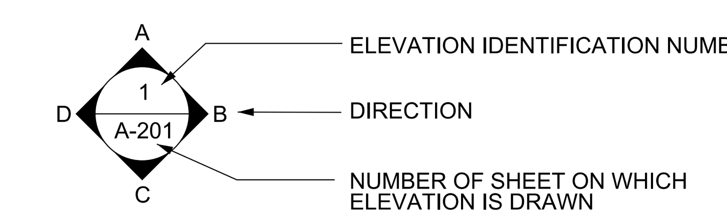
2 VICNITY MAP
NOT TO SCALE

ABBREVIATIONS

#	POUNDS
BOT	BOTTOM
CONC	COCRETE
℄	CENTERLINE
CY	CUBIC YARD
DIA	DIAMETER
DWG	DRAWING
EA	EACH
EL	ELEVATION
EXST	EXISTING
FT	FEET
HORIZ	HORIZONTAL
INV	INVERT
LB	LEFT BANK
LF	LINEAR FEET
MAINT	MAINTENANCE
MAX	MAXIMUM
MIN	MINIMUM
NO	NUMBER
OC	ON CENTER
RB	RIGHT BANK
S	SLOPE
SHT	SHEET
ST	STREET
STA	STATION
TYP	TYPICAL
VERT	VERTICAL

GENERAL SYMBOLS

ELEVATION



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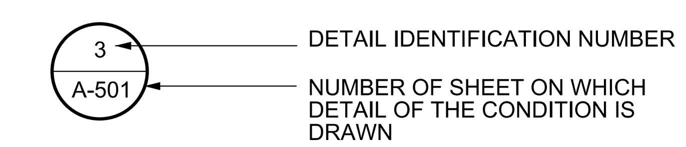

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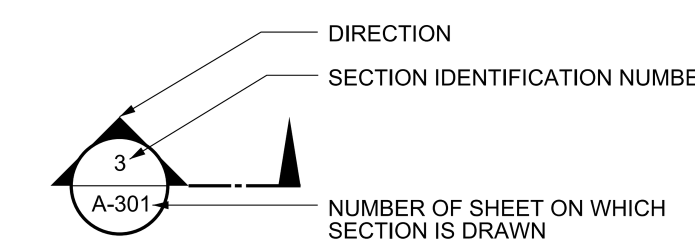

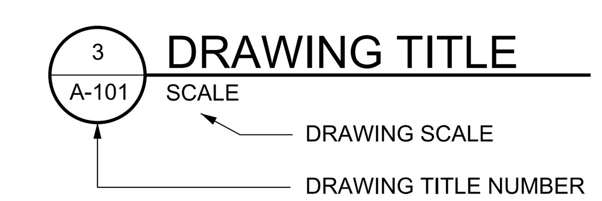

INDEX OF DRAWINGS

SHEET ID	SHEET OF	SHEET TITLE	REV
		GENERAL	
G-001		TITLE SHEET, VICINITY MAP, PROJECT LOCATION, SITE LOCATION	
		CIVIL	
C-101		GENERAL SITE PLAN	
C-102		CONC DIVERSION WEIR PLAN	
C-201		LATERAL WEIR AND OVERFLOW CHANNEL PROFILES	
C-202		RAISED BERM PROFILE	
C-301		TYPICAL CROSS SECTIONS @ STA. 75+10 TO 74+71	
C-302		TYPICAL CROSS SECTIONS @ STA. 75+50 TO 75+10	
C-303		TYPICAL CROSS SECTIONS, OVERFLOW CHANNEL	
C-501		CIVIL DETAILS	
		STRUCTURAL	
S-101		WEIR PLAN & ELEVATION	
S-301		DIVERSION WEIR CROSS SECTION	
S-302		RETAINING WALL CROSS SECTION	

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			A-2

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CKD BY:
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PLOT DATE:
SIZE: ANSI D
FILE NAME: FILE NUMBER

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FT SHAFTER, HAWAII

MODIFICATIONS TO THE
IAO STREAM FLOOD CONTROL PROJECT
ISLAND OF MAUI

TITLE SHEET
INDEX OF DRAWINGS
GENERAL NOTES AND LOCATION

SHEET IDENTIFICATION
G-001
SHEET 0 OF 0

ANSI D 22 x 34

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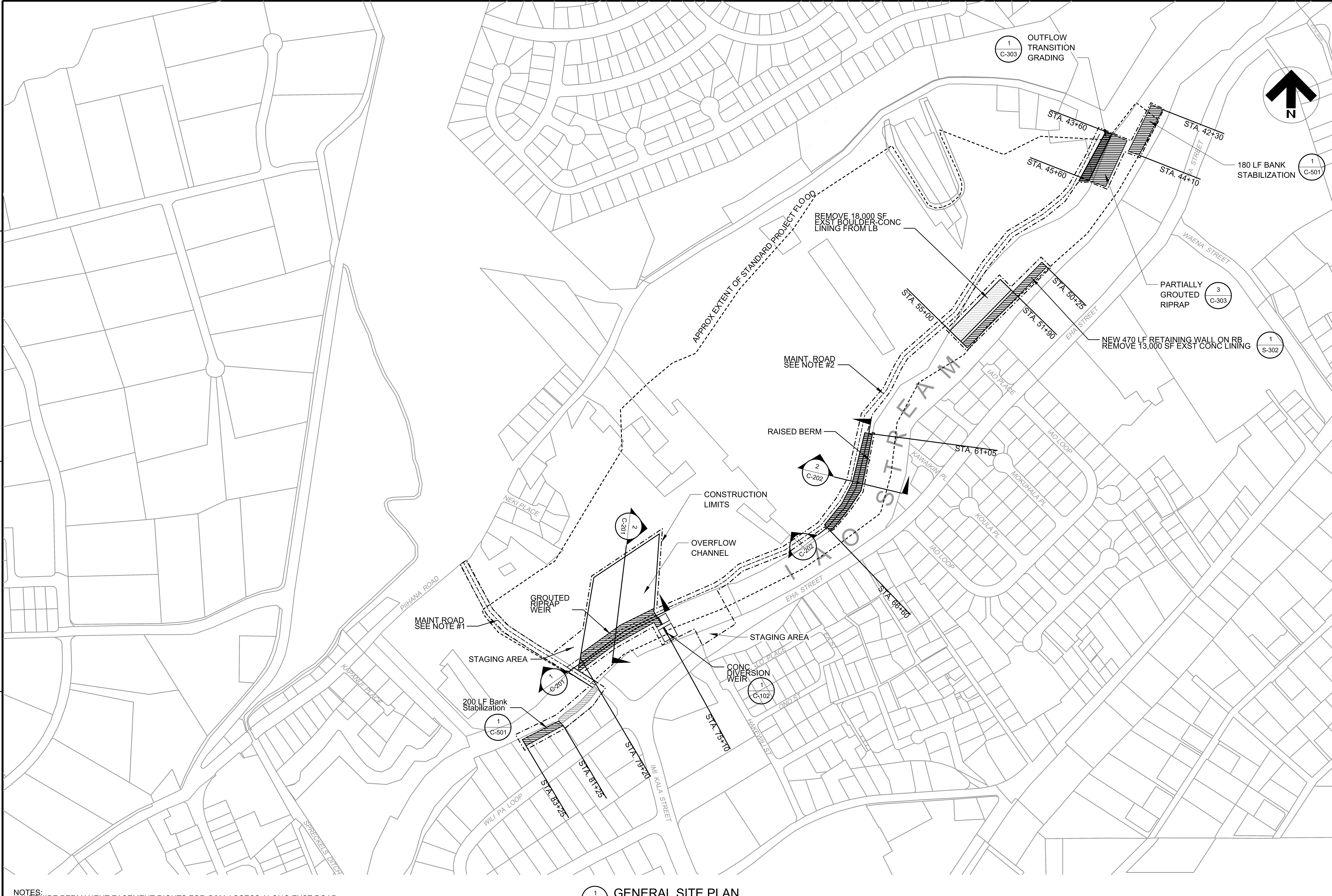

NOTES:
1. ACQUIRE PERMANENT EASEMENT RIGHTS FOR O&M ACCESS ALONG EXST ROAD.
2. CONSTRUCT PERMANENT O&M ROAD: 3" THICK GRAVEL ON GEOTEXTILE, 15' WIDE.

1 C-101 GENERAL SITE PLAN
1" = 200'

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MODIFICATIONS TO THE
IAO STREAM FLOOD CONTROL PROJECT
ISLAND OF MAUI

GENERAL SITE PLAN

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C-101
SHEET 0 OF 0

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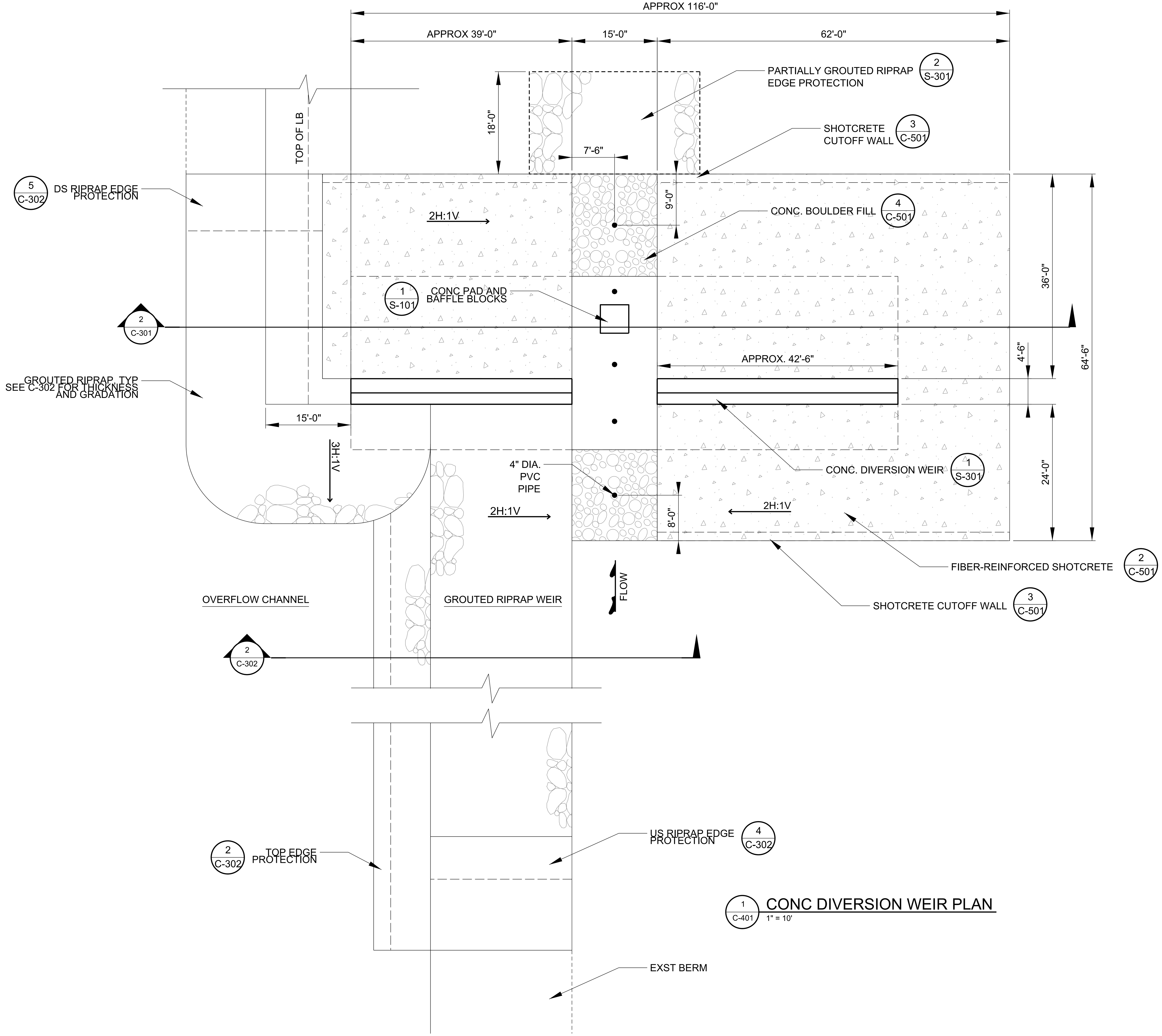

1 C-401 CONC DIVERSION WEIR PLAN
1" = 10'

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MODIFICATIONS TO THE
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ISLAND OF MAUI

WEIR SITE PLAN

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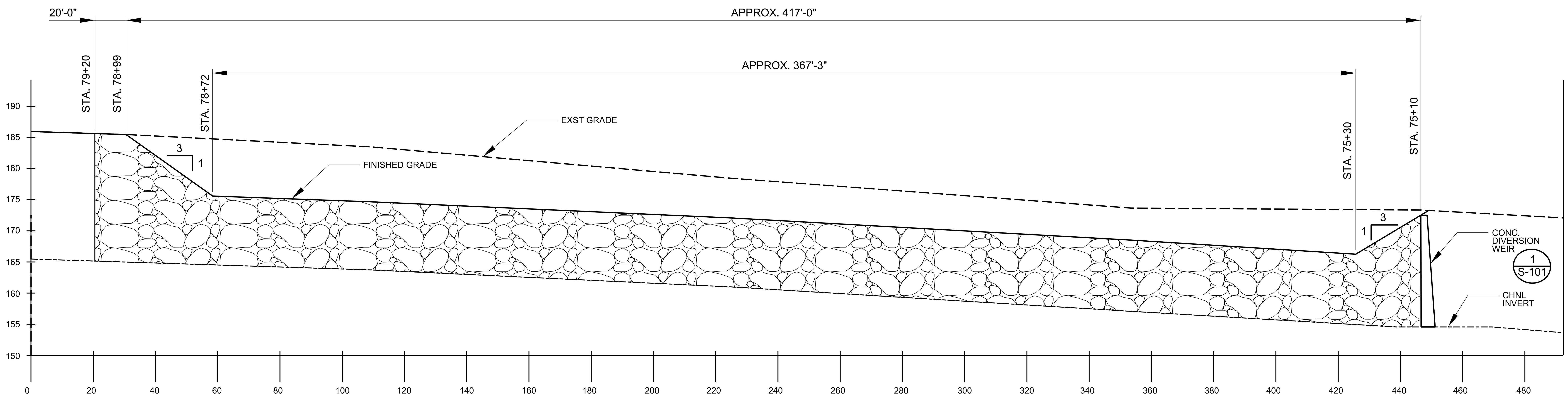
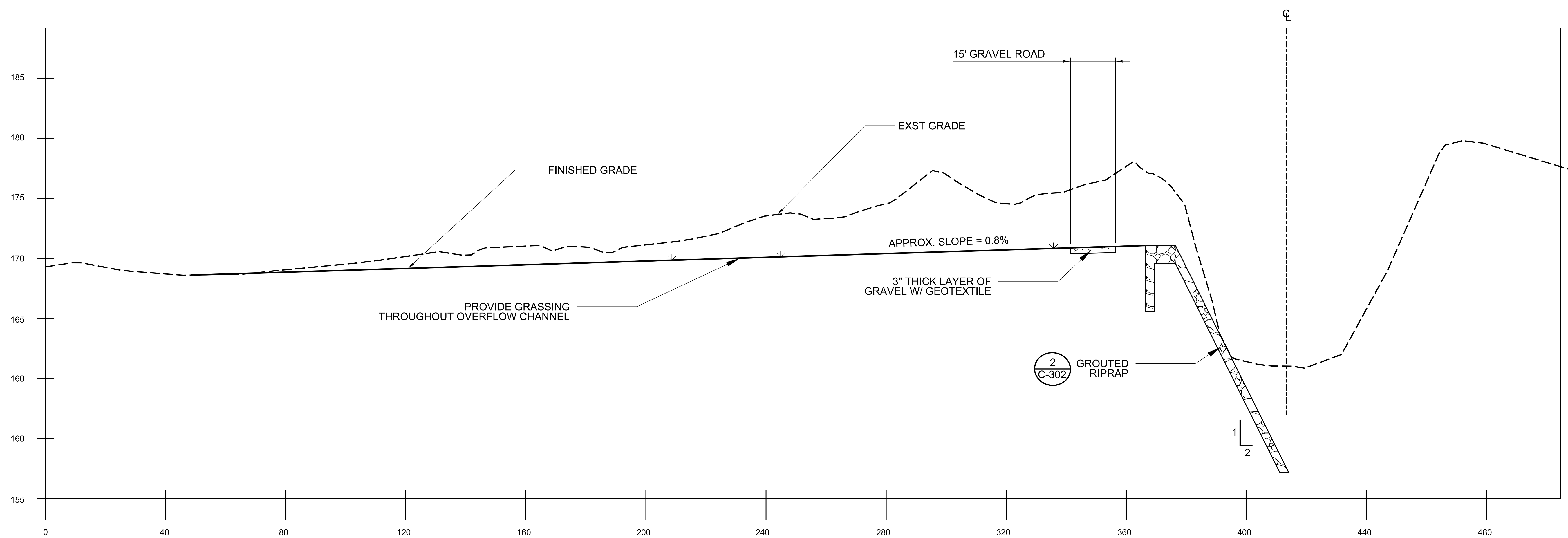


1
C-201
LB PROFILE, STA. 78+99 TO 75+10
HORIZONTAL 1" = 10' VERTICAL 1" = 20'



2
C-201
OVERFLOW CHANNEL PROFILE
HORIZONTAL 1" = 10' VERTICAL 1" = 40'

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MODIFICATIONS TO THE
IAO STREAM FLOOD CONTROL PROJECT
ISLAND OF MAUI

OVERFLOW CHANNEL
ELEVATION PROFILES

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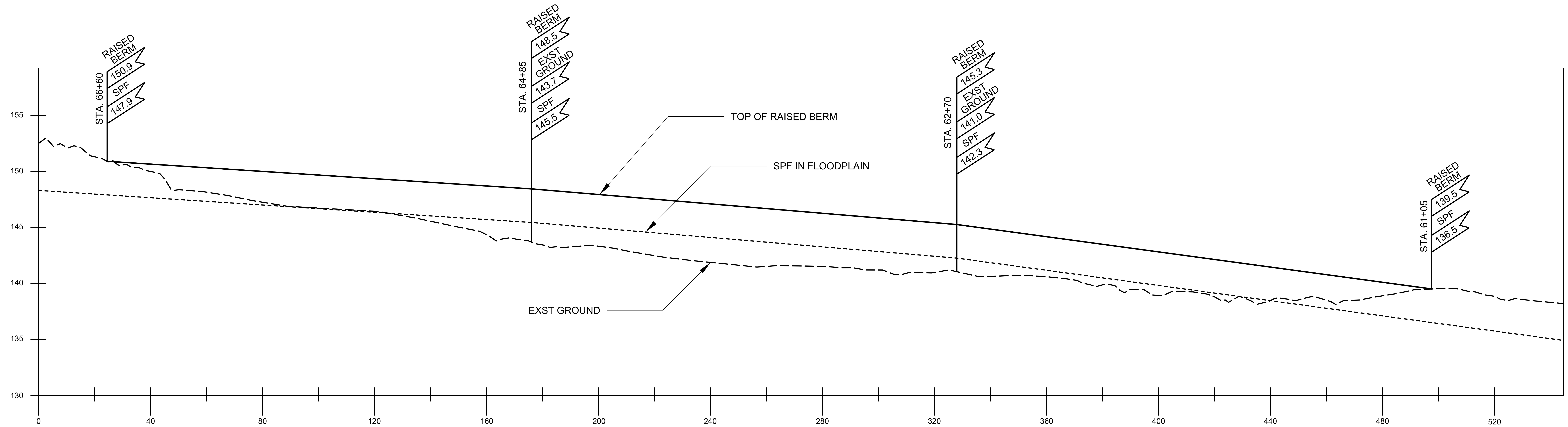
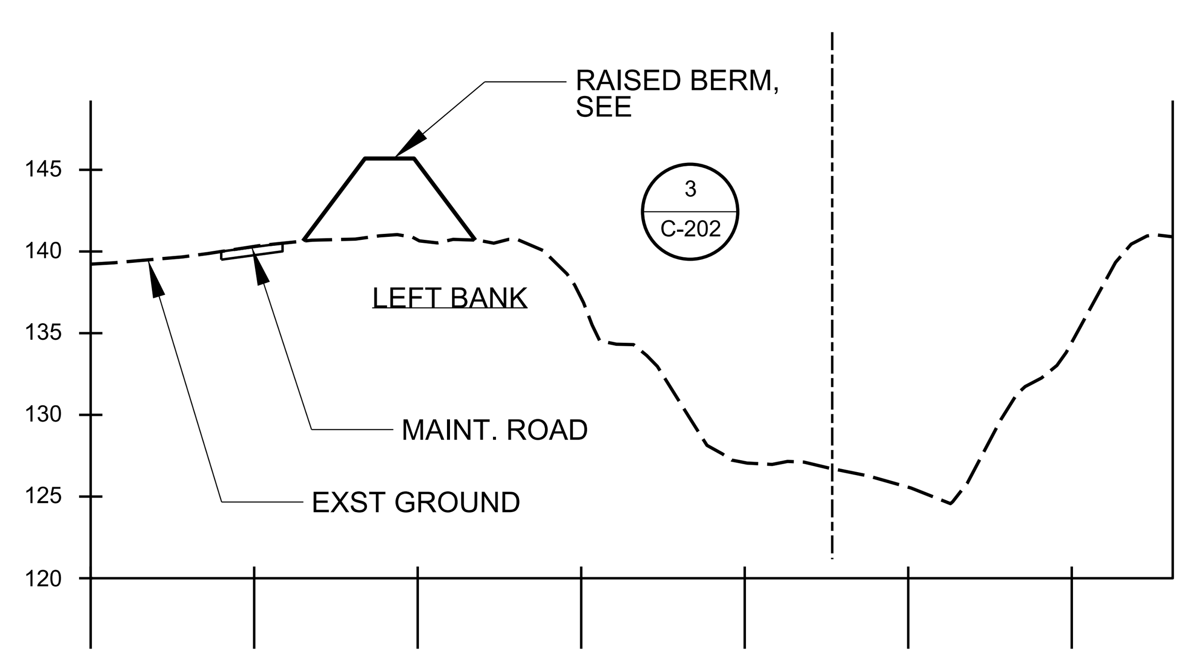


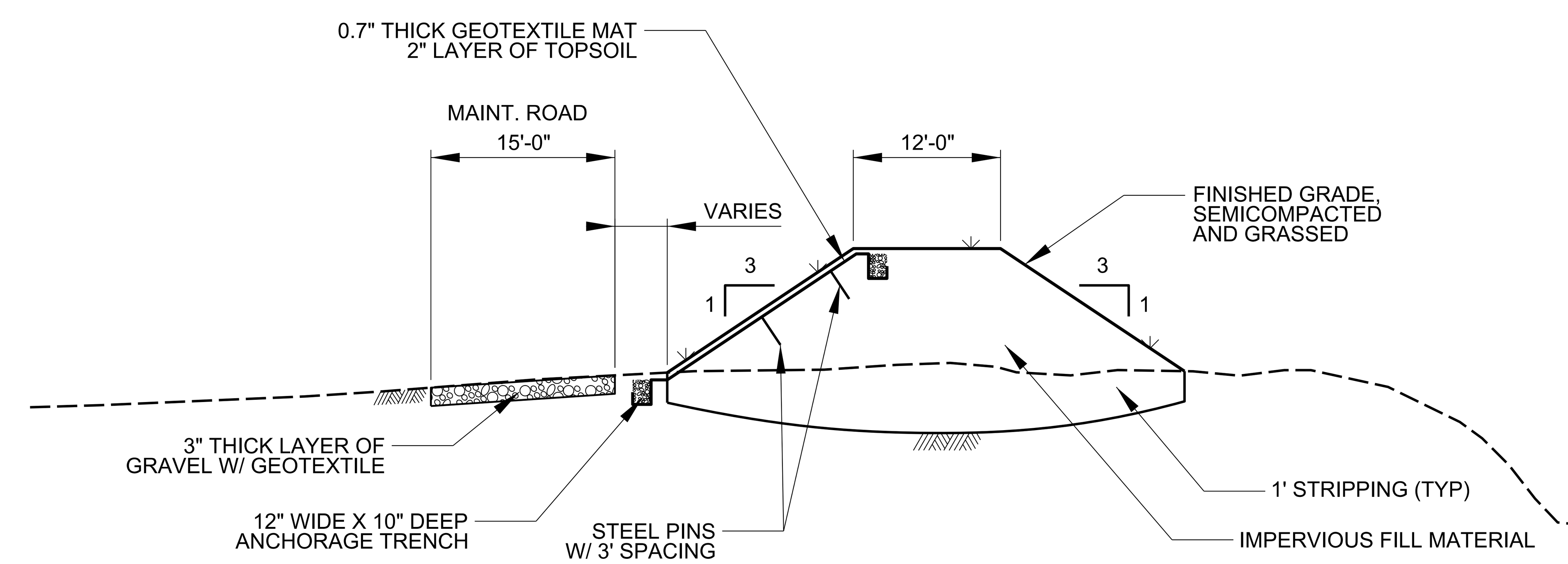
1 C-202 RAISED BERM PROFILE, STA. 66+60 TO 61+05

HORIZONTAL 1" = 20' VERTICAL 1" = 5'



2 C-202 CROSS SECTION, STA. 62+70

HORIZONTAL 1" = 40' VERTICAL 1" = 10'



3 C-202 RAISED BERM, TYP CROSS SECTION

HORIZONTAL 1" = 10' VERTICAL 1" = 5'

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MODIFICATIONS TO THE
IAO STREAM FLOOD CONTROL PROJECT
ISLAND OF MAUI

RAISED BERM
PROFILE AND SECTION

SHEET IDENTIFICATION
C-202
SHEET 0 OF 0

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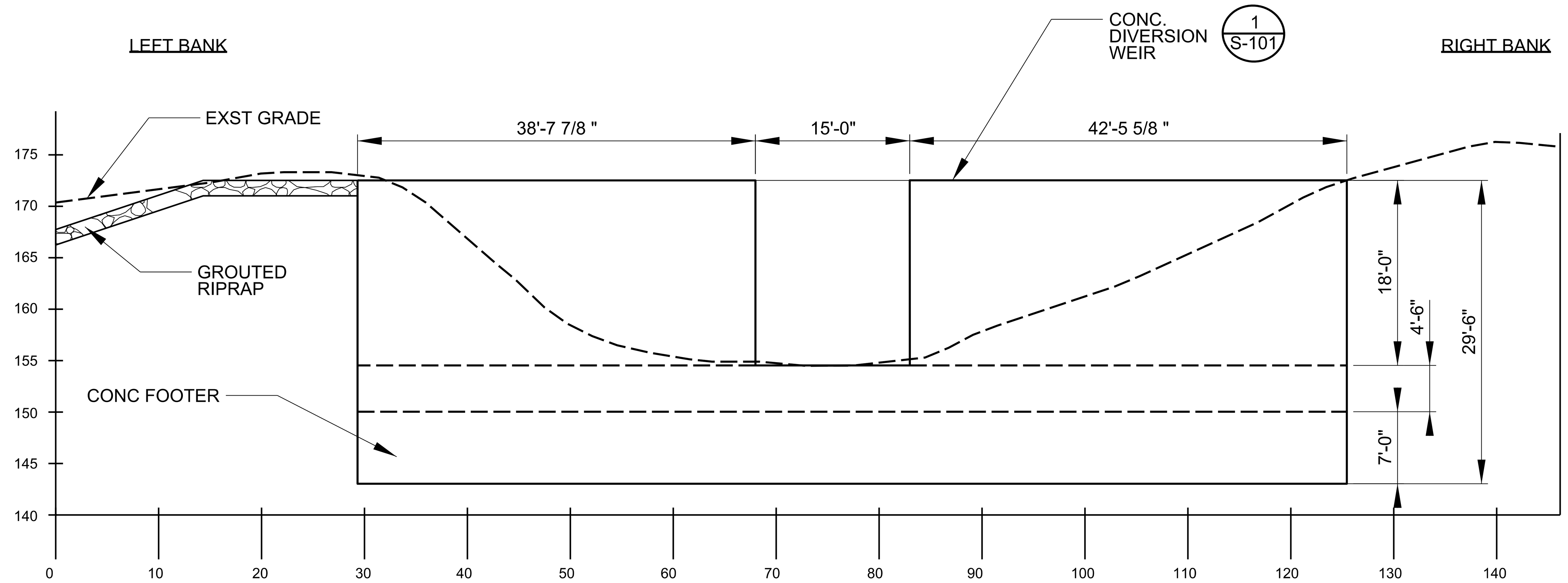
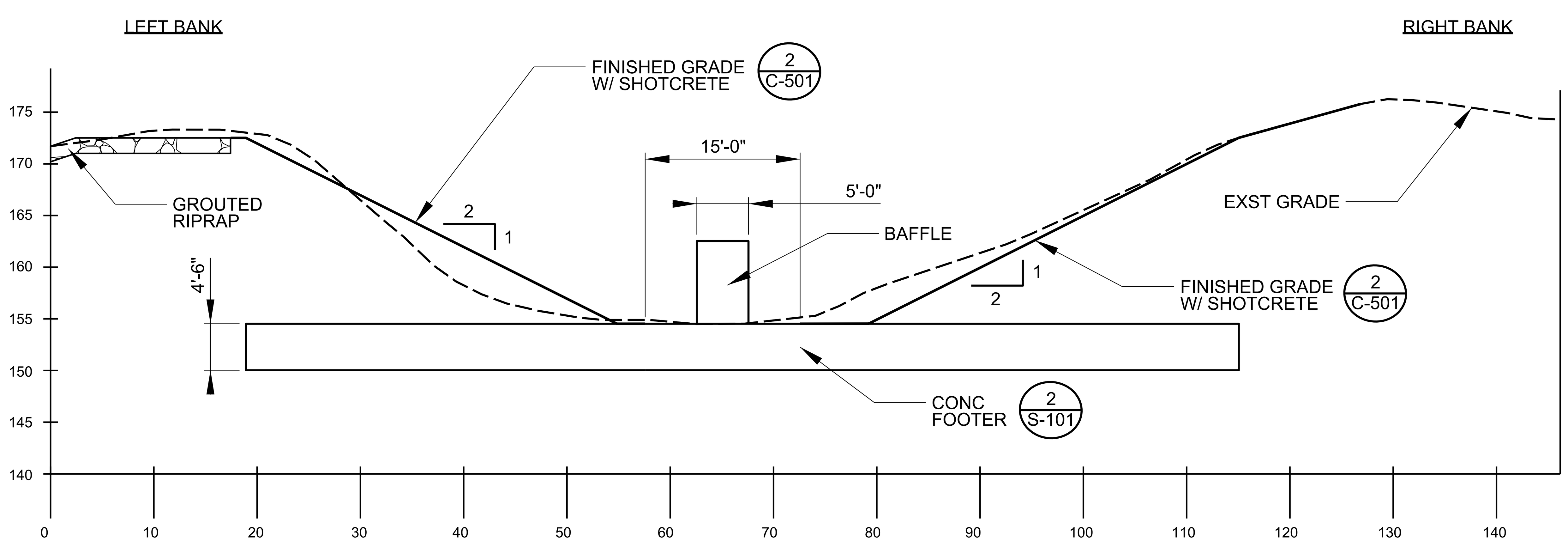


1
C-301
WEIR SECTION AT STA 75+10
1" = 10'



2
C-301
TYPICAL SECTION AT STA. 75+00
1" = 10'

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ISSUE DATE:
SOLICIT./ CONTRACT NO.:
LOCATION NO.:
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MODIFICATIONS TO THE
IAO STREAM FLOOD CONTROL PROJECT
ISLAND OF MAUI

TYPICAL CROSS SECTIONS
@ STA. 75+10 TO 74+71

SHEET IDENTIFICATION
C-301
SHEET 0 OF 0

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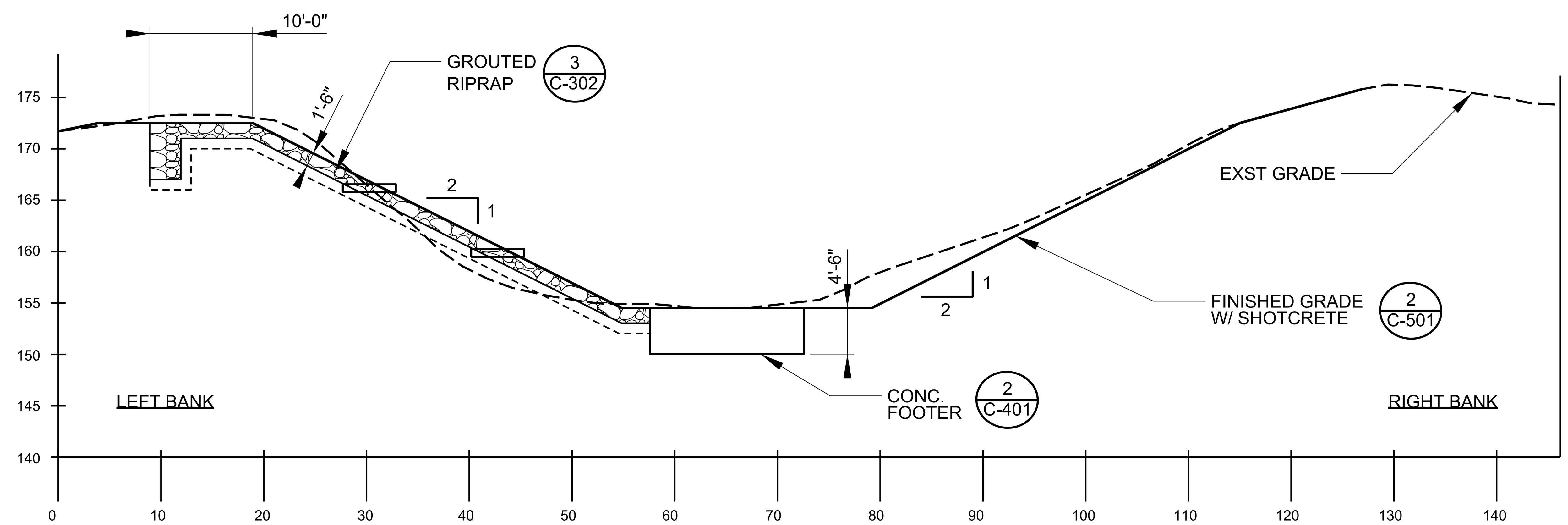
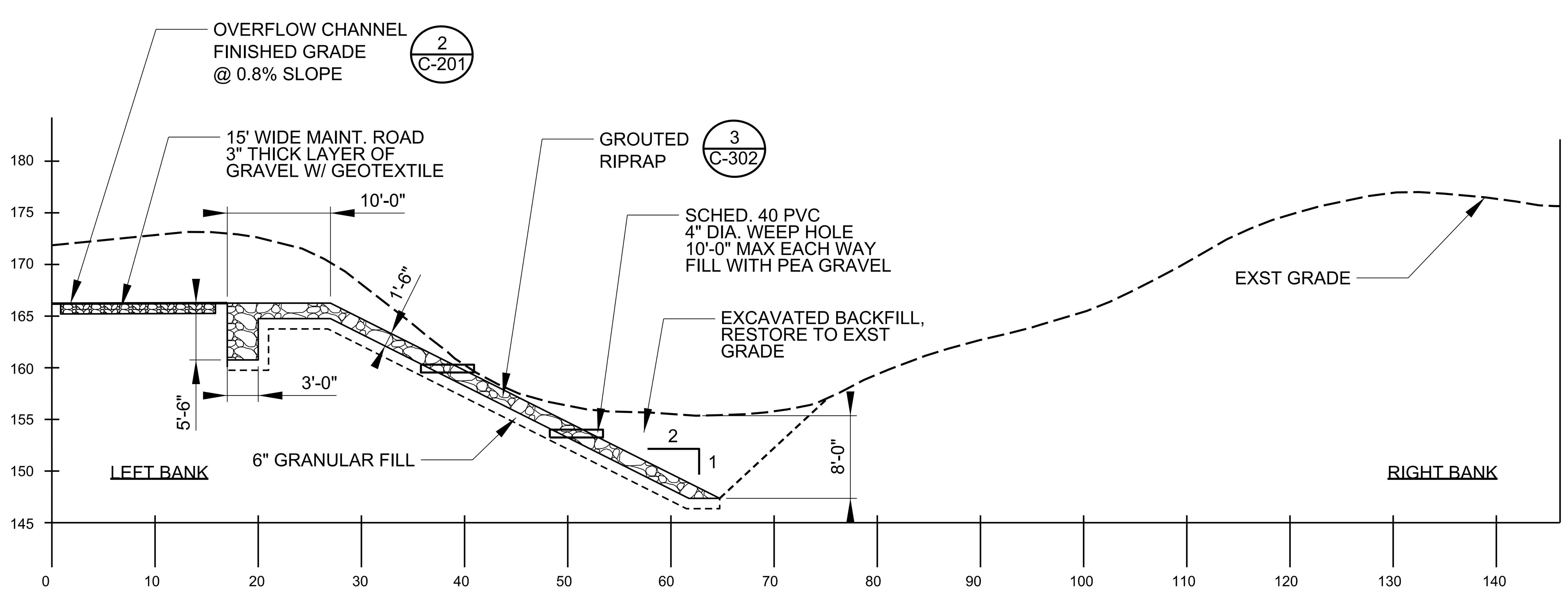


1 C-302 TYPICAL SECTION AT STA 75+15
1" = 10'

% LIGHTER BY WEIGHT	LIMITS OF STONE WEIGHT IN POUNDS
100%	2,200
85%	600 - 1,000
50%	240 - 420
15%	62 - 180

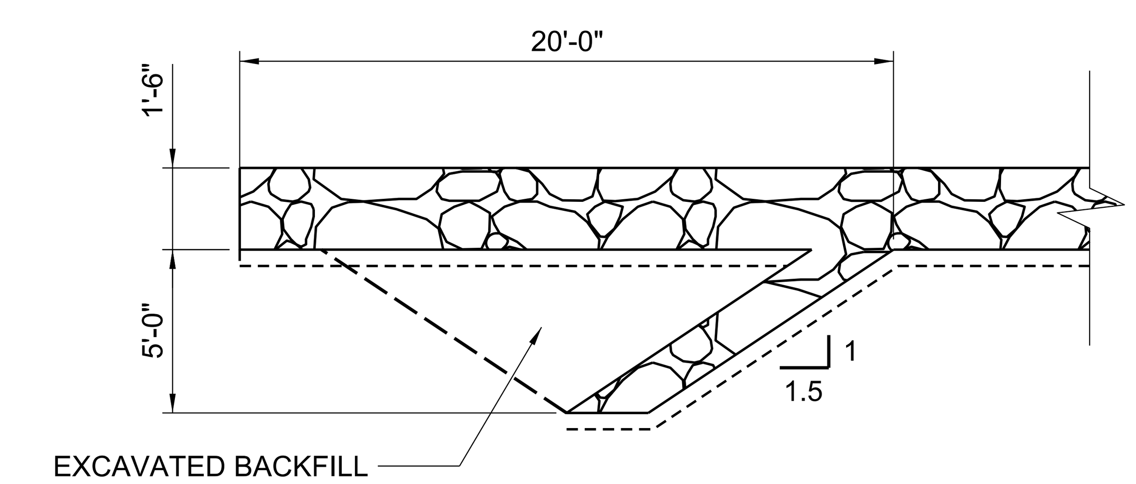
3 C-302 RIPRAP GRADATION SCHEDULE



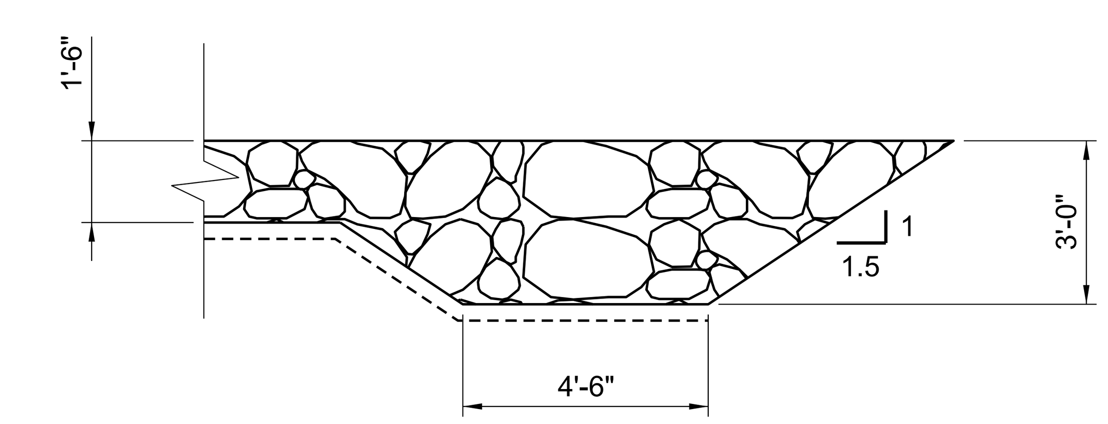
NOTES:

1. SUITABLE BOULDERS REMOVED DURING EXCAVATION FOR THE OVERFLOW CHANNEL MAY BE USED FOR THE GROUTED RIPRAP REVETMENT IF WITHIN THE ALLOWABLE WEIGHT RANGE.

2 C-302 TYPICAL SECTION AT STA. 75+50
1" = 10'



4 C-302 US RIPRAP EDGE PROTECTION



5 C-302 DS RIPRAP EDGE PROTECTION

US Army Corps of Engineers® HONOLULU DISTRICT

MARK | DESCRIPTION | DATE | APPR

DESIGNED BY: JRW | DWN BY: JRW | CKD BY: | SUBMITTED BY: | PLOT SCALE: AS SHOWN | SIZE: | PLOT DATE: | FILE NAME: | ISSUE DATE: | SOLICIT./ CONTRACT NO.: | LOCATION NO.: | FILE NUMBER:

US ARMY CORPS OF ENGINEERS HONOLULU DISTRICT FT SHAFTER, HAWAII

MODIFICATIONS TO THE IAO STREAM FLOOD CONTROL PROJECT ISLAND OF MAUI

TYPICAL CROSS SECTIONS @ STA. 75+50 TO 75+10

SHEET IDENTIFICATION
C-302
SHEET 0 OF 0

FILE: pw:\\POH-AP07FTS.poh.ds.usace.army.mil:poh-ap07fts\Documents\11 Other Locations\2 - Maui\Civil_Works\Iao Stream\01-Drawings\Civil\Typical Cross Sections
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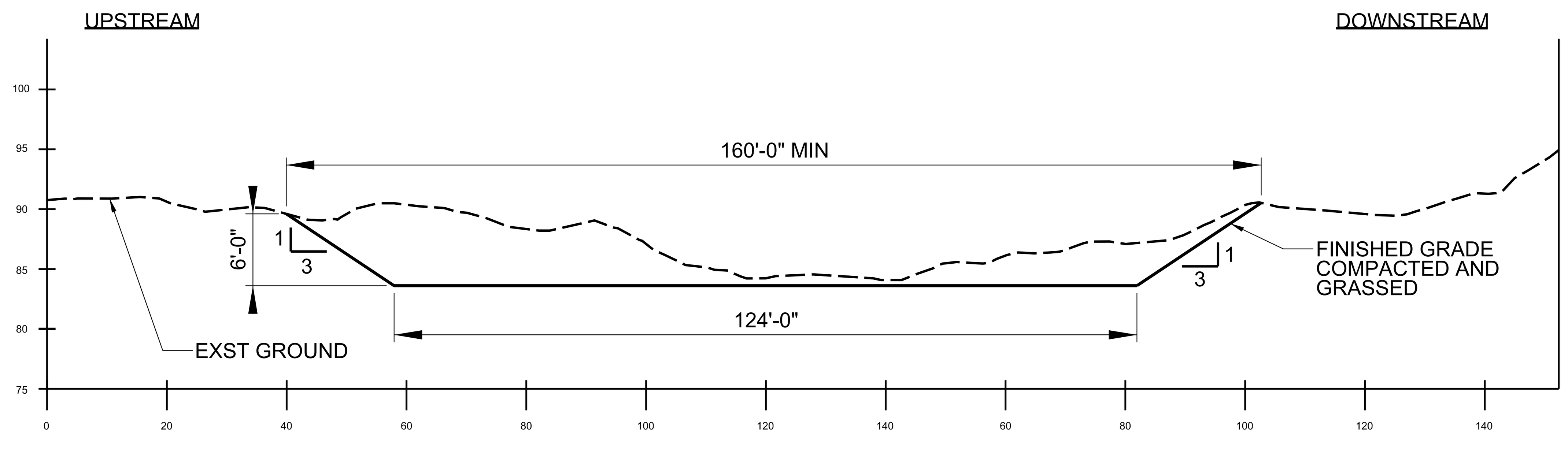
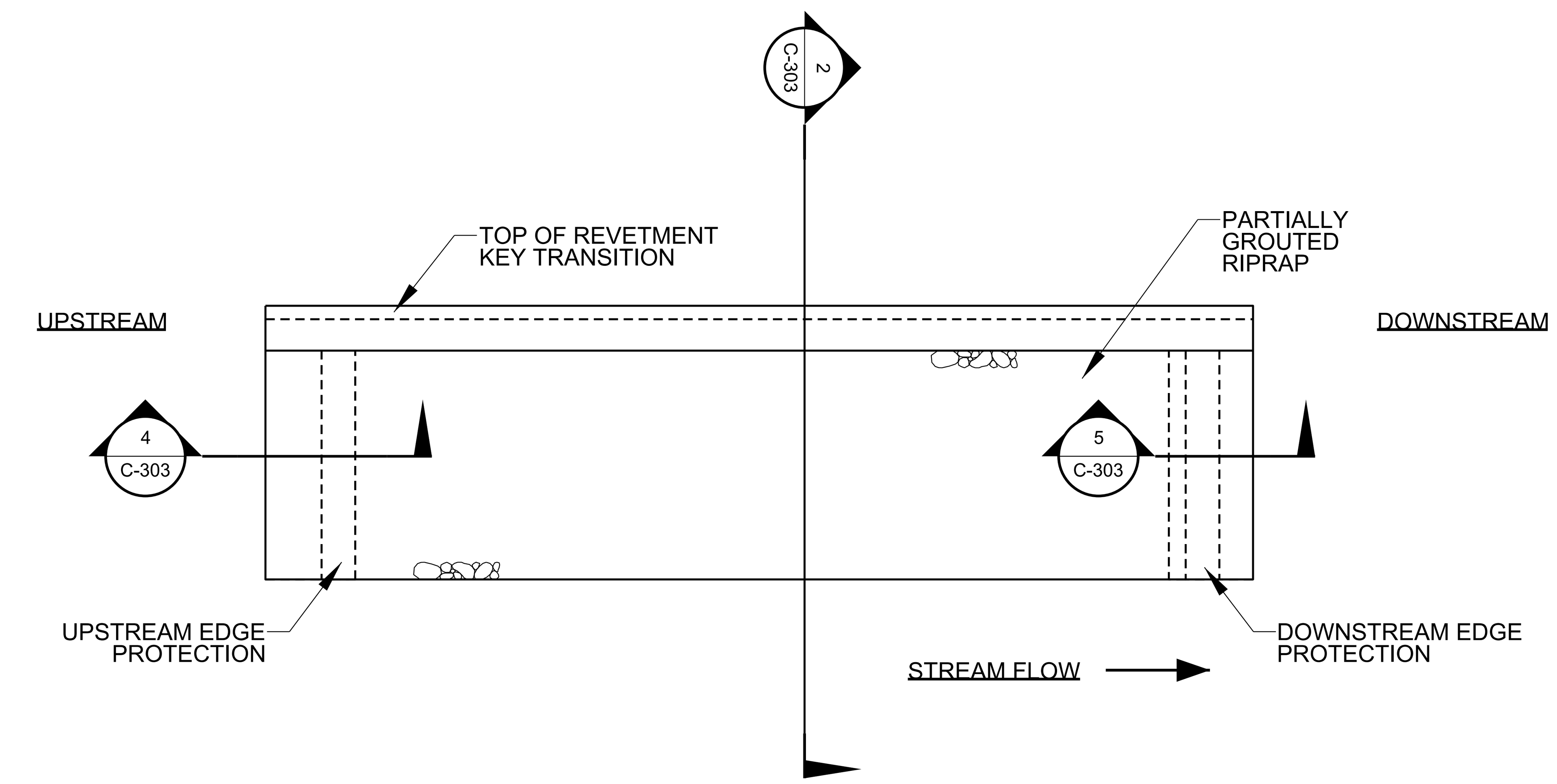
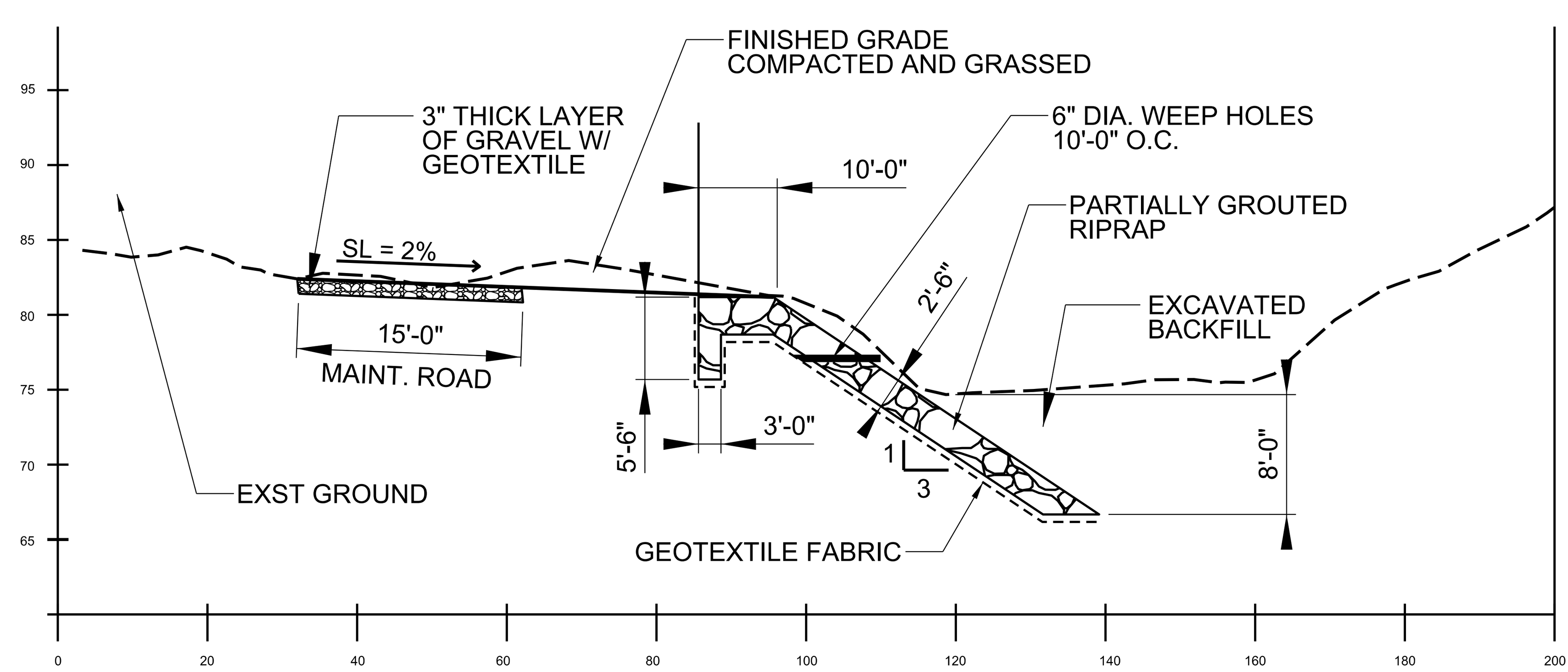


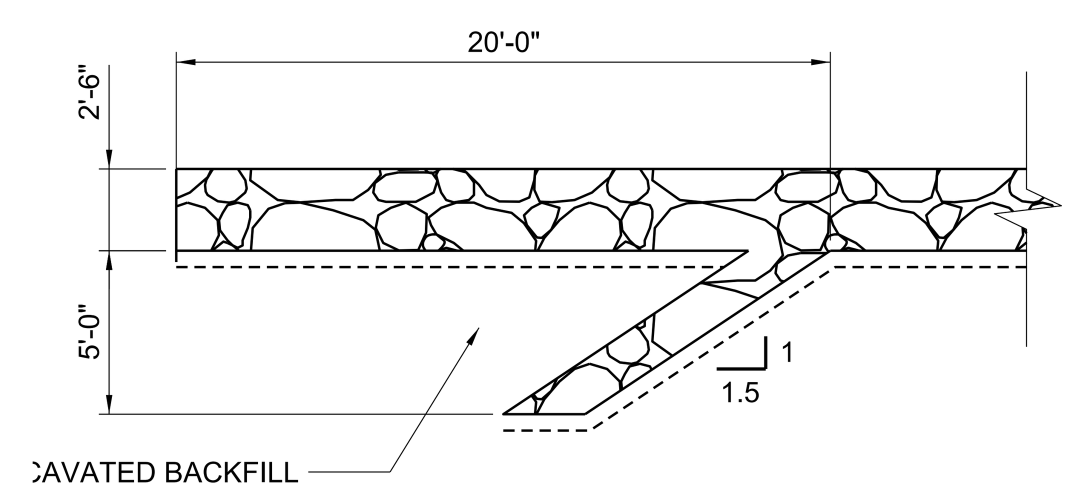
1 C-303 LEFT BANK PROFILE, STA 45+60 TO 43+60
HORIZONTAL 1" = 20' VERTICAL 1" = 10'



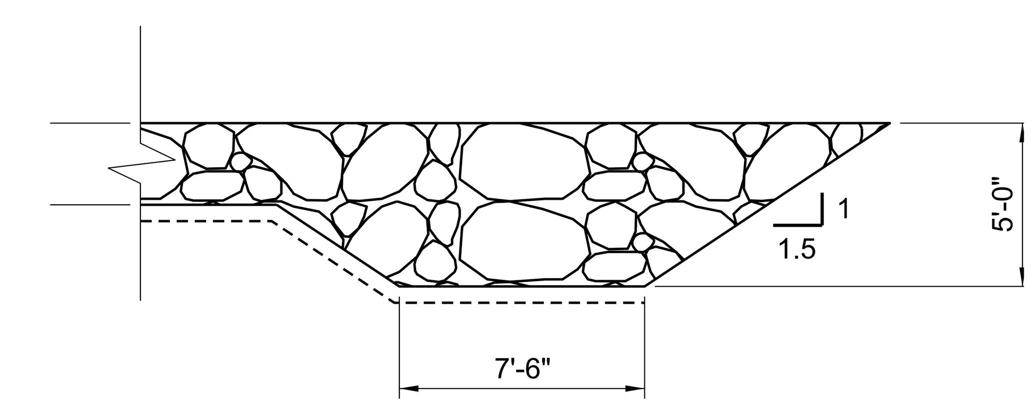
3 C-303 OUTFLOW REVETMENT PLAN
1" = 30'



2 C-303 TYP OUTFLOW SECTION @ STA 44+55
HORIZONTAL 1" = 20' VERTICAL 1" = 10'



4 C-303 TYP UPSTREAM SECTION
1" = 5'



5 C-303 TYP DOWNSTREAM SECTION
1" = 5'

% LIGHTER BY WEIGHT	LIMITS OF STONE WEIGHT IN POUNDS
100%	2,200
85%	600 - 1,000
50%	240 - 420
15%	62 - 180

6 C-303 RIPRAP GRADATION SCHEDULE

US Army Corps of Engineers®
HONOLULU DISTRICT

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

DESIGNED BY: JRW
DWN BY: JRW
CKD BY:
SUBMITTED BY:
PLOT SCALE: AS SHOWN
PLOT DATE:
SIZE:
FILE NAME:
ISSUE DATE:
SOLICIT / CONTRACT NO.:
LOCATION NO.:
FILE NUMBER:

US ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FT SHAFTER, HAWAII

MODIFICATIONS TO THE
IAO STREAM FLOOD CONTROL PROJECT
ISLAND OF MAUI

TYPICAL CROSS SECTIONS
FLOODPLAIN OUTFLOW

SHEET IDENTIFICATION
C-303
SHEET 0 OF 0

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PEN TABLE: $PENTBL$
PRINTED BY: $USER$

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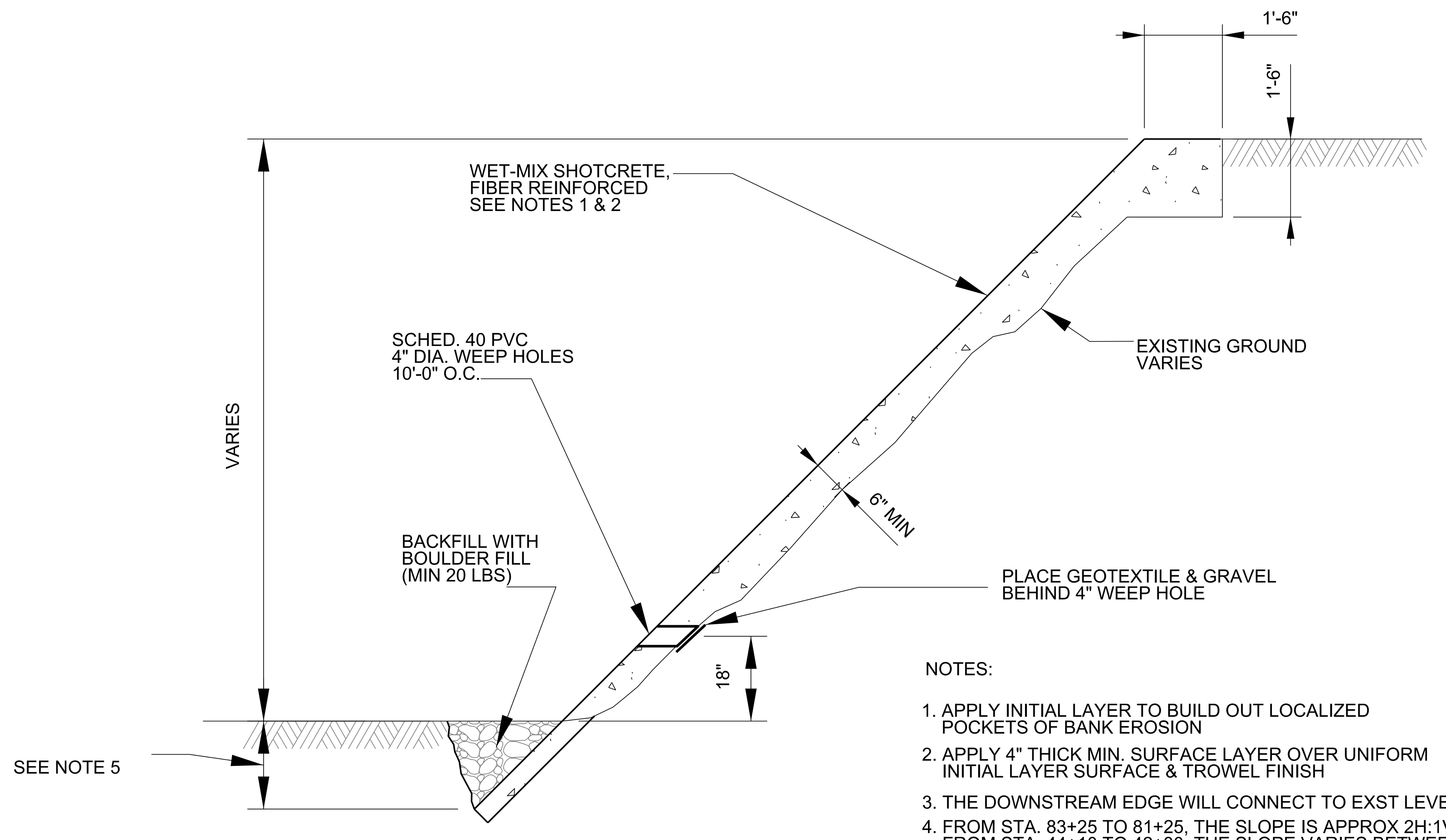
MODEL NAME: $MODELNAME$
DATE & TIME: $DATE$ $TIME$
LAST SAVED BY: J3EC9JRW

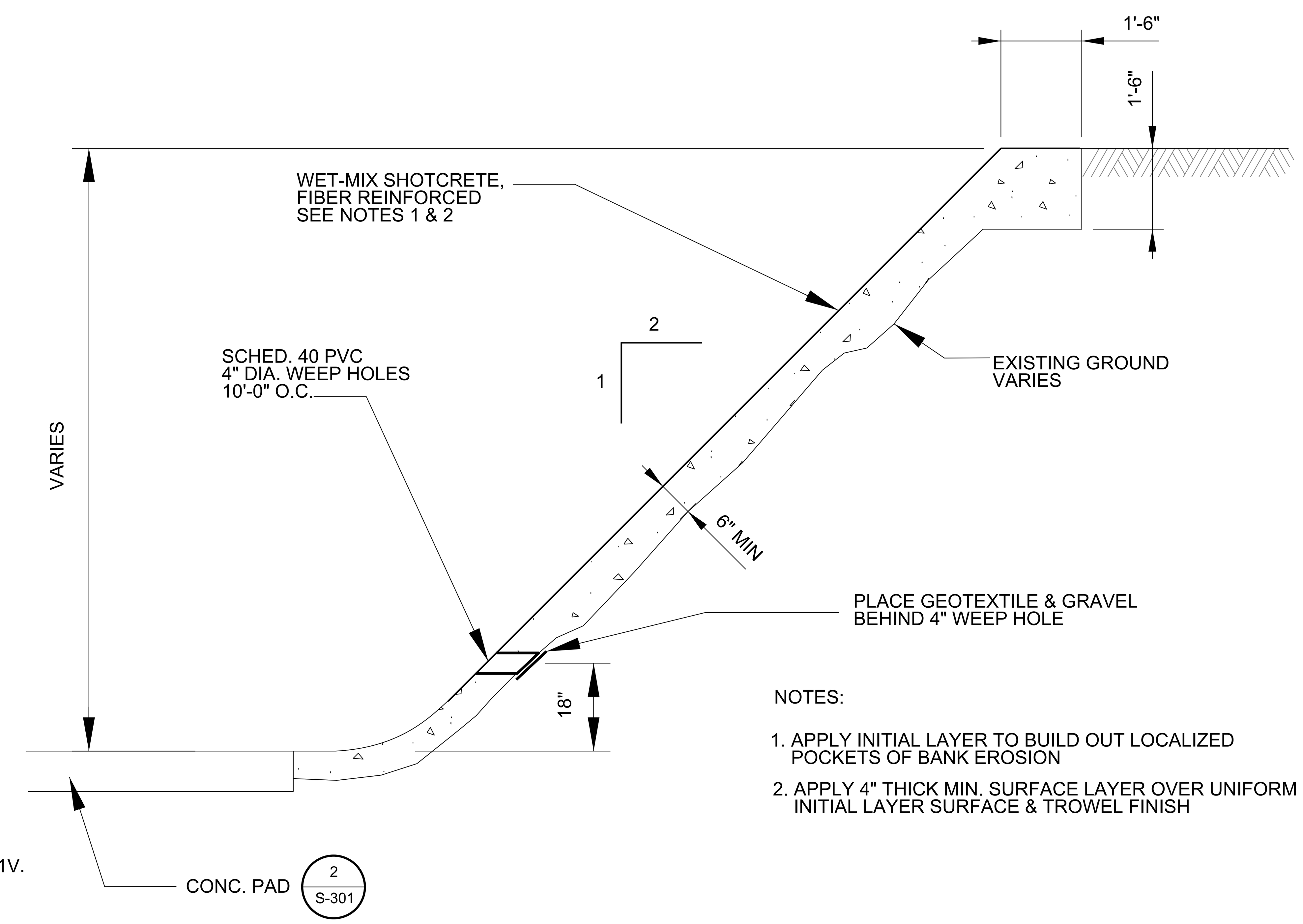
ANSI D 22 x 34



NOTES:

1. APPLY INITIAL LAYER TO BUILD OUT LOCALIZED POCKETS OF BANK EROSION
2. APPLY 4" THICK MIN. SURFACE LAYER OVER UNIFORM INITIAL LAYER SURFACE & TROWEL FINISH
3. THE DOWNSTREAM EDGE WILL CONNECT TO EXST LEVEE "E" REVETMENT
4. FROM STA. 83+25 TO 81+25, THE SLOPE IS APPROX 2H:1V. FROM STA. 44+10 TO 42+30, THE SLOPE VARIES BETWEEN 2H:1V AND 2.5H:1V.
5. FROM STA. 83+25 TO 81+25, THE FOOTER DEPTH IS 12 FT OR TO ROCK; FROM STA. 44+10 TO 42+30, THE FOOTER DEPTH IS 2 FT OR TO ROCK

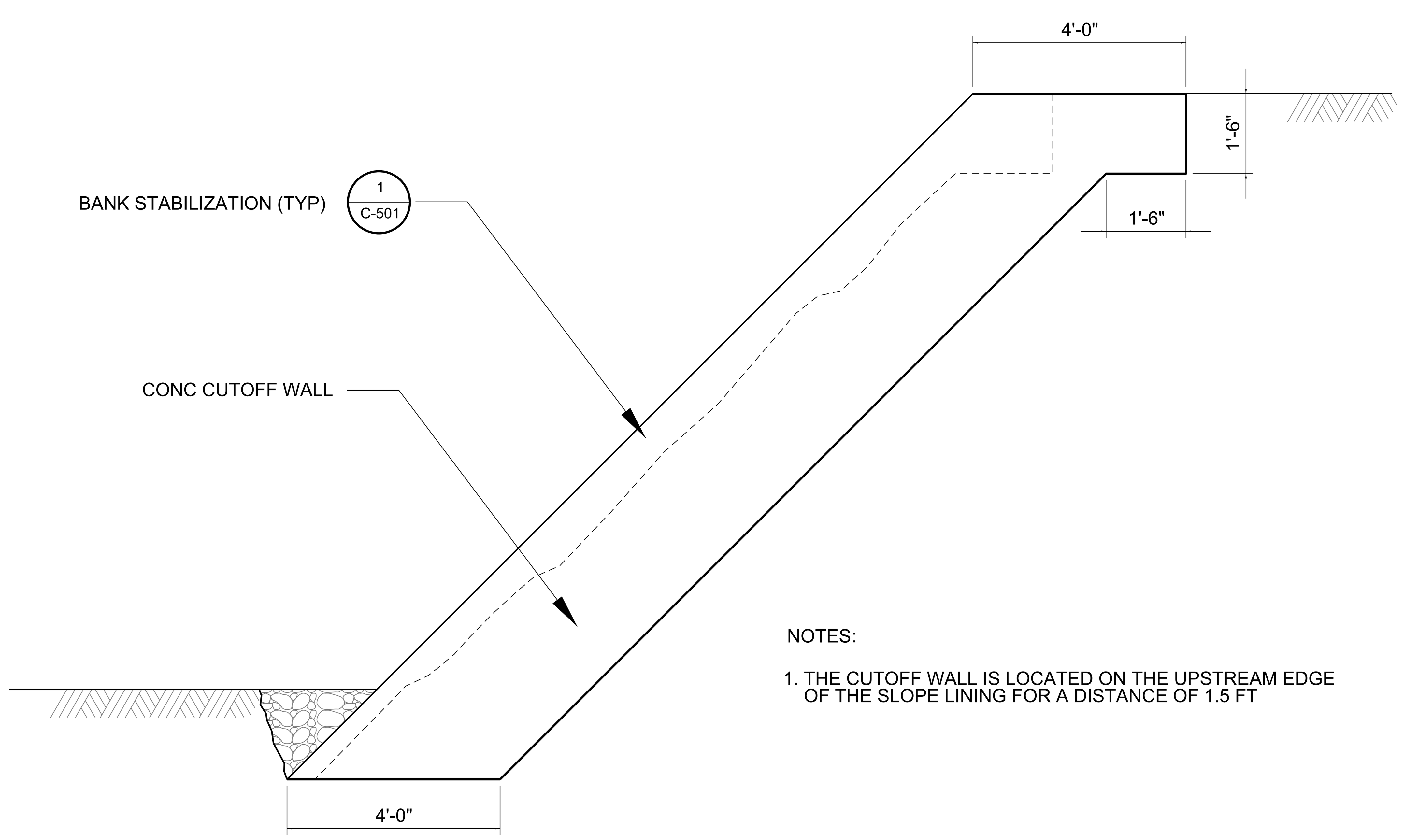
1 C-501 BANK STABILIZATION (TYP)
1" = 2'



NOTES:

1. APPLY INITIAL LAYER TO BUILD OUT LOCALIZED POCKETS OF BANK EROSION
2. APPLY 4" THICK MIN. SURFACE LAYER OVER UNIFORM INITIAL LAYER SURFACE & TROWEL FINISH

2 C-501 SLOPE LINING @ INLINE WEIR SITE
1" = 2'

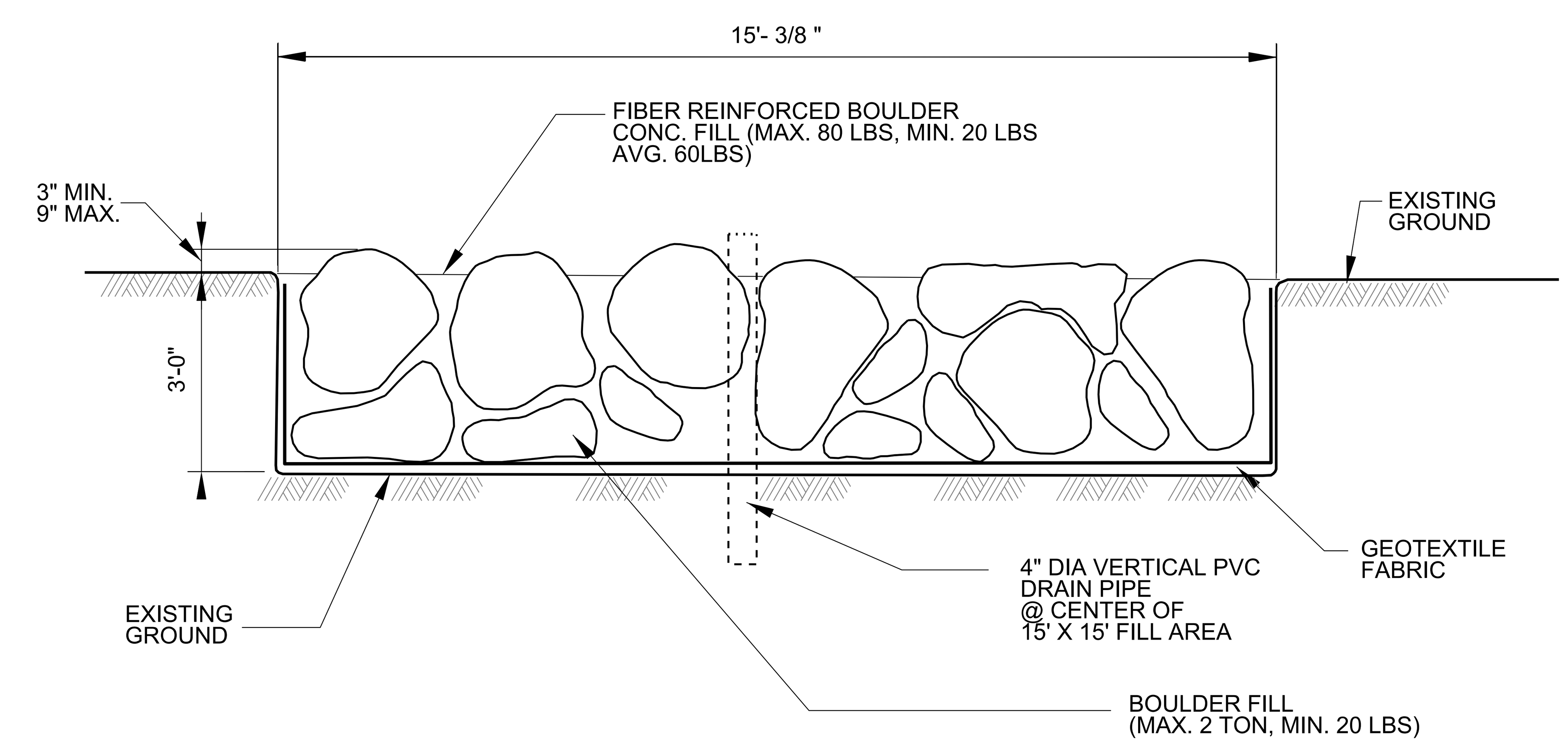


NOTES:

1. THE CUTOFF WALL IS LOCATED ON THE UPSTREAM EDGE OF THE SLOPE LINING FOR A DISTANCE OF 1.5 FT

3 C-501 CONC CUTOFF WALL
1" = 2'

NOTES:
1. ONLY USE SMALL COMPACTOR
2. GEOTEXTILE SHALL HAVE CONTINUOUS OVERLAP OF 12" MIN.



4 C-501 CONC. BOULDER FILL DETAIL
1" = 2'

US Army Corps of Engineers®
HONOLULU DISTRICT

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

DESIGNED BY: JRW
DWN BY: WKP
CKD BY:
SUBMITTED BY:
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PLOT DATE:
SIZE:
FILE NAME:
ISSUE DATE:
SOLICIT./CONTRACT NO.:
LOCATION NO.:
FILE NUMBER:

US ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FT SHAFTER, HAWAII

MODIFICATIONS TO THE
IAO STREAM FLOOD CONTROL PROJECT
ISLAND OF MAUI

CIVIL DETAILS

SHEET IDENTIFICATION
C-501
SHEET 0 OF 0

ANSI D 22 x 34

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FILE: pw:\\POH-AP07FTS.poh.ds.usace.army.mil:poh-ap07fts\Documents\11 Other Locations\2 - Maui\Civil_Works\Iao Stream\01-Drawings\Civil\Civil Details
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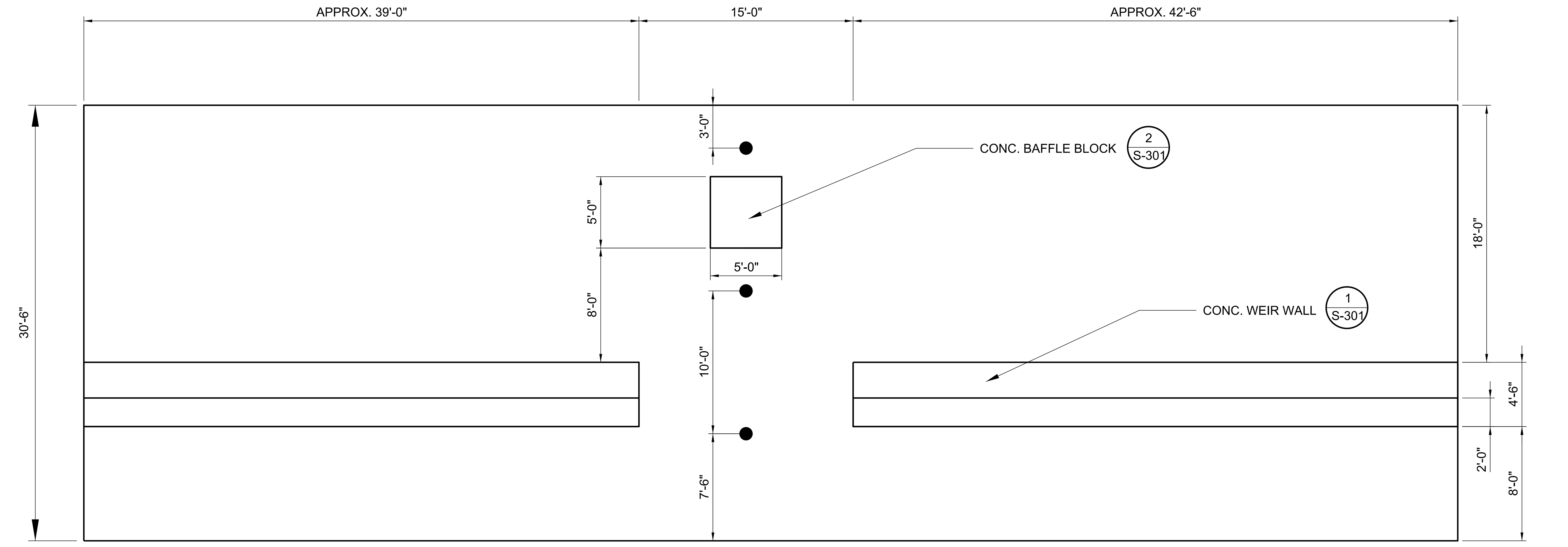
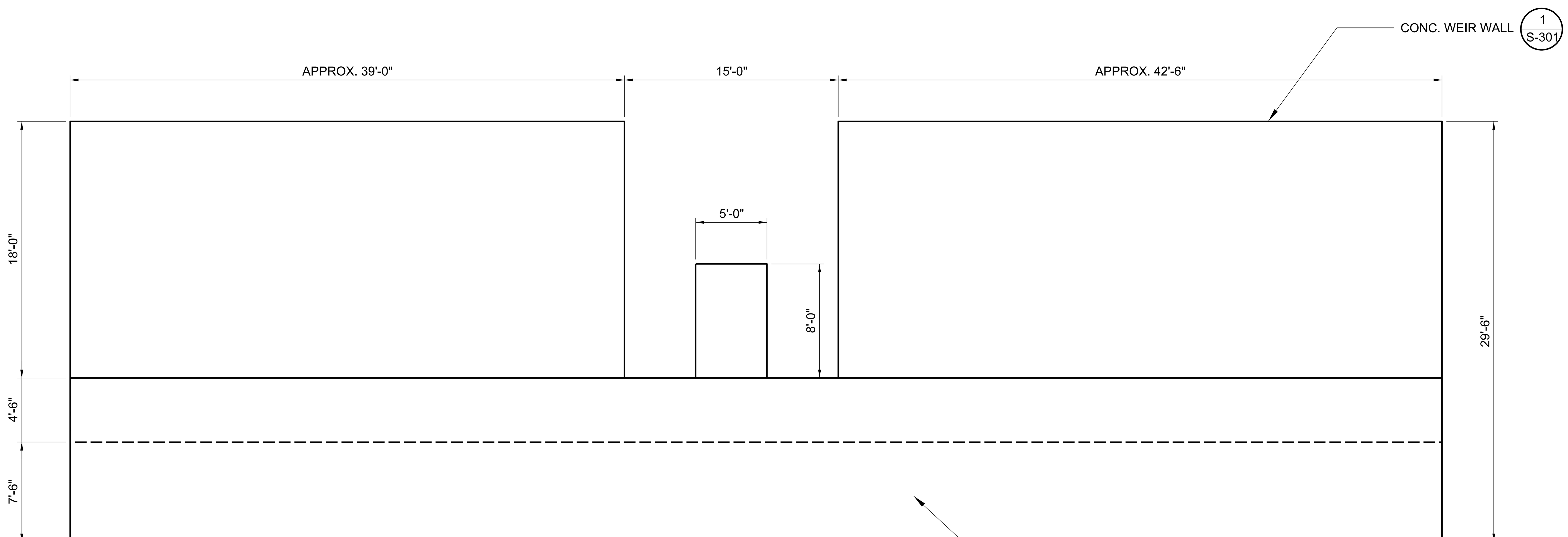


1 S-101 **CONC. WEIR PLAN**
1" = 5'



2 S-101 **CONC. WEIR ELEVATION**
1" = 5'

US Army Corps of Engineers®
HONOLULU DISTRICT

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

US ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FT SHAFTER, HAWAII

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MODIFICATIONS TO THE
IAO STREAM FLOOD CONTROL PROJECT
ISLAND OF MAUI

WEIR PLAN
AND ELEVATION

SHEET
IDENTIFICATION
S-101
SHEET 0 OF 0

ANSI D 22 x 34

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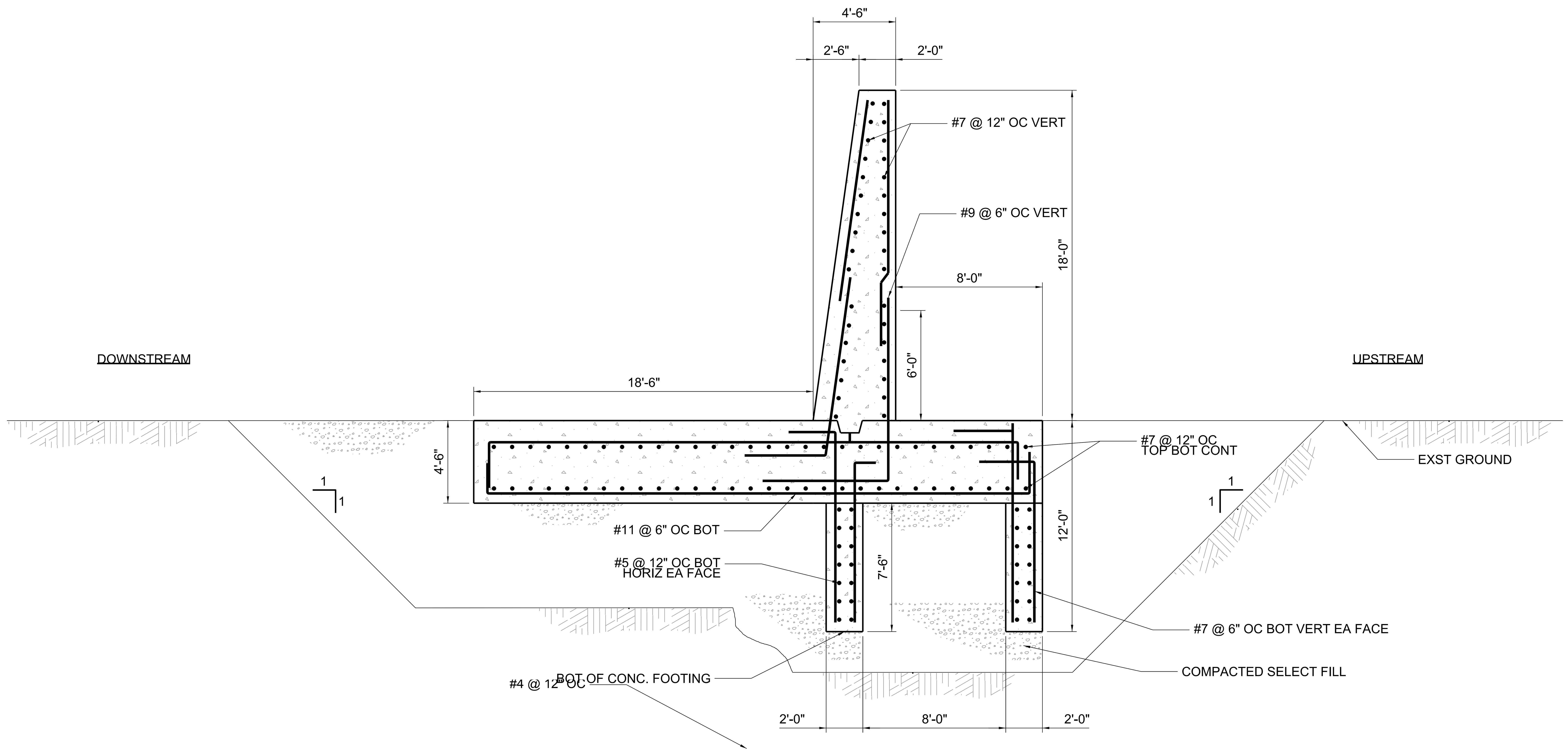
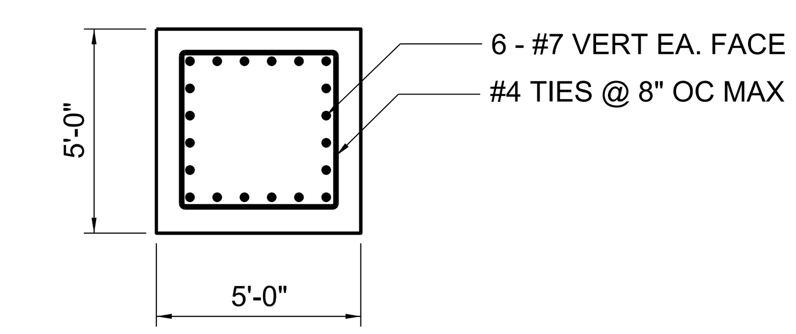
PRINTED BY: J3EC9JRW ()

1 2 3 4 5

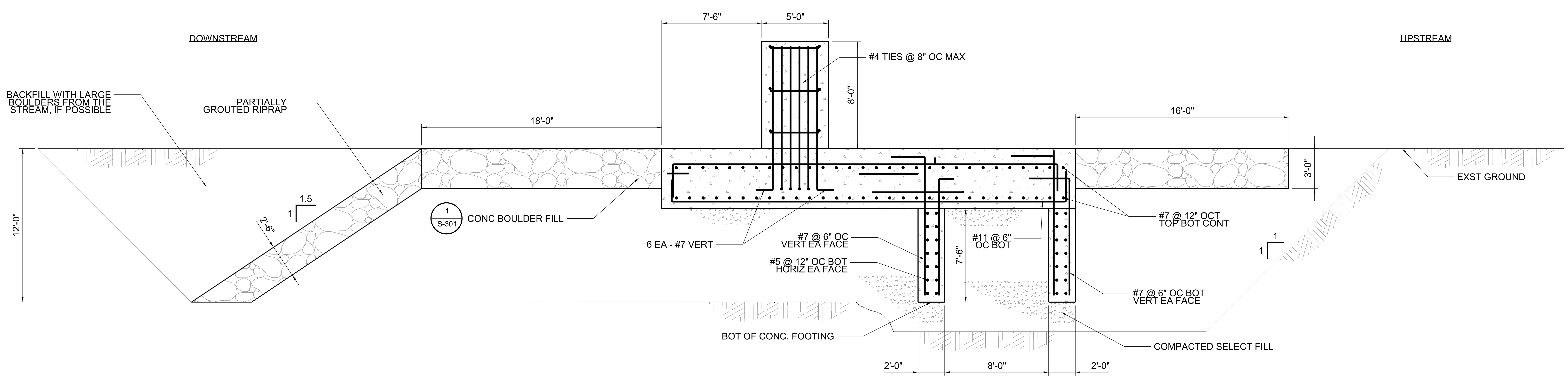
D C B A



1 S-301 CONC. WEIR SECTION
NOT TO SCALE



3 S-301 BAFFLE PLAN
NOT TO SCALE



2 S-301 CHANNEL AND BAFFLE SECTION
NOT TO SCALE

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LAST SAVED BY: J3EC9JRW PRINTED BY: J3EC9JRW ()

US Army Corps of Engineers®
HONOLULU DISTRICT

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

DESIGNED BY: JRW	ISSUE DATE:		
DWN BY: WKP	CKD BY:	SOLICIT / CONTRACT NO.:	
SUBMITTED BY:		LOCATION NO.:	
PLOT SCALE: AS SHOWN	PLOT DATE:	FILE NUMBER:	
SIZE:	FILE NAME:		

US ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FT SHAFTER, HAWAII

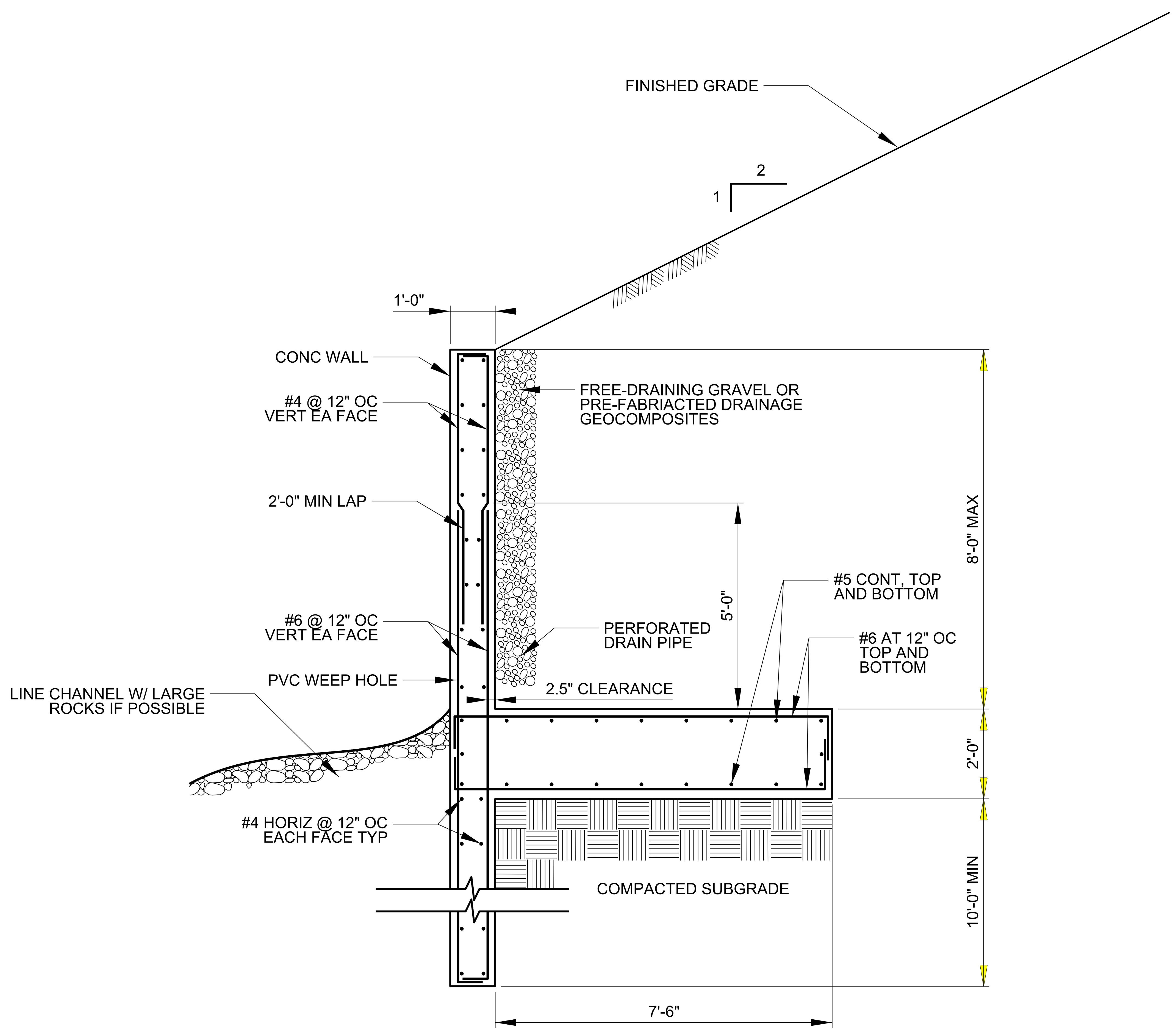
MODIFICATIONS TO THE
IAO STREAM FLOOD CONTROL PROJECT
ISLAND OF MAUI

WEIR AND BAFFLE
CROSS SECTION

SHEET
IDENTIFICATION
S-301
SHEET 0 OF 0

ANSI D 22 x 34

This project was designed by the Honolulu District of the U.S. Army Corps of Engineers. The initials or signatures and registration designations of individuals appear on these project documents within the scope of their employment as required by ER 1110-1-8152.



1 / S-302 RETAINING WALL AT REVETMENT X
1" = 1'

US Army Corps of Engineers®
HONOLULU DISTRICT

MARK	DESCRIPTION	DATE	APPR

MARK	DESCRIPTION	DATE	APPR

ISSUE DATE: | SOLICIT./ CONTRACT NO.: | LOCATION NO.: | FILE NUMBER:

DESIGNED BY: JRW | CKD BY: | DWN BY: JRW | SUBMITTED BY: | PLOT SCALE: AS SHOWN | PLOT DATE: | SIZE: | FILE NAME:

US ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FT SHAFTER, HAWAII

MODIFICATIONS TO THE
IAO STREAM FLOOD CONTROL PROJECT
ISLAND OF MAUI

TYPICAL CROSS SECTIONS
@ REVETMENT X

SHEET
IDENTIFICATION
S-302
SHEET 0 OF 0

FILE: pw:\\POH-AP07FTS.poh.ds.usace.army.mil:poh-ap07fts\Documents\11 Other Locations\2 - Maui\Civil_Works\Iao Stream\01-Drawings\Structural\Retaining Wall at Revetment X
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Appendix E:

Agency Communication

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT. SHAFTER, HAWAII 96858-5440

March 29, 1996

REPLY TO
ATTENTION OF

Planning and Operations Division

Don Hibbard, Ph.D.
Deputy State Historic Preservation Officer
State Historic Preservation Division
Department of Land and Natural Resources
33 South King Street, 6th Floor
Honolulu, Hawaii 96813

Dear Dr. Hibbard:

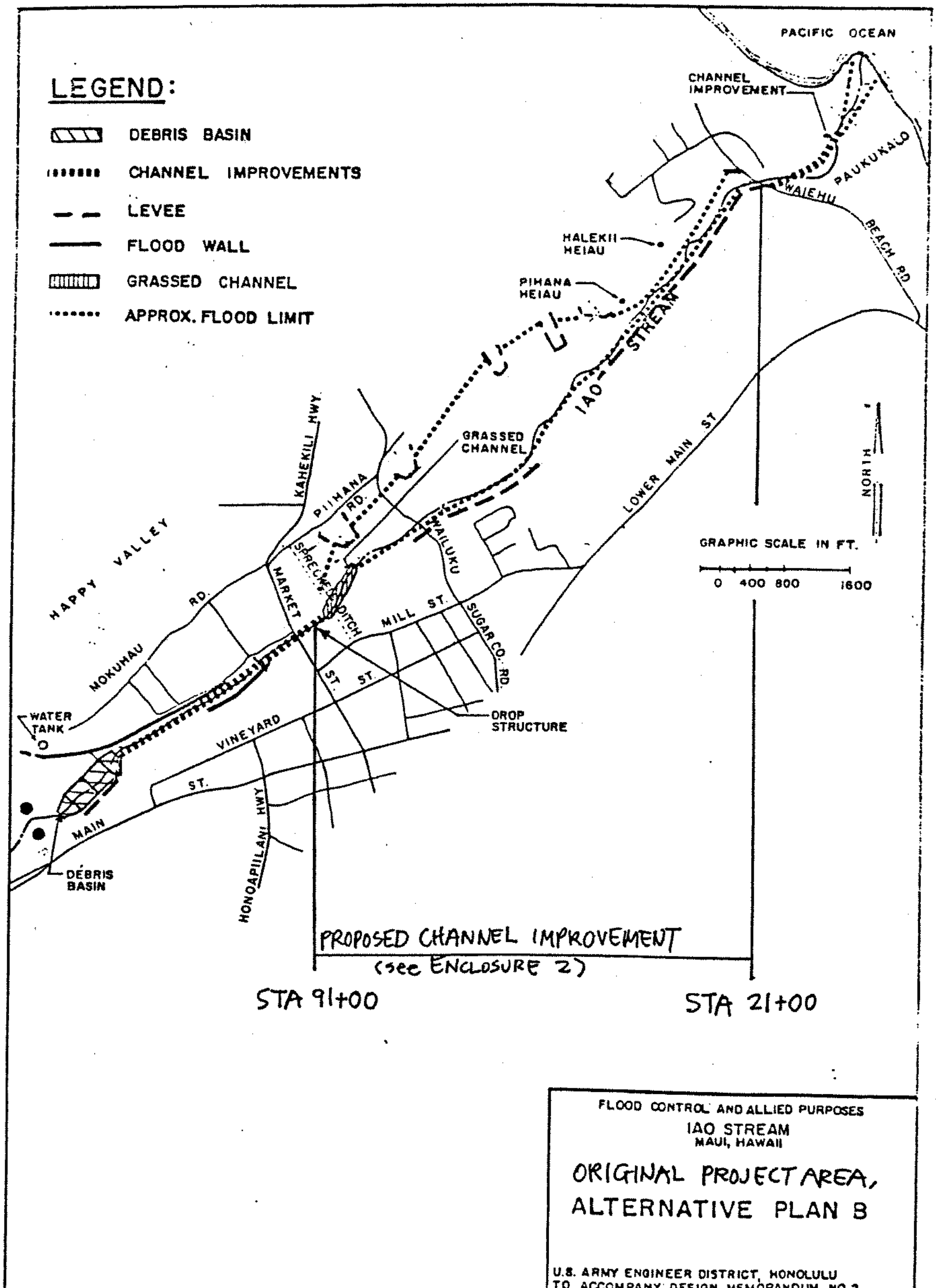
The U.S. Army Corps of Engineers, Honolulu Engineer District has assessed the potential effects of proposed modifications to the Iao Stream Flood Control Project area at Iao Stream, Wailuku, Maui Island (enclosures). The entire proposed undertaking consists of concrete drainage channel modifications confined to instream sections of the drainage way. Previous Section 106 consultation between the U.S. National Park Service and the President's Advisory Council on Historic Preservation in 1974 resulted in the Bishop Museum's identification of 2 historic properties in the uppermost portion of Iao Stream. This report is referenced in your library under Connolly, Robert, 1974, *Phase I Archaeological Survey of Iao Valley Flood Control Project Area, Maui*, Bishop Museum Manuscript Report 100374. This initial assessment did not identify any surface historic properties at the present project location and subsequent construction of the Iao Stream flood control improvements did not discover any unanticipated historic properties within the entire stream flow channel. Currently designated historic properties consisting of the Wailuku Historic District, Halekii and Pihana heiau, the Wallace System Complex, and the North Terrace System Complex are not located within the project area, nor will they be directly or indirectly impacted by any activities associated with construction of the proposed undertaking (enclosure). We request your comments and concurrence in determining that pursuant to 36 CFR Sections 800.4 and 800.5 of the regulations of the President's Advisory Council on Historic Preservation this proposed undertaking for flood control channel modifications at Iao Stream, Wailuku, Maui Island, will have No Effect on any identified or potential historic properties.

Thank you for your timely response in order that we may proceed to finalize the supplementary dEA and dFONSI and complete the Section 106 compliance process. If you have any further questions or comments, please contact Mr. Farley K. Watanabe, Staff Archaeologist at 438-7007 of my Planning & Operations Division.

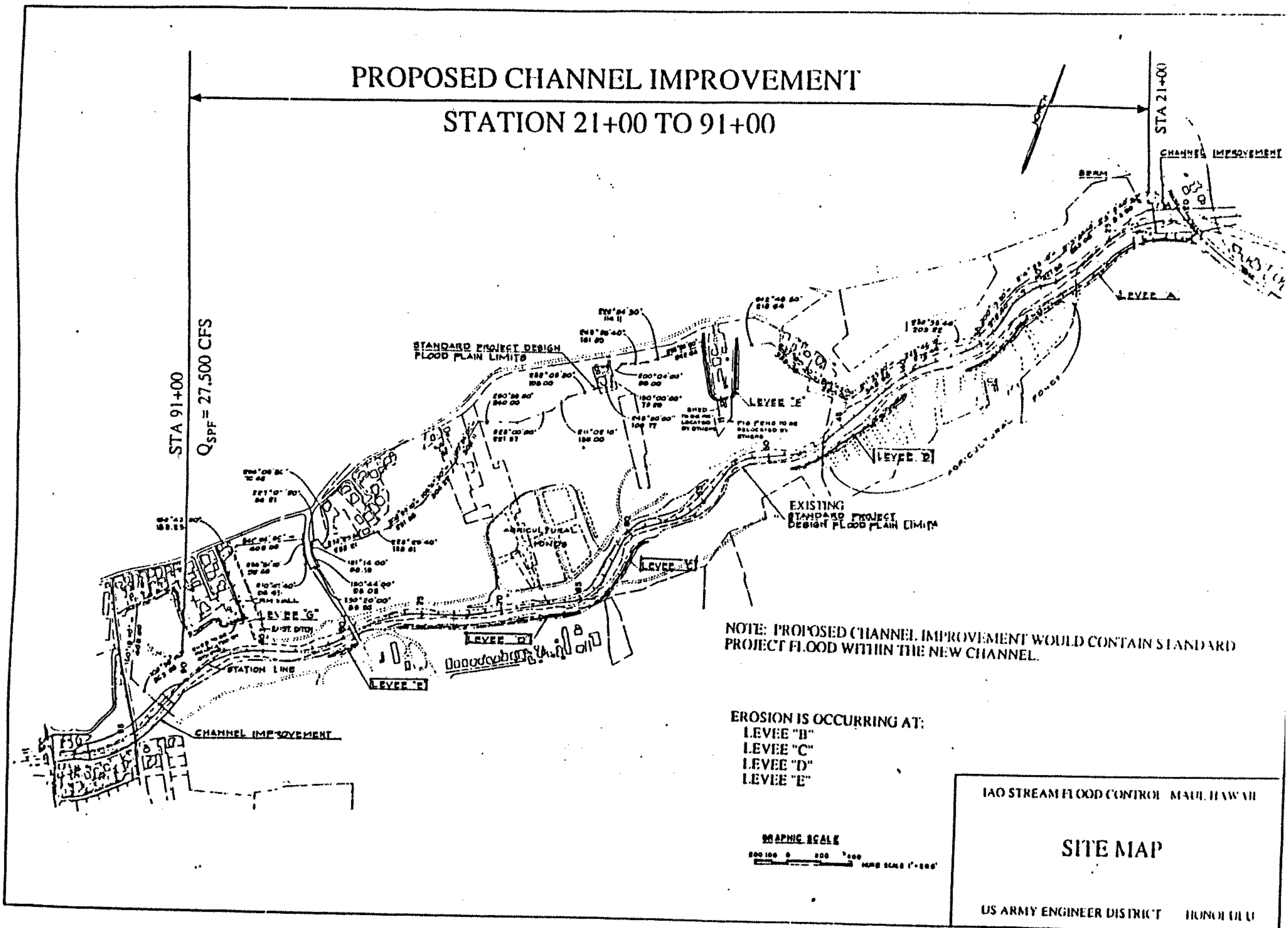
Sincerely,

Ray H. Jyo, P.E.
Director of Engineering
and Technical Services

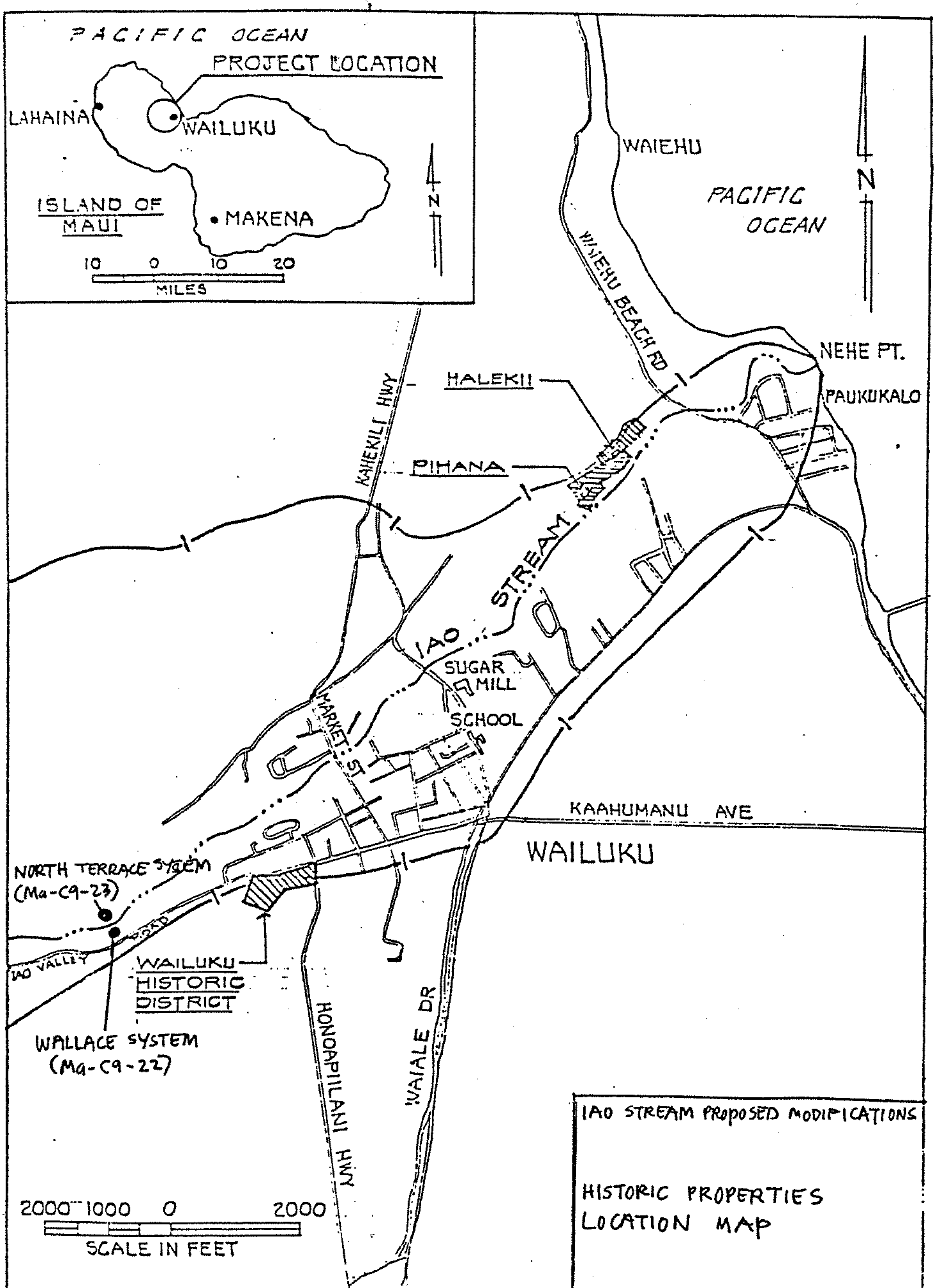
Enclosures


LEGEND:
DEBRIS BASIN
CHANNEL IMPROVEMENTS
LEVEE
FLOOD WALL
GRASSED CHANNEL
APPROX. FLOOD LIMIT
PACIFIC OCEAN
CHANNEL IMPROVEMENT
PAUKUKALO
WAIEHU
BEACH RD
HALEKII HEIAU
PIHANA HEIAU
IAO STREAM
NORTH
GRAPHIC SCALE IN FT.
0 400 800 1600
LOWER MAIN ST
GRASSED CHANNEL
KAHEKILI HWY
PIIHANA RD.
HAPPY VALLEY RD.
SPRECKELS DITCH
MARKET ST.
WAILUKU
MILL ST.
SUGAR CO. RD.
MOKUHAU
WATER TANK
VINEYARD ST.
DROP STRUCTURE
MAIN ST.
HONOAPIILANI HWY
DEBRIS BASIN
PROPOSED CHANNEL IMPROVEMENT
(see ENCLOSURE 2)
STA 91+00
STA 21+00
FLOOD CONTROL AND ALLIED PURPOSES
IAO STREAM
MAUI, HAWAII
ORIGINAL PROJECT AREA, ALTERNATIVE PLAN B
U.S. ARMY ENGINEER DISTRICT, HONOLULU
TO ACCOMPANY DESIGN MEMORANDUM NO. 2

Enclosure 1.


PROPOSED CHANNEL IMPROVEMENT
STATION 21+00 TO 91+00
STA 21+00
STA 91+00
Q_{SPF} = 27,500 CFS
CHANNEL IMPROVEMENT
BERM
LEVEE "A"
LEVEE "B"
LEVEE "C"
LEVEE "D"
LEVEE "E"
LEVEE "F"
LEVEE "G"
STANDARD PROJECT DESIGN FLOOD PLAIN LIMITS
EXISTING STANDARD PROJECT DESIGN FLOOD PLAIN LIMITS
AGRICULTURAL PONDS
STATION LINE
NOTE: PROPOSED CHANNEL IMPROVEMENT WOULD CONTAIN STANDARD PROJECT FLOOD WITHIN THE NEW CHANNEL.
EROSION IS OCCURRING AT:
LEVEE "B"
LEVEE "C"
LEVEE "D"
LEVEE "E"
GRAPHIC SCALE
IAO STREAM FLOOD CONTROL MAUI, HAWAII
SITE MAP
US ARMY ENGINEER DISTRICT HONOLULU

Enclosure 2.


PACIFIC OCEAN
PROJECT LOCATION
LAHAINA
WAILUKU
ISLAND OF MAUI
MAKENA
N
10 0 10 20
MILES
WAIEHU
PACIFIC OCEAN
N
WAIEHU BEACH RD
NEHE PT.
PAUKUKALO
HALEKII
KAHEKILI HWY
PIHANA
IAO STREAM
SUGAR MILL
SCHOOL
MARKET ST
KAAHUMANU AVE
WAILUKU
NORTH TERRACE SYSTEM
(Ma-C9-23)
IAO VALLEY ROAD
WAILUKU HISTORIC DISTRICT
WALLACE SYSTEM
(Ma-C9-22)
HONOAPIILANI HWY
WAIALE DR
2000 1000 0 2000
SCALE IN FEET
IAO STREAM PROPOSED MODIFICATIONS
HISTORIC PROPERTIES
LOCATION MAP

Enclosure 3.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF: HP-JEN

JUN 17 1996

Mr. Ray H. Jyo, Director of Engineering
Planning and Operations Division
Department of the Army
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858-5440

LOG NO: 17189
DOC NO: 9606KD04

Dear Mr. Jyo:

SUBJECT: **National Historic Preservation Act, Section 106 Review of the Iao Stream Flood Control Project Modifications**
Wailuku, Wailuku District, Maui

The Corps of Engineers proposes to make improvements along sections of the existing Iao Stream channel, in an area between Market Street and Waiehu Beach Road in Wailuku. The improvements will be confined to the existing concrete channel area and are within the previously impacted zone of the Iao Flood Control Project.

As indicated in your letter, the proposed improvements will not occur within or near areas of known historic sites. We concur with your determination that the project will have "no effect" on historic sites.

Please contact Ms. Theresa K. Donham at 243-5169 if you have any questions.

Aloha,

Gilbert S. Coloma-Agaran
for MICHAEL D. WILSON,
State Historic Preservation Officer

KD:jen

OFFICE	ACTION	INFO
Dir of Engrg	Tech Svcs	JN
Deputy		
Cost		
Constr		
Env		
Svcs		
Tech		

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

29 July, 2005

REPLY TO
ATTENTION OF
Environmental Technical Branch
Engineering and Construction Division

Mr. Clyde Namuo, Administrator
Office of Hawaiian Affairs
711 Kapiolani Blvd, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Namuo:

The U.S. Army Engineer District, Honolulu (POH) is proposing to undertake a flood control project on the lower (makai) segments of Iao Stream (multiple TMK) in Wailuku, Maui Island (Figure 1). Five (5) alternatives are being considered as flood control measures and, for the most part, these measures are confined to the stream channel proper and certain areas of the northern banks of the stream in the upper (mauka) section of the project area. No modification is being envisioned along the banks of the stream in the lower portion (makai) of the project area, across from the area encompassing Halekii Heiau.

Typical cross-sections of the flood control measures are illustrated in Figures 2, 3, and 4. Alternative 1 will result in a trapezoidal concrete-lined channel. Alternative 2 will consist of a rectangular concrete-lined channel plus approximately 50-feet wide modification on the left (north) bank floodplain. Alternative 3 will have the channel concrete lined with boulder inverts and modifications to the left bank flood plain, again about 50 feet wide. Alternative 4 will consist of levee construction with toe repairs. The fifth alternative would leave the channel in its natural state with the removal of all existing flood control features.

Archaeologist from my Environmental Technical Branch visited the project area with the State Historic Preservation Office Maui Island staff archaeologist, Dr. Melissa Kirkendall. During the site visit, it was determined that potential significant subsurface cultural resources may be present in the floodplain banks along the upper sections of the project area. Proposed modification of the floodplain banks in these upper areas may potentially impact these buried significant cultural resources. It was determined that a program of archaeological monitoring during construction should ensure that these resources will not be adversely impacted by the flood control construction activities.

A cultural impact study (CIS) was also undertaken for this project. The CIS included personal interviews of a number of native Hawaiian cultural experts knowledgeable in the folklore of the project area and its surroundings. The study identified no areas of traditional importance within the project area; however, this conclusion is still in draft format and a copy of this report will be submitted to your office for review and comments. A copy of the final report will then be furnished to your office.

Based on the above information, POH has made the determination that the proposed Iao Stream Flood Control Project will have "no adverse effect on historic properties", provided a program of archaeological monitoring accompanies construction activities at the upper portion of the project area. Furthermore, an archaeological monitoring plan will need to be compiled for review and acceptance by your office prior to the start of any construction activities. Furthermore, the archaeological monitoring will be undertaken by a reputable archaeological firm with prolonged experience in Hawaiian archaeology. In compliance with the National Historic Preservation Act of 1966, pursuant to implementing regulations 36 CFR Part 800 (NHPA), your concurrence to this determination is being requested. POH is also requesting concurrence from the Hawaii State Historic Preservation Officer and the Central Maui Hawaiian Civic Club, in accordance with the NHPA.

Should you require any additional information, please contact Kanalei Shun at 438-7000.

Sincerely,

James L. Bersson
Chief, Engineering and
Construction Division

Enclosures (4)

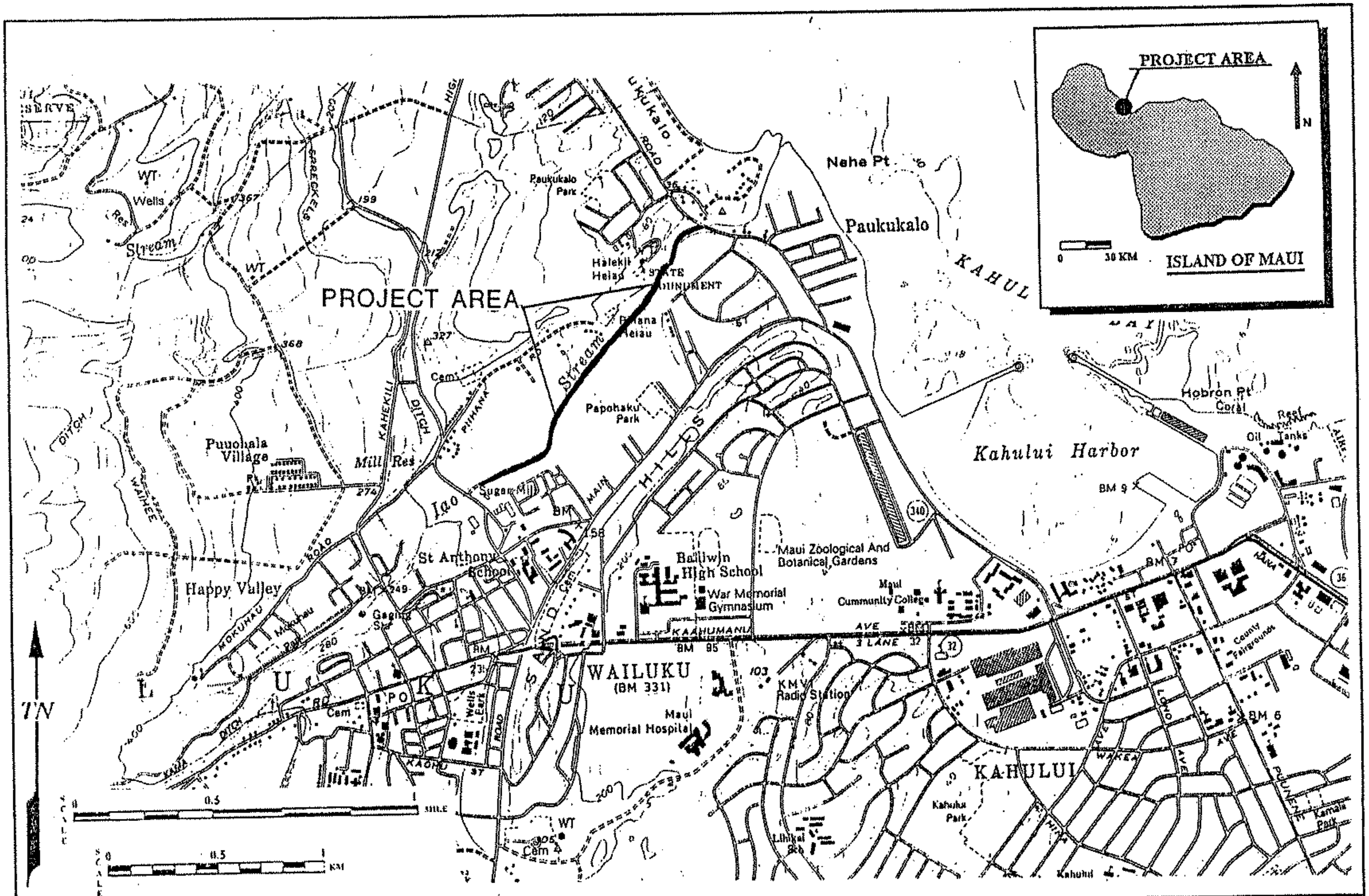


Figure 1: USGS Wailuku Quadrangle Showing Project Area.

FIG. 2

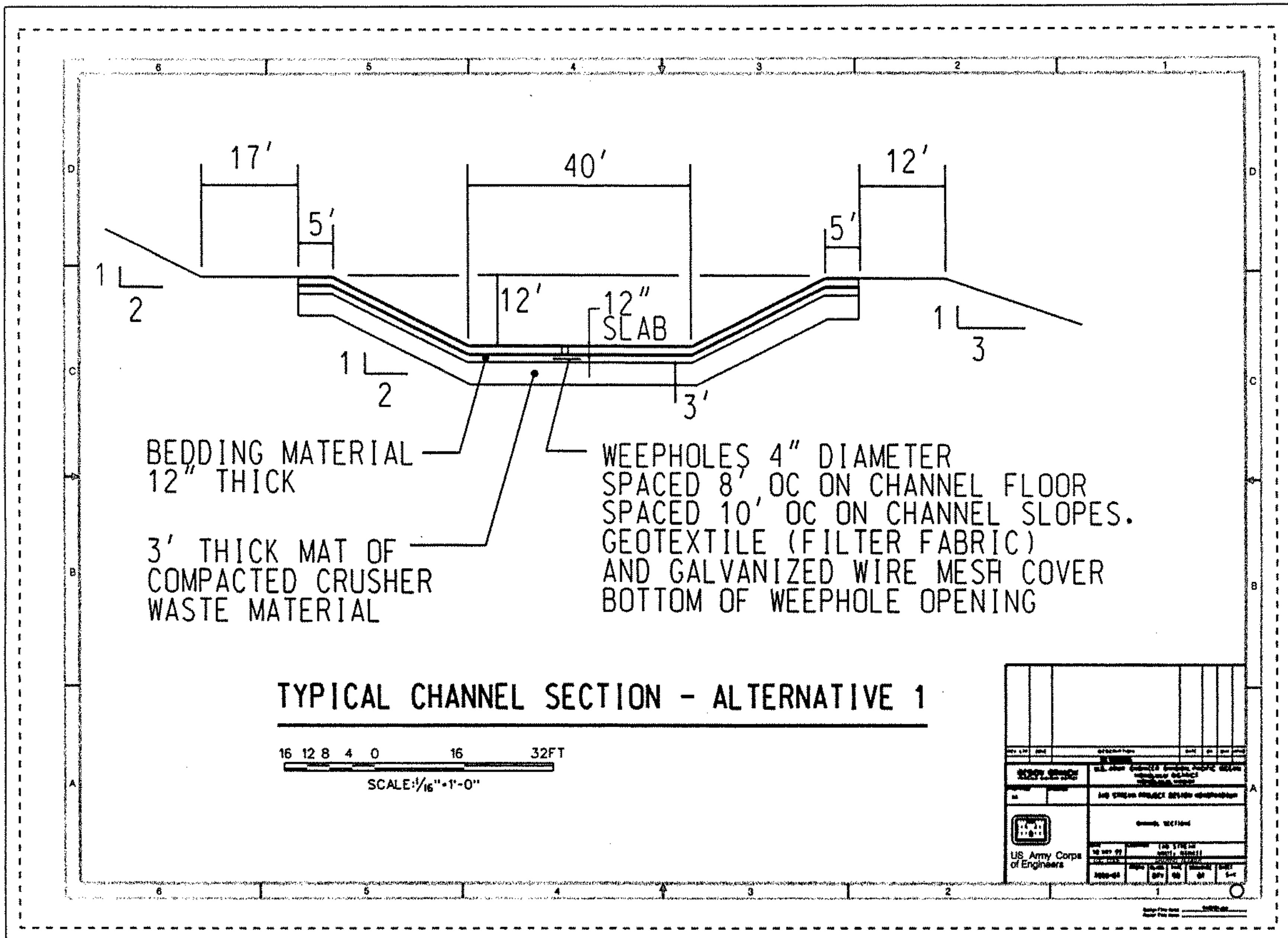


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FIG. 3

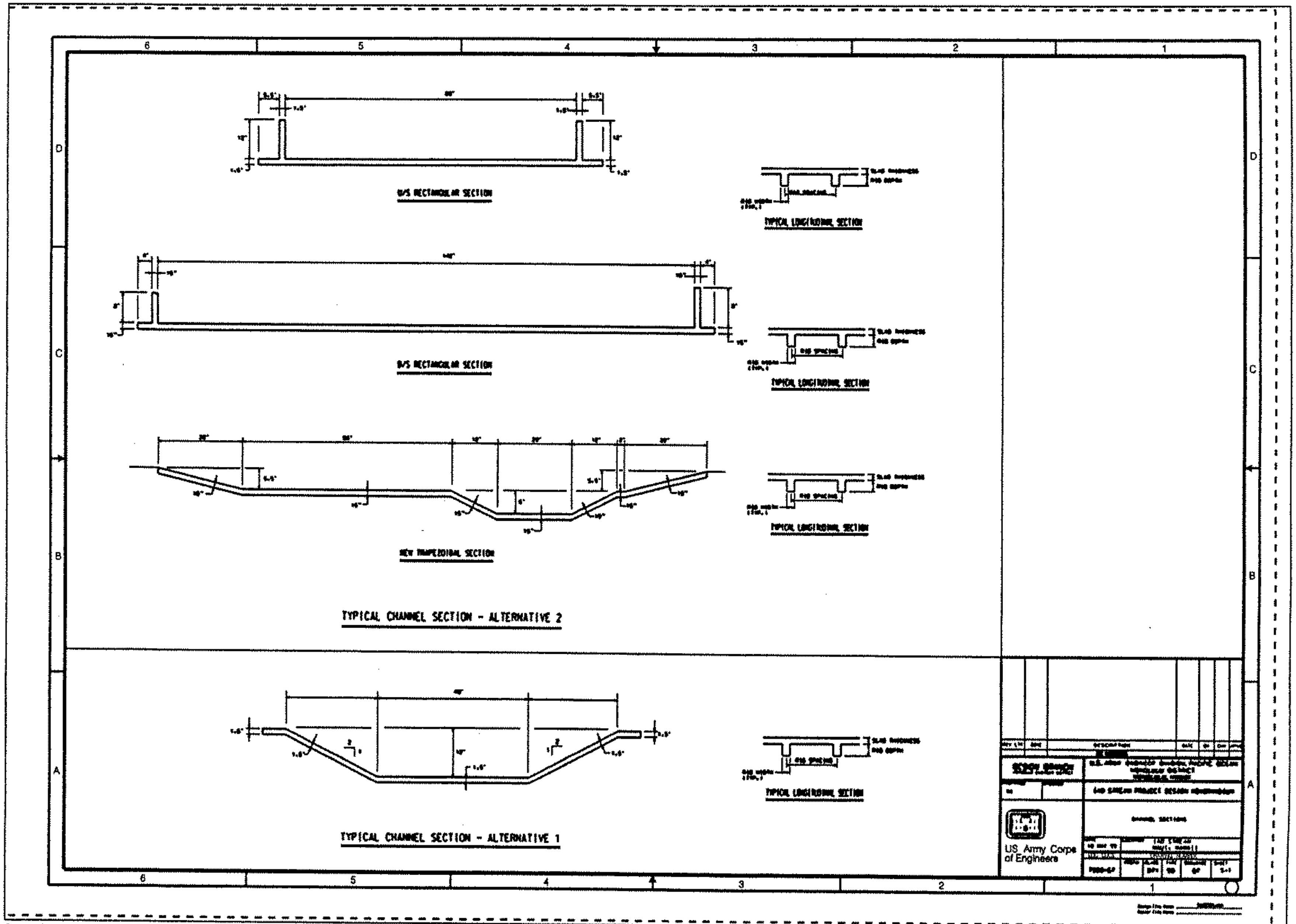

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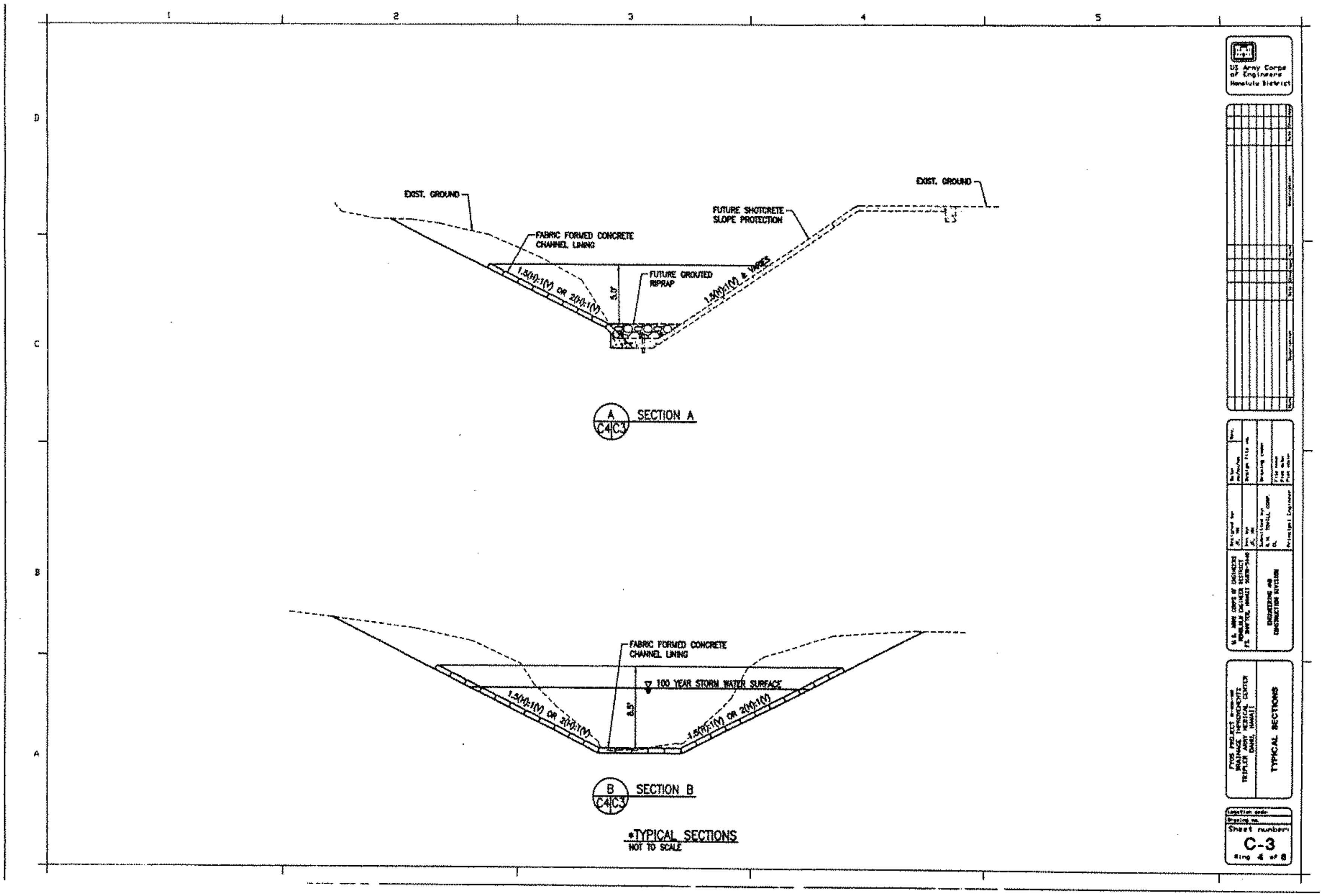
FIG. 4


EXIST. GROUND
FABRIC FORMED CONCRETE CHANNEL LINING
1.5(H):1(V) OR 2(H):1(V)
5.0'
FUTURE GROUTED RIPRAP
1.5(H):1(V) & VARIES
FUTURE SHOTCRETE SLOPE PROTECTION
EXIST. GROUND
A C4 C3
SECTION A
FABRIC FORMED CONCRETE CHANNEL LINING
100 YEAR STORM WATER SURFACE
8.5'
1.5(H):1(V) OR 2(H):1(V)
1.5(H):1(V) OR 2(H):1(V)
B C4 C3
SECTION B
*TYPICAL SECTIONS
NOT TO SCALE
US Army Corps of Engineers Honolulu District
ENGINEERING AND CONSTRUCTION DIVISION
TYPICAL SECTIONS
Sheet number:
C-3

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

September 10, 2007

REPLY TO

Engineering and Construction Division

Mr. Clyde W. Namu'o
Administrator
Office of Hawaiian Affairs
711 Kapiolani Blvd, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Namu'o:

The U.S. Army Engineer District, Honolulu (POH) is proposing to undertake a flood control project on the lower segments of Iao Stream (multiple TMK) in Wailuku, Maui Island (Figures 1, 2a, 2b, and 2c). The project area begins on the makai (east) end of Waiehu Beach Road The project was designed for Standard Project Flood (SPF) protection with a peak design discharge of 27,500 cubic feet/second (cfs) downstream at Station 22+00 and 26,000 cfs upstream at Station 92+02 (Figures 3-6). Five (5) alternatives are being considered for the flood control measures, and Alternative III has been proposed as the most viable based on engineering and cost benefits. A summary of the work under Alternative III is attached herein as Enclosure 1. Work proposed under Alternative III is an undertaking requiring consultation in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, pursuant to implementing regulations 36 CFR Part 800. The purpose of this letter is to initiate the Section 106 consultation process.

The area of potential effect (APE) of most of the work proposed under Alternative III is confined to the already highly disturbed stream channel. This work, listed under items 3-5, 7, and 9 in Enclosure 1, consists of modification to the existing channel. Such work should not affect any significant cultural resources as none is anticipated to be present within the stream channel itself.

The remaining work, listed under items 1, 2, 6, and 8, will entail new construction and/or construction excavations. A diversion levee in the form of a trapezoidal-shaped structure, 500 feet long, 65 feet wide, and 9 feet high, and a new ground water recharge basin are being proposed for construction at the upper end of the project area (see Figures 7a and 7b). Stream re-alignment and widening, anticipated to be no more than 30 feet wide, is being proposed between Stations 76+00 and 85+30 where the left (north) bank of the stream (see Figure 6) will be widen to reduce water surface profile to accommodate the County's proposed Imi Kala Bridge expansion construction. The areas of potential effect for this work is within the Iao Stream flood plain, and in the immediate vicinity of the channel. Based on previous archaeological investigations and historical accounts, prehistoric remains, except for *auwai* to feed taro loi, would not be anticipated to be present this type of terrain. Visual inspection of the stream channel's north embankment in the Imi Kala bridge location found no evidence to indicate potential presence of an *auwai* system. Thus, a determination can be made that this new construction work will not affect potentially surface or subsurface historic sites. However, to ensure that such will remain the case, POH is recommending that a professional archaeological monitor be present during construction excavation activities associated with any work in this area. Lastly, the raising of the right bank levee in the area between stations 45+37 to 48+85 and 25+62 to 26+46 are add-ons to existing levee and should not impact any cultural resources.

Thus, POH has made the determination that the proposed modification actions to the floodplain banks and immediate adjacent areas of the existing Iao Stream channel will have no affect to historic sites. To ensure no adverse impact will result to potentially significant subsurface cultural resources from construction activities to the north embankment in the Imi Kala bridge area, a program of archaeological monitoring during construction is being proposed. An archaeological monitoring plan will be compiled for review and acceptance by your office prior to the start of any construction; the archaeological monitoring will be undertaken by a reputable archaeological firm with prolonged experience in Hawaiian archaeology. The proposed archaeological monitoring program should ensure that the Alternative III will result in a "no effect to historic properties" determination. In compliance with the National Historic Preservation Act of 1966, pursuant to implementing regulations 36 CFR Part 800 (NHPA), your concurrence to this determination is being requested. POH is also requesting concurrence from the Hawaii State Historic Preservation Office, the Maui County Cultural Resources Commission, and the Central Maui Hawaiian Civic Club, in accordance with the NHPA.

We are also forwarding a copy of this letter to Mr. Stanley Solamilo, Maui County Cultural Resources Commission Minute, Maui County Planning Department, 250 S. High Street, Wailuku, Hawaii 96793. If you require any additional information, please contact Mr. Kanalei Shun at 438-7000.

Sincerely,

Todd C. Barnes, P.E.
Chief, Engineering and
Construction Division

Enclosures

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

October 5, 2007

REPLY TO
ATTENTION OF:

Engineering and Construction Division

Ms. Laura H. Thielen
Interim Chairman and State Historic Preservation Officer
Department of Land and Natural Resources
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

Dear Ms. Thielen:

Enclosed for your review and comment is a copy of the Cultural Impact Assessment (CIA) report that was compiled as part of the U.S. Army Engineer District, Honolulu (POH) Iao Stream Flood Control Project. The study was conducted by our Small Business contractor, Social Research Pacific, Inc., for the Environmental Assessment (EA) being prepared by POH for the project in compliance with the National Environmental Policy Act (NEPA). The CIA study was performed in accordance with Chapter 343 of the Hawaii Revised Statute and with the "Guidelines for Assessing Cultural Impacts" adopted in 1977 by the Environmental Council of the State of Hawaii.

In our 5 September 2007 letter to your office, POH initiated consultation for the project with your office in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, pursuant to implementing regulations 36 CFR Part 800. We await your response to our letter.

A copy of this report is also being forwarded to the Office of Hawaiian Affairs, the Maui County Cultural Resources Commission, the Central Maui Hawaiian Civic Club, and the President of the Association of Hawaiian Civic Clubs for review and comment. If you require any additional information, please contact Mr. Kanalei Shun at 438-7000.

Sincerely,

Curtis I. Yokoyama, S.E., P.E.
Chief, Engineering and
Construction Division

Enclosure

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

HRD07/3219B

October 30, 2007

Curtis Yokoyama, Chief
Department of the Army
U.S. Army Engineer District
Fort Shafter, Hawai'i 96858-5440

RE: Cultural Impact Assesment for 'Iao Stream Flood Control Project, Maui, Hawai'i.

Dear Mr. Yokoyama,

The Office of Hawaiian Affairs (OHA) is in receipt of your request for written comments regarding the Cultural Impact Statement (CIS) for the 'Iao Stream flood control project on Maui. We have the following comments:

OHA requests that the TMK number for this project be given so that we can determine whether this project will impact any of our ceded lands.

This CIS was sent to us separate from the environmental assessment (EA) for which it is to be incorporated into. OHA recognizes that this was done in order to begin the consultation process; however, it is not particularly useful to do so. It is difficult to review a CIS out of context form its associated project. Further, OHA understands that the EA for this CIS will be released soon and we will review it at that time. That being said, OHA wishes to make clear that we are always pleased to see an applicant working on a CIS and as such are happy to assist with its preparation. However, the review of the CIS as a stand-alone document is not the intent of the environmental review process and, as said, a bit difficult.

OHA also notes that the invitation to comment mentions that a Section 106 consultation was initiated by the U.S. Army Engineer District on September 5, 2007. However, our agency has no record of receiving this document and as such, does not recognize the initiation of the 106 process as of now.

In terms of the CIS, OHA appreciates that a number of sources were consulted in preparation of this document including archival searches, field studies, oral histories from kūpuna in the area, public scoping meetings and surveys. However, there are numerous lo'i, heiau, and other culturally significant sites in the area as well as constitutionally protected Native Hawaiian rights being practiced in the area. As such, OHA both compliments the research done for the CIS, while reserving the right to further comment for the EA.

Thank you for the opportunity to comment. If you have any further questions or concerns please contact Grant Arnold at (808) 594-0239 or granta@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

C: Thelma Shimaoka, Community Resource Coordinator
Office of Hawaiian Affairs, Maui Office
140 Ho'ohana St., Ste. 206
Kahului, Hawai'i 96732

From:	Shun, Kanalei POH
To:	Morgan.E.Davis@hawaii.gov; Jenny Pickett ARCHAEOLOGY
Cc:	Shimabuku, Lorayne P POH; Miya Akiba; Dennis Gosser
Subject:	Alt. F Iao Stream Flood Control Project - EOF report for AIS (UNCLASSIFIED)
Attachments:	image001.png image002.png image003.png image004.png Final EOF Report 13June2014.pdf

Classification: UNCLASSIFIED
Caveats: NONE

Aloha Morgan and Jenny:

Attached, for you information, is the end-of-field report for an AIS, performed by the archaeological firm, Pacific Consulting Services, Inc. (PCSI). AIS was done for Alternative F of the Iao Stream Flood Control Project. WE did a site visit of the project area with Hinano early this year. Tell Hinano sour sup tree went, not sure where and how.

Anyway, no subsurface cultural deposits were identified in any of PCSI excavated trenches (10 in all). Based on PCSI's background research, we did not think there would be any remnants of loi terraces in that area as it was too susceptible to big time flooding. Currently, I am leaning toward a no effect to historic properties determination, unless we come across some other evidence showing otherwise. I would recommend to ensure no impact to significant cultural resources, a program of archaeological monitoring during construction.

If either of you think of other avenues we should pursue for evidence of other subsistence or land use pattern, let me know.

I will wait for the final report to make the final determination of effect.

Thank you and take care.

Kanalei

Classification: UNCLASSIFIED
Caveats: NONE

GSI PACIFIC

MINUTES OF MEETING

Project: ‘Īao Stream Flood Control Project
Date: September 17, 2014
Time: 13:00 – 14:30
Location: United States Fish and Wildlife Service (USFWS) Pacific Islands Office-Main Conference Room 3-127
Attendees: **United States Army Corps of Engineers (USACE) -** Nani Shimabuku, Athline Clark, Jessica Wiggs, Lynn Schneider, Michael Wong
USFWS - Dan Polhemus, Tony Montgomery
United States Environmental Protection Agency (EPA) - Wendy Wiltse
National Oceanic and Atmospheric Administration (NOAA) National-Marine Fisheries Service (NMFS) - Danielle Jayewardene
State of Hawai‘i Department of Land and Natural Resources (DLNR)-Division of Aquatic Resources (DAR) - Skippy Hau
County of Maui (COM) - Kristi Hirata (via teleconference)
GSI Pacific Inc (GSI) - Sonia Shjegstad, Miya Akiba

DISCUSSION:
A meeting was held between the USACE, USFWS, EPA, NOAA-NMFS, DLNR-DAR, COM, and GSI to discuss the current status of the ‘Īao Stream Flood Control Project. The main focus of the meeting was to provide a technical overview of the preferred alternative (Alternative F) and to provide an opportunity for the group to raise any questions or concerns on the selected alternative. A brief summary of the major discussion elements are as follows:

1. USACE thanked the parties for attending the meeting and the opportunity for USACE to discuss the project with them. All parties briefly introduced themselves to the group.

2. USACE went over the current status of the project. The USACE is currently preparing the Engineering Documentation Report (EDR) that evaluates the new preferred alternative (Alternative F). The Environmental Assessment, which is included as an appendix to the EDR, evaluates the potential environmental impacts of Alternative F. During the course of developing Alternative F, USACE has met with this group of resource agencies to provide updates and has received comments that have been taken into consideration during the preparation of the draft EA. The EDR/EA is currently being reviewed internally within the Honolulu District. Following internal review, the documents will undergo Agency Technical Review (ATR), which is scheduled to take place next month. The draft EA is currently scheduled to be published for public review

early next year. The EA will be finalized following public review by Summer 2015. Designof the project will initiate shortly thereafter, pending receipt of funding.

3. EPA inquired whether an Environmental Impacts Statement (EIS) would be prepared for the project. USACE stated that while an EIS was initiated following the 2009 Draft EA, since Alternative F is much smaller in scope compared to the other alternatives evaluated in the past, and because the area of impact is relatively small, it was more appropriate to rescope the project from an EIS to an EA.

4. DLNR-DAR stated that stream waters will be restored based on the recent settlement of the Na Wai Eha case which will mandate an Interim Instream Flow Standard (IIFS) of 10 million gallons per day (mgd) below the first diversion, above Hawaii Nature Center (near Kepaniwai Park), and an IIFS of 5 mgd at or near the stream mouth. The team discussed what the conversion from mgd to cubic feet per second (CFS) would be to determine how much water would flow through the location of the proposed diversion weir (DLNR-DAR later confirmed that 10 mgd equates to 15.4722 cfs and 5 mgd equates to 7.736 cfs). DLNR-DAR stated that surveys for mapping the stream will be conducted in October. DLNR-DAR recommended that USACE check with the DLNR Commission on Water Resource Management on the exact date of the IIFS to be implemented.

5. USACE stated that restoration of stream waters has always been taken into consideration during project designs and that Alternative F takes into account that there will be continuous flow in the stream.

6. USACE gave an overview of the existing flood control features in the stream and presented the design features of the flood control structures that would be constructed under Alternative F. USACE explained that Alternative F is designed to reconnect the main channel with the existing floodplain on the left bank. Alternative F would reduce flood flows within the main channel; thereby reduce further erosion of the existing levees on the right bank reduce risks to properties on the right bank from flooding during large storm events. USACE stated that the main channel will be constricted by constructing a concrete diversion wall, approximately 18 feet (ft) high with a 15-ft wide opening to allow for fish passage and some flow to remain in the stream.

7. EPA inquired whether there is anything being done to lower the left bank to reconnect the main channel with the floodplain. USACE stated that an approximate length of 417 ft along the left bank would be lowered to allow for stream waters greater than a 10-year frequency event to enter the floodplain. USACE stated that materials that have been pushed against the left bank by illegal squatters that used to reside in the area in the past will be partially removed to accommodate this. USACE stated that excavated soil to lower the left bank at the diversion wall would be reused downstream to construct a raised berm intended to keep the diverted water within the floodplain.

8. USACE went over the detailed design features of the diversion weir to be constructed within the stream, including the dimensions and materials to be used. USACE stated that

water would flow through the opening during regular flow and would flow over the existing boulder stream bed upstream and downstream of the diversion wall.

9. USACE went over the different types of revetment to be used for features proposed under Alternative F. Fully grouted riprap would be used at the overflow channel section to accommodate high stream velocities and increased levels of turbulence as a result of changes in flow direction; partially grouted riprap would be used at the outflow section. Shotcrete would be used upstream of Imi Kala Bridge for bank protection. USACE added that the raised berm has been placed away from the main channel to avoid streambed lining at this section of the stream. USFWS noted their overall appreciation of the heterogeneity of the proposed stream bed modification in the area of the channel restriction and the fact that it would pose no impediments to fish passage.

10. EPA inquired whether any other alternatives have been considered for the project. USACE briefly went over the alternatives that were considered and explained why they were not carried forward for consideration. USACE explained that since no significant amount of channel hardening is involved with Alternative F, it was considered the most appropriate alternative in accomplishing the project objectives and recommended for implementation.

11. The project team discussed the current land uses of the floodplain. The USACE stated that the floodplain is currently classified as either designated floodplain or diversified agricultural land.

12. NOAA-NMFS inquired whether diversion of stream waters would result in any excess sediment/pollutants being carried into the stream from the floodplain. USACE stated that sediment/pollutants would settle out before the diverted water returns to the main channel and would not adversely affect the water quality of the stream.

13. EPA inquired whether there are any regulations within the floodplain to restrict the lessees from raising the land elevation or any regulations on storage of hazardous chemicals within the floodplain. EPA expressed their concerns about hazardous chemicals from machinery, fuel, or vehicles within the floodplain potentially being washed into the stream during large storm events. USACE stated that COM would be responsible for regulating land use practices and storage of hazardous chemicals/materials within the floodplain as part of the project cost-share agreement.

14. EPA inquired whether there would be any opportunities to include designs to place low-flow channels within the modified stretch of the stream bed (i.e., in the approximately 65 linear feet area of the proposed channel restriction) or to tilt the bottom of the stream to allow continuous flow during low-flow conditions. USACE stated that it would be possible to construct a low-flow channel within this stretch but it may become filled with sediment and lose its original intention over time. USACE asked if this low-flow channel would still be desired if there were a sufficient height of water flowing through the restriction. EPA stated that it would not be necessary if sufficient height of water is anticipated to flow through the channel restriction.

15. The team discussed the anticipated height of water that would flow through the opening of the diversion weir during regular flow following implementation of the new IIFS (5 mgd at the diversion weir location). USFWS and DLNR confirmed that they would like 4 inches at a minimum, or 6 inches preferably. USACE stated that the water flowing through the opening under base flow (5 mgd) should be at least 6 inches deep but stated that they will confirm the number.

    USACE later confirmed that although it is very difficult to confirm the water depth at such low flows, the calculated water depth is approximately 2 to 3 inches at 5mgd. Using a very simple HEC-RAS model, with 7.7 cfs (5 mgd) flow, the velocities near the diversion weir structure are approximately 2.2 to 2.8 ft/s. This would of course be affected by changes in the upstream and downstream natural channels, which would likely increase the channel roughness (with increased rocks and gravel) and slow the velocity (increasing water depth). Approximately 9 to 10 mgd would be needed for 4 to 6 inches of water at this location.

16. USFWS provided a brief update on the state of the offshore marine environment, as observed during their most recent field surveys. USFWS noted that despite a large amount of suspended sediment in the water, there was a tremendous amount of coral in the offshore area. USFWS and USACE noted that with implementation of Alternative F, there should be a net decrease in the amount of sedimentation coming from the stream and into the marine environment, which would be a benefit to the offshore coral reef ecosystem.

17. USFWS noted that they have previously submitted comments to USACE outlining some of their other concerns with the 1981 project, and that they still would like to see a path forward by the USACE on addressing those comments. The team discussed some of the measures proposed by USFWS to help restore the biological function of the overall stream, including areas outside of the project area of Alternative F. USACE stated that the Office of Hawaiian Affairs (OHA) has shown interest in stream ecosystem restoration and that they have consulted with the mayor regarding potential opportunities to implement any restoration projects.

18. USACE stated that funding may be available through their Continuing Authorities Program (CAP) program, particularly if matching funds were made available from another Federal partner such as fish restoration funding from USFWS. USACE stated that the local sponsor may partner with USACE for funding; however, that USACE currently does not have funding under Civil Works to correct design deficiencies from the past. CAP Section 1135 allows for environmental restoration of an existing Corps project. USFWS stated that they would like to keep the conversation open with the USACE so that efforts to correct previous design deficiencies and restore the biological function of the stream could be considered/incorporated into future projects.

19. NOAA-NMFS and USFWS agreed that Alternative F is a much preferred alternative compared to the other alternatives considered in the past.

Action Items

USACE will:

- Review these meeting minutes for accuracy and provide comments if needed.
- Continue to work with USFWS in completing the Section 7 consultation under the Endangered Species Act.

USFWS, EPA, NOAA-NMFS, DLNR-DAR, and COM will:

- Review these meeting minutes for accuracy and provide comments if needed.

GSI will:

- Draft minutes of the meeting and circulate for review.

This Minutes of Meeting memorandum is GSI's understanding of the items discussed during this meeting for the ʻĪao Stream Flood Control project. It is requested that all who were in attendance review this Minutes of Meeting for its content and accuracy. If there are no responses and/or comments to this Minutes of Meeting memorandum within ten (10) calendar days, GSI will assume that all information stated herein is correct and agreed upon by all who were in attendance.

Recorded by: Miya Akiba, GSI

cc:
USACE: Nani Shimabuku, Athline Clark, Jessica Wiggs, Lynn Schneider, Michael Wong
USFWS: Dan Polhemus, Tony Montgomery
EPA: Wendy Wiltse
NOAA-NMFS: Danielle Jayewardene
DLNR-DAR: Skippy Hau
COM: Kristi Hirata
GSI: Sonia Shjegstad

Appendix F:

Water Quality and Biological Survey

Water quality and biological surveys for the ʻĪao Stream Flood Control Project Wailuku, Maui

June 18, 2012 | ***DRAFT*** | *AECOS* No. 1232

Susan Burr and Eric B. Guinther
AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
Kāneʻohe, Hawaiʻi 96744
Phone: (808) 234-7770 Fax: (808) 234-7775 Email: aecos@aecos.com

Introduction

The ʻĪao Stream Flood Control Project ("Project") on the central isthmus of Maui (Fig. 1) proposes to correct deficiencies in the existing flood control channel, which was constructed in between 1968 and 1981. High stream flows have eroded segments of the flood control channel where the streambed is unmodified and also a portion of the base of the east bank levee. Several residential, commercial, and historical structures are threatened by continued stream bank erosion. Eroded segments caused by high flow events have been partially repaired with concrete rubble masonry (CRM); however these repairs have also started to fail.

AECOS, Inc. has been contracted by Environet, Inc.[1] to ascertain biological resources and assess water quality of ʻĪao Stream to provide data for a description of the environmental and data analysis in the Draft Environmental Impact Statement (DEIS) that they are preparing for the US Army Corps of Engineers (USACE). For these purposes, a field survey was undertaken by *AECOS* biologists on April 4, 2012. The survey included a portion of the lower, middle, and upper reaches of ʻĪao Stream, from ʻĪao Valley State Monument to the stream mouth.

[1] Report prepared for Environet, Inc. for environmental entitlements. This report is expected to become part of the administrative and/or public record for the project.

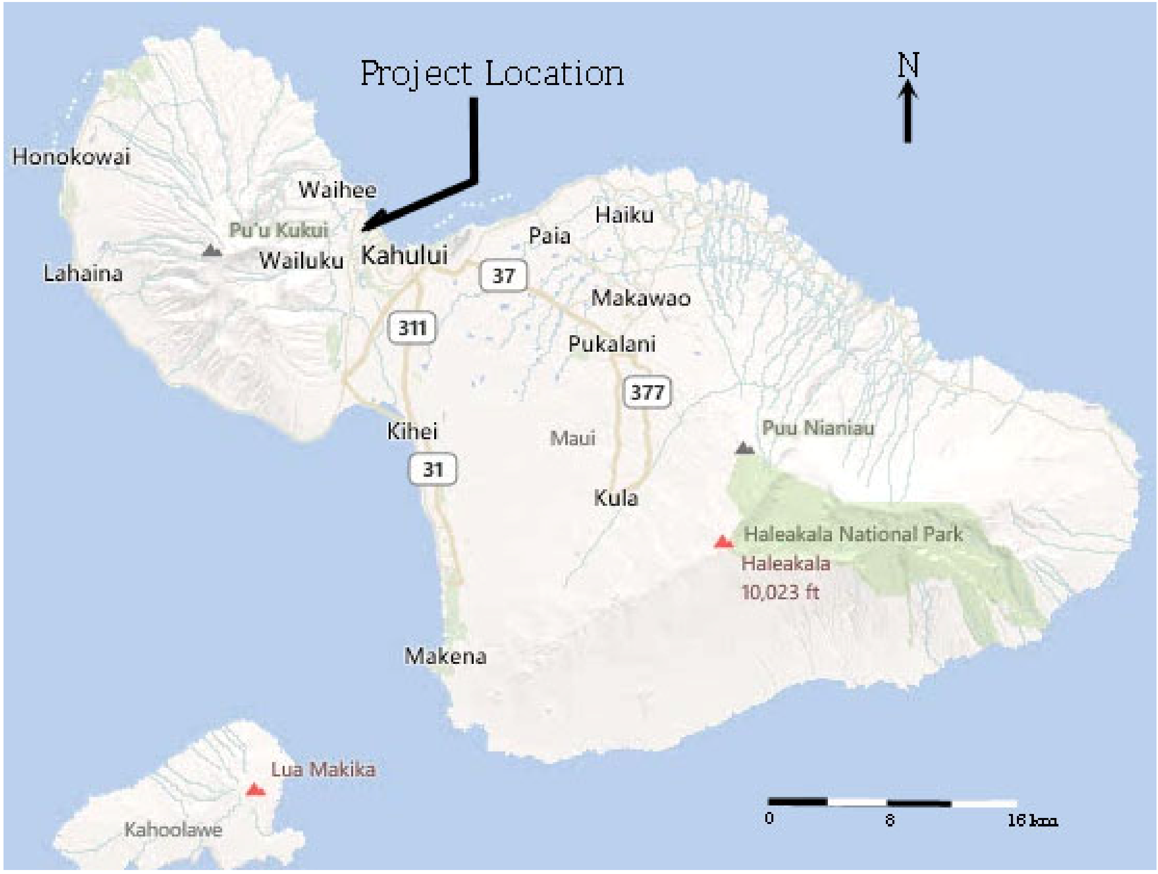


Figure 1. Map of Maui showing Project location on ʻĪao Stream.

Project Description

Modifications to the existing flood control channel are needed to prevent further property damage resulting from undermining of the stream bank and levees, and to protect Wailuku town from flood damage. In addition, levee certification that the completed project can withstand a 100-year frequency flood is required by the Federal Emergency Management Agency (FEMA); in their present condition, the levees will not be certified. Therefore, USACE has analyzed four alternatives and a no action alternative to modify the existing flood control channel to prevent further streambed erosion, and potential loss of life and property during stream freshets (USACE and Maui DPW, 2009).

Frequent repairs to the existing flood control channel have proved to be costly, both financially and environmentally, and do not adequately address problems of erosion, sedimentation, and degradation of native aquatic species populations. The Project includes measures to preserve natural ecosystems within the ʻĪao watershed. Engineering features have been planned that would allow native aquatic species return to the stream, and would work towards restoring the stream and the surrounding floodplain to a more natural state.

The five alternatives considered for the Project are: A) No Action Alternative, B) Removal of Flood Control Improvements, C) Roller Compacted Concrete (RCC) and Grouted Boulder Invert Channel Following Existing Alignment, D) Grade Control Structures in Conjunction with Stilling Basins, Channel Realignment and Erosion Protection (Wider Channel), and E) Grade Control Structures in Conjunction with Stilling Basins (Narrower Channel). These alternatives are described below:

Alternative A No Action - Alternative A is not to perform modifications to the existing flood control channel. Continuing severe erosion may be a result of the no action alternative, contributing to levee failure in multiple locations, which would eventually lead to flooding of parts of the ʻĪao Stream drainage basin. A project failure could cause loss of life and extensive property damage.

Alternative B Removal of Flood Control Improvements – This alternative would include removal of all existing man-made improvements to the existing channel and returning the stream to its original, natural state. The community of Wailuku would be placed back into the flood plain, with no flood protection levees. A state-of-the-art flooding warning system would replace man-made flood control devices.

Alternative C Roller Compacted Concrete (RCC) and Boulder Invert Channel – This alternative was designed for standard project flood (SPF) protection with a peak design discharge of 27,500 cubic feet per secton (cfs) downstream of Station 84+42 (0.5 miles upstream from the stream mouth) and 26,000 cfs downstream of Station 92+02. Typical stream stabilization improvements would consist of boulders in the main channel low flow section with RCC stream bank protection, in order to replicate a more natural stream invert. Design elements would be included into existing and planned channel segments to facilitate the movement of native fish and other aquatic organisms. Total project length extends from Station 22+00 to the debris basin (2.5 miles upstream from the shore). Modifications are described in more detail below:

- Create a new ground water recharge basin and diversion levee by partially blocking the low flow outlets at the existing debris basin located approximately 335 m (1,100 ft) upstream of Market Street and add a levee on the left bank upstream of the existing debris basin.

- Modify the drop structure between Stations 96+74.21 and 97+23.21. A new stepped drop structure would eliminate the dangerous 7-m (22-ft) vertical drop and improve passage of in-stream fish (ʻ*o*ʻ*opu*) and other aquatic organisms.
- Modify existing low flow concrete channels with small blocks to break up high velocity flows and facilitate fish passage.
- Add hydraulic improvements to the concrete channel between Stations 92+02 and 95+41. These improvements include baffle blocks and a weir within the existing concrete channel to more evenly distribute flow.
- Incorporate RCC side slopes and an approximately 5-m wide and 50-cm deep (15-ft wide and 20-in deep) grouted boulder invert channel that would mainly follow the alignment of the existing stream between Stations 22+00 and 92+02 (approximately 2195 m or 7,200 ft long). The median base width range would vary between 12 m and 18 m (40 and 60 ft).
- Realign and widen the stream between Stations 76+02 and 85+30. The channel would be realigned to the north on the left bank to avoid existing structures to the right bank and be widened to reduce water surface profile at the ʻImi Kālā Street Bridge. As a result of the channel widening, the 10-year flood (i.e., the low flow condition of 7,200 cfs) will be contained within the channel but floods greater than 7,200 cfs and up to the SPF of 27,500 cfs will spread out on the existing left bank flood plain area.
- Construct a low flow boulder channel within the RCC portion. The approximately 5-m (15-ft) wide low flow channel would use boulders embedded in concrete to replicate a more natural streambed substrate. Retrofit design elements have also been included to facilitate the movement of native organisms through the modified channel area. These elements include a step structure at the 7-m (22-ft) vertical drop (Station 97+23), widening existing low-flow channel areas, installing low-flow channel segments in existing flat-bottomed cement channel segments and in the center of the existing debris basin, blocks along the sloped portions of the existing channel to provide a resting place for climbing organisms, and an alignment along the vegetated portions of the left bank to provide shade and reduce water temperatures.
- The existing right bank levee would be raised at Stations 45+37 to 48+85 by 1.4 m (4.5 ft) using a concrete rubble masonry (CRM) wall on top of the existing earth levee and up to 21 cm (0.7 ft) at Stations 25+62 to 26+46. The 21-cm raise can be accomplished using earth levee fill material. Adjacent land uses that may have an impact to their viewscape by the levee raises include warehouses in the vicinity of the 22-cm levee raise and residential townhomes in the vicinity of the 1.4-m levee raise.

> Channel lining, retaining walls, and raising the levee walls would be necessary due to the excessive flow velocities and higher flood levels.

This alternative would achieve project objectives and is considered to be feasible from both engineering and cost perspectives.

Alternative D Wider Channel – This alternative is to create two large stilling basins designed to dissipate the energy of large floods. The stilling basins also act as debris traps and provide potential habitat and recreational areas. Alternative D also realigns the channel to avoid the bends that cause erosion at the levee toe.

Alternative E Narrower Channel – This alternative is similar to Alternative C, with the addition of small grade control structures that slow stream velocities and provide habitat within the channel. Alternative E also realigns the channel to avoid toe erosion at the bends.

Stream Description

Total area of the ʻĪao watershed (Department of Land and Natural Resources-Division of Aquatic Resources watershed code no. 62009) is estimated at 30.8 km^2 (11.9 mi^2; DLNR-DAR, 2008). ʻĪao Stream, a third order stream, extends approximately 42.1 km (26.2 mi) from near the top of West Maui Mountain down to the Pacific Ocean. The longest tributaries, Poʻonāhoahoa Stream and Nākalaloa Stream, originate at the western extent of ʻĪao Valley at approximately 300 and 600 m (1000 and 2000 ft) above sea level (ASL). Within ʻĪao Valley State Monument, four other tributaries (Ae, Kinihāpai, Puʻulio, and Māniania streams) join the main branch of ʻĪao Stream. The headwaters and upper reaches (segments greater than 200 m above sea level) of ʻĪao Stream, including all six tributaries, account for almost 80% of the length of the stream channel (DLNR-DAR, 2008).

The headwaters (segments greater than 750 m above sea level) and upper reaches (segments between 200 m and 750 m above sea level) of ʻĪao Stream are unmodified, although ʻĪao Tunnel and Maniania Ditch divert some of the stream flow from the upper reach. At Kepaniwai Park, just downstream from ʻĪao Valley State Monument, the floodplain is terraced and several *auwai* divert water through *kalo loʻi* (taro pondfields). Downstream from the park, the stream channel has been straightened, but the stream bed remains natural. A large debris basin and concrete debris fence have been constructed in the stream channel near Mokuhau Park (Fig. 2a). This basin is maintained by dredging on a regular basis. Downstream from Mokuhau Park, for much of the

Figure 2a (top). Debris basin (note biologist in white shirt for scale).
Figure 2b (bottom). Concrete channel of 'Īao Stream showing low flow channel.

remaining stream length, ʻĪao Stream is confined to a large, concrete-lined channel and disconnected from the floodplain by walls and levees (see Fig. 2b). The stream discharges into the Pacific Ocean at Nehe Point just northwest of Kahului Bay.

ʻĪao Stream is included in the Hawaiʻi Stream Assessment (Hawaii Cooperative Park Service Unit, 1990), which purports to list all perennial streams[2]. ʻĪao Stream is perennial in the upper reach, but it is clearly an interrupted stream—flow discontinuous in the middle and lower reaches. Several diversions, including ʻĪao Waikapu Ditch, Waihee Ditch, Kama Ditch and Spreckels Ditch, were constructed in the middle reach (along with ʻĪao Tunnel and Maniania Ditch in the upper reach) to divert water from the stream to irrigate sugar cane fields outside of the watershed. Though the crops are no longer grown, water is still diverted from the stream. Maui County Department of Water Supply (DWS) wells pump about 23 million gallons per day (Mgal/d) from the freshwater lens system of the ʻĪao aquifer (2006 value; Gingerich, 2008).

Figure 3. Fish passage structure at ʻĪao Tunnel intake on ʻĪao Stream.

[2] A perennial stream has year-round, continuous flow in at least part of its bed; flow need not be continuous from upper reaches to the sea.

Various best management practices (BMPs) have been constructed within the ʻĪao Stream Flood Control Project limits and upstream in an attempt to support biological resources in the stream. A simple fish passage has been constructed at the ʻĪao Tunnel and Maniania Ditch diversion, to allow native amphidromous[3] organisms to migrate past the diversion structure (Fig. 3, above). A low flow channel (Fig. 2b, above), which concentrates flow that would otherwise dissipate over the flat concrete bottom of the stream bed, is present for almost the entire length of the hardened channel from Mokuhau Park to Waiehu Beach Road. This low flow channel is concrete-lined, discontinuous (Fig. 4a), and does not always contain flowing water. Some parts of the flood control channel have boulders embedded in the bottom of the concrete channel to add rugosity to the feature and some parts of the channel remain unlined (Fig. 4b), though it appears the bed and banks are regularly maintained (boulders removed from channel and stacked on banks) with heavy equipment. No attempts have been made to improve conditions for riparian vegetation or shading for the stream within the ʻĪao Stream Flood Control Project limits.

Survey Methods

Water Quality Survey

On April 4, 2012, *AECOS* biologists measured selected parameters and collected water samples at three locations on ʻĪao Stream to characterize water quality (Fig. 5). Also shown in Fig. 5 is the general location of three points sampled in 2009 for a project at Waiehu Beach Road (*AECOS*, 2011). Field measurements (temperature, pH, and dissolved oxygen) were made and water samples collected for analyses (conductivity, turbidity, total suspended solids, and nutrients) in the laboratory. Samples were collected from just below the water surface. In the case of Sta. 2, samples were collected from presumed spring flow upwelling from pipe openings in the concrete channel bed. Samples were placed on ice and taken to the *AECOS* Laboratory in Kāneʻohe for analyses (*AECOS* Laboratory Log No. 28124). Table 1 lists the instruments and analytical methods used in the field and to analyze the samples.

Botanical Survey

The botanist covered the survey area on foot and noted plant species within the channel and along the tops of the banks as they were encountered. As the survey progressed, notes were made on the relative abundances of each species

[3] Meaning they move between fresh and salt water during their life cycle.

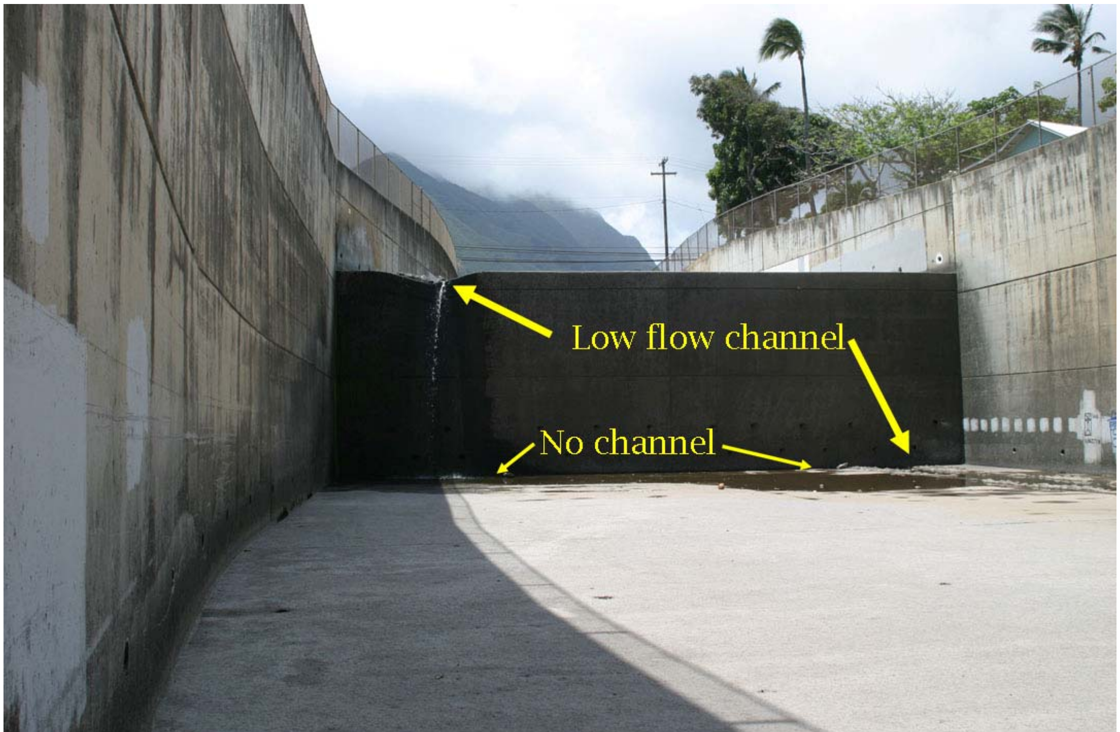


Figure 4a (top). In places, the low-flow channel is not continuous.
Figure 4b (bottom). An unlined stream section in the Project area.

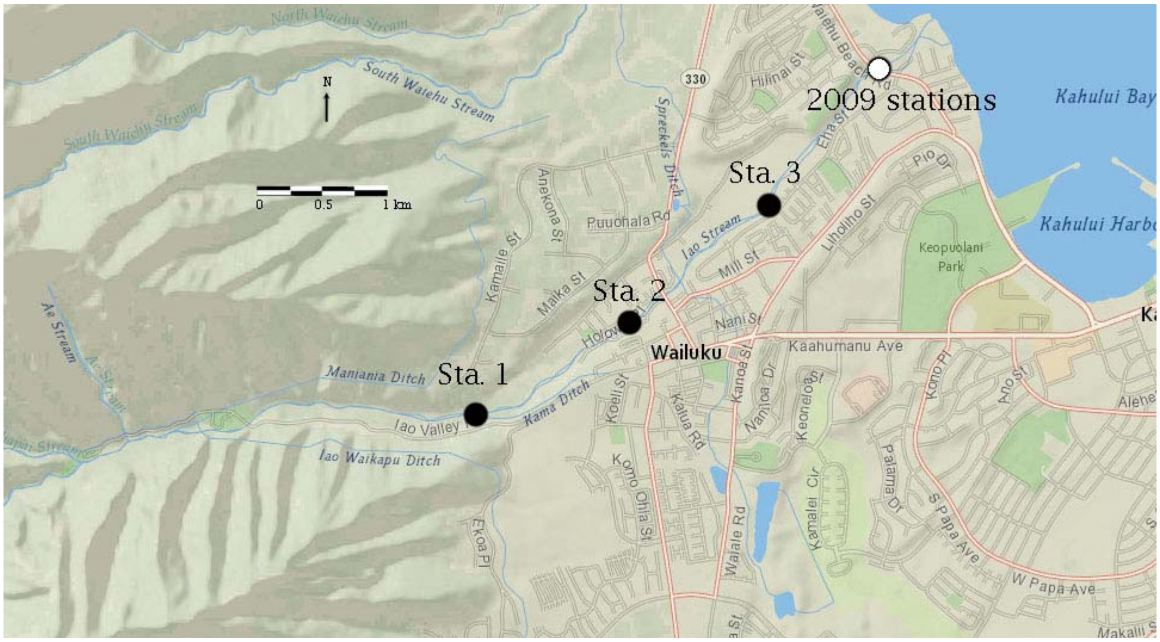


Figure 5. Three water quality stations sampled on April 4, 2012 (Sta. 1, 2, and 3) and general location of three stations sampled on December 4, 2009.

Table 1. Analytical methods used for April 4, 2012 water quality analysis of ʻĪao Stream.

Analysis	Method	Reference
Temperature	thermister calibrated to NBS. Cert. thermometer/ SM 2550 B	SM (1998)
Conductivity	SM 2510-B	SM (1998)
pH	SM 4500 H+	SM (1998)
Dissolved Oxygen	SM 4500-O G	SM (1998)
Turbidity	EPA 180.1 Rev 2.0	USEPA (1993)
Total Suspended Solids	SM 2540 D	SM (1998)
Nitrate + Nitrite	EPA 353.2 Rev 2.0	USEPA (1993)
Total Nitrogen	persulfate digestion/ EPA 353.2	Grasshoff et al. (1986)/ USEPA (1993)
Total Phosphorus	persulfate digestion/ EPA 365.1 Rev 2.0	Grasshoff et al. (1986)/USEPA (1993)

(e.g. rare, common, abundant). Photographs were taken, or specimens collected for closer inspection, of any plants not readily identified in the field. The survey area was limited to the stream channel and banks between the waterfall at Mokuhau Park above the debris basin (upper end), and the end of concrete near the stream mouth (lower end).

Aquatic Biota Survey

The aquatic biologist, accompanied by Hawaiʻi Division of Aquatic Resources (DAR) biologist, Skippy Hau, made observations and used hand nets to collect aquatic organisms for closer inspection from ʻĪao Stream. As the survey progressed, the biologist made notes on the relative abundances of each species (e.g. rare, common, abundant). Algal specimens and mollusks were collected for identification in the laboratory. The potential for migration of native amphidromous animals and the distribution of naturalized organisms throughout the stream was assessed.

Results

Water Quality Survey

Water quality results for the April 4, 2012 sampling event are summarized in Table 2. The mean values from data collected from the three stations near Waiehu Beach Road on December 4, 2009 are also included in Table 2. The 2012 samples were collected on a sunny day without rain. The 2009 samples were collected during a freshet flow event.

Temperature measured at Sta. 1 was typical of a well-shaded, swiftly flowing stream. Temperature at Sta. 2 was essentially the same as at Sta. 1, indicating that the water welling up from weep holes in the concrete here was different from that in the adjacent concrete-bottom channel (possibly spring water). Temperature was higher at Sta. 3 (24.2˚C), a station with minimal flow and no shade. The average temperature of the samples collected in 2009 was 22.9˚C, higher than expected for a freshet flow, but reflective of the heat gained by the water while traversing the long concrete channel.

Conductivities were low at all sampled locations. The slightly higher value at Sta. 2 is possibly indicative of groundwater input. Percent saturation of dissolved oxygen (DO) was normal at all stations. The lowest DO saturation (but

Table 2. Physical and chemical water quality characteristics of ʻĪao Stream from April 4, 2012 and December 4, 2009 (means) sampling events.

Station	Time	Temp. (°C)	Conductivity (μmhos/cm)	pH	DO (mg/l)	DO sat. (%)	Turbidity (ntu)	TSS (mg/l)	NO_3+NO_2 (μg N/l)	Total N (μg N/l)	Total P (μg P/l)
Sta. 1	1455	21.3	112	8.02	9.46	95	0.46	0.8	<9	107	49
Sta. 2	1520	21.8	154	7.17	6.82	78	2.00	5.1	268	321	58
Sta. 3	1540	24.2	139	7.73	6.78	81	0.52	0.3	90	226	77
Waiehu Beach Road	---	22.9†	112†	7.96†	6.80†	79†	1.14‡	1.1‡	91‡	161‡	17‡

† arithmetic mean of three stations;

‡ geometric mean of three stations.

not lowest DO concentration) was recorded at Sta. 2, again possibly indicative of groundwater. Particulate (turbidity and total suspended solids or TSS) levels were low at two stations (Stas. 1 and 3) and elevated at Sta. 2 (2.00 ntu and 5.1 mg/l). The higher values at Sta. 2 might be the result of suspended algae collected in this sample.

Nitrogen concentrations were low at Sta. 1 (<9 µg N/l of NO_3-NO_2 and 107 µg N/l of TN), elevated at Sta. 3 (90 µg N/l of NO_3-NO_2 and 226 µg N/l of TN), and high at Sta. 2 (268 µg N/l of NO_3-NO_2 and 321 µg N/l of TN). Total P increased steadily in the downstream direction, starting out at Sta. 1 somewhat elevated at 49 µg P/l as TP. The 2009 Waiehu Beach Road means were generally similar to our Sta. 3 sample with respect to nitrogen compounds (91 µg N/l of NO_3-NO_2 and 161µg N/l of TN), although much lower in total phosphorus. The high proportion of inorganic nitrate+nitrite at Sta. 2 again bolsters the inference that this water entering up from the bottom of the concrete lining is essentially spring water.

Botanical Survey

A checklist of plants recorded from ʻĪao Stream channel and banks on April 4, 2012 is presented as Table 3. Relative abundance values (under "Site") are for the stream channel and banks. The column marked "Area" notes—by an "x" indicating present—those species of trees or shrubs common in undeveloped areas adjacent to the stream.

A total of 60 species of ferns and flowering plants were recorded as growing in the stream channel and along the stream banks in the survey. Another 11 species of trees and shrubs were casually noted as growing nearby. With but a few exceptions, all of these plants are non-native species, and most are common weedy species that have established in the highly disturbed banks (regularly maintained by mowing or herbicide spraying) and sand/mud bars that form in the concrete channel. The four native or early Polynesian introduced species include two trees observed near the stream (*kukui* and *hau*), a sedge (*Fimbristylis cymosa*), and a wood sorrel (*ʻihiʻai* or *Oxalis corniculata*). These are common and widespread species in the Hawaiian Islands.

The vegetation in the project area is essentially ruderal (plants adapted to disturbed areas). Outside the channel banks, the area is urban or, in a limited area, agricultural. Forested areas occur opposite Mokuhau Park on the right bank and upstream of the park on the left bank.

Table 3. Checklist of plant species observed along middle and lower ʻĪao Stream, Wailuku, Maui.

Species listed by family	Common name	Status	Abundance Site	Abundance Area	Notes
FERNS AND FERN ALLIES					
BLECHNACEAE					
Blechnum appendiculatum Willd.	---	Nat	R		<1>
PTERIDACEAE					
Adiantum raddianum C. Presl.	---	Nat	R		<1>
Adiantum sp.	maidenhair fern	Nat	R		<1>
THELYPTERIDACEAE					
Christella sp.	wood fern	Nat	R		<1>
FLOWERING PLANTS					
DICOTYLEDONES					
ACANTHACEAE					
Thunbergia fragrans Roxb.	sweet clock-vine	Nat	R		
AMARANTHACEAE					
Alternanthera pungens Kunth	khaki weed	Nat	U		
Amaranthus spinosus L.	spiny amaranth	Nat	R		
ARALIACEAE					
Schefflera actinophylla (Endl.) Harms	octopus tree	Nat		x	
ASTERACEAE (COMPOSITAE)					
Ageratum conyzoides L.	*maile hohono*	Nat	R		
Bidens pilosa L.	beggartick	Nat	R		
Calyptocarpus vialis Less.	---	Nat	R		
Conyza bonariensis (L.) Cronq.	hairy horseweed	Nat	R		
Eclipta prostrata (L.) L.	false daisy	Nat	R		
Emilia fosbergii Nicolson	Flora's paintbrush	Nat	R		
Pluchea carolinensis (Jacq.) G. Don	sourbush	Nat	U		
Sonchus oleraceus L.	sow thistle	Nat	R		
Verbesina encellioides (Cav.) Bernth. & Hook.	golden crown-beard	Nat	R		
Vernonia cinerea (L.) Less.	little ironweed	Nat	R		
Xanthium strumarium L.	*kīkānia*	Nat	R		
BIGNONIACEAE					
Spathodea campanulata P. Beauv.	African tulip	Nat		x	
BORAGINACEAE					
Carmona retusa (Vahl.) Masam.	Fukien tea	Nat		x	

Table 3 (continued).

Species listed by family	Common name	Status	Abundance Site	- Area	Notes
Heliotropum procumbans Mill.	---	Nat	R		
BRASSICACEAE					
Lepidium virginicum L.	pepperwort	Nat	R		
BUDDLEIACEAE					
Buddleia asiatica Lour.	dog tail	Nat	R		<1>
CHENOPODIACEAE					
Chenopodium carinatum R.Br.	---	Nat	U		
COMBRETACEAE					
Terminalia catappa L.	false kamani	Nat	R		<1>
EUPHORBIACEAE					
Aleurites moluccana (L.) Willd.	*kukui*	**Pol**		x	
Euphorbia albomarginata Torr. & A. Grey	rattlesnake weed	Nat	R		
Euphorbia hirta L.	garden spurge	Nat	R		
Ricinus communis L.	castor bean	Nat	U	x	
FABACEAE					
Albizia saman F. Muell.	monkeypod	Nat		x	
Crotalaria cf. *assamica* Benth.	---	Nat	R		<2>
Crotalaria cf. *incana* L.	fuzzy rattlepod	Nat	R		<2>
Leucaena leucocephala (Lam.) de Wit	*koa haole*	Nat		x	
Macroptilium atropurpureum (DC) Urb.	---	Nat	R		
Medicago polymorpha L.	bur clover	Nat	R		
Pithecellobium dulce (Roxb.) Benth.	*'opiuma*	Nat		x	
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	*kiawe*	Nat		x	
LAMIACEAE					
Leonotis nepetifolia (L.) T. Br.	lion's ear	Nat	U		
MALVACEAE					
Hibiscus tiliaceus L.	*hau*	**Ind**		x	
Malvastrum coromandelianum (L.) Garcke	false mallow	Nat	R		
Sida rhombifolia L.	---	Nat	R		
MORACEAE					
Ficus microcarpa L. fil.	Chinese banyan	Nat	R		<1>
MYRTACEAE					
Psidium cattleianum Sabine	strawberry guava	Nat		x	
Syzygium cumini (L.) Skeels	Java plum	Nat		x	
NYCTAGINACEAE					
Boerhavia coccinea Mill.	false alena	Nat	U		

Table 3 (continued).

Species listed by family	Common name	Status	Abundance Site	- Area	Notes
OXALIDACEAE					
Oxalis corniculata L.	yellow wood sorrel	**Pol**	R		
PAPAVERACEAE					
Argemone Mill.	Mexican poppy	Nat	U		
POLYGALACEAE					
Polygala paniculata L.	bubblegum plant	Nat	R		
SOLANACEAE					
Solanum lycopersicum var. *cerasiforme* (Dunal) Spooner	cherry tomato	Nat	R		
URTICACEAE					
Pilea microphylla (L.) Liebm.	artillery plant	Nat	R		
VERBENACEAE					
Verbena litoralis Kunth	*owi*	Nat	R		
MONCOTYLEDONES					
CYPERACEAE					
Cyperus involucratus Roxb.	umbrella sedge	Nat	R		<1>
Fimbristylus cymosa R. Br.	*mauʻu ʻakiʻaki*	**Ind**	R		
POACEAE					
Axonopus fissifolius (Raddi) Kuhlm.	nrw-lvd carpet grass	Nat	U		
Cenchrus ciliaris L.	bufflegrass	Nat	R		
Cenchrus echinatus L.	sandbur	Nat	R		
Chloris barbata (L.) Sw.	swollen fingergrass	Nat	O		
Chloris virgata Sw.	feather fingergrass	Nat	O		
Cynodon dactylon (L.) Pers.	Bermuda grass	Nat	U		
Digiteria ciliaris (Retz.) Koeler	Henry's crabgrass	Nat	R		
Digiteria insularis (L.) Mez ex Ekman	sourgrass	Nat	U		
Echinochloa crus-galli (L.) P. Beauv.	barnyard grass	Nat	R		
Eleusine indica (L.) Gaertn.	wiregrass	Nat	R		
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	Nat	R		
Eragrostis tenella (L.) P. Beauv. ex Roem. & Schult.	lovegrass	Nat	R		
Melinus repens (Willd.) Zizka	Natal redtop	Nat	R		
Setaria verticillata (L.) P. Beauv.	bristly foxtail	Nat	R		
Panicum maximum Jacq.	Guinea grass	Nat	O	x	
*Pennisetum purp*ureum Schumach.	elephant grass	Nat	R1		<2>
indet.		Nat	R		

Table 3 (continued):

Legend to Table 3.

STATUS = distributional status for the Hawaiian Islands:

Ind = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.

Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.

Pol. = Polynesian introduction before 1778.

ABUNDANCE = occurrence ratings for plants by area:

R – Rare	seen in only one or perhaps two locations.
U - Uncommon-	seen at most in several locations
O - Occasional	seen with some regularity
C - Common	observed numerous times during the survey
A - Abundant	found in large numbers; may be locally dominant.
AA - Very abundant	abundant and dominant; defining species for vegetation type.

Numbers following an occurrence rating indicate clusters within the survey area. The ratings above provide an estimate of the likelihood of encountering a species within the specified survey area; numbers modify this where abundance, tends to be greater than the occurrence rating:

1 – several plants present in each location

2 - many plants present in each location

3 – locally abundant

NOTES:

<1> Seen only in area immediately above debris basin and below waterfall.

<2> Specimen(s) encountered lacked fruit or flowers; determination uncertain.

Aquatic Biota Survey

Table 4 is a listing of aquatic species identified in ʻĪao Stream. The table also includes earlier observations in this stream by *AECOS* (*AECOS*, 2011), U.S. Fish and Wildlife Service (2011), and those species reported in ʻĪao Stream by the Hawaiʻi Watershed Atlas (HDLNR-DAR, 2008).

Typical estuarine fishes such as mullet (*Mugil cephalus*), *ʻāholehole* (*Kuhlia xenura*), *kūpīpī* (*Abudefduf sordidus*), and dusky frillgoby (*Bathygobius fuscus*) inhabit the estuarine reach—downstream from the project area. Two endemic amphidromous mollusks, *hīhīwai* (*Neritina granosa*) and *hapawai* (*Neritina vespertina*), also inhabit the estuary (USFWS, 2011; Hau, 2007). *Hīhīwai* and *hapawai* are amphidromous animals that require stream flow for reproductive success. *Hīhīwai* also inhabit lower and middle reaches of streams, but they migrate slowly and the diversions in ʻĪao Stream make it nearly impossible for the juvenile snails to migrate past the flood control channel (Hau, 2007). We found a single *hīhīwai* shell near the debris dam in the middle reach of the stream. HDLNR-DAR implements a program to collect *hīhīwai* from the estuary and release them in a continuously flowing segment of stream at ʻĪao Valley State Monument (Hau, 2007).

Table 4. Checklist of aquatic species found in ʻĪao Stream.

PHYLUM, CLASS ORDER, FAMILY Species	Common name	Status	Abundance
MONERA			
CYANOPHYCOTA, CYANOPHYCEAE	cyanobacteria		
NOSTOCALES, RIVULARIACEAE			
Dichothrix sp.		**---**	P (1)
NOSTOCALES, OSCILLATORIACEAE			
Schizothrix sp.		**---**	P (1)
ALGAE			
CHLOROPHYTA, CHLOROPHYCEAE	green filamentous algae		
CHAETOPHORALES, CHAETOPHORACEAE			
Cloniophora sp.			P (1)
Stigeoclonium sp.		**Ind**	P (1, 2)
CHAETOPHORALES, CHARACEAE			
Chara sp.		Nat	O (1)
CHLOROPHYTA, ZYGNEMATOPHYCEAE			
ZYGNEMATALES, ZYGNEMATACEAE			
Spirogyra sp.		**Ind**	P (1)
INVERTEBRATES			
PLATYHELMINTHES, TRICLADIDA			
DUGESIIDAE			
Dugesia sp.	flatworm	Nat	O (1)
ANNELIDA, CLITELLATA			
Unidentified Oligochaeta	earthworm	Nat	P (3)
ANNELIDA, HIRUDINEA			
Unidentified Hirudinea	free-living leech	Nat	O (1)
ARTHROPODA, INSECTA			
DIPTERA			
unidentified Diptera	midge	---	P (3)
DIPTERA, CANACEIDAE			
Procanace sp.	surf fly	---	P (3)
DIPTERA, CHIRONOMIDAE	midges		
unidentified Chironomidae	larvae	---	O (1), P (3)
Telmatogeton sp.		---	P (3)
Telmatogeton torrenticola (Terry, 1913)	Hawaiian chironomid	**End**	P (3)

Table 4 (continued).

PHYLUM, CLASS ORDER, FAMILY Species	Common name	Status	Abundance
ODONATA			
unidentified Odonata	naiad	---	R (2)
ODONATA, LIBELLULIDAE	dragonflies		
Crocothemis servilia (Drury, 1773)	scarlet skimmer, adult	Nat	O (1)
Orthemis ferruginea (Fabricius, 1775)	roseate skimmer, adult	Nat	O (1)
ODONATA, COENAGRIONIDAE	damselflies		
Megalagrion sp.		**End**	P (3)
Megalagrion blackburni McLachlan, 1883	Blackburn's Hawaiian damselfly	**End**	P (3)
Megalagrion hawaiiense (McLachlan, 1883)	Hawaiian upland damselfly	**End**	P (3)
Megalagrion nigrohamatum nigrohamatum (Blackburn, 1884)	blackline Hawaiian damselfly	**End**	P (3)
TRICHOPTERA	caddisflies		
unidentified Trichoptera	larvae	Nat	P (3)
TRICHOPTERA, HYDROPSYCHIDAE	net-spinning caddisflies		
Cheumatopsyche analis (Banks, 1903)		Nat	P (3)
Cheumatopsyche pettiti Banks, 1908		Nat	P (3)
TRICHOPTERA, HYDROPTILOIDAE	micro-caddisflies		
unidentified Hydroptiloidae		Nat	O (1)
Hydroptila arctia Ross, 1938		Nat	P (3)
Hydroptila potosina Bueno-Soria, 1984		Nat	P (3)
ARTHROPODA, MALACOSTRACE			
DECAPODA, ATYIDAE			
Atyoida bisulcata J.W. Randall, 1840	*ʻōpae kalaʻole*	**End**	7.38/yd^2 Upper† (3)
DECAPODA, CAMBARIDAE			
Procambarus clarkii (Girard, 1852)	red swamp crayfish	Nat	R (1, 2)
DECAPODA, PALAEMONIDAE			
Macrobrachium lar (J.C. Fabricius, 1798)	Pacific prawn	Nat	0.02/yd^2 Mid (3)
ISOPODA			
unidentified Isopoda	isopod	Nat	P (3)
MOLLUSCA, GASTROPODA	snails		
unidentified Gastropoda		Nat	P (3)
BASOMMATOPHORA, LYMNAEIDAE			
unidentified Lymnaeidae	pond snail	Nat	P (3)
BASOMMATOPHORA, PHYSIDAE			
Physa sp.	pouch snail	Nat	R (1), 0.63/yd^2 Mid 0.63/yd^2 Upper (3)

Table 4 (continued).

PHYLUM, CLASS ORDER, FAMILY Species	Common name	Status	Abundance
BASOMMATOPHORA, PLANORBIDAE			
Planorbella duryi (Wetherby, 1879)	ramshorn snail	Nat	R‡ (1)
NEOTAENIOGLOSSA, THIARIDAE			
Melanoides tuberculatus (Muller, 1774)	red-rim melania	Nat	O (1)
NERITOPSINA, NERITIDAE			
Neritina granosa Sowerby, 1825	*hīhīwai*	**End**	R‡ (1), R (4)
Neritina vespertina Sowerby, 1849	*hapawai*	**End**	R (4)
VERTEBRATES			
CHORDATA, ACTINOPTERYGII	fishes		
CLUPEIFORMES, ENGRAULIDAE			
Encrasicholina purpurea (Fowler, 1900)	*nehu*	**End**	O (2) (estuary)
MUGILIFORMES, MUGILIDAE			
Mugil cephalus Linnaeus, 1758	*ʻamaʻama*	**Ind**	O (2), P (3) (estuary)
PERCIFORMES, CICHLIDAE			
Tilapia sp.	tilapia	Nat	P (3)
PERCIFORMES, KUHLIIDAE			
Kuhlia sp.	*ʻāholehole*	**Ind**	0.21/yd^2 Low (3)
Kuhlia xenura (Jordan and Gilbert, 1882)	*ʻāholehole*	**Ind**	R (1) (estuary)
PERCIFORMES, ELEOTRIDAE			
Eleotris sandwicensis (Vaillant and Sauvage, 1875)	*ʻoʻopu akupa*	**End**	P (3)
PERCIFORMES, GOBIIDAE			
unidentified Gobiidae			P (3)
Awaous guamensis (Valenciennes in Cuvier and Valenciennes, 1873)	*ʻoʻopu nākea*	**Ind**	R (1), 0.26/yd^2 Mid (3)
Bathygobius fuscus (Rüppell, 1830)	dusky frillgoby	**Ind**	R (1) (estuary)
Lentipes concolor (Gill, 1860)	*ʻoʻopu ʻalamoʻo*	**End**	R (1), 0.02/yd^2 Mid 0.07/yd^2 Upper (3)
PERCIFORMES, GOBIIDAE (continued)			
Sicyopterus stimpsoni (Gill, 1860)	*ʻoʻopu nopili*	**End**	R (1), 0.18/yd^2 Mid (3)
Stenogobius hawaiiensis Watson, 1991	*ʻoʻopu naniha*	**End**	P (3)
PERCIFORMES, POMACENTRIDAE			
Abudefduf sordidus (Forsskål, 1775)	*kūpīpī*	**Ind**	R (1)

Table 4 (continued).

PHYLUM, CLASS ORDER, FAMILY Species	Common name	Status	Abundance
CYPRINODONTIFORMES, POECILIIDAE			
unidentified Poeciliidae		Nat	7.75/yd^2 Mid 0.1/yd^2 Upper (3)
Gambusia affinis (Baird and Girard, 1853)	mosquitofish	Nat	0.49/yd^2 Mid 0.07/yd^2 Upper (3)
Poecilia reticulata Peters, 1859	guppy, rainbowfish	Nat	C (1), 1.66/yd^{2}Mid 5.25/yd^2 Upper (3)
Poecilia sp. hybrid complex (*salvatoris/mexicana* group)	liberty/Mexican molly	Nat	C(1), P (4)
Xiphophorus helleri Heckel, 1848	green swordtail	Nat	C(1), 0.54/yd^2 Mid 0.03/yd^2 Upper (3)
CHORDATA, AMPHIBIA	amphibians		
ANURA , BUFONIDAE	toads		
Rhinella marina (Linnaeus, 1758)	cane toad, eggs	Nat	C(1)
Rhinella marina (Linnaeus, 1758)	cane toad, tadpole	Nat	C(1)
Rhinella marina (Linnaeus, 1758)	cane toad, adult	Nat	R (1) ‡, R (2), 0.03/yd^2 Mid (3)
ANURA , RANIDAE	frogs		
Lithobates catesbeianus (Shaw, 1802)	American bullfrog, egg	Nat	A (1)
Lithobates catesbeianus (Shaw, 1802)	American bullfrog, adult	Nat	0.54/yd^2 Mid (3)

Key to Table 4

Status:

Nat - naturalized. An introduced or exotic species;
I**nd** - indigenous. A native species also found elsewhere in the Pacific;
E**nd** - endemic - A native species found only in the Hawaiian Islands.

Abundance categories:

P - present; abundance unknown;
R - rare; only one to three individuals seen;
O - occasional; three to twelve individuals seen;
C - common; many individuals seen;
A - abundant; numerous.

Notes:

†- average density reported for reach
‡ - molt, shell, or dead specimen

(1) - Observed in the present survey;
(2) - Reported in *AECOS* (2011);
(3) - Reported in HDLNR-DAR (2008);
(4) - Reported in USFWS (2011).

We observed three native amphidromous *ʻoʻopu* or gobies (*Awaous guamensis*, *Sicyopterus stimpsoni*, and *Lentipes concolor*) in the middle and upper reach of the stream: in a plunge pool upstream from Mokuhau Park (Fig. 6) and in ʻĪao Valley State Monument (Fig. 7). Total length (TL) estimates of the *ʻoʻopu* observed on April 4, 2012 are as follows: *ʻoʻopu nākea* (8 cm, 15 cm), *ʻoʻopu nopili* (5 cm, < 5 cm—both male), *oʻopu ʻalamoʻo* (4.5 cm—female). Two other *ʻoʻopu* species, *Stenogobius hawaiiensis* and *Eleotris sandwicensis*, have been reported from the stream (HDLNR-DAR, 2008), though seemingly erroneously from the upper reach because these fishes are typically found in the estuary and lower reaches of streams. The endemic ʻ*ōpae kalaʻole* (*Atyoida bisulcata*) is reported in ʻĪao Stream (HLDNR-DAR, 2008).

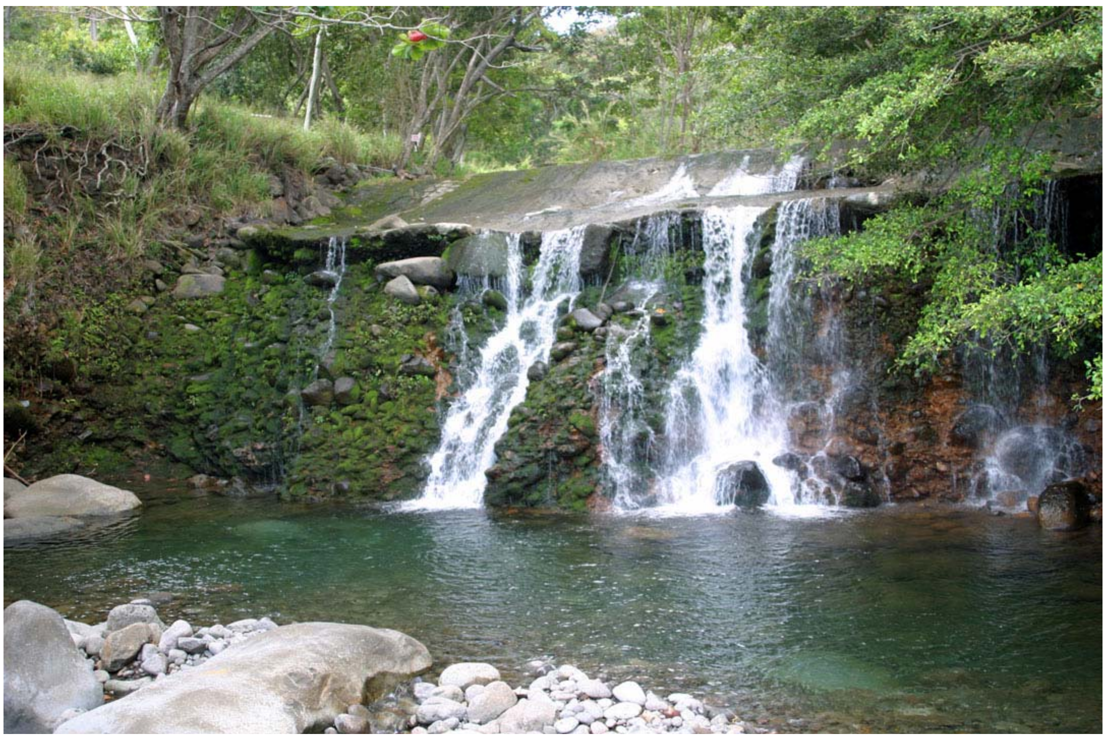


Figure 6. Plunge pool in which an *ʻoʻopu* was observed is a short distance upstream from Mokuhau Park.

Low densities of *ʻoʻopu* have been reported for the middle and upper reach of ʻĪao Stream (0.07 to 0.46 yd^{-2}, respectively; HDLNR-DAR, 2008). Far greater densities of poeciliid fishes (top-minnows) are present (5.45 to 10.44 yd^{-2}; HDLNR-DAR, 2008). High densities of ʻ*ōpae kalaʻole* (7.38 yd^{-2}) have been reported from the upper reach of ʻĪao Stream (HDLNR-DAR, 2008).

Figure 7. Upper reach of ʻĪao Stream in which *ʻoʻopu* were observed.

Photo credit: S. Hau, DLNR-DAR

Figure 8. Cane toad tadpoles dominate semi-permanent pools in flood control channel.

High temperatures (e.g. 32.6˚C on April 4, 2012) and minimal shelter and food resources make life difficult within the Flood Control Channel project limits. However, various species of algae, insect larvae, snails, and amphibians take advantage of these seemingly uninhabitable places and constitute the aquatic fauna found in the Flood Control Channel (Fig. 8).

The Hawaiʻi Watershed atlas (DLNR-DAR, 2008) also lists at least three endemic damselflies (*Megalagrion blackburni*, *M*. *hawaiiense*, and *M*. *nigrohamatum nigrohamatum*) as present in the stream. An unidentified *Megalagrion* species is reported from the lower, middle, and upper reach, *M*. *blackburni* is reported from the middle and upper reach, and *M*. *hawaiiense* and *M*. *nigrohamatum nigrohamatum* are reported from the upper reach.

Assessment

Water Quality

With regards to Hawaiʻi water quality standards, ʻĪao Stream is a Class 2 inland water body, except for a small segment of stream contained in ʻĪao Valley State Monument that is Class 1. ʻĪao Stream is listed on the Hawaiʻi Department of Health (HDOH) 2006 list of impaired waters in Hawaiʻi, prepared under Clean Water Act §303(d) (HDOH, 2008). The "impaired" listing is based upon visual observations made from 2001 to 2004. The HDOH listing indicates that ʻĪao Stream may not meet water quality standards for turbidity and trash. ʻĪao Stream is listed as a "Category 3" water body, meaning that "there is [sic] insufficient available data and/or information to make a use support determinations [sic]." ʻĪao Stream and has been assigned a TMDL priority code of "medium."

ʻĪao Stream discharges into Kahului Bay, which is considered a Class A embayment (HDOH, 2009). "Kahului Harbor (Bay)" is a station listed on the HDOH 2006 list of impaired waters (HDOH, 2008). The "impaired" listing is based upon data collected from Sta. HIW00105 that indicates Kahului Harbor (Bay) does not meet Hawaiʻi water quality standards for turbidity, chl α, and NH_4. Kahului Harbor (Bay) is listed as a "Category 3" water body and as "Category 5" water body, meaning that "[a]vailable data and/or information indicate that at least one or more designated use is not being supported or is threatened, and a [total maximum daily load or] TMDL is needed." Kahului Harbor (Bay) has been assigned a TMDL priority code of "low."

The State water quality standards pertaining to streams are given in Table 6. The criteria for temperature and pH are based on deviations from ambient conditions (not applicable here). Criterion for DO saturation is a minimum value and conductivity is based upon a not to exceed value. Criteria for turbidity and nutrients are based on geometric means and values not to exceed 10% and 2% of the time.

Table 6. Selected state of Hawaiʻi water quality criteria for streams (HAR §11-54-5.2; HDOH, 2009).

Parameter	Geometric Mean value not to exceed this value	Value not to be exceeded more than 10% of the time	Value not to be exceeded more than 2% of the time
Total Nitrogen	250.0	520.0	800.0
(µg N/l)	*180.0*	*380.0*	*600.0*
Nitrate+Nitrite	70.0	180.0	300.0
(µg N/l)	*30.0*	*90.0*	*170.0*
Total Phosphorus	50.0	100.0	150.0
(µg P/l)	*30.0*	*60.0*	*80.0*
Total Suspended Solids	20.0	50.0	80.0
(mg/l)	*10.0*	*30.0*	*55.0*
Turbidity	5.0	15.0	25.0
(NTU)	*2.0*	*5.5*	*10.0*

Upper values are for the wet season (November 1 through April 30).
Lower *italicized* values are for the dry season (May 1 through October 31).

Other "standards":

- pH units shall not deviate more than 0.5 units from ambient conditions and not lower than 5.5 nor higher than 8.0
- Dissolved oxygen shall not decrease below 80% of saturation.
- Temperature shall not vary more than 1C^{o} from ambient conditions.
- Conductivity shall not be more than 300 µmhos/cm.

The purpose of the water quality measurements presented in this report is to characterize existing aquatic environments, not to establish compliance with water quality standards. In fact, the criteria for turbidity, TSS, and nutrient measurements are based on making comparisons with geometric mean values, so a minimum of three separate sampling events per location would be required to generate a proper statistic for comparison with a criterion. Ideally, multiple samplings would encompass a "typical" range of conditions for the location. These standards may be used, together with "baseline" data collected from a series of preconstruction sampling events, to develop decision rules as part of the data quality objectives (DQO) process in an applicable monitoring and assessment program (AMAP) developed in accordance with a Clean Water Act Section 401 Water Quality Certification, if required.

The April 4, 2012 samples in ʻĪao Stream do not show high turbidity levels as indicated by the impaired listing and we did not observe much trash within the stream channel. NO_3-NO_2 was high at Sta. 2, as is often the case with groundwater or spring water in Hawaiʻi, and this large amount of inorganic nitrogen contributed to the high total nitrogen (TN). The concentration of total phosphorus (TP) increased from moderate to high levels in the downstream direction.

ʻĪao Stream does not appear to be much degraded in terms of either suspended sediments or nutrients. Inorganic nitrogen appears to be high in the groundwater of the watershed and water quality exceedances may be possible if additional groundwater were discharged into the stream. The land use of the watershed (48.9% evergreen forested and 25.9% scrub/shrub; HDLNR-DAR, 2008) is likely responsible for the relative low suspended sediments in the stream. The biggest water quality problems faced in the ʻĪao Stream Flood Control Channel is likely the result of low flow over a concrete channel. Warmer water cannot contain as much dissolved oxygen (essential to all aquatic life) as cooler water. Many *ʻoʻopu* are temperature sensitive (Timbol and Maciolek, 1978) and the high temperatures experienced in the channel may exceed the tolerances of the native organisms but be tolerable by introduced fishes and mollusks.

Botanical Resources

All of the plant species recorded within the Project area are widespread species; most are common weedy species. None of the plant species recorded is endemic (unique to the Hawaiian Islands) and none is listed as endangered or threatened or proposed for inclusion as a listed species by federal or state governments (USFWS, 2008, 2012a).

A portion of the upper watershed has been designated as critical habitat for at least 45 threatened or endangered species of plants (USFWS, 2012b). However, this designated area is not within the boundaries of the Project or even particularly close.

Aquatic Biota

No aquatic species protected by State of Hawaiʻi Administrative Rules (DLNR, 1998, 2007), nor federally endangered or threatened species (USFWS, 2008, 2012a) were observed in Īao Stream within the Project area. The native stream macrofauna are diadromous: eggs are laid in the stream and the larvae that hatch from these eggs move down stream and out into the ocean where they develop for a time before migrating back into fresh water to grow to maturity (Ford and Kinzie, 1982; Kinzie, 1988). *Hīhīwai* (Hau, 2007) and *ʻoʻopu* (S. Hau, DLNR-DAR, pers. comm.) still attempt to migrate into ʻĪao Stream even though it has been diverted for over 100 years and flow is interrupted throughout the middle reach. Currently, some of these animals are transported by DLNR-DAR from the estuary to suitable habitats upstream of the flood control project (S. Hau, DLNR-DAR, pers. comm.).

We recommend various factors be considered in the ʻĪao Stream Flood Control Project to aid aquatic fauna in the existing flood control project. Increasing stream flow in the middle and lower reach is essential to allow both downstream and upstream migration of amphidromous animals. Maximization of groundwater input to the stream would increase stream flow and could be achieved with porous pavement in places where new concrete lining is being considered. The low flow channel should be made continuous to, at a minimum, serve the purpose for which it was designed. The concrete lining of the low flow channel should be removed to allow for groundwater recharge, and shade should be provided to reduce thermal stress. In some places, the channel could be narrowed and deepened to allow for greater and longer flows. In other places, the channel could be modified to create pools to serve as semi-permanent refugia for animals migrating upstream during flow interruptions. "Fish passages" should be present at all diversion structures. Shading, whether it is natural or artificial, will decrease heat stress on aquatic biota.

Riffles and pool complexes, such as those present upstream of the ʻĪao Stream Flood Control Project are important because they help maintain good water quality, provide habitat diversity, and maintain water holding capacity. These complexes have been designated as Special Aquatic Site in the Clean Water Act (USC, 1972).

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Appendix G:

Fish and Wildlife Coordination Act (FWCA) Report Addendum

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:
12200-2010-CPA-0194

DEC 2 9 2011

Anthony J. Paresa, P.E.
Deputy District Engineer
Programs and Project Management/Civil Works
U.S. Army Corps of Engineers
Building 230
Fort Shafter, Hawaii, 96858-5440

Subject: Phase 1 Marine Habitat Characterization Fish and Wildlife Coordination Act Report Addendum for Iao Stream Flood Control Project, Wailuku, Maui

Dear Mr. Paresa:

The Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 et seq.; 48 Stat. 401], as amended (FWCA), was established to provide a basic procedural framework for the orderly consideration of fish and wildlife conservation measures to be incorporated into Federal water resources development projects. In coordination with your staff, the U.S. Fish and Wildlife Service (Service) is providing this Phase 1 Marine Habitat Characterization FWCA 2(b) Report Addendum for the proposed Iao Stream Flood Control Project. This addendum was prepared by the Service in coordination with the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), and the Department of Land and Natural Resources, Hawaii Division of Aquatic Resources (HDAR). This report has been prepared under the authority of and in accordance with provisions of FWCA; and the Federal Clean Water Act of 1977 [33 U.S.C. 1251 et seq.; 62 stat. 1155], as amended (CWA). These comments are also consistent with the National Environmental Policy Act of 1969 [42 U.S.C. 4321 et seq.; 83 Stat. 852], as amended, and other authorities mandating the Service's review of projects and provision of technical assistance to conserve trust resources.

The purpose of the proposed project is to correct deficiencies in the Iao Stream Flood Control Project that was constructed in 1979-1981. The Corps' March, 2009, Draft Environmental Assessment (DEA) evaluated several alternatives that entailed additional hardening of stream banks to control erosion, straightening the stream channel, and raising levee heights to contain potential flood waters.

The Service provided technical assistance, detailed in a January, 2006 Draft, 2(b) FWCA report as well as in an August, 2011 Draft, 2(b) FWCA report. The enclosed Phase 1 Marine Habitat Characterization FWCA Report Addendum includes results from mapping surveys in the coastal area of Iao Stream mouth as well as an in-depth review of existing datasets and information from the area. The report addendum also provides recommendations to minimize the impact to marine resources from the proposed project.

We appreciate the opportunity to provide input on the proposed project. If you have questions regarding our FWCA investigation and report, please contact Coastal Conservation Program Coordinator Dan Polhemus (Dan_Polhemus@fws.gov or 808-792-9400), Fish and Wildlife Biologist Paula Levin (Paula_Levin@fws.gov or 808-792-9417), or Marine Biologist Tony Montgomery (Tony_Montgomery@fws.gov or 808-792-9456).

Sincerely,

For Loyal Mehrhoff
Field Supervisor

cc:
NMFS-PIRO, Honolulu
HDAR-DLNR, Honolulu
USEPA-Region IX, Honolulu
CZM, Honolulu
DOH-CWB, Honolulu
CWRM, Honolulu

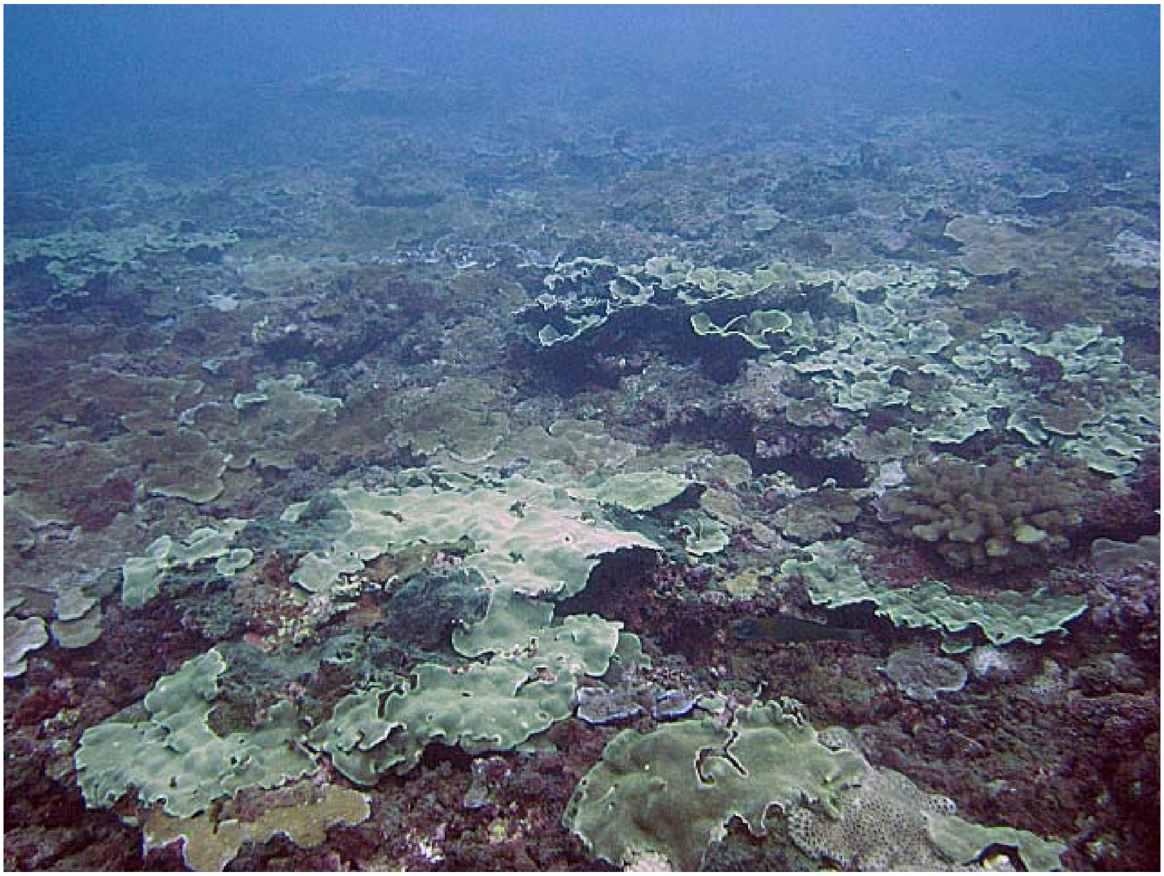

Photo: G. Smith, USFWS

FINAL
FISH AND WILDLIFE COORDINATION ACT REPORT ADDENDUM

PHASE 1 MARINE HABITAT CHARACTERIZATION
IAO STREAM FLOOD CONTROL PROJECT,
WAILUKU, MAUI, HI

DECEMBER 2011

FINAL
FISH AND WILDLIFE COORDINATION ACT REPORT ADDENDUM

PHASE 1 MARINE HABITAT CHARACTERIZATION
IAO STREAM FLOOD CONTROL PROJECT,
WAILUKU, MAUI, HI

Prepared by

Anthony Montgomery
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, HI

Prepared for

U.S. Army Corps of Engineers
Honolulu, HI

December 2011

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INTRODUCTION

Authority, Purpose and Scope

This Phase 1 Draft report is prepared in accordance with the August 26, 2010, U.S. Fish and Wildlife Service's (Service) Planning Aid Letter (PAL), Scope of Work (SOW) and Budget for assisting the U.S. Army Corps of Engineers (Corps) with the Environmental Impact Statement (EIS) for the Iao Stream Flood Control Project in Wailuku, Maui, Hawaii. This addendum describes the results of a Phase 1 marine habitat characterization survey of the marine coastal area within the vicinity of the mouth of Iao Stream. The proposed project is sponsored by the County of Maui, Department of Public Works, in partnership with the Corps. This report has been prepared under the authority of and in accordance with provisions of 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 of 1977 [33 USC 1251 *et seq*.; 91 Stat. 1566], as amended; the Endangered Species Act of 1973 [16 U.S.C. 1531 *et seq*.; 87 Stat. 884], as amended; and other authorities mandating the Service to provide technical assistance to conserve trust resources.

The FWCA provides the basic authority for the Secretary of the Interior, through the Service, to assist and cooperate with Federal, State and public or private agencies and organizations in the conservation and rehabilitation of aquatic wildlife. The National Marine Fisheries Service (NMFS) provides similar assistance and cooperation for wildlife species conservation under the management responsibilities of the Department of Commerce. Phase 1 consultation under the FWCA regarding analysis of the proposed project's impacts on marine resources were conducted with the NMFS, and the Hawaii Division of Aquatic Resources (HDAR), the State agency responsible for administering the wildlife resources of the State. The Service is the lead agency and has the responsibility of ensuring that concerns and recommendations of the other resource agencies are considered fully in FWCA reviews. Collectively, the Service, NMFS, and HDAR are referred to as Resource Agencies.

The Corps produced a Draft Environmental Assessment (DEA) for this project in March 2009. The public review process for the DEA resulted in new concerns being raised regarding the project's potential ecosystem impacts as well as concerns about the adequacy of the proposed mitigation to offset anticipated, unavoidable impacts. The Corps is re-analyzing and modifying proposed alternatives and mitigation measures described in the March 29, 2009, DEA and new alternatives and mitigation may be identified through further agency coordination.

The phased approach to the Service's activities under Section 2(b) of the FWCA is described in the August 26, 2010, Scope of Work. Phase I included a marine survey and a supplemental stream and project area survey which occurred in coordination with the HDAR.

Prior Fish and Wildlife Service Studies and Reports

Prior to this survey, no Fish and Wildlife Service surveys or studies have been conducted in the marine areas in the vicinity of the Iao Stream confluence with the sea.

DESCRIPTION OF THE PROJECT AREA

Iao Stream is located in Iao Valley in the West Maui mountains on the Island of Maui and is 5 kilometers (km) (3.1 miles) west of Wailuku (Figure 1). The stream mouth is located 1.5 km (0.9 miles) northeast from Kahului Harbor and 1.1 km (0.7 miles) southwest of Waiehu Stream mouth. The coastal area between streams forms a small embayment that is somewhat protected from small swells. The shoreline consists mostly of small basaltic boulders and is north facing subject to strong seasonal winter swell and strong seasonal summer trade wind swell. The conditions around this area are routinely rough and therefore may experience lighter vessel traffic than leeward areas.

FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES

The primary concerns with the proposed project include potential impacts to native stream fauna due to planned project construction and operation, and impacts to the coral reef resources and near shore environment adjacent to the mouth of Iao Stream. As noted, the Scope of Work (SOW) was divided into marine and freshwater survey phases due to the seasonal availability of access to the site to perform the surveys. Therefore, in Phase 1, the specific planning objective is to provide technical assistance to the Corps for the development of alternative project plans for evaluation in the DEIS that avoid and minimize impacts to existing aquatic resources. An additional objective is to assist the Corps with developing mitigation measures that compensate for unavoidable impacts. The Resource Agencies encourage the Corps to work with Maui County, the local sponsor to select an alternative that meets their flood control objectives while maintaining and enhancing the existing significant habitat values at the proposed project site. Achieving this goal will necessitate the Corps, in partnership with Maui County, and with technical assistance from the Service to; 1) obtain updated biological data and habitat assessment for the proposed project site; and when the DEIS is published; 2) analyze the impacts of proposed-project alternatives on fish and wildlife resources and their habitats; 3) identify the proposed-project alternative least damaging to fish and wildlife resources, and 4) recommend mitigation for unavoidable project-related habitat losses consistent with the FWCA and the Service's Mitigation Policy (U.S. Fish and Wildlife Service, 1981), as well as the Corps and Environmental Protections Agency’s 2008 Compensatory Mitigation for Losses of Aquatic Resources.

The Service's Mitigation Policy (U.S. Fish and Wildlife Service, 1981) outlines internal guidance for evaluating project impacts affecting fish and wildlife resources. The Mitigation Policy complements the Service's participation under NEPA and the FWCA. The Service's Mitigation Policy was formulated with the intent of protecting and conserving the most important fish and wildlife resources while facilitating balanced development of this nation's natural resources. The policy focuses primarily on habitat values and identifies four resource categories and mitigation guidelines. The resource categories are the following:

a. Resource Category 1: Habitat to be impacted is of high value for the evaluation species and is unique and irreplaceable on a national basis or in the local region.

b. Resource Category 2: Habitat to be impacted is of high value for the evaluation species and is relatively scarce or becoming scarce on a national basis or in the local region.

c. Resource Category 3: Habitat to be impacted is of high to medium value for the evaluation species and is relatively abundant on a national basis.

d. Resource Category 4: Habitat to be impacted is of medium to low value for the evaluation species.

The marine coastal area surrounding Iao Stream mouth is considered a coral reef and meets the description of Resource Category 2. The coral reef surrounding the mouth of Iao Stream can be considered high value due to the marine resources documented in this Phase 1 survey. In addition, coral reefs are considered scarce based on the local, national, and global decline of coral reefs (Williams et al., 2009; Walsh *et al.*, 2010; Waddell (ed.), 2005; Waddell and Clarke (eds.), 2008; Wilkinson (ed), 1998; Wilkinson (ed), 2000; Wilkinson (ed), 2004; Wilkinson (ed), 2008) and the geographical constraints of coral reefs in the United States. Coral reefs have also been designated as Special Aquatic Sites under the Clean Water Act (CWA). Special Aquatic Sites are defined as "geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values." They are further described as "significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region" (40 CFR Part 230 §230.44/FR v.45n.249).

These designations of Resource Category 2 and Special Aquatic Site require the Service to recommend ways for the action agency to mitigate losses, through measures to avoid or minimize significant adverse impacts. In the event losses are unavoidable, measures to immediately rectify, reduce, or eliminate losses commensurate with project permitting (with the understanding that the Corps Planning Division is responsible for their own consistent with CWA regulatory requirements) or implementation will be recommended under the FWCA. Recommendations will focus on compensation for the replacement of in-kind habitat values and ecological functions. An effective and verifiable mitigation program planned and executed by the project proponent is required under NEPA and the CWA.

EVALUTION METHODOLOGY

Information from other sources

Information relating to the coastal area surrounding Iao Stream was collected from literature searches and known entities conducting research or management. Although sparse results were developed from literature searches, a substantial amount of information was discovered to be available through government agencies doing work within the region. These sources include the Coral Reef Assessment and Monitoring Program (CRAMP) (Jokiel *et al.*, 2011), HDAR Habitat and Fish Assessments (Walsh *et al.*, 2010), National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Ecosystem Division (CRED) surveys (unpublished), NOAA's Shallow-Water Benthic Habitat Maps (Battista *et al.*, 2007), Lidar imagery (JALBTCX, 2002; JALBTCX, 2007), historical imagery (Coastal Geology Group, 2011), and sea turtle disease and nesting (Van Houtan *et al.*, 2010; Parker and Balazs, 2010; Balazs and Hau, 1986). In addition, information on sea turtles and historical observations were collected by direct communication with HDAR and included unpublished information (Skippy Hau, pers. comm.).

Phase 1 Survey protocols

The goal of a Phase 1 survey is to generally document and spatially define the marine resources within a potential project area. This Phase 1 marine survey was conducted with two teams, consisting of two marine biologists per survey team. A combination of snorkeling and scuba gear was used to directly observe the coral reef community around the mouth of Iao Stream. Surveys were concentrated within 500 to 700 meters (m) (545 to 765 yards) of Iao Stream mouth extending an additional 1000 m (1095 yards) to the northwest and 450 m (490 yards) to the southeast. Equipment used to conduct the marine survey included: snorkel and scuba diving equipment, safety equipment, data sheets and clip-boards, digital dive watches, digital cameras, handheld Global Positioning Systems (GPS), waterproof bags, cave reels with sufficient line (at least 75 m (80 yards)), and towed floats (large enough to support the GPS). Marine survey work was limited to between 6:00am and 10:00am due to strong seasonal winds.

Each of the two survey teams was equipped with a digital camera, a floated GPS unit, and datasheets attached to a clipboard to record data. The teams snorkeled or dived in a pre-determined direction or pattern following a compass heading. The direction and length of a survey transect was determined by the extent and shape of the project survey area or limitations of dive time. The survey team was comprised of a photographer and a data observer. The data observer was responsible for recording habitat observations and biological classifications with relative abundance as well as maintaining the compass bearing and direction of the survey transect. The photographer was primarily responsible for photo-documenting habitat features, species and anomalies (*e.g.*, debris) and towing the GPS.

The GPS was contained in a waterproof pouch attached to a surface float. The GPS was mounted on the top of the float to maintain a good connection with satellites. The observer was responsible for maintaining the float line directly above the dive team to ensure that the floated GPS was in close proximity to the photographer.

Prior to departing the harbor in the morning, the dive teams synchronized the times on the GPS units, dive watches and digital cameras. A photograph was taken of the GPS time after the GPS unit acquired a strong satellite signal. This was repeated for both cameras and GPS units and was later used to completely synchronize the time between camera and GPS for each dive team. GPS waypoints were taken at the start and end of the survey transect.

The photographer was responsible for photographing dominant habitats, sub-habitats, unique features, species and debris. Photographs were taken periodically to document habitat conditions. Additional photos were taken when there was: 1) a change in benthic habitat type, a sub-habitat or unique feature, 2) a rare or protected species, 3) invasive or alien species, 4) disease, 5) debris, and 6) unexploded ordnances. After the survey team descended to the survey depth, the photographer adjusted the white balance function on the digital camera to correct for coloration. Adjustments to the digital camera white balance were also performed any time the survey depth changed substantially in the course of a survey transect. Digital photographs were taken at approximately a 45^{o} angle to the benthic substrate to document habitat features.

The data observer was responsible for recording benthic habitat observations of the affected marine environment on a data sheet. The time and date of the dive was recorded so that it could be referenced to underwater photos and GPS data. The dominant benthic habitat was identified and described on the datasheet, and the time of observation noted. Observations of sub-habitats, such as a variation in substrate composition, were also recorded. Unique features such as ledges, crevices or overhangs were similarly recorded. Observations of organism disease, presence of invasive species, alien species, rare and/or protected species, debris, contaminants or unexploded ordnance were noted as well. In addition, the data observer recorded relative abundance for types of substrate and biological classifications. The relative abundance was recorded as a category 0-3 with zero being not present, category 1 being sparse, category 2 being moderate, and category 3 being dominant. Generally, category 1 was considered less than 10% visual coverage, category 2 being 10–80% visual coverage, and category 3 greater than 80% visual coverage. These relative abundances were recorded for each classification including: 1) mud, 2) sand, 3) bare substrate, 4) sea grass, 5) crustose coralline algae, 6) turf algae, 7) filamentous-like bloom, 8) macroalgae, 9) zoanthids, 10) soft coral, and 11) coral. In addition, when coral was estimated the coral growth forms present were noted. These growth forms included: 1) encrusting, 2) branching, 3) sub-massive (lobate), 4) massive, 5) columnar, 6) foliaceous, 7) plate-like, and 8) free-living.

Processing data included using GPS Photolink© software to geo-reference photos. Geo-referenced photos were labeled with descriptive information such as latitude, longitude, time, date, habitat descriptors, species names, and any other pertinent information. GPS

Photolink© provided a geo-database that was imported into ArcGIS©. The geo-database was then overlaid on an existing data-layer of the Iao Stream mouth area to produce a map of the GPS tracks (Figure 2).

Relative abundance data was processed by entering the abundance data for each classification into a spreadsheet. The GPS data was downloaded in a .txt format. Both the abundance data and the GPS data were imported into the same Microsoft Excel© spreadsheet. The abundance date/time column was compared to the GPS date/time column to determine appropriate latitude and longitudes for each entry. This was completed automatically by the VLOOKUP formula. This datasheet was then imported into ArcGIS© allowing any of the relative abundances and classifications to be displayed geographically. These relative abundances and classifications were then processed with an Inverse-Distance Weight Interpolation tool in order to predict the area covered by a specific classification. The output resulted in a mosaic of the surveyed area (Figures 3-5).

DESCRIPTION OF FISH AND WILDLIFE RESOURCES AND HABITAT

Information from other sources

Coral Reef Assessment and Monitoring Program

The Coral Reef Assessment and Monitoring Program (CRAMP) has conducted long-term monitoring at over 30 sites across the Main Hawaiian Islands including nine sites on the Island of Maui. One of those sites is Papaula Point (20º 55.307’ N, 156º 25.572’ W; Figure 6) located 5.3 km (3.3 miles) northeast of the entrance to Kahului Harbor and approximately 6.2 km (3.9 miles) from the mouth of Iao Stream. The HDAR has continued surveys at this site and has plans to continue to monitor this location.

Papaula Point monitoring site includes data from both 4 m (13 feet) and 10 m (33 feet) depth. CRAMP describes the surrounding area as:

> “Agricultural in nearby saddle land. Colonized hard bottom with thin veneer over basalt pavement. Encrusting coral colonies dominant form. Pseudo spur and groove with narrow channels of course carbonate sand. Northern exposure with low rugosity and low relief due to extreme wave impacts. Low human activity due to inaccessibility.”

CRAMP reports benthic data that includes rugosity, sediment composition, sediment grain size, coral cover (%), and fish density and biomass. Algae and invertebrate data were not reported. Data is reported from 1999 to 2010 (Jokiel *et al.*, 2011). Figure 7 shows the coral cover at both the 4 m (13 feet) and 10 m (33 feet) sites and a decline in coral cover from nearly 60% in 2002 to 8% in 2009. In addition, the invasive macroalga, *Acanthopora spicifera*, has increased. HDAR lists Papaula Point as a site of particular concern and suggests the site may have undergone an ecosystem collapse (Walsh *et al.*, 2010). The proximity of this site to the mouth of Iao Stream may denote a similar vulnerability or a susceptibility to decline of the existing coral reef resources.

HDAR's Habitat and Fish Assessments

The HDAR also monitors sites for trends in reef fishes that may be affected by the 2007 State of Hawaii law that bans lay-gillnets on Maui (HAR 13-75-12.4). These surveys are known as the Habitat and Fish Assessment (HAFA) surveys. The HAFA surveys include seven sites on the Island of Maui and two of the sites are near to Iao Stream's mouth. These sites include Waihee and Paia. Waihee (20º 56.511' N, 156º 30.451' W; Figure 6) is located 4.2 km (2.6 miles) northwest from Iao Stream and 5.7 km (3.5 miles) northwest of Kahului Harbor. Paia (20º 55.945' N, 156º 22.457' W; Figure 6) is located 11.7 km (7.3 miles) east of Iao Stream and 10.7 km (6.6 miles) northeast from Kahului Harbor.

These sites are rated to have had a high level of pressure from lay gill-nets. Waihee is reported to have about 17% coral and 17% algae cover while Paia is reported to have approximately 17% coral and 34% algae cover (Walsh *et al.*, 2010). Waihee is characterized as pavement and Paia mostly basaltic rocky and boulder habitat (Kristy Stone, HDAR, pers. comm.).

NOAA's Coral Reef Ecosystem Division

NOAA's CRED in partnership with the HDAR conducts Ecological Assessments every two years around the Main Hawaiian Islands (MHIs). These surveys typically focus on areas around the MHIs that are generally considered hard to reach and fairly inaccessible and are typically north facing shores. NOAA CRED conducted surveys along north Maui in 2006, 2008 and 2010. The Ecological Assessments consist of three types of diver surveys including Towed Diver Surveys (TDS), Rapid Ecological Assessments (REAs), and Stationary Point Counts (SPCs). A full description of the methods and analysis of the Ecological Assessments can be found at http://www.pifsc.noaa.gov/cred/eco_assess.php. TDS tracks and locations of REAs for 2006, 2008, and 2010 are shown in Figure 6. The TDS and REAs collect different types of benthic data. While the TDS collects an estimate of coral cover as well as fish biomass and conspicuous invertebrate abundance, the REAs collect more specific and accurate data. REAs include an assessment of coral size class structure which can be used as a metric for ecological function within an area. The coral cover estimated by the four nearest TDS from 2006 to 2010 ranged from 21% to 63%. Of these four surveys, three survey tracks were conducted in similar locations for each year while one track was immediately offshore of Iao Stream. The coral cover ranged from for 21% to 30% to 27% for the years 2006 to 2008 to 2010. These estimates are similar and provide a broad context for coral cover in the area to the NNW of Iao stream. The additional survey track immediately offshore from Iao stream estimates coral cover to be 63% and correlates to a "reef pavement" classification on the NOAA Shallow Water Benthic Habitat maps (see below). The REA from the nearest sites (MAI-21) has coral size frequency distribution (Figure 8) that suggests a fairly stable coral size structure as corals remain present in the larger size classes suggesting less environment disturbance over time. The only exception is coral in the genus *Montipora* where intermediate sized classes were found, but not larger sizes classes (> 0.8 m (31 inches)). This may be a result of species differences within the genus *Montipora* or an environmental constraint on the genus at the specific location. Additional biological data exists for other nearby sites.

NOAA's Shallow-Water Benthic Habitat Maps

NOAA's Shallow-Water Benthic Habitat Maps of the Main Hawaiian Islands (2007) provide classification of habitats including habitat zone, habitat structure (both major and detailed geomorphological), and biological cover information (both major and detailed) (Battista *et al.*, 2007). The maps were generated by using interpretation of orthorectified satellite imagery. The types of habitat zones within the area of Iao Stream are shown in Figure 9. These include Bank/Shelf, Fore Reef, and Reef Flat, and unknown types. The unknown classification correlates to survey observations of high water turbidity and these high turbidity areas may obscure satellite interpretation. The habitat structure is shown in Figures 10-11 and includes coral reef and hardbottom, unconsolidated sediment, and unknown for gross structure (Figure 10) and mud/sand, pavement, rock/boulder, spur-and-groove, and unknown for more specific structure types (Figure 11). The biological cover is shown in Figure 12 and includes coral, macroalgae, and unknown. More specifically, detailed biological cover in Figure 13 is separated by percentage of cover into 10%-<50%, 50%-<90%, and 90%-100% for each biological classification.

The NOAA maps provide some useful but broad overview of the habitat within the given area. However, the maps are not entirely accurate based on field observations from this Phase 1 survey. For example, Figure 11 shows the area within the Phase 1 surveys as reef pavement and the area to the northeast as spur-and-groove habitat. The Phase 1 surveys found the entire area to be spur and groove. In addition, a large portion of this area is also labeled as unknown. Anecdotal observations from the area suggest that the areas listed as unknown correlate with extremely low water visibility as discussed in the Phase I observations. High water turbidity may limit the interpretation of satellite imagery.

NOAA's Shallow-Water Benthic Habitat Maps can be useful in providing very general information on habitat, structure, and biological cover, however must be interpreted with caution due to the inaccuracies occurring in some of the maps.

Lidar Imagery

In 1999 data were collected by the Scanning Hydrographic Operational Airborne Lidar Survey (SHOALS) to investigate near-shore bathymetry of Maui (JALBTCX, 2002). Lidar (Light Detection and Ranging) is able to measure water depth through the reflection of light from the water surface and sea bottom. The data is then able to be processed to develop a bathymetric layer for the area. Further description of the technology and metadata for the 1999 Maui dataset can be found at: ftp://soest.hawaii.edu/coastal/webftp/Maui/Shoals/Maui.met.

In 2007 the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) collected Lidar data for the northern coastlines of the Hawaiian Islands (JALBTCX, 2007). Further information on this dataset can be found at: http://csc.noaa.gov/dataviewer/webfiles/metadata/usace2007_hi_template.html.

High quality bathymetric maps can be extremely valuable in describing and understanding a coral reef. For example, bathymetry may be able to show that the reef around the Iao Stream mouth area is a spur and groove habitat. While this data exists for much of the northern Maui coastline, there is a gap in the data for the immediate area outside Iao Stream mouth as shown in Figure 14. It is recommended that further surveys using Lidar should be conducted to fill this gap.

Historical Coastal Imagery

A compilation of coastal imagery around Maui can be found at: http://www.soest.hawaii.edu/coasts/data/maui/index.html (Coastal Geology Group, 2011). This compilation includes some historical satellite images of the reef area around Iao Stream. Of particular note is an image taken in 1960 showing a large sediment plume coming from Iao Stream (Figure 15). This image is evidence of historical sediment impacts for at least 50 years. Anecdotal observations have been reported about episodes of sea urchins (*Echinothrix* sp.) dying and washing on the shore. These episodes were reported near Paukukalo, Maui (located at the bay in-between Waiehu and Iao Streams) in the 1980s after heavy flow from Iao Stream, suggesting a correlation between events (Skippy Hau, pers. comm.). An understanding of the historical changes to this area is important in developing mitigation for any future projects.

Turtles

Green Sea Turtle, *Chelonia mydas*, presence has been documented within the area of Iao Stream and northern Maui and this species has been reported to nest at several locations on northern Maui (Figure 16) (S. Hau, unpublished data). These locations include Waihee and Waiehu, with the Waiehu nesting site very close to Iao Stream (small beach in between Waiehu and Iao Streams) (Parker and Balazs, 2010). However, these areas are not routinely monitored and it is presumed that the incidence of turtle nesting is under-reported. If turtles have been reported to nest within an area, it should be assumed that they could nest again within the vicinity of the reported nesting location. Turtles were sighted offshore during the Phase 1 surveys. Additionally, the area around Iao and Waiehu has been categorized as having a high incidence of fibropapillomatosis, a tumor-forming disease (Van Houtan *et al.*, 2010). This disease has been shown to be elevated in areas with increased coastal eutrophication (Van Houtan *et al.*, 2010).

Hawksbill Turtles, *Eretmochelys imbricata*, have not been reported to nest along the northern coastline of Maui (Parker and Balazs, 2010). However, Olive Ridley, *Lepidochelys olivacea*, turtles have been reported to nest at Paia, Maui (Parker and Balazs, 2010; Balazs and Hau, 1986).

Observations from Phase 1 Survey

The area in the vicinity of Iao Stream includes three discreet reef areas. These include an inshore reef, surf zone, and spur-and-groove reef (Figure 17). This Phase I survey was only able to map resources in the inshore reef and spur-and-groove habitats due to high swells in the surf zone. Detailed observations are discussed for each area below.

Inshore Reef

The inshore reef area consisted of the shallow bay immediately to the west of the mouth of Iao stream. The Phase I surveys included photo documenting the inshore reef area as well as qualitatively describing the benthic cover within the area. The area was fairly homogenous in habitat type and is represented by geo-referenced photographs in Figures 18–19. The area was dominated by filamentous turf algae growing over small boulders and cobble. Coral was present, but scarce (<<10% cover) and scattered across the area as shown in Figure 3. Coral species observed included *Montipora patula, Montipora capitata, Montipora flabellata, Porites lobata, Porites compressa, Pocillopora meandrina, and Pocillopora damicornis*. Figure 4 shows zoanthids were very rare and largely absent from the area. Macroalgae were present, but not in high abundance or biomass. Figure 5 shows the cover of macroalgae to be less than 10% in some areas, but greater than 10% in others. The invasive alga, *Acanthopora spicifera*, was observed in low abundance within the bay. Macro-invertebrates were observed, as well as a few surgeon fishes. Turtles were not observed in the Inshore Reef area during the Phase I surveys.

The benthos was covered with a fine layer of dark colored sediment likely originating from the terrestrial environment. Visibility in the water column ranged from approximately 0.5–1 m (1–2 feet) up to 3 m (10 feet). The lowest visibility was within what seemed to be a semi-permanent turbid plume located perpendicular to shore in the central section of the Bay. This semi-permanent turbid plume can be seen from Google images and also correlates with an unknown designation in the NOAA Benthic Habitat maps (Figures 9–13). This plume may represent the transport of suspended sediment out of the bay from which from both Iao and Waiehu Stream waters enter and mix with the marine environment.

Spur-and-Groove Reef

A spur-and-groove reef area was found immediately offshore of the Iao stream mouth beyond the surf break, located along the coastline extending north-northwest (NNW) and south-southeast (SSE). This area consisted of highly three-dimensional topography. The ridges (spurs) of carbonate structure and intervening sand channels (grooves) were oriented parallel to the dominant wave-approach direction and perpendicular to shore. The spur-and-groove area found within the vicinity of Iao Stream extended beyond the scope of the surveys both to the NNW and SSE.

Phase I surveys included photo documenting the area as well as estimating the benthic cover within the area. The area was fairly homogenous in habitat type and is represented by geo-referenced photographs in Figures 20–21. The estimation of benthic cover shows the spur-and-groove area was dominated by coral with the majority of the area having approximately 10% to 80% coal cover as shown in Figure 3. In Figure 3, note the method of interpolation may overestimate the coverage of coral due to few data points taken in sandy areas. The area was also dominated by the presence of zoanthids, *Palythoa caesia*, at less than 10% cover as shown in Figure 4. The common corals included *M. patula, M. capitata, M. flabellata, P. lobata, P. compressa, and P. meandrina*. Less common but also present were *P. damicornis, Pocillopora eydouxi*, *Pavona varians*, *Pavona duerdeni*, *Porites lichen* and *Fungia scutaria*. The dominant zoanthids included *P. caesia* and *Zoanthus sp*. Soft coral observed included *Sinularia densa* found in a patch on one of the ridge tops, and small colonies of *Carijoa riseii* near some ledges. A complete list of observed corals is shown in Table 1 along with coral species observed in previous studies of the coastline. The species list shown in Table 1 does not represent a comprehensive inventory. Hard corals were mostly encrusting in morphology (*M. patula, M. capitata, M. flabellata*), especially along the tops of the ridges. Along the edges of the spurs, colonies were often plate-like (*Montipora spp.*). Sub-massive (*P. lobata*) and branching morphologies (*P. compressa and P. meandrina)* were also present. Several of the observed corals have been petitioned to be listed under the Endangered Species Act including *M. patula*, *M. flabellata*, *P. stellata*, *Cyphastrea ocellina*, *Leptoseris incrustans* (Sakashita and Wolf, 2009). Other petitioned corals not observed, but which may be present include *Cyphastrea agassizi*, *Porites pukoensis*, and *Montipora dilitata*. Crustose coralline algae (CCA) were observed mostly in encrusting from, and less commonly in discrete foliose form. CCA, macroalgae, and filamentous turf algae were present across all ridges. Macroalgae cover in the area was generally sparse, but occasionally present in less than 10% cover as shown in Figure 5. Macro-invertebrates were observed, as well as several families of fishes. In particular, lobsters of significant size (near terminal size) were observed on multiple occasions. Small Green Sea Turtles, *C. mydas*, were rarely seen and appeared to be skittish when observed.

Fine sediment (a mix of terrestrially derived fines and carbonate derived sand) was present in the system and most conspicuous where it had settled on top of filamentous turf. Visibility varied from 1–5 m (3–15 feet), with waters southward being clearer, and waters northward being more turbid. Suspended sediment and decreased visibility appeared to be more prevalent at deeper ends of spurs. Typically, a layer of suspended sediment was observed hovering the bottom in sandy areas both in deeper water (~ 15 m (50 feet)) and in-between spurs.

Surf Zone

The area of reef in-between the inshore reef area and the spur-and-groove reef area largely represents the surf zone. This area is prone to large winter north swells as well as intermediate sized waves during summer trade winds. This area was observed to be a high energy habitat during the Phase 1 surveys while the weather conditions were mild and is known to generally be a high energy area (Patrick C. Caldwell, National

Oceanographic Data Center Honolulu, pers. comm. 7/15/2010). Surveys were not able to be conducted within this zone due to swells during the survey period. However, based on observations of the seaward side of the inshore reef area and the inshore side of the spur-and-groove area, we presume this surf zone has a decreased amount of coral cover and probably has seasonal variation of macroalgae. It is assumed the spur-and-groove area extends into the surf zone area from a habitat perspective. The significance of this area lies in its potential importance for certain species of fishes. The HDAR has a HAFA survey location within this surf zone to monitor fish abundance (Figure 6).

Other

An additional reef area exists approximately 1.6 km (1.0 mile) off shore of Iao stream. The NOAA Benthic Habitat Maps show coral reef and hard bottom habitat to exist a significant distance off shore (Figures 6 and 10). NOAA's TDS conducted at this location (Figure 6) validates this habitat and shows a high percent coral cover of 63% (CRED, unpublished). While this habitat was not surveyed during this Phase I survey, it is suggested that this area be mapped if additional surveys are to be conducted.

PROJECT IMPACTS

Impacts to the marine area surrounding Iao Stream that may result from the proposed stream construction action are difficult to predict. The spur-and-groove area located in the immediate vicinity of Iao Stream was observed to have a high abundance of coral by Hawaii standards, given that the Coral Reef Assessment and Monitoring Program indicates that average coral cover in the Main Hawaiian Islands is approximately 22% (CRAMP, 2008). Additionally, the area was observed to have generally low water visibility (1–5 m (3–15 feet)) and signs of sedimentation. While there was little sedimentation found on the carbonate structures of the spur-and-groove, suspended sediment was otherwise apparent across the area. An increase in suspended sediment may reduce water clarity further, which can have a number of impacts on the ecological processes of the reef. The chronic deposition and resuspension of sediment can also have additional impacts on ecological processes (Rodgers, 1990; Fabricius, 2005). Potential impacts can be lethal and sub-lethal and may include an increase in coral mortality, a decrease in coral and other organism recruitment success, a decrease in coral fecundity, a decrease in coral growth rate, the alteration of bioerosion processes, an increase in disease in marine fauna, an increase in nutrients coupled with algal blooms, and a reduction in suitable habitat for coral reef organisms (Rodgers, 1990; Grigg and Dollar, 1990; Nugues and Roberts, 2003; van Katwijk *et al.*, 1993; Gilmour, 1999; Babcock and Smith, 2000; Fabricius, 2005; Weber *et al.*, 2006). Hence, a further increase in sedimentation and turbidity resulting from sediment transfer due to the project may contribute to coral reef decline within the area.

RECOMMENDATIONS

The following recommendations are provided by the U.S. Fish and Wildlife Service (USFWS) in coordination with the National Marine Fisheries Service (NMFS) and the

Hawaii Department of Land and Natural Resources, Division of Aquatic Resources (HDAR):

1) The Army Corp of Engineers (ACOE) should evaluate the risk of increased turbidity and sedimentation being transferred to the marine environment from fine particulates for each project alternative. This can be achieved by developing a sediment transport model consisting of information from existing conditions within and adjacent to the stream corridor within the influence of floodwaters. Model parameters can be projected for each project alternative and stream component modification to estimate changes in sediment transport. This assessment should include sediment data collection on current baseline conditions under normal and peak flows (to the extent peak flows can be estimated and monitored) and the contribution from each stream feature or characteristic such as stream bed, sedimentation basin contours, stream flow obstructions (natural or man-made), stream bank morphology, composition and character, and any other stream design feature. Sediment data collection should include the type and size of sediment that is transported through various sections of the stream and that is potentially deposited in the marine environment.

2) The ACOE should consider alternatives that minimize sediment transport to the marine environment to the maximum extent practicable. Options that minimize sediment transfer and simultaneously do not present other environmental problems should be considered priority design criteria. Actions that increase ground water recharge and drainage retention while minimizing the use of storm drain, or relict irrigation ditch systems should be considered. Examples of options include: 1) construction of strategically located sediment trapping basins, or 2) maintaining or emulating a natural stream bottom or permeable substrate. These approaches would decrease the volume of sediment laden flood water transported by channelized areas that would normally be directly shunted to the marine environment.

3) The ACOE should evaluate the impact to the marine environment from potential changes that may occur in the sediment rate and sediment load as well as potential increases in eutrophication. Potential marine impacts include sedimentation (smothering of coral and other benthic organisms) and turbidity (suspended fine sediments), which can result in a reduction of coral health via decreased light availability, increases in algal growth and decreases in coral cover, changes in organism diversity and abundance, changes in the composition of sand/sediment, increased incidence of disease in corals, fishes, turtles or key invertebrates, and any other biological or habitat changes. To better understand these impacts, we recommend a Phase II survey be conducted near the mouth of Iao Stream as well as on the reef directly offshore to measure and document coral reef conditions.

4) The ACOE should consider quantifying contribution of fine sediment and sediment-related impacts to coastal marine waters and associated coral reefs from Waiehu stream. If it is found that this stream is a significant source of

sedimentation to the local coral reef, actions to reduce sediment inputs could be considered partial mitigation for impacts of the Iao Stream project.

5) The ACOE should consider taking actions to minimize sedimentation and erosion through a broader watershed management approach. An analysis of the broader watershed to determine individual key threats that increase the likelihood of increased erosion will allow for targeted actions to be taken to minimize the transfer of sediment into Iao Stream, thereby reducing subsequent sediment transport to the marine environment. An example of an upper watershed action that could help to reduce future sediment load from erosion is to provide ungulate fencing and removal in certain forested areas.

SUMMARY OF POSITION

The summary of position is provided jointly by the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), and the Hawaii Division of Aquatic Resources (HDAR).

This Fish and Wildlife Coordination Act Report should be considered an Addendum Marine Habitat Characterization to the previous Phase I Supplemental Stream Survey, and its recommendations should be considered in addition to the recommendations from the report. The USFWS, NMFS, and HDAR are concerned with increased sedimentation in the marine environment around the mouth of Iao Stream as a result of this proposed project. Available information from similar habitats along the coast suggests that coral reef resources are in decline, and this Phase I survey detected high turbidity in the area around Iao Stream's mouth. Further investigation should be conducted to determine the current rate of sediment deposition from Iao Stream, and any potential increase resulting from the project. It is also important to further investigate the contribution of sediment from Waiehu Stream to determine the scale of deposition relative to Iao Stream.

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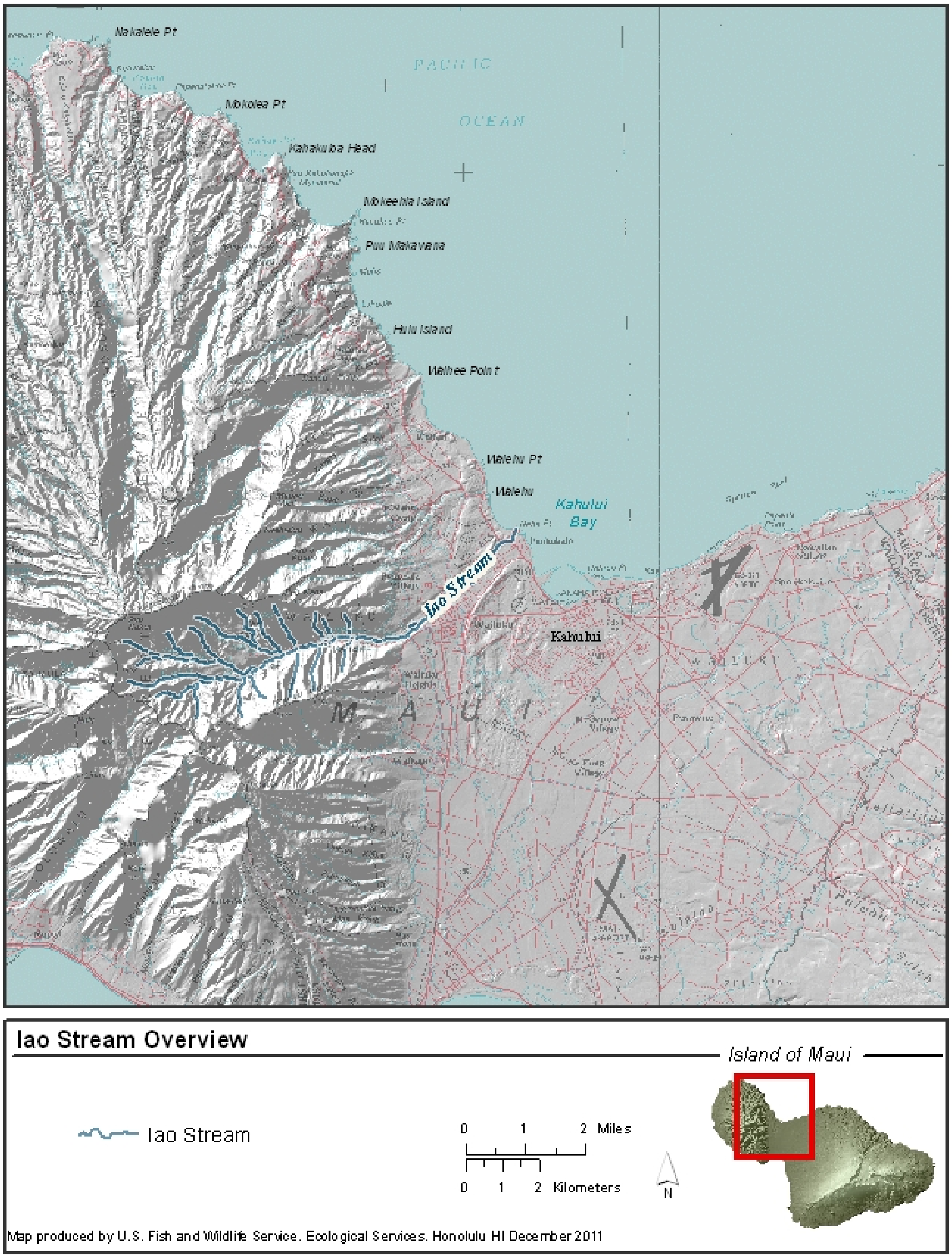

Figure 1. Map showing location of Iao Stream on the Island of Maui.

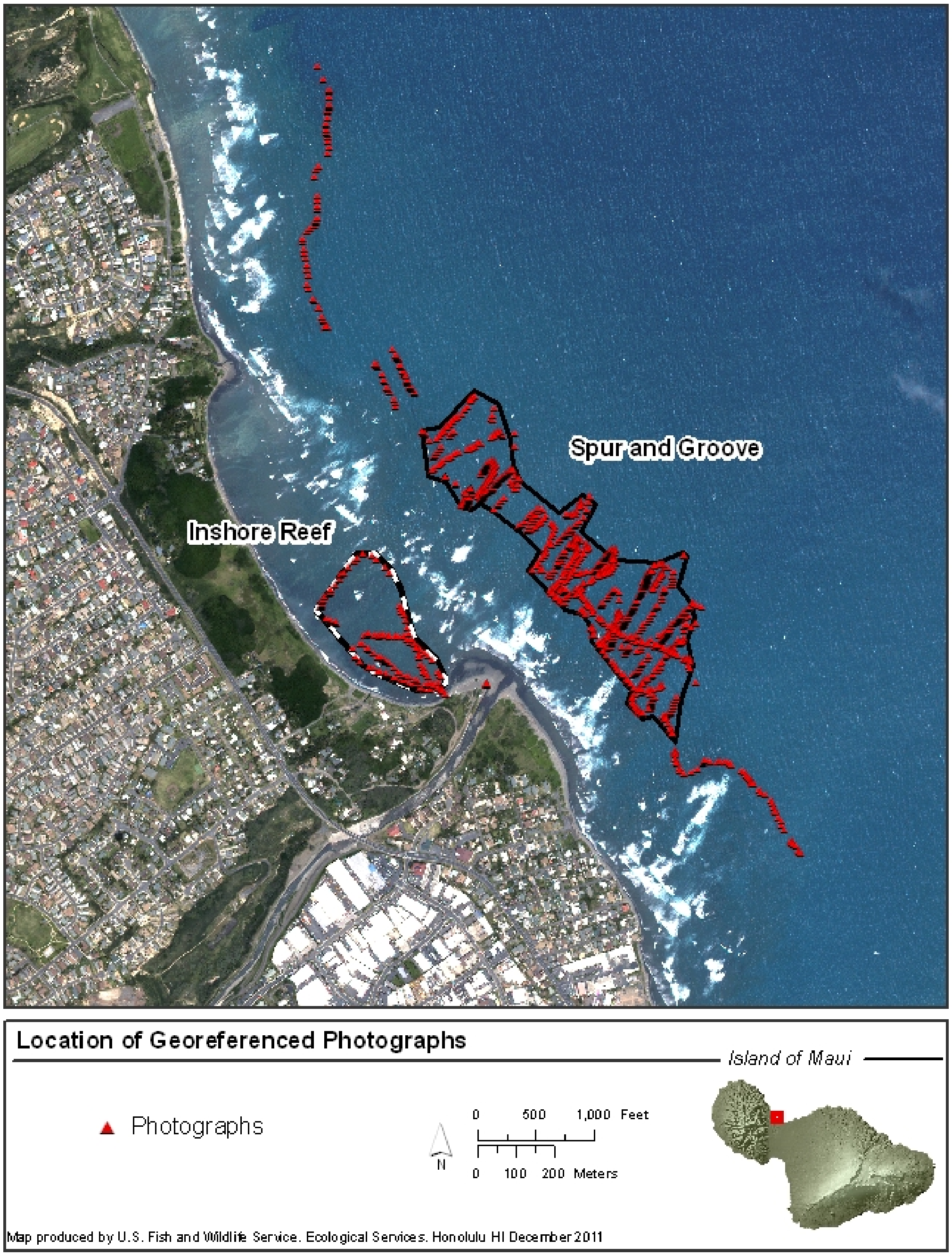

Figure 2. Map showing the location of all georeferenced photographs taken during the Phase I survey.

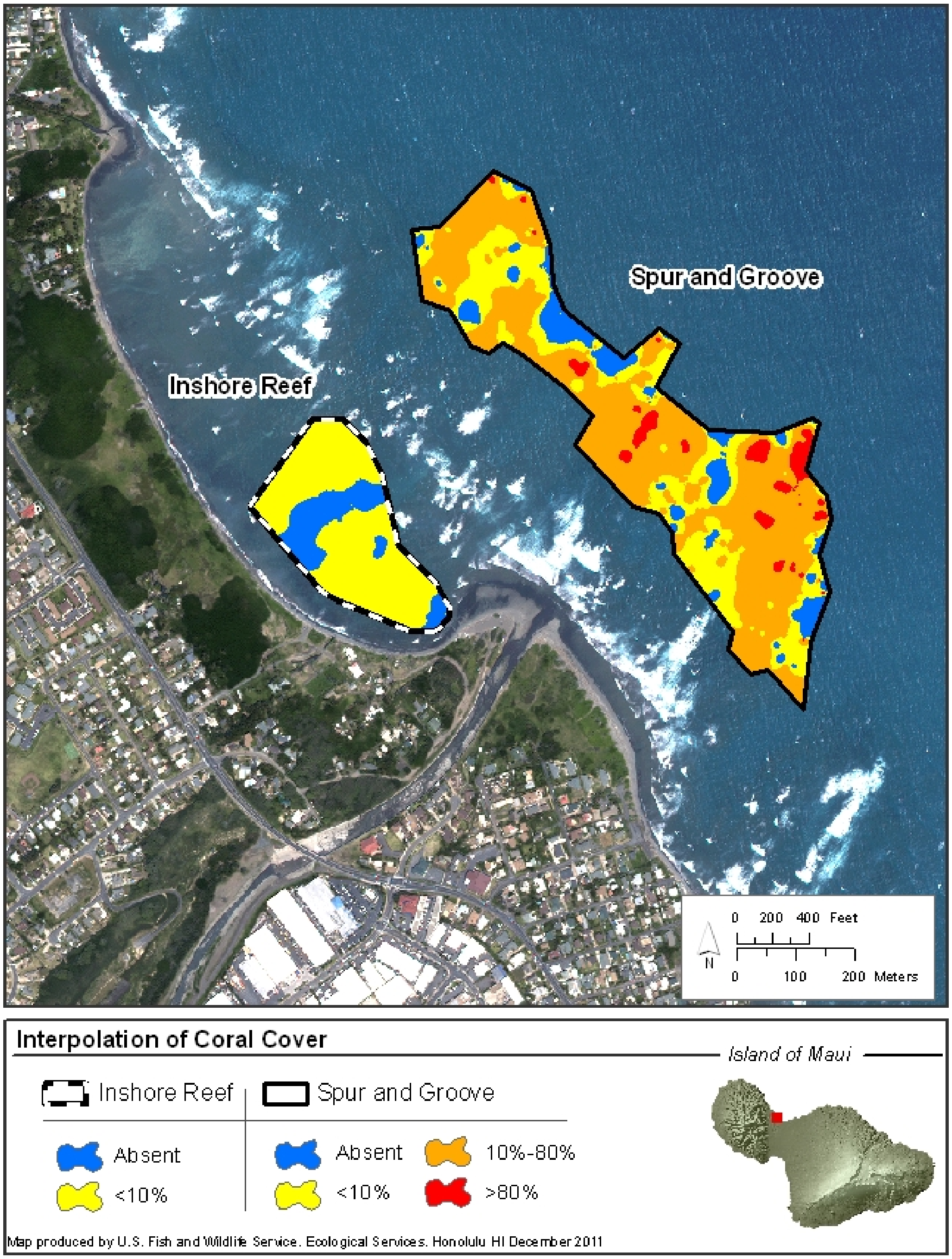

Figure 3. Map showing the interpolation of coral relative abundance data.

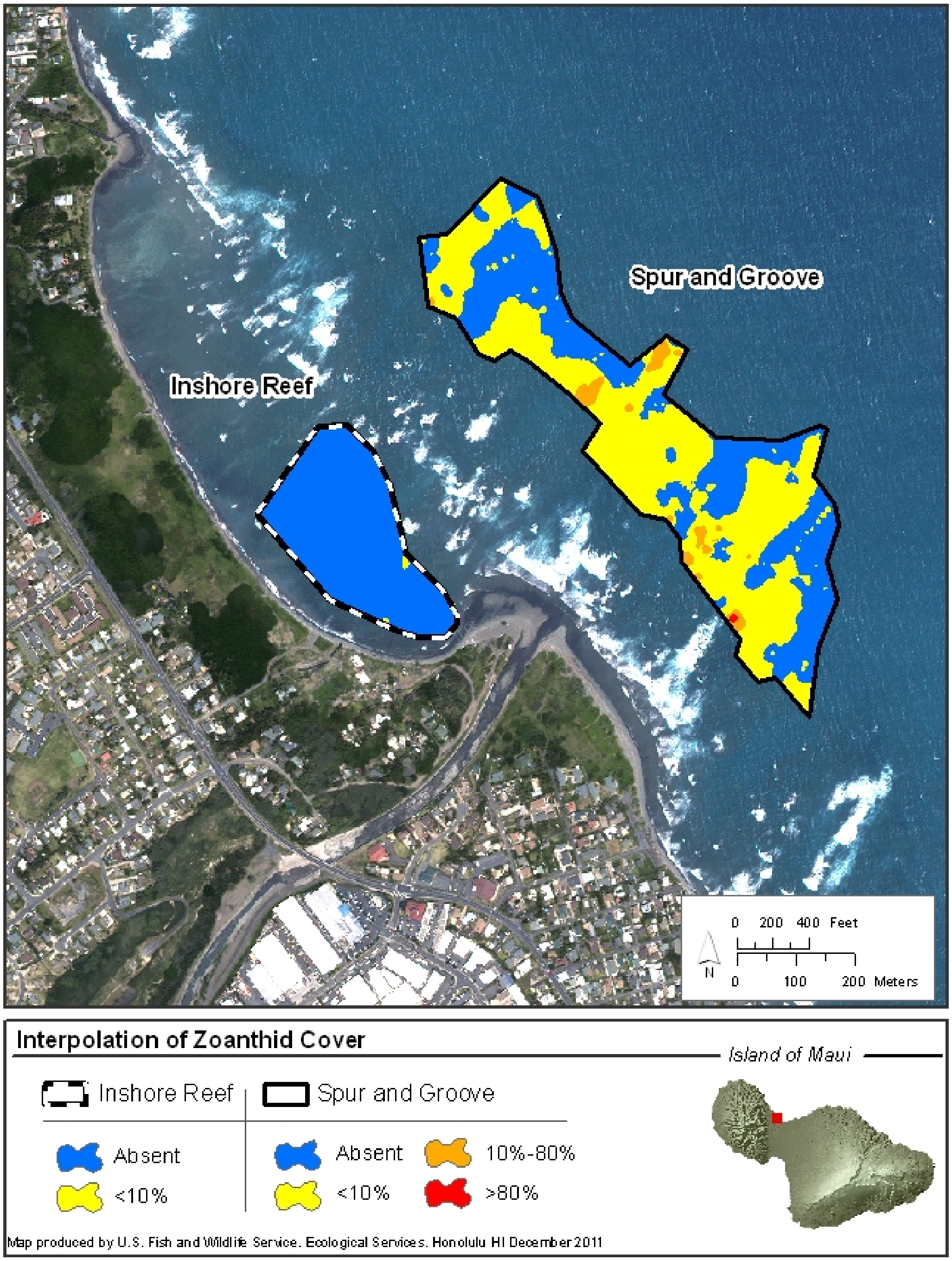

Figure 4. Map showing the interpolation of zoanthid relative abundance data.

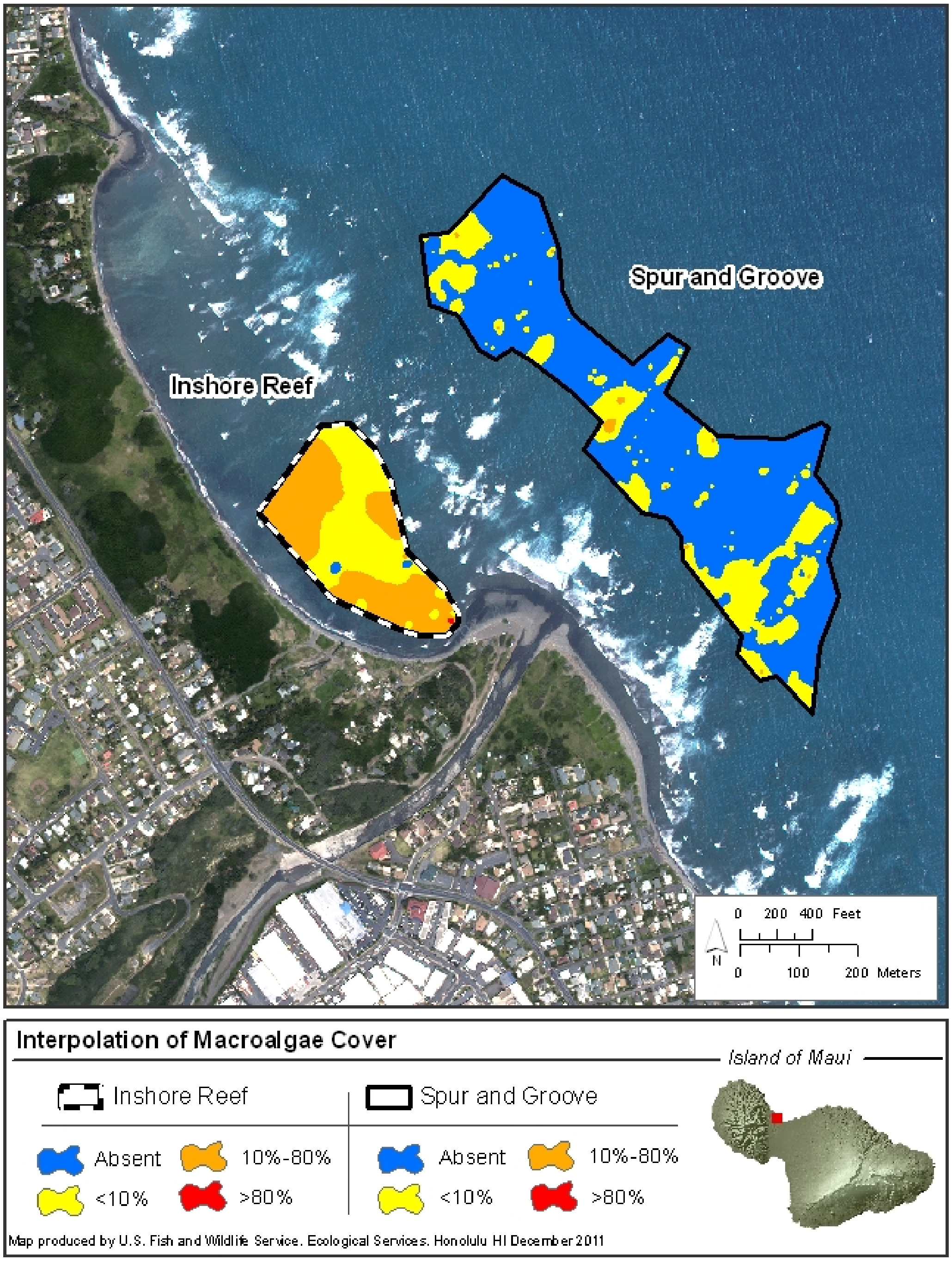

Figure 5. Map showing the interpolation of macroalgae relative abundance data.

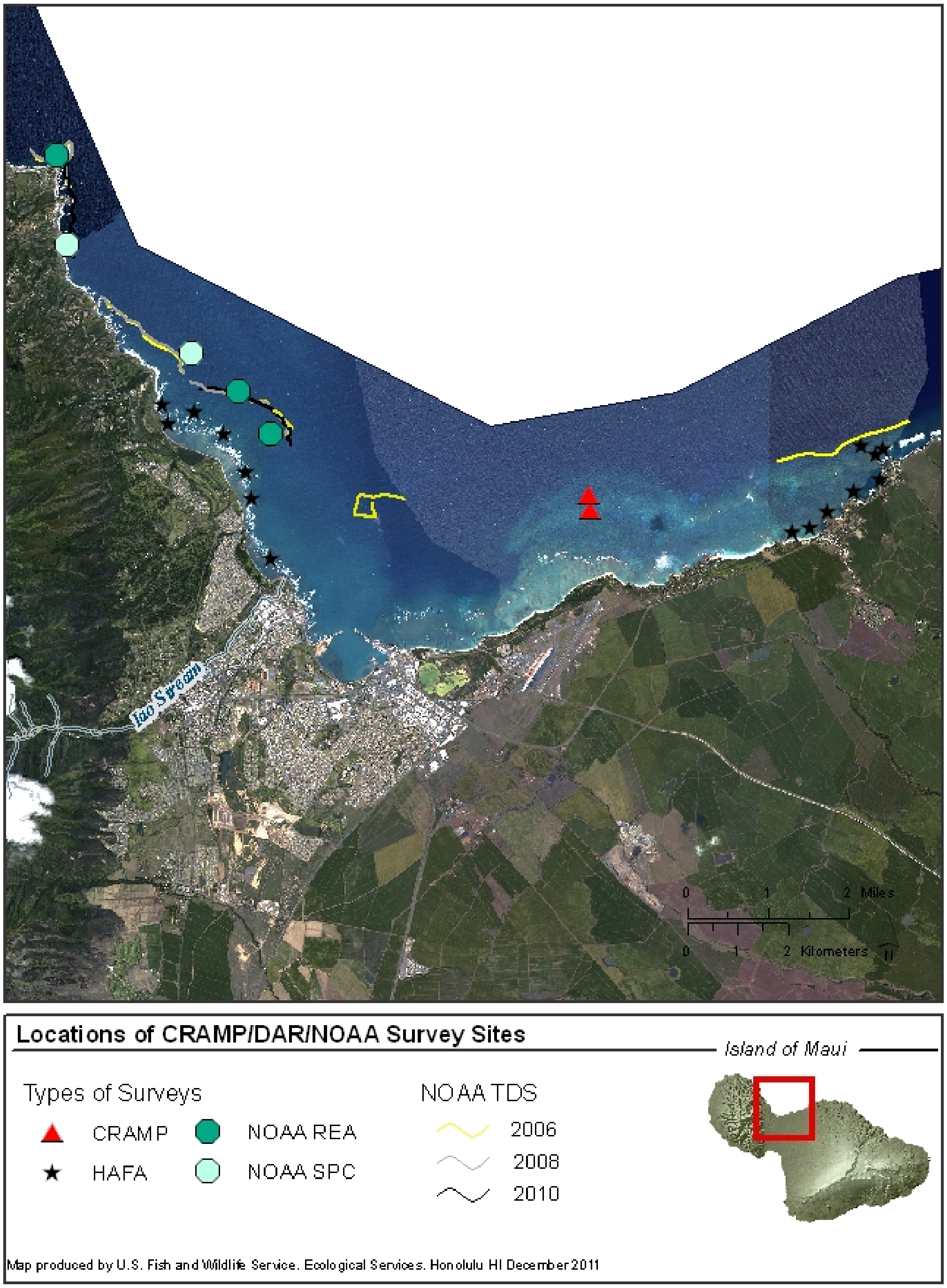

Figure 6. Map showing the location of other known surveys including CRAMP, HDAR HAFA, NOAA SPC, NOAA REA, and NOAA TDS.

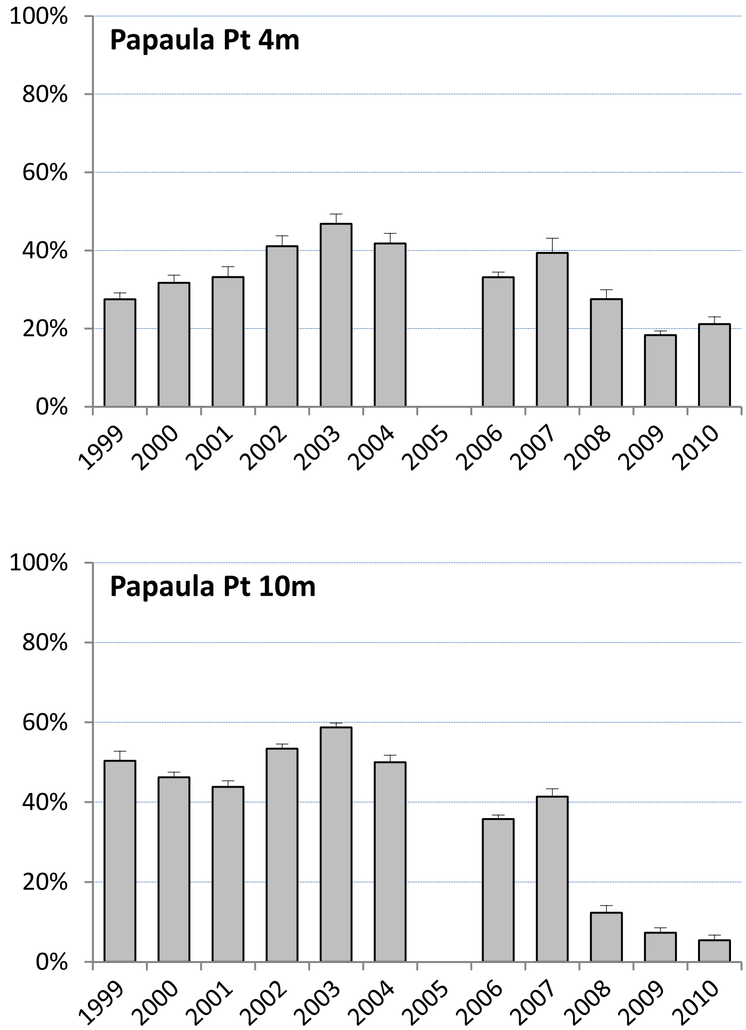

Figure 7. Graphs showing the percent coral cover over time from Papaula, Maui (Walsh *et al.*, 2010).

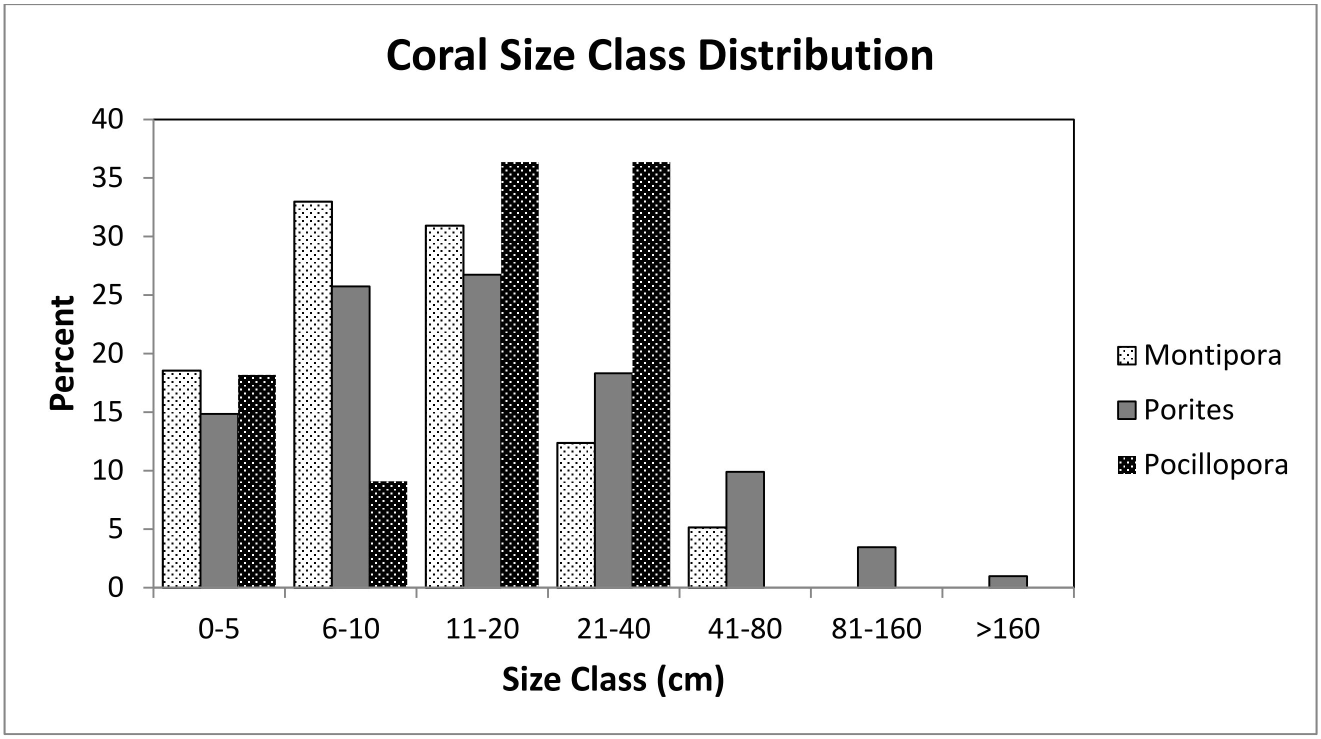

Figure 8. Graph showing the coral size class distribution for the closest NOAA REA site (MAI-21) to Iao Stream (NOAA unpublished data).

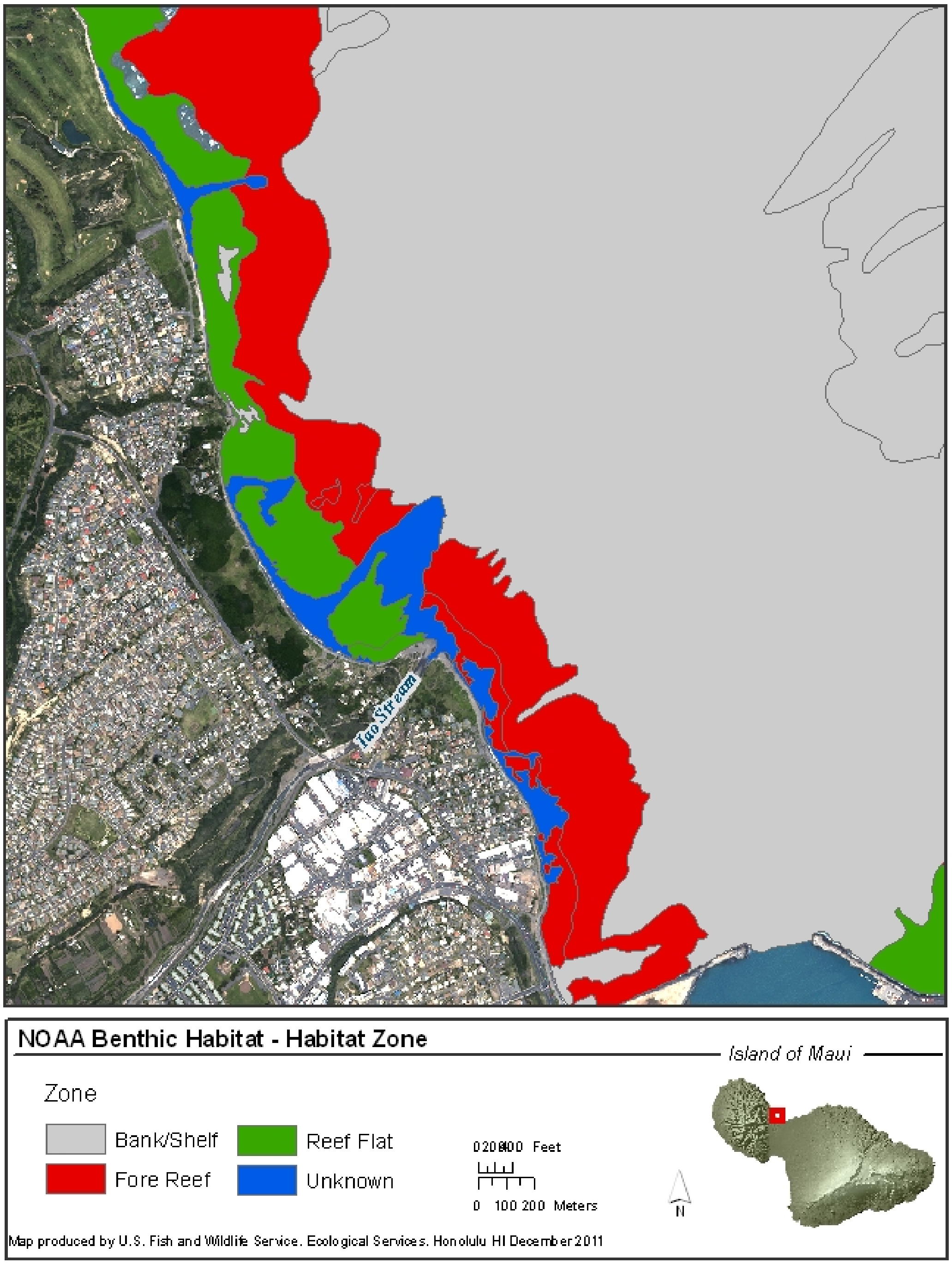

Figure 9. Map showing the NOAA's Benthic Habitat data for habitat zone.

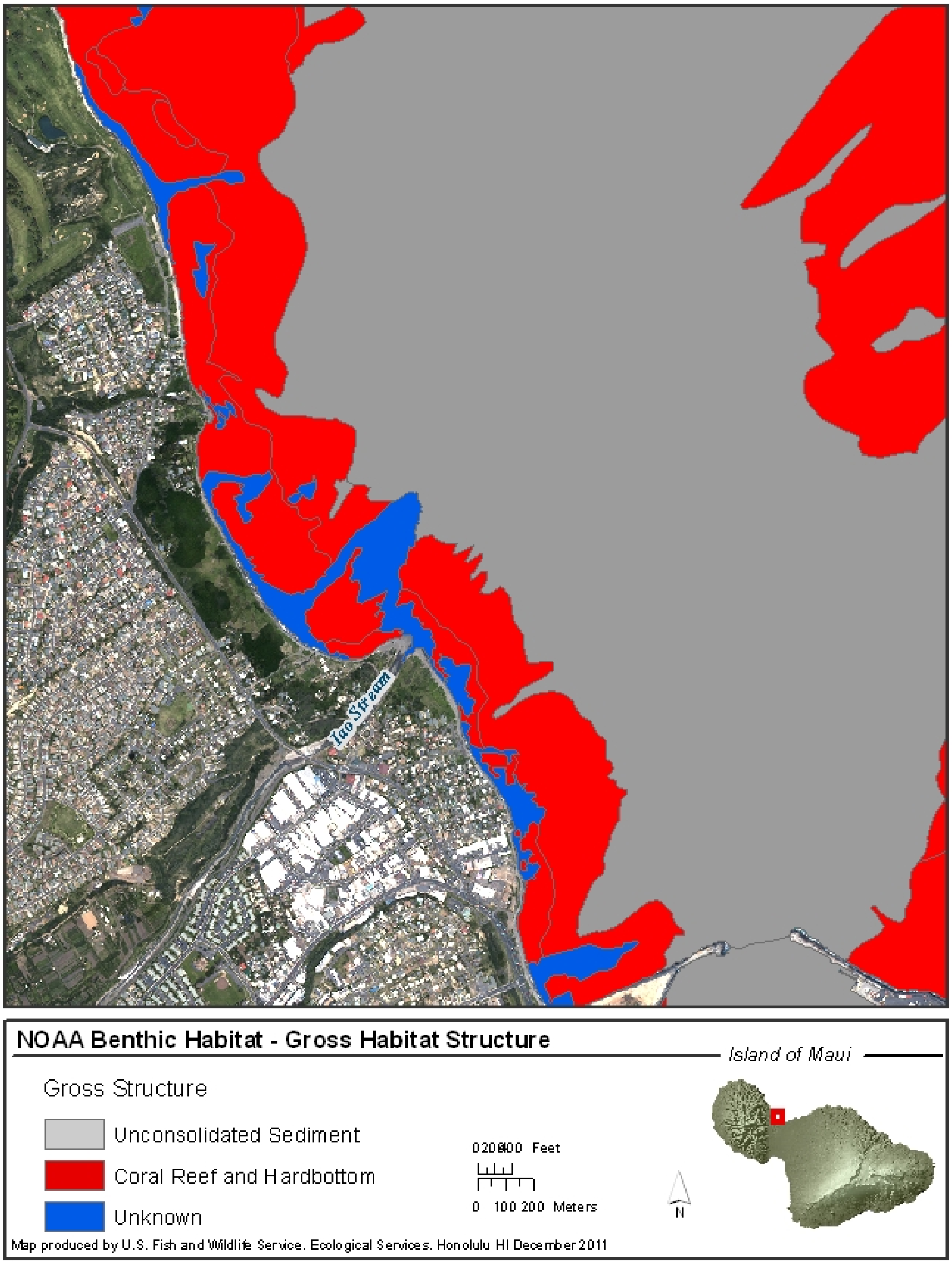

Figure 10. Map showing the NOAA's Benthic Habitat data for gross habitat structure.

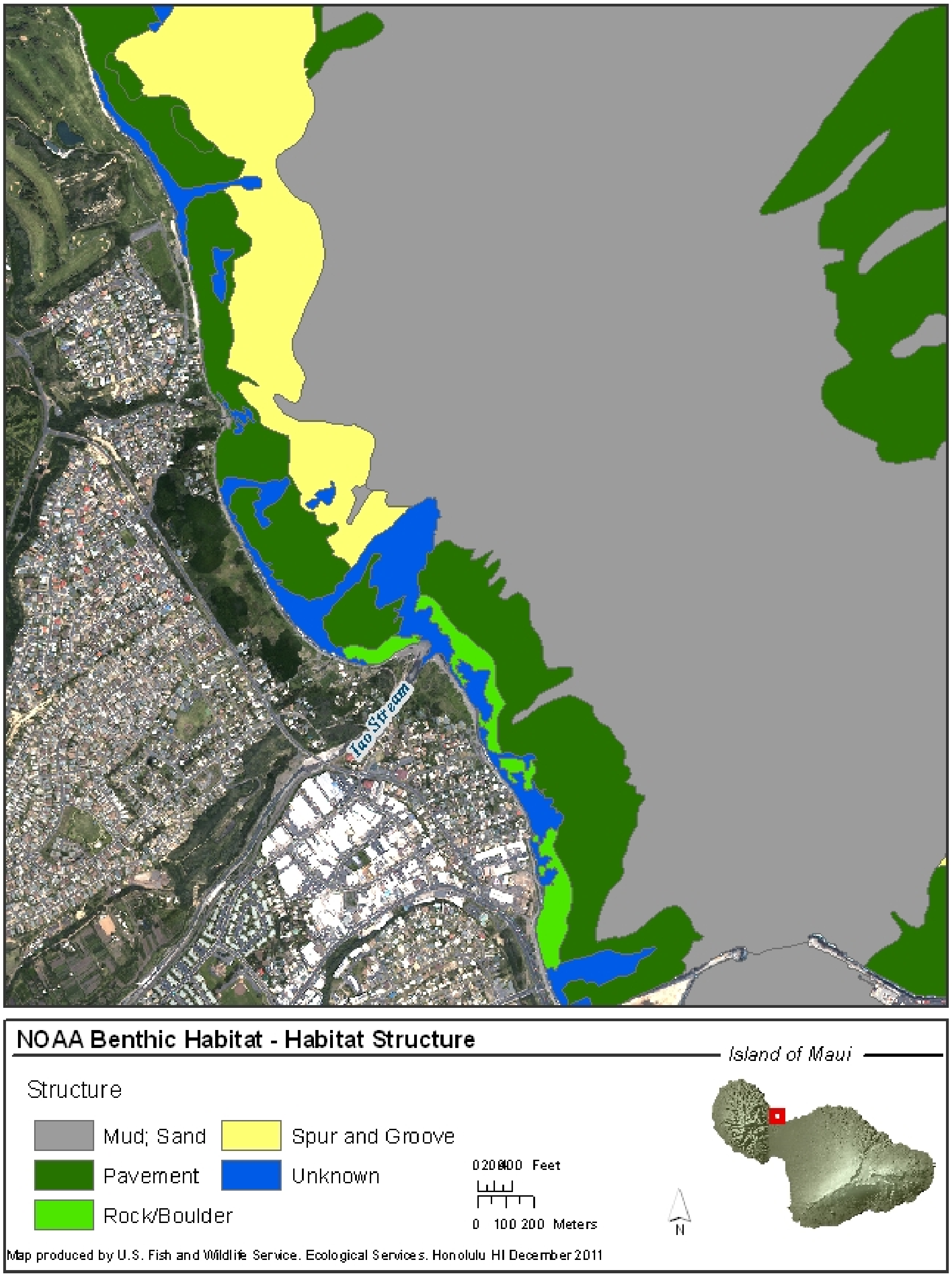

Figure 11. Map showing the NOAA's Benthic Habitat data for habitat structure.

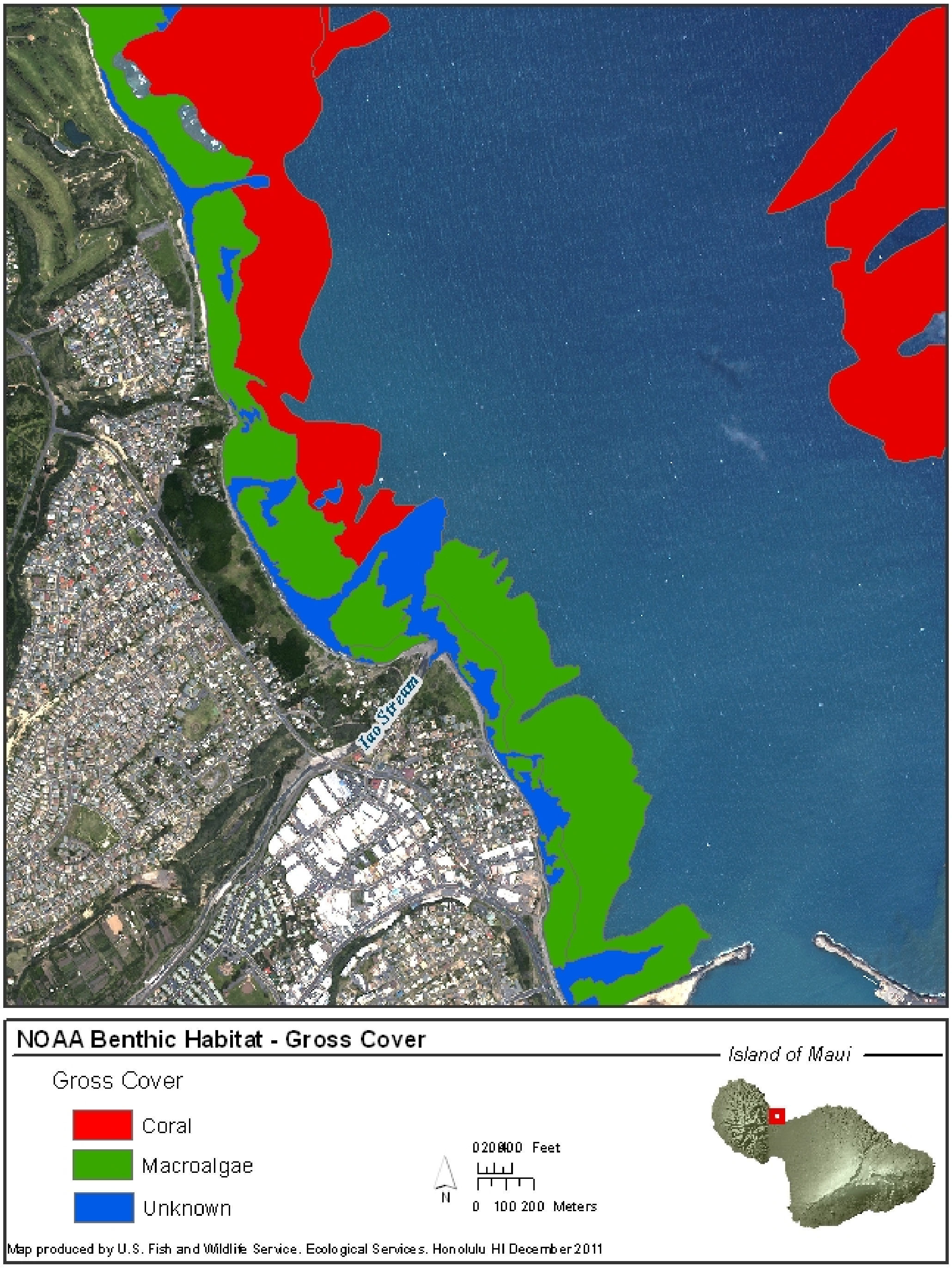

Figure 12. Map showing the NOAA's Benthic Habitat data for gross benthic cover.

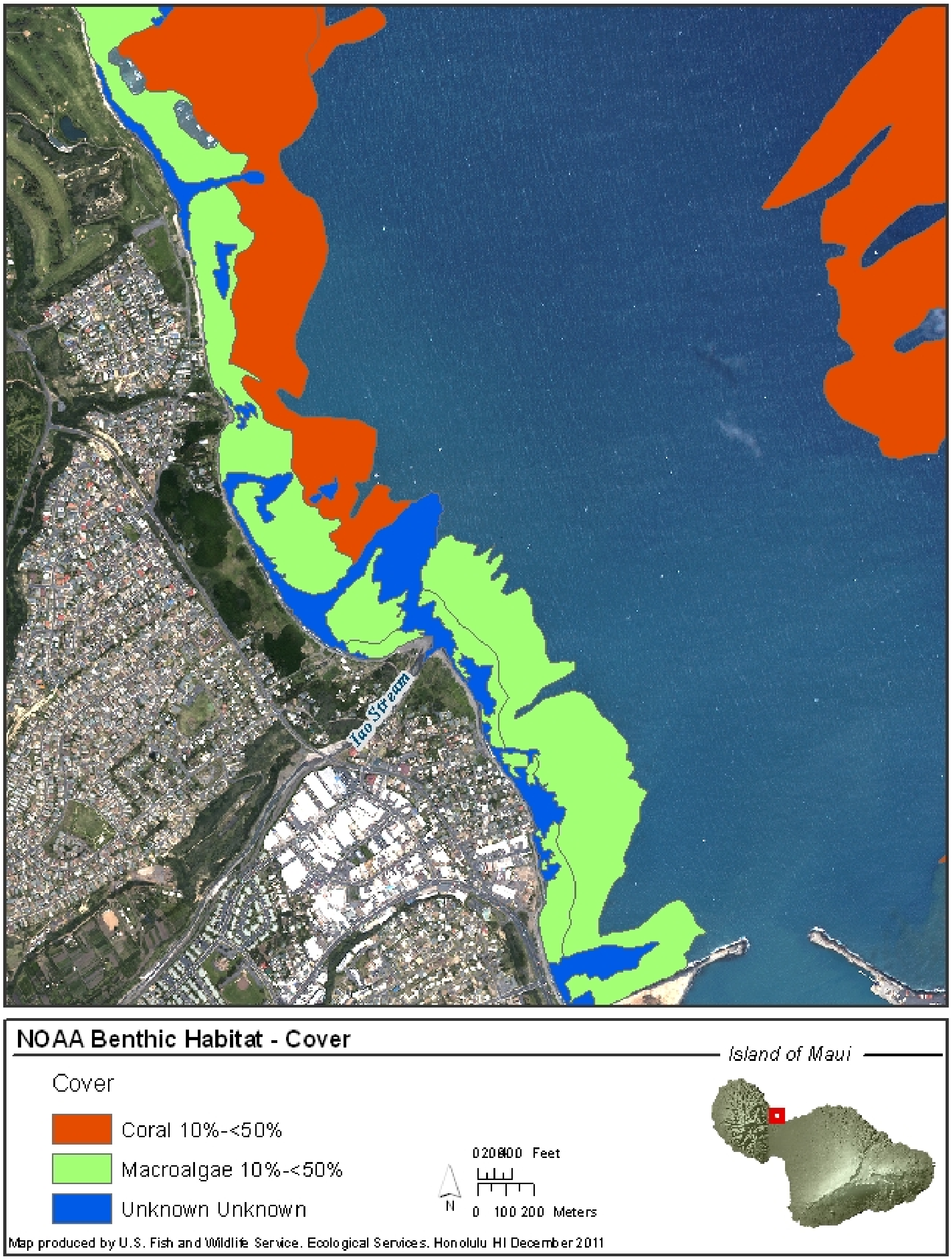

Figure 13. Map showing the NOAA's Benthic Habitat data for benthic cover.

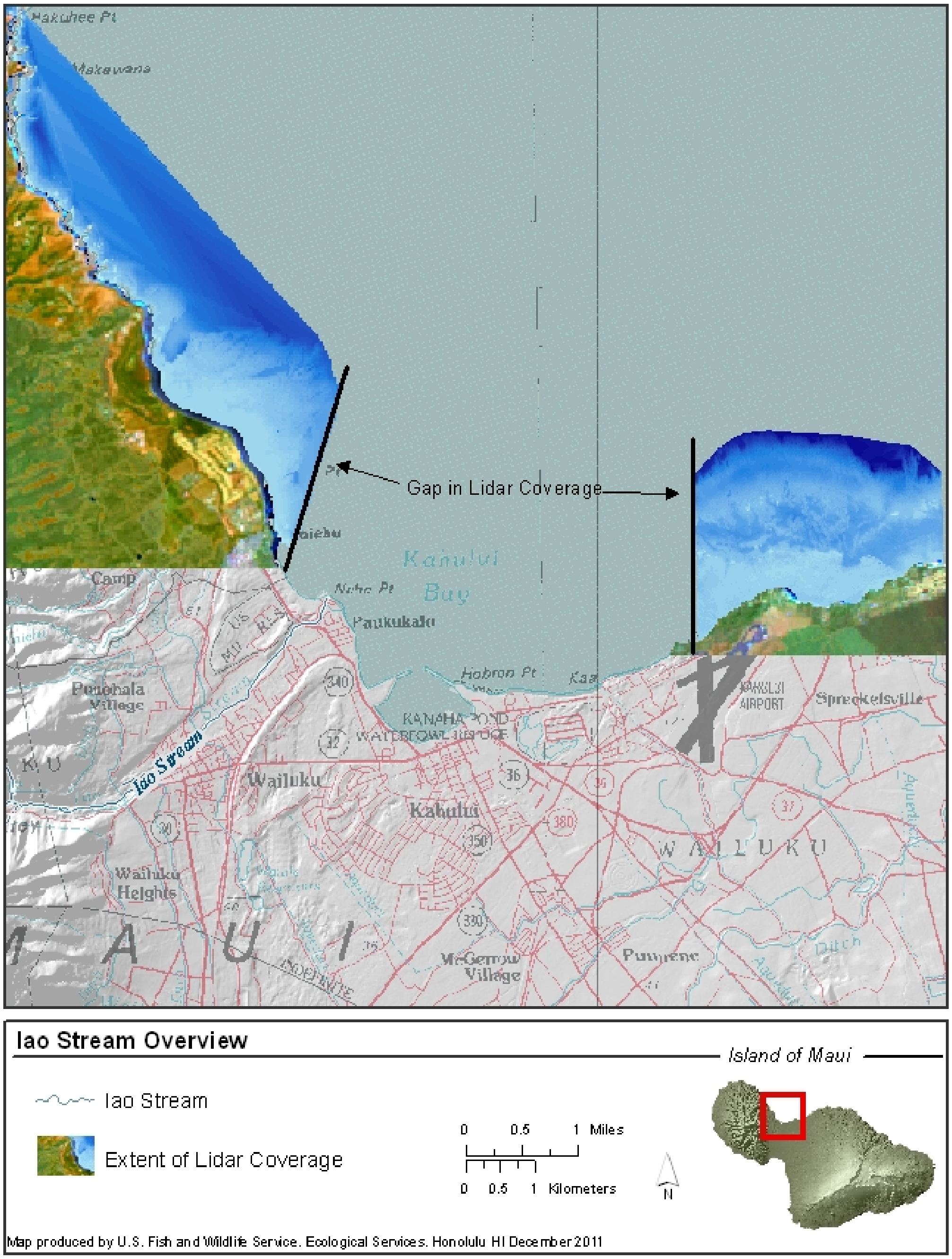

Figure 14. Map showing the gap in Lidar coverage for the marine area around Iao Stream.

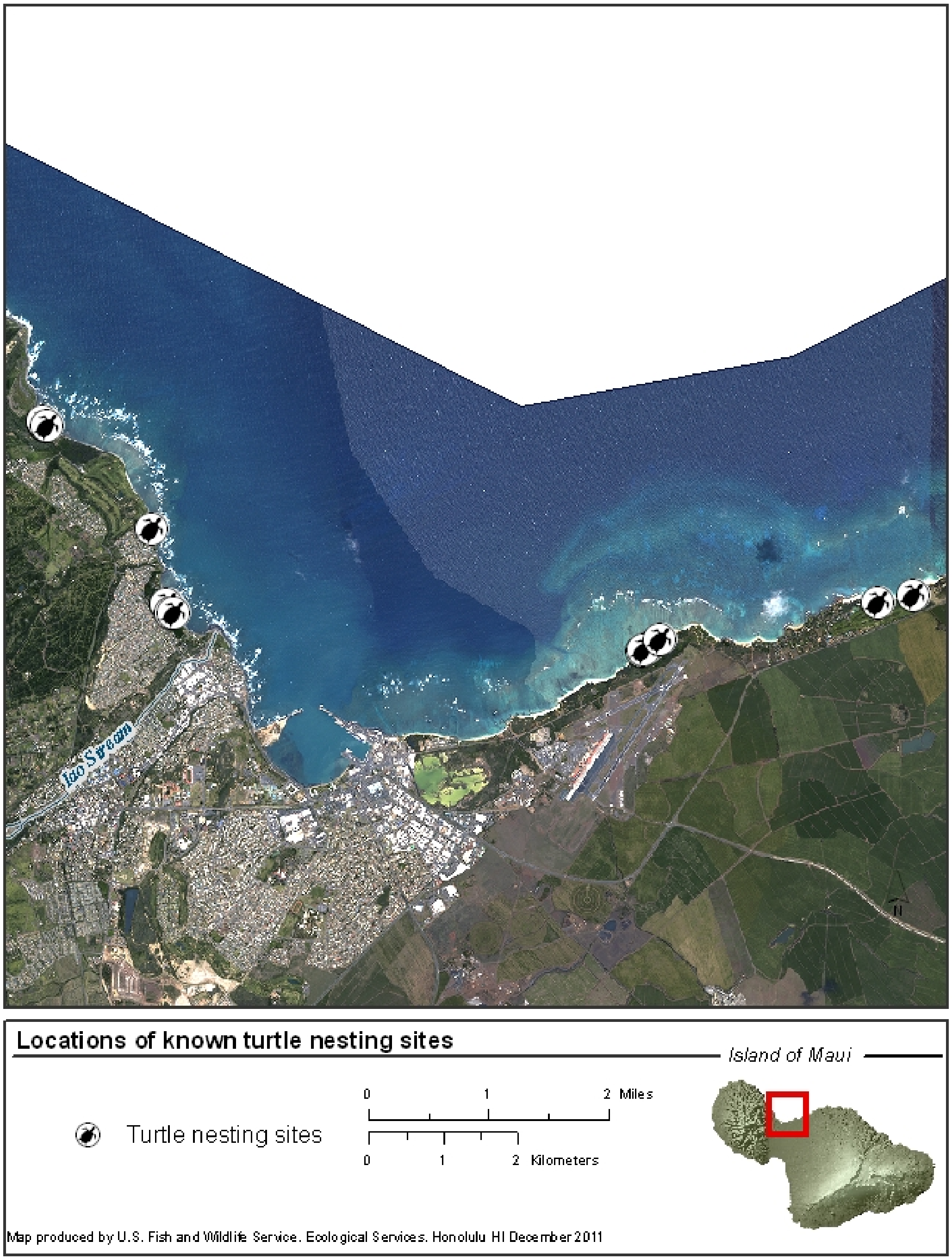

Figure 15. Map showing documented turtle nesting locations (S. Hau, unpublished data).

Figure 16. Map showing a large sediment plume in the marine area around Iao Stream in 1960.

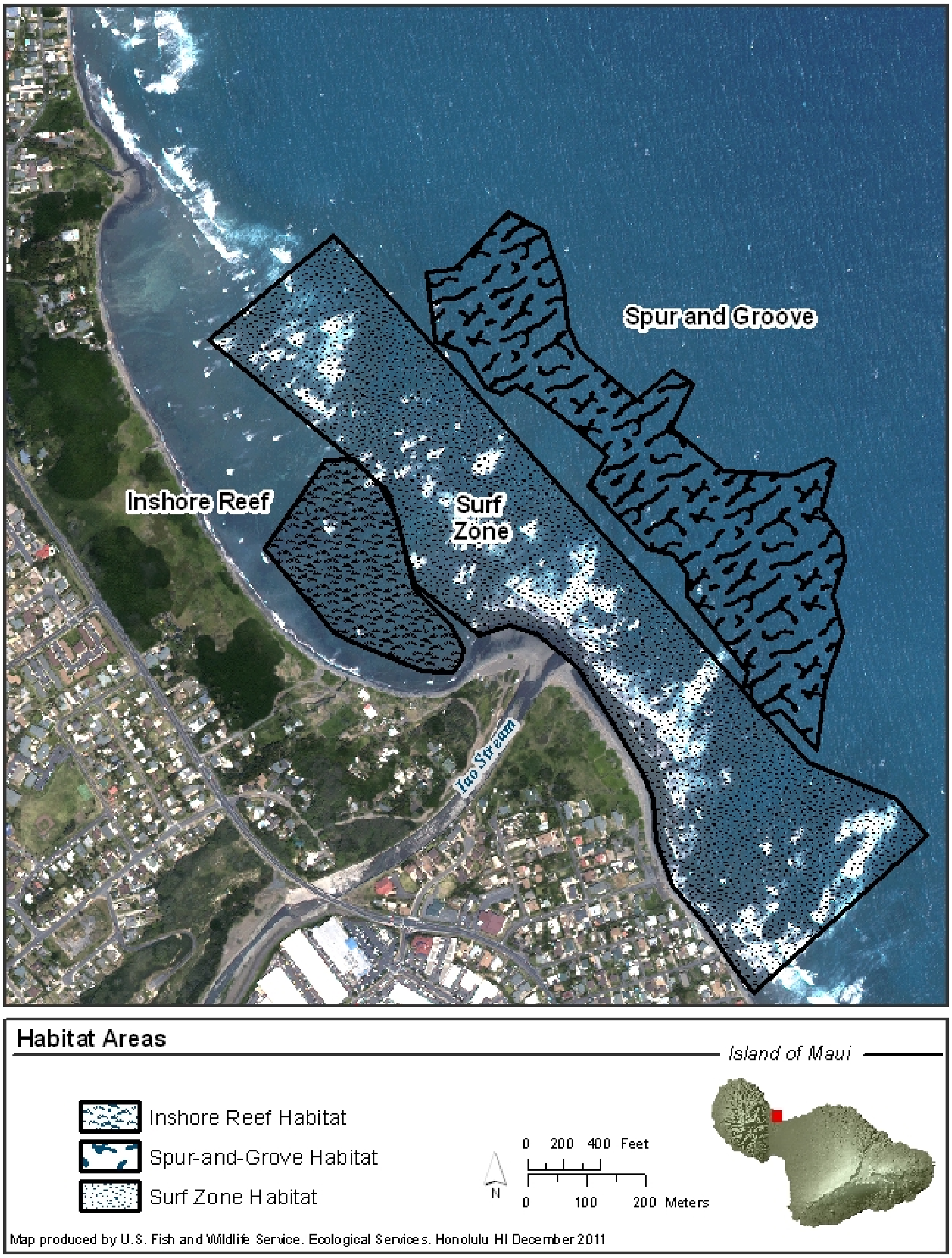

Figure 17. Map showing three designation habitats documented in this Phase I survey.

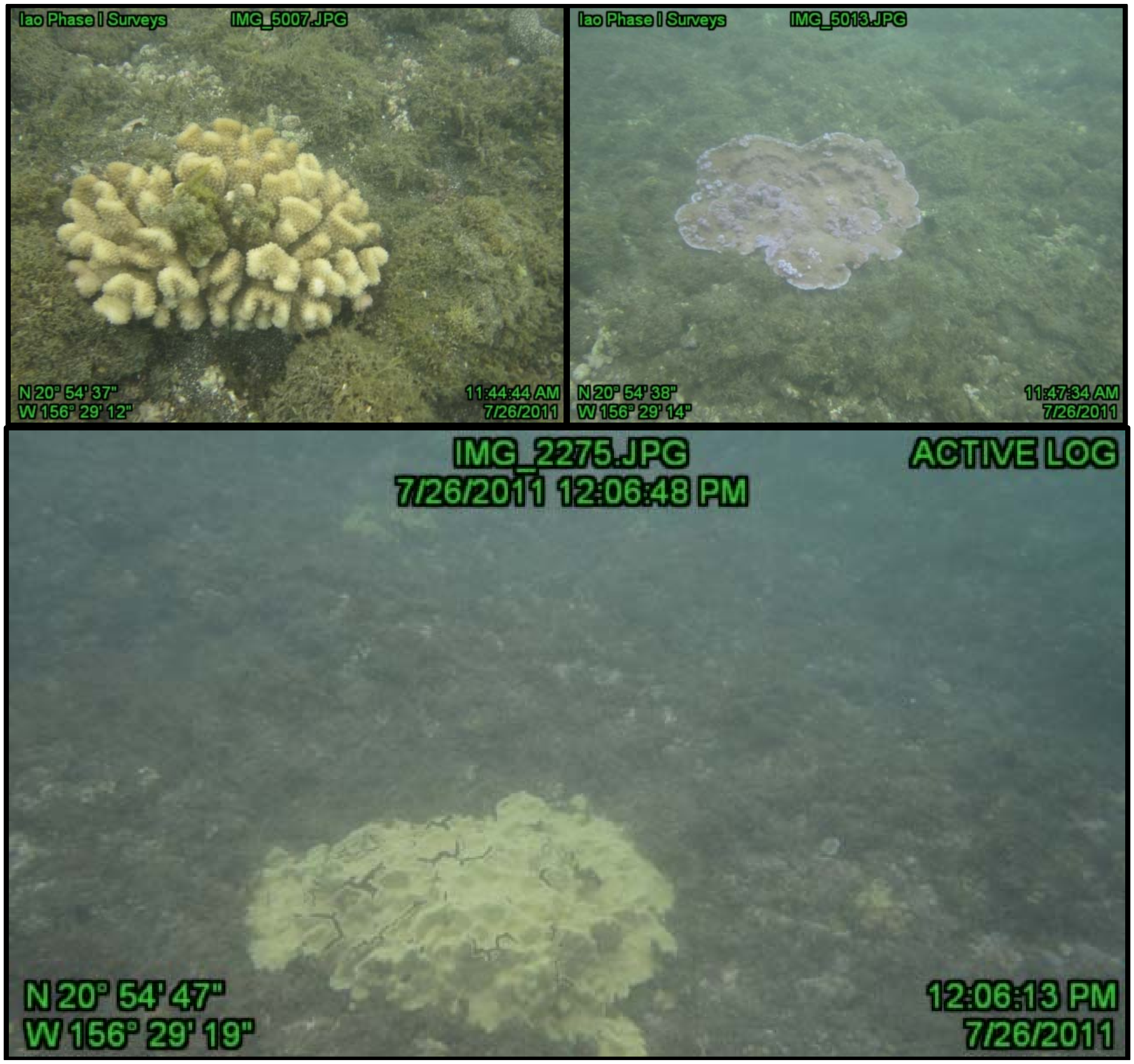

Figure 18. Images of coral from the Inshore Reef area. Upper left: *Pocillopora meandrina*. Upper right: *Montipora flabellata*. Lower: *Porites lobata*.

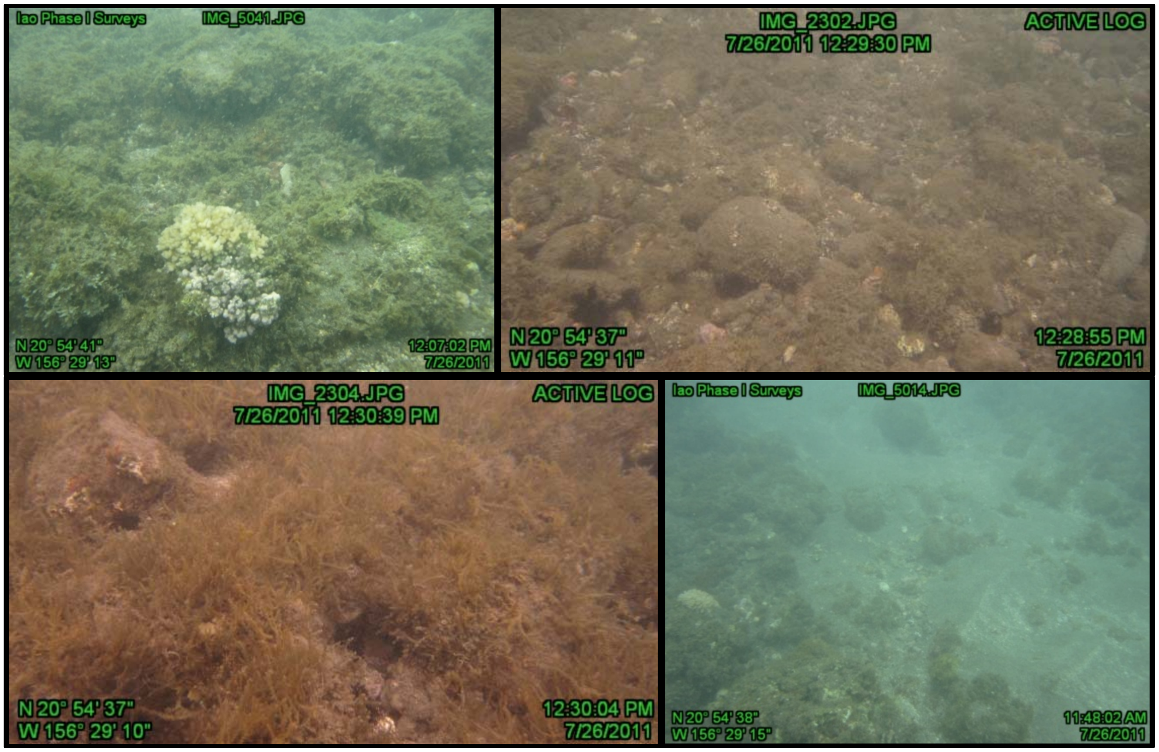

Figure 19. Images of habitat characteristics from the Inshore Reef area. Upper left: mix of macroalgal cover and sporadic corals (*Pocillopora damicornis*). Upper right: mix of sand and small boulders. Lower left: invasive macroalgae, *Acanthopora spicifera*. Lower right: small sandy area with small boulders and macroalgae.

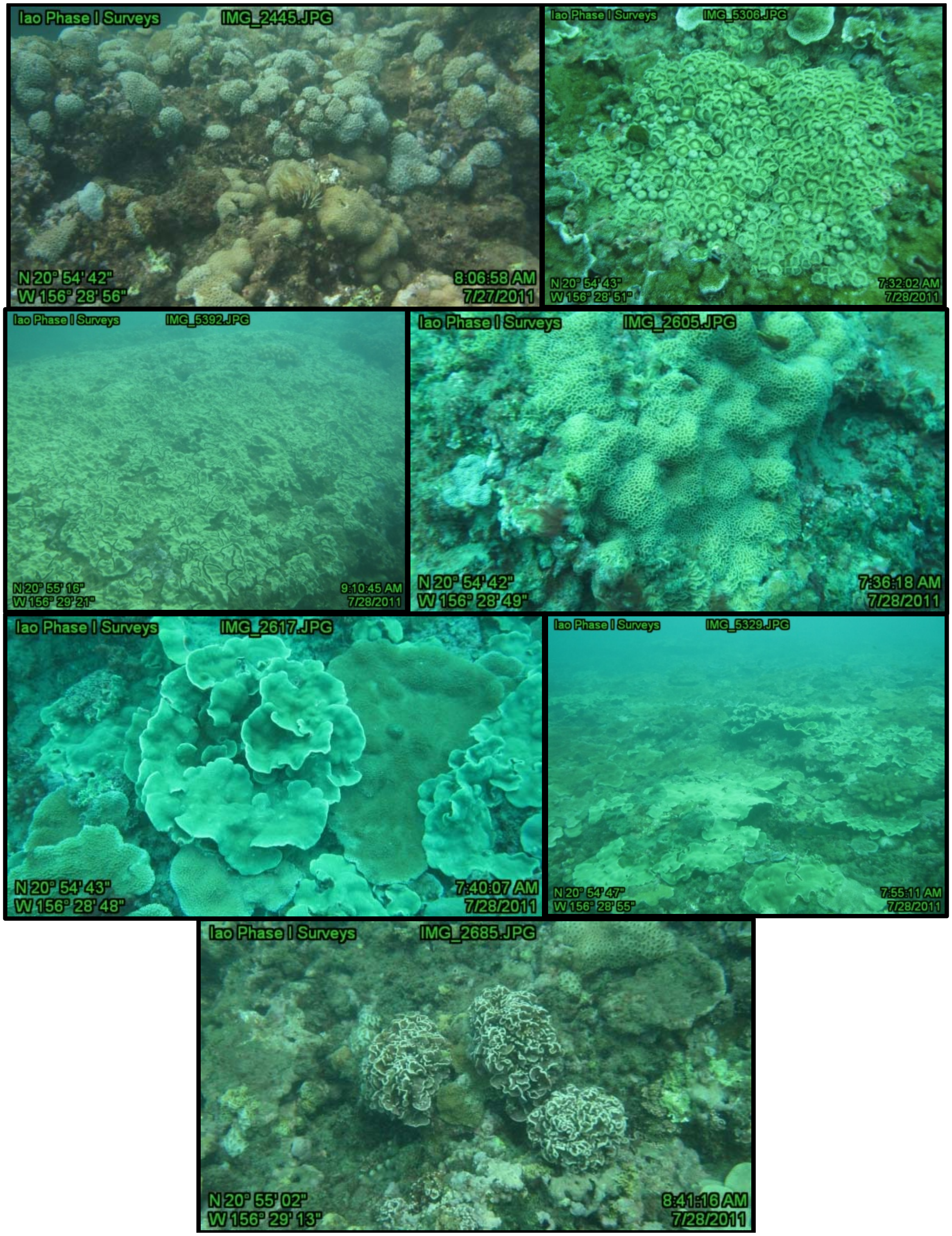

Figure 20. Images of coral and habitat from the Spur-and-Groove area. Upper left: area dominated by the Zoanthid, *Palythoa caesia*. Upper right: zoanthid, *Zoanthus* sp. Second from top, left: area dominated by encrusting Porites lobata. Second from top, right: coral, *Pavona varians*. Third from top, left: corals, *Portites lichen* and *Montipora capitata*. Third from top, right: reef area dominated by encrusting coral. Lower: Small clumps of bushy coralline algae (species uncertain).

Figure 21. Images for Spur-and-Groove area. Upper left: edge of a vertical side of spur with coral dominating top of spur. Upper right: edge of spur and sand interface with plate and encrusting coral dominating spur edge. Lower left: small sand channel in coral surrounding. Lower right: sloping spur with intermittent encrusting corals.

Table 1. Table showing documented coral species within the marine area of Iao Stream. Corals notated with an asterisk represent species that have been petitioned to be listed under the ESA.

NOAA REA	CRAMP	FWS Phase I
Fungia scutaria	*Cyphastrea ocellina**	*Carijoa riseii*
Montipora capitata	*Fungia scutaria*	*Cyphastrea ocellina*
*Montipora flabellata**	*Leptastrea bottae*	*Fungia scutaria*
Montipora incrassata	*Leptastrea purpurea*	*Montipora capitata*
*Montipora patula**	*Leptoseris incrustans**	*Montipora flabellata**
Montipora sp.	*Montipora capitata*	*Montipora patula**
Palythoa sp.	*Montipora flabellata**	*Palythoa caesia*
Pavona duerdeni	*Montipora patula**	*Pavona duerdeni*
Pavona varians	*Montipora studeri*	*Pavona varians*
Pocillopora meandrina	*Montipora studeri*	*Pocillopora damicornis*
Pocillopora sp	*Pavona maldivensis*	*Pocillopora eydouxi*
Porites compressa	*Pavona varians*	*Pocillopora meandrina*
Porites evermanni	*Pocillopora damicornis*	*Porites compressa*
Porites lobata	*Pocillopora eydouxi*	*Porites lichen*
	Pocillopora ligulata	*Porites lobata*
	Pocillopora meandrina	*Psammocora nierstraszi*
	Porites brighami	*Psammocora stellata**
	Porites compressa	*Sinularia densa*
	Porites evermanni	*Zooanthus sp.*
	Porites lichen	
	Porites lobata	
	Porites rus	
	Psammocora nierstraszi	
	*Psammocora stellata**	
	Unknown Coral	

Appendix H:

Sedimentation Study

Sedimentation Study
Environmental Assessment for
ʻĪao Stream Flood Control Project
Wailuku, Island of Maui, Hawaiʻi
March 2015

The objective of this sedimentation study was to determine whether implementing the Preferred Alternative of the proposed Iao Stream channel modification would result in increased sediment loads that could impact water quality as this stream water enters Kahului Bay. The preferred alternative is to construct a diversion structure to divert stream flow into a natural wetland area during high flow events to reduce the rate of discharge within the main channel section that has been most affected by erosion during such flow events. Improvements to the affected channel section are also proposed to maintain the integrity of the channel and to reduce erodibility of this channel section. Therefore, this sedimentation study focused on potential changes in sediment loads associated with channel erosion within the affected reach, immediately upstream of the proposed diversion structure (river station 79+20) and extending to the point at which water within the wetland re-enters the main channel (river station 45+60). Results for the current condition (i.e., no channel modifications) are compared to those for the implemented Preferred Alternative.

Assumptions made in this study include:

1. A Standard Project Flood (SPF) flow event of 27,500 cubic feet per second (cfs)
2. Upstream sediment basin is properly maintained and captures all upstream sediment load for the SPF flow condition
3. Sediment sources affecting ocean are limited to in-channel erosion (scour and bank erosion) during high flow events.
4. Eroded soil has same physical properties throughout affected reach

Approach

Main Channel

Given the lack of existing measured data associated with in-channel erosion and sedimentation yields for Iao Stream, the current analysis had to rely on empirical relationships based on rates of erosion predicted from soil properties and shear stresses associated with different sized flow events. The rate of erosion of fine grained sediments within the affected reach was estimated using the following modified form of the excess shear stress equation (Clark and Wynn, 2007):

$$\varepsilon^* = k_d(\tau_a - \tau_c)hL \qquad [1]$$

where ε^* is the eroded sediment volume per time per unit length of the stream segment (m^3/sec), k_d is the erodibility coefficient (m^3/N•s), α is an exponent (assumed here to be 1), τ_a is the applied sheer stress at the channel midpoint (Pa), and τ_c is the critical shear stress to initiate erosive loss (Pa), *h* is height of the inundated channel section for a specific flow event, and *L* is the length of the stream segment. τ_a was calculated from the slope of the energy grade line (S) that was provided as output of the HEC-RAS design simulations (included in the Engineering Documentation Report [EDR] prepared for the Preferred Alternative) for the SPF flow event and application of the following equation:

$$\tau_a = \rho g d S \qquad [2]$$

where ρ is the density of water (kg/m^3), *g* is acceleration of gravity (m/s^2), and *d* is the height of water above the midpoint of the channel during a flow event (m). Equation 2 parameter *d* and Equation 1 parameters *h* and *L* were also obtained from the HEC-RAS design simulation output at each channel segment cross-section simulated.

Values for the parameters k_d and τ_c, in Equation 1, are difficult to quantify and assign for a given channel reach as they can be highly variable and dependent on soil physical characteristics and stream bank vegetative root density conditions that can change between channel segments within a given reach. Empirical relationships have been developed for these parameters based on the results of flume studies and in-channel measurements. In this study, the following empirical relationship was employed (Hanson and Simon, 2001):

$$k_d = 0.2{\tau_c}^{-0.5} \qquad [3]$$

which was derived from in-channel measurements (i.e., in situ submerged jet tests) on cohesive stream beds across the Midwestern United States. Based on the results of Hanson and Simon (2001) study, a value of 10 Pa was assigned to represent τ_c for the affected reach for Iao Stream as a conservative estimate for a "moderately resistant" soil. Applying Equation 3, a value of 6.3×10^{-8} m^3/N•s was obtained and used to represent k_d for the affected reach.

Overflow Channel

The approach used to estimate sediment yields for the overflow channel was the same as that used for the main channel. However, values for k_d and τ_c were modified to account for reductions in erosion potential resulting from the presence of vegetative cover within the overflow channel. During a recent reconnaissance trip, photographic images (similar to those provided as Figure 1 were taken within the overflow area. Figure 1a is the view from Imi Kala bridge looking west and shows bare soil that is assumed to be returned to grassland similar to that in the image background. Figure 2a and 3a are views from atop Levee F looking into the overflow area, showing current land use as pasture land and small agriculture.

The presence of vegetation within the overflow area will reduce the erodibility of the soils (i.e. increase τ_c) by reducing flow velocities and strengthening the soil by adding cohesion. To account for this reduced erodibility, critical shear stress coefficients (τ_c^*) determined for varying vegetative cover types (Julian and Torres, 2006) (Table 1) were applied to develop an effective critical shear stress coefficient ($\tau_{c,eff}^{overflow}$) representing the overflow area as:

$$\tau_{c,eff}^{overflow} = \tau_c^{bare} f_{bare} + \tau_c^{grass} f_{grass} + \tau_c^{ST} f_{ST} + \tau_c^{DT} f_{DT} \qquad [4]$$

Applying Equation 4, a value of 4.875 was determined for $\tau_{c,eff}^{overflow}$ that served as a multiplier to the critical shear stress value of 10 Pa determined for the main channel soils, resulting in a critical shear stress of 48.75 for the overflow area. Equation 3, was then used to provide an k_d for the overflow area of 2.86×10^{-8} m^3/N•s.

Table 1. Critical shear stress coefficients and vegetative cover fractions applied to overflow.

Vegetative Cover*	τ_c^*	fraction within overflow (f)
Bare Soil (bare)	1	0.2
Grass Cover (grass)	1.97	0.5
Sparse Trees (ST)	5.4	0.15
Dense Trees (DT)	19.2	0.15

Figure 1. Current vegetated condition of the overflow area: a) looking west from Imi Kala bridge, b,c) views from Levee F looking into the overflow area.

Results

Main Channel

The results of these calculations are summarized in Table 2. The Current Condition case represents hydraulic conditions and total sediment loading rates resulting from an SPF flow event (i.e., 25-year recurrence interval event) occurring with no channel modifications or flow diversions present. The Preferred Alternative case represents implementing the proposed flow diversion into the adjacent flood plain without any additional channel modifications downstream of the diversion. Construction of the flow diversion reduces the flood discharge through the affected reach from 27,500 cfs (total SPF flow) to 5,670 cfs during the SPF event, thereby reducing the overall hydraulic contribution to erosion. The rate of sediment loss from the affected reach during an SPF flow event for the current condition is estimated as 1044 metric tons per hour (Mg/hr). For a 1-hour SPF event, the estimated 1044 Mg of sediment lost from the 0.7 mile long affected reach represents the total sediment load for the event, and would include both the suspended and bed load components. Implementing the flow diversion alone results in a reduced sediment loading rate of 288 Mg/hr, or an estimated 72% reduction in total sediment lost during the SPF event. Channel improvements included in the Preferred Alternative (i.e., stream bank stabilization via partially grouted riprap, fully grouted riprap, and shotcrete along the affected reach) will further reduce total sediment losses resulting from an SPF event, and consequently reduced suspended sediment loads. Therefore, implementing the Preferred Alternative will provide a net benefit with respect to mitigating the suspended sediment load entering Kahului Bay.

Overflow Area

For an SPF flow event (i.e., 25-year recurrence interval event), the rate of sediment loss from within the overflow area for the current condition of the overflow area is estimated as 97 Mg/hr (Table 3). This sediment load would be additive to the main channel yields when flow re-enters the main channel. Over time, allowing the bare soil areas to return to a natural vegetative cover or implementing engineered cover options would further reduce erosion potentials and resulting sediment yields within the overflow area.

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Table 2. Results of Sediment Load Calculations for the Iao Stream Affected Reach

	Current Condition					Implementing Proposed Action (Flow Diversion Only)				
Distance from ocean outlet (miles)	SPF Discharge (cfs)	Energy Grade Slope (ft/ft)	Calculated Applied Shear Stress (Pa)	Estimated Total Sediment Load (m^3/hr)	Estimated Total Sediment Load (Mg/hr)	SPF Discharge (cfs)	Energy Grade Slope (ft/ft)	Calculated Applied Shear Stress (Pa)	Estimated Total Sediment Load (m^3/hr)	Estimated Total Sediment Load (Mg/hr)
1.5	Bridge Above Diversion									
1.473	27500	0.0012	40	2.1	5.5	20049	0.0148	383	15.6	0.0
1.452	27500	0.0213	503	18.2	48.2	18237	0.0275	511	16.4	0.0
1.429	27500	0.0365	774	27.7	73.5	10131	0.0008	26	0.8	2.0
1.411	27500	0.0376	724	18.4	48.8	5670	0.0206	537	18.4	48.6
1.397	27500	0.0341	685	14.1	37.4	5670	0.1027	842	7.1	18.8
1.361	27500	0.0315	618	31.9	84.6	5670	0.0236	226	5.5	14.6
1.323	27500	0.0253	503	27.8	73.7	5670	0.0253	250	6.7	17.7
1.285	27500	0.0077	176	10.7	28.5	5670	0.0205	240	7.6	20.1
1.248	27500	0.0046	104	5.9	15.5	5670	0.0293	294	7.8	20.8
1.209	27500	0.0743	814	25.5	67.7	5670	0.0282	225	5.0	13.2
1.174	27500	0.0276	348	11.1	29.4	5670	0.0315	256	5.2	13.8
1.128	27500	0.0120	220	13.3	35.1	5670	0.0260	222	6.2	16.5
1.088	27500	0.0145	245	11.8	31.3	5670	0.0324	215	4.1	10.8
1.043	27500	0.0236	448	27.9	73.9	5670	0.0413	401	12.7	33.7
1.013	27500	0.0154	407	23.5	62.3	5670	0.0214	227	5.1	13.6
0.972	27500	0.0250	523	32.8	86.8	5670	0.0275	225	5.4	14.2
0.932	27500	0.0201	404	23.5	62.3	5670	0.0230	194	4.6	12.2
0.898	27500	0.1121	1334	39.9	105.7	5670	0.0292	270	6.1	16.2
0.857	27500	0.0213	339	16.0	42.4	5670	0.0007	14	0.2	0.6
0.821	27500	0.0175	282	11.8	31.2	12615	0.0004	12	0.1	0.3
Totals					**1044**					**288**

Table 3. Results of Sediment Load Calculations within Overflow Area

	Current Condition				
Floodplain Stage (miles)	SPF Discharge (cfs)	Energy Grade Slope (ft/ft)	Calculated Applied Shear Stress (Pa)	Estimated Total Sediment Load (m^3/hr)	Estimated Total Sediment Load (Mg/hr)
1.473	2730	0.025505	154.4704882	0.455056057	0.0
1.452	21720	0.019144	166.0450171	0.791893565	0.0
1.429	21720	0.045095	405.2919999	1.952041718	5.2
1.411	21720	0.030547	383.7187482	2.56322956	6.8
1.397	21720	0.0219	242.348872	1.015065341	2.7
1.361	21720	0.05476	507.7153537	5.184483714	13.7
1.323	21720	0.018203	158.4277016	1.227598485	3.3
1.285	21720	0.025737	185.1263195	1.261534291	3.3
1.248	21720	0.024928	159.17706	0.882950853	2.3
1.209	21720	0.013359	99.08793878	0.492802762	1.3
1.174	21720	0.016418	137.490739	0.880259121	2.3
1.128	21720	0.064283	327.805083	2.215305215	5.9
1.088	21720	0.029409	188.6699427	1.215145614	3.2
1.043	21720	0.018486	118.8711796	0.686691393	1.8
1.013	21720	0.043825	231.3458952	0.9786297	2.6
0.972	21720	0.010756	135.2732603	1.509885971	4.0
0.932	21720	0.100318	742.5902319	6.95274162	18.4
0.898	21720	0.012555	116.217769	0.718616752	1.9
0.857	21720	0.02611	182.3429264	1.294540441	3.4
0.821	21720	0.01687	301.4728148	5.502325491	14.6
Total					**96.8**

Appendix I:

USFWS Planning Aid Letter

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

Rc'd 5/1/14
PP - original

In Reply Refer To:
CPA-12200-2011-CPA-061

APR 2 9 2014

Anthony J. Paresa, P.E.
Deputy District Engineer
Programs and Project Management
U.S. Army Corps of Engineers
Civil and Public Works Branch
Fort Shafter, Hawaii 96858-5440

April 22, 2014

Dear Mr. Paresa:

The U.S. Fish and Wildlife Service (Service) is providing this Planning Aid Letter (PAL) in response to your request, based on the substantial changes to the proposed Iao Stream flood Control Project in Wailuku, Maui, Hawaii. The proposed "Alternative F" has been tentatively selected by the Corps to most effectively address the needs of the local sponsor, County of Maui, Department of Public Works. This letter has been prepared under the authority of and in accordance with provisions of 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 of 1977 [33 USC 1251 *et seq*.; 91 Stat. 1566], as amended; and the Endangered Species Act of 1973 [16 U.S.C. 1531 *et seq*.; 87 Stat. 884]. These comments are also consistent with the National Environmental Policy Act of 1969 [42 U.S.C. 4321 et seq.; 83 Stat. 852], as amended, and other authorities mandating the Service's review of projects and provision of technical assistance to conserve trust resources.

The FWCA provides the basic authority for the Secretary of the Interior, through the Service to assist and cooperate with Federal, state and public or private agencies and organizations in the conservation and rehabilitation of wildlife. The National Marine Fisheries Service (NMFS) provides similar assistance and cooperation for wildlife species under the management responsibilities of the Department of Commerce. Consultation under the FWCA is to be conducted with the Service, the State agency responsible for administering the wildlife resources of the jurisdiction involved (in this case the Hawaii Division of Aquatic Resources, or DAR), and NMFS as appropriate. The Service is the lead agency and has the responsibility of ensuring that concerns and recommendations of the other resource agencies are considered fully in FWCA reviews.

The proposed alternative project (Alternative F) involves modifications of an existing Iao Stream flood control project, located within the 10-square-mile Iao Stream drainage basin. The basin begins at the boundary between the Lahaina and Wailuku Judicial Districts and extends along the crests of the Kahoolewa and Kapilau Ridges to the Pacific Ocean. The project impact area consists of an approximately 417-foot-long overflow channel section located on the left bank of the Iao Stream lower midreach between river stations 79+00 and 75+12, and a channel constriction that will be created by a concrete diversion weir, located within the channel at the downstream end of the overflow section. These modifications will reduce flows in approximately 3,200 linear feet of streambed during flood stages, with potential impacts both up- and down-stream of the project footprint. The revised project design, due to its emphasis on upland flood water retention and settlement as opposed to direct and accelerated conveyance to the ocean, appears to avoid and minimize impacts to the nearshore marine environment adjacent to the project.

Specifically, Alternative F as currently proposed consists of an overflow section located on the left bank of Iao Stream, and a channel constriction located within the channel at the downstream end of the overflow section. The purpose of the overflow section and associated constriction is to force flood flows to leave the main channel and enter the designated floodplain area on the left bank of the stream. The reduction in the main channel flow in this approximately 3,200-foot-long river reach will result in reduced erosion and lower water surface elevations. This will in turn result in increased reliability for the existing flood damage reduction system. Flow which enters the left bank near station 41+10 will remain separated from the main channel flows until it reenters the channel near river station 8+98. The overflow section involves a 417-foot- long diversion located on the left bank of Iao Stream between river stations 79+00 and 75+12 and a channel constriction by concrete diversion weir, located within the channel at the downstream end of the overflow section at station 75+10. Flood flows will leave the main channel then enter and remain on the designated floodplain area on the left bank of Iao Stream between stations 79+00 and 43+80. Flow which enters the left bank near station 75+12 will remain separated from the main channel flows until it re-enters the channel near river station 45+00. Bank protection will be provided by boulder concrete or shotcrete at this return location. A section of the left bank between stations 66+50 and 60+20 will be raised by an earthern berm approximately 4 feet high to contain the left bank overflow in the floodplain.

This alternative will change the probability of flooding on the left bank floodplain from approximately a 1-percent chance per year based on the current conditions to a 10-percent chance per year. The reduction in main channel flow in this approximately 3,200-foot-long river reach will result in reduced erosion and lower water surface elevations within the main channel. This will result in increased reliability to the existing flood damage reduction system. Additional right bank armoring upstream of river station 79+00 will be required to increase the reliability of existing levees. This work will consist of about 200 linear feet of shotcrete between stations 83+25 to 81+25. Other features of this alternative are the approximate 65 linear feet of boulder-concrete bank protection along both banks at the diversion weir and a 15-foot-wide gravel maintenance road in the floodplain along the left bank starting from Piihana Road and ending at station 45+00. Flood flows in the left bank floodplain will spread out and flow following the topographic gradient from the end of the overflow diversion channel to the return point. There is no designed channel in the left bank floodplain.

Background

This project already produced a Draft Environmental Assessment (DEA) in March 2009. The public review process for the DEA resulted in new concerns being raised regarding the project's potential ecosystem impacts, as well as concerns about the adequacy of the proposed mitigation to offset anticipated, unavoidable impacts. Alternatives and mitigation measures from the March 29, 2009 DEA were reanalyzed and modified, according to public input, resulting in the currently proposed Alternative F. The Service acknowledges that some of our earlier general recommendations (*e.g.*, reduce sediment input into the marine environment, minimize stream hardening, provide low flow channels and passage for native stream fauna) have been partially incorporated into the new design and commends the Corps for these improvements. However, some concerns still remain with the proposed Alternative F.

Following the release of the 2009 DEA, but prior the new proposal for Alternative F, the Service conducted a FWCA 2b survey along the length of the project footprint in May 2011. A report summarizing the findings and recommendations related to inland waters was provided to the Corps in July 2011, and a second report summarizing the findings and recommendations for associated nearshore marine systems was provided to the Corps in December 2011. The findings and recommendations contained in these reports form the basis for our current comments in regard to Alternative F.

The subsequent proposal of Alternative F by the Corps has required a Supplemental EIS, with associated re-evaluation of environmental impacts and renewed coordination with federal and state resource agencies. At the most recent meeting with the Service regarding this new alternative on February 12, 2014, the Corps' took the position that Alternative F avoids and minimizes impacts to the aquatic environment more effectively than earlier proposed alternatives, and that mitigation should not be necessary or required. The Service does not entirely agree with this position due to 1) long-term permanent losses of aquatic habitat already resulting from earlier project phases; 2) the relationship of the proposed alternative to earlier work (the current proposals were developed to correct deficiencies in the earlier construction); and 3) because of existing and future watershed level impacts that could be rectified to conserve stream function to support native stream fauna. Several of the recommendations put forth by the Service and DAR on earlier renditions of the proposed project, contained in our July 2011 and December 2011 FWCA 2b reports and in response to the Draft Environmental Assessment, therefore remain relevant regardless of design changes.

Recommendations

The Service acknowledges that the Corps does not agree with the applicability of compensatory mitigation under the Clean Water Act (according to the 2008 Mitigation Rule) because the Corps asserts that the smaller project footprint in comparison to the earlier proposed alternatives alleviates the need to replace functional losses. Although the Service concurred that the proposed alternative is better (i.e., less environmentally damaging) than any other proposed to date, the Service disagrees that the project should go forward without any mitigating measures.

Cumulative project impacts, including past stream channelization and modifications, must be included within the scope of the overall project impact analysis. The Service disagrees with the Corps assertion that the scope of their authority for environmental review, and for rectifying earlier damage, is limited. However, it is understood that the Corps flood risk management authorities might limit the actual amount of "ecological restoration" funding or capability.

Long-term functional losses within the project area still need to be addressed both up- and downstream of the proposed footprint; these are well within the appropriate scope of impact analysis. Much of the impact to stream function has already occurred from earlier project elements and additional impacts are now proposed. It is the position of the Service that these should not be reviewed in a piecemeal, out-of-context approach.

The NEPA process was conducted to address a project design that corrects earlier project/construction deficiencies, and would therefore not be needed if not for problems that had arisen in regard to these earlier project elements. There is no reasonable basis under NEPA for segmenting review of the new work and excluding earlier impacts. The Corps' approach of narrowing the scope of the project to only a review of the environmental impacts of the new project, without analyzing cumulative impacts, and in the absence of a watershed context, is in conflict with both NEPA and with the Fish and Wildlife Coordination Act.

The Corps has noted for several years that the design has to consider the potential for flow to be restored to the stream. This has now become a salient consideration, given the recent settlement of the Na Wai Eha case, which will mandates an Interim Instream Flow Standard (IIFS) of 10 mgd in the reach from the Waikapu and Maniania Ditch intakes downstream to the Spreckles Ditch intake, and an IIFS of 5 mgd in the terminal reach downstream of Spreckles Ditch. Given that these IIFS flows will now permanent perennial connectivity throughout the length of the Iao Stream system, the Service maintains that all earlier recommendations to improve stream function and faunal passage are now imperative for the Corps to consider. The Service therefore contends that evaluation of project impacts for the new proposal must be considered in relation to, and not separate from, impacts that have already taken place, and in the context of the newly mandated base flow restoration.

Earlier proposals to replace certain stream function and habitat characteristics, such as increasing channel roughness to slow flow and to provide shelter for migrating stream fauna, included "stream baffle blocks" - structures cemented into the stream bed. Although the fill/concrete stream bed hardening that would necessitate these structures is no longer proposed in the reach involved with Alternative F, DAR and the Service continue to recommend that placement of appropriately sized boulders in certain locations would serve the same function. DAR notes that in the recent past boulders have been moved out of the stream channel (by the County of Maui) and placed in areas where they are not of any functional benefit to native stream fauna. These provide a source of boulders that should be replaced within the stream channel to provide benefits to stream species in terms of shelter and habitat complexity.

Additional design features that could help improve aquatic biological function in the stream include: 1) realignment and possible deepening of the low flow channels, specifically reconnecting the channels where they are bifurcated; 2) modifications of the Happy Valley Diversion weir to allow diadromous faunal passage, a DAR recommendation which the Service supports (see email from Dan Polhemus, March 3, 2014 follow-up regarding this recommendation); and 3) creating native stream faunal passage/structures or modifying existing vertical drop structures to better enable faunal passage.

Endangered Species

Finalize consultation. Based on analysis provided by the Corps, Alternative F flood waters will remain in the left bank natural flood plain for approximately 9 hours, at the longest, before returning to the stream channel. Although the Hawaiian Stilt might be attracted to the site for foraging, the design and duration of flood water retention at the site are unlikely to provide the physical and biological elements to be considered an attractive nuisance for nesting or long-term occupation. The Corps should follow up with the Service to complete consultation with Ian Bordenave of our Maui Island Office.

The Service appreciates the opportunity to work with the Corps during the planning phases of this project. If you have any questions regarding this letter, please contact Fish and Wildlife Biologist Dan Polhemus by telephone at (808) 792-9400 or by electronic mail at Dan_Polhemus@fws.gov.

Sincerely,

Acting for

Loyal Mehrhoff
Field Supervisor

cc:
NMFS
EPA
DAR

Appendix J:

Archaeological Inventory Survey

FINAL REPORT

Archaeological Inventory Survey in Support of the Modification to the ʻĪao Stream Flood Control Project, Alternative F, Wailuku Ahupuaʻa, Wailuku District, Maui Island, Hawaiʻi.

TMK: [2] 3-4-032: 001 [por.]

Prepared for:

GSI Pacific Inc.
181 South Kukui Street
Honolulu, Hawaii 96813

March 2015

PACIFIC CONSULTING SERVICES, INC.

720 Iwilei Road, Suite 424, Honolulu Hawaii 96817

FINAL REPORT
Archaeological Inventory Survey In Support of Modification to the ʻĪao Stream Flood Control Project, Alternative F, Wailuku District, Wailuku Ahupuaʻa, Maui Island, Hawaiʻi

(TMK:[2] 3-4-032:001 [por.])

Prepared by
Nicole Vernon, M.A.
Stephan D. Clark, B.S.
and
Dennis C. Gosser, M.A., RPA
Principal Investigator

Prepared by
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Honolulu, HI 96813

March 2015

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INTRODUCTION

Under contract to GSI Pacific, Inc., Pacific Consulting Services, Inc. (PCSI) has prepared this Archaeological Inventory Survey report in support of the proposed modification, Alternative F, to the ʻĪao Stream Flood Control Project, Maui Island, State of Hawaiʻi [TMK (2) 3-4-032:001 (por.)]. The subsurface archaeological survey was carried out in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and its implementing regulations (36 CFR 800).

PROJECT DESCRIPTION AND LOCATION

The Proposed Action, Alternative F, consists of features intended to reconnect the main channel with the floodplain to reduce damaging flows along the main channel and right bank levees. The reconnection would be accomplished by lowering the left bank, grading the overflow area to disperse flow into the floodplain, and constricting the main channel with a concrete diversion wall to force flood flows to leave the main channel and enter the existing floodplain on the left bank of the stream. A portion of the left bank would be raised further downstream to contain the overflow within the floodplain. Even further downstream, the left bank would be lowered to allow the return of the overflow into the main channel. The Proposed Action would also include bank stabilization along the right bank upstream of the proposed overflow channel and downstream of the outflow return location to prevent further erosion in these areas. Furthermore, the existing revetment between the overflow channel and outflow return location would be reconstructed as part of the Proposed Action.

The objective of the archaeological study was to sample the proposed overflow channel area (herein referred to as the project area) where ground-disturbing activities are being proposed to determine if subsurface historic properties are present, and to determine if additional archaeological features are likely to be present in the non-sampled portion of the floodplain where stream waters would be diverted to until returning to the main channel downstream.

The approximately 0.7 hectares (1.7-acre) project area is located along the north bank of ʻĪao Stream, 2.1 km (1.3-miles) inland (southwest) of Nehe Point in Wailuku Ahupuaʻa (Figure 1). ʻĪao Stream flows through ʻĪao Valley from the West Maui Mountains. Wailuku Ahupuaʻa extends *makai* from Kauaula Ahupuaʻa in the Lahaina District through the valley and coastal plain to Kahalui Bay. Waiehu Ahupuaʻa and Waiehu Valley are to the northwest, and Waikapu Ahupuaʻa and Wailuku Town are to the southeast.

ENVIRONMENTAL BACKGROUND

TOPOGRAPHY AND SOILS

ʻĪao Valley is formed of younger alluvium with lithified calcareous sand dunes resting on alluvial fans near the shoreline and on each side of the *makai* portion of the stream near Wailuku Town (Macdonald et al. 1983:387). The cliffs at the back of ʻĪao Valley are the boundary of an extinct caldera. The lava that once flowed has been eroded by ʻĪao Stream, which formed a deep valley “into the low-permeability volcanic dike compartments which impound groundwater to high altitudes” (USGS 2013). During dry periods the stream continues to be fed by groundwater leaking from these dike compartments. Downstream water is diverted by tunnels and ditches to irrigated agricultural fields, which may at times run dry (USGS 2013).

The project area is situated on the north side of ʻĪao Stream, approximately 50 to 60 m above mean sea level (amsl). Soils at the project area include ʻĪao cobbly silty clay with 3–7 percent slopes (IbB) and Pulehu cobbly clay loam with 0–3 percent slopes (PtA). The ʻĪao series

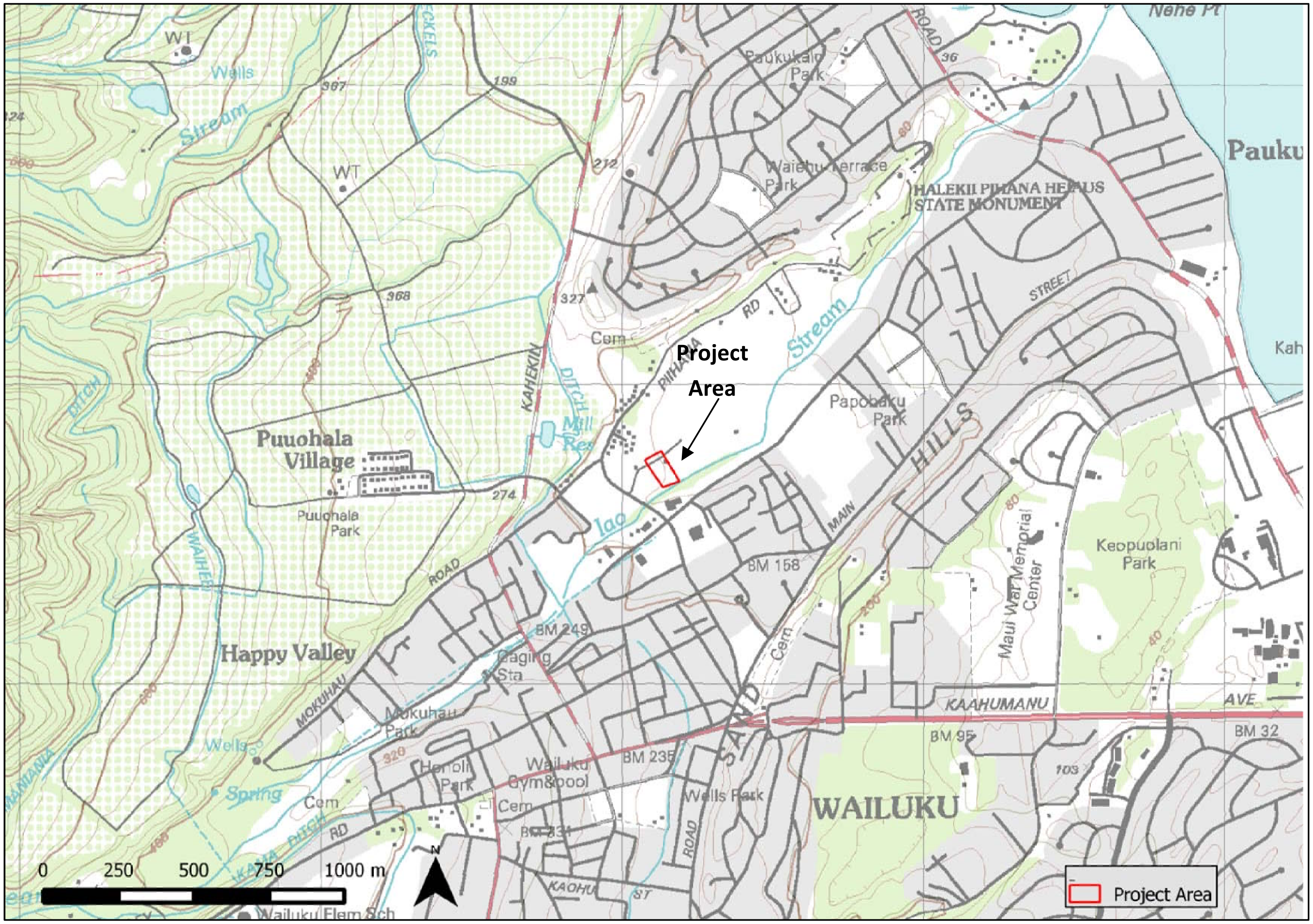


Figure 1. The Project Area Shown on the USGS 7.5-minute Wailuku, HI (1999) Topographic Quadrangle.

is found on valley fills and alluvial fans and consists of deep, well drained soils that formed in alluvium weathered from basic igneous rock (Soil Survey Staff 2014). Pulehu series is found on alluvial fans, stream terraces, and in basins and well drained soils that formed from alluvium washed from basic igneous rock (Soil Survey Staff 2014).

RAINFALL AND VEGETATION

Annual rainfall in the lower part of ʻĪao Valley averages about 630 mm (24.84 in) per year, with most rain falling in the winter months between November and March (Giambelluca et al. 2013:313-316). Current land use can be described as informal ranching. Satellite imagery indicates that recently TMK 3-4-032:001 was divided by fencing into lots containing small structures (likely for chickens) with some larger structures possibly used as residences. Prior to the current study, all above-ground structures were removed from the property.

Current vegetation in the project area consists of grasses and trees, including *kao haole (Luceana glauca*). Past land use on the project parcel likely included wetland taro (*Colocasia esculenta*) and sugarcane (*Saccharum* spp.) agriculture. Sections of sugarcane drip line were still visible in 1998 (Burgett and Spear 2003:6). Prior to a flood in 1916, the vegetation along ʻĪao Stream included Hawaiian *kamani* trees (*Calophyllum inophyllum*), but since then *koa haole (Luceana glauca*) and *kukui* (*Aleurites molucanus*) dominate the streambed (Connolly 1974:6).

HISTORICAL BACKGROUND

This section presents the ethno-historical and archaeological background information for the project area. Data from background research were compiled to create an overview of traditional Hawaiian and historic-era land use and subsistence practices.

MYTHS AND LEGENDS

Na Wai ʻEha, or "the four waters," is the traditional name for the land containing the Waikapu, Wailuku, Waiehu, and Waiheʻe streams (Handy and Handy 1972:496). Each of these areas has its own wind. Wailuku's wind is named Makani-lawe-malie, or "the wind that takes it easy" (Sterling 1998:62). The streams have more violent names from their association with past battles. Wailuku is known as "water of destruction" after a legendary battle where men fought with owls (Sterling 1998:63, 74).

There are several chants that mention Wailuku. In a chant to Keʻelikōlani (Princess Ruth Keelikolani), Pipi composed the following:

Koe Wailuku i ka malu Kuawa, Ke hoopaio la me Kaiaiki, me ke Kaahaaha, Anu o Niua, hamo ke kilioopu ka o kai, Pohu ke kaha maloko o Hupukoa, Hoopaaia i ka uwahi a ke kai . . .	Except Wailuku in the shade of Kuawa In the contentions of Kaiaiki with Kaahaaha, Niua was cold; the grass waved towards the sea. Calm was the channel within. Hupukoa, Withheld was the spray of the sea. . . [Fornander 1919–20:487]

Another chant describes the landscape of Wailuku:

Kahua aolelo Wailuku-e. He Aha Kula-loa? Kaupaku Lanakila. Kaluanui o Kaluanui, Ke ku la i na puu mahoe; Na hale loulu a Kane, I ako noʻu i Auwahi.	Wailuku is the locality of flying clouds. It is broad Kula? It is open upland. Kaluanui of Kaluanui, It stands by the twin hills, The palm houses of Kane Which were thatched for me at Auwahi. [Fornander 1916-7: IV: 286-7]

The chiefess Wailuku, who was the wife of chief Maui-nui and sister of the Oahu chief Kakuhihewa, appears in the legend of "Lepeamoa." Towards the end of the legend:

> Kakuhihewa of Oahu is entertaining his sister [Wailuku] and her husband Maui-nui and has bet his own lands against those of his brother-in-law upon a cock-fight. He now offers his daughter in marriage to the man who can produce a cock to win the bet for him. Kauilani, who is in high favor with the chiefess, promises to do this. The Maui cock is a kupua bird related to Lepe-a-moa's family and named Ke-au-hele-moa. A kupua in the form of an elepaio bird warns Kauilani not to let the cock see his sister before the fight. He wears her concealed in a garland about his neck until the fight begins. The Maui cock tries all its bodies in succession but the hen wins. At first the new wife is jealous of the beautiful sister, but after their girl child Kamamo is born and adopted by the kupua sister, Kauilani goes to live at Kakuhihewa's court. [Westervelt 1923:429]

Wailuku is also the death place of the Maui chief Hua who was known for his wickedness. After being unjust to his *kahuna* (priest; expert) he was sentenced to death. Seeking revenge, the *kahuna* brought on a drought:

> Hua, the chief, lived on, and because of the lack of water and food he sailed for Hawaii, the home of his elder brother; but because Hawaii also suffered from lack of water and food he came back and lived at Wailuku. Wailuku also did not have any water, and that caused the chief to be crazed, so he leaned against the edge of the precipice and died, and that was the origin of the saying "The bones of Hua rattle in the sun." [Fornander 1918-19: 516]

TRADITIONAL LAND USE

During the pre-Contact and early post-Contact periods ʻĪao Valley and the greater Wailuku area was a political and ceremonial center (Cordy 1981, 1996; Kirch 1985). According to Sterling, ʻĪao Valley and the surrounding area was home to many chiefs and a large population, making Wailuku a "chiefly center" (1998:90). The literal translation of ʻĪao is "cloud supreme" and was once a sacred burial place for chiefs (Pukui et al. 1974:55). Numerous *heiau* were once present in the area, which indicates ʻĪao Valley was of ceremonial importance during the pre-Contact period. During the early historic period several famous battles were fought from the coast to the valley. Land Commission Awards (LCA) granted in the mid-nineteenth century in lower ʻĪao Valley indicate a substantial population was once present in the area and that the land was agriculturally very important.

Archaeological investigations in Wailuku Ahupuaʻa indicate settlement occurred between c. A.D. 1100 (Kirch 1985:142) and A.D. 1200 (Fredericksen and Fredericksen 1996). An early traditional account from the 1400s tells of how the king of Maui, Kakaʻe, was so revered that commoners would suffer punishment by death if they looked upon him (Sterling 1998:84). As a result, King Kakaʻe became a hermit in ʻĪao Valley in order for his subjects to live without fear. It is also said that Kakaʻe created a sacred burial ground in ʻĪao Valley for himself and worthy successors (Burgett and Spear 2003:12).

The pre-Contact population in ʻĪao Valley was centered at ʻĪao Needle (Connolly 1974:5). Fish and *kalo* (taro) supplied from the nearby coast and the *loʻi* systems along stream banks was the base of a subsistence diet. Sterling reports that there were two ʻ*auwai* (irrigation ditch) in the valley that "have existed immemorially and were evidently constructed for the purpose of irrigating *kalo* on the plains which stretch away to the northward and southward of the river. Several minor ʻ*auwai* have, since ancient times, tapped the river at different points lower down and spread the water through the lands in the gulch on either side of the river bed" (1998:86).

Similarly, Handy and Handy reported that in “ancient times” the *lo‘i* system in Waihee and Wailuku Valley “was the largest continuous area of wet taro cultivation in the islands” (1972:496). During the early nineteenth century, Rev. H.T. Cheever, wrote:

> As you get into the valley and vega of Wailuku, you see numerous remains of old kihapai, or cultivated lots, and divisions of land now waste, showing how much more extensive formerly was the cultivation, and proportionally numerous the people, than now . . . The whole valley of Wailuku, cultivated terrace after terrace, gleaming with running waters and standing pools, is a spectacle of uncommon beauty to one that has a position a little above it. [Cheever 1851:124]

‘Īao Valley’s importance as a ceremonial and political center is reflected in traditional accounts as well as the Haleki‘i-Pihana heiau complex (SIHP No. 50-50-04-0522) constructed in the eighteenth century. These *heiau* are most often associated with Kahekili between c. A.D. 1765–1790 and Kamehameha I during his conquest of Maui in 1792 (Yent 1983: 18). Haleki‘i Heiau was possibly designed by a Hawaiian named “Kiha” (Sterling 1998:89). The name of the *heiau* means “house of images.” It is said to have been a chiefly residence guarded by images (Kolb 1990:4).

Pihana Heiau is credited to Kahekili, though it is also said that the *heiau* was constructed overnight by *Menehune* using rocks from Paukukalo beach (Kolb 1990:4). The *heiau* is known as the place where Kamehameha I’s wife — Keopuolani, a *tabu* chiefess of divine rank — was born, where Kahekili lived, and where Kahekili’s father, Kekaulike, died (Yent 1983:7). Also, Thrum (1906:46) wrote that Kamehameha I invoked his god of war at Pihana Heiau after defeating Kalanikupuli and his warriors at the Battle of ‘Īao in 1790).

Aside from the legendary battle where men fought alongside owls, there were three early battles at Wailuku. The first took place “in the Wailuku valley near the present female seminary,” where Kihapi‘ilani, the future king of Maui, was defeated and barely escaped (Thrum 1913:130). In the second battle, Kihapi‘ilani was victorious with the help of warriors from Hawai‘i. The third battle was fought on the Wailuku plains in the 1770s. At Ka-lani-hale (“house of heaven”), the royal palace of the Maui king Kahekili, King Kalaniopuu and his army, called the *Alapa*, were surprised by a huge force composed of both O‘ahu and Maui warriors. The *Alapa* were decimated and Kahekili remained king of Maui (Westervelt 1923:124-142). After the battle, Kiwalao, Kalaniopu‘u’s son and a high ranking chief, was sent as an ambassador to Kahekili’s court in Wailuku:

> Runners carried the news of the coming of this prince to the Maui king. He was lying on a mat in the royal grass house at Wailuku. Ka-lani-hale —“the heaven house” — was the name of this home of the king.
>
> As Kiwalao drew near the door all the Maui chiefs prostrated themselves before him, while the king lazily turned over and partly raised himself, lifting his head in token of friendly greeting. To have turned away from the prince, letting his face look down, would have been the sign of immediate death of his visitor. Kiwalao, with slow and dignified tread, crossed the room and seated himself in his uncle's lap. Then both wailed over the troubles which had brought them together, and over the deaths among their followers.
>
> The embassy was successful, and terms of peace between the two kings were arranged. Kalaniopuu returned to Hawaii, to begin at once a new crusade against Kahekili. During the ensuing two years the war degenerated into a series of petty raids by which he kept his wife's brother busy marching warriors from one end of Maui to the other to repel his attacks. In 1779 the coming of Captain Cook changed the course of action and gave the people new things to think about, until Kamehameha secured white men's arms and conquered all the islands. [Westervelt 1923:141–2]

HISTORIC LAND USE

The population in ʻĪao Valley began declining in the 1800s, although people continued to depend upon the stream for subsistence as in the past (Connolly 1974:5). Traditional land divisions of the fifteenth and sixteenth centuries persisted until the 1848 *Māhele*, which introduced private property into Hawaiian society (Kamakau 1991:54). During the *Māhele*, the Land Commission required the Hawaiian chiefs and *konohiki* (land agent for the *aliʻi*) to present their claims to the Land Commission. In return they were granted awards for the land quit-claimed to them by Kamehameha III. The remaining unclaimed land was then sold publicly, "subject to the rights of the native tenants" (Chinen 1958:29). The new western system of ownership resulted in many losing their land. Often claims would be made for discontiguous cultivated plots with varying crops, but only one parcel would be awarded.

Following the Kuleana Act of 1850 that granted individual *kuleana* (commoner) lots, records of the LCAs associated with the area indicate that the population was concentrated near ʻĪao Stream. According to Sterling (1998:86): "The district of Wailuku was once thickly settled, *kuleanas* to the number of over 400 were granted to natives and others. A large portion of these cultivated *kalo* with the aid of water from the river." In 1848, Wailuku area residents submitted 199 land claims, 127 of these being awarded by the Land Commission (Burgett and Spear 2003:14). These LCAs indicate several types of land use: *loʻi* systems, *kula* lands (dry land agriculture), *hala* clumps *(Pandanus odoratissimus* or screw pine, whose leaves are woven into baskets or mats); and *po'ālima* (land farmed by tenants for *aliʻi* one day in five) (Tome and Dega 2004:8). Claims were also made for ʻ*ili* (land division of an *ahupuaʻa*), *moʻo* (land division of an ʻ*ili*), and *apana* (land division of a *kuleana).* LCA within or adjacent to the current project area on the north side of ʻĪao Stream are listed in Table 1 and illustrated in Figure 2 and Figure 3 (see Appendix A for copies the LCA documentation and Appendix B for Foreign Testimony).

Table 1. Land Commission Awards (LCAs) in the Vicinity of the Study Area.

LCA No.	Award	Claimant
3465	One *loʻi.*	Keawe
3477	One *loʻi* and six *poʻālima*.	Kekoona
3385:2	One *loʻi.*	Pahoa
3381	One *loʻi* and one *moʻo*.	Puniho

In 1823, a Chinese man named Hung-tai operated Wailuku's first sugar mill (Silva N.D.:13). During the following decade, Missionary Richard Armstrong promoted the planting of sugarcane to residents in Wailuku. He supervised the construction of a rudimentary mill and offered technical support (Weaver 1924:59). Kamahameha III began small-scale sugarcane cultivation in ʻĪao valley in the 1840s. The American Charles Wilkes stayed in Wailuku during this time. A plantation that he visited was operated by Chinese and used local labor. He wrote the following narrative about his experience:

> After breakfast, Mr. Greene was obliging enough to accompany us to see the sugar-mills and taro-plantations, in the valley of the Wailuku. The sugar-manufactory is an experiment of the king, and is now under the superintendence of a Chinese. By some awkward mistake in making the agreement, his majesty's interests were entirely lost sight of, and it is said that he will lose money, although his agents have a prospect of considerable gain. The iron-work of the mill was imported from the United States, and is turned by water-power. The water wheel is badly constructed: it is a breast-wheel, with great loss of power.

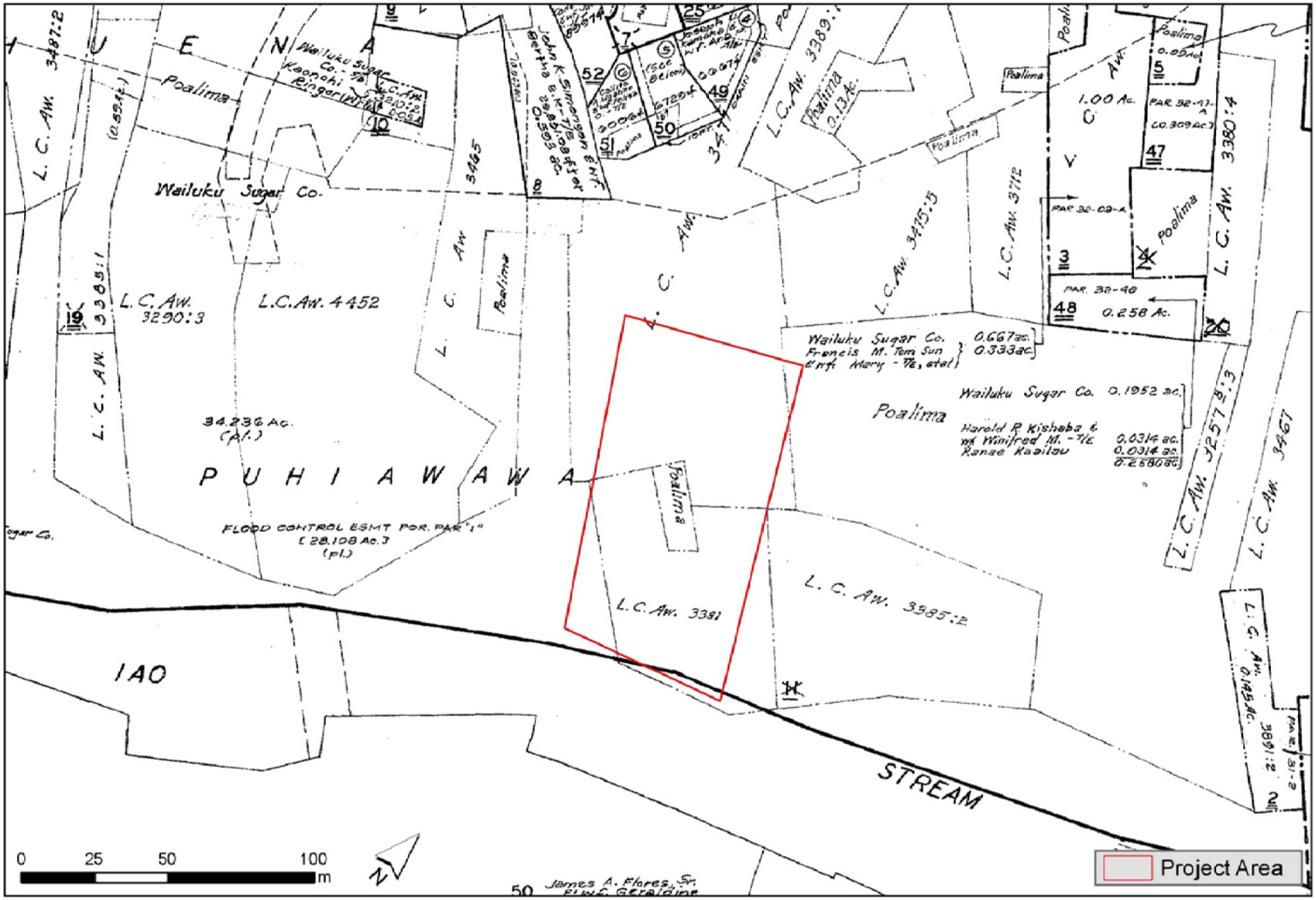


Figure 2. TMK Map Showing LCA Parcel with Project Area Overlain (Tax Map Bureau 1994).

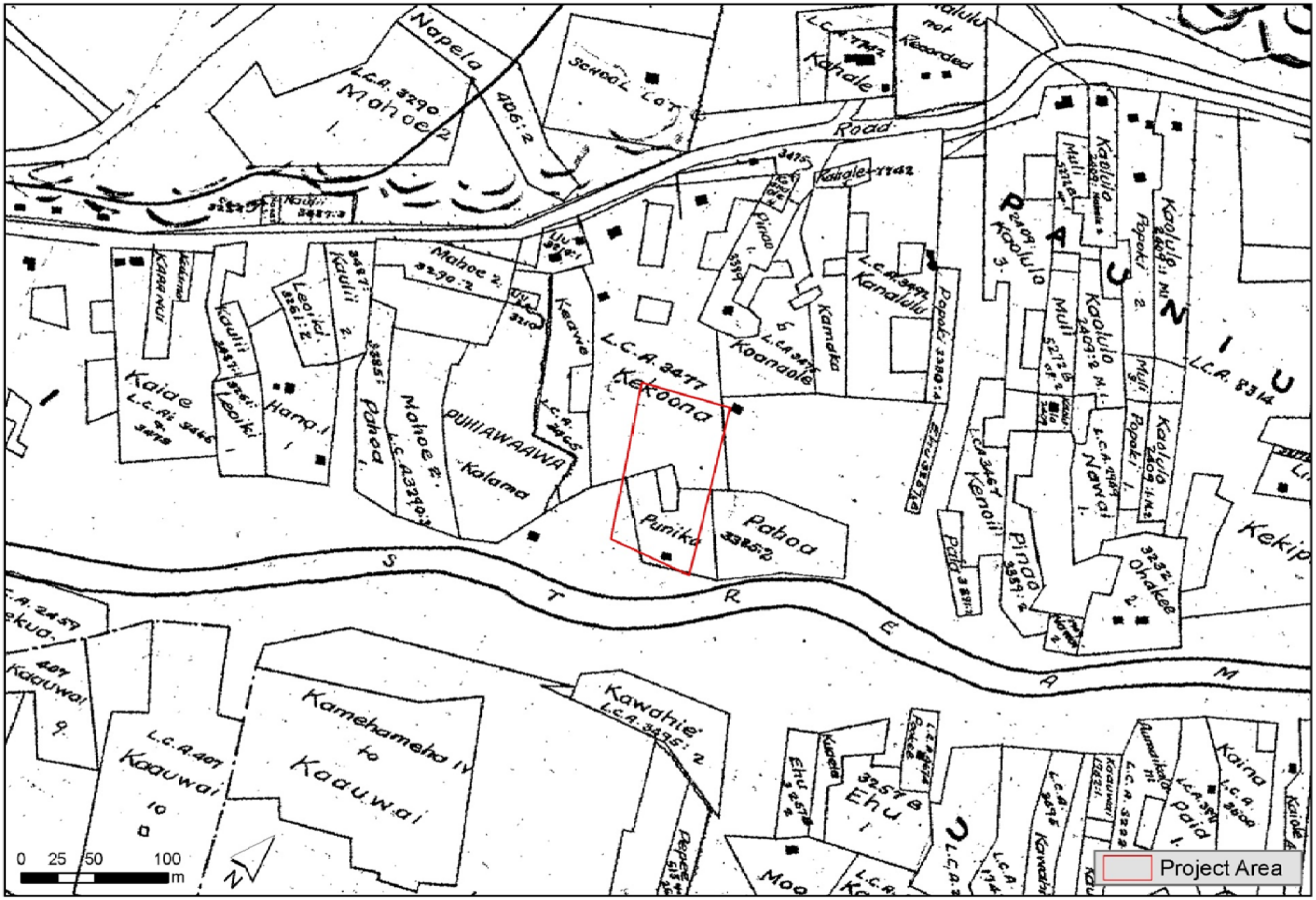


Figure 3. 1882 Map by Monseratt with Project Area Overlain (Monserrat 1882).

> There appears but little economy about the establishment: as an instance of this, instead of drying and preparing the cane for fuel, they use wood altogether, which is very scarce, and costs much to transport it. The sugar appears to be of good quality, and with proper attention, the manufacture could no doubt be made profitable. I understood from the Chinese who had charge, that the sugar could be sold at four cents per pound, and that with a proper economy as to fuel, might be reduced to half that sum.
>
> Both the king and chiefs have a desire to encourage the arts and agriculture. Unfortunately, however, after they have incurred expenses, they are obliged to give the sole direction into the hands of those who have nothing but their own interests in view. The consequence is that in all these undertakings the king and chiefs have found themselves deceived, by listening to foreigners by whom they have been defrauded. [Wilkes 1845:242-32]

The Wailuku Sugar Company was established in 1862 by James Robinson & Company, Thomas Cumming, J. Fuller, and agent C. Brewer and Company (Wilcox 1996:122). The company was managed by Rev. Edward Bailey, who had traveled to Maui as a missionary in 1837. He left the mission in 1850 to farm. By 1867 the Wailuku Sugar Company was producing 800 tons of sugar from 500 acres of cane. In 1868 Bailey resigned in order to run his own plantation (Dorrance and Morgan 2001:65). During this early period, a visiting American official of the American Board of Commissioners for Foreign Missions documented productivity in the area:

> The soil of Wailuku is rich and deep, and the sugarcane is extensively cultivated. The rains, though copious, are not sufficient, and channels are therefore cut along the foot of the hills, for conveying the waters of the mountain streams where they may be diffused over the entire plantations. Good cane lands have here been sold for eighty dollars the acre. Along the streams are numerous taro patches, of course covered with water. This district is one of the chief producing regions for that indispensable article of native food, out of which the poi is manufactured. [Anderson 1864:177]

By the late 1800s, a vast amount of ʻĪao Valley was planted with sugarcane. In 1865, the Wailuku Sugar Company purchased a mill and land from the neighboring Bal & Adams plantation. Ten years later they incorporated. In 1877, the son of Rev. Edward Bailey, William Bailey, sold the family's 420-acre plantation to Wailuku Sugar Company. A map was produced for a court case over water rights between E. Bailey and Wailuku Plantation, which dates the map to between 1868 and 1877. The map depicts the Wailuku mill, the Bal & Adam mill, *loʻi*, and various other structures in the area (Figure 4). The current study area is situated in a former cane field of the Wailuku Sugar Company. In the following decades the company continued expanding by acquiring new plantations in Waiheʻe and Waikapu, constructing a larger mill, and laying a railroad transport system (Silva N.D.:15).

According to Connolly the sugarcane industry dominated commerce and land use in the ʻĪao Valley area in the early 1900s (1974:5). Throughout the valley extensive water irrigation ditches, terraces, free standing walls, historic house sites, and mill structures were constructed. In 1905, Wailuku Sugar Company built another mill and again increased its acreage (Silva N.D.:15). Along the lower portion of the stream there was agricultural terracing and a Portuguese worker's camp. The laborers planted taro and other vegetable in the *loʻi* nearby (Connolly 1974:5). The work camps were destroyed by the flood in 1916.

In 1912, Mr. Willie Crozier installed a rock crusher in the valley, hoping to supply rock to all construction projects on the island (Burgett and Spear 2003:24). Four years later it was destroyed in the flood. The flood also devastated remaining *loʻi* and portions of the Halekiʻi-

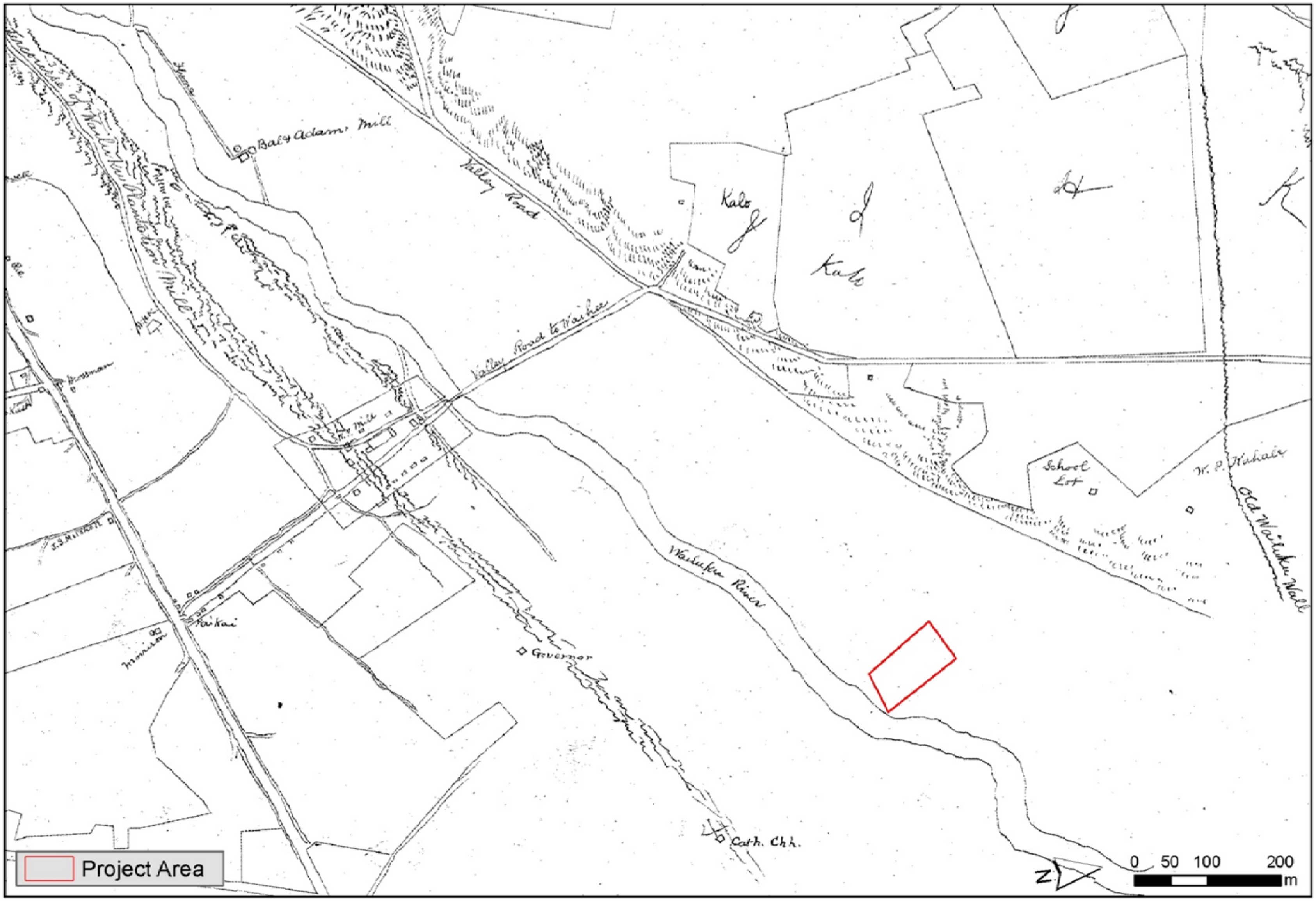


Figure 4. Map of Wailuku Sugar Company ca. 1867 by Rev. E. Bailey (Baily N.D.).

Pihana Heiau Complex. According to Burgett and Spear (2003:24), archaeological remnants in the valley may also have been detrimentally affected by the flood. After the 1916 flood the land was replanted in sugarcane and the water systems were restored (Connolly 1974:6). A historic topographic map from 1924 shows the location of various camps, the rail, and the mill at Wailuku Sugar Company (Figure 5). The following excerpt from Handy and Handy (1972) describes the landscape during this period:

> Wailuku is the third of "the Four Streams," the great torrent that drains the highest cloud-capped uplands of western Maui through deep ʻĪao Valley. Much of the upper section of what is now the city of Wailuku is built on old terrace sites. Along the broad stream bed of ʻĪao Valley, extending several miles up and inland, the carefully leveled and stone-encased terraces may be seen. In the lower section of the valley these broad terraces served, in 1934, as sites for Camps 6 and 10 of Wailuku Sugar Plantation, being utilized for houses, gardens, playgrounds, and roads. A little farther up, neat private homes and vegetable and flower gardens covered these old taro terraces; while at their upper limit the terraces were submerged in guava thickets. Here a few wild taros were found, but we saw no terraces in ʻĪao or Wailuku being used as flooded taro patches. It is significant that here, as at Waiheʻe, the old terraces were adapted to market gardening (Chinese bananas, vegetables, and owners) by Japanese and Portuguese gardeners. [Handy and Handy 1972:497]

Sugarcane production continued to dominate until the mid-twentieth century. Figure 6 is an aerial photograph from 1950 that shows the Wailuku Sugar mill in operation (note the smoke billowing from the stack), and Figure 7 shows the current study area situated in a sugarcane field in 1965. Wailuku Sugar Company ended their operations in 1988. At this time, the irrigation water was diverted to macadamia nut orchards and pineapple crops in the area (Wilcox 1996:125).

PREVIOUS ARCHAEOLOGICAL RESEARCH

Numerous archaeological investigations have been conducted in ʻĪao Valley. Previous work has included archaeological assessment, archaeological surface survey, archaeological inventory survey, archaeological subsurface testing, and archaeological monitoring. A few of these projects were carried out within or near the current study area. The following section focuses on projects conducted in the immediate vicinity of the study parcel in order to compare previous findings of land use (Figure 8). Additional studies near the stream in lower ʻĪao Valley are also included in Table 2.

In 1998, Scientific Consulting Services, Inc. (SCS) conducted archaeological reconnaissance survey and limited subsurface testing for the ʻĪao Stream Flood Control Project (Burgett and Spear 2003). A reconnaissance survey that included the current study parcel revealed only one site (SIHP No. 50-50-04-4755). The site comprises three features: a concrete foundation with concrete troughs, a soil-filled terrace and retaining wall, and wall remnant. These features were interpreted as a small historic habitation complex-activity area (Burgett and Spear 2003:34–6). The excavation of three test units at the site revealed historic and recent materials (modern debris). Historic materials were possibly associated with a post-Contact (late nineteenth or early twentieth century) agricultural site. According to local informants, the area of the find was formerly a piggery. Architectural and surface remains were minimal.

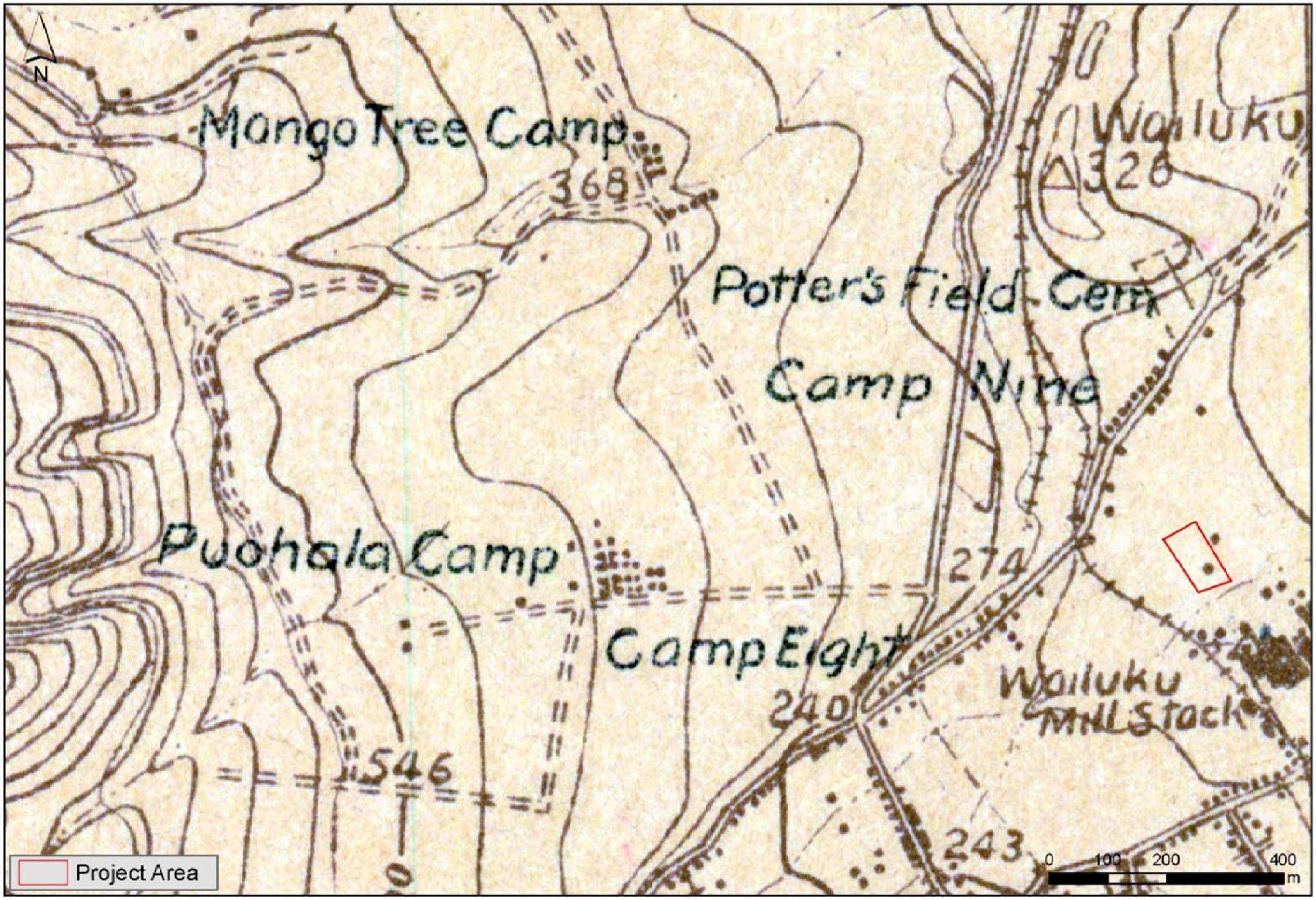


Figure 5 1924 USGS Topographical Quadrangle with Project Area Overlain (U.S. Geological Survey 1927-28).

Figure 6. 1950 Aerial Photograph of ʻĪao Valley with Project Area Overlain (USGS 1950).

Figure 7. 1965 Aerial Photograph of ʻĪao Valley with Project Area Overlain (USGS 1965).

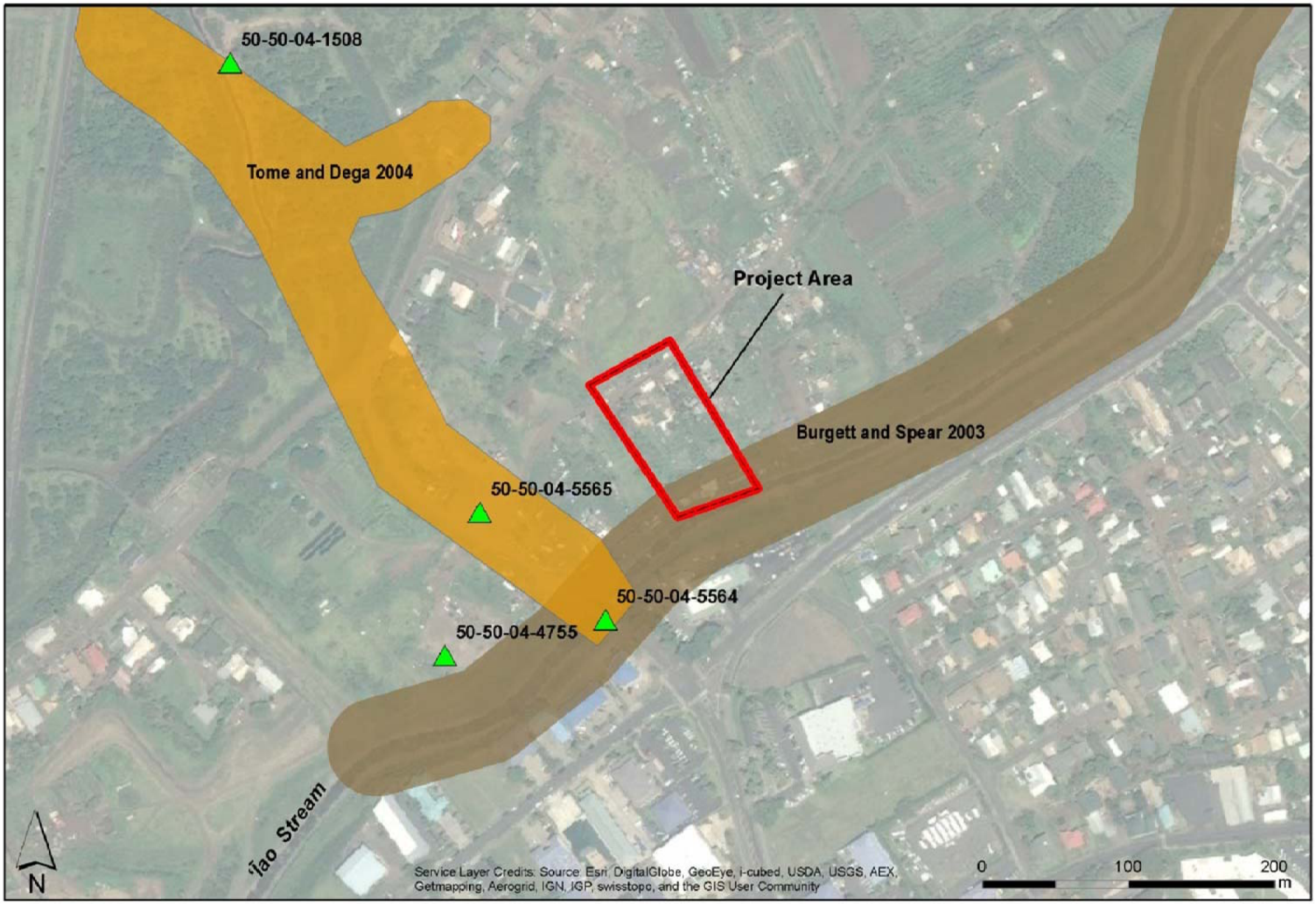


Figure 8. Previously Recorded Historic Properties and Archaeological Projects Near the Project Area.

Table 2. Additional Archaeological Projects Near the Project Area.

TMK	Title	Sites 50-50-04-	Reference
2-3-3-0010:16	Archaeological Survey and Subsurface Testing for the Proposed Piʻihana Grading Project, TMK 3-3-01:16 (POR.).		Kennedy 1989
2-3-3-002:001	Archaeological Inventory Survey of Puʻuohala Mauka Residential Subdivision, Wailuku Ahupua`a, Wailuku District, Maui Island.	01508, 05195, 05196, 05197	Fredricksen and Fredricksen 2002
2-3-4-002:036	Archaeological Monitoring Report Waiale Road, Land of Wailuku, Wailuku District, Island of Maui. [TMK: 3-4-02:36; 3-4-03:19; 3-4-10:2]	04005, 04067, 04068	Spear, Monahan, Chaffee, Dunn 2004
2-3-4-011:032	Proposed Ke Kama Pono Program Facility Wailuku, Maui Final Archaeological Monitoring Report		Cleghorn and Kirkendall 2009
2-3-4-020:075	Archaeological Reconnaissance of TMK: 3-4-20:75 Lot 55C, A Proposed Post Office Building on the Site of the Wailuku Sugar Mill, Wailuku, Maui		Hammatt 1985
2-3-4-022:005	An Archaeological Assessment Report for a 0.45-Acre Lot on Lower Main Street		Dega and Pestana 2005
2-3-4-023:024	An Archaeological Monitoring Report for a Parcel of Land Located at 1234 Lower Main Street, Wailuku		Fredricksen 2003
2-3-4-030:004	Preliminary Report. Phase I: Archaeological Data Recovery Pihana Heiau, Halekiʻi-Pihana Heiau State Monument, Paukukalo, Wailuku, Maui	00592	Yent 1995
2-3-4-030:004	Final Report on the Restoration of Pihana Heiau, Paukukalo, Wailuku, Maui.	00043	Fields and Pagliaro 1996
2-3-4-030:011	Inventory Survey of TMK: 3-4-30:11, Subdivision "C", Located at Paukukalo, Wailuku, Island of Maui.		Kennedy 1990
2-3-4-037:082	Inventory Survey of TMK 3-4-39:82, Lower Main Street and Mill Street.		Fredricksen and Fredricksen 1992
2-3-4-039:051	Archaeological Monitoring Report for the Maui Electric Company Substation Project on Lower Main Street, Wailuku Ahupuaʻa, Wailuku District, Island of Maui (TMK: 3-4-039:051)	04127	Fredricksen and Fredricksen 2003
2-3-4-039:075	An Archaeological Monitoring Report for a Parcel of Land at 1191 Lower Main Street, Wailuku Ahupuaʻa, Wailuku District, Maui Island.	04730	Fredricksen 1999
2-3-4-039:076	An Archaeological Inventory Survey of a Parcel of Land in Wailuku Ahupua'a, Wailuku District, Island of Maui		Fredricksen and Fredricksen 2002
2-3-4-039:077	An Inventory Survey of a Commercial Parcel on Lower Main Street, Wailuku, Maui, Hawaiʻi.		Fredricksen and Fredricksen 1990
2-3-4-039:077	An Archaeological Inventory Survey of the Oceanhouse Inc. Property. TMK: 3-4-39:77. Land of Wailuku, Wailuku District, Island of Maui	04004	Burgett and Spear 1996
2-3-4-039:077	DRAFT: Archaeological Monitoring for the Nicholes Building, Lower Main Street, Wailuku, Island of Maui.	04004	Carson 1999
2-3-4-039:082	Archaeological Inventory Survey for Proposed Maui Texaco Service Station Located at Lower Main and Mill Streets, Wailuku Ahupuaʻa, Wailuku District, Island of Maui.	04127, 04414	Fredricksen and Fredricksen 1997
2-3-3-001:016 2-3-3-001:033 2-3-3-001:039 2-3-4-032:001 2-3-4-032:010 2-3-4-032:018	Summary Document Regarding Archaeological Activities Surrounding Piʻihana District #2.		Kennedy 1990

Table 2. Additional Archaeological Projects Near the Project Area.

TMK	Title	Sites 50-50-04-	Reference
2-3-4-012:045 2-3-4-012:047 2-3-4-012:048 2-3-4-012:083 2-3-4-012:086	An Archaeological Monitoring Report for a Portion of Land in Wailuku.		Fredricksen, Erik 2006
2-3-4-013:096 2-3-4-013:100	An Archaeological Inventory Survey for Main Street Promenade, Wailuku Ahupuaʻa, Wailuku District, Maui Island.	01636, 04834	Fredricksen and Fredricksen 2000
2-3-4-030:019 2-3-4-030:020 2-3-4-030:023	DRAFT An Archaeological Inventory Survey of the proposed Wailuku Parkside Property, Wailuku, Maui Island		Spear, Dunn, Asbury-Smith, and Chaffee 1998
2-3-4-039:081 2-3-4-039:082	Report on Subsurface Inventory Survey at Lower Main and Mill Street, Wailuku Ahupuaʻa, Wailuku District, Maui Island.	04127	Fredricksen, Fredrickson, and Fredricksen 1995

Archaeological inventory survey was carried out in 2004 by SCS for the proposed Imi Kala Street and Neki Place Extensions (Tome and Dega 2004). Eleven test trenches were excavated at various locations throughout the project area. The testing revealed that evidence of former *loʻi* is extant in the lower valley. Four archaeological sites were documented, one of which, Spreckels Ditch (SIHP No. 50-50-04-1508), was previously recorded. SIHP No. 50-50-04-5564 is the historic bridge constructed for Wailuku's sugarcane industry; and SIHP No.50-50-04-5566 is a small, concrete-lined irrigation ditch constructed by the sugarcane industry and utilized by the more recent macadamia nut industry.

SIHP No. 50-50-04-5565 is former *loʻi* used during the pre-Contact and early post-Contact periods. According to Tome and Dega (2004:26), Layer V (246-311 cmbs) was a compact, very dark grayish brown (10YR 3/2, moist) very fine clayey silt with many iron inclusions and few flecks of charcoal. A single soil sample obtained at 311 cmbs within Layer V was submitted for radiocarbon dating (Beta No. 192863/SCSRC No. 378). This soil sample contained organic material, and yielded a calibrated date range of 1180 to 1290 AD (at 2 sigma) and 1231 to 1272 AD (at 1 sigma) (Tome and Dega 2004:41). No other traditional archaeological sites or features were identified.

Table 3. List of Previously Recorded Archaeological Sites Near the Project Area.

SIHP No.	Period	Description	Source
50-50-04-1508	Historic	Spreckels Ditch	Tome and Dega 2004
50-50-04-4755	Historic	Concrete foundation, one terrace and retainments, and a portion of a stacked wall	Burgett and Spear 2003
50-50-04-5564	Historic	Historic bridge used during the cultivation of sugarcane.	Tome and Dega 2004
50-50-04-5565	Pre-Contact; early post-Contact	Former *loʻi*.	Tome and Dega 2004
50-50-04-5566	Historic	Concrete-lined irrigation ditch	Tome and Dega 2004

RESEARCH DESIGN

Based on the results of archival research and previous archaeological studies in the area, it was expected that historic properties would not be present on the surface of the project area. Likewise, it was expected that historic land-use patterns (sugar cane cultivation) and natural environmental events (e.g., the 1916 flood) may have obscured traditional agricultural features and historic occupation within the project area. Nonetheless, it was considered possible that remnants of traditional *lo'i* (irrigation ditches, pond basins, terrace faces, etc.) could be present within the project area. Because of the likelihood that historic land use may have altered the material evidence of pre-Contact agriculture, the focus of the field operation was based on possible subtle differences in soil characteristics rather than on built features such as retaining walls. Thus, it was anticipated that most of the data collected in the field would consist of detailed stratigraphic profile drawings and photographs.

RESEARCH QUESTIONS

Three research questions drove the sampling strategy and fieldwork:

1. Is there evidence of pre-Contact/early post-Contact *lo'i* in the project area? If so, is there sufficient evidence to determine the age and integrity of the historic properties?
2. Is there evidence of temporary pre-Contact occupation associated with *lo'i* or post-Contact occupation associated with sugarcane cultivation? And
3. Is there stratigraphic evidence of the 1916 flood episode and if so can subsurface features be temporally correlated with this episode?

SAMPLING STRATEGY

The sampling approach for the current project was to provide sufficient coverage of the project area to identify randomly distributed subsurface features with an areal extent of approximately 10 m x 5 m (an average size *lo'i*). Figure 9 shows the parquet-style configuration of ten 15-20 meter-long trenches distributed systematically across the project area. Using this configuration, the probability of discovering a 10 m x 5 m subsurface feature is approximately 70 percent. Because the orientation of traditional *lo'i* within the project area is not known, the excavation of trenches were oriented in approximately cardinal directions (perpendicular and parallel) relative to the stream orientation within the project area.

METHODS

Fieldwork was conducted between May 12 and May 21, 2014, and guided by the project Work Plan (Vernon and Gosser 2014). Fieldwork involved one archaeologist monitoring trench excavations and two archaeologists recording stratigraphic profiles and collecting data. Monitoring of the trench excavations was necessary to ensure that subsurface historic properties or human burials were not inadvertently impacted.

The horizontal extent of profiling was dependent on the stratigraphic complexity of each trench. Sufficient data was recorded to capture the complexity of the natural stratigraphy. Soil descriptions were compiled using standards established by the USDA and included information concerning soil color (Munsell 2000), texture, consistence, and boundary topography. Where possible, stratigraphic events were correlated between trenches in order to characterize the overall depositional history of the project area.

LABORATORY

One historic glass fragment was recovered during trench excavations. This artifact was transported to the PCSI Archaeology Laboratory in Honolulu for further analysis. In the laboratory, it was cleaned, measured, photographed, and described.

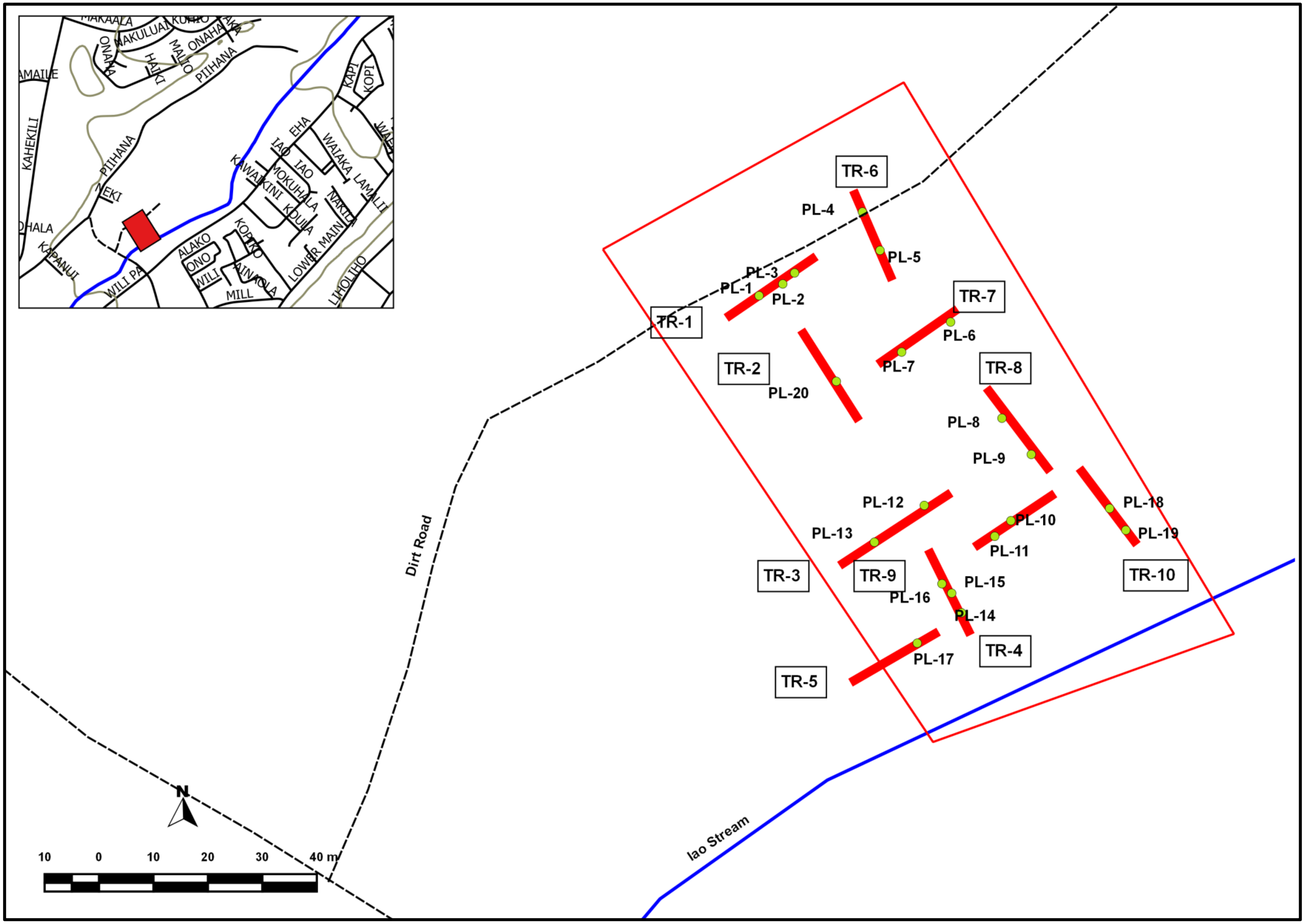


Figure 9. Backhoe Trench Locations and Profile Locales. Inset: Lower Iao Valley Showing Project Area Location.

RESULTS

A total of 10 stratigraphic trenches were excavated by backhoe across the project area (see Figure 9). Table 4 presents a summary of TR1-TR10, and includes the length, depth, and orientation of each trench (trench width was consistently 1.2 m).

Table 4. Proposed Location and Orientation of Trenches within the Project Area.

Trench	Length[1] (m)	Depth (cm) Min/Max	Orientation (deg)
1	19.1	80/140	56/236
2	18.0	120/152	149/329
3	23.0	60/140	57/237
4	16.2	140/230	154/334
5	19.5	150/260	61/241
6	19.7	70/248	158/338
7	16.5	120/136	56/236
8	18.9	100/140	144/324
9	21.2	90/134	57/237
10	20.5	120/160	144/324

[1]:All trenches were approximately 1.2 m wide

No pre-Contact archaeological materials or features were encountered during trench excavations. Recent trash (rusted metal items, aluminum cans, whole and fragmentary bottles, and plastic items) were observed in Layer I deposits but not collected due to the recent age of these items. One piece of possible historic glass was recovered from Layer III in TR-7. Evidence of sugar cane agriculture, in the form of black plastic fragments, was observed in Layer I in all of the trenches, and black plastic fragments in Layer II in TR3 as well as sugar cane slag in TR9.

Stratigraphic sequences were examined within each of the 10 trenches and representative, as well as anomalous stratigraphic sequences in each trench were documented through profile drawings, photographs, and soil descriptions. Nineteen (19) stratigraphic profiles were drawn, and designated as Profile Locales 1 through 15 (PL1-15) and PL17-20. The designation of Profile Locale 16 (PL16) was not used. The term PL1-20 used in this report therefore refers to all the profile locales except PL16. The locations of PL1-20 are presented in Figure 9. A total of ten stratigraphic layers, designated Layers I-X, were identified in PL1-20 in TR1-TR10. In addition, two lenses, designated as Lens A and Lens B, were recorded. A summary of PL1-20 is presented in Appendix C.

Figure 10 presents a composite stratigraphic profile drawing representing all stratigraphic layers observed in TR1-TR10. Table 5 provides a general description, interpretation, and horizontal distribution (i.e., trench and profile location) for each of the ten recorded stratigraphic layers. Because of the many variations observed in color and texture in a majority of the strata, both across the project area and within the trenches, the general descriptions provided in Table 5 provides the predominant color (or colors), and the range of textural classes identified for each stratigraphic layer. Detailed soil/sediment descriptions for 15 of the 19 profile locales (PL1, PL3, PLs 5-7, PLs9-11, PLs13-15, and PL17-20) are presented below by the TR in which they were documented.

Because of the extent of soil color and texture variations within the project area stratigraphy, it was decided to simply designate the observed layers by stratigraphic position for

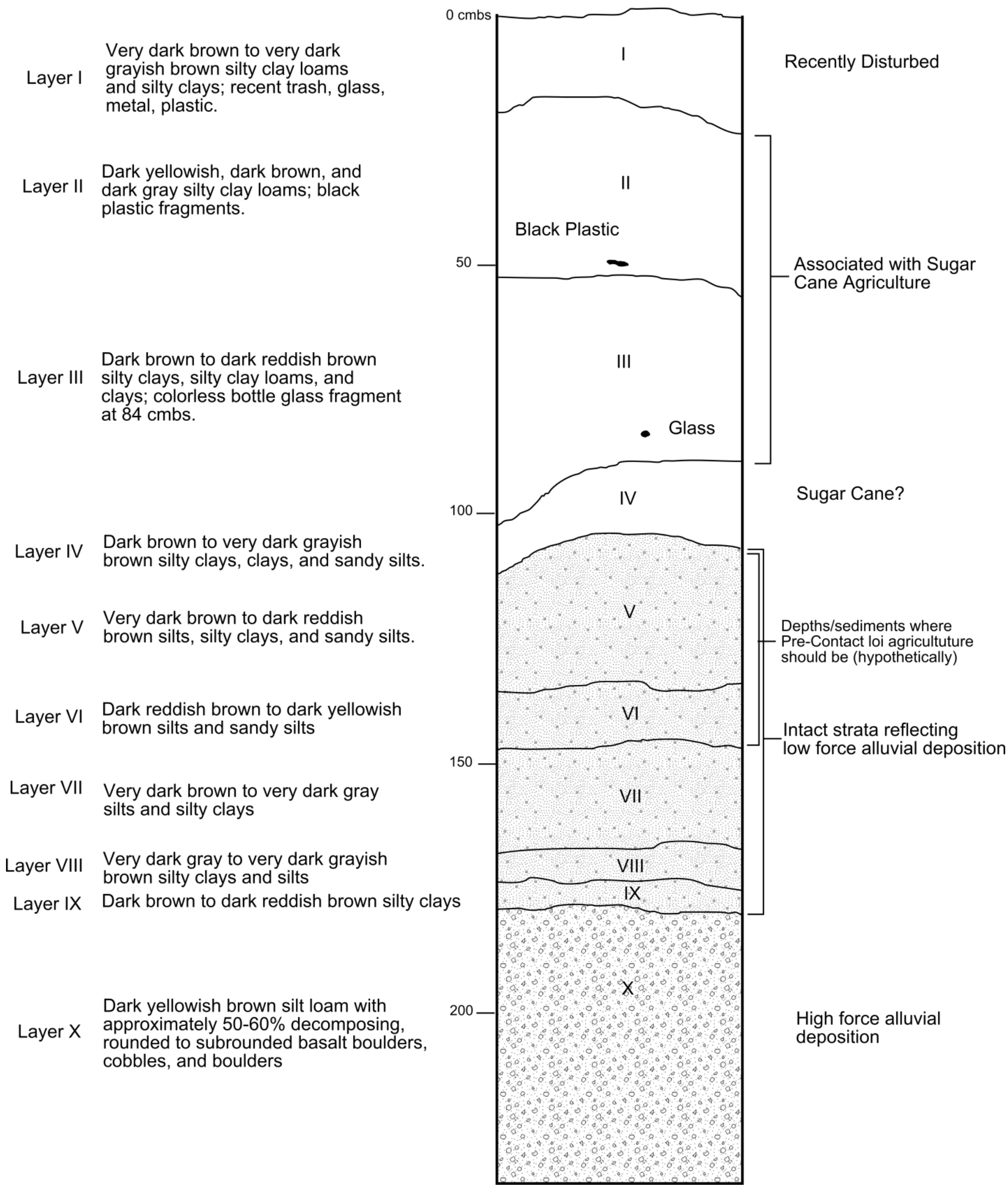


Figure 10. Composite Stratigraphic Sequence.

Table 1. Summary of Stratigraphic Layers Identified in the Project Area.

Layer	Interpretation	General Description	Distribution	Comments
I	Disturbed modern A Horizon	Very dark gray (10YR 3/1, moist) silt loams and very dark grayish brown (10YR 3/2, moist) silty clays and silty clay loams; also present are sandy clay loams; contains recent trash (aluminum cans, bottles, plastic fragments, metal, and PVC pipe fragments).	TR1-10 (PL1-20)	
II	Upper portions of sugar cane agricultural zone	Very dark gray (10YR 3/1, moist) silty clays; also present are silty clay loams, clayey silts, clays, and silt loams with color variations present; contains black plastic fragments.	TR1-10 (PL1-20)	Lens B dark reddish brown silty clay is found within Layer II in TR9 (PL11)
III	Middle portions of sugar cane agricultural zone	Dark brown (10YR 3/3, moist), very dark brown (10YR 2/2, moist), and dark reddish brown (5YR 3/3, 3/2, and 2.5YR 3/4, moist) silty clays, silty clay loams, silt loams, clays, clayey silts, and sandy silts; clear bottle glass fragment found in situ at 82-84 cmbs in TR7 (PL7)	TR1-10 (PL1-20)	Strong brown staining of ped surfaces observed in TR8, PL8-9
IV	Lower portion of sugar cane agricultural zone	Dark brown (7.5YR 3/4, moist) and very dark grayish brown (10YR 3/2, moist) silty clays, clays, sandy silts, silts, and clayey silts; non-cultural.	TR1-10 (PL1-20)	
V	In situ terrigenous sediments	Dark brown (10YR 3/3 and 7.5YR 3/2, moist) and dark reddish brown (5YR 3/3, moist) silty clays, sandy silts, silts, sandy silt loams, and clayey silts, and extremely cobbly, pebbly, sandy silt loams; non-cultural.	TR1 (PL1-3), TR2 (PL20), TR3 (PL13), TR4 (PL14-15), TR5 (PL17), TR6 (PL4), TR7 (PL6), TR8 (PL8-9), TR10 (PL18-19)	Lens A black silt loam found within Layer V in TR7 (PL6); Layer V in TR4 (PL15) correlates to cobble/pebble layer in banks of ʻĪao Stream
VI	In situ terrigenous sediments	Dark reddish brown (5YR 3/4, moist) and dark yellowish brown (10YR 3/4; 10YR 4/6, moist) silts, silty clays, and sandy silts; contains sparse charcoal flecking in TR1 (PL1); non-cultural.	TR6 (PL5), TR7 (PL6), TR8 (PL8-9), TR4 (PL14), TR5 (PL17), TR10 (PL18)	Charcoal in insecure context and insufficient weight for dating

Table 2. Summary of Stratigraphic Layers Identified in the Project Area.

Layer	Interpretation	General Description	Distribution	Comments
VII	In situ terrigenous sediments	Dark brown (7.5YR 3/2; 7.5YR 3/4, moist) to very dark gray (10YR 3/1, moist) silts, silty clays, silty sands, and extremely cobbly, pebbly, silty sand; non-cultural.	TR6 (PL5), TR8 (PL8-9), TR4 (PL14), TR5 (PL17), TR10 (PL18)	Layer VII in TR6 (PL5) correlates to cobble/pebble layer in banks of ʻIāo Stream
VIII	In situ terrigenous sediments	Dark brown (10YR 3/3, 7.5YR 3/2, moist) to very dark gray (10YR 3/1, moist) silts and silty clays; non-cultural.	TR8 (PL9), TR4 (PL14), TR5 (PL17), TR10 (PL18)	
IX	In situ terrigenous sediments	Dark brown (7.5YR 3/4, moist) to dark reddish brown (5YR 3/3, moist) silty clays and silt loams; non-cultural.	TR8 (PL9), TR4 (PL14), TR5 (PL17)	
X	In situ terrigenous sediments	Dark yellowish brown (10YR 3/4, moist) silt loam and very dark brown (10YR 2/2, moist) silty clay with approximately 50-60% decomposing, rounded to subrounded basalt boulders, cobbles, and pebbles; lower boundary not reached; non-cultural.	TR8 (PL9), TR5 (PL17)	Correlates to cobble/pebble layer in banks of ʻIāo Stream

each trench. It was decided not to designate facies changes within the stratigraphic sequences. Facies changes are defined as different stratigraphic layers occupying the same stratigraphic position in a given locale or region. Although there is a variety of sediment color/textures in the same stratigraphic position in the project area, this variation does not include significantly different parent materials, and can be explained by the close proximity of the project area to ʻĪao Stream (from 10.0 to 108 m), one of the primary sources of the sediments observed in the backhoe trenches excavated in the project area. The results of the testing are presented by backhoe trench below. Soil/sediment layer descriptions, profile drawings, and photographs of the profiles are presented for the profile locales documented within each backhoe trench.

TRENCH 1

Trench 1 (TR1) was excavated near the northwest corner of the project area (see Figure 9; see Table 4). This was the first excavated trench, and the stratigraphic sequence recorded at PL1 was considered to be the initial working stratigraphic sequence, to be compared with stratigraphic sequences in the other trenches. Figure 11 presents an overview photograph of TR1 (post-excavation).

Three profile locales (PL1-PL3) were documented in TR1. Profile Locales 1 and 2 (PL1 and PL2), documented in the west-central portions of TR1, are quite similar. Profile Locale 3 documents the stratigraphic sequence in the eastern part of TR1, which exhibited color and texture variations in Layers II, III, IV, and V, not observed in the sequences documented in PL1 and PL2. It was noted that in TR1, more silt layers were present in lower portions of the stratigraphic sequence than were present in upper layers of the sequence.

No archaeological materials or features were found in TR1 excavations. The stratigraphic sequences observed at PL1, PL2, and PL3 are presented below.

Profile Locale 1

Profile Locale 1 was documented on the east face of TR1. The base of excavation at this locale was approximately 131 cmbs.

A total of six stratigraphic layers were identified at PL1, and designated as Layers I-VI. Table 6 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 12 presents the profile drawing at PL1 and a photograph.

Layer II dark yellowish brown silty clay loam deposits documented in PL1 are found only in the western portions of TR1 (including PL2) and in eastern portions of TR7 (PL6). It was not present in PL3 in TR1. Layers V and VI are silt layers, with Layer V exhibiting a dark grayish brown zone overlying Layer VI dark yellowish brown silts.

Sparse charcoal flecking was found in Layer VI in PL1, but it could not be ascertained whether or not the charcoal was cultural. A sample of the charcoal flecking was taken but the sample did not yield a sufficient quantity of charcoal for ID or dating. No definitive archaeological materials or features were encountered in Layers I-VI at PL1.

Profile Locale 2

Profile Locale 2 was documented on the west face of TR1. The base of excavation at this locale was 140 cmbs.

A total of five stratigraphic layers were identified at PL2, and designated as Layers I-V. Table 7 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 13 presents the profile drawing at PL2 and a photograph. In PL2, Layers III, IV, and V show color and textural variations not present in these layers in PL1. While


Trench 1, post-excavation with exposed utility line; PL1 adjacent to photo scale; view to north.

Figure 11. Overview Photograph of Trench 1.

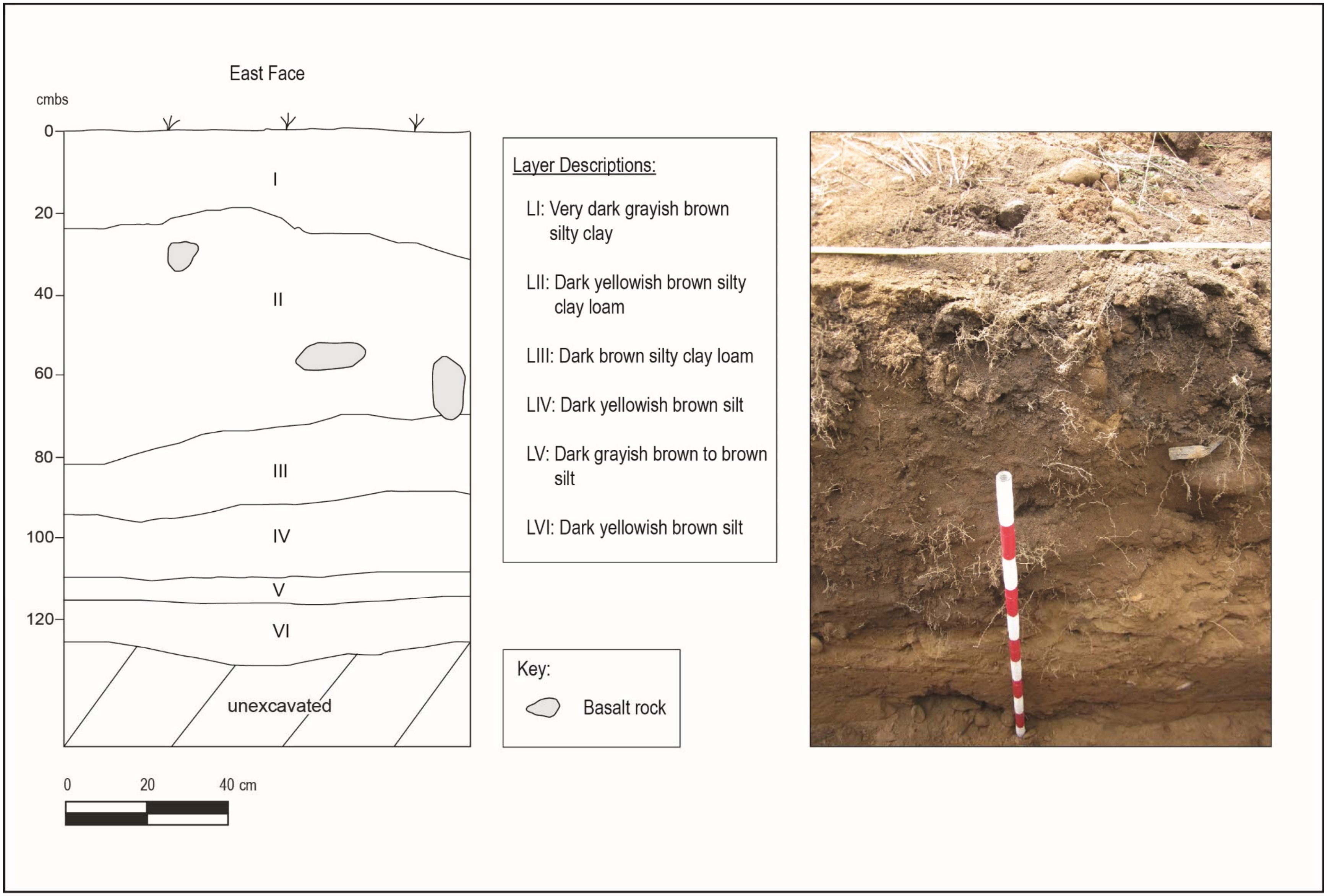


Figure 12. Profile and Photograph of East Face of Trench 1 at PL1.

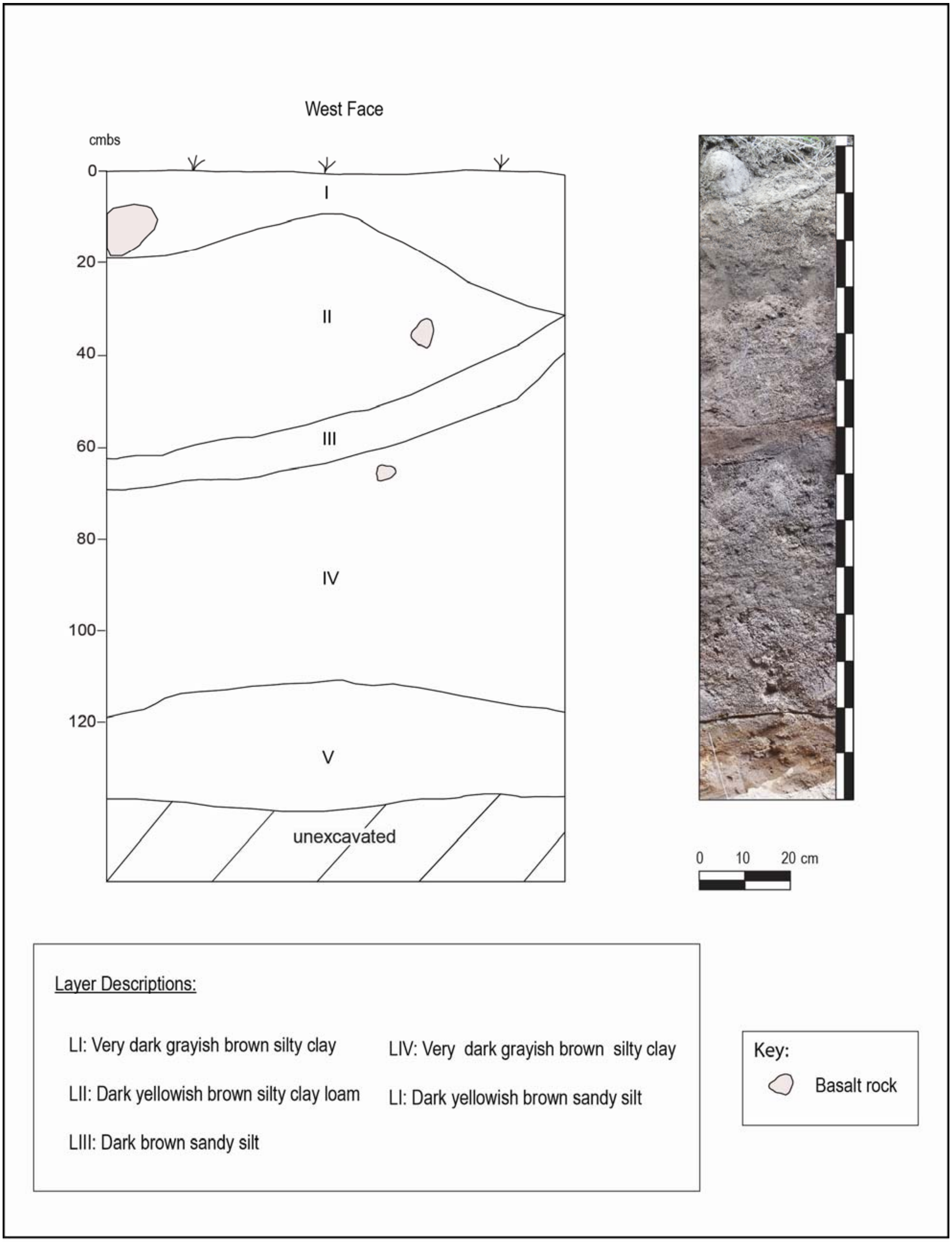


Figure 13. Profile and Photograph of West Face of Trench 1 at Profile Locale 2.

Layer V in PL2 is a sandy silt, it is the same color as Layer VI in PL1 and it is possible these layers may correlate. No archaeological materials or features were encountered in Layers I-V at PL2.

Table 6. Stratigraphic Layer Descriptions for Profile Locale 1 in Trench 1.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/32	18-32 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, plastic; contains less than 2%, by volume, rounded to subrounded basalt pebbles and cobbles; common, fine to medium, interstitial roots; abrupt, wavy lower boundary; contains recent rubbish items (rubber/plastic strips).
II	18/82	46-58 cm thick; dark yellowish brown (10YR 3/4, moist) silty clay loam; slightly hard, firm, very slightly sticky, slightly plastic; contains approximately 5%, by volume, rounded to subrounded basalt pebbles, cobbles, and small boulders; few, fine interstitial roots; abrupt, smooth lower boundary; contains limited (sparse) charcoal flecking.
III	70/95	12-22 cm thick; Dark brown (7.5YR 3/3, moist) silty clay loam; slightly hard, firm, slightly sticky, very slightly plastic; contains less than 3%, by volume, rounded to subrounded basalt cobbles and boulders; few, fine, interstitial roots; clear, wavy lower boundary.
IV	89/110	14-19 cm thick; dark yellowish brown (10YR 3/4, moist) silt; soft, very friable, nonsticky, nonplastic; contains less than 2%, by volume, rounded to subrounded basalt pebbles; few, fine interstitial roots; abrupt, smooth lower boundary.
V	108/116	6-8 cm thick; dark grayish brown to brown (10YR 4/2.5, moist) silt; slightly hard, friable, nonsticky, nonplastic; no rock inclusions; no roots; abrupt, smooth lower boundary.
VI	115/131+	10-16+ cm thick; dark yellowish brown (10YR 4/6, moist) silt; slightly hard, friable, nonsticky, nonplastic; no rock inclusions; no roots; lower boundary not reached; contains limited charcoal flecking.

Table 7. Stratigraphic Layer Descriptions for Profile Locale 2 in Trench 1.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/32	11-32 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; contains less than 2%, by volume, rounded to subrounded basalt pebbles and cobbles; common, fine to medium, interstitial roots; diffuse, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	11/64	5-44 cm thick; dark yellowish brown (10YR 3/4, moist) silty clay loam; slightly hard, firm, very slightly sticky, slightly plastic; contains approximately 5%, by volume, rounded to subrounded basalt pebbles, cobbles, and small boulders; few, fine interstitial roots; abrupt, smooth lower boundary; contains limited (sparse) charcoal flecking.

Table 7. Stratigraphic Layer Descriptions for Profile Locale 2 in Trench 1.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
III	34/70	7-10 cm thick; dark brown (7.5YR 3/4, moist) sandy silt; slightly hard, friable, very slightly sticky, nonplastic; contains less than 3%, by volume, rounded to subrounded basalt cobbles and boulders; no roots; diffuse, smooth lower boundary.
IV	42/118	48-68 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; contains less than 2%, by volume, rounded to subrounded basalt pebbles; few, fine interstitial roots; clear, smooth lower boundary.
V	112/140+	17-28+ cm thick; dark yellowish brown (10YR 3/6, moist) sandy silt; slightly hard, friable, nonsticky, nonplastic; contains fine to very find basalt sands; no rock inclusions; no roots; lower boundary not reached.

Profile Locale 3

Profile Locale 3 (PL3) was documented on the west face of TR1. The base of excavation at this locale was 140 cmbs.

A total of six stratigraphic layers were identified at PL3, and designated as Layers I-VI. Table 8 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 14 presents the profile drawing at PL3 and a photograph. In PL3, Layer III is a dark reddish brown clayey silt that is not present in PL1 and PL2 in the southern portion of TR1. Layers IV, V and VI at this locale are comprised of sandy silts and silts.

Table 8. Stratigraphic Layer Descriptions for Profile Locale 3 in Trench 1.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/31	24-31 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; contains less than 2%, by volume, round ed to subrounded basalt pebbles and cobbles; common, fine to medium, interstitial roots; diffuse, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	24/70	16-38 cm thick; dark brown (7.5YR 3/2, moist) to dark grayish brown (10YR 4/2, moist) clayey silt; slightly hard, firm, very slightly sticky, nonplastic; few, fine interstitial roots; clear, wavy lower boundary.
III	46/124	54-58 cm thick; dark reddish brown (5YR 3/3, moist) clayey silt; slightly hard, firm, very slightly sticky, nonplastic; very few, fine, interstitial roots; abrupt, wavy lower boundary.
IV	104/134	7-28 cm thick; very dark grayish brown (10YR 3/2, moist) sandy silt; slightly hard, friable, very slightly sticky, nonplastic; few, fine interstitial roots; clear, smooth lower boundary.
V	124/139	7-8 cm thick; dark brown to dark yellowish brown (10YR 3/3.5, moist) sandy silt; slightly hard, friable, very slightly sticky, nonplastic; contains fine to very fine basalt sands; no roots; clear, wavy lower boundary.
VI	132/140+	2-8+ cm thick; dark yellowish brown (10YR 4/6, moist) silt; slightly hard, friable, nonsticky, nonplastic; no rock inclusions; no roots; lower boundary not reached.

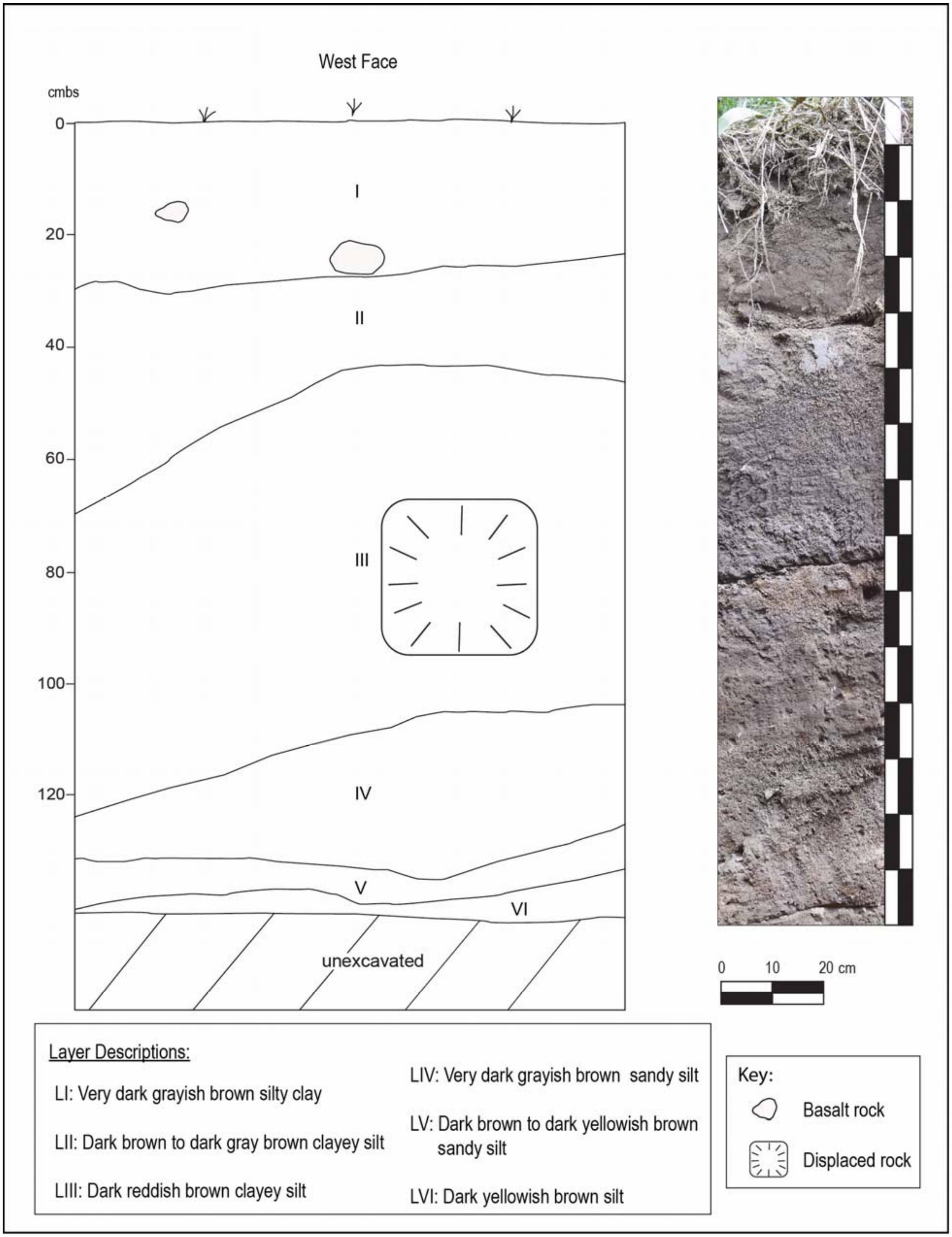


Figure 14. Profile and Photograph of West Face of Trench 1 at Profile Locale 3.

TRENCH 2

Trench 2 (TR2) was excavated in the northwest quadrant of the project area, approximately 10.0 m south of TR1 in a low-lying area that was constantly saturated as a result of three days of rain at the beginning of the project (see Figure 9; see Table 4). This area was approximately 0.5 m lower than the surrounding areas. The base of excavation at this locale was 152 cmbs. Figure 15 presents an overview photograph of TR2, post-excavation. One profile locale, PL20, was documented in TR2. The stratigraphic sequence for this locale is presented below.

Profile Locale 20

Profile Locale 20 (PL20) was documented on the south face of TR2. The base of excavation at this locale was 152 cmbs.

A total of five stratigraphic layers were identified (Layers I-V) in PL20. The stratigraphic sequence in TR2 was consistent within TR2. Table 9 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 16 presents the profile drawing at PL20 and a photograph. Layer V appears to be the cobble/pebble layer observed on the banks of ʻĪao Stream. No archaeological materials or features were found in Layers I-V at PL20.

Table 9. Stratigraphic Layer Descriptions for Profile Locale 20 in Trench 2.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/40	10-40 cm thick; Very dark gray to very dark grayish brown (10YR 3/1.5, moist) sandy clay loam; slightly hard, firm, slightly sticky, plastic; very few, fine, interstitial roots; diffuse, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	10/60	13-28 cm thick; dark brown (10YR 3/3, moist) silt loam; slightly hard, firm, very slightly sticky, slightly plastic; contains decomposing basalt sands and fine gravel; very few, fine, interstitial roots; diffuse, wavy lower boundary.
III	26/96	28-52 cm thick; dark yellowish brown (10YR 3/6, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; very few, fine, interstitial roots; gradual, wavy lower boundary.
IV	80/120	20-30 cm thick; black (10YR 2/1, moist) clay; contains less than 3%, by volume, decomposing, rounded to subrounded basalt cobbles; hard, firm, sticky, plastic; few, fine, interstitial roots; clear, wavy, lower boundary.
V	108/152+	26-44+ cm thick; dark yellowish brown (10YR 4/6, moist) extremely cobbly, pebbly, sandy silt loam; slightly hard, friable, slightly sticky, nonplastic; contains approximately 50%, by volume, decomposing basalt cobbles; no roots; lower boundary not reached.


Trench 2, post-excavation; view to northwest.

Figure 15. Overview Photograph of Trench 2.

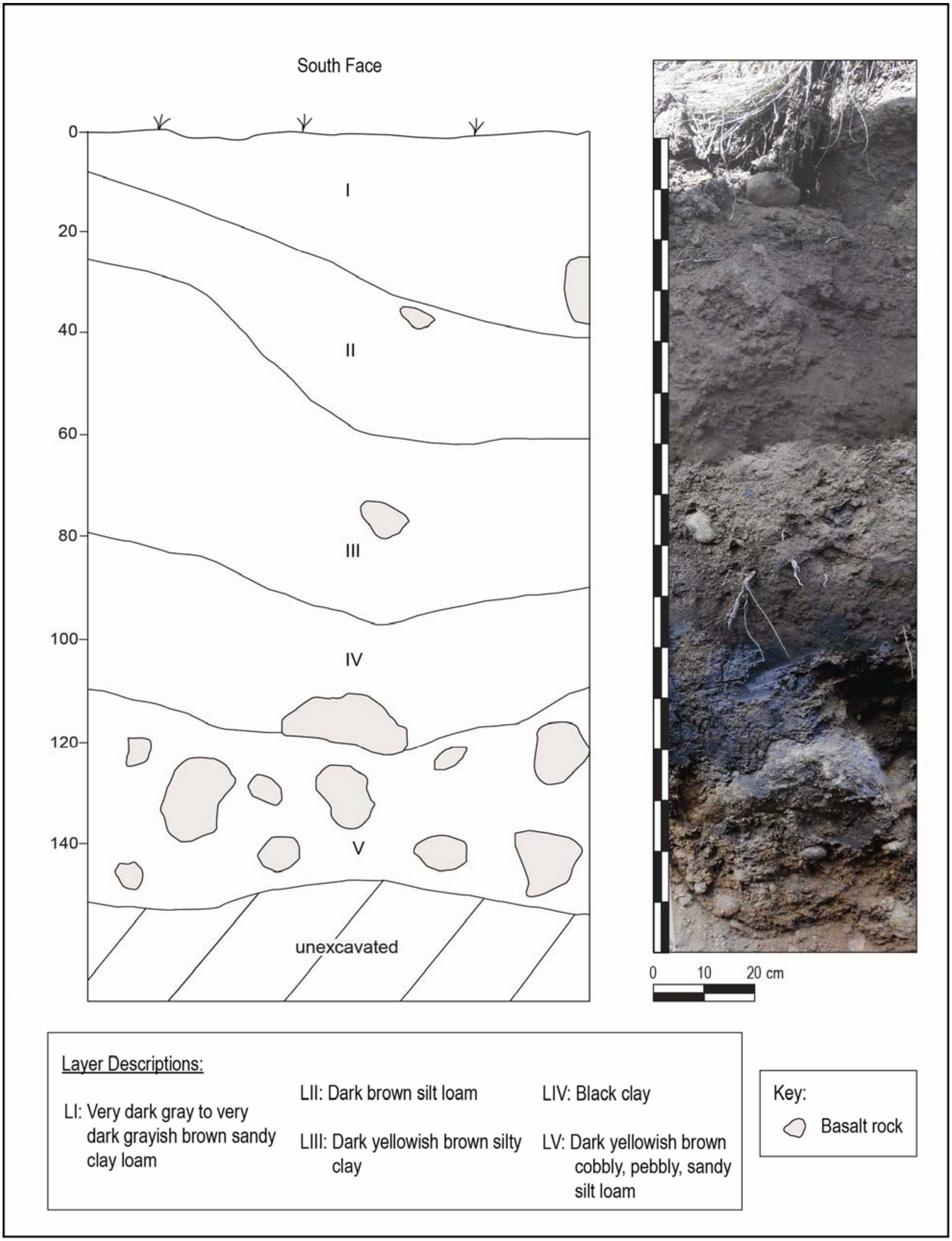


Figure 16. Profile and Photograph of South Face of Trench 2 at Profile Locale 20.

TRENCH 3

Trench 3 was excavated in the west-central portion of the project area (see Figure 9; see Table 4). A total of five stratigraphic layers were identified (Layers I-V) in TR3. Figure 17 presents an overview photograph of TR3, post-excavation. No archaeological materials or features were found in TR3 excavations.

Two profile locales (PL12 and PL13) were documented in TR3. The stratigraphic sequences in these two profile locales are presented below.

Profile Locale 12

Profile Locale 12 (PL12) was documented on the west face of TR3. The base of excavation at this locale was 140 cmbs.

A total of four stratigraphic layers were identified at PL12, and designated as Layers I-IV. Table 10 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 18 presents the profile drawing at PL12 and a photograph. No archaeological materials or features were encountered in Layers I-IV at PL12.

Table 10. Stratigraphic Layer Descriptions for Profile Locale 12 in Trench 3.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/18	14-18 cm thick; very dark gray (10YR 3/1, moist) silt loam; slightly hard, firm, slightly sticky, plastic; abundant, fine, interstitial roots; abrupt, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	14/102	84-88 cm thick; dark brown (7.5YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; few, fine interstitial roots; abrupt, wavy lower boundary.
III	97/134	30-34 cm thick; very dark brown (10YR 2/2, moist) silty clay; slightly hard, firm, slightly sticky, very slightly plastic; no roots; abrupt, wavy lower boundary.
IV	130/140+	8-10+ cm thick; dark brown to dark yellowish brown (10YR 3/3.5, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no roots; lower boundary not reached.

Profile Locale 13

Profile Locale 13 (PL13) was documented on the west face of TR3. The base of excavation at this locale was 140 cmbs.

A total of five stratigraphic layers were identified at PL13, and designated as Layers I-V. Table 11 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 19 presents the profile drawing at PL13 and a photograph. Layer V at PL13 is a silt deposit. A piece of black plastic, the type of material frequently observed in sugar cane fields, was found at the base of Layer II in this locale. Samples of Layer IV had strong brown (10YR 5/8, moist) staining on ped surfaces. No archaeological materials or features were encountered in Layers I-V at PL13.


Trench 3, post-excavation with large boulders visible within Layer II; view to northeast.

Figure 17. Overview Photograph of Trench 3.

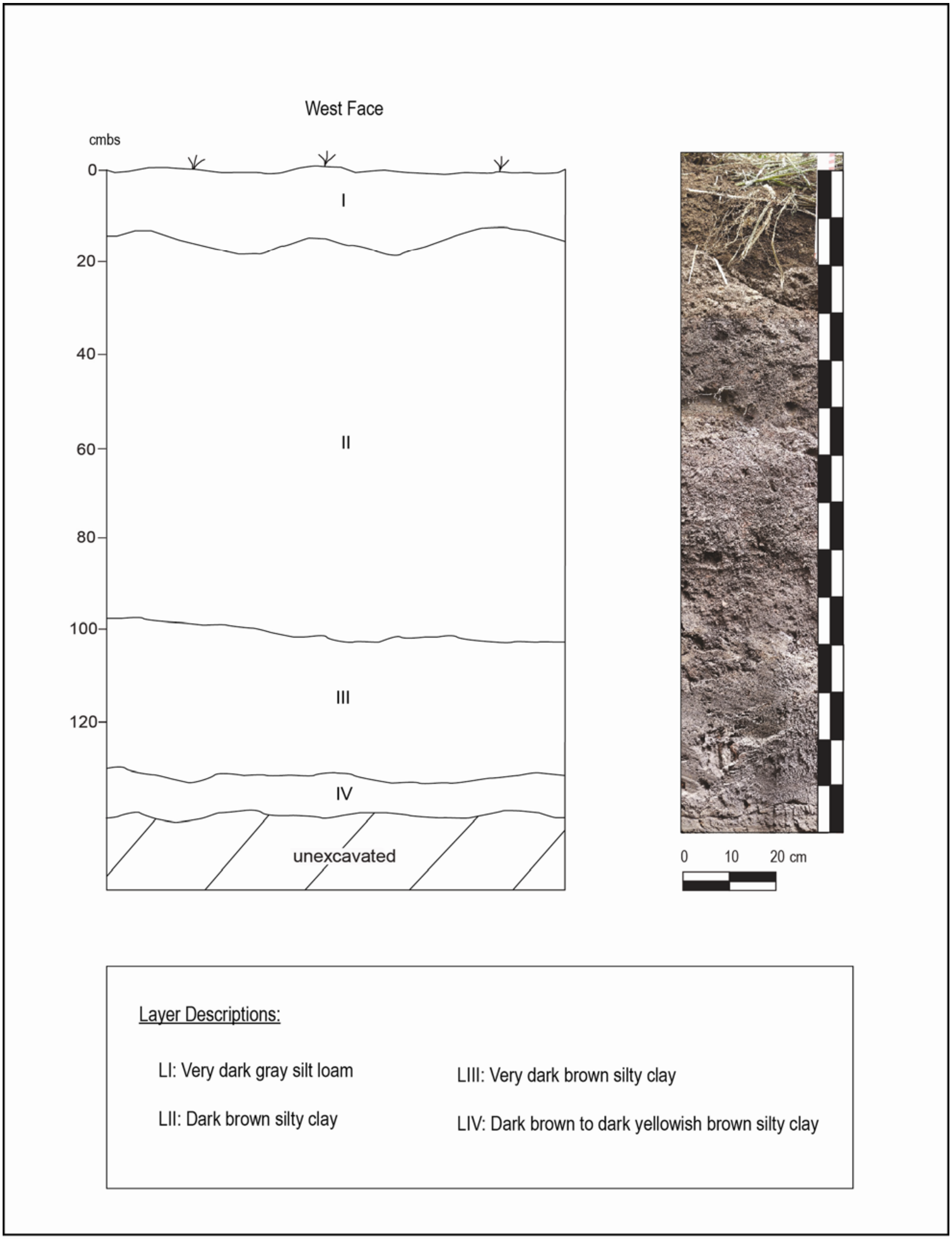


Figure 18. Profile and Photograph of West Face of Trench 3 at Profile Locale 12.

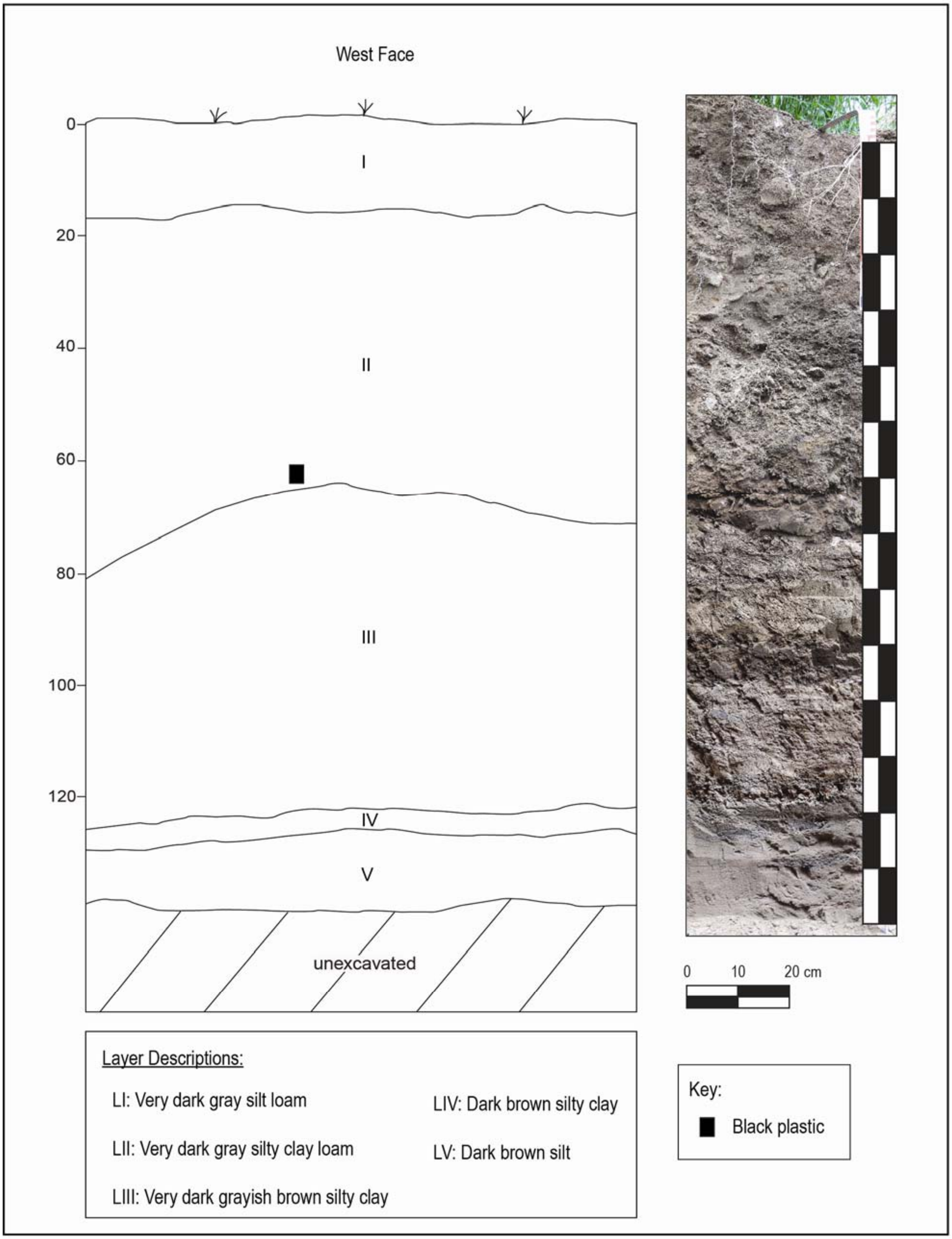


Figure 19. Profile and Photograph of West Face of Trench 3 at Profile Locale 13.

Table 11. Stratigraphic Layer Descriptions for Profile Locale 13 in Trench 3.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/18	16-18 cm thick; very dark gray (10YR 3/1, moist) silt loam; slightly hard, firm, slightly sticky, slightly plastic; abundant, fine, interstitial roots; abrupt, smooth lower boundary; contains recent rubbish items (glass, metal, plastic).
II	16/82	30-64 cm thick; very dark gray (10YR 3/1 , moist) silty clay loam; slightly hard, firm, very slightly sticky, slightly plastic; few, fine interstitial roots; abrupt, wavy lower boundary; contains black plastic fragments.
III	66/127	44-58 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, very slightly plastic; no roots; abrupt, smooth lower boundary.
IV	122/130	4-6 cm thick; dark brown (10YR 3/3, moist) silty clay; hard, firm, slightly sticky, slightly plastic; contains strong brown (10YR 5/8, moist) staining on ped surfaces; no roots; abrupt, smooth boundary
V	127/140+	10-14+ cm thick; dark brown (10YR 3/3, moist) silt; firm, friable, nonsticky, nonplastic; no roots; lower boundary not reached.

TRENCH 4

Trench 4 (TR4) was excavated in the southwest quadrant of the project area (see Figure 9; see Table 4). Trench 4 was one of four trenches excavated deeper in an attempt to reach the cobble/pebbble layer observed along the banks of ʻĪao Stream; it excavated to depths ranging from 190 to 230 cmbs. Figure 20 presents an overview photograph of TR4, post-excavation. A total of nine stratigraphic layers were identified (Layers I-IX) in TR4. No archaeological materials or features were found in TR4 excavations.

Two profile locales (PL14 and PL15) were documented on the east face of TR4. The stratigraphic sequences observed at PL14 and PL15 are presented below.

Profile Locale 14

Profile Locale 14 was documented on the west face of TR4. The base of excavation at this locale was approximately 230 cmbs.

A total of nine stratigraphic layers were identified at PL14, and designated as Layers I-IX. Table 12 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 21 presents the profile drawing at PL14 and a photograph. Layers IV, V, and VII consist of clayey silts and silts. Layer IX at PL14 has been identified as the cobble/pebbble layer observed along the banks of ʻĪao Stream. No archaeological materials or features were encountered in Layers I-IX at PL14.

Profile Locale 15

Profile Locale 15 was documented on the east face of TR4. The base of excavation at this locale was approximately 190 cmbs.

A total of five stratigraphic layers were identified at PL15, and designated as Layers I-V. Table 13 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 22 presents the profile drawing at PL15 and a photograph.


Trench 4 with stepped excavation; post-excavation; view to southeast.

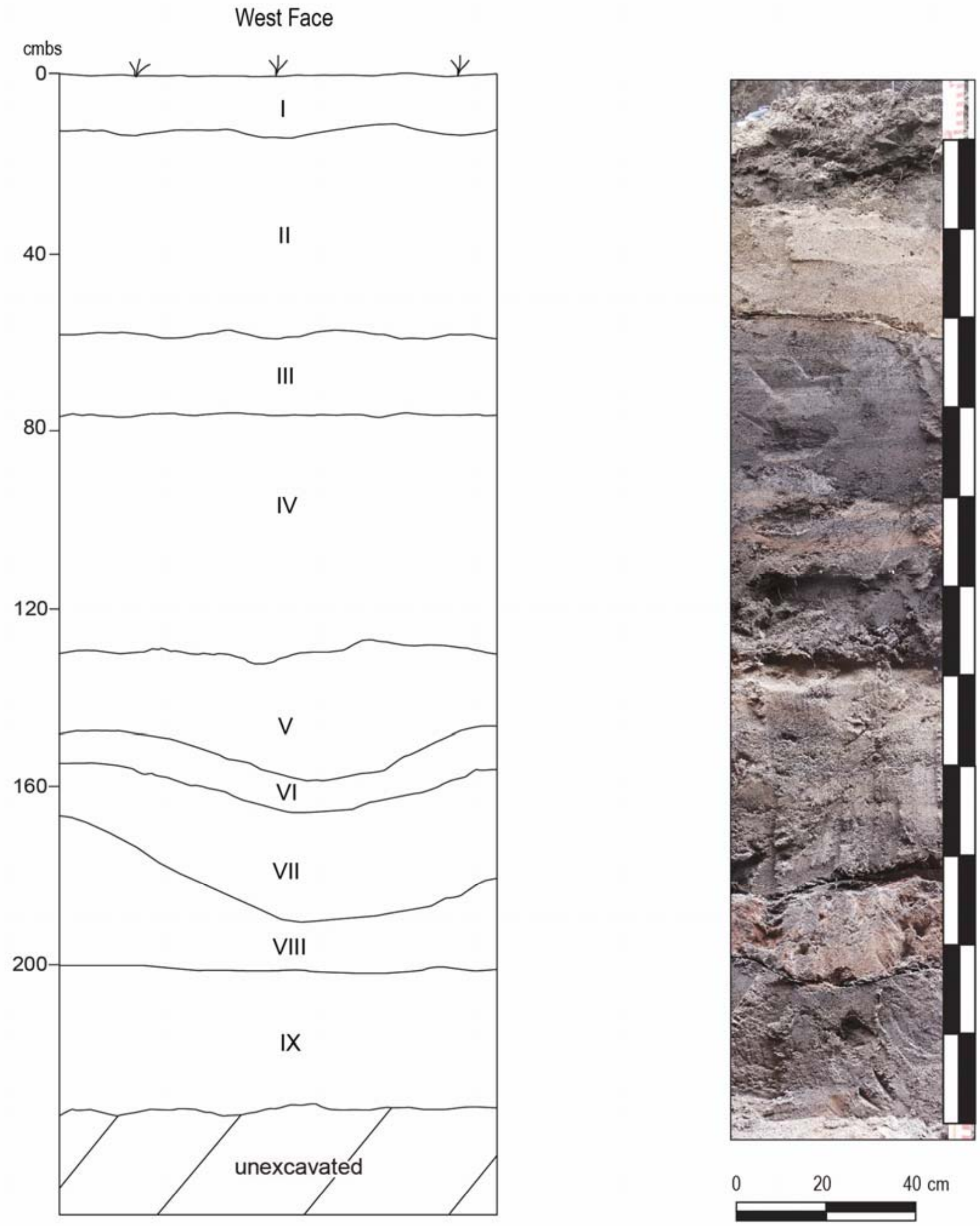
Figure 20. Overview Photograph of Trench 4.

Table 12. Stratigraphic Layer Descriptions for Profile Locale 14 in Trench 4.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/14	12-14 cm thick; very dark gray (10YR 3/1, moist) silt loam; slightly hard, firm, slightly sticky, slightly plastic; abundant, fine, interstitial roots; abrupt, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	12/58	46-48 cm thick; very dark gray (10YR 3/1, moist) silty clay; slightly hard, firm, very slightly sticky, slightly plastic; few, fine interstitial roots; abrupt, wavy lower boundary.
III	58/76	16-18 cm thick; dark brown (10YR 3/3, moist) silty clay; slightly hard, firm, slightly sticky, very slightly plastic; no roots; abrupt, smooth lower boundary.
IV	76/132	54-56 cm thick; very dark gray to black (10YR 2.5/1, moist) clayey silt; slightly hard, firm, very slightly sticky, nonplastic; no roots; abrupt, wavy lower boundary.
V	128/158	16-28 cm thick; dark brown (10YR 3/3, moist) silt; slightly hard, friable, nonsticky, nonplastic; no roots; abrupt, wavy lower boundary.
VI	146/165	7-10 cm thick; dark reddish brown (5YR 3/4, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no roots; abrupt, wavy lower boundary.
VII	155/188	12-27 cm thick; dark gray (10YR 3/1, moist) silt; slightly hard, friable, nonsticky, nonplastic; no roots; abrupt, smooth lower boundary.
VIII	166/200	10-33 cm thick; dark brown (7.5YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no roots; abrupt, smooth boundary.
IX	200/230+	30+ cm thick; dark brown (7.5YR 3/4, moist) extremely cobbly, pebbly silt loam; contains 50-60%, by volume, decomposing, rounded to subrounded basalt cobbles and pebbles; slightly hard, firm, very slightly sticky, nonplastic; no roots; lower boundary not reached.

Table 13. Stratigraphic Layer Descriptions for Profile Locale 15 in Trench 4.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/12	11-12 cm thick; very dark gray (10YR 3/1, moist) silt loam; slightly hard, firm, slightly sticky, slightly plastic; abundant, fine, interstitial roots; abrupt, smooth lower boundary; contains recent rubbish items (glass, metal, plastic).
II	11/130	112-119 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; few, fine interstitial roots; abrupt, wavy lower boundary.
III	124/170	39-44 cm thick; very dark brown (10YR 2/2, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no roots; abrupt, wavy lower boundary.
IV	168/174	3-4 cm thick; dark brown to dark yellowish brown (10YR 3/3.5, moist) silty clay with strong brown (10YR5/8, moist) staining on ped surfaces; slightly hard, firm, slightly sticky, slightly plastic; no roots; abrupt, wavy lower boundary.
V	172/190+	17-20+ cm thick; dark brown (10YR 3/3, moist) extremely cobbly, pebbly, sandy silt; slightly hard, friable, nonsticky, nonplastic; contains coarse basalt sands and fine gravels and approximately 50%, by volume, decomposing rounded basalt cobbles and pebbles; no roots; lower boundary not reached.



Layer Descriptions:

LI: Very dark gray silt loam

LII: Very dark gray silty clay

LIII: Dark brown silty clay

LIV: Very dark gray to black clayey silt

LV: Dark brown silt

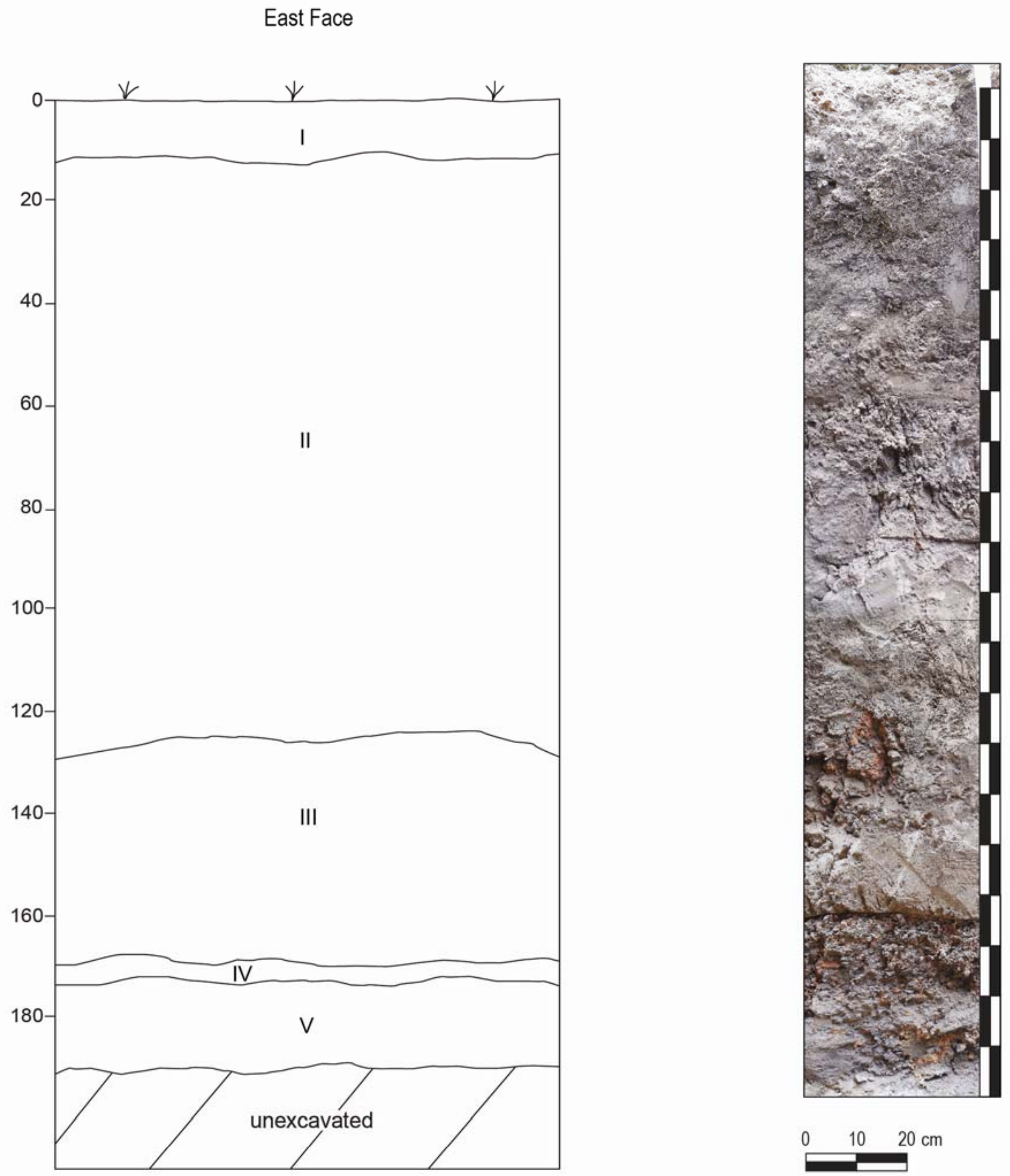
LVI: Dark reddish brown silty clay

LVII: Dark gray silt

LVIII: Dark brown silty clay

LIX: Dark brown extremely cobbly, pebbly silt loam

Figure 21. Profile and Photograph of West Face of Trench 4 at Profile Locale 14.



Layer Descriptions:

LI: Very dark gray silt loam

LII: Very dark grayish brown silty clay

LIII: Very dark brown silty clay

LIV: Dark brown to dark yellowish brown silty clay with strong brown staining on ped surfaces

LV: Dark brown extremely cobbly, pebbly sandy silt with approximately 50%, by volume, rounded to subrounded, decomposing basalt cobbles and pebbles

Figure 22. Profile and Photograph of East Face of Trench 4 at Profile Locale 15.

At PL15, Layer II thickness is significantly greater in the north end of the trench at PL15 (112-119 cm) than in the south end (46-48 cm). Layer IV had strong brown (10YR5/8, moist) staining on ped surfaces. Layer V is a sandy silt deposit. No archaeological materials or features were encountered in Layers I-V at PL15.

TRENCH 5

Trench 5 (TR5) was excavated in the southwest quadrant of the project area (see Figure 9; see Table 4), just west of TR4. Trench 5, one of three of the deeper trenches, was excavated to approximately 260 cmbs. Figure 23 presents an overview photograph of TR5, post excavation. A total of ten stratigraphic layers were identified (Layers I-X) in TR5. No archaeological materials or features were found in TR5 excavations.

One profile locale (PL17) was documented in TR5. The stratigraphic sequence observed at PL17 is presented below.

Profile Locale 17

Profile Locale 17 was documented on the west face of TR5. The base of excavation at this locale was approximately 260 cmbs.

A total of ten stratigraphic layers were identified at PL17, and designated as Layers I-X. Table 14 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 24 presents the profile drawing at PL17 and a photograph. The stratigraphic sequence in TR5 appears to be void of layers associated with sugar cane agriculture. This is based on the presence of microstratigraphy in the thicker layers in TR5. The number of layers may reflect TR5's proximity to ʻĪao Stream, which is situated less than 10 meters from TR5. No archaeological materials or features were encountered in Layers I-X at PL17. Layer X in TR5 is the cobble/pebble layer observed along the banks of ʻĪao Stream.

TRENCH 6

Trench 6 was excavated in the northeast quadrant of the project area (see Figure 9; see Table 4), just east of TR1. Trench 6 was excavated to depths ranging from 140 to 248 cmbs. The western portion of TR6 was excavated deeper than the eastern portion in order to reach the cobble/pebble layer observed along the banks of ʻĪao Stream. An intact PVC utility line was encountered while excavating TR6. Figure 25 presents overview photographs of TR6.

A total of seven stratigraphic layers were identified in TR6 (Layers I-VII). No archaeological materials or features were found in TR6 excavations.

Two profile locales (PL4 and PL5) were documented in TR6. The stratigraphic sequence observed at PL4 and PL5 are presented below.

Profile Locale 4

Profile Locale 4 (PL4) was documented on the east face of TR6. The base of excavation at this locale was approximately 140 cmbs.

A total of five stratigraphic layers were identified at PL4, and designated as Layers I-V. Table 15 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 26 presents the profile drawing at PL4 and a photograph. Layers IV and V are sandy silt and silt deposits, respectively. No archaeological materials or features were encountered in Layers I-V at PL4.

Table 14. Stratigraphic Layer Descriptions for Profile Locale 17 in Trench 5.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/35	14-35 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, plastic; contains sparse decomposing, rounded boulders; common, fine, interstitial roots; clear, wavy boundary; contains recent rubbish (glass, metal, plastic).
II	14/56	14-38 cm thick; very dark gray (10YR 3/1, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; few, fine interstitial roots; abrupt, wavy lower boundary.
III	50/72	3-16 cm thick; dusky red (2.5YR 3/2, moist) to dark reddish brown (2.5YR 3/4, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no roots; abrupt, wavy lower boundary.
IV	53/140	56-68 cm thick; very dark gray (5YR 3/1, moist) clayey silt; soft, friable, very slightly sticky, slightly plastic; no roots; abrupt, wavy lower boundary.
V	120/148	8-18 cm thick; very dark gray (7.5YR 3/1, moist) silt; soft, very friable, nonsticky, nonplastic; no roots; abrupt, smooth boundary.
VI	138/156	8-12 cm thick; brown (7.5YR 4/3, moist) silt; soft, very friable, nonsticky, nonplastic; no roots; abrupt, smooth lower boundary
VII	150/174	18-20 cm thick; black (10YR 2/1, moist) silt; soft, very friable, nonsticky, nonplastic; no roots; abrupt, smooth boundary
VIII	168/178	6-10 cm thick; very dark gray (10YR 3/1, moist) silty clay; soft, very friable, very slightly sticky, nonplastic; no roots; abrupt, smooth boundary
IX	178/185	2-6 cm thick; dark reddish brown (5YR 3/3, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no roots; abrupt, smooth lower boundary.
X	180/260+	76-80+ cm thick; dark yellowish brown (10YR 3/4, moist) extremely cobbly, pebbly silt loam; contains decomposing, rounded to subrounded basalt cobbles and pebbles; slightly hard, firm, very slightly sticky, nonplastic; no roots; lower boundary not reached.

Table 15. Stratigraphic Layer Descriptions for Profile Locale 4 in Trench 6.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/11	8-11 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; contains less than 2%, by volume, rounded to subrounded basalt pebbles and cobbles; common, fine to medium, interstitial roots; abrupt, smooth lower boundary; contains recent rubbish items (glass, metal, plastic).
II	8/71	57-60 cm thick; dark reddish brown (5YR 3/3, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; few, fine interstitial roots; abrupt, smooth lower boundary.
III	66/98	23-30 cm thick; dark brown (10YR 3/3, moist) silt loam with rounded to subrounded basalt gravels and medium to fine sands; slightly hard, friable, very slightly sticky, nonplastic; very few, fine, interstitial roots; abrupt, smooth lower boundary.
IV	91/130	27-37 cm thick; dark yellowish brown (10YR 4/4, moist) sandy silt; slightly hard, friable, nonsticky, nonplastic; contains less than 2%, by volume, rounded to subrounded basalt pebbles; few, fine interstitial roots; abrupt, smooth lower boundary.
V	124/140+	10-16+ cm thick; dark brown to dark yellowish brown (10YR 3/3.5, moist) sandy silt; slightly hard, friable, nonsticky, nonplastic; no rock inclusions; no roots; lower boundary not reached.


Trench 5 stepped excavation; post-excavation; view to northeast.

Figure 23. Overview of Trench 5.

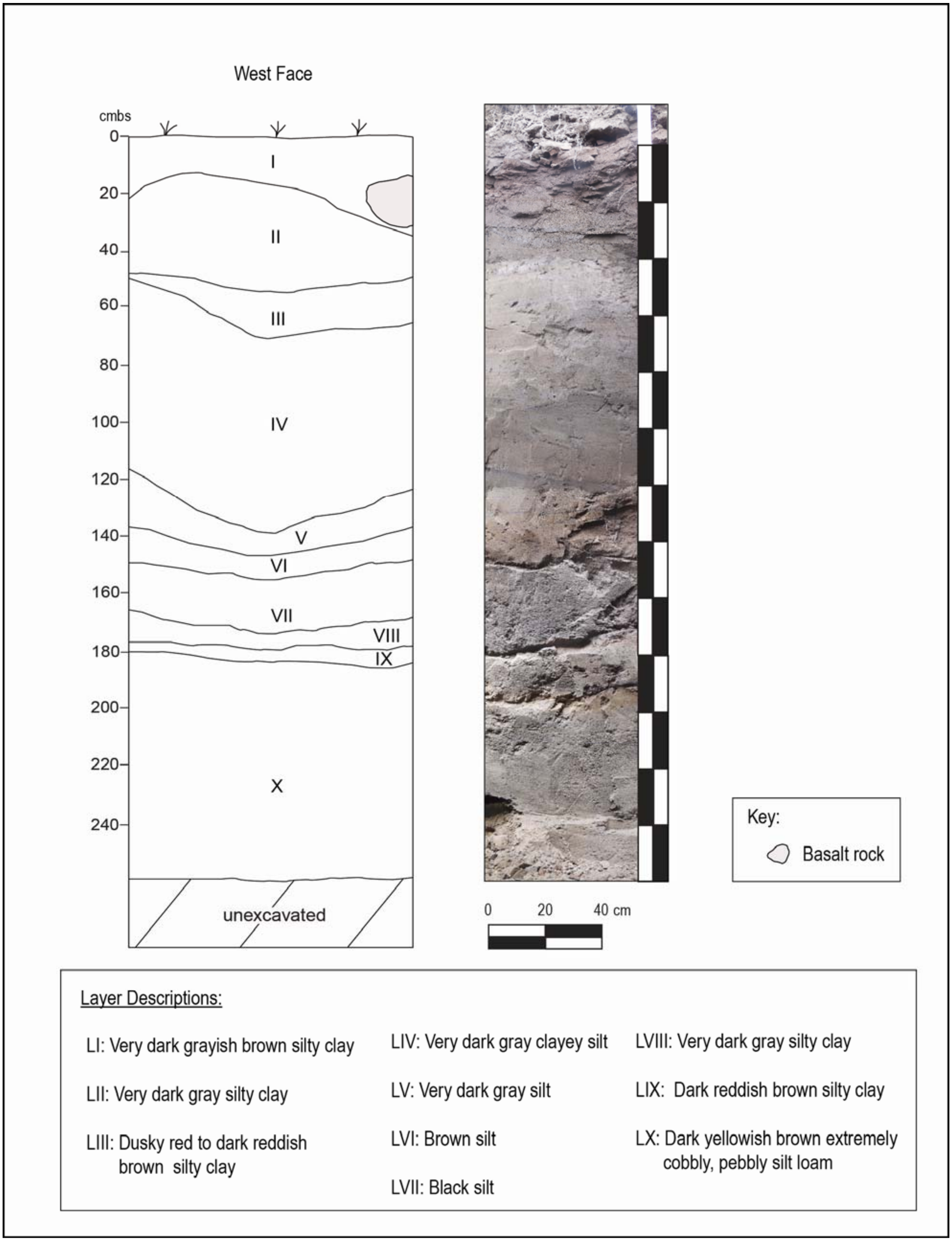
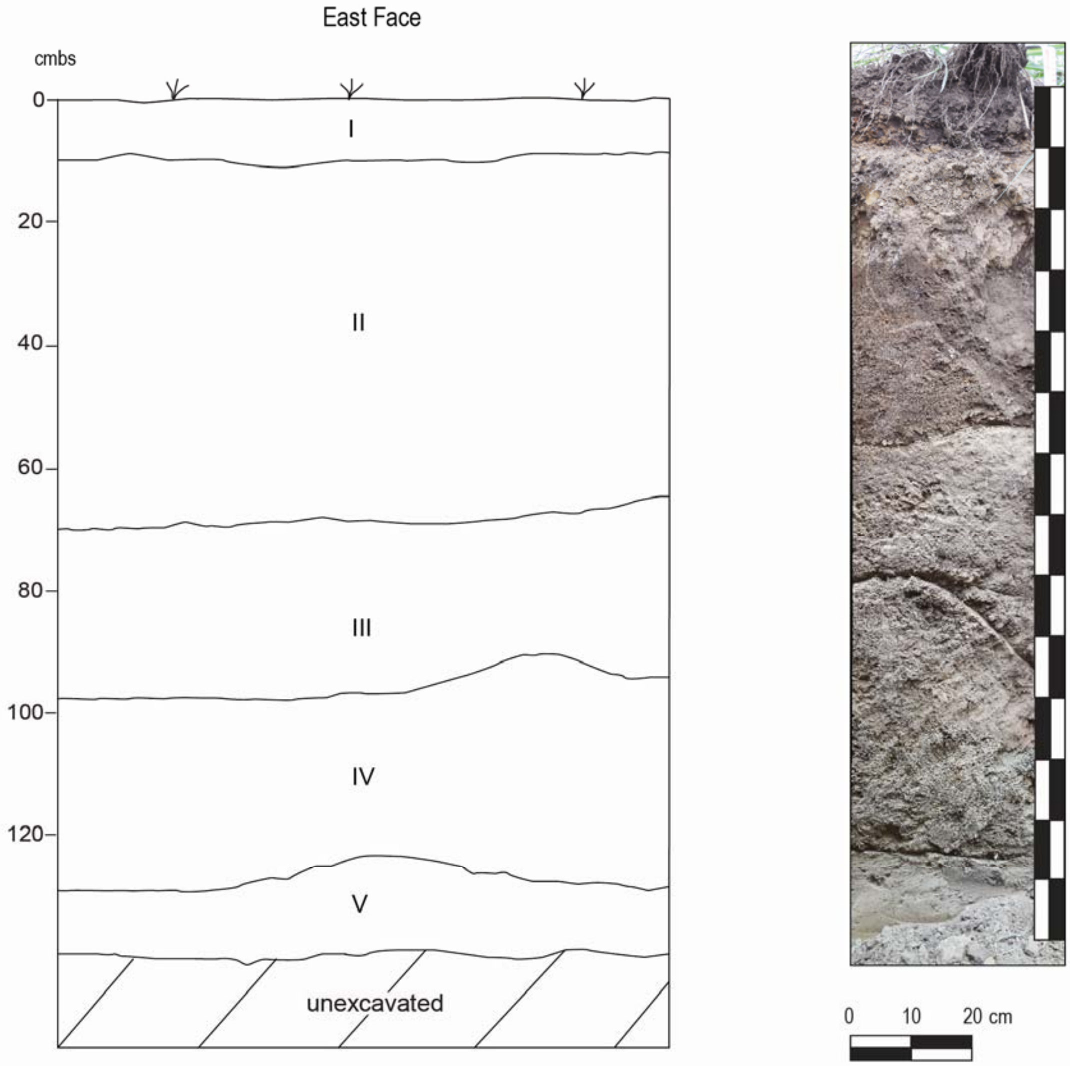


Figure 24. Profile and Photograph of West Face of Trench 5 at Profile Locale 17.

Trench 6, post excavation with active utility line; view to southeast.

Trench 6, post excavation; view to northeast.

Figure 25. Overview Photographs of Trench 6.



Layer Descriptions:

LI: Very dark grayish brown silty clay

LII: Dark reddish brown silty clay

LIII: Dark brown silt loam with rounded to subrounded basalt gravels and medium to fine sands

LIV: Dark yellowish brown sandy silt

LV: Dark brown to dark yellowish brown sandy silt

Figure 26. Profile and Photograph of East Face of Trench 6 at Profile Locale 4.

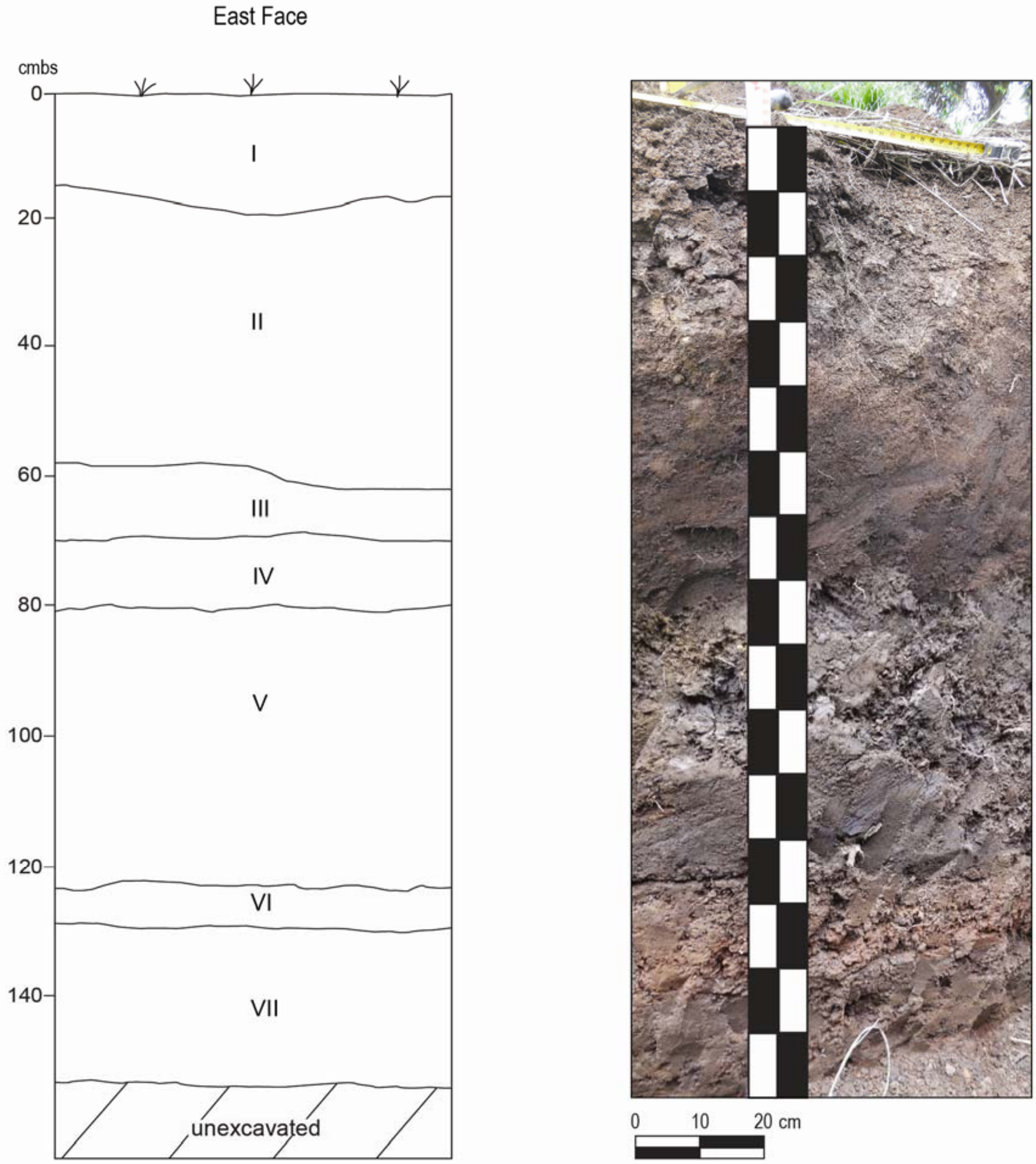
Profile Locale 5

Profile Locale 5 was documented on the east face of TR6. The base of excavation at this locale was approximately 248 cmbs.

A total of seven stratigraphic layers were identified at PL5, and designated as Layers I-VII. Table 16 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 27 presents the profile drawing at PL5 and a photograph. Layer IV contained strong brown (10YR 5/8, moist) staining on ped surfaces. Layers V and VI are silt and sandy silt deposits, respectively. No archaeological materials or features were encountered in Layers I-VII at PL5.

Table 16. Stratigraphic Layer Descriptions for Profile Locale 5 in Trench 6.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/30	23-30 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay loam; slightly hard, firm, slightly sticky, slightly plastic; common, fine to medium, interstitial roots; clear, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	23/100	70-74 cm thick; very dark gray (10YR 3/1, moist) clay; hard, firm, sticky, plastic; few, fine interstitial roots; abrupt, smooth lower boundary.
III	92/111	12-20 cm thick; dark reddish brown (2.5YR 3/4, moist) clay; hard, firm, sticky, plastic; very few, fine, interstitial roots; clear, smooth lower boundary.
IV	109/129	16-20 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay with strong brown (10YR 5/8, moist) staining on ped surfaces; hard, firm, slightly sticky, slightly plastic; no roots; abrupt, smooth lower boundary.
V	129/200	68-72 cm thick; dark reddish brown (5YR 3/3, moist) silt; slightly hard, friable, very slightly sticky, nonplastic; no rock inclusions; no roots; abrupt, wavy lower boundary.
VI	196/210	8-13 cm thick; dark yellowish brown (10YR 3/3, moist) sandy silt; slightly hard, friable, nonsticky, nonplastic; no rock inclusions; no roots; abrupt, broken, lower boundary.
VII	208/248+	38-40+ cm thick; dark brown (7.5YR 3/2, moist) extremely cobbly, pebbly silty sand with approximately 50-60%, by volume, decomposing, rounded to subrounded basalt cobbles and pebbles; slightly hard, friable, nonsticky, nonplastic; no roots; lower boundary not reached.



Layer Descriptions:

LI: Very dark grayish brown silty clay loam

LII: Very dark gray clay

LIII: Dark reddish brown clay

LIV: Very dark grayish brown silty clay with strong brown staining on ped surfaces

LV: Dark reddish brown silt

LVI: Dark yellowish brown sandy silt

LVII: Dark brown extremely cobbly, pebbly silty sand with approximately 50-60%, by volume, decomposing, rounded to subrounded basalt cobbles and pebbles

Figure 27. Profile and Photograph of East Face of Trench 6 at Profile Locale 5.

TRENCH 7

Trench 7 was excavated in the northeast quadrant of the project area (see Figure 9; see Table 4), just south of TR6. Trench 7 was excavated to depths ranging from 120 to 136 cmbs. Figure 28 presents an overview photograph of TR7, post-excavation. A total of six stratigraphic layers were identified in TR7 (Layers I-VI). One piece of historic glass was found and collected in TR6 (see PL7 below).

Two profile locales (PL6 and PL7) was documented in TR7. The stratigraphic sequence observed at PL6 and PL7 are presented below.

Profile Locale 6

Profile Locale 6 was documented on the south face of TR7. The base of excavation at this locale was approximately 120 cmbs.

A total of six stratigraphic layers, designated as Layers I-VI, and one lens, Lens A, were identified at PL6. Table 17 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 29 presents the profile drawing at PL6 and a photograph.

Lens A is a 4.0 cm thick, black silt loam lens present near the upper boundary of Layer V dark reddish brown silty clay sediments. No charcoal or other materials were observed within Lens A. Layer VI contained strong brown (10YR 5/8, moist) staining on ped surfaces. No archaeological materials or features were encountered in Layers I-VI at PL6.

Table 17. Stratigraphic Layer Descriptions for Profile Locale 6 in Trench 7.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/34	29-34 cm thick; very dark brown (10YR 2/2, moist) silty clay loam; hard, firm, slightly sticky, slightly plastic; common, fine to medium, interstitial roots; gradual, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	29/48	7-20 cm thick; dark yellowish brown (10YR 3/4, moist) silty clay; slightly hard, firm, very slightly sticky, slightly plastic; few, fine interstitial roots; clear, wavy lower boundary.
III	40/66	12-26 cm thick; dark reddish brown (5YR 3/3, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; very few, fine, interstitial roots; abrupt, wavy lower boundary.
IV	60/80	7-16 cm thick; dark brown (7.5YR 3/4, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no roots; abrupt, wavy lower boundary.
V	67/102	20-33 cm thick; dark reddish brown (5YR 3/3, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no rock inclusions; no roots; abrupt, smooth lower boundary.
Lens A	76/83	4 cm thick; black (7.5YR 2.5/1, moist) silt loam; slightly hard, friable, slightly sticky, nonplastic; no rock inclusions; no roots; abrupt, smooth lower boundary; lens is approximately 47.0 cm in length; non-cultural.
VI	98/120+	16-21+ cm thick; very dark grayish brown (10YR 3/2, moist) silty clay with strong brown (10YR 5/8, moist) staining on ped surfaces; slightly hard, firm, slightly sticky, slightly plastic; no rock inclusions; no roots; lower boundary not reached.

Trench 7, post- excavation; view to southwest.

Figure 28. Overview Photograph of Trench 7.

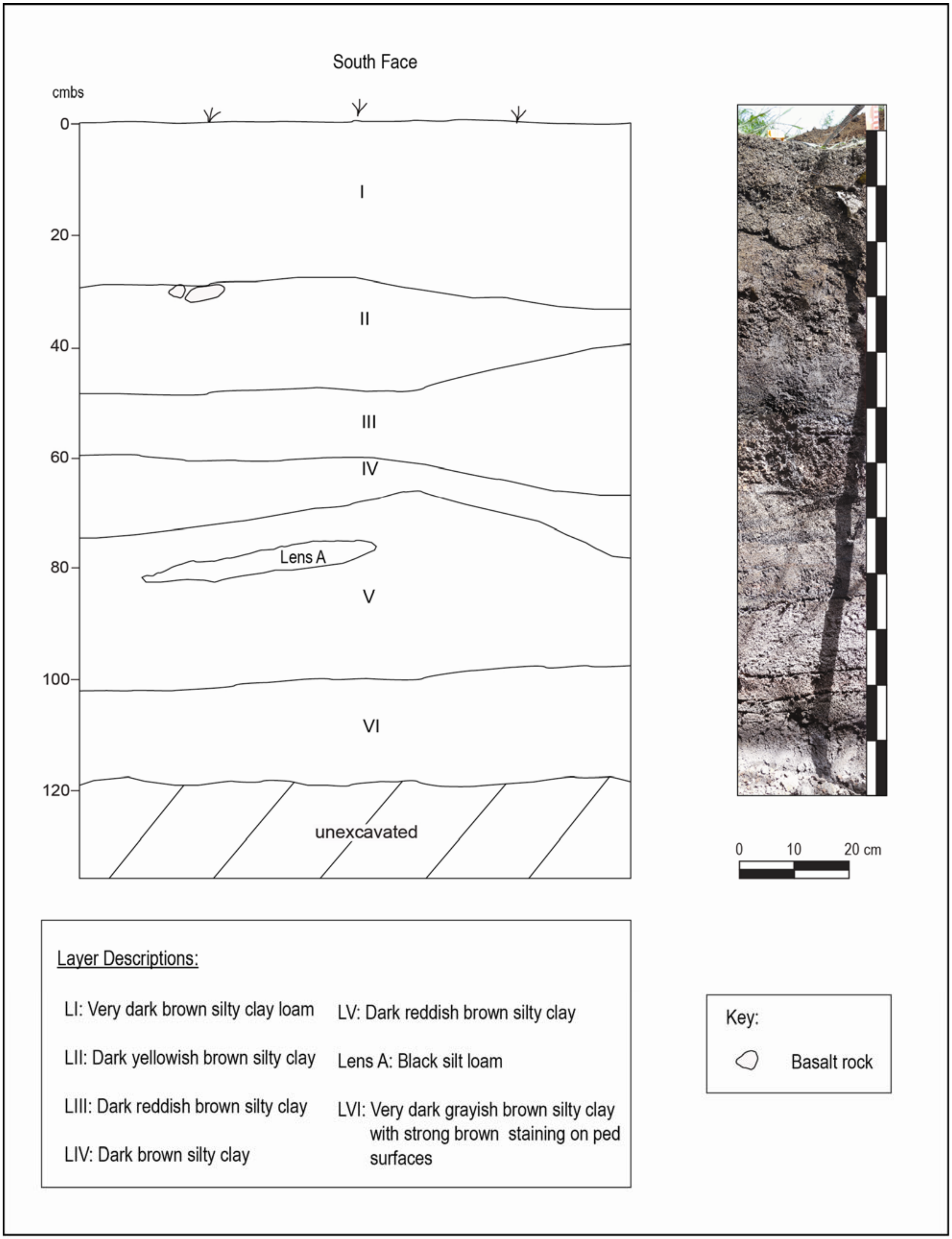


Figure 29. Profile and Photograph of South Face of Trench 7 at Profile Locale 6.

Profile Locale 7

Profile Locale 7 (PL7) was documented on the south face of TR7. The base of excavation at this locale was approximately 136 cmbs.

A total of four stratigraphic layers were identified at PL7, and designated as Layers I-IV. Table 18 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 30 presents the profile drawing at PL7 and a photograph.

One clear glass fragment was found protruding from the south face in Layer III deposits, at 82-84 cmbs (see Figure 30). No other archaeological materials or features were encountered in Layers I-IV at PL7.

Table 18. Stratigraphic Layer Descriptions for Profile Locale 7 in Trench 7.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/31	21-31 cm thick; very dark brown (10YR 2/2, moist) silty clay loam; hard, firm, slightly sticky, plastic; common, fine to medium, interstitial roots; diffuse, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	21/68	39-46 cm thick; very dark brown (10YR 2/2, moist) silty clay; slightly hard, firm, very slightly sticky, slightly plastic; no roots; abrupt, wavy lower boundary.
III	60/104	20-36 cm thick; dark brown (7.5YR 3/4, moist) silty clay; slightly hard, firm, slightly sticky, very slightly plastic; very few, fine, interstitial roots; clear, smooth lower boundary; one clear glass fragment was collected at 82-84 cmbs from profile face.
IV	80/136+	36-52+ cm thick; very dark grayish brown (10YR 3/2, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no roots; abrupt, lower boundary not reached.

TRENCH 8

Trench 8 (TR8) was excavated in the central-east portion of the project area (see Figure 9; see Table 4). Trench 8 was excavated to depths ranging from 134 to 140 cmbs. Figure 31 presents an overview photograph of TR8, post-excavation. A total of ten stratigraphic layers were identified in TR8 (Layers I-X). No archaeological materials or features were found in TR6 excavations.

Two profile locales (PL8 and PL9) were documented in TR8. The stratigraphic sequence observed at PL8 and PL9 are presented below.

Profile Locale 8

Profile Locale 8 (PL8) was documented on the north face of TR8. The base of excavation at this locale was approximately 140 cmbs.

A total of seven stratigraphic layers were identified at PL8, and designated as Layers I-VII. Table 19 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 32 presents the profile drawing at PL8 and a photograph. Layer III contained strong brown (10YR 5/8, moist) stains on ped surfaces. Layers II-VII are all silty clay deposits; no silt layers were identified at PL8. No archaeological materials or features were encountered in Layers I-VII at PL8.

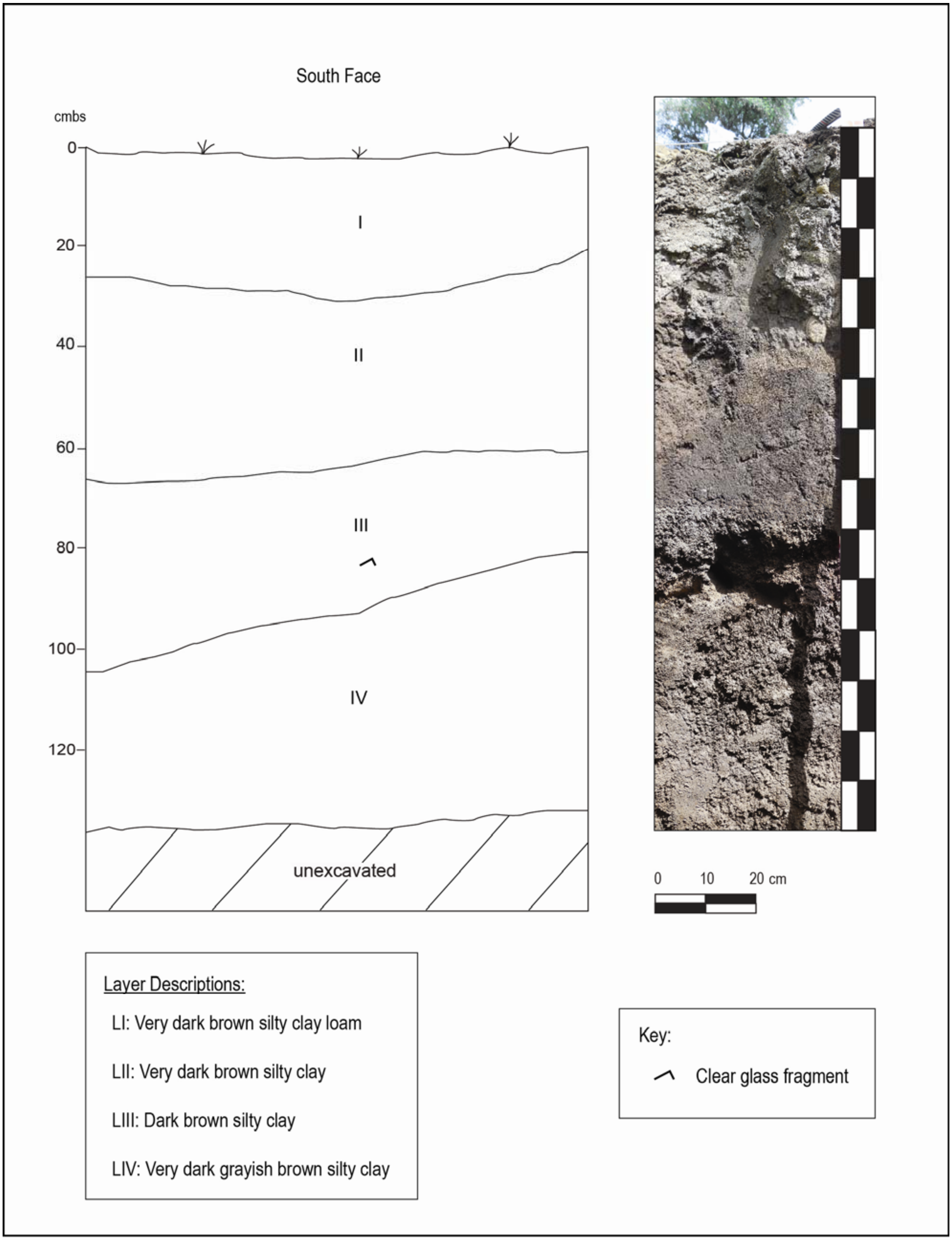
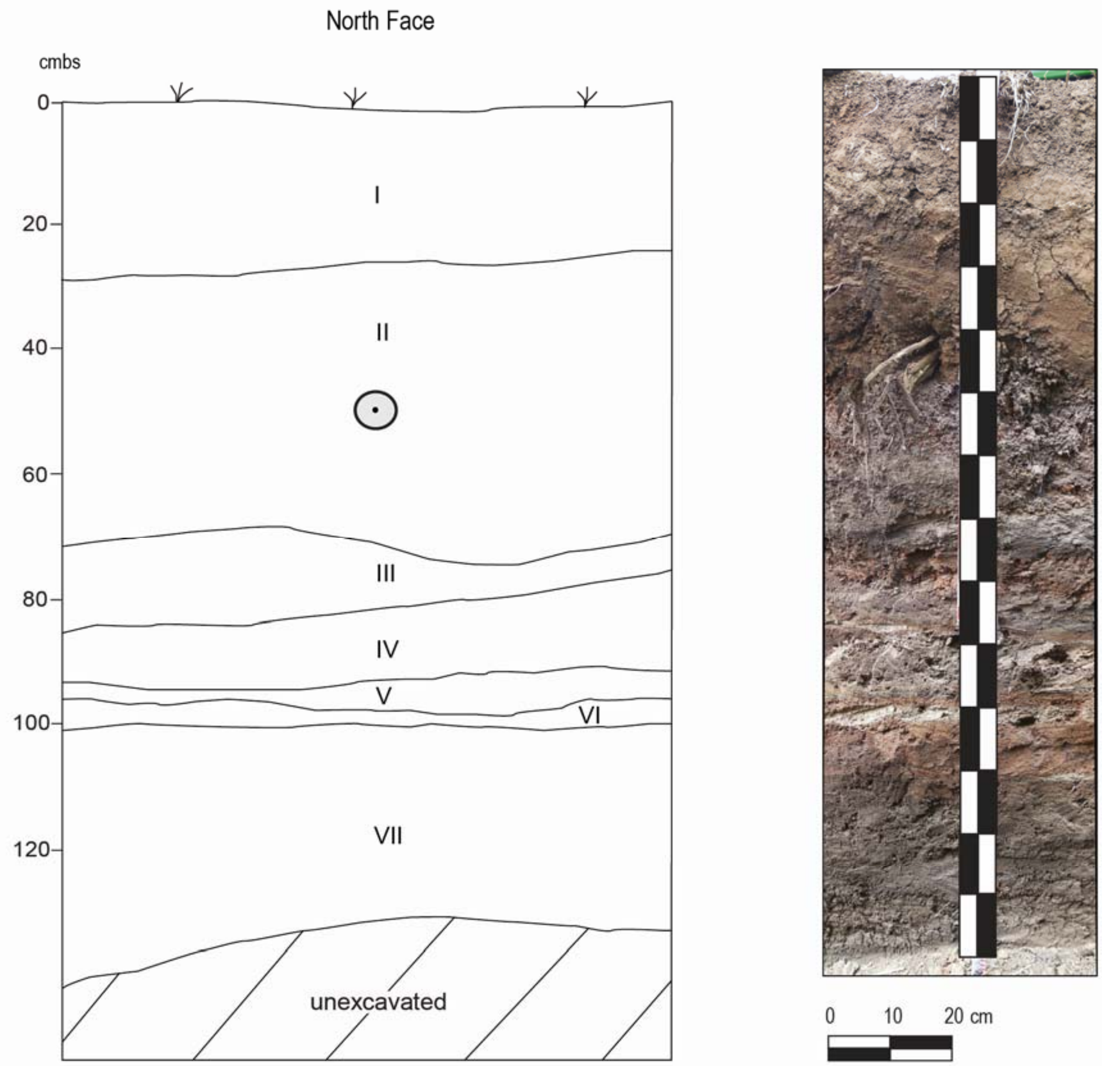


Figure 30. Profile and Photograph of South Face of Trench 7 at Profile Locale 7.

Trench 8, post-excavation; view to northwest.

Figure 32. Overview Photograph of Trench 8.



Layer Descriptions:

LI: Dark brown silty clay

LII: Dark brown silty clay

LIII: Very dark brown silty clay with strong brown stains on ped surfaces

LIV: Dark brown silty clay

LV: Brown silty clay

LVI: Dark reddish brown silty clay

LVII: Very dark brown silty clay

Key:

Root

Figure 32. Profile and Photograph of North Face of Trench 8 at Profile Locale 8.

Table 19. Stratigraphic Layer Descriptions for Profile Locale 8 in Trench 8.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/29	25-29 cm thick; dark brown (10YR 3/3, moist) silty clay loam; slightly hard, firm, slightly sticky, slightly plastic; common, fine to medium, interstitial roots; diffuse, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	25/74	43-46 cm thick; dark brown (10YR 3/3, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; few, fine to very fine interstitial roots and few large tubular roots; diffuse, wavy lower boundary.
III	68/85	6-16 cm thick; very dark brown (10YR 2/2, moist) silty clay with strong brown (10YR 5/8, moist) stains on ped surfaces; slightly hard, firm, slightly sticky, slightly plastic; very few, fine, interstitial roots; gradual, wavy lower boundary.
IV	76/94	8-16 cm thick; dark brown (7.5YR 3/4, moist) silty clay; slightly hared, firm, slightly sticky, slightly plastic; few, fine, interstitial roots; gradual, smooth boundary.
V	92/98	1-6 cm thick; brown (10YR 4/3, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; few, fine interstitial roots; clear, wavy lower boundary.
VI	93/100	2-4 cm thick; dark reddish brown (5YR 3/4, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no rock inclusions; few, fine, interstitial roots; diffuse, wavy lower boundary.
VII	96/140+	36-44+ cm think; very dark brown (10YR 2/2, moist) silty clay; slightly hard, firm, nonsticky, nonplastic; no rock inclusions; few, fine, interstitial roots; lower boundary not reached.

Profile Locale 9

Profile Locale 9 was documented on the north face of TR8. The base of excavation at this locale was approximately 134 cmbs.

A total of ten stratigraphic layers were identified at PL9, and designated as Layers I-X. Table 20 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 33 presents the profile drawing at PL9 and a photograph. Layer III contained strong brown (10YR 5/8, moist) stains on ped surfaces. Layer VIII at this locale is a silt deposit. No archaeological materials or features were encountered in Layers I-X at PL9.

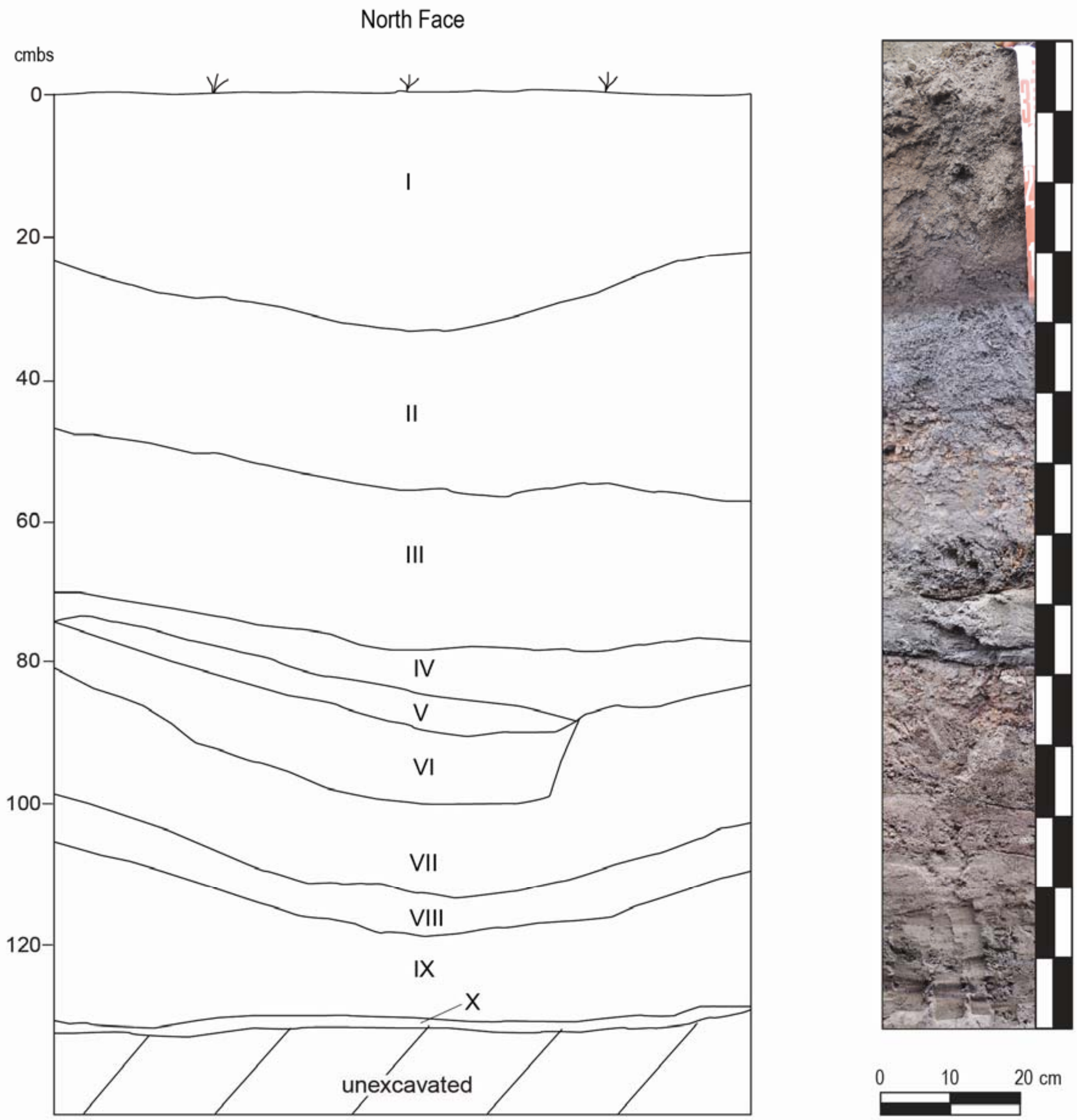
TRENCH 9

Trench 9 was excavated in the south-central portion of the project area (see Figure 9; see Table 4), between TR4 and TR10. Trench 9 was excavated to depths ranging from 132 to 134 cmbs. Figure 34 presents an overview photograph of TR9, post-excavation. A total of four stratigraphic layers were identified in TR9 (Layers I-IV). No archaeological materials or features were found in TR6 excavations.

Two profile locales (PL10 and PL11) were documented in TR9. The stratigraphic sequences observed at PL10 and PL11 are presented below.

Table 20. Stratigraphic Layer Descriptions for Profile Locale 9 in Trench 8.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/33	22-33 cm thick; dark brown (10YR 3/3, moist) silty clay; slightly hard, firm, slightly sticky, plastic; common, fine to medium, interstitial roots; gradual, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	22/58	28-36 cm thick; very dark gray (10YR 3/1 , moist) silty clay; slightly hard, firm, very slightly sticky, slightly plastic; few, fine to very fine interstitial roots; abrupt, wavy lower boundary.
III	48/77	19-22 cm thick; very dark grayish brown (10YR 3/2, moist) silty clay with strong brown (10YR 5/8, moist) staining on ped surfaces; slightly hard, firm, slightly sticky, slightly plastic; very few, fine, interstitial roots; abrupt, smooth lower boundary.
IV	70/85	4-10 cm thick; very dark brown (10YR 2/2, moist) to dark brown (10YR 3/3, moist) silt; soft, friable, nonsticky, nonplastic; few, very fine, interstitial roots; abrupt, wavy boundary.
V	74/89	2-6 cm thick; very dark gray (10YR 3/1, moist) silty clay; slightly hard, firm, sticky, plastic; few, very fine, interstitial roots; gradual, broken boundary.
VI	76/100	Dark brown to dark yellowish brown (10YR 3/3.5, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; very few, very fine interstitial roots; abrupt, broken lower boundary.
VII	80/113	16-20 cm thick; dark brown (7.5YR 3/3, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no rock inclusions; very few, very fine, interstitial roots; abrupt, smooth lower boundary.
VIII	100/120	6-8 cm thick; dark brown (10YR 3/3, moist) silt; slightly hard, friable, nonsticky, nonplastic; no rock inclusions; no roots; clear, wavy lower boundary.
IX	106/132	12-24 cm thick; dark brown to very dark grayish brown (10YR 3/2.5, moist) silty clay; slightly hard, firm, very slightly sticky, very slightly plastic; no rock inclusions; no roots; lower boundary not reached
X	132/134+	2 + cm thick; very dark brown (10YR 2/2, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; no rock inclusions; no roots; lower boundary not reached.



Layer Descriptions:

LI: Dark brown silty clay

LII: Very dark gray silty clay

LIII: Very dark grayish brown silty clay with strong brown staining on ped surfaces

LIV: Very dark brown to dark brown silt

LV: Very dark gray silty clay

LVI: Dark brown to dark yellowish brown silty clay

LVII: Dark brown silty clay

LVIII: Dark brown silt

LIX: Dark brown to very dark grayish brown silty clay

LX: Very dark brown silty clay

Figure 33. Profile and Photograph of North Face of Trench 8 at Profile Locale 9.

Trench 9, post-excavation; view to northeast.

Figure 34. Overview Photograph of Trench 9.

Profile Locale 10

Profile Locale 10 (PL10) was documented on the west face of TR9. The base of excavation at this locale was approximately 132 cmbs.

A total of four stratigraphic layers were identified at PL10, and designated as Layers I-IV. Table 21 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 35 presents the profile drawing at PL10 and a photograph. Layer II dark brown silty clay loam deposits are 92-104 cm thick. Layer IV is a sandy silt deposit.

A piece of sugar cane slag was found and collected at approximately 80 cmbs in Layer II deposits. No other archaeological materials or features were encountered in Layers I-IV at PL10.

Table 21. Stratigraphic Layer Descriptions for Profile Locale 10 in Trench 9.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/18	12-18 cm thick; dark brown (10YR 3/3, moist) silty clay loam; firm, slightly sticky, slightly plastic; common, fine to medium, interstitial roots; gradual, smooth lower boundary; contains recent rubbish items (glass, metal, plastic).
II	12/120	92-104 cm thick; dark brown (7.5YR 3/2 , moist) silty clay loam; slightly hard, firm, very slightly sticky, slightly plastic; very few, very fine interstitial roots; diffuse, wavy lower boundary.
III	102/131	8-56 cm thick; brown (10YR 4/3, moist) silty clay; slightly hard, firm, slightly sticky, very slightly plastic; no roots; abrupt, wavy lower boundary.
IV	124/132+	2-8+ cm thick; dark yellowish brown (10YR 3/4, moist) sandy silt; soft, very friable, nonsticky, nonplastic; no roots; lower boundary not reached.

Profile Locale 11

Profile Locale 11 was documented on the east face of TR9. The base of excavation at this locale was approximately 134 cmbs.

A total of four stratigraphic layers were identified at PL11, and designated as Layers I-IV. In addition, a dark reddish brown lens, designated as Lens B, was present near the surface of Layer II. Table 22 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 36 presents the profile drawing at PL11 and a photograph.

Layer IV at PL11 appears to have been impacted by some type of disturbance, possibly excavation associated with sugar cane agriculture. A roughly vertical section of Layer IV dark yellowish brown sandy silt extends up into Layer III brown silty clay deposits (see Figure 36). No archaeological materials or features were encountered in Layers I-IV at PL11.

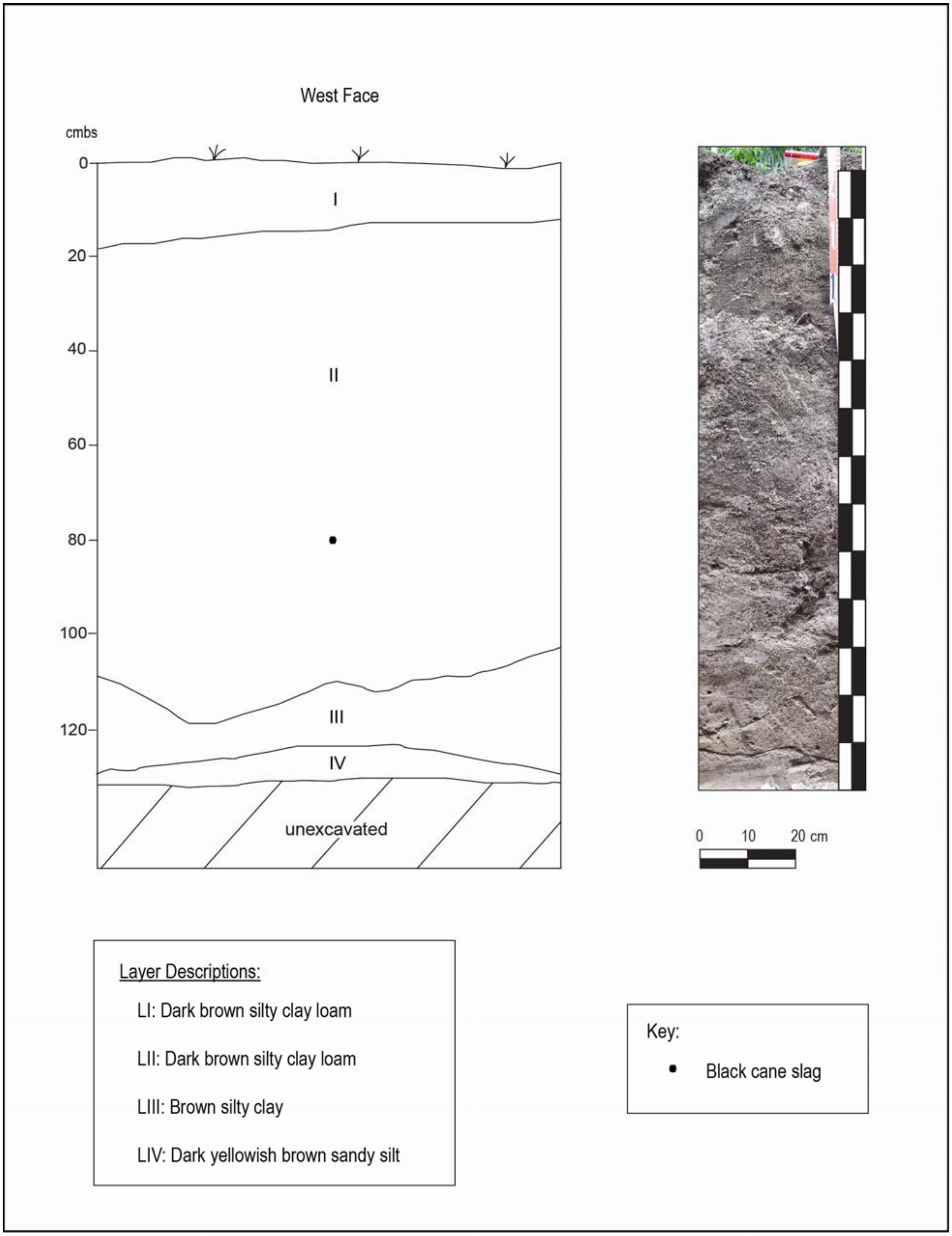
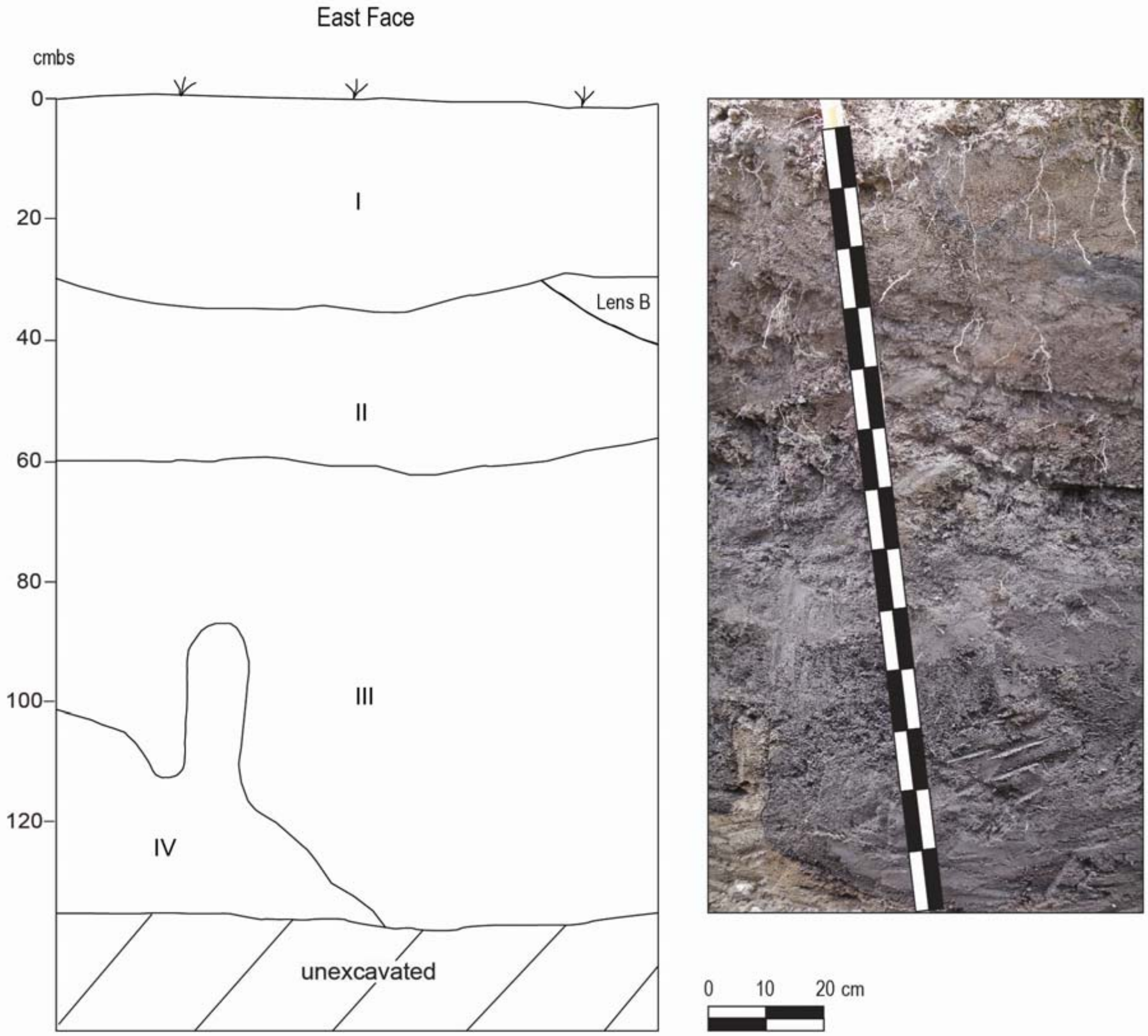


Figure 35. Profile and Photograph of West Face of Trench 9 at Profile Locale 10.



Layer Descriptions:

LI: Very dark gray silt loam

LII: Very dark brown clayey silt

Lense B: Dark reddish brown silty clay

LIII: Dark reddish brown silty clay

LIV: Very dark grayish brown to very dark brown silt

Figure 36. Profile and Photograph of East Face of Trench 9 at Profile Locale 11.

Table 22. Stratigraphic Layer Descriptions for Profile Locale 11 in Trench 9.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/35	24-35 cm thick; very dark gray (10YR 3/1, moist) silt loam; hard, firm, slightly sticky, plastic; common, fine, interstitial roots; diffuse, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	24/62	26-31 cm thick; very dark brown (10YR 2/2 , moist) clayey silt; slightly hard, firm, very slightly sticky, slightly plastic; common, fine interstitial roots; diffuse, wavy lower boundary.
Lens B	24/40	2-12 cm thick; dark reddish brown (5YR 3/2 , moist) silty clay; slightly hard, firm, sticky, slightly plastic; few, fine interstitial roots; clear, wavy lower boundary.
III	56/134+	40-75+ cm thick; dark reddish brown (5YR 2.5/2, moist) silty clay; slightly hard, firm, sticky, plastic; few, fine, interstitial roots; clear, irregular lower boundary where Layer IV is present; lower boundary not reached where Layer IV is absent.
IV	92/134+	4-40+ cm thick; Very dark grayish brown to very dark brown (10YR 2.5/2, moist) silt; slightly hard, friable, nonsticky, nonplastic; no roots; lower boundary not reached

TRENCH 10

Trench 10 (TR10) was excavated in the southeast quadrant of the project area (see Figure 9; see Table 4), east of TR9. Trench 10 was excavated to depths ranging from 152 to 160 cmbs. Figure 37 presents an overview photograph of TR10, post-excavation. A total of eight stratigraphic layers were identified in TR10 (Layers I-VIII). No archaeological materials or features were found in TR10 excavations.

Two profile locales (PL18 and PL19) were documented in TR10. The stratigraphic sequences observed at PL18 and PL19 are presented below.

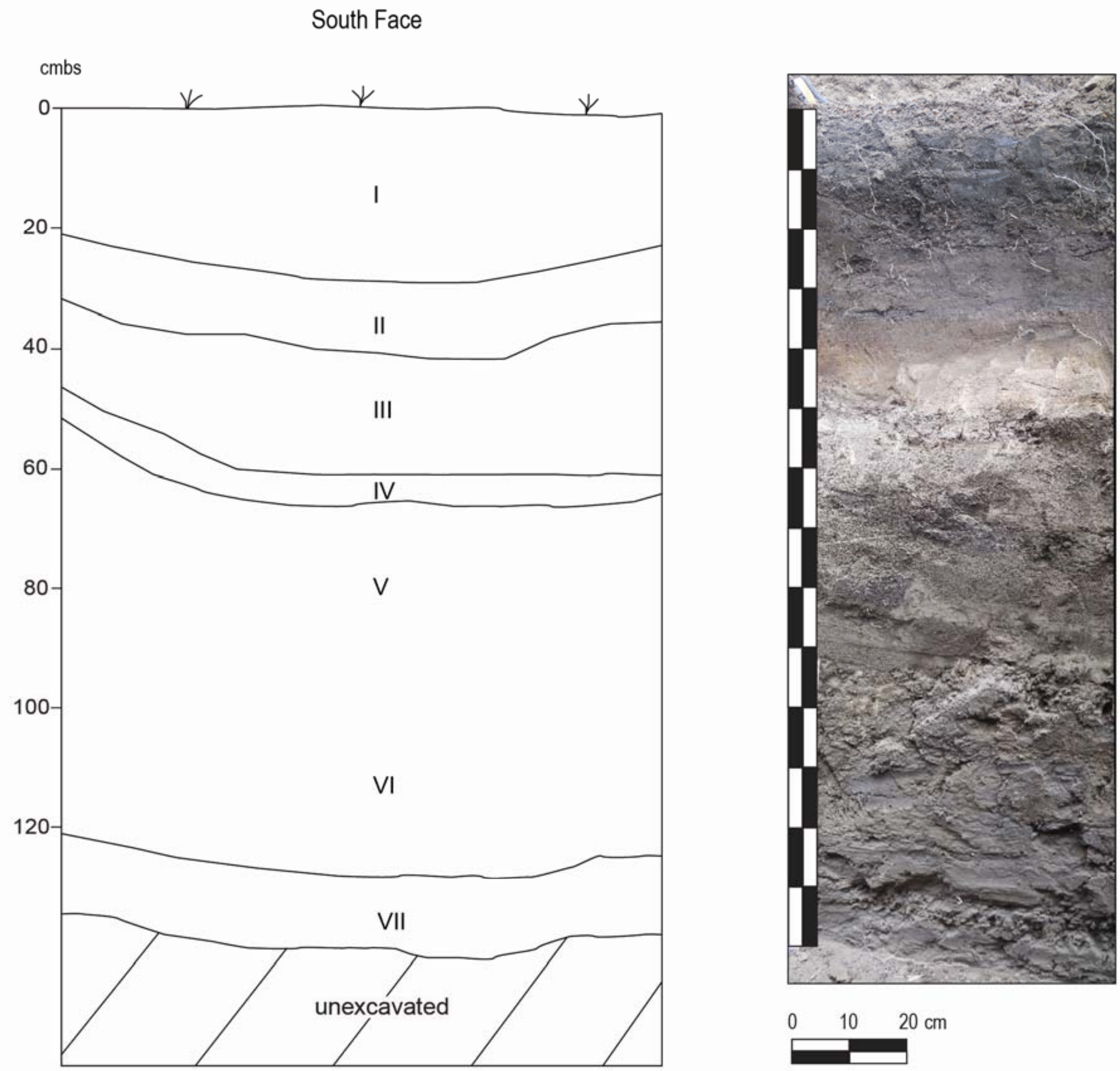
Profile Locale 18

Profile Locale 18 (PL18) was documented on the south face of TR10. The base of excavation at this locale was approximately 160 cmbs.

A total of eight stratigraphic layers were identified at PL18, and designated as Layers I-VIII. Table 23 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 38 presents the profile drawing at PL18 and a photograph. Layers VI, VII and VIII consist of silt and clayey silt deposits. No archaeological materials or features were found in Layers I-VII at PL18.

Trench 10, post-excavation; view to northwest.

Figure 37. Overview Photograph of Trench 10.



Layer Descriptions:

LI: Very dark gray silt loam

LII: Very dark gray silty clay

LIII: Very dark grayish brown silty clay

LIV: Very dark gray silty clay

LV: Dark reddish brown silty clay

LVI: Dark grayish brown silt

LVII: Very dark gray clayey silt

LVIII: Very dark grayish brown silt

Figure 38. Profile and Photograph of South Face of Trench 10 at Profile Locale 18.

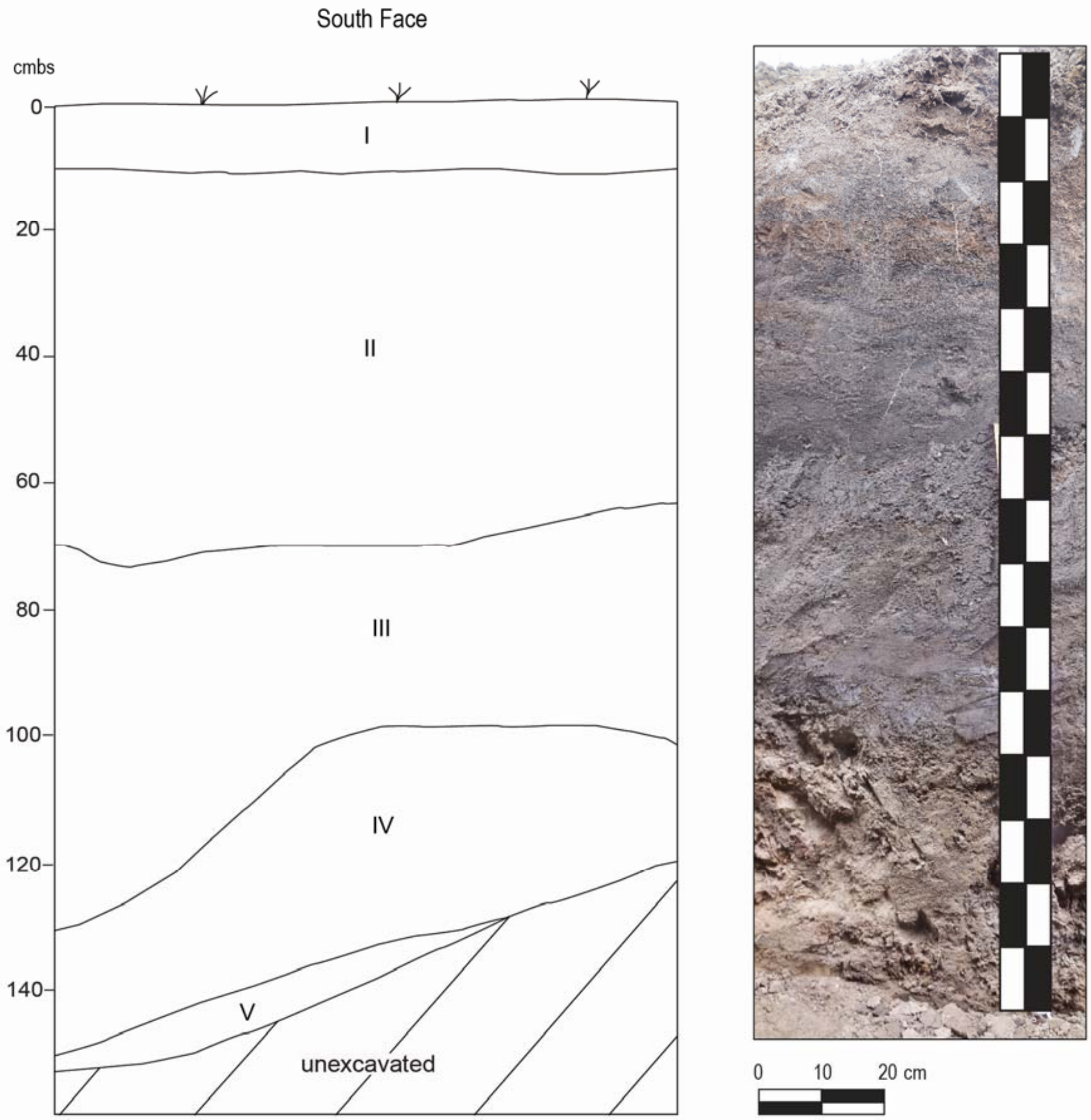
Table 23. Stratigraphic Layer Descriptions for Profile Locale 18 in Trench 10.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/28	20-28 cm thick; very dark gray (10YR 3/1, moist) silt loam; slightly hard, firm, slightly sticky, plastic; common, fine, interstitial roots; gradual, wavy lower boundary; contains recent rubbish items (glass, metal, plastic).
II	20/40	10-12 cm thick; very dark gray (10YR 3/1, moist) silty clay; slightly hard, firm, sticky, plastic; common, fine interstitial roots; diffuse, wavy, lower boundary.
III	32/60	14-26 cm thick; very dark grayish brown (10YR 3/3, moist) silty clay; slightly hard, firm, slightly sticky, very slightly plastic; common, fine, interstitial roots; clear, wavy lower boundary.
IV	47/64	3-4 cm thick; very dark gray (10YR 3/1, moist) silty clay; slightly hard, friable, slightly sticky, slightly plastic; very few, fine, interstitial roots; clear, wavy, lower boundary.
V	52/106	18-46 cm thick; dark reddish brown (5YR 3/3, moist) silty clay; slightly hard, slightly sticky, slightly plastic; very few, fine, interstitial roots; clear, wavy lower boundary.
VI	70/124	14-50 cm thick; dark grayish brown (10YR 4/2, moist) silt; soft, very friable, nonsticky, nonplastic; few, fine, interstitial roots; diffuse, wavy lower boundary.
VII	118/136	12-14 cm thick; very dark gray (10YR 3/1, moist) clayey silt; slightly hard, slightly sticky, slightly plastic; no roots; diffuse, wavy lower boundary.
VIII	130/160+	28-30+ cm thick; very dark grayish brown (10YR 3/2, moist) silt; slightly hard, nonsticky, nonplastic; few, fine, interstitial roots; lower boundary not reached.

Profile Locale 19

Profile Locale 19 was documented on the south face of TR10, approximately 7 m south of PL18. The base of excavation at PL19 ranged from 120 to 152 cmbs.

A total of five stratigraphic layers were identified at PL19, and designated as Layers I-V. Table 24 presents the maximum layer depths (top/bottom) and stratigraphic layer descriptions for these layers. Figure 39 presents the profile drawing at PL19 and a photograph. Layer IV at this locale appears to have been impacted, possibly by excavations associated with sugar cane agriculture. The surface of Layer IV slopes down to the east.



Layer Descriptions:

LI: Very dark gray to very dark grayish brown sandy clay loam

LII: Dark reddish brown silty clay with black mottles

LIII: Black silty clay

LIV: Very dark gray clay with dark yellowish brown mottles

LV: Dark brown silty clay

Figure 39. Profile and Photograph of South Face of Trench 10 at Profile Locale 19.

Table 24. Stratigraphic Layer Descriptions for Profile Locale 19 in Trench 10.

Layer	Maximum Layer Depths (cmbs)	Layer Descriptions
I	0/12	11-12 cm thick; very dark gray to very dark grayish brown (10YR 3/1.5, moist) sandy clay loam; slightly hard, firm, slightly sticky, plastic; common, fine to medium, interstitial roots; gradual, smooth lower boundary; contains recent rubbish items (glass, metal, plastic).
II	11/70	52-60 cm thick; dark reddish brown (5YR 3/2 , moist) silty clay; black (10YR 2/1, moist) mottles present; slightly hard, firm, very slightly sticky, slightly plastic; common, fine, interstitial roots; clear, wavy lower boundary.
III	64/130	36-60 cm thick; black (7.5YR 2.5/1, moist) silty clay; slightly hard, firm, slightly sticky, slightly plastic; few, fine, interstitial roots; abrupt, wavy lower boundary.
IV	99/150	20-28 cm thick; very dark gray (7.5YR 3/1, moist) clay with dark yellowish brown (10YR 3/4, moist) mottles; hard, firm, sticky, plastic; very few, fine, interstitial roots; gradual, wavy, lower boundary.
V	130/152+	2-8+ cm thick; dark brown (7.5YR 3/3, moist) silty clay; slightly hard, friable, slightly sticky, slightly plastic; no roots; lower boundary not reached.

LABORATORY RESULTS

This section presents the analysis of a single historic artifact, a sample of wood charcoal, and a piece of sugar cane slag.

Historic Artifact

A single historic glass artifact was recovered during subsurface testing in the ʻĪao Stream project area. It was recovered in situ from Layer III deposits on the south face of TR7 at PL7. This specimen is a clear glass fragment that is likely from a bottle or a jar.

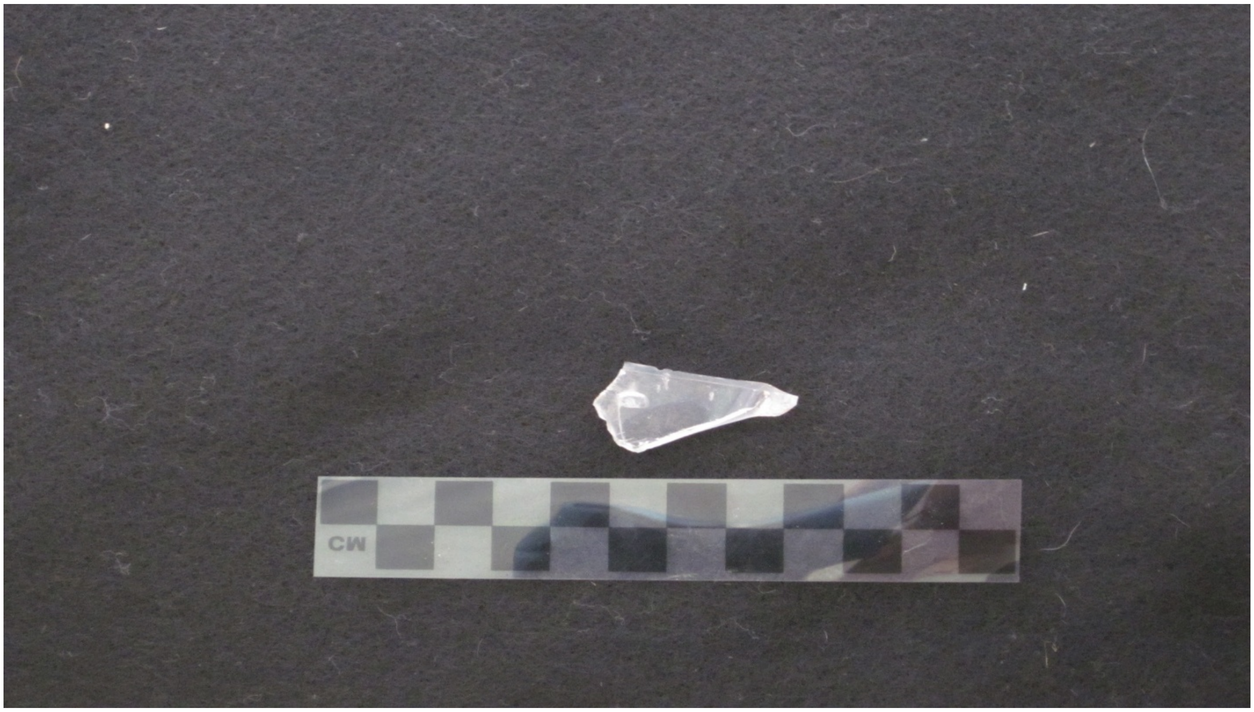
The glass fragment has a flattened facet on the exterior surface, and measures 3.5 long, from 0.7 to 2.0 cm wide, and is 0.40 cm thick. Figure 40 presents a photograph of the glass fragment.

Floral Materials

A bulk sample of Layer VI silt deposits in TR1 was collected to examine the charcoal flecking observed on the west side of TR1 at PL1. When the sample was examined in the lab, three thin flakes of what appeared to be wood charcoal were observed. Using forceps, the charcoal flakes were so fragile that two of the flakes disintegrated when first touched. Based on the size and thickness of these flakes, their weight was estimated to be less than 0.01 grams.

Sugar Cane Slag

A single piece of sugar cane slag was recovered in situ from Layer II deposits on the west face of TR9 at PL10. Slag is created during the burning of sugar. During these intense fires, the sediments in the soils get super-heated and melt. With the right mixture of minerals in the soils and the sugar, cane slag forms. Cane slag has been observed in sugar cane fields in Kahuku on O`ahu by the authors.



Top view.

Side view

Figure 40, Photographs of Clear Glass Fragment from TR7 at Profile Locale 7.

SUMMARY AND INTERPRETIVE DISCUSSION

Under contract to GSI Pacific, Inc. (GSI), Pacific Consulting Services, Inc. (PCSI) conducted a subsurface archaeological inventory survey (AIS) on an approximate 0.7-hectare (1.7-acre) project area located along the north bank of ʻĪao Stream, about 2.1 km (1.3-miles) inland (southwest) of Nehe Point in Wailuku Ahupuaʻa.

Background research has determined that the historic land use of the project area included both wetland taro (*loʻi*) and sugar cane agriculture. LCAs in and near the project area indicate that *loʻi* systems may have been present in this locale (see Table 1).

Sugar was grown in this region as early as 1880s and based on Figure 5 may have been well established in the project area by the early 1900s. After the devastation caused by the 1916 flood, sugar was replanted. Based on Figures 6 and 7, sugar was flourishing during the 1950s and 1960s in this locale. A sugar mill was constructed close to the project area.

To address research questions pertaining to the presence/absence of features associated with pre-Contact *loʻi* systems and sugar cane agriculture, as well as a 1916 flooding event that caused devastation in this region, a program of subsurface archaeological testing was implemented (Vernon and Gosser 2014). The research questions are addressed later in this section.

Ten backhoe trenches (TR1-10) were excavated within the project area (see Figure 9). These averaged approximately 20 m long and 1.2 m wide, and were excavated to depths ranging from 60 to 260 cmbs. Four of the trenches, TR2, TR4, TR5, and TR6, exposed a cobble/pebble layer observed along the banks at the base of ʻĪao Stream. The assumption related to exposing this cobble/pebble layer in some of the trenches is that this layer likely predates the settlement of ʻĪao Valley by Hawaiians.

In all of the trenches, the upper proveniences of the stratigraphic sequence are disturbed. This is due to two factors: (1) the recent bulldozing of this area to remove expediently built structures on the property, and (2) sugar cane agriculture.

Trench 5, situated closest to ʻĪao Stream, exhibits a stratigraphic sequence that does not appear to have been impacted by sugar cane agriculture. The absence of evidence of sugar cane agriculture in TR5 is based on the presence of internal bedding (microstratigraphy) observed in the thicker layers within this trench. This trench is also quite close to (within 10 meters) ʻĪao Stream, which may have been too close to plant sugar cane.

No definitive pre-Contact archaeological materials or features were found during excavations. One piece of non-diagnostic, clear historic glass was found in situ in Layer III, TR7. Very sparse charcoal flecking was found in Layer VI silt deposits in TR1 (PL1).

STRATIGRAPHY

A total of ten stratigraphic layers, designated as Layers I-X, and two lenses (Lens A and Lens B) were identified and documented through 19 profile drawings (see profile drawings for PL1-20) in TR1-10.

The environment of deposition for the documented stratigraphic layers is the flood plain associated with ʻĪao stream. This is based on the topography of the project area and surrounding lands, the presence of the adjacent ʻĪao Stream, and the fine-textured sediments (clays, silty clays, silts, clayey silts sandy silts) that comprise the layers.

The mode of deposition for these layers is alluvial deposition, specifically, ʻĪao Stream flooding events that resulted in overflowing stream waters transporting fine-textured sediments onto the flood plain. One flooding event had sufficient force to transport basalt cobbles and pebbles. This flooding event is evident by the cobble/pebble layer visible along the banks of the stream.

The color and texture variations documented in the stratigraphic sequences in TR1-10 were immediately visible. These variations were so extensive that the sequences varied from one end of a trench to the other. In addition, layers in any given stratigraphic position varied from one trench to the next. For example, in the fourth stratigraphic position, Layer IV color and texture variations included (but were not limited to) dark yellowish brown (10YR 3/4) silt in TR1 (PL1), dark brown (7.5YR 3/4) silty clay in TR7 (PL6), dark reddish brown (5YR 2.5/2) silty clay in TR9 (PL11), very dark grayish brown (10YR 3/2) sandy silt in TR1 (PL3), very dark gray (5YR 3/1) clayey silt in TR5 (PL17), and black (10YR 2/1) clay in TR2 (PL20).

While there are extensive textural variations in the stratigraphic layers in all stratigraphic positions, it is noted that stratigraphic layers comprising the upper proveniences of the sequences (Layers I-III) are primarily silty clays, silty clay loams, clays, and silt loams. In lower proveniences, starting with the fourth stratigraphic position (Layer IV), it was observed that the number of layers containing primarily silt deposits increased. These deposits, including silts, sandy silts, and clayey silts (as opposed to silty clays, clays, silt loams, and silty clay loams in Layers I-III) are present in layers that frequently do not exceed 20 cm in thickness.

With this extensive variation in color and texture, it was decided not to attempt definitive correlations of individual layers within the sequences across the project area. Figure 41 therefore presents preliminary interpretive correlations on a general level using 17 of the 19 documented stratigraphic sequences in TR1-10. These interpretive correlations are shown on the composite stratigraphic sequence in Figure 10. A general discussion of the layers observed in the stratigraphic sequences is presented below.

Layer I

In the first stratigraphic position, Layer I deposits represent the modern A Horizon-an organic rich surface layer that supports vegetation. In the project area, Layer I consists predominantly of dark grayish brown, dark gray, and dark brown silty clay loams and silty clays. Observations indicate that Layer I is also a disturbed and mixed zone, probably due to the recent grading of the project area in support of cleaning a homeless camp (Kanalei Shun, personal communication). The depth of recent grading/bulldozing, defined as the base of Layer I, ranges from 11 to 40 cmbs (see Figure 41).

Recent trash items were found in Layer I deposits, including items of rusted metal, plastic, glass, ceramic, aluminum cans, and broken segments of PVC pipe. None of these items were collected.

The Sugar Cane Agriculture Zone

Prior to fieldwork, it was anticipated that layers near the surface would reflect sugar cane agriculture. Based on stratigraphic position, as well as on the presence of items like black plastic and sugar cane slag, Layers II and III, and *possibly* Layer IV, are believed to be associated with sugar cane agriculture (see Figure 41). The predominantly dark sediments of these layers also support this interpretation.

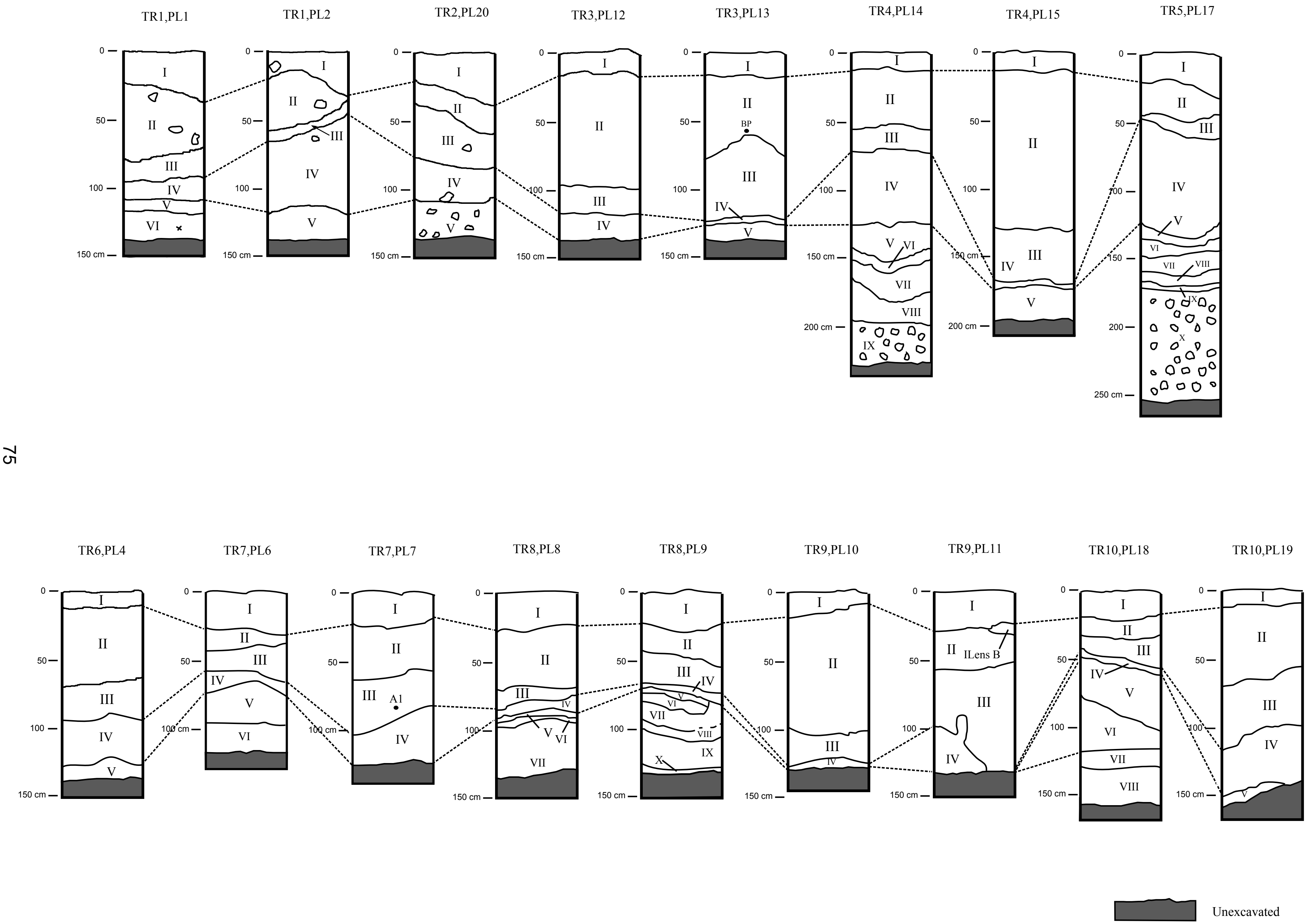


Figure 41. Preliminary Stratigraphic Correlations.

Layers II and III

Layer II consists predominantly of dark soils/sediments- very dark gray, very dark brown, and dark brown silty clays, silty clay loams, clayey silts, clays, and silt loams. Pieces of black plastic and sugar cane slag were found in Layer II deposits in TR3 (PL13) and TR9 (PL10), respectively. Black plastic was used, and is still being used today in sugar cane agriculture to control weeds after initial plantings. Sugar cane slag is sometimes created during the burning of sugar cane. Slag is created by the burning of sugar and super heating of the sediments in the soils. With the right mixture of minerals in the soils and the sugar, cane slag forms. This has been seen in sugar cane fields in Kahuku on O‘ahu by the authors.

Layer III also consists of dark soils and sediments-dark brown, very dark brown, and dark reddish brown silty clays, silty clay loams, silt loams, clays, clayey silts, and sandy silts. While no plastic or cane slag was observed in Layer III, a piece of clear glass, from a bottle or jar, was found in situ in the dark brown silty clay deposits of Layer III in TR7 (PL7). This glass fragment is, unfortunately, small and non-diagnostic. Its presence in situ, however, does place Layer III in the post-Contact period (post A.D. 1778), most likely between the late 1800s and the mid-twentieth century, and possibly as late as 1988 (Wilcox 1996:125).

The presence of strong brown staining of ped surfaces observed in Layer III may also be evidence that Layer III is associated with sugar cane agriculture. Peds are the basic structural units of soil, and iron in the soil often leaves a reddish residue on the roots of plants. These residues were observed in Layer III soil samples collected from PL8 and PL9 in TR8.

The thicknesses of Layer II and III deposits across the project area also support the interpretation of sugar cane agriculture. The average thickness of Layer II is 54 cm (thickness range is 12 to 119 cm), while the average thickness of Layer III is 37 cm (thickness range is 10 to 75 cm). When combined the average thickness of these two layers is 91 cm, which is approximately 3 feet, which is within the range of plow zone thickness for sugar cane fields.

The depth of the sugar cane plow zone, defined as the base of Layer III, ranges from 48 to 170 cmbs. If Layer IV is included in the sugar cane plow zone, the maximum depth of this plow zone would extend to 174 cmbs, representing only a slight increase in depth.

Layer IV

It is quite possible that Layer IV is also associated with sugar cane agriculture. Layer IV consists of darker sediments, including very dark brown, dark brown, dark gray, very dark grayish brown, dark yellowish brown, and dark reddish brown silty clays, clays, sandy silts, clayey silts and silts. Considering the historic clear glass fragment found in Layer III and the impacts to Layer IV believed to be caused by grading/excavation by heavy machinery associated with Layer III, it is postulated that Layer IV is associated with early sugar cane production in the project area (late 1800s-early 1900s). The presence of strong brown staining of ped surfaces observed in Layer IV at in TR3 (PL13), TR4 (PL15), and TR6 (PL5) supports an interpretation of sugar cane agriculture.

Profile Locales 11 (TR9) and 19 (TR10) suggest that grading or excavations associated with Layer III impacted not only the surface the Layer IV (see Figure 29; see Figure 41), but middle to lower proveniences of Layer IV as well (see Figure 27; see Figure 41). These impacts to Layer IV are believed to be associated with grading and replanting of sugar cane sometime during the early twentieth century. A more precise date of these impacts to Layer IV cannot be determined at this time.

The Anticipated *Loʻi* Zone: Layers V-IX

The search for evidence of pre-Contact *loʻi* systems and associated subsurface habitation features focused on subsurface proveniences at the base of the sugar cane plow zone, or directly underlying the plow zone. Thus, if there were pre-Contact subsurface agricultural and habitation features, these would likely be visible between Layers III/IV and as deep as Layer VI (see Figure 41). There may even have even a remote possibility that these subsurface features would be present as deep as the layers that directly overlying the cobble/pebble layer noted in the banks of ʻĪao Stream.

All 10 trenches reached Layer IV deposits. Eight of the 10 trenches reached Layer V deposits. Only seven profile locales reached deposits below Layer V. As can be seen in Figure 41, many of the layers below Layer IV are relatively thin compared to Layers II-IV. It is in these lower proveniences that PCSI anticipated finding evidence of the 1916 flooding event as well as evidence of *loʻi* agriculture.

The presence of very sparse charcoal flecking (no fragments observed) in Layer VI in TR1 (PL1) is the only material observed that could be construed as evidence for pre-Contact *loʻi* agriculture. However, this charcoal flecking was observed *only* in this locale; no other charcoal was seen in Layers V-IX. Layer VI is an alluvially deposited silt, and the charcoal was within the layer matrix, not within a subsurface feature. Therefore, the charcoal could have originated anywhere upstream from the project area and deposited in the project area. A bulk sample was collected where the charcoal flecking was observed, but the weight of the charcoal (less than 0.01 g) was insufficient for radiocarbon dating.

Since no *definitive* evidence of *loʻi* agriculture or associated habitation features were identified anywhere in the stratigraphic sequences, Layers V-IX identified above the cobble/pebble layer, are interpreted as non-cultural in situ alluvial deposits comprised of fine-textured terrigenous sediments.

The Cobble/Pebble Layer

While three of the trenches, TR4, TR5, and TR6, were excavated deeper (190-260) in order to reach a cobble/pebble layer observed along the banks of ʻĪao Stream, this deposit was also encountered in TR2. This is due to the fact that the area where TR2 was excavated was a depression and was approximately 0.50 m lower than the surrounding areas. As stated previously, the assumption related to exposing this cobble/pebble layer in TR4-6 is that this layer likely predates the settlement of ʻĪao Valley by Hawaiians.

This layer contains approximately 50-60%, by volume, decomposing, rounded to subrounded basalt cobbles and pebbles. Small boulders and gravels are also present. The fine sediments present in the cobble/pebble layer vary and include silts, silty sands, and silt loams. The cobble/pebble layer was identified in the fifth stratigraphic position (Layer V, TR2, PL20; Layer V, TR4, PL15), the seventh stratigraphic position, (Layer VII, TR6, PL5), the ninth stratigraphic position (Layer IX, TR4, PL14), and the tenth stratigraphic position (Layer X, TR5, PL15).

RESEARCH QUESTIONS.

Three research questions that drove the sampling strategy and fieldwork are restated here:

1. *Is there evidence of pre-Contact/early post-Contact loʻi in the project area? If so, is there sufficient evidence to determine the age and integrity of the historic properties?*

2. *Is there evidence of temporary pre-Contact occupation associated with lo'i or post-Contact occupation associated with sugarcane cultivation?*
3. *Is there stratigraphic evidence of the 1916 flood episode and if so can subsurface features be temporally correlated with this episode?*

<u>Questions 1 and 2:</u>

1. *Is there evidence of pre-Contact/early post-Contact lo'i in the project area? If so, is there sufficient evidence to determine the age and integrity of the historic properties?*
2. *Is there evidence of temporary pre-Contact occupation associated with lo'i or post-Contact occupation associated with sugarcane cultivation?*

The subsurface testing yielded no definitive evidence of pre-Contact/early post-Contact *lo'i* in the project area, nor was there evidence of temporary pre-Contact occupation associated with *lo'i* or post-Contact occupation associated with sugar cane cultivation. There was no sign of subsurface features (pits, post molds, fire features, etc.) at the base of the sugar cane plow zone, or associated with layers below the plow zone. There were no buried *lo'i* walls present, and no evidence of decomposing taro corms in the any of the layers. There was an insignificant amount of charcoal flecking in an insecure context (Layer VI, an alluvially-deposited silt layer) that cannot be construed as evidence because it could have originated anywhere upstream from the project area.

It is suspected that sugar cane agriculture may have obliterated any evidence for subsurface (buried) features associated with *lo'i* systems or temporary habitation. It is also possible that the 1916 flooding event may have contributed to the destruction of such evidence.

<u>Question 3:</u> *Is there stratigraphic evidence of the 1916 flood episode and if so can subsurface features be temporally correlated with this episode?*

There was no definitive evidence that could be attributed to the 1916 flooding event that occurred in this region. Based on background research, after this flooding event, sugar cane was replanted and the damaged infrastructure was rebuilt. It is therefore likely that any evidence of the 1916 flooding event was obliterated by sugar cane agriculture.

RECOMMENDATIONS

Although no definitive evidence of pre-Contact use of the area was found during subsurface testing in the project area for Alternative F, background and archival documentation indicate that pre-Contact or early historic *lo'i* agriculture occurred in the general region. There is also a potential for pre-Contact native Hawaiian burials to be present along the base of the sand dunes near Pihana Heiau. Therefore, it is recommended that archaeological monitoring be conducted during all ground disturbing activities to insure that any potential historic properties encountered are appropriately recorded and documented. It is also recommended that an archaeological monitoring plan (AMP) be prepared that includes anticipated finds as well as a summary discussion of the types (and interpretations) of the soil stratigraphic sequences likely to be encountered.

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1950 *Maui*. Project MFO00. Frame: 25. Roll 003. Date: 19501012. Flight Line No: 051. ID: 1MFO000030025.

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APPENDIX A: LAND CLAIM AWARD DOCUMENTS

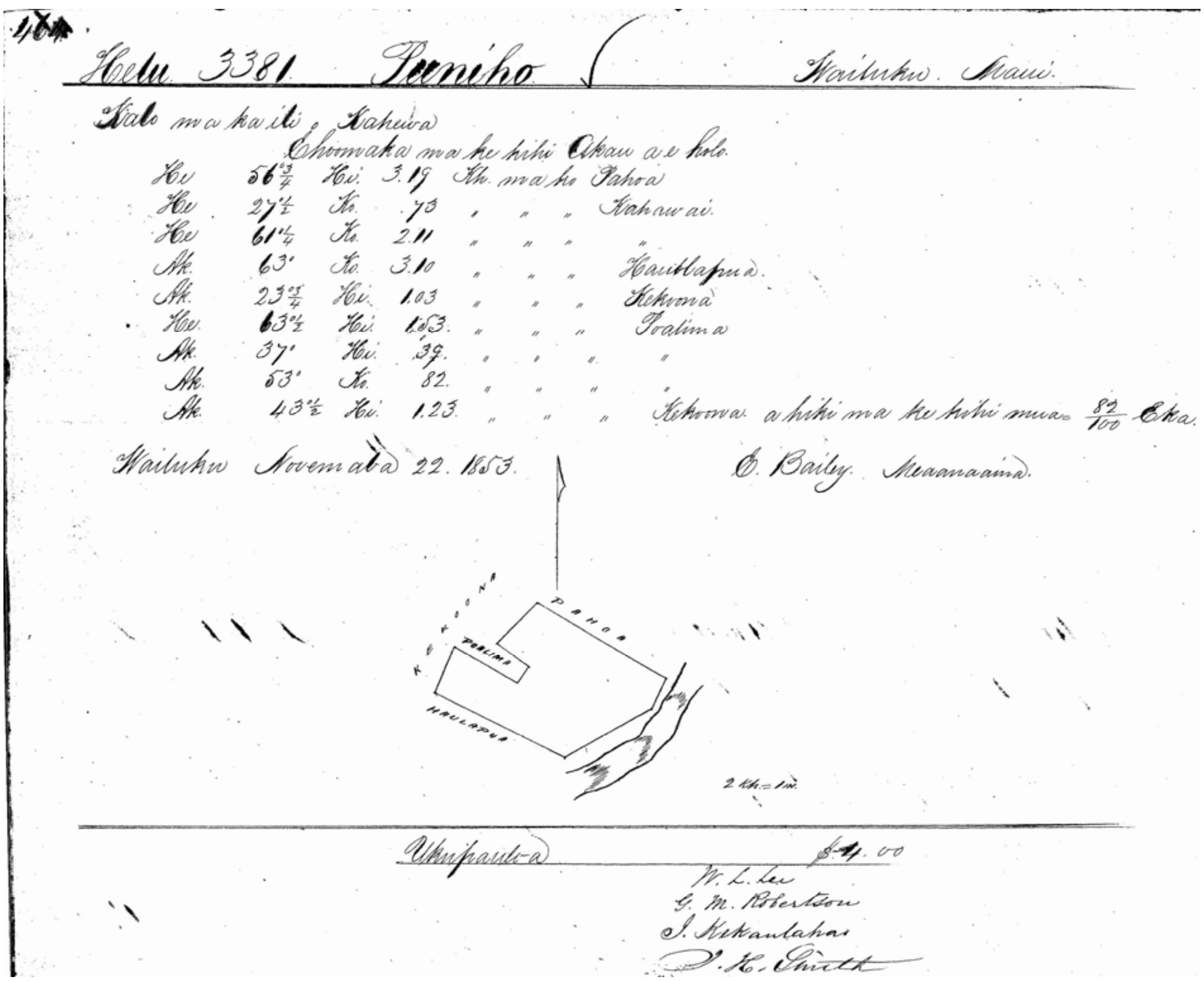
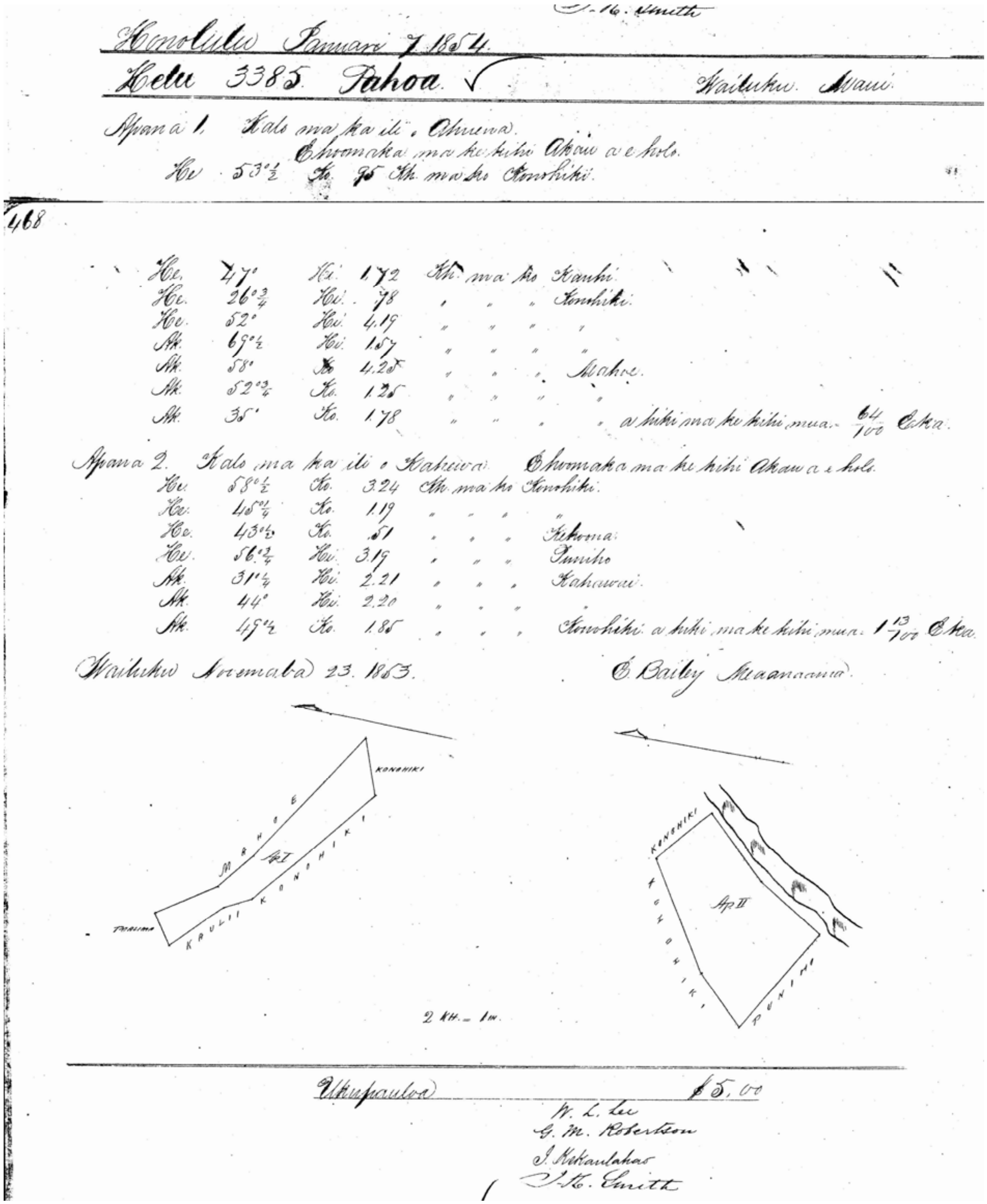


Figure A42. **LCA 3381 (Māhele Book 1848:464).**



J. H. Smith

Honolulu Ianuari 7 1854.

Helu 3385 Pahoa ✓ Wailuku Maui.

Apana 1. Kalo ma ka ili o Ohuna. Ehoomaka ma ke kihi Akau a e holo.

He 53°½ Ko 95 Kh. ma ko Konohiki.

468

He.	47°	Hi.	1.72	Kh. ma ko Kauhi.	
He.	26°¾	Hi.	78	" " " Konohiki.	
He.	52°	Hi.	4.19	" " " "	
Ak.	69°½	Hi.	1.57	" " " "	
Ak.	58°	Ko	4.25	" " " Mahoe.	
Ak.	52°¾	Ko.	1.25	" " " "	
Ak.	35°	Ko.	1.78	" " " " a kihi ma ke kihi mua.	64/100 Eka.

Apana 2. Kalo ma ka ili o Kaheiwa. Ehoomaka ma ke kihi Akau a e holo.

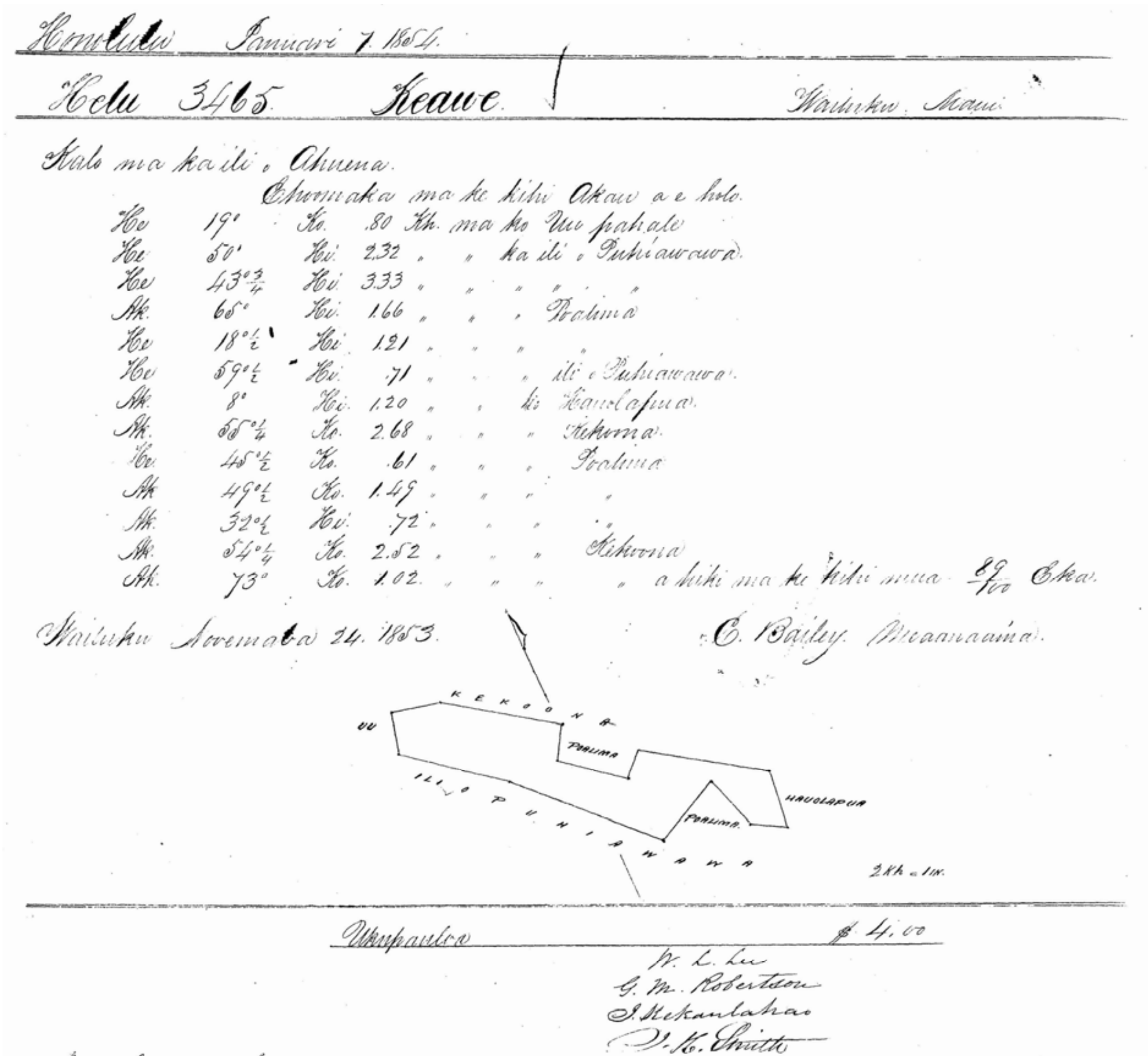
He.	58°½	Ko.	3.24	Kh. ma ko Konohiki.	
He.	48°¼	Ko.	1.19	" " " "	
He.	43°½	Ko.	.51	" " " Kekoona.	
He.	56°¾	Hi.	3.19	" " " Puniho	
Ak.	31°¼	Hi.	2.21	" " " Kahawai.	
Ak.	44°	Hi.	2.20	" " " "	
Ak.	49°½	Ko.	1.85	" " " Konohiki a kihi ma ke kihi mua.	1 13/100 Eka.

Wailuku Novemaba 23. 1853. E. Bailey Anaaina

Ukupaulua $5.00

W. L. Lee
G. M. Robertson
J. Kekaulahao
J. H. Smith

Figure A43. LCA 3385 (Māhele Book 1848:467–8).



Honolulu Ianuari 7. 1854.

Helu 3465. Keawe. Wailuku. Maui

Kalo ma ka ili o Ahuena.

Ehomaka ma ke kihi Akau a e holo.

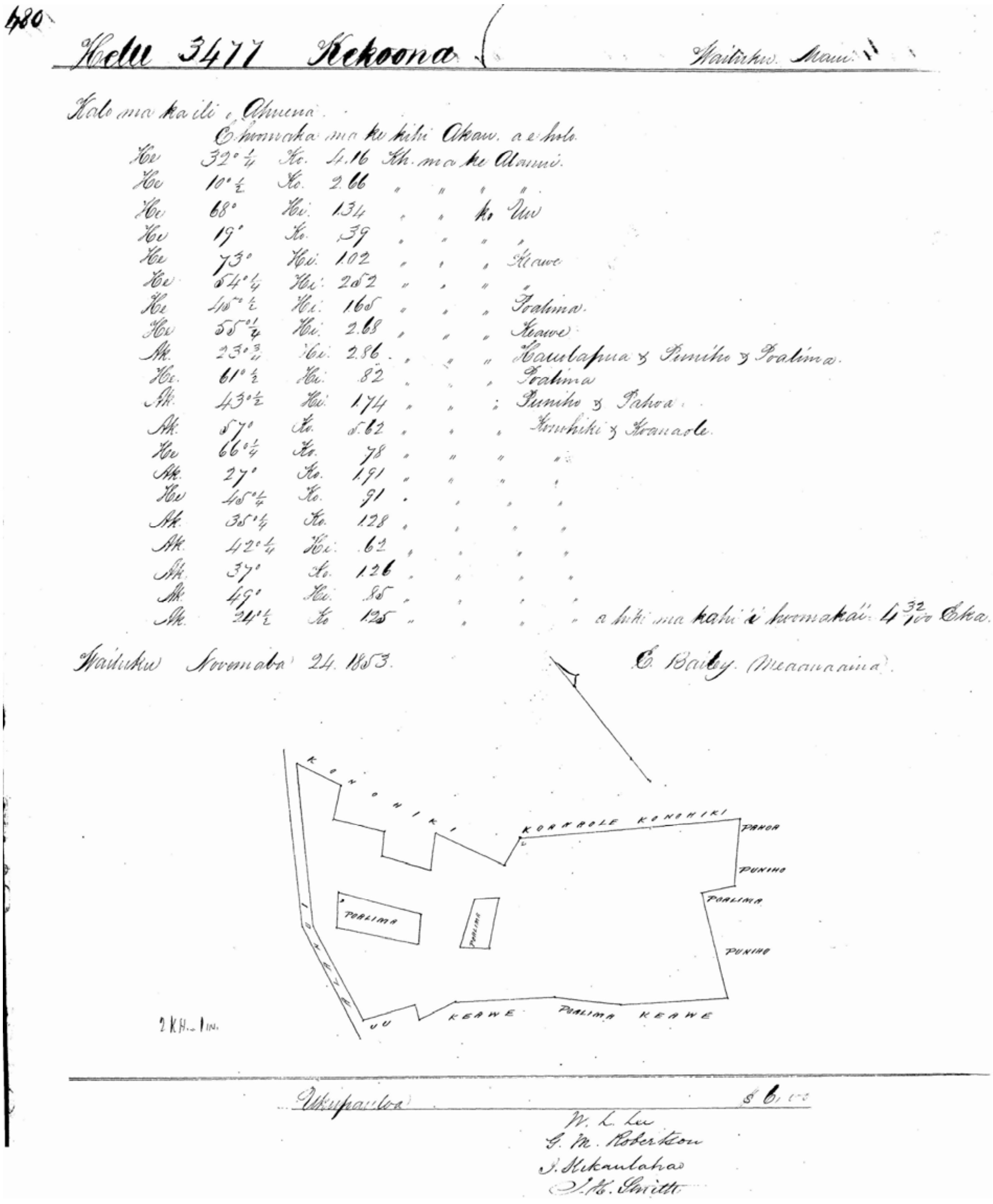
He	19°	Ko.	.80 Kh.	ma ko Uu pahale
He	50°	Hi.	2.32 "	" ka ili o Puhiawawa.
He	43°¾	Hi.	3.33 "	" " " "
Ak.	65°	Hi.	1.66 "	" " Poalima
He	18°½	Hi.	1.21 "	" "
He	59°½	Hi.	.71 "	" " ili o Puhiawawa.
Ak.	8°	Hi.	1.20 "	" ili Haualapua.
Ak.	55°¼	Ko.	2.68 "	" " Kekoona.
He	45°½	Ko.	.61 "	" " Poalima
Ak	49°½	Ko.	1.49 "	" " "
Ak.	32°½	Ho.	.72 "	" " "
Ak.	54°¼	Ko.	2.52 "	" " Kekoona
Ak.	73°	Ko.	1.02 "	" " " a hiki ma ke kihi mua 89/100 Eka.

Wailuku Novemaba 24. 1853. E. Bailey. Anaaina.

Ukupaulea $4.00

W. L. Lee
G. M. Robertson
J. Kekaulahao
J. Y. Smith

Figure A44. LCA 3465 (Māhele Book 1848:484).



480

Helu 3477 Kekoona — Wailuku, Maui

Kalo ma ka ili o Ahuena.

E hoomaka ma ke kihi Akau a e holo

He 32° 1/4 Ko. 4.16 Kh. ma ke Alanui.
He 10° 1/2 Ko. 2.66 " " " "
He 68° Hi. 1.34 " " ko Uu
He 19° Ko. .39 " " " "
He 73° Hi. 1.02 " " " Keawe
He 54° 1/4 Hi. 2.52 " " " "
He 48° 1/2 Hi. 1.65 " " " Poalima.
He 55° 1/4 Hi. 2.68 " " " Keawe
Ak. 23° 3/4 Hi. 2.86 " " " Kaulapua & Puniho & Poalima.
He. 61° 1/2 Hi. .82 " " " Poalima
Ak. 43° 1/2 Hi. 1.74 " " " Puniho & Pahoa
Ak. 57° Ko. 5.62 " " " Konohiki & Koanaole.
He 66° 1/4 Ko. .78 " " " "
Ak. 27° Ko. 1.91 " " " "
He 45° 1/4 Ko. .91 " " " "
Ak. 35° 1/4 Ko. 1.28 " " " "
Ak. 42° 1/4 Hi. .62 " " " "
Ak. 37° Ko. 1.26 " " " "
Ak. 49° Hi. .85 " " " "
Ak. 24° 1/2 Ko. 1.25 " " " " a hiki ma kahi i hoomaka ai. 4 32/100 Eka.

Wailuku Novemaba 24. 1853.

E. Bailey. (Meaauaaina)

Ukupau loa $6.00

W. L. Lee
G. M. Robertson
J. Kekaulahao
J. H. Smith

Figure A45. LCA 3477 (Māhele Book1848:480).

Reference

Buke Mahele
1948 *Buke Māhele*. http://www.avakonohiki.org/buke-mahele.html. Accessed 27 March 2014.

APPENDIX B: FOREIGN TESTIMONY DOCUMENTS

Cl. 3381 Puniko.

Pahoa Sw. I know the land of the Clt. It is one piece of kalo land, one Moo, in the ili of Kahua, Wailuku, Maui.

The Clt. rec'd this land from me before 1839. His title is not disputed. There is one poalima loi in it belonging to Kalawaiahonu.

It is bounded. Mauka, by Kahanuloipua's land. Waihee, by the ili of Ahuena. Makai, by my land. Maalaea, by the Creek of Wailuku.

Figure B1. F.T. for Claim 3381 (Foreign Testimony 1846-53:421).

Cl. 3385 Pahoa.

Puhiniko Sw. I know the lands of the Clt. They consist of 2 pieces in Ahuena & Kahua, Wailuku, Maui.

No. 1 is a kalo land in Ahuena.

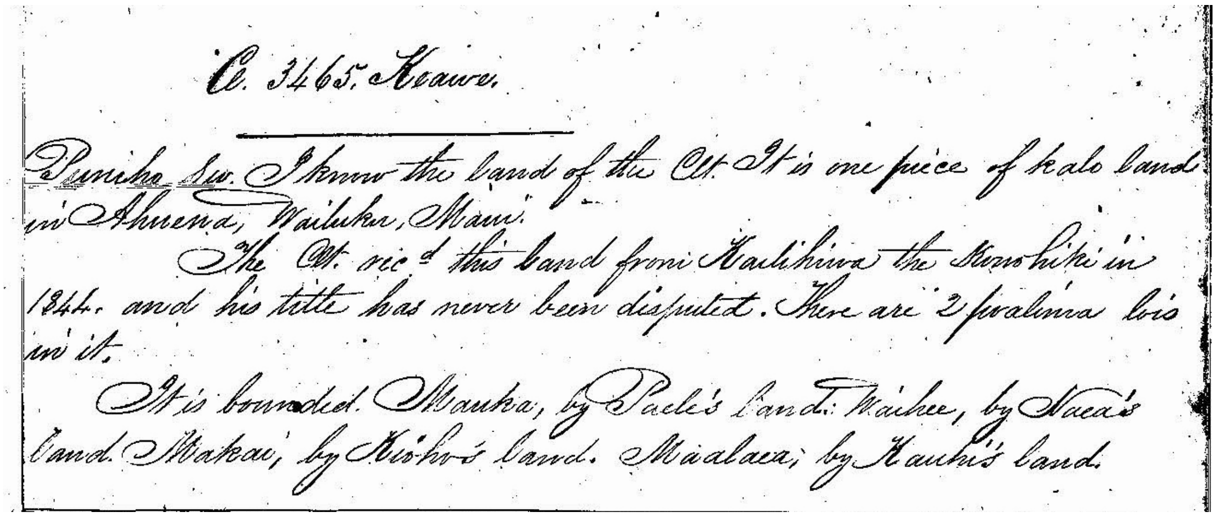
" 2 " " " " " Kahua.

The Clt. rec'd these lands from Moomoo in 1835, and his title is undisputed.

No. 1 is bounded. Mauka, by the ili of Hanapepe. Waihee, by Puni's land. Makai, by the same. Maalaea, by Kalawaiahonu's land.

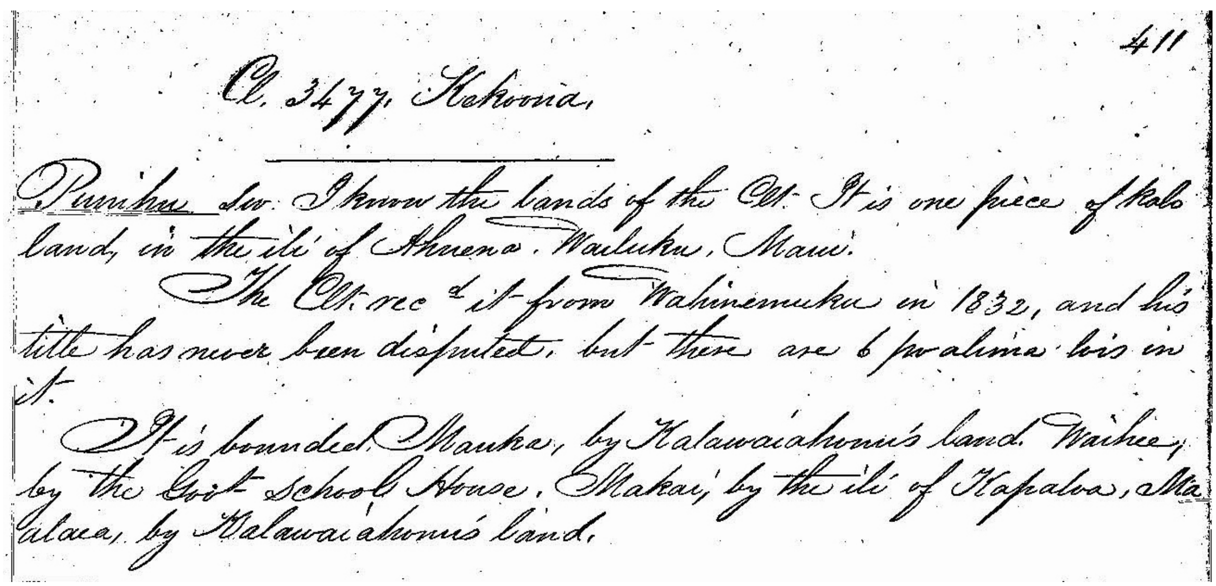
No. 2 is bounded. Mauka, by my land. Waihee, by the ili of Kapalaalaea. On other two sides, by Kalawaiahonu's land.

Figure B2. F.T. for Claim 3385 (Foreign Testimony 1846-53:413).


Cl. 3465. Keawe.

Puniho Sw. I know the land of the Clt. It is one piece of kalo land in Ahuena, Wailuku, Maui.
The Clt. rec^d this land from Kailihiwa the Konohiki in 1844. and his title has never been disputed. There are 2 poalima lois in it.
It is bounded. Mauka, by Paele's land. Waihee, by Naea's land. Makai, by Kiho's land. Maalaea, by Kauhi's land.

Figure B3. F.T. for Claim 3465 (Foreign Testimony 1846-53:413).


411

Cl. 3477. Kekoona,

Punihu Sw. I know the lands of the Clt. It is one piece of kalo land, in the ili of Ahuena. Wailuku, Maui.
The Clt. rec^d it from Wahinemuku in 1832, and his title has never been disputed, but there are 6 poalima lois in it.
It is bounded. Mauka, by Kalawaiahonu's land. Waihee, by the Govt School House. Makai, by the ili of Kapalua, Maalaea, by Kalawaiahonu's land.

Figure B4. F.T. for Claim 3477 (Foreign Testimony 1846-53:411).

Reference

Foreign Testimony

1846-53 *Foreign Testimony of Kuleana Claims to Quiet Land Titles in the Hawaii Islands*. http://www.avakonohiki.org/foreign-testimonies.html. Accessed 27 March 2014.

APPENDIX C: SUMMARY OF PROFILE LOCALES IN TRENCHES 1-10

Table C-1. Summary of Profile Locales in Trenches 1-10.

Profile Locale No.	Trench No.	Face Profiled	Layers Present	Depth at BOE* (cmbs)	Layer(s) present at BOE	Comments
1	TR1	East	I-VI	131	VI	Very sparse charcoal flecking observed in Layer VI
2	TR1	West	I-V	140	V	
3	TR1	West	I-VI	140	VI	
4	TR6	East	I-V	140	V	
5	TR6	East	I-VII	248	VII	Layer VII has 50-60% decomposing basalt cobbles and pebbles
6	TR7	South	I-VI, Lens A	120	VI	
7	TR7	South	I-IV	136	IV	Clear glass fragment found in Layer III at 82-84 cmbs
8	TR8	North	I-VII	140	VII	
9	TR8	North	I-X	134	X	
10	TR9	West	I-IV	132	IV	Cane slag found in Layer II at 80 cmbs
11	TR9	East	I-IV, Lens B	134	III, IV	Lens B is within Layer II
12	TR3	West	I-IV	140	IV	
13	TR3	West	I-V	140	V	Black plastic at base of Layer II
14	TR4	West	I-IX	230	IX	Layer IX has 50-60% decomposing basalt cobbles and pebbles
15	TR4	East	I-V	190	V	Layer V has 50-60% decomposing basalt cobbles and pebbles
17	TR5	West	I-X	260	X	No evidence of sugar cane agriculture in TR5; Layer X has 50-60% decomposing basalt cobbles and pebbles
18	TR10	South	I-VIII	160	VIII	
19	TR10	South	I-V	152	IV, V	
20	TR2	South	I-V	152	V	Surface elevation approximately 0.5 m lower in elevation, and thus Layer V has 50-60% decomposing basalt cobbles and pebbles

* BOE - Base of Excavation

Appendix K:

Cultural Impact Assessment

Draft Report

Oral History Studies for the Determination of Traditional Cultural Properties and Cultural Impact Assessment for the `Iao Flood Control Project, Maui Island, Hawaii

Contract No. DACA83-02-D-0005
Task Order 0004

Prepared for
E&C, Environmental Tech Branch
United States Army Engineer District, Honolulu, Bldg. 230
Fort Shafter, Hawaii 96858-5440

Prepared by

Social Research Pacific, Inc.
667 Old Mokapu Road
Kailua, HI 96734

December 5, 2003

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List of Figures and Tables

1.0 Introduction

At the request of the U.S. Army Corps of Engineers, Honolulu Engineer District, under Contract No. DACA83-02-D-0005 (Task Order 0004), Social Research Pacific, Inc., completed "Oral History Studies for the Determination of Traditional Cultural Properties and Cultural Impact Assessment for the 'Ī`ao Flood Control Project, Maui Island, Hawaii." The study was done between August 12 and November 15, 2003. This draft report presents the findings of this study.

The U.S. Army Corps of Engineers is conducting a Feasibility Study and Environmental Assessment (EA) for flood control measures in the 'Ī`ao Stream Drainage on the southern end of Maui Island. The determination of Traditional Cultural Properties (TCPs) and Cultural Impact Assessment (CIA) partially fulfill the requirements for an EA as specified by Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and Chapter 343 of the State Constitution of Hawai`i (HRS and Act 50).

The major tasks involved in completion of this TCP/CIA included: 1) preparation of a Work Plan (WP); 2) archival and record searches; 3) field study (collection of oral histories from native Hawaiians knowledgeable about traditional uses of the area, survey of area residents to identify potential cultural impacts, and attendance at scoping and public meetings); 4) description and assessment of Traditional Cultural Properties (TCPs) identified during field studies; and 5) preparation of this report.

1.1 Goal and Purpose of Study

The goal of this project was twofold: 1) to identify potential TCPs through archival searches and oral histories; and 2) to complete a CIA that addresses the potential impacts of the proposed project. The completed TCP/CIA study also meets both federal and State of Hawaii NEPA requirements for the 'Ī`ao Flood Control Project in the documentation of an Environmental Assessment.

Archaeological work completed for an earlier phase of this project by Scientific Consultant Services, Inc. (SCS 1999), indicated that potentially significant Native Hawaiian cultural remnants, eligible for the National Register of Historic Places, were likely to be present in the project area. More recent archaeological investigations upstream of the current project area (Haun and Associates 2002), found traditional Hawaiian residential and agricultural sites. Along with known historical uses and archaeological sites in the vicinity of the project area, portions of the flood plains within the streambed are presently used as for small-scale agricultural and subsistence purposes. There also remain a handful of land owners on parcels originally given during the Land Commission Awards [LCA); most of these are located north (*mauka*) of the project area. Knowledge about traditional and historic land uses along ʻĪao Stream made it likely that TCPs would be found in the vicinity of the project area.

Land use along ʻĪao Stream is primarily residential. This is particularly true for the upper and lower portions of the stream. Within the immediate vicinity of the project area, particularly along the southern flanks of the stream, there are a large number of commercial interests. Based on observations of current impacts, the residents and businesses along the southern flanks will be most directly impacted by any future flood control measures. This area also forms the primary user group identified by this study. The potential impacts and cultural concerns that area residents (and other user groups) relate directly to the proposed project forms the basis for the cultural impact assessment.

1.2 Project Location

ʻĪao Valley lies within Wailuku *ahupuaʻa,* in the northeastern portion of Maui Island (Figure 1). The project area includes only that portion of ʻĪao Stream which has not previously been upgraded; it extends approximately 7,200 lineal feet between Market Street and Waiehu Beach Road, in Wailuku town. The remainder of the stream, immediately above and downstream of the project area, is already lined in concrete (previous improvements). Among the options being considered in the present EA, is concrete lining of the portion of the stream that forms the project area.

While the stream proper runs as a fairly narrow channel, the width of the streambed (floor) varies significantly. In the north-central portion of the project area (between Pihana Street and the active stream flow channel) lays a flood plain that is currently used as both pastureland and for growing vegetables (Burgett and Dega 1999:5). Along with a very large banana patch, newly planted cultivars such as taro can also be seen in the flood plain area. Along the upper, westernmost portion of Pihana Street are residential units; a few small businesses can be found along Market Street, on either side of the bridge. A Hawaiian Homes Lands subdivision lies along the eastern, lower portion, of Pihana Street, ending at Waiehu Beach Road.

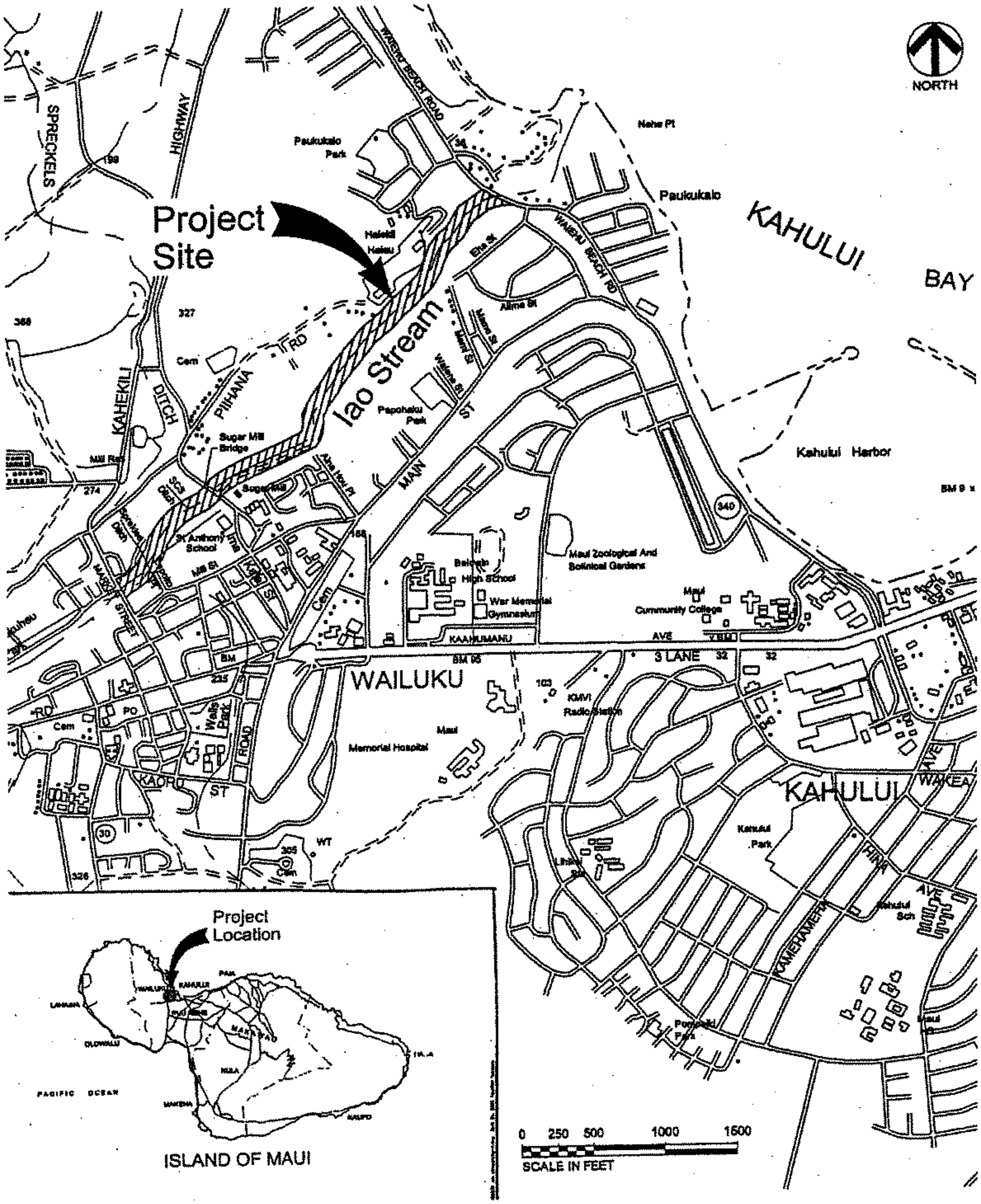

Figure 1. Map of Project Area showing the Iao Stream Hydraulic Design (M&E Pacific, Inc. 2000).

The area along the southern flanks of ʻĪao Stream is a mixture of residences and business/commercial interests. Part of this area makes up the Wailuku Industrial Park and the Millyard (formerly Mill Camp) business complex (Figure 2). Residential units are found nestled

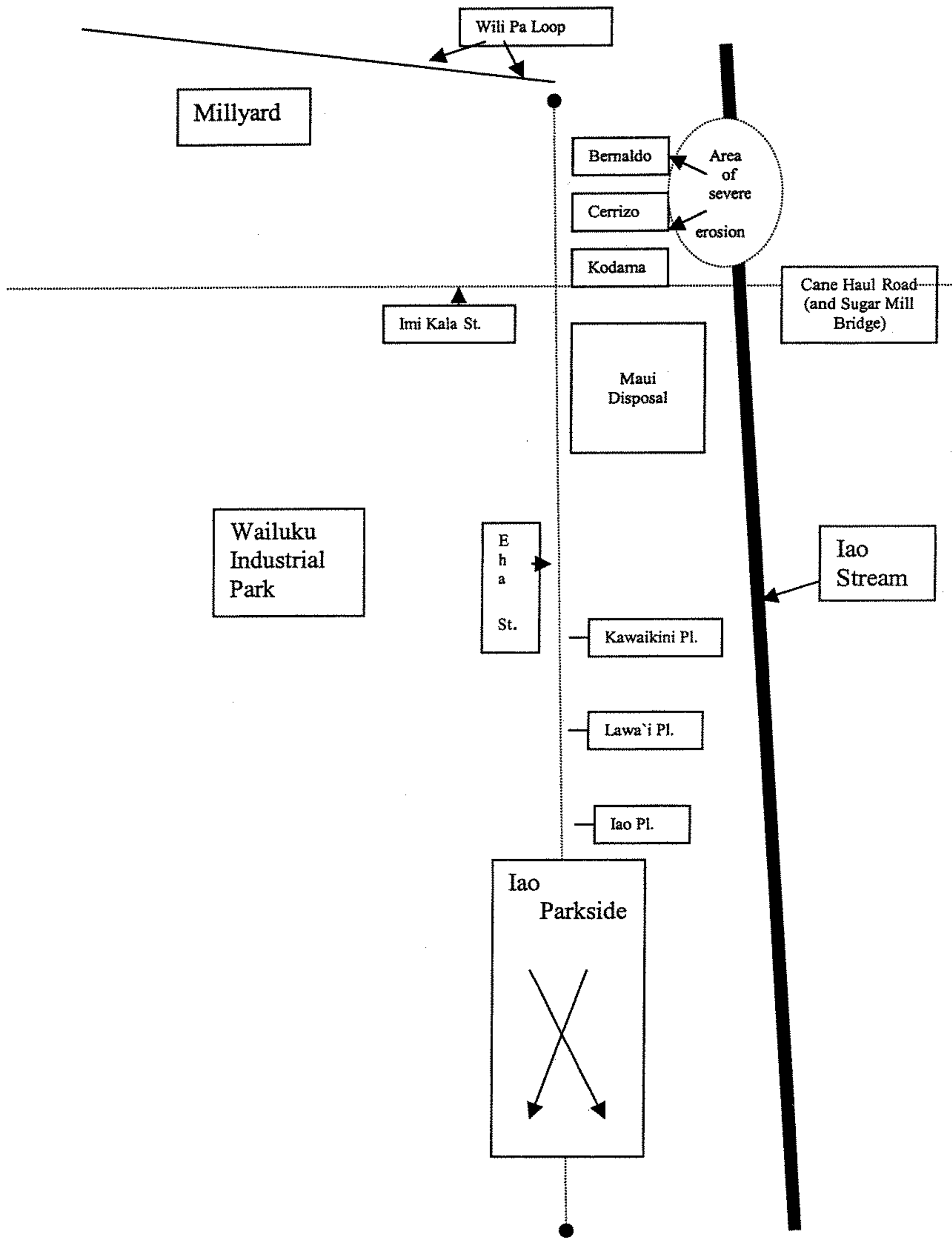

Figure 2. Location of Selected Sites in the Project Area

between commercial buildings and ʻĪʻao Parkside; the latter is an extensive condominium development that borders on the southeastern flanks of the project area.

1.3 Federal Guidelines for Identifying TCPs

Federal guidelines define (identify) what properties constitute a TCP. In the *Guidelines for Evaluating and Documenting Traditional Cultural Properties* (National Register Bulletin No.38) a TCP is defined as:

> "...[a traditional cultural property is generally] one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identify of the community" (Parker and King 1995:2).

The process of identifying a Traditional Cultural Property calls for a "systematic study, just as most other kinds of historic properties" (Parker and King 1995:5). The ultimate goal of identifying a TCP is to evaluate its eligibility to the National Register of Historic Places... "its significance (former and present) must be at the very least, mentioned in planning federal, federally assisted, and federally licensed undertakings" (ibid 1995:4). An interview with knowledgeable sources is among the primary method for identifying TCPs. Among the individuals contacted were *kūpuna* (Hawaiian elders) from Maui Island who can identify properties of cultural/historical significance in ʻĪʻao Valley. Along with interviews, information about TCPs was gathered from written and archival (mostly photographic) sources. These data helped identify areas/properties in ʻĪʻao Valley that have cultural/historical significance and satisfy the criteria established for TCPs, and areas/properties of local cultural importance that do not meet the criteria. Both categories are discussed in later sections of this report.

1.4 State of Hawaiʻi Guidelines for Cultural Impact Assessments

Articles IX and XII of the State Constitution of Hawaiʻi (Chapter 343, HRS), require government agencies to promote and preserve cultural beliefs, practices, and resources of native Hawaiians and other ethnic groups. As such, preparers of environmental impact assessments and statements need to study the impacts of a proposed action on cultural practices and features associated with a project area. The "Guidelines for Assessing Cultural Impacts", (Appendix A) adopted by the Environmental Council of the State of Hawaiʻi, on November 19, 1997, identifies the protocol for conducting cultural assessments. The impacts addressed by this study look at the potential cultural impacts of the proposed flood control project on the resident community. The evaluation of potential cultural impact(s) of the flood control project is based primarily on the results of a questionnaire-based survey done among residents and organizations in the Wailuku area. Some of these individuals participated in the EA Scoping Meeting, held in Wailuku on August 12, 2003. The results of this survey are presented in Section 4.0 of this report.

2.0 The Study Approach

Since the purpose of this study was twofold - identification of TCPs and completion of a CIA – the data needed to complete the project involved gathering information from both historical and present sources. Hence, the study approach taken was both ethnohistorical and ethnographic in nature. The categories of data gathered included: 1) historical information from written/archival sources; 2) oral information (on TCPs and traditional land uses) from Hawaiian *kūpuna* familiar with the project area; and 3) a questionnaire-based survey of individuals and groups who are current "users" of the project area.

The primary objective of the TCP study was to:

- identify potential areas, features and/or sites of traditional (Native Hawaiian) significance within the vicinity of the project area.

The primary objectives of this CIA was to:

- identify current cultural uses of the 'Īao Flood Control Project area;
- identify user groups at that would be affected (culturally impacted) by the proposed project;
- conduct interviews with individuals and groups to identify these potential affects; and
- assess the level of impact(s) from these potential affects on cultural practices in the area.

2.1 Tasks Completed

Data gathered for this study combined available background information on the cultural and historical make-up of the project area, with results of the oral interviews and the questionnaire-based survey. Specifically, the following tasks were completed:

1. gathering of background data (written traditional/cultural and historical data on the project area)
2. designing a survey questionnaire
3. field research
   - identification of primary user/interest groups and stakeholders, particularly residents and businesses that were most likely to be directly impacted by the proposed project
   - administration of survey questionnaire
   - oral interviews (individual and group meetings)
   - general community observations
   - field visits to the project area.
4. quantitative and qualitative analyses of data gathered from field research and general background information
5. development of recommendations based on the findings
6. preparation of this draft report

2.1.1 Background Data

Background data was gathered from the initial stages of the project up to the present. Interviews were completed on the island of Maui between the months of September and November 2003 (see Appendix B for transcripts of the interviews). The survey of residents, households, businesses and other potentially affected 'user groups' for the CIA survey was completed alongside the field site visits and oral interviews. All but two oral interviews were held in person; the remaining two were completed via telephone.

2.1.2 Survey Questionnaire

A one-page survey questionnaire (Appendix C) was developed to gather information for the CIA component of this study. Its primary purpose was to gather responses about the possible cultural impacts any individual and/or business may experience as a result of the proposed flood control project; secondarily, it served as a tool for obtaining information about TCPs in the project area. The questionnaire was administered in person, as well as via telephone (a few individuals were unable to meet in person). Individuals attending the 'Ī'ao Flood Control Project Scoping Meeting, held in Wailuku on August 12, 2003, were also contacted.

2.1.3 Field Research

One of the initial tasks of this study was to identify (a) *kūpuna* and knowledgeable others about TCPs in the area, and (b) individuals and groups likely to be impacted by the proposed project. Most of the contacts for identifying TCPs did not live in the immediate vicinity of the project area, while nearly all of the individuals to whom the questionnaire was administered, lived and/or worked immediately adjacent to the project area. The latter included residents and businesses along 'Ī'ao Stream. Interviews were held at individual residences, at places of business as well as at other convenient meeting places. In some cases, meetings were completed in group settings. Throughout the field research phase, general observations were made within and around the project area (several individuals were approached after being observed in the immediate vicinity of the project area).

2.1.3.1 Oral Interviews

All individuals who provided oral interviews about TCPs in the project area have consented to the sharing of their information (the CIA did not entail formal interviews). Two of these interviews were recorded on audiocassette (see Appendix B); the remainder was recorded in written form. The identification of Hawaiian *kūpuna* for the island of Maui came from previous oral history research on the island, the Office of Hawaiian Affairs (OHA), the State Historic Preservation Office (SHPO) on Maui, and the Maui Historical Society (Appendix D). Additionally, there were residents who have taken an interest in the TCPs of 'Ī'ao Valley that provided useful information.

3.0 Traditional and Current Land Uses of 'Ī'ao Flood Control Project Area and Surrounding Vicinities

'Ī'ao Valley, as with the remainder of Wailuku *ahupua'a* is known to have numerous traditional and historic sites of significance. Many of these are not located within the project area however, they may have had significant association with features in the project area. The next two sections review the significance of Wailuku *ahupua'a* and 'Ī'ao Valley, first in its historical context, and second in its present day.

3.1 Traditional Hawaiian Uses of ʻĪao Valley and Wailuku *ahupuaʻa*: Written and Oral Accounts

In a recent historical literature review of the traditional land uses of Kahului Harbor, Tomonari-Tuggle and Welch (in Prasad and Tomonari-Tuggle 1999) discuss the importance of the Wailuku area. The project area falls within the traditional *ahupuaʻa* of Wailuku in the district of Wailuku. The district encompasses the eastern flank of the West Maui Mountains and all of the isthmus between east and west Maui, including the coastal stretches of both Kahului Bay on the north and Māʻalaea Bay on the south. The *ahupuaʻa* of Wailuku covers the coastal area of Kahului Bay, all of ʻĪao Valley, and the north half of the isthmus.

Handy and Handy (1972:272) call Wailuku district *Na Wai ʻEha*, "The Four Waters," after the four major streams and taro-growing areas of windward West Maui: Waikapū, Wailuku, Waiehu, and Waiheʻe. Based on the account of a native Hawaiian of "considerable age," a writer at the turn-of-the-century described the district (Paradise of the Pacific, September 1900, in Silva n.d.,10):

> The district was called Nawaieha (the four streams) and was famous throughout the group, not only for the magnificence of Kahekili's court but for the vastness of its products. The shores of Kahului harbor, from Waihee Point to Haiku, were surrounded with the grass huts of the fishermen and of those connected with the innumerable war canoes of the king. Myriads of cocoanut [sic] trees lined the beach from Kahakuloa to Wailuku, the trunks of many of which are found in the marshes at Wailuku at this day, the trees having been destroyed by a conquering army from Hawaii.

In the late prehistoric period, a time of frequent warfare among the chiefs of Maui, Oʻahu, and Hawaiʻi, Wailuku was a chiefly center and a site of decisive battles. In 1736, the fatally ill Maui chief Kekaulike heard that the Hawaiʻi chief Alapaʻi was planning to invade his island. He and his retinue retreated from Kaupo to Kula and then to Wailuku where the Maui chief died at Halekiʻi Heiau. There, his body was burned and his ashes thrown into ʻĪao Stream (Speakman 1978:13, in Kennedy et al. 1993).

Between 1765 and 1793, Kahekili was chief of the island (as well as Oʻahu, Molokaʻi, and Lānaʻi). Late in his rule, war broke out between Kahekili and the chief of Hawaiʻi, who led a force of special warriors in an invasion of Maui. Kahekili awaited the outcome of the battle at his residence in Wailuku. Kamehameha fought one of his first battles with European weapons on the plains of

Wailuku. "The bay from Kahului to Hopukoa was filled with war canoes. For two days there was constant fighting in which many of the most skillful warriors of Maui took part, but Kamehameha brought up the cannon, Lopaka, with men to haul it and the white men, John Young and Isaac Davis, to handle it; and there was great slaughter (Kamakau 1961:148). But Wailuku was also a place where chiefs passed their quiet times. In the 1760s, "the chiefs of Wailuku passed their time in the surf of Kehu and Ka'akau" (Kamakau (1961:83). 'Ī'ī (1959:135) identifies "the surfs of Kaleholeho, Kaakau-pohaku, and Paukukalo" in Wailuku as some of the attractive locations for this sport.

Written and oral traditions associated with 'Ī'ao Valley clearly point out the area's unique significance to Native Hawaiian culture. 'Ī'ao was the name of Maui and Hina's daughter, whose lover was turned into a pillar of salt ('Ī'ao Needle) by Maui. Numerous chiefs are said to be buried at Oloeio, a cave located in 'Ī'ao Valley (Fornander 1996) that served as a royal burial grounds (*kapela*). Some of the biggest battles in Hawaiian history (Battle of'Ī'ao, Battle of Kepaniwai, Kamehameha I's victory in 'Ī'ao) were fought within and around 'Ī'ao Valley. Wailuku *ahupua`a*, which translates to "water [of] destruction" (Pukui et al. 1976:225), and Wailuku District were ceremonial and political centers for Hawaiian chiefs (Kirch 1985). Wailuku was considered a "chiefly center" (Sterling 1998:90), with many of the chiefs and area's population residing near or within portions of 'Ī'ao Valley.

Traditional land use of 'Ī'ao included intense cultivation of taro; many *lo`i* systems line the stream banks of 'Ī'ao Valley. A total of sixty-six LCAs, primarily taro patch *kuleana*, and thirty-nine *po`alima* are located between the old Wailuku Mill site and Paukūkalo, on the southern side of 'Ī'ao Stream (Fredericksen 2001:4). Two *`auwai* (prehistoric ditches), were "constructed for the purpose of irrigating *kalo* on the plains which stretch away to the northward and southward of the ['Ī'ao] river" (Sterling 1998:86). Much of the historical literature supports extensive taro cultivation in greater Wailuku Valley. Habitation sites along Lower Main Street in Wailuku "are associated with the rich taro producing lands in the Lower 'Iao River flood plain, and the extensive cultivation systems present in `Iao Valley" (Burgett and Dega 1999:14). Taro from Wailuku *ahupua`a* also supplied other areas of the island. For instance, areas such as Kahikinui were not suitable for taro cultivation, therefore its people would trade ocean food sources for taro with their distant neighbors in Wailuku. It is highly likely that similar trade arrangements existed with other parts of the island that were unsuitable for cultivating taro.

A maps prepared by Monsarrat in the 1880s offer 'snapshots' of late 19th century history of Wailuku *ahupua`a* and 'Ï`ao Valley. Figure 3 is a portion of Monsarrat's 1888 map that shows 'Ï`ao Stream

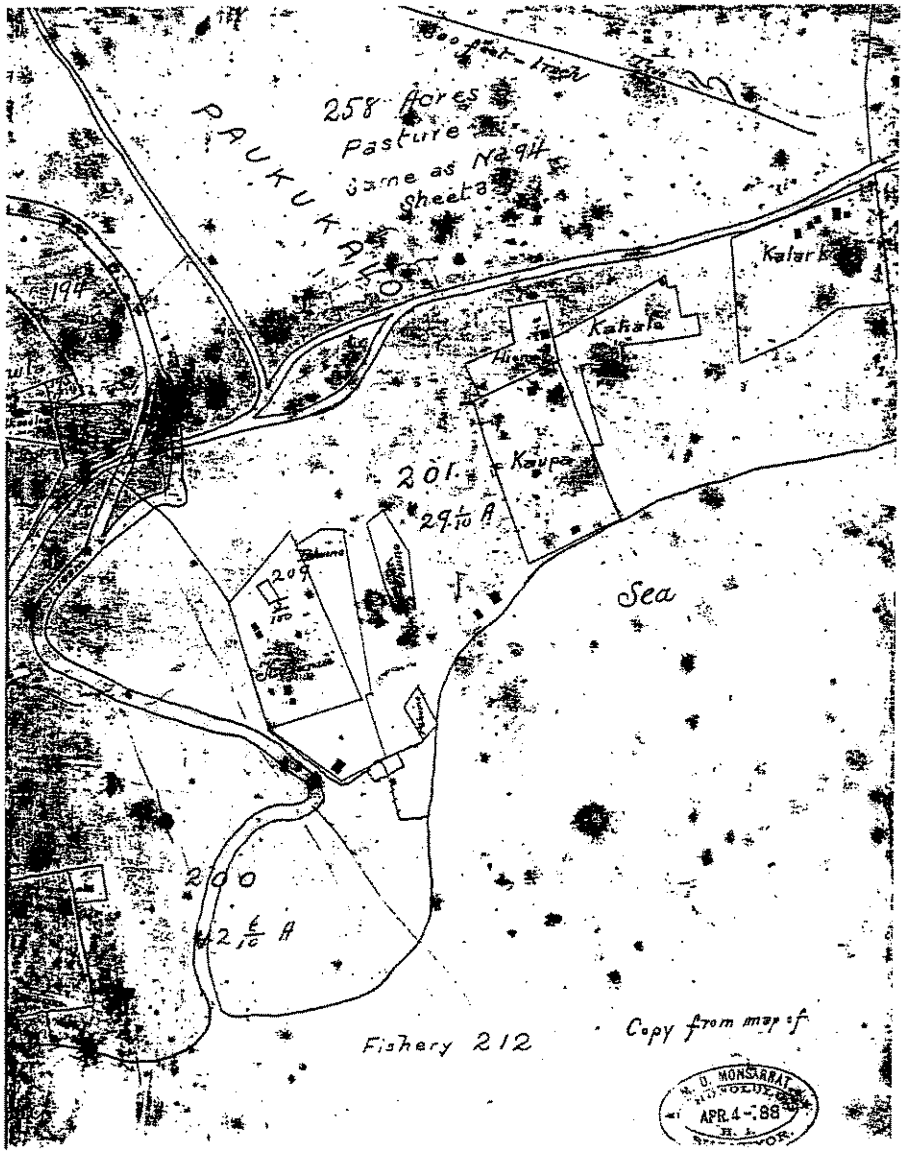

Figure 3. Portion of Monsarrat's 1888 map showing 'Ï`ao Stream and Paukükalo.

curving around *kuleana* lots in the Paukükalo area, and emptying into Kahului Bay. An earlier map (1882) shows all the traditional Hawaiian land divisions are shown on this map – district, *kalana, ahupua`a, ili, mo`o (mo`o `äina)* and *paukū (kuleana)*. There are also a large number of subdivisions (areas with names that are no longer known or used) along either side of 'Ï`ao Stream. According to Bob Hobdy (pers. comm.) who has done extensive research relocating sites identified on early historic maps, these were likely to be *mo`o*. Altogether, he identified a total of twenty-six *mo`o* along 'Ï`ao Stream. The *mo`o* are attached to wetland taro cultivation; each one is serviced by its own *`auwai,* and includes several *kuleana* (ibid). In a similar map of Honokohau from the 1930s, Hobdy saw complete descriptions of *kuleana, mo`o* and the *`auwai*. Each *`auwai* coming off Honokohau Stream showed a cluster of *lo`i* and multiple *kuleana* within the *mo`o.*

In addition to *lo`i,* there are two *heiau* in the immediate vicinity of the project area. The Haleki`i-Pihana Heiau State Monument can be easily seen on the northwest flank of ʻĪ`ao Stream, along the lower portion of the project area. This is the third largest structure on Maui, after Pi`ilanihale *Heiau* in Hana, and Loaloa *Heiau* in Kaupo (Kolb and Keau 1990:5). Other heiau are known to have existed in the area, however, as noted by Winslow Walker, all but two (Haleki`i and Pihana) of the known *heiau* were still standing during his initial archaeological survey of Wailuku. Keahuku, Olokua, Olopio, Malena, Pohakuokahi, Lelemako, Kawelowelo, Kaulupala, Palamaihiki, and Oloolokalani could not be found (Walker 1931:146-148, in Fredericksen 2001:11-12). Halekii-Pihana *heiau* sits at the edge of lithified sand dunes, which itself is a significant prehistoric burial site that runs semi-parallel to ʻĪ`ao Stream and mid-way up Wailuku *ahupua`a*. Early historic burials are also known from Mahalani Cemetery, located between the *Pu`u One Dunes* and the flood plains along the project area portion of ʻĪ`ao Stream. According to its President, King Kekaulike's wife is buried at the cemetery along with burials are from the later historic, plantation period (W. Cockett, pers. comm.).

Traditional uses of the land area can also be seen in the travel routes taken by people. At least one prehistoric-historic trail, crossing the saddle to the western side of the island, is known to exist in the back of Wailuku Valley. The trail is believed to have been used by a fighting chief who escaped by taking it to cross the saddle to Olowalu. Na Ala Hele, the group tasked with locating/identifying ancient trails throughout the islands, has found many similar trails in and out of the gulches of Maui. As a member of Na Ala Hele, Bob Hobdy (pers. comm.) says that trails along the gulches are most visible due to the terrain on which they sit; those in flat areas or bottom lands are less known since they were most likely to have been converted into roadways for buggies and cars.

Many of the elders, including long-term area residents, discuss what was likely found in the Wailuku before changes were introduced by the sugar plantations. These are sites and features that no longer exist or have been greatly disturbed. *Kūpuna* Charlie Keau knows of many previous traditional sites throughout the Wailuku area, including *heiau,* fishing shrines (*ko`a*), trails, and *lo`i*. Charlie grew up in Paukūkalo, which was good for fishing and picking *limu*. He recalls that the old folks really liked Paukūkalo and how dramatically the area has changed since construction of the Maui Community

Center. Charlie remembers that old timers used to put their canoes out from "Kalo Grounds," the present day location of Maui Beach Hotel in Kahului. Some of these people also lived underneath the nearby trees. Members of the Duarte family, with multiple generations living in 'Ī'ao Valley, recall some prehistoric and historic features used by Hawaiian families; these, too however, no longer exist. Kaahumanu Church, the oldest church in Wailuku, was deliberately built on the foundation of Kahekili's *heiau*. (Ashdown 1970:34). More recently, Bob Hobdy has seen areas that contained extensive rock walls, delineating small units of land, bulldozed in Waikapu`u. Likewise, the old *`auwai* system was most likely destroyed when irrigation ditches were placed for sugar plantations.

Recent studies within the immediate vicinity of the project area indicate that traditional, prehistoric features and sites are not likely to be found. During the Phase I archaeological survey of the Flood-Control Project Area, Connolly (1974) noted that "no positive structural evidence of a prehistoric occupation was observed...all of these structural remains–considered with the surface-artifact and midden remains, and the known ethno-historical materials appeared to be principally historic (post-European contact) in age" (1974:Abstract). The boundaries of Phase I border on the eastern-most boundary of the current project area.

3.1.1 Land-Use Changes resulting from Changes in Land Ownership

The first commercial activity in the Wailuku area appears to have been cattle ranching. As early as 1845, large herds of cattle were roaming the Kahului Isthmus (Barrere 1975:52). The cattle, under royal *kapu* which kept the herd from being harmed, were very destructive to the environment (ibid). In the 1830s, there was also an attempt to grow cotton. Although the environment was additionally impacted by the attempt, cotton growing also met with little success (Fredericksen 2001:4).

During the mid-19th century Mahele or division of lands, Wailuku was designated as Crown Lands claimed by the Kamehameha III. Numerous Land Commission awards to commoners were given out in the area around Wailuku and 'Iao Valley. In 1878, through his friendship with King Kalākaua, Claus Speckles secured a lease of 40,000 acres of land, among which was a portion of Wailuku *ahupua'a*. In 1882, he acquired fee simple title to all of the *ahupua'a* through Grant 3343 (Kennedy et al. 1992:12). That same year, Speckles built the Waihe`e ditch and founded the Hawaiian Commercial and Sugar Company (HC&S), which quickly became the largest and best-equipped sugar plantation in the islands (Kuykendall 1967:60). Figure 4 shows that by 1937, the majority of Wailuku was designated as "ranch land", being used primarily for sugar.

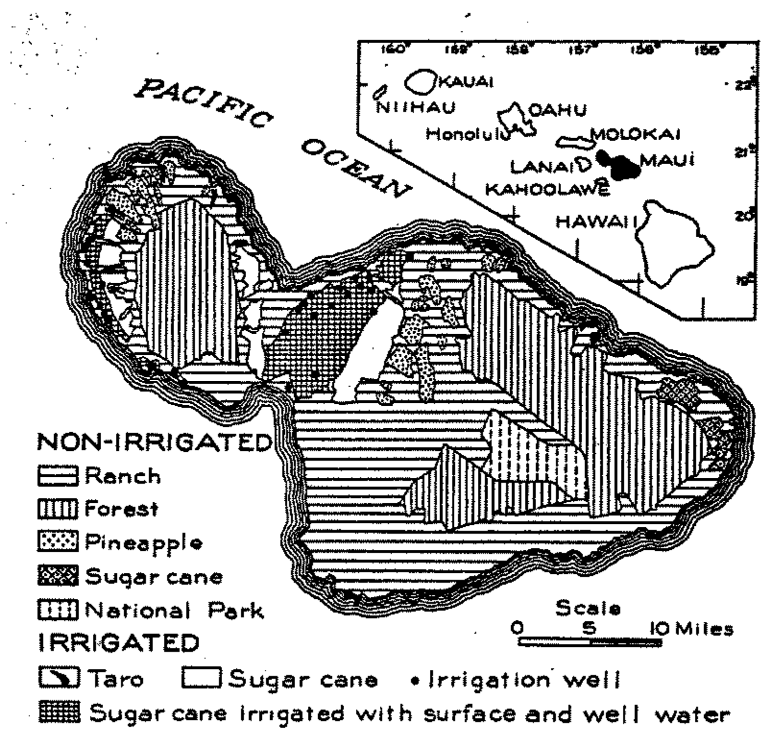

Figure 4. Land Utilization on Maui in 1937 (Source: Territorial Planning Board 1939, in Stearns and MacDonald 1942).

On a smaller-scale, change to land use has also been brought about by the U.S. military's use of the Wailuku area. As with many areas on Maui (e.g. Pu`unene Air Station, Naval Air Station Kahului [NASKA], the U.S. Marine Camp in Hailemaile), military use of the island intensified during World War II. Like the commercial farming ventures before them, the military has brought about fairly permanent changes to land use. Gordon and W. Cockett recall the Army Camp that was set up in Paukükalo, bordering Pihana and near the Haleki`i-Pihana heiau, shortly after World War II. The area is now mostly Hawaiian homesteads. A portion of this earlier camp may also be the present day location of the Hawaii National Guard Camp Site and Rifle Range (c.f. Yent 1995:2-3). An undated photo below (Figure 5) shows another camp set up along Kahului Harbor, before reaching Waiehu and Paukükalo. Kahului Harbor served as the main port of entry for military ships during WWII.

Written and oral histories tell of the traditional significance of Wailuku. Once an area of great traditional significance to Native Hawaiians, Wailuku went on to become a major sugar

Figure 5. Village at Paukükalo c.1946, showing military barracks at upper left, fronting the Pu`u One Dunes (Courtesy of Bailey House Museum).

cultivation/production area, to its present day residential and business use. Sugar plantations dominated the Wailuku landscape, especially along ʻĪ`ao Stream, for much of the very late 19th and early 20th centuries. These changes in land use have significantly compromised the existence of prehistoric, traditional archaeological features. According to Haun and Henry (2002), the density per acre value of archaeological sites and features are relatively low due to the extensive impact of plantation agriculture and urbanization (Hahn and Henry 2002:17). The following section briefly discusses current land use within the immediate vicinity of the project area.

3.2 Current Uses of the Project Area

Current uses of the project area differ dramatically from its traditional uses. The change has come about in several stages. If for instance, the maps prepared by Monsarrat in the late 19th century depict a true picture of land use in that day, than along with the prehistoric uses, the intermediate phase of land use is also long gone. Sugar has left its imprint primarily in the form of water diversions (dikes, ditches), and other structural remnants such as bridges and a few old buildings. But these are becoming less obvious with the rather rapid level of urban development in the Wailuku area. Present day land uses identified during this study fall into three categories:

Residential

Commercial

Recreational

Farming

Residential development along ‘Ī`ao Stream extends from Kahului Bay to the far western (*mauka*) sections of the valley. The most dense residential settlement is along the lower (*makai*) portions of the stream, in the areas of Waiehu, `Iao Parkside, Happy Valley, Pihana, Millyard and the Hawaiian Homestead bordering on the Haleki`i-Pihana Heiau. Along the northern corridor of the project area, which extends from Millyard to Waiehu Beach Road (see Fig. 2), there is continuous housing except for within the flood plain bordering Pihana. The southern corridor of the project area consists of both residential and commercial properties. Many of the homes in Pihana date back to the plantation period; there are three known *kuleana* lots. According to Winifred Cockett, a third generation Pihana resident and *kuleana* lot owner, the remaining two lots are between her property and the *heiau*. The remainder of the Pihana area is largely settled by non-Hawaiians whose ancestors may have once worked for the sugar plantation.

Commercial development is restricted largely to the southern corridor of the project area. (There are a few older businesses such as Takamiya Store, in upper Pihana, just outside the northern corridor of the project area). Eha Street (Fig. 2) which runs parallel to the project area, is a mixture of newly built homes (within last three years), the `Iao Parkside condominium complex, and several businesses at either end of the project area portion of this roadway. Older homes exist on both the *mauka* (above Millyard) and *makai* (below Waiehu Beach Road) ends of the southern corridor of the project area. The types of businesses vary significantly. At the eastern most end of the project area is Sak & Save Supermarket; at the western most end, is Maui Waste Disposal and several legal, accounting and real estate firms. A levee, which also serves as the maintenance road for Maui County vehicles, separates many of the homes from the stream. It is this levee and maintenance road, along with the streambed, that also serves as a recreational area.

Farming is occurring within the flood plain area in Pihana; it is restricted to the northern corridor of the stream. A total of four farms, all on leasehold land, were identified. These are mostly banana and papaya patches owned by farmers of Filipino descent. A newly established horse stable, operated by one of the Hawaiian homeowners, lies adjacent to a *kuleana* lot. Several families have backyard/kitchen gardens but none of these are near the stream area.

Recreational uses of the project area consist primarily of walking/jogging (on the maintenance road), bicycling and dirt bike/small motorcycle use. There are occasional boogie boarders and swimmers in the stream but they are confined to areas where water level gets high enough to be used for these activities. Of the area residents interviewed, only two used the levee maintenance road for leisure walks; the majority of those who appear to use the area regularly for recreational purposes do not live adjacent to the stream. Fishing within the project area portion of ʻĪʻao Stream does not seem to take place.

This mixture of land use along the project area does not seem to be in conflict with one another in any way. While noise from the dirt bikes and their use of people's backyards has been a problem, most individuals have put up fences and would be pleased to see the area improved for further recreational use.

4.0 Identification of Traditional Cultural Properties and Cultural Impacts

One of the two goals of this project was to identify TCPs and oral traditions associated with ʻĪʻao Valley that meet the criteria established in the National Register; the second was to complete a CIA of the potential effects of the proposed project. While no TCPs were identified in the project area, oral and written history indicates TCPs within the general vicinity of the project area; they also identify historic properties that hold local cultural significance. The following sections present the findings of this study, first addressing TCPs, and second, the CIA.

4.1 Traditional Cultural Properties in the Project Area: Findings

Although no specific features that can be classified as a TCP were located within the project area, the overall traditional significance of Wailuku is to be noted. There has been substantial change to this cultural landscape, yet remnants of its highly significant past remain. The following discussion on TCPs is presented in a question/answer format to simplify the essential findings of this study.

Were any new Traditional Cultural Properties identified within the Project area?

No, not any that can be identified. This question was asked during each field interview, especially with Hawaiian *kūpuna*. At present, no one can identify any TCPs within the immediate vicinity of the project area.

Are there any existing TCPs within the general vicinity of the project area?

Yes, there are *heiau,* fresh water springs, burials, and *loi.* While some have already been labeled as a TCP, the remaining qualify based on significance criteria. These are as follows:

1. Haleki`i-Pihana Heiau State Monument lies above the northeastern corridor of the project area, in the *ahupua`a* of Paukükalo. *Haleki`i* means the "house of images", and *Pihana* means "fullness", is believed to be the only complex remaining of pre-contact Hawaiian structure of religious and historical importance in the Wailuku-Kahului area (Yent 1995:1). Some area residents refer to Pihana as "Pi`ihanakalani", which means "ascending into heaven" (M.J.K. Kolb and G.M. Murakami 1994:61). The *heiau* (Figure 6), State of Hawaii Site number 50-50-04-592, is under the jurisdiction of the Division of State Parks.

2. A second *heiau* or *ko`a* (fishing shrine) is believed to have been located at Mele-ha`a-ko`a, the Singing Reef. According to Ashdown, whose father had a house, corrals and slaughterhouse near the shrine, it was "along the old road between Wailuku and Kahului by the present Maui Dry Goods building in the area called Kawela" (Ashdown 1970:38). She adds that the shrines and temple were ruined, and "most of the buildings taken out to sea" in the tidal wave of 1946 (ibid). According to D. Sevilla, the remnants of this *heiau* may presently lie on private property near the shoreline.

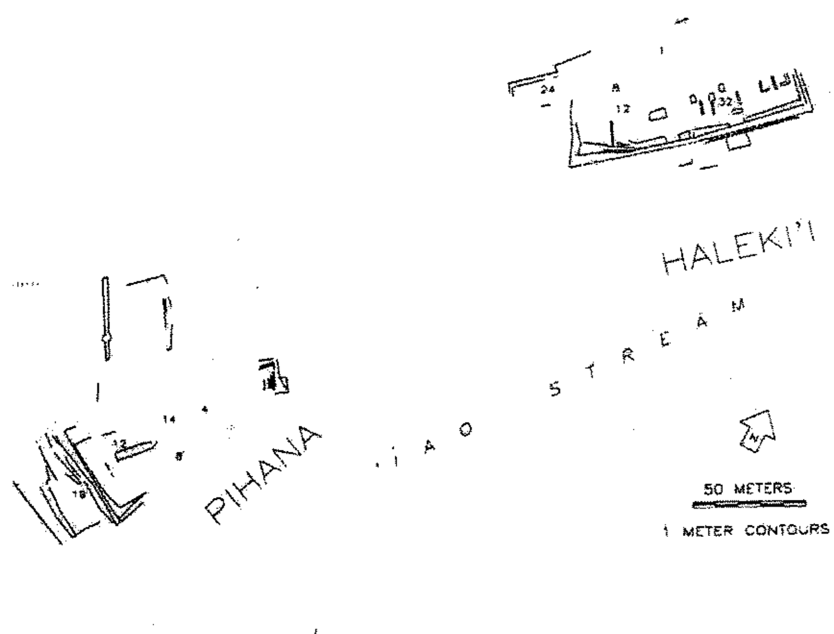

Figure 6. Location of the Halekii-Pihana Complex, along 'Ï`ao Stream (Source: Kolb and Murakami 1994).

3. A fresh water spring, presently known as Waiola, located on the Sevilla property in Waiehu (Tax Map Key No. 3-3001-054), is believed to be part of an ancient fish pond (Commission on Water Resource Management, 1990). The true name of the spring is no longer known (C. Keau and D. Sevilla, pers. comm.) but some refer to it as Waiola. C. Keau believes the name may have been "Wailuku" (pers. comm..). The spring measures six feet wide and five feet deep. There are three main sections to the spring, most of which are separated by stone walls (Fig. 7). The spring was dry

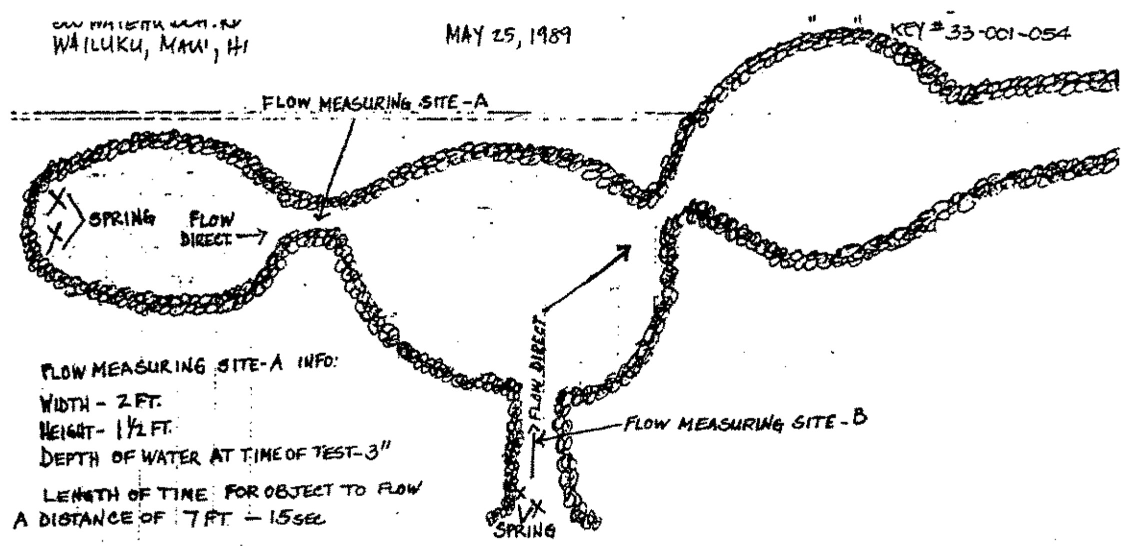

Figure 7. Waiola Spring, Waiehu, Maui (Source: Commission on Water Resource Management, 1990).

during the time this study was being conducted. According to D. Sevilla (pers. comm.), a mullet (fish) pond lay immediately east (*makai*) of Waiola, on the Kekona property. However, "Uncle Kekona filled up the pond once the water started to dry up" (ibid). The absence of water in both Waiola and the mullet pond are believed to have occurred after the diversion was placed in ʻĪ`ao Stream.

4. Burials in the *ahupua`a* of Waiehu and Wailuku. As briefly discussed in section 3.1, prehistoric and historic burials are known from the vicinity of the project area. Most of these have been identified from the *Pu`u One* sand dunes that lie north of the project area; some are also known from Mahalani Cemetery (the majority of these burials are believed to be from the plantation era). A recent excavation a *kuleana* lot in the north easternmost corner of the flood plain area (down slope from the *heiau* complex), led to the discovery of several burials. According to W. Cockett (pers. comm.), who identified the area in which the burials were located, there will be no further ground disturbance for the sake of the burials.

5. Ancient and historic period *loi* are known to exist upstream of the project area. M. Duarte (pers. comm.) recalls several Hawaiians who used to grow taro nearby the Duarte residence. Many of these individuals had *kuleana* lots and *kuleana* water rights. As observed behind the 'Tropical Gardens of Maui', many of these *kuleana* still have *po`alima* within their boundaries. At present, *loi* are known from several family lots but the majority of taro appears to be grown in the adjacent *ahupua`a* of Waihee and Kahakuloa.

Based on observations and the information gathered fro *kūpuna* and knowledgeable individuals/residents, traditional land uses of the project area have been discontinued. 'Ī`ao Stream, or Wailuku River as once called by some of the older area residents, was known as a source for *o`opu* and *opai*, water for *loi*, and swimming/washing. However, none of these activities are currently taking place. While development along the stream's banks has changed accessibility to 'Ī`ao, earlier diversion measures have also brought about significant changes. The latter will be briefly addressed as known impacts to the project area in this report (c.f. the Environmental Assessment being prepared for the current project for a more detailed, in-depth review of diversion-related impacts).

As with traditional uses of the project area, land uses associated with the historic period also no longer take place. Both fishing and recreational uses (swimming/washing) were known to take place during the early to mid-1900s. Farming along the stream banks (raising hogs and cattle) was known up until shortly after the initial diversion measures. (The Duarte family, who live further upstream of the project area, maintained a hog farm until approximately two months ago). Historic uses of the project area, such as washing cars in the stream near Waiehu Beach Road, also appear to have been fairly common until recently. Rose Duey (pers. comm.) recalls that Waiehu Beach Road was at one time a rock and pebble roadway that crossed through 'Ī`ao Stream. In the event the water was too high, cars had to pull over and wait until their vehicles could safely cross the stream (ibid). Often on such occasions, their father would pull over the car/truck so it could be washed in the stream. Several other individuals recall Waiehu Beach Road before it was cemented; many remember driving across or having to wait for the water level in 'Ī`ao to go down. Kanji Wakamatsu, present owner of the Wakamatsu Fish Store in Wailuku, recalls catching *o`opu* and catfish, and picking *hi`iwai*, between Market Street and Waiehu Beach Road (K. Wakamatsu, pers. comm.). He would sell his catch to the Chinese families that lived in a camp near Paukūkalo. "The fish were large size, and the *hi`iwai* were 'big enough to use as whistles" (ibid).

4.2 Cultural Impacts from the Proposed Flood Control Project

The following section summarizes the major issues or cultural impacts identified through the survey questionnaire and interviews; it is presented in both quantitative and qualitative format. First, the issues and/or impacts are addressed in question/answer format; these were not questions asked directly but are the result of people's perceptions of the proposed project. (Many of the people interviewed were not aware of the flood control project until approached for this survey). Second, results of the questionnaire are presented in table format to show a numerical breakdown of the survey population's responses.

4.2.1 Is flooding of 'Ï̀ao Stream a concern (fear) for area residents?

Generally, no. While most area residents have witnessed the 'flash' floods that can occur of 'Ï̀ao Stream, they do not feel further channelization is necessary. This was true of both the relatively new short-term residents, and the long-term, older residents who have witnessed at least one or two large floods. K. Wakamatsu, now 84 years old, recalls a young boy being swept away during the flood in the 1940s. The Cocketts remember a storm in the 1950s when pigs were floating in the stream, and the water level reached their doorstep (at their current home in the floodplain). In this undated photo (Figure 8), Ashdown captured the impact of a major flood/storm on a house in the flood plain area, and the cane haul bridge (possibly the same location as the bridge shown in Figure 2). The photograph notes 'cane'and 'part of Iao Mts.', in the upper left corner.

Several present day residents have become familiar with the 'tell-tale' signs of impending floods. John Duey who lives in the upper portion of 'Ï̀ao Valley, and Emmett Rodrigues who lives in the lower portion of the valley within the project area, know that when gray clouds and heavy rains occur up in the mountains, it is time to watch for the water to come rushing downstream. Some of these individuals have timed the sequence of events (development of clouds, rainfall) in order to prepare for the heavy flow that passes near their residence.

Figure 8. Aftermath of the 1950 Flood, photo taken by Inez Ashdown (Courtesy of Bailey House Museum).

Unlike the upper portions of the valley where flooding can impact homes along the stream banks, in the project area itself, there does not appear to be great concern about flooding. Previous flood control measures have acted to protect the stream banks from overflowing, but it is also a matter of experience. Residences (and residents) in the upper portion of the valley have likely been there for several generations, whereas most of the residences and businesses along the project area portion of ʻĪao Stream have been built within the past three to ten years. The people higher up in the valley have witnessed many more flood related events, whereas, the people in the lower portion have likely been present only since the initial flood control measures were put in place. Many of the present day residents who live off of Eha Street, are new to the area...hence they are not aware of the potential dangers from major floods. Most, however, have witnessed flash floods that periodically occur.

While flooding may not be a major concern, the erosion caused by heavy, rapid moving stream water, is. This is particularly true for the businesses located in the immediate 'erosion path', along Wili Pa Loop (Figure 2). Much of the area adjacent (immediately downstream) to these businesses are somewhat protected by concrete lining along the streambanks. However, there are no protective barriers lining the streambank behind the buildings housing these businesses.

Tables 1 through 6 present the quantitative results of the survey questionnaire. Included in the survey population are individuals with whom interviews were held for the identification of TCPs. A total of thirty two residents/business owners were approached and/or interviewed about the proposed project, including representatives of the four primary businesses within and across Wili Pa Loop (two of which have experienced severe erosion by the present stream flow). And important factor to note is that the majority of the people interviewed/surveyed were not aware of the proposed Flood Control Project. This will be discussed further in the conclusions.

Table 1. Population Surveyed, by Approximate Area of Residence

Participants in the Survey	**Total**
Men	21
Women	11
Total	32
Place of Residence	
Within immediate vicinity of Project Area	21
Wailuku side	15
Pihana side	06
Wailuku (general)	07
Outside of Wailuku *ahupua`a*	04

Table 2. Quantifiable Responses to Survey Questions[1]

	Yes	No	Unable to comment
Do you live near *'Ī`ao* Stream	15	17	
Do you use *'Ī`ao* Stream for recreational and/or subsistence purposes?	02	29	
Have you witnessed any changes to the stream over the years (e.g. stream flow, erosion, floods, etc.)?	11	21	
Are you familiar with the proposed flood control project (and or measures)?	05	27	
Are you familiar with any or all of the alignments (alternatives) proposed?	05[1]	27	
Do you have a preference for any one alterative	07[2]	17	8

[1] All of these individuals had either attended or were aware of the Public Scoping Meeting, or had red newspaper announcements about the proposed project.

[2] Includes individuals to whom the diagrams of the proposed alternatives were shown for the first time.

Table 3. Uses of *'Ïao* Stream in the Vicinity of the Project Area[1]

1.	Recreational (bicycling, dirt biking, jogging, swimming, boogie boarding)
2.	Farming (presently done only in the flood plain)
3.	Fishing and food gathering (catching/gathering *O`opu, opai,* or *hi`iwai* in the stream beds)

[1] Activities identified as either known about or personally performed, in order of occurrence.

Table 4. Knowledge about Traditional Uses and/or Sites along *'Ïao* Stream[1]

	Yes	No
Do you know of any traditional uses of *'Ïao* Stream?	07	25
Are you familiar with any traditional sites/features along the stream and/or within the flood plains area?	02	30
Would the proposed flood control affect/impact any of these traditional sites or features	0	

[1] The sites known to most people are *Haleki`i-Pihana Heiau*, the *Pu`u One Sand Dunes,* and the spring located behind the Sevilla property; all of these are outside of the project area.

4.2.2 *Are further flood control measures perceived as being needed?*

While the survey questionnaire did not include this question, based on the responses and inquiries made by the interviewees, the issue of whether or not further flood control measures are necessary became important. This question was formulated based on the lack of response or absence of knowledge about the proposed project. Table 5 summarizes the general response that was received.

Table 5. How would you Characterize the Effect(s) of Further Flood Control Measures for 'Ïao Stream?

Necessary (Positive)	09
Not necessary (Negative)	21[1]
No opinion/unable to judge	02

[1] five individuals saw negative effects as a result of the "cumulative" impacts of stream channelization and/or diversion techniques.

An overwhelming number of the people interviewed saw no need for further stream channelization and/or alignment. Part of this judgment appears to be based on past and existing experiences and observations of 'Ïao Stream; there is also great support for wanting the stream to be reverted back to its more original form. The latter includes many newcomers to the area, several of whom enjoy and/or chose to live along the stream. Perhaps not so surprisingly, it also includes a significant number of the *kūpuna* and long term residents.

Table 6. Suggestions/Observations on how the Corps of Engineers can help the Community better Understand the Flood Control Project

		Frequency
1.	Provide further information about the proposed project[1]	16
2.	Hold [another] public meeting where the alternatives can be reviewed	07
3.	Help stop the erosion	11
4.	Identify who will benefit for these measures	04
5.	Restore the stream by placing back the animals that once lived in it	14

[1] seven individuals acknowledged that they were aware of the Public Scoping Meeting but just were not able to or did not attend.

The following is a summary of the potential negative and positive cultural impacts identified:

4.3 Summary and Recommendations: Cultural [impact] Mitigations and Enhancements

Potential Long-term "Direct" Cultural Impacts (Negative) from the Proposed 'Ïao Flood Control Project

1. Continued reduction or additional decrease in water flow. Most people would like to see a return of some regular flow of water. Further flood measures are seen as possibly further reducing water flow.
2. Additional concrete/cementing within streambed will add aggravate existing hazards, e.g. further compounding erosion action along stream banks. At present, physical impacts of erosion are greatest along the southeastern portion of the project area. (Many doubt the potential positive impacts from new flood control measures based on these impacts that are likely from previous channelization measures).
3. Further channelization measures will further discourage the return of original stream biota (e.g. *o`opu, opai* and *hi`iwai*). For people who are familiar with the biota of 'Ï`ao Stream, or know of the various animals that are found in fresh water, there is a desire to see these return to the stream. This is part of the greater desire to help return the stream to its earlier, pre-channelization, stage. There are also a few people who would like to enhance the stream by [re]introducing some of these species (some of this has already been done by the Hawaii Division of Aquatic Resources).

Potential Short-term "Indirect" Cultural Impacts (Negative) from the Proposed 'Ī`ao Flood Control Project

1. Inconveniences to area residents as a result of construction activities in the streambed, e.g. re-directing of traffic, dust and noise.
2. Restricted access to the maintenance road and stream for walking, biking and other recreational uses.

No Cultural Impacts (Positive) from the Proposed 'Ī`ao Flood Control Project

1. Threat of potential floods will be further removed.
2. Recreational features can be included as part of the flood control measures, e.g. walkways and safer guidelines for kids whom swim/bike within and along the streambed
3. Aesthetic value of the stream will increase with safer and more pleasant surroundings.
4. Measures can include improvements to existing water flow patterns, thereby allowing some of the original stream fauna to return. (While there isn't a direct desire to fish/gather in the stream, there is a strong desire to have it return to a more natural, biologically thriving system).

No Cultural Impacts to known Traditional Cultural Properties in the Vicinity of the Proposed 'Ī`ao Flood Control Project Area

No immediate/direct changes are foreseen to known Traditional Cultural Properties within the vicinity of the project area as a result of the proposed project. The only TCP that lies immediately along the banks of the 'Ī`ao Stream is the Haleki`i-Pihana Heiau State Monument. This site is situated well above the stream bank. However, if flood control measures lead to severe erosion along the stream bank that lies directly below the monument, the land area on which the *heiau* sits may be compromised. The potential impacts to the heiau should be monitored on a continuous basis. Other features and sites such as Mahalani Cemetery and the *Pu`u One* Sand Dunes are not likely to be affected by future flood control measures.

4.3.1 Recommendations

Based on requests made and observations, the following are recommended:

- Repair cement cracking along existing wall (off `Iao Place). At least two residents pointed to these cracks that lie behind their property. Both have concerns about the further widening of the cracks and the potential for water-flow to be compromised during heavy flows (e.g. flash floods).
- Help contain (repair) the eroding of the streambank along Wili Pa Loop.

- Incorporate recreational features and/or visual enhancement to the stream's levee. This can be done with the community's input and assistance.
- Schedule another meeting prior to implementation of any measures. While this may not dramatically increase the attendance of area residents, it allows individuals a second opportunity to participate in the 'decision-making' process.
- Clarify which agency is responsible for maintaining the stream (clearing of debris, etc.), and general contact information for area residents.

4.3.2 General Concerns/Issues

It would appear that most people who live and work along 'Ï`ao Stream have become familiar with the stream's somewhat 'predictable' nature as it concerns the occasional flash floods. As discussed earlier, a few people have become rather savvy to the expectations resulting from heavy rain pours can lead to.

No one interviewed currently uses the streambed for recreational activities; at least two residents use the access/levee road for leisurely walks but this is on a limited basis. The majority of individuals who seem to use the streambed are either children or from homes located away from the levee road. Some people expressed concerns over who will maintain/upkeep the stream in the event there is debris build-up. There isn't a clear knowledge about who is responsible; the question of whether it's the County, the State or the Corps of Engineers often arose. Most are concerned about erosion and/or feel sympathy with the owners of the land being impacted, several see it as the owner's responsibility for purchasing lands that had the potential to erode. Several have questioned diversion of water by the large companies and the county, and water rights access. There is a fair amount of distrust of the companies requesting water diversions (e.g. Wailuku Sugar Company), and their future intentions (e.g. directing water towards Kihei/Makena side, for further housing development, etc.).

In general, flood control does not seem to be a concern/issue, including for those residents and businesses living along the access/levee road. The concern over erosion is far greater, particularly for the two businesses directly affected. The community appears to be more concerned (or desires) about the social/recreational values of the stream. If control measures are enacted, there would be a greater sense of accomplishment (and cooperation) if it was done in consideration of the community's present needs and desires. This opinion was fairly common, from both the newcomers and the individuals who have experienced flooding, either at 'Ï`ao or elsewhere.

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APPENDIX A

GUIDELINES FOR ASSESSING CULTURAL IMPACTS Adopted by the Environmental Council, State of Hawaii November 19, 1997

I.

INTRODUCTION

It is the policy of the State of Hawaii under Chapter 343, HRS, to alert decision makers, through the environmental assessment process, about significant environmental effects which may result from the implementation of certain actions. An environmental assessment of cultural impacts gathers information about cultural practices and cultural features that may be affected by actions subject to Chapter 343, and promotes responsible decision making. Articles IX and XII of the State Constitution, other state laws, and the courts of the state require government agencies to promote and preserve cultural beliefs, practices, and resources of native Hawaiians and other ethnic groups. Chapter 343 also requires environmental assessment of cultural resources, in determining the significance of a proposed project.

The Environmental Council encourages preparers of environmental assessments and environmental impact statements to analyze the impact of a proposed action on cultural practices and features associated with the project area. The Council provides the following methodology and content protocol as guidance for any assessment of a project that may significantly affect cultural resources.

II.

CULTURAL IMPACT ASSESSMENT METHODOLOGY

Cultural impacts differ from other types of impacts assessed in environmental assessments or environmental impact statements. A cultural impact assessment includes information relating to the practices and beliefs of a particular cultural or ethnic group or groups.

Such information may be obtained through scoping, community meetings, ethnographic interviews and oral histories. Information provided by knowledgeable informants, including traditional cultural practitioners, can be applied to the analysis of cultural impacts in conjunction with information concerning cultural practices and features obtained through consultation and from documentary research.

In scoping the cultural portion of an environmental assessment, the geographical extent of the inquiry should, in most instances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in the assessment. Thus, for example, a proposed action that may not physically alter gathering practices, but may affect access to gathering areas would be included in the assessment. An ahupua'a is usually the appropriate geographical unit to begin an assessment of cultural impacts of a proposed action, particularly if it includes all of the types of cultural practices associated with the project area. In some cases, cultural practices are likely to extend beyond the ahupua'a and the geographical extent of the study area should take into account those cultural practices.

The historical period studied in a cultural impact assessment should commence with the initial presence in the area of the particular group whose cultural practices and features are being assessed. 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, including submerged cultural resources, which support such cultural practices and beliefs.

The Environmental Council recommends that preparers of assessments analyzing cultural impacts adopt the following protocol:

(1) identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupua 'a;

(2) identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;

(3) receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;

(4) conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;

(5) identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and

(6) assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

Interviews and oral histories with knowledgeable individuals may be recorded, if consent is given, and field visits by preparers accompanied by informants are encouraged. Persons interviewed should be afforded an opportunity to review the record of the interview, and consent to publish the record should be obtained whenever possible. For example, the precise location of human burials are likely to be withheld from a cultural impact assessment, but it is important that the document identify the impact a project would have on the burials. At times an informant may provide information only on the condition that it remain in confidence. The wishes of the informant should be respected.

Primary source materials reviewed and analyzed may include, as appropriate: Mahele, land court, census and tax records, including testimonies; vital statistics records; family histories and genealogies; previously published or recorded ethnographic interviews and oral histories; community studies, old maps and photographs; and other archival documents, including correspondence, newspaper or almanac articles, and visitor journals. Secondary source materials such as historical, sociological, and anthropological texts, manuscripts, and similar materials, published and unpublished, should also be consulted. Other materials which should be examined include prior land use proposals, decisions, and rulings which pertain to the study area.

III. CULTURAL IMP ACT ASSESSMENT CONTENTS

In addition to the content requirements for environmental assessments and environmental impact statements, which are set out in HAR §§ 11-200-10 and 16 through 18, the portion of the assessment concerning cultural impacts should address, but not necessarily be limited to, the following matters:

1. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.

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. Ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.

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 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. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.

6. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.

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.

11. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

The inclusion of this information will help make environmental assessments and environmental impact statements complete and meet the requirements of Chapter 343, HRS. If you have any questions, please call us at 586-4185.

APPENDIX B

Transcripts of Oral Interviews completed for
TCP and CIA Study of `Iao Flood Control Project

(to be inserted)

APPENDIX C

Questionnaire for Oral History Studies for the Determination of Traditional Cultural Properties and Cultural Impact Assessment for the `Iao Flood Control Project, Maui Island, Hawaii

Name: ______________________ **Contact #** (optional): ______________________

Place of Residence: ______________________

1. Do you live near `Iao Stream? Yes_______ No_______
   Adjacent to levee _______ Nearby _______

2. How much time have your spent around the stream area?______________________

3. Do you use `Iao Stream for recreational and/or subsistence purposes?
   If yes, describe activity______________________

4. Do you know of any traditional uses of `Iao Stream?______________________

   a.. Are you familiar with any of the traditional sites/features along the stream and/or within the flood plains area?
   If yes, list here (provide complete description)
   ____
   ____

5. Have you witnessed any changes to the stream over the years (e.g., stream flow, erosion, floods, etc.)?
   If yes, describe the change______________________
   ____

6. Do you feel flood control efforts are necessary for `Iao Stream? Yes_____ No______
   Have you observed any of the activities:______________________

7. Are you familiar with the proposal to repair erosion along the stream? Yes_____ No_____
   If yes, is there one particular proposed alignment you favor others? (List by #)
   Why______________________
   Which other alternative alignment would want to see?______________________

   a. Will one or any of these alternatives impact your use of the stream?
   If YES, then how?______________________

8. Do you think that any of the proposed flood control measures will affect traditional sites/features along the stream?

8. Do you think that any of the proposed flood control measures will affect traditional sites/features along the stream?
   If YES, then how?____

9. In general, how would you characterize the effect(s) of the proposed flood control measures for `Iao Stream?

   a. Positive: ______________________________
   a. Negative:______________________________
   b. None foreseen:__________________________
   c. Unable to form opinion:__________________

10. Do you have any concerns/issues about the proposed flood control measures?
   ____
   ____

1. Do you have any suggestions/observations of what the Corps of Engineers can do to help the community better understand their proposal(s) for `Iao Stream?
   ____
   ____

2. Is there anything else you would like to add or say?
   ____
   ____

APPENDIX D

List of Individuals Interviewed and/or Contacted for Oral History Studies for the Identification of TCPs in the `Iao Flood Control Project, Maui Island, Hawaii

3. Charles Keau
4. Sam Ka`a`ai
5. Ned Purdy, Division of Forestry
6. Skippy Hau, area resident and employee of Department of Land and Natural Resources
7. John Duey
8. Rose Duey
9. Bob Hobdy, Division of Forestry
10. Ed Lindsey
11. Duke Sevilla, area resident
12. Kaimu Willstein, Office of Hawaiian Affairs
13. Melissa Kykendall, State Historic Preservation Office, Maui
14. Leona Ryder, `Iao Valley School
15. Manual and Margaret Duarte
16. Manual Duarte Jr.
17. Joe Duarte (Manual's nephew)
18. Charlie Duarte
19. Takamiya Family
20. Kamita family
21. Honda family
22. Kanji Wakamatsu (Wakamatsu Fish Market)
23. Gordon Cockett
24. Winifred Cockett
25. Tom Cerizo
26. Alan K. Bernaldo
27. Ken and Beverly Kurokawa
28. Greg Apa
29. Emmett Rodrigues

Appendix L:

EDR Radius Map

Iao Stream
Iao Stream
Wailuku, HI 96793

Inquiry Number: 3914751.2s
April 16, 2014

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

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SECTION | **PAGE**

GEOCHECK ADDENDUM

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

IAO STREAM
WAILUKU, HI 96793

COORDINATES

Latitude (North):	20.8962000 - 20˚ 53' 46.32''
Longitude (West):	156.4993000 - 156˚ 29' 57.48''
Universal Tranverse Mercator:	Zone 4
UTM X (Meters):	760140.1
UTM Y (Meters):	2312549.0
Elevation:	161 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	20156-H4 KAHAKULOA, HI
Most Recent Revision:	Not reported
West Map:	20156-H5 NAPILI, HI
Most Recent Revision:	Not reported

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL - National Priority List
Proposed NPL - - - - - - - - - - - - - - - Proposed National Priority List Sites

EXECUTIVE SUMMARY

NPL LIENS - - - - - - - - - - Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL - - - - - - - - - National Priority List Deletions

Federal CERCLIS list

CERCLIS - - - - - - - - - - Comprehensive Environmental Response, Compensation, and Liability Information System
FEDERAL FACILITY - - - - - Federal Facility Site Information listing

Federal RCRA CORRACTS facilities list

CORRACTS - - - - - - - - - Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF - - - - - - - - - RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG - - - - - - - - - RCRA - Large Quantity Generators

Federal institutional controls / engineering controls registries

US ENG CONTROLS - - - - - Engineering Controls Sites List
US INST CONTROL - - - - - Sites with Institutional Controls
LUCIS - - - - - - - - - - - - Land Use Control Information System

Federal ERNS list

ERNS - - - - - - - - - - - - Emergency Response Notification System

State and tribal landfill and/or solid waste disposal site lists

SWF/LF - - - - - - - - - - - Permitted Landfills in the State of Hawaii

State and tribal leaking storage tank lists

INDIAN LUST - - - - - - - - Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

UST - - - - - - - - - - - - - Underground Storage Tank Database
INDIAN UST - - - - - - - - - Underground Storage Tanks on Indian Land
FEMA UST - - - - - - - - - - Underground Storage Tank Listing

State and tribal institutional control / engineering control registries

ENG CONTROLS - - - - - - - Engineering Control Sites

State and tribal voluntary cleanup sites

VCP - - - - - - - - - - - - - Voluntary Response Program Sites
INDIAN VCP - - - - - - - - - Voluntary Cleanup Priority Listing

EXECUTIVE SUMMARY

State and tribal Brownfields sites

BROWNFIELDS .... Brownfields Sites

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS .... A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9 .... Torres Martinez Reservation Illegal Dump Site Locations
ODI .... Open Dump Inventory
INDIAN ODI .... Report on the Status of Open Dumps on Indian Lands

Local Lists of Hazardous waste / Contaminated Sites

US CDL .... Clandestine Drug Labs
CDL .... Clandestine Drug Lab Listing
US HIST CDL .... National Clandestine Laboratory Register

Local Land Records

LIENS 2 .... CERCLA Lien Information

Records of Emergency Release Reports

HMIRS .... Hazardous Materials Information Reporting System
SPILLS .... Release Notifications
SPILLS 90 .... SPILLS 90 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR .... RCRA - Non Generators
DOT OPS .... Incident and Accident Data
DOD .... Department of Defense Sites
FUDS .... Formerly Used Defense Sites
CONSENT .... Superfund (CERCLA) Consent Decrees
ROD .... Records Of Decision
UMTRA .... Uranium Mill Tailings Sites
US MINES .... Mines Master Index File
TRIS .... Toxic Chemical Release Inventory System
TSCA .... Toxic Substances Control Act
FTTS .... FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS .... FIFRA/TSCA Tracking System Administrative Case Listing
SSTS .... Section 7 Tracking Systems
ICIS .... Integrated Compliance Information System
PADS .... PCB Activity Database System
MLTS .... Material Licensing Tracking System
RADINFO .... Radiation Information Database
FINDS .... Facility Index System/Facility Registry System

EXECUTIVE SUMMARY

RAATS	RCRA Administrative Action Tracking System
RMP	Risk Management Plans
UIC	Underground Injection Wells Listing
DRYCLEANERS	Permitted Drycleaner Facility Listing
AIRS	List of Permitted Facilities
INDIAN RESERV	Indian Reservations
SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing
LEAD SMELTERS	Lead Smelter Sites
2020 COR ACTION	2020 Corrective Action Program List
US AIRS	Aerometric Information Retrieval System Facility Subsystem
PRP	Potentially Responsible Parties
Financial Assurance	Financial Assurance Information Listing
US FIN ASSUR	Financial Assurance Information
PCB TRANSFORMER	PCB Transformer Registration Database
COAL ASH EPA	Coal Combustion Residues Surface Impoundments List
COAL ASH DOE	Steam-Electric Plant Operation Data
EPA WATCH LIST	EPA WATCH LIST

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP	EDR Proprietary Manufactured Gas Plants

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LF	Recovered Government Archive Solid Waste Facilities List
RGA HWS	Recovered Government Archive State Hazardous Waste Facilities List
RGA LUST	Recovered Government Archive Leaking Underground Storage Tank

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

Federal CERCLIS NFRAP site List

CERC-NFRAP: Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

A review of the CERC-NFRAP list, as provided by EDR, and dated 10/25/2013 has revealed that there is 1 CERC-NFRAP site within approximately 0.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
KUKUI GROVE HOLDER	*46 TINGS DR*	*SSE 1/4 - 1/2 (0.476 mi.)*	*C14*	*21*

Federal RCRA generators list

RCRA-SQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

A review of the RCRA-SQG list, as provided by EDR, and dated 03/11/2014 has revealed that there is 1 RCRA-SQG site within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
MAUI S QUALITY DRY CLEANING	*210 IMI KALA ST*	*S 1/8 - 1/4 (0.213 mi.)*	*A4*	*10*

RCRA-CESQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

A review of the RCRA-CESQG list, as provided by EDR, and dated 03/11/2014 has revealed that there is 1 RCRA-CESQG site within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
BROWNING FERRIS IND	*280 IMI KALA ST*	*W 0 - 1/8 (0.101 mi.)*	*3*	*9*

State- and tribal - equivalent CERCLIS

SHWS: The State Hazardous Waste Sites records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. The data come from the Department of Health.

A review of the SHWS list, as provided by EDR, and dated 01/04/2014 has revealed that there are 12

EXECUTIVE SUMMARY

SHWS sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
WAILUKU SUGAR COMPANY PESTICID	*250 IMI KALA ST*	*SW 0 - 1/8 (0.075 mi.)*	*1*	*7*
GOMES CONSTRUCTION & REPAIRS I	*1790 MILL ST*	*SSW 1/4 - 1/2 (0.297 mi.)*	*8*	*13*
MECO TRANSFORMER 3358	*1540 E MAIN ST*	*SE 1/4 - 1/2 (0.362 mi.)*	*B10*	*17*
WAILUKU SUGAR AGRICULTURAL DEP	*2015 HOLOWAI PL*	*SW 1/4 - 1/2 (0.449 mi.)*	*12*	*19*
MAUI SANDTORCHES	*46 TING DR*	*SSE 1/4 - 1/2 (0.476 mi.)*	*C13*	*20*
REX TIRE & SUPPLY, DIESEL	*1728 KAAHUMANU AVE*	*SSE 1/2 - 1 (0.572 mi.)*	*15*	*23*
2102 VINEYARD ST.	*2102 VINEYARD ST*	*SSW 1/2 - 1 (0.572 mi.)*	*16*	*24*
ROBERT JOSLIN	*2026 MAIN ST*	*SSW 1/2 - 1 (0.610 mi.)*	*17*	*25*
MAIN STREET PROMENADE PROJECT	*2058 MAIN ST*	*SSW 1/2 - 1 (0.629 mi.)*	*D18*	*30*
ALVIN'S UPTOWN CHEVRON SERVICE	*2085 WEST MAIN ST*	*SSW 1/2 - 1 (0.648 mi.)*	*D19*	*31*
ORGANIZATIONAL MAINTENANCE SHO	*260 S MARKET ST*	*S 1/2 - 1 (0.799 mi.)*	*20*	*32*

Lower Elevation	Address	Direction / Distance	Map ID	Page
WAIALE ASH PILE	*MAHALANI ST*	*ESE 1/2 - 1 (0.958 mi.)*	*21*	*33*

State and tribal leaking storage tank lists

LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the Department of Health's Active Leaking Underground Storage Tank Log Listing.

A review of the LUST list, as provided by EDR, and dated 12/04/2013 has revealed that there are 2 LUST sites within approximately 0.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
HALE MAKUA NURSING HOME - WAIL Facility Status: Site Cleanup Completed (NFA)	*1540 LOWER MAIN ST*	*SE 1/4 - 1/2 (0.362 mi.)*	*B9*	*16*
OGAWA SERVICE STATION Facility Status: Site Cleanup Completed (NFA)	*327 N MARKET ST*	*SW 1/4 - 1/2 (0.415 mi.)*	*11*	*18*

State and tribal institutional control / engineering control registries

Voluntary Remediation Program and Brownfields sites with institutional controls in place.

A review of the INST CONTROL list, as provided by EDR, and dated 01/04/2014 has revealed that there is 1 INST CONTROL site within approximately 0.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
WAILUKU SUGAR AGRICULTURAL DEP	*2015 HOLOWAI PL*	*SW 1/4 - 1/2 (0.449 mi.)*	*12*	*19*

EXECUTIVE SUMMARY

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR US Hist Auto Stat: EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

A review of the EDR US Hist Auto Stat list, as provided by EDR, has revealed that there are 3 EDR US Hist Auto Stat sites within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
Not reported	395 NEKI PL	WNW 0 - 1/8 (0.101 mi.)	2	8
Not reported	1720 WILI PA LOOP	S 1/8 - 1/4 (0.231 mi.)	6	12
Not reported	1726 MILL ST	SSE 1/8 - 1/4 (0.237 mi.)	7	13

EDR US Hist Cleaners: EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

A review of the EDR US Hist Cleaners list, as provided by EDR, has revealed that there is 1 EDR US Hist Cleaners site within approximately 0.25 miles of the target property.

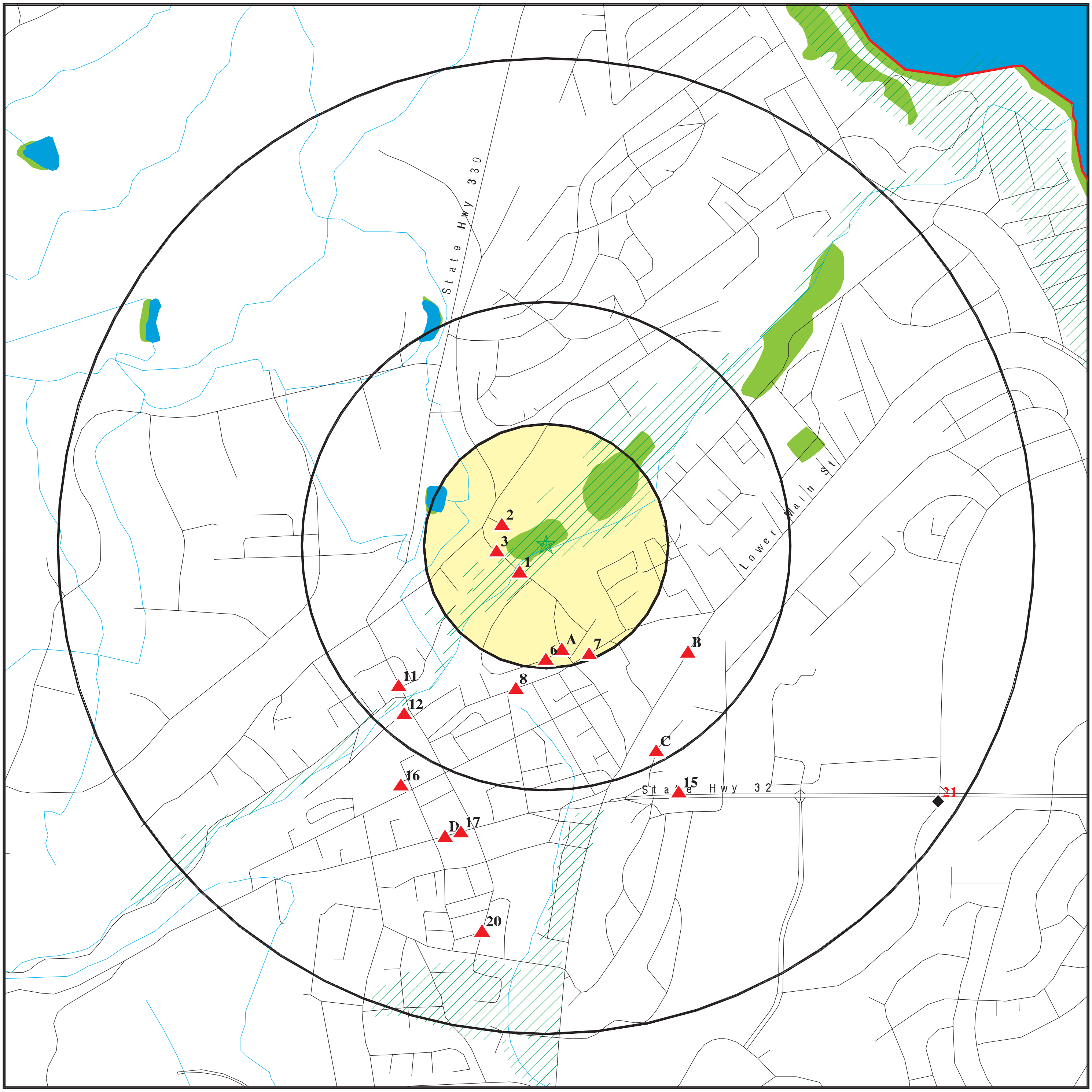
Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
Not reported	210 IMI KALA ST	S 1/8 - 1/4 (0.213 mi.)	A5	12

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 20 records.

Site Name	Database(s)
LOT F4 KANE STREET	SHWS, ENG CONTROLS, INST CONTROL
KALAMAULA LANDFILL	SHWS, ENG CONTROLS
MECO STATION-CLASS TRANSFORMER NO.	SHWS, SPILLS
MECO PAD-MOUNT TRANSFORMER NO. 137	SHWS
VECTOR CONTROL BRANCH, MAUI	SHWS, RGA HWS
HOBRON AVE AREA (KAHULUI)	SHWS, RGA HWS
FONG CONSTRUCTION	SHWS, RGA HWS
A&B DUMP SITE	SHWS, RGA HWS
WAIKAPU DUMP-MAUI COUNTY DUMP	SHWS, RGA HWS
PAIA SUGAR MILL	SHWS, RGA HWS
MECO POLE-MOUNT TRANSFORMER NO. 88	SHWS
Y HATA- MAUI	SHWS, SPILLS
WAIKAPU DUMP-MAUI COUNTY DUMP	CERC-NFRAP
MAUI BLOCKS	UST
VACANT LAND TMK NO (2) 3-8-7:101	RCRA NonGen / NLR
IAO VALLEY STATE PARK - LCC	FINDS
WAILUKU AG DIVERSION OF IAO STREAM	FINDS
IAO MIDDLE SCHOOL	FINDS
IAO STREAM	FINDS
WAIEHU BEACH ROAD, REHABILITATION	FINDS

OVERVIEW MAP - 3914751.2s



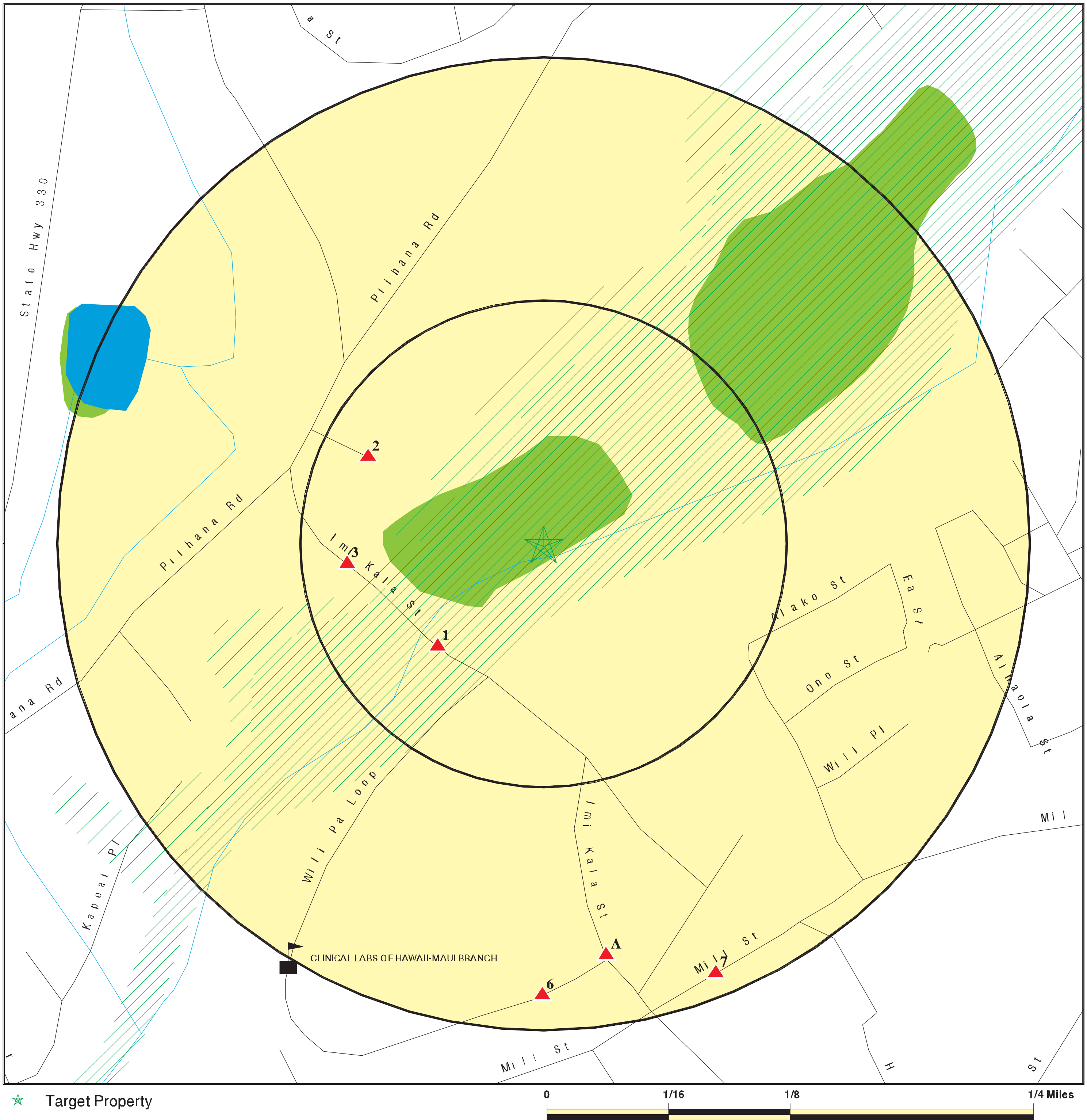
0 1/4 1/2 1 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	Iao Stream	CLIENT:	Environet
ADDRESS:	Iao Stream	CONTACT:	Taylor Chock
	Wailuku HI 96793	INQUIRY #:	3914751.2s
LAT/LONG:	20.8962 / 156.4993	DATE:	April 16, 2014 7:29 pm

DETAIL MAP - 3914751.2s



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	Iao Stream	CLIENT:	Environet
ADDRESS:	Iao Stream	CONTACT:	Taylor Chock
	Wailuku HI 96793	INQUIRY #:	3914751.2s
LAT/LONG:	20.8962 / 156.4993	DATE:	April 16, 2014 7:29 pm

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	TP		NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
CERCLIS	0.500		0	0	0	NR	NR	0
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP	0.500		0	0	1	NR	NR	1
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	1	NR	NR	NR	1
RCRA-CESQG	0.250		1	0	NR	NR	NR	1
Federal institutional controls / engineering controls registries								
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
LUCIS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	1.000		1	0	4	7	NR	12
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	2	NR	NR	2
INDIAN LUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
UST	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
INDIAN UST	0.250		0	0	NR	NR	NR	0
FEMA UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
ENG CONTROLS	0.500		0	0	0	NR	NR	0
INST CONTROL	0.500		0	0	1	NR	NR	1
State and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0

ADDITIONAL ENVIRONMENTAL RECORDS

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL	TP		NR	NR	NR	NR	NR	0
CDL	TP		NR	NR	NR	NR	NR	0
US HIST CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
SPILLS	TP		NR	NR	NR	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
DOD	1.000		0	0	0	0	NR	0
FUDS	1.000		0	0	0	0	NR	0
CONSENT	1.000		0	0	0	0	NR	0
ROD	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
TSCA	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
AIRS	TP		NR	NR	NR	NR	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR US Hist Auto Stat	0.250		1	2	NR	NR	NR	3
EDR US Hist Cleaners	0.250		0	1	NR	NR	NR	1
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA LF	TP		NR	NR	NR	NR	NR	0
RGA HWS	TP		NR	NR	NR	NR	NR	0
RGA LUST	TP		NR	NR	NR	NR	NR	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

1 **SW** **< 1/8** **0.075 mi.** **396 ft.**	**WAILUKU SUGAR COMPANY PESTICIDE MIXING AREA** **250 IMI KALA ST** **WAILUKU, HI 96793**	**SHWS** **RGA HWS**	**S110061652** **N/A**

Relative: **Higher**

Actual: **164 ft.**

SHWS:

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Maui Disposal
HID Number:	Not reported
Facility Registry Identifier:	Not reported
Lead Agency:	HEER
Program:	State
Project Manager:	Cal Miyahara
Hazard Priority:	NFA
Potential Hazards And Controls:	No Hazard
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Maui Disposal
HID Number:	Not reported
Facility Registry Identifier:	Not reported
Lead Agency:	HEER
Progran Name:	State
Potential Hazard And Controls:	No Hazard
Priority:	NFA
Assessment:	Response Necessary
Response:	Response Complete
Nature of Contamination:	Found: TPH-o exceeds residential use levels in surface soils.
Nature of Residual Contamination:	Two of four DUs had minimal concentrations (563 and 767 mg/kg) of Petroleum Hydrocarbon as motor oil exceeding residential use EALs of 500 mg/kg for gross contamination. However, there were no signs of soil staining or petroleum odor.
Use Restrictions:	No Hazard Present For Unrestricted Residential Use
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	No Further Action Letter - Unrestricted Residential Use
Document Date:	07/21/2011
Document Number:	2011-412-CMM
Document Subject:	Removal Action Report, Maui Disposal - Wailuku Post Office Former Parking Lot, 250 Imi Kala St, Wail
Project Manager:	Cal Miyahara
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Wailuku Sugar Company Pesticide Mixing Area
HID Number:	Not reported
Facility Registry Identifier:	Not reported
Lead Agency:	HEER
Program:	Site Discovery
Project Manager:	Cal Miyahara
Hazard Priority:	NFA
Potential Hazards And Controls:	No Hazard

WAILUKU SUGAR COMPANY PESTICIDE MIXING AREA (Continued) **S110061652**

Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Wailuku Sugar Company Pesticide Mixing Area
HID Number:	Not reported
Facility Registry Identifier:	Not reported
Lead Agency:	HEER
Progran Name:	Site Discovery
Potential Hazard And Controls:	No Hazard
Priority:	NFA
Assessment:	Response Necessary
Response:	Response Complete
Nature of Contamination:	Presumed: possible arsenic, organochlorine release in vicinity of former PMA
Nature of Residual Contamination:	Soils do not pose a threat to human health or the environment based on three factors: the low concentrations relative to our unrestricted action levels, the small area impacted and the presence of clean soils above and below the impacted soils.
Use Restrictions:	No Hazard Present For Unrestricted Residential Use
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	No Further Action Letter - Unrestricted Residential Use
Document Date:	03/06/2013
Document Number:	2013-128-CMM
Document Subject:	No Further Action Determination for Pesticides and Metals Contamination at the Wailuku Sugar Company
Project Manager:	Cal Miyahara
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

RGA HWS:

2012 MAUI DISPOSAL 250 IMI KALA ST
2012 WAILUKU SUGAR COMPANY PESTICIDE MIXING AREA 250 IMI KALA ST
2009 MAUI DISPOSAL 250 IMI KALA ST

2
WNW
< 1/8
0.101 mi.
534 ft.

395 NEKI PL
WAILUKU, HI 96793

EDR US Hist Auto Stat **1015465504** **N/A**

Relative: **Higher**

Actual: **183 ft.**

EDR Historical Auto Stations:

Name:	BIG AL S AUTO SERVICE
Year:	2001
Address:	395 NEKI PL

3 **West** **< 1/8** **0.101 mi.** **535 ft.**	**BROWNING FERRIS IND** **280 IMI KALA ST** **WAILUKU, HI 96793**	**RCRA-CESQG** **FINDS**	**1004688734** **HI0000146969**

Relative:
Higher

Actual:
174 ft.

RCRA-CESQG:

Date form received by agency:	02/11/1994
Facility name:	BROWNING FERRIS IND
Facility address:	280 IMI KALA ST WAILUKU, HI 96793
EPA ID:	HI0000146969
Mailing address:	IMI KALA ST WAILUKU, HI 96793
Contact:	KIRK DUNCAN
Contact address:	280 IMI KALA ST WAILUKU, HI 96793
Contact country:	US
Contact telephone:	(808) 242-7999
Contact email:	Not reported
EPA Region:	09
Classification:	Conditionally Exempt Small Quantity Generator
Description:	Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

Owner/Operator Summary:

Owner/operator name:	BROWNING FERRIS IND OF HAWAII INC
Owner/operator address:	207 PUUHALE RD HONOLULU, HI 96819
Owner/operator country:	Not reported
Owner/operator telephone:	(808) 833-9969
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No

BROWNING FERRIS IND (Continued) **1004688734**

Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Violation Status: No violations found

FINDS:

Registry ID: 110005721889

Environmental Interest/Information System

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

STATE MASTER

A4
South
1/8-1/4
0.213 mi.
1123 ft.

MAUI S QUALITY DRY CLEANING
210 IMI KALA ST
WAILUKU, HI

Site 1 of 2 in cluster A

RCRA-SQG **1000860456**
FINDS **HI0000076869**

Relative:
Higher

Actual:
193 ft.

RCRA-SQG:

Date form received by agency:	12/06/1993
Facility name:	MAUI S QUALITY DRY CLEANING
Facility address:	210 IMI KALA ST WAILUKU, HI 96793
EPA ID:	HI0000076869
Mailing address:	IMI KALA ST WAILUKU, HI 96793
Contact:	JAMIE LANIAS
Contact address:	210 IMI KALA ST WAILUKU, HI 96793
Contact country:	US
Contact telephone:	(808) 244-1945
Contact email:	Not reported
EPA Region:	09
Land type:	Private
Classification:	Small Small Quantity Generator
Description:	Handler: generates more than 100 and less than 1000 kg of hazardous waste during any calendar month and accumulates less than 6000 kg of hazardous waste at any time; or generates 100 kg or less of hazardous waste during any calendar month, and accumulates more than 1000 kg of hazardous waste at any time

Owner/Operator Summary:

Owner/operator name:	LLOYD EUGENE WIENS
Owner/operator address:	41 KUPUNA ST KIHEI, HI 96753
Owner/operator country:	Not reported

MAUI S QUALITY DRY CLEANING (Continued) **1000860456**

Owner/operator telephone:	(808) 879-3603
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Violation Status: No violations found

Evaluation Action Summary:

Evaluation date:	01/23/2007
Evaluation:	COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation:	Not reported
Date achieved compliance:	Not reported
Evaluation lead agency:	State
Evaluation date:	12/18/2003
Evaluation:	FOLLOW-UP INSPECTION
Area of violation:	Not reported
Date achieved compliance:	Not reported
Evaluation lead agency:	State

FINDS:

Registry ID: 110005721781

Environmental Interest/Information System

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

STATE MASTER

A5 **EDR US Hist Cleaners** **1015016621**
South **210 IMI KALA ST** **N/A**
1/8-1/4 **WAILUKU, HI 96793**
0.213 mi.
1123 ft. **Site 2 of 2 in cluster A**

Relative: Higher

Actual: 193 ft.

EDR Historical Cleaners:

Name:	MAUIS QUALITY DRY CLEANING & LAUNDRY
Year:	1999
Address:	210 IMI KALA ST
Name:	MAUIS QLTY DRY CLNNG & LNDRY
Year:	2001
Address:	210 IMI KALA ST
Name:	MAUIS QUALITY DRY CLEANING
Year:	2001
Address:	210 IMI KALA ST
Name:	MAUIS QLTY DRY CLNNG & LNDRY
Year:	2002
Address:	210 IMI KALA ST
Name:	MAUIS QLTY DRY CLNNG & LNDRY
Year:	2003
Address:	210 IMI KALA ST
Name:	MAUIS QLTY DRY CLNNG & LNDRY
Year:	2004
Address:	210 IMI KALA ST

---

6 **EDR US Hist Auto Stat** **1015269450**
South **1720 WILI PA LOOP** **N/A**
1/8-1/4 **WAILUKU, HI 96793**
0.231 mi.
1219 ft.

Relative: Higher

Actual: 197 ft.

EDR Historical Auto Stations:

Name:	AUTO TECH
Year:	2007
Address:	1720 WILI PA LOOP
Name:	AUTO TECH
Year:	2009
Address:	1720 WILI PA LOOP
Name:	AUTOTECH MAUI INC
Year:	2010
Address:	1720 WILI PA LOOP
Name:	AUTOTECH MAUI INC
Year:	2011
Address:	1720 WILI PA LOOP
Name:	AUTOTECH MAUI INC
Year:	2012
Address:	1720 WILI PA LOOP

7
SSE **1726 MILL ST**
1/8-1/4 **WAILUKU, HI 96793**
0.237 mi.
1250 ft.

EDR US Hist Auto Stat **1015270281**
N/A

Relative:
Higher

Actual:
196 ft.

EDR Historical Auto Stations:

Name:	MAUI AUTOMOTIVE CTR
Year:	2001
Address:	1726 MILL ST
Name:	MAUI AUTOMOTIVE CTR
Year:	2003
Address:	1726 MILL ST
Name:	WAILUKU AUTOMOTIVE
Year:	2009
Address:	1726 MILL ST
Name:	WAILUKU AUTOMOTIVE
Year:	2010
Address:	1726 MILL ST

8
SSW **GOMES CONSTRUCTION & REPAIRS INC**
1/4-1/2 **1790 MILL ST**
0.297 mi. **WAILUKU, HI**
1569 ft.

RCRA NonGen / NLR **1000220754**
FINDS **HID982027682**
SHWS
UST
RGA HWS
Financial Assurance

Relative:
Higher

Actual:
210 ft.

RCRA NonGen / NLR:

Date form received by agency:	08/24/1987
Facility name:	GOMES CONST & REPAIRS INC
Facility address:	1790 MILL ST WAILUKU, HI 96793
EPA ID:	HID982027682
Contact:	ENVIRONMENTAL MANAGER
Contact address:	1790 MILL ST WAILUKU MILL, HI 96793
Contact country:	US
Contact telephone:	(808) 244-4083
Contact email:	Not reported
EPA Region:	09
Land type:	Other land type
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	GOMES CONST JACK GOMES
Owner/operator address:	NOT REQUIRED NOT REQUIRED, ME 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(415) 555-1212
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported
Owner/operator name:	NOT REQUIRED

GOMES CONSTRUCTION & REPAIRS INC (Continued) **1000220754**

Owner/operator address:	NOT REQUIRED NOT REQUIRED, ME 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(415) 555-1212
Legal status:	Private
Owner/Operator Type:	Operator
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Violation Status: No violations found

Evaluation Action Summary:

Evaluation date:	01/17/1996
Evaluation:	COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation:	Not reported
Date achieved compliance:	Not reported
Evaluation lead agency:	State

Evaluation date:	05/19/1992
Evaluation:	COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation:	Not reported
Date achieved compliance:	Not reported
Evaluation lead agency:	State

FINDS:

Registry ID: 110006399940

Environmental Interest/Information System

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

STATE MASTER

GOMES CONSTRUCTION & REPAIRS INC (Continued) **1000220754**

SHWS:

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Gomes Construction - 1790 Mill Street, Wailuku, Maui
HID Number:	Not reported
Facility Registry Identifier:	Not reported
Lead Agency:	HEER
Program:	State
Project Manager:	Clarence Callahan
Hazard Priority:	NFA
Potential Hazards And Controls:	No Hazard
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Gomes Construction - 1790 Mill Street, Wailuku, Maui
HID Number:	Not reported
Facility Registry Identifier:	Not reported
Lead Agency:	HEER
Progran Name:	State
Potential Hazard And Controls:	No Hazard
Priority:	NFA
Assessment:	Assessment Ongoing
Response:	Response Complete
Nature of Contamination:	Not reported
Nature of Residual Contamination:	Petroleum contaminated soil
Use Restrictions:	No Hazard Present For Unrestricted Residential Use
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	No Further Action - Type Undetermined
Document Date:	08/24/2005
Document Number:	Not reported
Document Subject:	Not reported
Project Manager:	Clarence Callahan
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

UST:

Facility ID:	9-500384
Owner:	GOMES CONSTRUCTION & REPAIRS INC
Owner Address:	1790 MILL
Ownder City,St,Zip:	Wailuku, 96793 96793

Tank ID:	R-1
Date Installed:	04/10/1968
Tank Status:	**Permanently Out of Use**
Date Closed:	02/01/1994
Tank Capacity:	550
Substance:	Gasoline

RGA HWS:

2012	1790 MILL STREET	1790 MILL ST
2009	1790 MILL STREET	1790 MILL ST
2008	1790 MILL STREET	1790 MILL ST
2006	1790 MILL STREET	1790 MILL ST

GOMES CONSTRUCTION & REPAIRS INC (Continued) **1000220754**

2005 1790 MILL STREET 1790 MILL ST

HI Financial Assurance:
Alt Facility ID: 9-500384
Tank Id: R-1
Tank Status: Permanently Out of Use
FRTYPE: Self Insured
Expiration Date: Not reported

B9
SE
1/4-1/2
0.362 mi.
1912 ft.

HALE MAKUA NURSING HOME - WAILUK
1540 LOWER MAIN ST
WAILUKU, HI 96793

LUST
UST
RGA LUST

U003222260
N/A

Site 1 of 2 in cluster B

Relative:
Higher

Actual:
185 ft.

LUST:
Facility ID: 9-502621
Facility Status: Site Cleanup Completed (NFA)
Facility Status Date: 10/20/1997
Release ID: 930098
Project Officer: Jose Ruiz

UST:
Facility ID: 9-502621
Owner: HALE MAKUA
Owner Address: 472 KAULANA ST
Ownder City,St,Zip: Wailuku, 96793 96793

Tank ID: R-1
Date Installed: 01/01/1966
Tank Status: **Permanently Out of Use**
Date Closed: 11/06/1992
Tank Capacity: 1000
Substance: Diesel

Tank ID: R-2
Date Installed: 01/01/1966
Tank Status: **Permanently Out of Use**
Date Closed: 11/06/1992
Tank Capacity: 500
Substance: Diesel

Tank ID: R-3
Date Installed: 01/01/1966
Tank Status: **Permanently Out of Use**
Date Closed: 11/06/1992
Tank Capacity: 500
Substance: Diesel

Tank ID: R-4
Date Installed: 01/01/1967
Tank Status: **Permanently Out of Use**
Date Closed: 11/06/1992
Tank Capacity: 500
Substance: Diesel

HALE MAKUA NURSING HOME - WAILUK (Continued) **U003222260**

RGA LUST:

2012	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2011	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2010	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2009	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2008	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2007	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2006	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2005	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2004	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2003	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2002	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2001	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
2000	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
1999	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
1998	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
1997	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST
1995	HALE MAKUA NURSING HOME - WAILUK	1540 LOWER MAIN ST

B10 **MECO TRANSFORMER 3358** **SHWS** **S110061657**
SE **1540 E MAIN ST** **SPILLS** **N/A**
1/4-1/2 **WAILUKU, HI 96793** **RGA HWS**
0.362 mi.
1912 ft. **Site 2 of 2 in cluster B**

Relative:
Higher

Actual:
185 ft.

SHWS:

Organization:	Not reported
Supplemental Location:	Hale Makua
Island:	Maui
Environmental Interest:	MECO Transformer 3358 Self Implementing PCB Cleanup
HID Number:	Not reported
Facility Registry Identifier:	Not reported
Lead Agency:	HEER
Program:	State
Project Manager:	Paul Chong
Hazard Priority:	NFA
Potential Hazards And Controls:	No Hazard
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Hale Makua
SDAR Environmental Interest Name:	MECO Transformer 3358 Self Implementing PCB Cleanup
HID Number:	Not reported
Facility Registry Identifier:	Not reported
Lead Agency:	HEER
Progran Name:	State
Potential Hazard And Controls:	No Hazard
Priority:	NFA
Assessment:	Response Necessary
Response:	Self Implementing TSCA Cleanup
Nature of Contamination:	Found: PCBs in soil.
Nature of Residual Contamination:	Confirmation samples were collected beneath the excavated area and all samples were below HDOH environmental action levels for unrestricted use.
Use Restrictions:	No Hazard Present For Unrestricted Residential Use
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported

MECO TRANSFORMER 3358 (Continued) **S110061657**

Site Closure Type:	No Further Action Letter - Unrestricted Residential Use
Document Date:	01/27/2011
Document Number:	2011-043-PC
Document Subject:	Pad Mount Transformer 3358 PCB Release
Project Manager:	Paul Chong
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

HI SPILLS:

Island:	Maui
Supplemental Loc. Text:	Hale Makua
Case Number:	20080714-1258
HID Number:	Not reported
Facility Registry Id:	Not reported
Lead and Program:	HEER EP&R
ER:	None
Units:	MECO Pad-Mount Transformer no. 3358
Substances:	Oil Lubricating
Less Or Greater Than:	Not reported
Numerical Quantity:	3
Units:	Gallons
Activity Type:	Response
Activity Lead:	Liz Galvez
Assignment End Date:	Not reported
Result:	Not reported
File Under:	Maui Electric Co., Inc.

RGA HWS:

2012	MECO TRANSFORMER 3358	1540 E MAIN ST
2009	MECO TRANSFORMER 3358	1540 E MAIN ST

11
SW
1/4-1/2
0.415 mi.
2191 ft.

OGAWA SERVICE STATION
327 N MARKET ST
WAILUKU, HI 96793

LUST
UST
RGA LUST

U003222184
N/A

Relative:
Higher

Actual:
240 ft.

LUST:

Facility ID:	9-500398
Facility Status:	Site Cleanup Completed (NFA)
Facility Status Date:	08/19/1996
Release ID:	960046
Project Officer:	Jose Ruiz

UST:

Facility ID:	9-500398
Owner:	MASASHI OGAWA
Owner Address:	327 N MARKET ST
Ownder City,St,Zip:	Wailuku, 96793 96793

Tank ID:	R-001
Date Installed:	07/27/1956
Tank Status:	**Permanently Out of Use**
Date Closed:	03/04/1995
Tank Capacity:	1000
Substance:	Gasoline

OGAWA SERVICE STATION (Continued) **U003222184**

Tank ID: R-002
Date Installed: 07/27/1956
Tank Status: **Permanently Out of Use**
Date Closed: 03/04/1996
Tank Capacity: 1000
Substance: Gasoline

Tank ID: R-003
Date Installed: 07/27/1977
Tank Status: **Permanently Out of Use**
Date Closed: 03/04/1996
Tank Capacity: 5000
Substance: Gasoline

RGA LUST:

2012	OGAWA SERVICE STATION	327 N MARKET ST
2011	OGAWA SERVICE STATION	327 N MARKET ST
2010	OGAWA SERVICE STATION	327 N MARKET ST
2009	OGAWA SERVICE STATION	327 N MARKET ST
2008	OGAWA SERVICE STATION	327 N MARKET ST
2007	OGAWA SERVICE STATION	327 N MARKET ST
2006	OGAWA SERVICE STATION	327 N MARKET ST
2005	OGAWA SERVICE STATION	327 N MARKET ST
2004	OGAWA SERVICE STATION	327 N MARKET ST
2003	OGAWA SERVICE STATION	327 N MARKET ST
2002	OGAWA SERVICE STATION	327 N MARKET ST
2001	OGAWA SERVICE STATION	327 N MARKET ST
2000	OGAWA SERVICE STATION	327 N MARKET ST
1999	OGAWA SERVICE STATION	327 N MARKET ST
1998	OGAWA SERVICE STATION	327 N MARKET ST
1997	OGAWA SERVICE STATION	327 N MARKET ST

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12 **SW** **1/4-1/2** **0.449 mi.** **2371 ft.**	**WAILUKU SUGAR AGRICULTURAL DEPARTMENT PESTICIDE MIXING** **2015 HOLOWAI PL** **WAILUKU, HI 96793**	**SHWS** **INST CONTROL**	**S113230524** **N/A**

Relative: **Higher**

Actual: **250 ft.**

SHWS:

Organization: Not reported
Supplemental Location: Kahekili Terrace
Island: Maui
Environmental Interest: Wailuku Sugar Agricultural Department Pesticide Mixing
HID Number: Not reported
Facility Registry Identifier: Not reported
Lead Agency: HEER
Program: Site Discovery
Project Manager: Unassigned
Hazard Priority: Medium
Potential Hazards And Controls: Hazard Managed With Controls
Organization: Not reported
Island: Maui
Supplemental Location Text: Kahekili Terrace
SDAR Environmental Interest Name: Wailuku Sugar Agricultural Department Pesticide Mixing
HID Number: Not reported
Facility Registry Identifier: Not reported
Lead Agency: HEER

WAILUKU SUGAR AGRICULTURAL DEPARTMENT PESTICIDE MIXING (Continued) **S113230524**

Progran Name:	Site Discovery
Potential Hazard And Controls:	Hazard Managed With Controls
Priority:	Medium
Assessment:	Assessment Ongoing
Response:	Not reported
Nature of Contamination:	Found: Arsenic, lead and dioxin in soil.
Nature of Residual Contamination:	Not reported
Use Restrictions:	Controls Required to Manage Contamination
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Government - Hawaii Dept. of Health Letter Issued
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	Not reported
Document Date:	Not reported
Document Number:	Not reported
Document Subject:	Not reported
Project Manager:	Unassigned
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

INST CONTROL:

Potential hazards and controls:	Hazard Managed With Controls
Supplemental Location:	Kahekili Terrace
Zip Suffix:	Not reported
Island:	Maui
Institutional Control:	Government - Hawaii Dept. of Health Letter Issued

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C13
SSE
1/4-1/2
0.476 mi.
2511 ft.

MAUI SANDTORCHES
46 TING DR
WAILUKU, HI 96793

Site 1 of 2 in cluster C

SHWS **RGA HWS** — **S106819015** **N/A**

Relative: Higher

Actual: 243 ft.

SHWS:

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Maui Sandtorches
HID Number:	HID077670842
Facility Registry Identifier:	110005723217
Lead Agency:	Not reported
Program:	State
Project Manager:	Unassigned
Hazard Priority:	NFA
Potential Hazards And Controls:	Hazard Undetermined
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Maui Sandtorches
HID Number:	HID077670842
Facility Registry Identifier:	110005723217
Lead Agency:	Not reported
Progran Name:	State
Potential Hazard And Controls:	Hazard Undetermined
Priority:	NFA
Assessment:	Response Necessary
Response:	Response Complete
Nature of Contamination:	Not reported

MAUI SANDTORCHES (Continued) **S106819015**

Nature of Residual Contamination:	Not reported
Use Restrictions:	Undetermined
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	No Further Action - Type Undetermined
Document Date:	04/15/1996
Document Number:	Not reported
Document Subject:	Not reported
Project Manager:	Unassigned
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

RGA HWS:

2012	MAUI SANDTORCHES	46 TING DR
2009	MAUI SANDTORCHES	46 TING DR
2008	MAUI SANDTORCHES	46 TING DR
2006	MAUI SANDTORCHES	46 TING DR
2005	MAUI SANDTORCHES	46 TING DR

C14
SSE
1/4-1/2
0.476 mi.
2514 ft.

KUKUI GROVE HOLDER
46 TINGS DR
WAILUKU, HI

Site 2 of 2 in cluster C

CERC-NFRAP
RCRA NonGen / NLR
FINDS

1000245007
HID077670842

Relative:
Higher

Actual:
243 ft.

CERC-NFRAP:

Site ID:	0902848
Federal Facility:	Not a Federal Facility
NPL Status:	Not on the NPL
Non NPL Status:	NFRAP-Site does not qualify for the NPL based on existing information

CERCLIS-NFRAP Site Contact Details:

Contact Sequence ID:	13037389.00000
Person ID:	9000059.00000

CERCLIS-NFRAP Assessment History:

Action:	DISCOVERY
Date Started:	/ /
Date Completed:	07/01/80
Priority Level:	Not reported
Action:	ARCHIVE SITE
Date Started:	/ /
Date Completed:	09/01/84
Priority Level:	Not reported
Action:	PRELIMINARY ASSESSMENT
Date Started:	08/01/84
Date Completed:	09/01/84
Priority Level:	NFRAP-Site does not qualify for the NPL based on existing information

RCRA NonGen / NLR:

Date form received by agency:	07/30/1980
Facility name:	MAUI SANDTORCHES
Facility address:	46 TINGS DR WAILUKU, HI 96793

KUKUI GROVE HOLDER (Continued) **1000245007**

EPA ID:	HID077670842
Mailing address:	46 TINGS DRIVE WAILUKU MAUI, HI 96793
Contact:	ENVIRONMENTAL MANAGER
Contact address:	46 TINGS DR WAILUKU, HI 96793
Contact country:	US
Contact telephone:	(808) 244-7541
Contact email:	Not reported
EPA Region:	09
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	JACQUELINE CARLIN
Owner/operator address:	NOT REQUIRED NOT REQUIRED, ME 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(415) 555-1212
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Owner/operator name:	NOT REQUIRED
Owner/operator address:	NOT REQUIRED NOT REQUIRED, ME 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(415) 555-1212
Legal status:	Private
Owner/Operator Type:	Operator
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Violation Status: No violations found

FINDS:

Registry ID: 110005723217

KUKUI GROVE HOLDER (Continued) **1000245007**

Environmental Interest/Information System

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

15
SSE
1/2-1
0.572 mi.
3019 ft.

REX TIRE & SUPPLY, DIESEL
1728 KAAHUMANU AVE
KAHULUI, HI 96732

SHWS **S106820230**
RGA HWS **N/A**

Relative:
Higher

Actual:
212 ft.

SHWS:

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Rex Tire Diesel
HID Number:	Not reported
Facility Registry Identifier:	110013778386
Lead Agency:	HEER
Program:	State
Project Manager:	Eric Sadoyama
Hazard Priority:	NFA
Potential Hazards And Controls:	No Hazard
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Rex Tire Diesel
HID Number:	Not reported
Facility Registry Identifier:	110013778386
Lead Agency:	HEER
Progran Name:	State
Potential Hazard And Controls:	No Hazard
Priority:	NFA
Assessment:	Response Necessary
Response:	Response Complete
Nature of Contamination:	Found: Diesel fuel in soil
Nature of Residual Contamination:	Diesel fuel
Use Restrictions:	No Hazard Present for Unrestricted Residential Use
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	No Further Action Letter - Unrestricted Residential Use
Document Date:	03/14/2006
Document Number:	2006-149-ES
Document Subject:	No further action determination for 1991 diesel release from heating oil UST
Project Manager:	Eric Sadoyama
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

RGA HWS:

2012	REX TIRE & SUPPLY, DIESEL	1728 KAAHUMANU AVE
2009	REX TIRE & SUPPLY, DIESEL	1728 KAAHUMANU AVE

REX TIRE & SUPPLY, DIESEL (Continued) **S106820230**

2008	REX TIRE & SUPPLY, DIESEL	1728 KAAHUMANU AVE
2006	REX TIRE & SUPPLY, DIESEL	1728 KAAHUMANU AVE
2005	REX TIRE & SUPPLY, DIESEL	1728 KAAHUMANU AVE

16	**2102 VINEYARD ST.**	**SHWS**	**U003222271**
SSW	**2102 VINEYARD ST**	**UST**	**N/A**
1/2-1	**WAILUKU, HI 96793**	**Financial Assurance**	
0.572 mi.		**RGA HWS**	
3021 ft.			

Relative:
Higher

Actual:
299 ft.

SHWS:

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Vineyard Street Tank Closure
HID Number:	Not reported
Facility Registry Identifier:	110013766656
Lead Agency:	HEER
Program:	State
Project Manager:	Paul Chong
Hazard Priority:	NFA
Potential Hazards And Controls:	No Hazard
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Vineyard Street Tank Closure
HID Number:	Not reported
Facility Registry Identifier:	110013766656
Lead Agency:	HEER
Progran Name:	State
Potential Hazard And Controls:	No Hazard
Priority:	NFA
Assessment:	Response Necessary
Response:	Response Complete
Nature of Contamination:	Not reported
Nature of Residual Contamination:	Petroleum in soil
Use Restrictions:	No Hazard Present For Unrestricted Residential Use
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	No Further Action Letter - Unrestricted Residential Use
Document Date:	04/01/2011
Document Number:	2011-196-PC
Document Subject:	No Further Action Determination for Removal of Underground Fuel Tank located at 2102 Vineyard St dat
Project Manager:	Paul Chong
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

UST:

Facility ID:	9-503115
Owner:	RALPH KATO
Owner Address:	1063 LOWER MAIN ST
Ownder City,St,Zip:	Wailuku, 96793 96793

Tank ID:	R-1
Date Installed:	Not reported
Tank Status:	**Permanently Out of Use**

2102 VINEYARD ST. (Continued) **U003222271**

Date Closed: 10/05/1995
Tank Capacity: 550
Substance: Diesel

HI Financial Assurance:
Alt Facility ID: 9-503115
Tank Id: R-1
Tank Status: Permanently Out of Use
FRTYPE: Insurance
Expiration Date: Not reported

RGA HWS:

2012	MAUI VINEYARD INN, UST CLOSURE	2102 VINEYARD ST
2009	MAUI VINEYARD INN, UST CLOSURE	2102 VINEYARD ST
2008	MAUI VINEYARD INN, UST CLOSURE	2102 VINEYARD ST
2006	MAUI VINEYARD INN, UST CLOSURE	2102 VINEYARD ST
2005	MAUI VINEYARD INN, UST CLOSURE	2102 VINEYARD ST
2000	2102 VINEYARD ST	

17
SSW
1/2-1
0.610 mi.
3222 ft.

Relative:
Higher

Actual:
282 ft.

ROBERT JOSLIN
2026 MAIN ST
WAILUKU, HI 96793

RCRA-CESQG
SHWS
LUST
UST
SPILLS
RGA LUST
RGA HWS

1000601460
HID984466896

RCRA-CESQG:
Date form received by agency: 04/27/2001
Facility name: ROBERT JOSLIN
Facility address: 2026 MAIN ST
WAILUKU, HI 96793
EPA ID: HID984466896
Contact: ROBERT JOSLIN
Contact address: 2026 MAIN ST
WAILUKU, HI 96793
Contact country: US
Contact telephone: (808) 244-3980
Contact email: Not reported
EPA Region: 09
Land type: Private
Classification: Conditionally Exempt Small Quantity Generator
Description: Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

ROBERT JOSLIN (Continued) **1000601460**

Owner/Operator Summary:

Owner/operator name:	ROBERT JOSLIN
Owner/operator address:	2026 MAIN ST WAILUKU, HI 96793
Owner/operator country:	Not reported
Owner/operator telephone:	(808) 244-3980
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Hazardous Waste Summary:

Waste code:	D000
Waste name:	Not Defined
Waste code:	D001
Waste name:	IGNITABLE HAZARDOUS WASTES ARE THOSE WASTES WHICH HAVE A FLASHPOINT OF LESS THAN 140 DEGREES FAHRENHEIT AS DETERMINED BY A PENSKY-MARTENS CLOSED CUP FLASH POINT TESTER. ANOTHER METHOD OF DETERMINING THE FLASH POINT OF A WASTE IS TO REVIEW THE MATERIAL SAFETY DATA SHEET, WHICH CAN BE OBTAINED FROM THE MANUFACTURER OR DISTRIBUTOR OF THE MATERIAL. LACQUER THINNER IS AN EXAMPLE OF A COMMONLY USED SOLVENT WHICH WOULD BE CONSIDERED AS IGNITABLE HAZARDOUS WASTE.
Waste code:	D008
Waste name:	LEAD
Waste code:	D018
Waste name:	BENZENE
Violation Status:	No violations found

Evaluation Action Summary:

Evaluation date:	01/19/1996
Evaluation:	COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation:	Not reported
Date achieved compliance:	Not reported
Evaluation lead agency:	State

ROBERT JOSLIN (Continued) **1000601460**

SHWS:

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Valley Isle Motors Leaking UST
HID Number:	Not reported
Facility Registry Identifier:	110005727516
Lead Agency:	SHWB
Program:	State
Project Manager:	Melody Calisay
Hazard Priority:	NFA
Potential Hazards And Controls:	No Hazard
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Valley Isle Motors Leaking UST
HID Number:	Not reported
Facility Registry Identifier:	110005727516
Lead Agency:	SHWB
Progran Name:	State
Potential Hazard And Controls:	No Hazard
Priority:	NFA
Assessment:	Response Necessary
Response:	Response Complete
Nature of Contamination:	Found: Petroleum in soil
Nature of Residual Contamination:	None
Use Restrictions:	No Hazard Present for Unrestricted Residential Use
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	No Further Action Letter - Unrestricted Residential Use
Document Date:	05/15/2003
Document Number:	Not reported
Document Subject:	Former Valley Isle Motors
Project Manager:	Melody Calisay
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

LUST:

Facility ID:	9-501588
Facility Status:	Site Cleanup Completed (NFA)
Facility Status Date:	05/15/2003
Release ID:	900024
Project Officer:	Shunsheng Fu

Facility ID:	9-501588
Facility Status:	Site Cleanup Completed (NFA)
Facility Status Date:	05/15/2003
Release ID:	010004
Project Officer:	Shunsheng Fu

UST:

Facility ID:	9-501588
Owner:	VALLEY ISLE MOTORS, LTD.
Owner Address:	2026 MAIN St
Ownder City,St,Zip:	Wailuku, 96793 96793

ROBERT JOSLIN (Continued) **1000601460**

Tank ID: R-1
Date Installed: 04/22/1966
Tank Status: **Permanently Out of Use**
Date Closed: 05/10/1990
Tank Capacity: 1000
Substance: Used Oil

Tank ID: R-2
Date Installed: 04/22/1966
Tank Status: **Permanently Out of Use**
Date Closed: 05/10/1990
Tank Capacity: 1000
Substance: Used Oil

Tank ID: R-3
Date Installed: Not reported
Tank Status: **Permanently Out of Use**
Date Closed: 05/10/1990
Tank Capacity: 1000
Substance: Used Oil

Tank ID: R-4
Date Installed: Not reported
Tank Status: **Permanently Out of Use**
Date Closed: 01/01/1990
Tank Capacity: 1000
Substance: Gasoline

Tank ID: R-7
Date Installed: Not reported
Tank Status: **Permanently Out of Use**
Date Closed: 10/01/2000
Tank Capacity: 300
Substance: Used Oil

Tank ID: R-8
Date Installed: Not reported
Tank Status: **Permanently Out of Use**
Date Closed: 01/01/1990
Tank Capacity: 300
Substance: Kerosene

Tank ID: r-5
Date Installed: Not reported
Tank Status: **Permanently Out of Use**
Date Closed: 01/01/1990
Tank Capacity: 1000
Substance: Gasoline

Tank ID: r-6

ROBERT JOSLIN (Continued) **1000601460**

Date Installed:	Not reported
Tank Status:	**Permanently Out of Use**
Date Closed:	01/01/1990
Tank Capacity:	1000
Substance:	Gasoline

HI SPILLS:

Island:	Maui
Supplemental Loc. Text:	Not reported
Case Number:	19990804-1500
HID Number:	Not reported
Facility Registry Id:	110005727516
Lead and Program:	HEER EP&R
ER:	No
Units:	Valley Isle Motors LUST
Substances:	Oil
Less Or Greater Than:	Not reported
Numerical Quantity:	Not reported
Units:	Not reported
Activity Type:	Response
Activity Lead:	Bill Perry
Assignment End Date:	Not reported
Result:	Refer to ISST
File Under:	Valley Isle Motors

Island:	Maui
Supplemental Loc. Text:	Not reported
Case Number:	19990805-1343
HID Number:	Not reported
Facility Registry Id:	110005727516
Lead and Program:	HEER EP&R
ER:	No
Units:	Former Valley Isle Motors LUST
Substances:	Not reported
Less Or Greater Than:	Not reported
Numerical Quantity:	Not reported
Units:	Not reported
Activity Type:	Response
Activity Lead:	Terry Corpus
Assignment End Date:	Not reported
Result:	Refer to ISST
File Under:	Valley Isle Motors

RGA LUST:

2012	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2011	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2010	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2009	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2008	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2007	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2006	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2005	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2004	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2003	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2002	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
2001	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST

ROBERT JOSLIN (Continued) **1000601460**

2000	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
1999	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
1998	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST
1997	VALLEY ISLE MOTORS, LTD.	2026 MAIN ST

RGA HWS:

2012	VALLEY ISLE MOTORS LUST	2026 MAIN ST
2009	VALLEY ISLE MOTORS LUST	2026 MAIN ST
2008	VALLEY ISLE MOTORS LUST	2026 MAIN ST
2006	VALLEY ISLE MOTORS LUST	2026 MAIN ST
2005	VALLEY ISLE MOTORS LUST	2026 MAIN ST

D18
SSW
1/2-1
0.629 mi.
3320 ft.

MAIN STREET PROMENADE PROJECT (DEMOLITION PHASE 1B) — **SHWS** — **S106818881**
2058 MAIN ST — **RGA HWS** — **N/A**
WAILUKU, HI

Site 1 of 2 in cluster D

Relative: Higher

Actual: 290 ft.

SHWS:

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Main Street Promenade Project (Demolition Phase 1B)
HID Number:	Not reported
Facility Registry Identifier:	Not reported
Lead Agency:	Not reported
Program:	State
Project Manager:	Mike Cripps
Hazard Priority:	NFA
Potential Hazards And Controls:	Hazard Undetermined
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Main Street Promenade Project (Demolition Phase 1B)
HID Number:	Not reported
Facility Registry Identifier:	Not reported
Lead Agency:	Not reported
Progran Name:	State
Potential Hazard And Controls:	Hazard Undetermined
Priority:	NFA
Assessment:	Assessment Ongoing
Response:	Not reported
Nature of Contamination:	Not reported
Nature of Residual Contamination:	Not reported
Use Restrictions:	Undetermined
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	No Further Action - Type Undetermined
Document Date:	09/01/2000
Document Number:	Not reported
Document Subject:	Not reported
Project Manager:	Mike Cripps
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

RGA HWS:

2012 MAIN STREET PROMENADE PROJECT (DEMOLITION PHASE 1B) 2058
MAIN ST

MAIN STREET PROMENADE PROJECT (DEMOLITION PHASE 1B) (Continued) **S106818881**

2009 MAIN STREET PROMENADE PROJECT (DEMOLITION PHASE 1B) 2058 MAIN ST
2008 MAIN STREET PROMENADE PROJECT (DEMOLITION PHASE 1B) 2058 MAIN ST
2006 MAIN STREET PROMENADE PROJECT (DEMOLITION PHASE 1B) 2058 MAIN ST
2005 MAIN STREET PROMENADE PROJECT (DEMOLITION PHASE 1B) 2058 MAIN ST

D19
SSW
1/2-1
0.648 mi.
3421 ft.

ALVIN'S UPTOWN CHEVRON SERVICE STATION **SHWS** **S107022542**
2085 WEST MAIN ST **RGA HWS** **N/A**
WAILUKU, HI 96793

Site 2 of 2 in cluster D

Relative:
Higher

Actual:
297 ft.

SHWS:

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Hydraulic Hoist and Sand-and-Grease Trap Removal
HID Number:	Not reported
Facility Registry Identifier:	110006399922
Lead Agency:	HEER
Program:	State
Project Manager:	Diane England
Hazard Priority:	NFA
Potential Hazards And Controls:	Hazard Undetermined
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Hydraulic Hoist and Sand-and-Grease Trap Removal
HID Number:	Not reported
Facility Registry Identifier:	110006399922
Lead Agency:	HEER
Progran Name:	State
Potential Hazard And Controls:	Hazard Undetermined
Priority:	NFA
Assessment:	Response Necessary
Response:	Response Complete
Nature of Contamination:	Not reported
Nature of Residual Contamination:	Petroleum impacted soil
Use Restrictions:	Undetermined
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	No Further Action Letter - Unrestricted Residential Use
Document Date:	04/28/2005
Document Number:	2005-185-DE
Document Subject:	No Further Action Determination for Release No. 20031119-0831
Project Manager:	Diane England
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

RGA HWS:

2012	ALVIN'S UPTOWN CHEVRON SERVICE STATION	2085 WEST MAIN ST
2009	ALVIN'S UPTOWN CHEVRON SERVICE STATION	2085 WEST MAIN ST
2008	ALVIN'S UPTOWN CHEVRON SERVICE STATION	2085 WEST MAIN ST
2006	ALVIN'S UPTOWN CHEVRON SERVICE STATION	2085 WEST MAIN ST

ALVIN'S UPTOWN CHEVRON SERVICE STATION (Continued) **S107022542**

2005 ALVIN'S UPTOWN CHEVRON SERVICE STATION 2085 WEST MAIN ST

20
South
1/2-1
0.799 mi.
4217 ft.

ORGANIZATIONAL MAINTENANCE SHOP #3 (OMS #3)
260 S MARKET ST
WAILUKU, HI 96793

SHWS **1006818976**
RGA HWS **N/A**

Relative:
Higher

Actual:
257 ft.

SHWS:

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Organizational Maintenance Shop #3 (OMS #3)
HID Number:	Not reported
Facility Registry Identifier:	110013767352
Lead Agency:	Not reported
Program:	Hawaii Air National Guard
Project Manager:	Unassigned
Hazard Priority:	Low
Potential Hazards And Controls:	Hazard Undetermined
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Organizational Maintenance Shop #3 (OMS #3)
HID Number:	Not reported
Facility Registry Identifier:	110013767352
Lead Agency:	Not reported
Progran Name:	Hawaii Air National Guard
Potential Hazard And Controls:	Hazard Undetermined
Priority:	Low
Assessment:	Assessment Ongoing
Response:	Not reported
Nature of Contamination:	Not reported
Nature of Residual Contamination:	Not reported
Use Restrictions:	Undetermined
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	Not reported
Document Date:	Not reported
Document Number:	Not reported
Document Subject:	Not reported
Project Manager:	Unassigned
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

RGA HWS:

2012	ORGANIZATIONAL MAINTENANCE SHOP #3 (OMS #3)	260 S MARKET ST
2009	ORGANIZATIONAL MAINTENANCE SHOP #3 (OMS #3)	260 S MARKET ST
2008	ORGANIZATIONAL MAINTENANCE SHOP #3 (OMS #3)	260 S MARKET ST
2006	ORGANIZATIONAL MAINTENANCE SHOP #3 (OMS #3)	260 S MARKET ST
2005	ORGANIZATIONAL MAINTENANCE SHOP #3 (OMS #3)	260 S MARKET ST

Map ID Direction Distance Elevation	Site	Database(s)	EDR ID Number EPA ID Number
21 **ESE** **1/2-1** **0.958 mi.** **5060 ft.**	**WAIALE ASH PILE** **MAHALANI ST** **WAILUKU, HI 96793**	**SHWS** **RGA HWS**	**1006819707** **N/A**

Relative:
Lower

Actual:
80 ft.

SHWS:

Organization:	Not reported
Supplemental Location:	Not reported
Island:	Maui
Environmental Interest:	Waiale Ash Pile
HID Number:	Not reported
Facility Registry Identifier:	110013775575
Lead Agency:	HEER
Program:	State
Project Manager:	Anna Fernandez
Hazard Priority:	Low
Potential Hazards And Controls:	Hazard Present
Organization:	Not reported
Island:	Maui
Supplemental Location Text:	Not reported
SDAR Environmental Interest Name:	Waiale Ash Pile
HID Number:	Not reported
Facility Registry Identifier:	110013775575
Lead Agency:	HEER
Progran Name:	State
Potential Hazard And Controls:	Hazard Present
Priority:	Low
Assessment:	Response Necessary
Response:	Response Ongoing
Nature of Contamination:	Presumed: TPH, metals, pesticides, heterogenous mixture associated with landfills in soil
Nature of Residual Contamination:	Not reported
Use Restrictions:	Controls Required to Manage Contamination
Engineering Control:	Not reported
Description of Restrictions:	Not reported
Institutional Control:	Not reported
Within Designated Areawide Contamination:	Not reported
Site Closure Type:	Not reported
Document Date:	Not reported
Document Number:	Not reported
Document Subject:	Not reported
Project Manager:	Anna Fernandez
Contact Information:	(808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814

RGA HWS:

2012	WAIALE ASH PILE	MAHALANI ST
2009	WAIALE ASH PILE	MAHALANI ST
2008	WAIALE ASH PILE	MAHALANI ST
2006	WAIALE ASH PILE	MAHALANI ST
2005	WAIALE ASH PILE	MAHALANI ST

Count: 20 records.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
KAHULUI	1003879111	WAIKAPU DUMP-MAUI COUNTY DUMP	CENTRAL MAUI	96732	CERC-NFRAP
KAHULUI	S113230501	MECO STATION-CLASS TRANSFORMER NO.	DAIRY RD SE CORNER OF HANA HWY	96732	SHWS, SPILLS
KAHULUI	S113230485	MECO PAD-MOUNT TRANSFORMER NO. 137	DAIRY RD & HANA HWY	96732	SHWS
KAHULUI	S106820852	VECTOR CONTROL BRANCH, MAUI	54 HIGH ST, 641 MUA ST, KAHALE	96793	SHWS, RGA HWS
KAHULUI	1006820577	HOBRON AVE AREA (KAHULUI)	HOBRON AVE	96732	SHWS, RGA HWS
KAHULUI	S106817098	FONG CONSTRUCTION	HUKILIKI ST	96732	SHWS, RGA HWS
KAHULUI	S113230471	LOT F4 KANE STREET	KANE ST	96732	SHWS, ENG CONTROLS, INST CONT
KAHULUI	1006820345	A&B DUMP SITE	W PAPA AVE	96732	SHWS, RGA HWS
KAHULUI	1006819647	WAIKAPU DUMP-MAUI COUNTY DUMP	WAIKAPU RD	96732	SHWS, RGA HWS
KAUNAKAKAI	S108859913	KALAMAULA LANDFILL	HOAWA RD	96793	SHWS, ENG CONTROLS
PAIA	S106819555	PAIA SUGAR MILL	BALDWIN AVE	96732	SHWS, RGA HWS
WAIKAPU	1008194955	VACANT LAND TMK NO (2) 3-8-7:101	KUIHELANI HWY NEAR WAIKO RD	96793	RCRA NonGen / NLR
WAILUKU	1012152162	IAO VALLEY STATE PARK - LCC	900 IAO VALLEY ROAD		FINDS
WAILUKU	1009332782	WAILUKU AG DIVERSION OF IAO STREAM	KEPANIWAI PARK		FINDS
WAILUKU	1015914219	IAO MIDDLE SCHOOL	260 SOUTH MARTKET STREET		FINDS
WAILUKU	S113230499	MECO POLE-MOUNT TRANSFORMER NO. 88	POLE E-1-16 AT WAIHEE VALLE RD	96793	SHWS
WAILUKU	1014884259	IAO STREAM	UNK		FINDS
WAILUKU	S108008644	Y HATA- MAUI	200 WAIEHU BEACH RD & KAHULU B	96793	SHWS, SPILLS
WAILUKU	1015940186	WAIEHU BEACH ROAD, REHABILITATION	WAIEHU BEACH ROAD		FINDS
WAILUKU	U001236653	MAUI BLOCKS	WAIKAPU-OFF HONOAPIILANI HWY	96793	UST

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 01/28/2014
Number of Days to Update: 78

Source: EPA
Telephone: N/A
Last EDR Contact: 04/08/2014
Next Scheduled EDR Contact: 07/21/2014
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 5
Telephone 312-886-6686

EPA Region 10
Telephone 206-553-8665

EPA Region 6
Telephone: 214-655-6659

EPA Region 7
Telephone: 913-551-7247

EPA Region 8
Telephone: 303-312-6774

EPA Region 9
Telephone: 415-947-4246

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 01/28/2014
Number of Days to Update: 78

Source: EPA
Telephone: N/A
Last EDR Contact: 04/08/2014
Next Scheduled EDR Contact: 07/21/2014
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Federal Delisted NPL site list

DELISTED NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 01/28/2014
Number of Days to Update: 78

Source: EPA
Telephone: N/A
Last EDR Contact: 04/08/2014
Next Scheduled EDR Contact: 07/21/2014
Data Release Frequency: Quarterly

Federal CERCLIS list

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 02/13/2014
Number of Days to Update: 94

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 02/28/2014
Next Scheduled EDR Contact: 06/09/2014
Data Release Frequency: Quarterly

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 05/31/2013
Date Data Arrived at EDR: 07/08/2013
Date Made Active in Reports: 12/06/2013
Number of Days to Update: 151

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 04/11/2014
Next Scheduled EDR Contact: 07/21/2014
Data Release Frequency: Varies

Federal CERCLIS NFRAP site List

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 02/13/2014
Number of Days to Update: 94

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 02/28/2014
Next Scheduled EDR Contact: 06/09/2014
Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 03/11/2014
Date Data Arrived at EDR: 03/13/2014
Date Made Active in Reports: 04/09/2014
Number of Days to Update: 27

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 03/13/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 03/11/2014
Date Data Arrived at EDR: 03/13/2014
Date Made Active in Reports: 04/09/2014
Number of Days to Update: 27

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/13/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/11/2014
Date Data Arrived at EDR: 03/13/2014
Date Made Active in Reports: 04/09/2014
Number of Days to Update: 27

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/13/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 03/11/2014
Date Data Arrived at EDR: 03/13/2014
Date Made Active in Reports: 04/09/2014
Number of Days to Update: 27

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/13/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/11/2014
Date Data Arrived at EDR: 03/13/2014
Date Made Active in Reports: 04/09/2014
Number of Days to Update: 27

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/13/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Varies

Federal institutional controls / engineering controls registries

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 12/17/2013
Date Data Arrived at EDR: 01/14/2014
Date Made Active in Reports: 01/28/2014
Number of Days to Update: 14

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 03/10/2014
Next Scheduled EDR Contact: 06/23/2014
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 12/17/2013
Date Data Arrived at EDR: 01/14/2014
Date Made Active in Reports: 01/28/2014
Number of Days to Update: 14

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 03/10/2014
Next Scheduled EDR Contact: 06/23/2014
Data Release Frequency: Varies

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 11/20/2013
Date Data Arrived at EDR: 11/21/2013
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 95

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 02/14/2014
Next Scheduled EDR Contact: 06/02/2014
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 09/30/2013
Date Data Arrived at EDR: 10/01/2013
Date Made Active in Reports: 12/06/2013
Number of Days to Update: 66

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 04/04/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Annually

State- and tribal - equivalent CERCLIS

SHWS: Sites List

Facilities, sites or areas in which the Office of Hazard Evaluation and Emergency Response has an interest, has investigated or may investigate under HRS 128D (includes CERCLIS sites).

Date of Government Version: 01/04/2014
Date Data Arrived at EDR: 02/26/2014
Date Made Active in Reports: 03/07/2014
Number of Days to Update: 9

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 02/26/2014
Next Scheduled EDR Contact: 06/09/2014
Data Release Frequency: Semi-Annually

State and tribal landfill and/or solid waste disposal site lists

SWF/LF: Permitted Landfills in the State of Hawaii
Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 09/17/2012
Date Data Arrived at EDR: 04/03/2013
Date Made Active in Reports: 05/10/2013
Number of Days to Update: 37

Source: Department of Health
Telephone: 808-586-4245
Last EDR Contact: 04/04/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Varies

State and tribal leaking storage tank lists

LUST: Leaking Underground Storage Tank Database
Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 12/04/2013
Date Data Arrived at EDR: 12/05/2013
Date Made Active in Reports: 12/10/2013
Number of Days to Update: 5

Source: Department of Health
Telephone: 808-586-4228
Last EDR Contact: 03/17/2014
Next Scheduled EDR Contact: 06/16/2014
Data Release Frequency: Semi-Annually

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 08/27/2013
Date Data Arrived at EDR: 08/27/2013
Date Made Active in Reports: 11/01/2013
Number of Days to Update: 66

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 09/12/2011
Date Data Arrived at EDR: 09/13/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 59

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 02/21/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Varies

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 03/01/2013
Date Data Arrived at EDR: 03/01/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 42

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Quarterly

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 11/06/2013
Date Data Arrived at EDR: 11/07/2013
Date Made Active in Reports: 12/06/2013
Number of Days to Update: 29

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Quarterly

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 08/27/2012
Date Data Arrived at EDR: 08/28/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 49

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Quarterly

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land
Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 02/13/2014
Date Data Arrived at EDR: 02/14/2014
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 10

Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Varies

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 02/01/2013
Date Data Arrived at EDR: 05/01/2013
Date Made Active in Reports: 11/01/2013
Number of Days to Update: 184

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/30/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 11/21/2013
Date Data Arrived at EDR: 11/26/2013
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 90

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Semi-Annually

State and tribal registered storage tank lists

UST: Underground Storage Tank Database
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 12/04/2013
Date Data Arrived at EDR: 12/05/2013
Date Made Active in Reports: 12/10/2013
Number of Days to Update: 5

Source: Department of Health
Telephone: 808-586-4228
Last EDR Contact: 03/17/2014
Next Scheduled EDR Contact: 06/16/2014
Data Release Frequency: Semi-Annually

INDIAN UST R1: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 02/01/2013
Date Data Arrived at EDR: 05/01/2013
Date Made Active in Reports: 01/27/2014
Number of Days to Update: 271

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/30/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 11/21/2013
Date Data Arrived at EDR: 11/26/2013
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 90

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Semi-Annually

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 02/13/2014
Date Data Arrived at EDR: 02/14/2014
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 10

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 01/29/2014
Date Data Arrived at EDR: 01/29/2014
Date Made Active in Reports: 03/12/2014
Number of Days to Update: 42

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Semi-Annually

INDIAN UST R7: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 02/28/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 43

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Varies

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 07/29/2013
Date Data Arrived at EDR: 08/01/2013
Date Made Active in Reports: 11/01/2013
Number of Days to Update: 92

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Quarterly

INDIAN UST R9: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 07/29/2013
Date Data Arrived at EDR: 07/30/2013
Date Made Active in Reports: 12/06/2013
Number of Days to Update: 129

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Quarterly

INDIAN UST R10: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 02/05/2013	Source: EPA Region 10
Date Data Arrived at EDR: 02/06/2013	Telephone: 206-553-2857
Date Made Active in Reports: 04/12/2013	Last EDR Contact: 01/27/2014
Number of Days to Update: 65	Next Scheduled EDR Contact: 05/12/2014
	Data Release Frequency: Quarterly

FEMA UST: Underground Storage Tank Listing

A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010	Source: FEMA
Date Data Arrived at EDR: 02/16/2010	Telephone: 202-646-5797
Date Made Active in Reports: 04/12/2010	Last EDR Contact: 04/15/2014
Number of Days to Update: 55	Next Scheduled EDR Contact: 07/28/2014
	Data Release Frequency: Varies

State and tribal institutional control / engineering control registries

ENG CONTROLS: Engineering Control Sites

A listing of sites with engineering controls in place.

Date of Government Version: 01/04/2014	Source: Department of Health
Date Data Arrived at EDR: 02/26/2014	Telephone: 404-586-4249
Date Made Active in Reports: 03/07/2014	Last EDR Contact: 02/26/2014
Number of Days to Update: 9	Next Scheduled EDR Contact: 06/09/2014
	Data Release Frequency: Varies

INST CONTROL: Sites with Institutional Controls

Voluntary Remediation Program and Brownfields sites with institutional controls in place.

Date of Government Version: 01/04/2014	Source: Department of Health
Date Data Arrived at EDR: 02/26/2014	Telephone: 808-586-4249
Date Made Active in Reports: 03/07/2014	Last EDR Contact: 02/26/2014
Number of Days to Update: 9	Next Scheduled EDR Contact: 06/09/2014
	Data Release Frequency: Varies

State and tribal voluntary cleanup sites

INDIAN VCP R1: Voluntary Cleanup Priority Listing

A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 09/17/2013	Source: EPA, Region 1
Date Data Arrived at EDR: 10/01/2013	Telephone: 617-918-1102
Date Made Active in Reports: 12/06/2013	Last EDR Contact: 04/01/2014
Number of Days to Update: 66	Next Scheduled EDR Contact: 07/14/2014
	Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008	Source: EPA, Region 7
Date Data Arrived at EDR: 04/22/2008	Telephone: 913-551-7365
Date Made Active in Reports: 05/19/2008	Last EDR Contact: 04/20/2009
Number of Days to Update: 27	Next Scheduled EDR Contact: 07/20/2009
	Data Release Frequency: Varies

VCP: Voluntary Response Program Sites

Sites participating in the Voluntary Response Program. The purpose of the VRP is to streamline the cleanup process in a way that will encourage prospective developers, lenders, and purchasers to voluntarily cleanup properties.

Date of Government Version: 01/04/2014
Date Data Arrived at EDR: 02/26/2014
Date Made Active in Reports: 03/07/2014
Number of Days to Update: 9

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 02/26/2014
Next Scheduled EDR Contact: 06/09/2014
Data Release Frequency: Varies

State and tribal Brownfields sites

BROWNFIELDS: Brownfields Sites

With certain legal exclusions and additions, the term ‘brownfield site’ means real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

Date of Government Version: 01/04/2014
Date Data Arrived at EDR: 02/26/2014
Date Made Active in Reports: 03/07/2014
Number of Days to Update: 9

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 02/26/2014
Next Scheduled EDR Contact: 06/09/2014
Data Release Frequency: Varies

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 03/20/2014
Date Data Arrived at EDR: 03/20/2014
Date Made Active in Reports: 04/09/2014
Number of Days to Update: 20

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 03/20/2014
Next Scheduled EDR Contact: 07/07/2014
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: No Update Planned

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands
Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 11/04/2013
Next Scheduled EDR Contact: 02/17/2014
Data Release Frequency: Varies

Local Lists of Hazardous waste / Contaminated Sites

US CDL: Clandestine Drug Labs
A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 12/04/2013
Date Data Arrived at EDR: 12/10/2013
Date Made Active in Reports: 02/13/2014
Number of Days to Update: 65

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/04/2014
Next Scheduled EDR Contact: 06/16/2014
Data Release Frequency: Quarterly

CDL: Clandestine Drug Lab Listing
A listing of clandestine drug lab site locations.

Date of Government Version: 08/04/2010
Date Data Arrived at EDR: 09/10/2010
Date Made Active in Reports: 10/22/2010
Number of Days to Update: 42

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 03/03/2014
Next Scheduled EDR Contact: 06/16/2014
Data Release Frequency: Varies

US HIST CDL: National Clandestine Laboratory Register
A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 09/01/2007
Date Data Arrived at EDR: 11/19/2008
Date Made Active in Reports: 03/30/2009
Number of Days to Update: 131

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/04/2014
Next Scheduled EDR Contact: 06/16/2014
Data Release Frequency: No Update Planned

Local Land Records

LIENS 2: CERCLA Lien Information
A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/06/2013
Date Data Arrived at EDR: 04/25/2013
Date Made Active in Reports: 05/10/2013
Number of Days to Update: 15

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 01/27/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Varies

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System
Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 01/03/2014
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 52

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 04/01/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Annually

SPILLS: Release Notifications
Releases of hazardous substances to the environment reported to the Office of Hazard Evaluation and Emergency Response since 1988.

Date of Government Version: 01/04/2014
Date Data Arrived at EDR: 02/26/2014
Date Made Active in Reports: 03/10/2014
Number of Days to Update: 12

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 02/26/2014
Next Scheduled EDR Contact: 06/09/2014
Data Release Frequency: Varies

SPILLS 90: SPILLS90 data from FirstSearch
Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 03/10/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/11/2013
Number of Days to Update: 39

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Other Ascertainable Records

RCRA NonGen / NLR: RCRA - Non Generators
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 03/11/2014
Date Data Arrived at EDR: 03/13/2014
Date Made Active in Reports: 04/09/2014
Number of Days to Update: 27

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/13/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Varies

DOT OPS: Incident and Accident Data
Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/07/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 42

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 02/06/2014
Next Scheduled EDR Contact: 05/19/2014
Data Release Frequency: Varies

DOD: Department of Defense Sites
This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 01/15/2014
Next Scheduled EDR Contact: 04/28/2014
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites
The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 02/26/2013
Date Made Active in Reports: 03/13/2013
Number of Days to Update: 15

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 03/10/2014
Next Scheduled EDR Contact: 06/23/2014
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees
Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 01/24/2014
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 31

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 03/27/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Varies

ROD: Records Of Decision
Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 11/25/2013
Date Data Arrived at EDR: 12/12/2013
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 74

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 03/11/2014
Next Scheduled EDR Contact: 06/23/2014
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites
Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 02/25/2014
Next Scheduled EDR Contact: 06/09/2014
Data Release Frequency: Varies

US MINES: Mines Master Index File
Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 08/01/2013
Date Data Arrived at EDR: 09/05/2013
Date Made Active in Reports: 10/03/2013
Number of Days to Update: 28

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 03/05/2014
Next Scheduled EDR Contact: 06/16/2014
Data Release Frequency: Semi-Annually

TRIS: Toxic Chemical Release Inventory System
Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 07/31/2013
Date Made Active in Reports: 09/13/2013
Number of Days to Update: 44

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 02/26/2014
Next Scheduled EDR Contact: 06/09/2014
Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2006
Date Data Arrived at EDR: 09/29/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 64

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 03/28/2014
Next Scheduled EDR Contact: 07/07/2014
Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 02/24/2014
Next Scheduled EDR Contact: 06/09/2014
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 02/24/2014
Next Scheduled EDR Contact: 06/09/2014
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing

A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing

A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 01/28/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 07/20/2011
Date Data Arrived at EDR: 11/10/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 10/09/2014
Next Scheduled EDR Contact: 07/21/2014
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 06/01/2013
Date Data Arrived at EDR: 07/17/2013
Date Made Active in Reports: 11/01/2013
Number of Days to Update: 107

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 01/28/2014
Next Scheduled EDR Contact: 04/28/2014
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 07/22/2013
Date Data Arrived at EDR: 08/02/2013
Date Made Active in Reports: 11/01/2013
Number of Days to Update: 91

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 03/10/2014
Next Scheduled EDR Contact: 06/23/2014
Data Release Frequency: Quarterly

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 01/09/2014
Date Data Arrived at EDR: 01/10/2014
Date Made Active in Reports: 03/12/2014
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 04/09/2014
Next Scheduled EDR Contact: 07/21/2014
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 11/18/2013	Source: EPA
Date Data Arrived at EDR: 02/27/2014	Telephone: (415) 947-8000
Date Made Active in Reports: 03/12/2014	Last EDR Contact: 03/14/2014
Number of Days to Update: 13	Next Scheduled EDR Contact: 06/23/2014
	Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995	Source: EPA
Date Data Arrived at EDR: 07/03/1995	Telephone: 202-564-4104
Date Made Active in Reports: 08/07/1995	Last EDR Contact: 06/02/2008
Number of Days to Update: 35	Next Scheduled EDR Contact: 09/01/2008
	Data Release Frequency: No Update Planned

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 11/01/2013	Source: Environmental Protection Agency
Date Data Arrived at EDR: 12/12/2013	Telephone: 202-564-8600
Date Made Active in Reports: 02/13/2014	Last EDR Contact: 01/27/2014
Number of Days to Update: 63	Next Scheduled EDR Contact: 05/12/2014
	Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2011	Source: EPA/NTIS
Date Data Arrived at EDR: 02/26/2013	Telephone: 800-424-9346
Date Made Active in Reports: 04/19/2013	Last EDR Contact: 02/28/2014
Number of Days to Update: 52	Next Scheduled EDR Contact: 06/09/2014
	Data Release Frequency: Biennially

UIC: Underground Injection Wells Listing

A listing of underground injection well locations.

Date of Government Version: 02/07/2013	Source: Department of Health
Date Data Arrived at EDR: 02/12/2013	Telephone: 808-586-4258
Date Made Active in Reports: 04/09/2013	Last EDR Contact: 03/03/2014
Number of Days to Update: 56	Next Scheduled EDR Contact: 06/16/2014
	Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

DRYCLEANERS: Permitted Drycleaner Facility Listing
A listing of permitted drycleaner facilities in the state.

Date of Government Version: 01/01/2014
Date Data Arrived at EDR: 02/21/2014
Date Made Active in Reports: 03/07/2014
Number of Days to Update: 14

Source: Department of Health
Telephone: 808-586-4200
Last EDR Contact: 04/07/2014
Next Scheduled EDR Contact: 07/21/2014
Data Release Frequency: Varies

AIRS: List of Permitted Facilities
A listing of permitted facilities in the state.

Date of Government Version: 01/01/2014
Date Data Arrived at EDR: 02/21/2014
Date Made Active in Reports: 03/07/2014
Number of Days to Update: 14

Source: Department of Health
Telephone: 808-586-4200
Last EDR Contact: 04/07/2014
Next Scheduled EDR Contact: 07/21/2014
Data Release Frequency: Varies

INDIAN RESERV: Indian Reservations
This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 01/15/2014
Next Scheduled EDR Contact: 04/28/2014
Data Release Frequency: Semi-Annually

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing
The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011
Date Data Arrived at EDR: 03/09/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 54

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 01/20/2014
Next Scheduled EDR Contact: 05/05/2014
Data Release Frequency: Varies

LEAD SMELTER 1: Lead Smelter Sites
A listing of former lead smelter site locations.

Date of Government Version: 01/29/2013
Date Data Arrived at EDR: 02/14/2013
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 13

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 04/04/2014
Next Scheduled EDR Contact: 07/21/2014
Data Release Frequency: Varies

LEAD SMELTER 2: Lead Smelter Sites
A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 11/11/2011
Date Data Arrived at EDR: 05/18/2012
Date Made Active in Reports: 05/25/2012
Number of Days to Update: 7

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 02/14/2014
Next Scheduled EDR Contact: 05/26/2014
Data Release Frequency: Varies

PRP: Potentially Responsible Parties

A listing of verified Potentially Responsible Parties

Date of Government Version: 04/15/2013
Date Data Arrived at EDR: 07/03/2013
Date Made Active in Reports: 09/13/2013
Number of Days to Update: 72

Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 04/04/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Quarterly

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 01/15/2014
Next Scheduled EDR Contact: 04/28/2014
Data Release Frequency: N/A

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)

The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 10/23/2013
Date Data Arrived at EDR: 11/06/2013
Date Made Active in Reports: 12/06/2013
Number of Days to Update: 30

Source: EPA
Telephone: 202-564-5962
Last EDR Contact: 03/31/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Annually

US AIRS MINOR: Air Facility System Data

A listing of minor source facilities.

Date of Government Version: 10/23/2013
Date Data Arrived at EDR: 11/06/2013
Date Made Active in Reports: 12/06/2013
Number of Days to Update: 30

Source: EPA
Telephone: 202-564-5962
Last EDR Contact: 03/31/2014
Next Scheduled EDR Contact: 07/14/2014
Data Release Frequency: Annually

Financial Assurance: Financial Assurance Information Listing

A listing of financial assurance information for underground storage tank facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 01/23/2014
Date Data Arrived at EDR: 01/24/2014
Date Made Active in Reports: 03/07/2014
Number of Days to Update: 42

Source: Department of Health
Telephone: 808-586-4226
Last EDR Contact: 03/17/2014
Next Scheduled EDR Contact: 06/30/2014
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information

All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 02/25/2014
Date Data Arrived at EDR: 02/27/2014
Date Made Active in Reports: 04/09/2014
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 02/14/2014
Next Scheduled EDR Contact: 06/02/2014
Data Release Frequency: Quarterly

PCB TRANSFORMER: PCB Transformer Registration Database

The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011
Date Data Arrived at EDR: 10/19/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 83

Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 01/30/2014
Next Scheduled EDR Contact: 05/12/2014
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 08/17/2010
Date Data Arrived at EDR: 01/03/2011
Date Made Active in Reports: 03/21/2011
Number of Days to Update: 77

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 03/11/2014
Next Scheduled EDR Contact: 06/23/2014
Data Release Frequency: Varies

COAL ASH DOE: Sleam-Electric Plan Operation Data

A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 01/13/2014
Next Scheduled EDR Contact: 04/28/2014
Data Release Frequency: Varies

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 06/30/2013
Date Data Arrived at EDR: 08/13/2013
Date Made Active in Reports: 09/13/2013
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 02/10/2014
Next Scheduled EDR Contact: 05/26/2014
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR US Hist Auto Stat: EDR Exclusive Historic Gas Stations

EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR US Hist Cleaners: EDR Exclusive Historic Dry Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR US Hist Auto Stat: EDR Proprietary Historic Gas Stations - Cole

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: N/A
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR US Hist Cleaners: EDR Proprietary Historic Dry Cleaners - Cole

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: N/A
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LF: Recovered Government Archive Solid Waste Facilities List
The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health in Hawaii.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/17/2014
Number of Days to Update: 200

Source: Department of Health
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA HWS: Recovered Government Archive State Hazardous Waste Facilities List
The EDR Recovered Government Archive State Hazardous Waste database provides a list of SHWS incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health in Hawaii.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/08/2014
Number of Days to Update: 191

Source: Department of Health
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank
The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health in Hawaii.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/03/2014
Number of Days to Update: 186

Source: Department of Health
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Electric Power Transmission Line Data
Source: Rextag Strategies Corp.
Telephone: (281) 769-2247
U.S. Electric Transmission and Power Plants Systems Digital GIS Data

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

STREET AND ADDRESS INFORMATION

GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

IAO STREAM
IAO STREAM
WAILUKU, HI 96793

TARGET PROPERTY COORDINATES

Latitude (North):	20.8962 - 20˚ 53’ 46.32’’
Longitude (West):	156.4993 - 156˚ 29’ 57.48’’
Universal Tranverse Mercator:	Zone 4
UTM X (Meters):	760140.1
UTM Y (Meters):	2312549.0
Elevation:	161 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	20156-H4 KAHAKULOA, HI
Most Recent Revision:	Not reported
West Map:	20156-H5 NAPILI, HI
Most Recent Revision:	Not reported

EDR’s GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principal investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

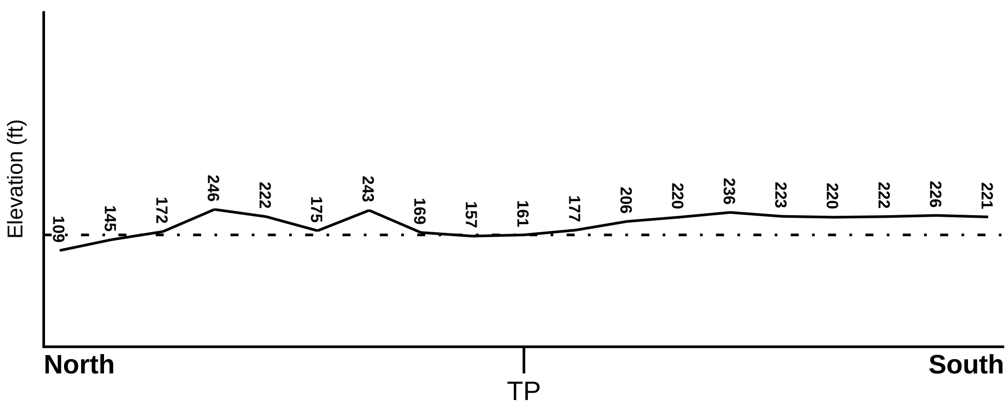
TOPOGRAPHIC INFORMATION

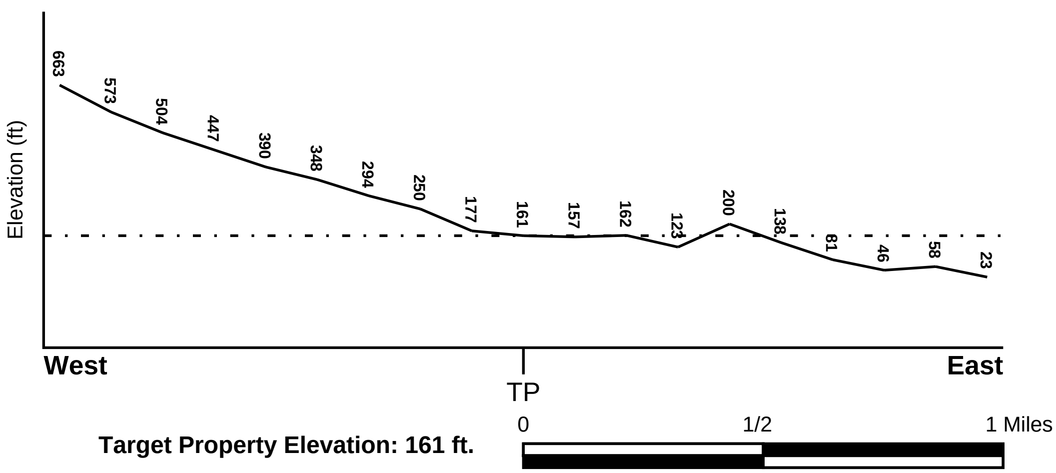
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General ENE

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES





Target Property Elevation: 161 ft.

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
MAUI, HI	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property: 1500030190D - FEMA Q3 Flood data

Additional Panels in search area: 1500030170B - FEMA Q3 Flood data

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
NOT AVAILABLE	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

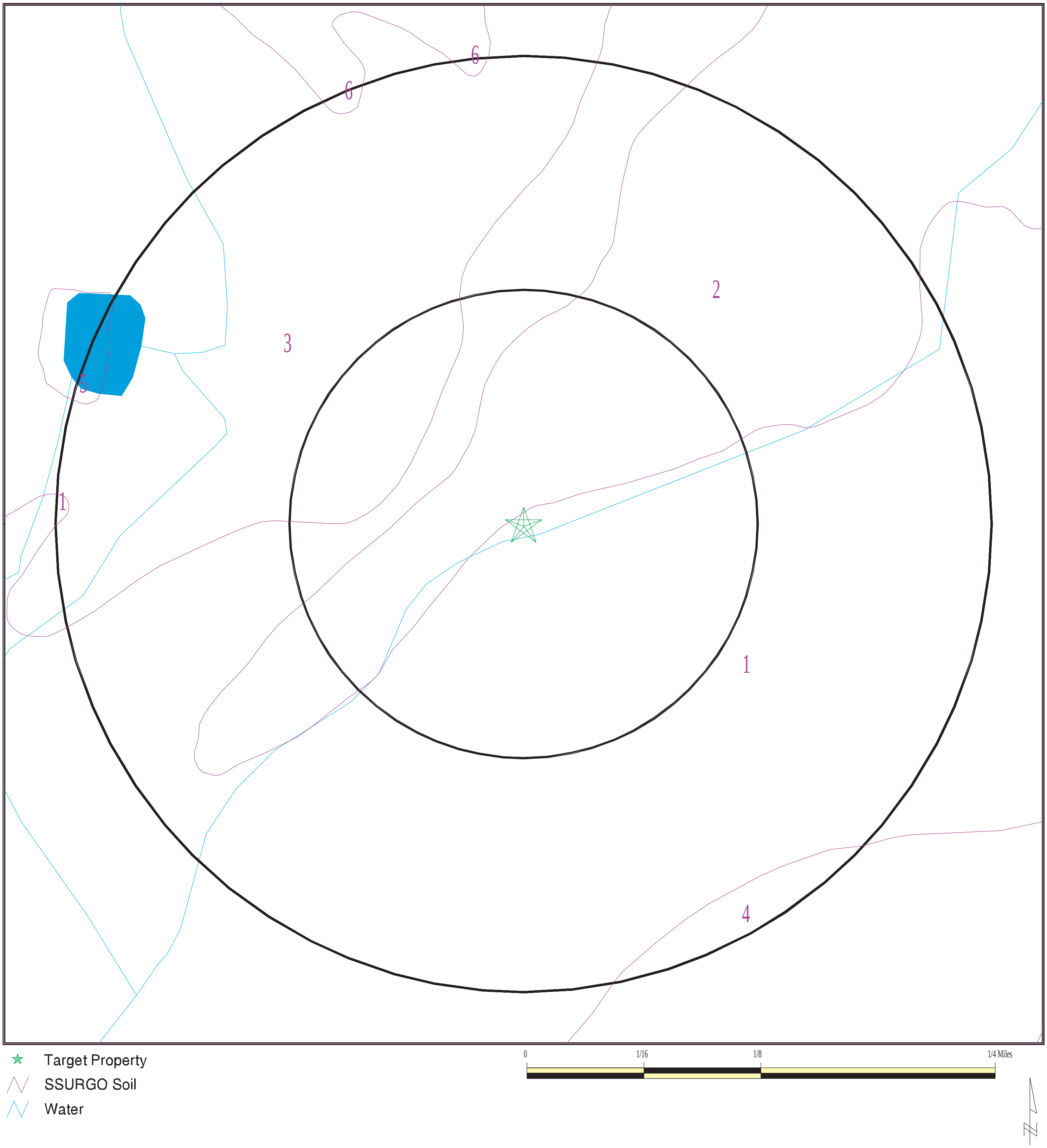
Era: -
System: -
Series: -
Code: N/A *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: -

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 3914751.2s



SITE NAME: Iao Stream	CLIENT: Environet
ADDRESS: Iao Stream	CONTACT: Taylor Chock
Wailuku HI 96793	INQUIRY #: 3914751.2s
LAT/LONG: 20.8962 / 156.4993	DATE: April 16, 2014 7:30 pm

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: Iao

Soil Surface Texture: cobbly silty clay

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
1	0 inches	14 inches	cobbly silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	ML-K (proposed)	Max: 14.11 Min: 1.41	Max: 7.3 Min: 6.6
2	14 inches	48 inches	clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	ML-K (proposed)	Max: 4.23 Min: 1.41	Max: 7.3 Min: 6.6
3	48 inches	59 inches	silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	ML-K (proposed)	Max: 14.11 Min: 1.41	Max: 7.3 Min: 6.6

Soil Map ID: 2

Soil Component Name: Pulehu

Soil Surface Texture: cobbly clay loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	**Upper**	**Lower**	**Soil Texture Class**	**AASHTO Group**	**Unified Soil**		**Soil Reaction (pH)**
1	0 inches	20 inches	cobbly clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4.23	Max: 7.3 Min: 6.6
2	20 inches	59 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 141 Min: 14.11	Max: 7.8 Min: 6.6

Soil Map ID: 3

Soil Component Name: Iao

Soil Surface Texture: clay

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
1	0 inches	14 inches	clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 14.11 Min: 1.41	Max: 7.3 Min: 6.6
2	14 inches	48 inches	clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 4.23 Min: 1.41	Max: 7.3 Min: 6.6
3	48 inches	59 inches	silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 14.11 Min: 1.41	Max: 7.3 Min: 6.6

Soil Map ID: 4

Soil Component Name: Wailuku

Soil Surface Texture: silty clay

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
1	0 inches	11 inches	silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 14 Min: 1.41	Max: 6.5 Min: 5.6
2	11 inches	59 inches	silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 4.23 Min: 0.42	Max: 6.5 Min: 5.6

Soil Map ID: 5

Soil Component Name: Water > 40 acres

Soil Surface Texture: silty clay

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class:
Hydric Status: Unknown

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

No Layer Information available.

Soil Map ID: 6

Soil Component Name: Puuone

Soil Surface Texture: sand

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Somewhat excessively drained

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	20 inches	sand	Granular materials (35 pct. or less passing No. 200), Fine Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 141 Min: 42.34	Max: 8.4 Min: 7.9
2	20 inches	40 inches	cemented material	Granular materials (35 pct. or less passing No. 200), Fine Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 14.11 Min: 4.23	Max: 8.5 Min: 8

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
A1	USGS40000269171	0 - 1/8 Mile SE

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
A2	USGS40000269170	0 - 1/8 Mile SSE
B5	USGS40000269164	1/2 - 1 Mile ESE
C8	USGS40000269173	1/2 - 1 Mile West
D11	USGS40000269158	1/2 - 1 Mile SE
D13	USGS40000269157	1/2 - 1 Mile SE
14	USGS40000269162	1/2 - 1 Mile ESE
E15	USGS40000269184	1/2 - 1 Mile WNW
D16	USGS40000269156	1/2 - 1 Mile SE
F18	USGS40000269159	1/2 - 1 Mile WSW
G24	USGS40000269188	1/2 - 1 Mile NW
H25	USGS40000269160	1/2 - 1 Mile WSW
G29	USGS40000269190	1/2 - 1 Mile NW
I30	USGS40000269145	1/2 - 1 Mile ESE
J31	USGS40000269154	1/2 - 1 Mile WSW
J35	USGS40000269152	1/2 - 1 Mile WSW
J36	USGS40000269149	1/2 - 1 Mile SW

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

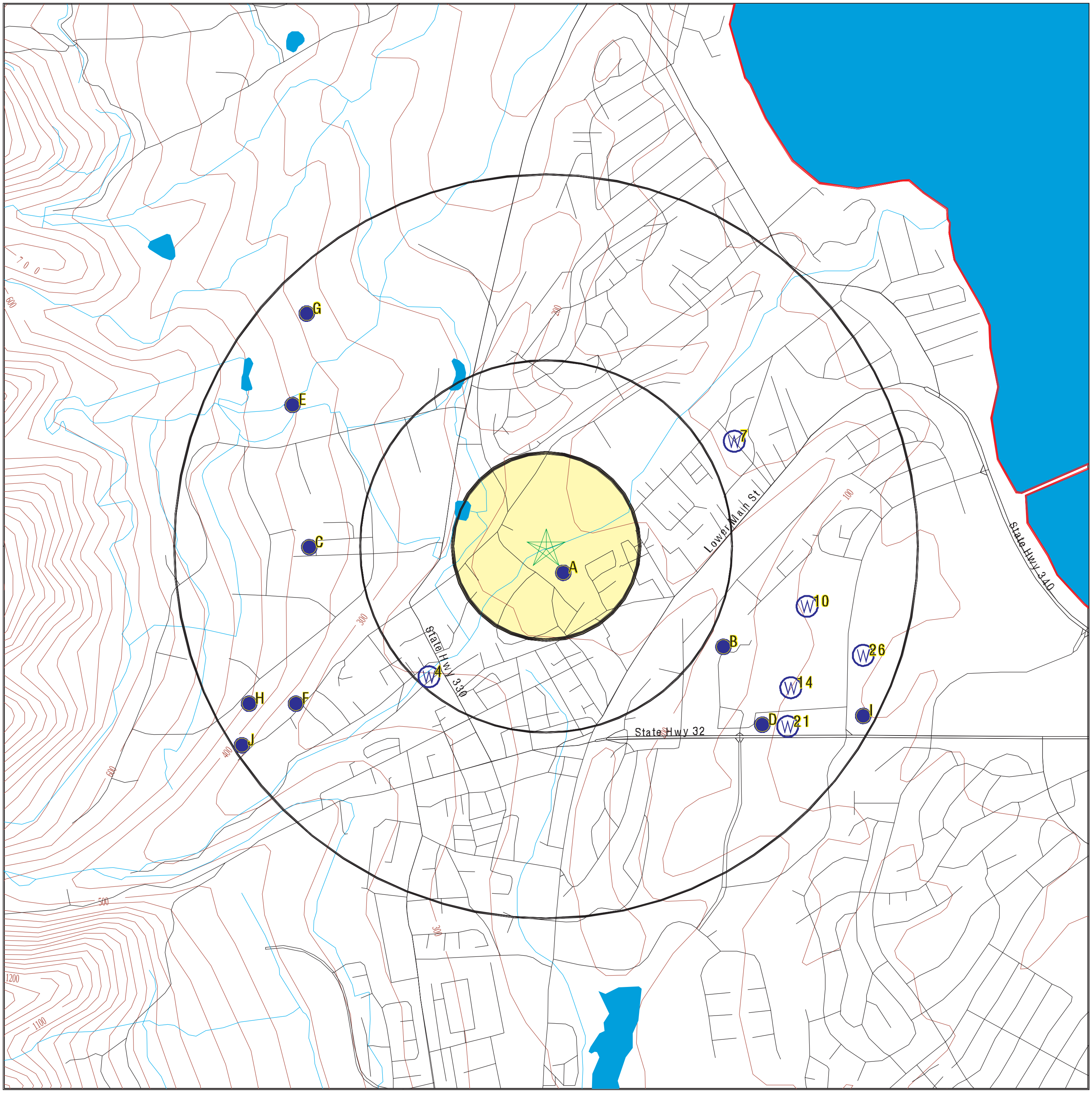
MAP ID	WELL ID	LOCATION FROM TP
G23	HI0000212	1/2 - 1 Mile NW

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
A3	HI8000000001574	0 - 1/8 Mile SSE
4	HI8000000001562	1/4 - 1/2 Mile SW
B6	HI8000000001568	1/2 - 1 Mile ESE
7	HI8000000001589	1/2 - 1 Mile ENE
C9	HI8000000001575	1/2 - 1 Mile West
10	HI8000000001573	1/2 - 1 Mile ESE
D12	HI8000000001552	1/2 - 1 Mile SE
D17	HI8000000001554	1/2 - 1 Mile SE
E19	HI8000000001594	1/2 - 1 Mile WNW
F20	HI8000000001559	1/2 - 1 Mile WSW
21	HI8000000001555	1/2 - 1 Mile SE
G22	HI8000000001603	1/2 - 1 Mile NW
26	HI8000000001565	1/2 - 1 Mile ESE
H27	HI8000000001558	1/2 - 1 Mile WSW
G28	HI8000000001606	1/2 - 1 Mile NW
J32	HI8000000001545	1/2 - 1 Mile SW
J33	HI8000000001548	1/2 - 1 Mile WSW
I34	HI8000000001556	1/2 - 1 Mile ESE

PHYSICAL SETTING SOURCE MAP - 3914751.2s



County Boundary
Major Roads
Contour Lines
Earthquake epicenter, Richter 5 or greater
Water Wells
Public Water Supply Wells
Cluster of Multiple Icons

0 1/4 1/2 1 Miles

Groundwater Flow Direction
Indeterminate Groundwater Flow at Location
Groundwater Flow Varies at Location

SITE NAME: Iao Stream ADDRESS: Iao Stream Wailuku HI 96793 LAT/LONG: 20.8962 / 156.4993	CLIENT: Environet CONTACT: Taylor Chock INQUIRY #: 3914751.2s DATE: April 16, 2014 7:30 pm

Map ID Direction Distance Elevation	Database	EDR ID Number
A1 **SE** **0 - 1/8 Mile** **Higher**	**FED USGS**	**USGS40000269171**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205355156300501		
Monloc name:	6-5330-04 Wailuku Well at Wailuku, Maui, HI		
Monloc type:	Well		
Monloc desc:	Former well name Maui T-113		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8954018
Longitude:	-156.498567	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Unknown		
Horiz coord refsys:	NAD83	Vert measure val:	180
Vert measure units:	feet	Vertacc measure val:	1
Vert accmeasure units:	feet		
Vertcollection method:	Reported		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	Not Reported	Welldepth:	705
Welldepth units:	ft	Wellholedepth:	705
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 0

Map ID Direction Distance Elevation	Database	EDR ID Number
A2 **SSE** **0 - 1/8 Mile** **Higher**	**FED USGS**	**USGS40000269170**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205354156300501		
Monloc name:	6-5330-04 Test Hole T-113, Wailuku Mill, Maui, HI		
Monloc type:	Well: Test hole not completed as a well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8951241
Longitude:	-156.498567	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	180
Vert measure units:	feet	Vertacc measure val:	10
Vert accmeasure units:	feet		
Vertcollection method:	Unknown		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		

Aquifer type:	Not Reported		
Construction date:	1945	Welldepth:	705
Welldepth units:	ft	Wellholedepth:	705
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 0

A3
SSE
0 - 1/8 Mile
Higher

HI WELLS HI8000000001574

Objectid:	3450	Wid:	6-5330-004
Island:	Maui	Well name:	Wailuku Mill TH
Old name:	Not Reported		
Yr drilled:	1945		
Driller:	MULLIN		
Quad map:	5		
Long83dd:	-156.498611		
Lat83dd:	20.895		
Gps:	0	Utm:	-1
Owner user:	Wailuku Sugar	Old number:	113-TH
Well type:	ROT	Casing dia:	1
Ground el:	180		
Well depth:	705		
Solid case:	663	Perf case:	705
Use:	OBS - Observation	Use year:	Not Reported
Init head:	16.4	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	22		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	0		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	TW		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	-525
Bot solid:	-483	Bot perf:	-525
Spec capac:	Not Reported		
Pump mgd:	0		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	(2) 3-4-020:084
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	01-JAN-45
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001574

4
SW
1/4 - 1/2 Mile
Higher

HI WELLS HI8000000001562

Objectid:	3448	Wid:	6-5330-002
Island:	Maui	Well name:	Iao Tunnel (Puako)
Old name:	Not Reported		
Yr drilled:	1900		
Driller:	Not Reported		
Quad map:	5		
Long83dd:	-156.504167		
Lat83dd:	20.891111		
Gps:	0	Utm:	-1
Owner user:	Hawaiian Commercial & Sugar Co. (HC&S)	Old number:	10-TU
Well type:	TUN	Casing dia:	Not Reported
Ground el:	240		
Well depth:	0		
Solid case:	Not Reported	Perf case:	Not Reported
Use:	IRR - Irrigation (non-domestic, non-agriculture)	Use year:	Not Reported
Init head:	240	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	0		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	0		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	RA		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	Not Reported
Bot solid:	Not Reported	Bot perf:	Not Reported
Spec capac:	Not Reported		
Pump mgd:	0		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	(2) 3-4-033:000
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	02-JAN-00
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001562

B5
ESE
1/2 - 1 Mile
Higher

FED USGS **USGS40000269164**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205344156294101		
Monloc name:	6-5329.06 -17		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8923465
Longitude:	-156.4919007	Sourcemap scale:	24000
Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	180.00
Vert measure units:	feet	Vertacc measure val:	5
Vert accmeasure units:	feet		
Vertcollection method:	Interpolated from topographic map		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		

Aquifer type:	Not Reported		
Construction date:	19690101	Welldepth:	122
Welldepth units:	ft	Wellholedepth:	122
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 0

B6
ESE
1/2 - 1 Mile
Higher

HI WELLS **HI8000000001568**

Objectid:	3442	Wid:	6-5329-017
Island:	Maui	Well name:	Wailuku Arm
Old name:	Not Reported		
Yr drilled:	1969		
Driller:	ROSCOE MOSS		
Quad map:	5		
Long83dd:	-156.491944444		
Lat83dd:	20.8922222222		
Gps:	0	Utm:	-1
Owner user:	U S Army	Old number:	Not Reported
Well type:	PER	Casing dia:	8
Ground el:	180		
Well depth:	122		
Solid case:	102	Perf case:	Not Reported
Use:	UNU - Unused	Use year:	Not Reported
Init head:	Not Reported	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	0		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	0		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	Not Reported		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	58
Bot solid:	78	Bot perf:	Not Reported
Spec capac:	Not Reported		
Pump mgd:	0		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	Not Reported
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	04-APR-69
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001568

7
ENE
1/2 - 1 Mile
Lower

HI WELLS **HI8000000001589**

Objectid:	3528	Wid:	6-5429-002
Island:	Maui	Well name:	Papohaku Park
Old name:	Not Reported		
Yr drilled:	1991		
Driller:	ROSCOE MOSS		
Quad map:	5		
Long83dd:	-156.491472		
Lat83dd:	20.900306		
Gps:	0	Utm:	-1
Owner user:	Maui Parks & Recreation	Old number:	Not Reported
Well type:	PER	Casing dia:	8
Ground el:	85		
Well depth:	140		
Solid case:	80	Perf case:	110
Use:	IRR - Parks	Use year:	Not Reported
Init head:	24.71	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	60		
Test date:	6/4/1991	Test gpm:	150
Test ddown:	0.5	Test chlor:	60
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	150		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	RA		
Pump yr:	1991		
Draft yr:	Not Reported	Bot hole:	-55
Bot solid:	5	Bot perf:	-25
Spec capac:	300		
Pump mgd:	.21		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	(2) 3-4-030:015
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	07-JUN-91
Pir:	7/7/1991	Surveyor:	Not Reported
T:	140	Site id:	HI8000000001589

C8
West
1/2 - 1 Mile
Higher

FED USGS **USGS40000269173**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205358156304301		
Monloc name:	6-5330-12 Puuohala TH-C, Maui, HI		
Monloc type:	Well: Test hole not completed as a well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8962353
Longitude:	-156.5091223	Sourcemap scale:	24000
Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	397.66
Vert measure units:	feet	Vertacc measure val:	.01
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		

Aquifer type:	Not Reported		
Construction date:	19750813	Welldepth:	610
Welldepth units:	ft	Wellholedepth:	610
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1975-08-12	14.40	

C9
West
1/2 - 1 Mile
Higher

HI WELLS **HI8000000001575**

Objectid:	3458	Wid:	6-5330-012
Island:	Maui	Well name:	Puuohala TH-C
Old name:	Not Reported		
Yr drilled:	1975		
Driller:	CONTINENTAL		
Quad map:	5		
Long83dd:	-156.509166667		
Lat83dd:	20.8961111111		
Gps:	0	Utm:	-1
Owner user:	Wailuku Sugar	Old number:	Not Reported
Well type:	Not Reported	Casing dia:	1
Ground el:	398		
Well depth:	610		
Solid case:	400	Perf case:	610
Use:	UNU - Unused	Use year:	Not Reported
Init head:	16.7	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	0		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	0		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	TW		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	-212
Bot solid:	-2	Bot perf:	-212
Spec capac:	Not Reported		
Pump mgd:	0		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	Not Reported
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	12-AUG-75
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001575

10
ESE
1/2 - 1 Mile
Lower

HI WELLS **HI8000000001573**

Objectid:	3439	Wid:	6-5329-014
Island:	Maui	Well name:	War Memorial Footbal
Old name:	Not Reported		
Yr drilled:	1970		
Driller:	OCEAN VIEW		
Quad map:	5		
Long83dd:	-156.488444		
Lat83dd:	20.893861		
Gps:	0	Utm:	-1
Owner user:	Maui Parks & Recreation	Old number:	17-1
Well type:	ROT	Casing dia:	Not Reported
Ground el:	120		
Well depth:	128		
Solid case:	106	Perf case:	Not Reported
Use:	IRR - Parks	Use year:	Not Reported
Init head:	Not Reported	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	285		
Test date:	Not Reported	Test gpm:	300
Test ddown:	Not Reported	Test chlor:	74
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	300		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	THO		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	-8
Bot solid:	14	Bot perf:	Not Reported
Spec capac:	Not Reported		
Pump mgd:	.288		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	(2) 3-8-007:055
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	01-JAN-70
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001573

D11
SE
1/2 - 1 Mile
Lower

FED USGS **USGS40000269158**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205333156293701		
Monloc name:	6-5329-06 T105		
Monloc type:	Well: Test hole not completed as a well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8892913
Longitude:	-156.4907896	Sourcemap scale:	24000
Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	120.00
Vert measure units:	feet	Vertacc measure val:	5
Vert accmeasure units:	feet		
Vertcollection method:	Interpolated from topographic map		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		

Aquifer type:	Not Reported		
Construction date:	19390101	Welldepth:	131
Welldepth units:	ft	Wellholedepth:	131
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 0

D12
SE
1/2 - 1 Mile
Lower

HI WELLS **HI8000000001552**

Objectid:	3431	Wid:	6-5329-006
Island:	Maui	Well name:	Baldwin High TH
Old name:	Not Reported		
Yr drilled:	1939		
Driller:	JM HEIZER		
Quad map:	5		
Long83dd:	-156.490833333		
Lat83dd:	20.8891666667		
Gps:	0	Utm:	-1
Owner user:	Maui County	Old number:	105-TH
Well type:	ROT	Casing dia:	1
Ground el:	120		
Well depth:	131		
Solid case:	131	Perf case:	Not Reported
Use:	UNU - Unused	Use year:	Not Reported
Init head:	5.9	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	152		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	0		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	THO		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	-11
Bot solid:	-11	Bot perf:	Not Reported
Spec capac:	Not Reported		
Pump mgd:	0		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	Not Reported
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	01-JAN-39
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001552

D13
SE
1/2 - 1 Mile
Lower

FED USGS **USGS40000269157**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205333156293601		
Monloc name:	6-5329-05 W19B		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8892913
Longitude:	-156.4905118	Sourcemap scale:	24000
Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	120.00
Vert measure units:	feet	Vertacc measure val:	5
Vert accmeasure units:	feet		
Vertcollection method:	Interpolated from topographic map		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19630101	Welldepth:	Not Reported
Welldepth units:	Not Reported	Wellholedepth:	Not Reported
Wellholedepth units:	Not Reported		

Ground-water levels, Number of Measurements: 0

14
ESE
1/2 - 1 Mile
Lower

FED USGS **USGS40000269162**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205338156293101		
Monloc name:	6-5329-14 W17-1		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.89068
Longitude:	-156.489123	Sourcemap scale:	24000
Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	120.00
Vert measure units:	feet	Vertacc measure val:	5
Vert accmeasure units:	feet		
Vertcollection method:	Interpolated from topographic map		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19700101	Welldepth:	128
Welldepth units:	ft	Wellholedepth:	Not Reported
Wellholedepth units:	Not Reported		

Ground-water levels, Number of Measurements: 0

Map ID Direction Distance Elevation	Database	EDR ID Number
E15 **WNW** **1/2 - 1 Mile** **Higher**	**FED USGS**	**USGS40000269184**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205419156304401		
Monloc name:	6-5430-03 TH-E Waiehu, Maui, HI		
Monloc type:	Well: Test hole not completed as a well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.9020682
Longitude:	-156.5094	Sourcemap scale:	24000
Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	415.0
Vert measure units:	feet	Vertacc measure val:	.5
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Hawaii volcanic-rock aquifers		
Formation type:	Wailuku Volcanic Series, Lava Flows		
Aquifer type:	Not Reported		
Construction date:	19760204	Welldepth:	580
Welldepth units:	ft	Wellholedepth:	580
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 176

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
2004-08-18		9.88	2004-07-12		10.55
2004-05-13		11.22	2004-04-02		11.15
2004-02-10		10.72	2004-01-07		9.58
2003-11-13		8.89	2003-10-02		8.86
2003-08-19		10.31			
2003-07-10		10.71			

Note: Other conditions existed that would affect the measured water level.

2003-05-14		10.81

Note: Other conditions existed that would affect the measured water level.

2003-03-31		11.66

Note: Other conditions existed that would affect the measured water level.

2003-02-11		11.79

Note: Other conditions existed that would affect the measured water level.

2003-01-07		11.08

Note: Other conditions existed that would affect the measured water level.

2002-11-18		10.72

Note: Other conditions existed that would affect the measured water level.

2002-10-01		9.53

Note: Other conditions existed that would affect the measured water level.

2002-08-20		9.70

Note: Other conditions existed that would affect the measured water level.

2002-07-02		10.82

Note: Other conditions existed that would affect the measured water level.

2002-05-14		12.10

Note: Other conditions existed that would affect the measured water level.

Ground-water levels, continued.

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
2002-04-02		11.96			
Note: Other conditions existed that would affect the measured water level.					
2002-02-21		12.27			
Note: Other conditions existed that would affect the measured water level.					
2002-01-08		11.55			
Note: Other conditions existed that would affect the measured water level.					
2001-12-04		10.50			
Note: Other conditions existed that would affect the measured water level.					
2001-10-16		9.43	2001-08-21		9.22
2001-07-03		9.75	2001-05-15		10.08
2001-04-03		10.47	2001-03-08		10.87
2001-01-09		11.30	2000-12-07		11.10
2000-10-03		10.29	2000-08-24		9.98
2000-07-06		10.15	2000-05-16		11.03
2000-04-04		11.12	2000-02-16		11.71
2000-01-04		10.84	1999-11-19		9.52
1999-10-01		9.08	1999-08-24		9.27
1999-07-01		10.32	1999-05-18		11.35
1999-03-30		12.55	1999-03-09		12.97
1999-01-05		12.88	1998-12-01		12.34
1998-09-29		11.79	1998-08-24		11.64
1998-07-02		12.14	1998-05-26		11.99
1998-04-02		12.40	1998-02-24		12.64
1998-01-05		13.05	1997-11-25		12.53
1997-10-01		11.34	1997-08-25		10.47
1997-08-06		9.97	1997-06-30		10.19
1997-05-27		10.80	1997-04-01		11.63
1997-02-24		11.35	1997-01-03		11.55
1996-11-25		11.27	1996-10-01		9.65
1996-08-26		9.96	1996-07-01		10.80
1996-05-29		11.70	1996-04-02		12.82
1996-02-12		13.34	1996-01-03		12.46
1995-11-21		11.54	1995-10-04		11.04
1995-08-07		11.50	1995-07-06		12.04
1995-05-12		13.97	1995-01-11		12.94
1994-10-05		12.11	1994-08-10		12.15
1994-06-17		13.10	1994-04-28		14.29
1994-03-17		14.60	1994-01-19		14.27
1993-12-01		14.06	1993-11-08		13.74
1993-08-23		13.23	1993-06-18		13.63
1993-04-29		14.38	1993-03-29		14.71
1993-01-26		15.47	1992-12-21		15.02
1992-11-05		14.71	1992-09-08		14.24
1992-07-22		14.47	1992-06-03		15.58
1992-04-24		15.72	1992-03-12		15.52
1992-01-22		16.61	1991-12-05		16.07
1991-10-17		15.47	1991-10-01		15.25
1991-09-04		14.4	1991-06-27		14.47
1991-05-23		15.45	1991-04-11		16.65
1991-03-04		16.95	1991-01-23		16.9
1990-11-28		16.38	1990-10-24		16.39
1990-08-22		16.86	1990-07-23		16.02
1990-05-29		18.31	1990-04-17		18.38
1990-03-07		19.51	1990-01-18		19.91
1989-11-27		19.86	1989-10-24		19.62

Ground-water levels, continued.

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
1989-09-21		18.85	1989-08-11		18.43
1989-07-18		18.3	1989-05-04		18.23
1989-03-03		19.38	1989-01-17		19.25
1988-12-01		18.22	1988-10-11		17.76
1988-09-13		17.93	1988-07-20		18.18
1988-05-18		18.73	1988-04-18		18.77
1988-02-23		19.04	1988-01-11		18.55
1987-11-23		17.58	1987-10-15		17.12
1987-08-17		16.75	1987-07-14		16.8
1987-05-20		17.16	1987-04-13		16.65
1987-02-25		17.28	1987-01-13		16.95
1986-11-21		16.06	1986-10-09		15.6
1986-08-22		15.06	1986-07-08		15.04
1986-05-16		15.19	1986-04-22		15.38
1986-02-28		15.76	1986-01-16		15.87
1985-11-29		15.67	1985-10-11		14.67
1985-09-16		14.88	1985-08-28		14.86
1985-07-05		15.09	1985-05-15		15.54
1985-03-29		16.07	1985-02-12		16.21
1985-01-03		16.08	1984-11-01		15.65
1984-10-18		15.77	1984-08-14		16.02
1984-07-03		16.43	1984-05-22		17.09
1984-04-09		17.46	1984-03-01		17.83
1983-12-06		18.16	1983-10-19		18.13
1983-08-24		18.24	1983-07-13		18.77
1983-06-15		19.35	1983-05-25		19.55
1983-04-14		20.35	1983-03-02		21.22
1983-01-18		22.03	1982-12-02		21.85
1982-11-02		21.37	1982-10-14		20.84
1982-08-06		19.57			

D16
SE
1/2 - 1 Mile
Lower

FED USGS **USGS40000269156**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205333156293301		
Monloc name:	6-5329-04 W19A		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8892913
Longitude:	-156.4896785	Sourcemap scale:	24000
Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	80.00
Vert measure units:	feet	Vertacc measure val:	5
Vert accmeasure units:	feet		
Vertcollection method:	Interpolated from topographic map		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		

Aquifer type:	Not Reported		
Construction date:	19630101	Welldepth:	110
Welldepth units:	ft	Wellholedepth:	Not Reported
Wellholedepth units:	Not Reported		

Ground-water levels, Number of Measurements: 0

D17
SE
1/2 - 1 Mile
Lower

HI WELLS **HI8000000001554**

Objectid:	3429	Wid:	6-5329-004
Island:	Maui	Well name:	Maui Stadium Well
Old name:	Not Reported		
Yr drilled:	1971		
Driller:	PAUL SMITH		
Quad map:	5		
Long83dd:	-156.489722		
Lat83dd:	20.889167		
Gps:	0	Utm:	-1
Owner user:	Maui Parks & Recreation	Old number:	Not Reported
Well type:	ROT	Casing dia:	8
Ground el:	80		
Well depth:	110		
Solid case:	Not Reported	Perf case:	Not Reported
Use:	UNU - Unused	Use year:	Not Reported
Init head:	Not Reported	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	0		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	250		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	THO		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	-30
Bot solid:	Not Reported	Bot perf:	Not Reported
Spec capac:	Not Reported		
Pump mgd:	.36		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	(2) 3-8-007:055
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	30-DEC-99
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001554

F18
WSW
1/2 - 1 Mile
Higher

FED USGS **USGS40000269159**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205336156304501		
Monloc name:	6-5330-06 Mokuhau Test Hole Ex-1, Maui, HI		
Monloc type:	Well: Test hole not completed as a well		
Monloc desc:	alternate well name 15C		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8901248
Longitude:	-156.5096778	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	309.6
Vert measure units:	feet	Vertacc measure val:	.1
Vert accmeasure units:	feet		
Vertcollection method:	Reported		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19500803	Welldepth:	431
Welldepth units:	ft	Wellholedepth:	431
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 0

E19
WNW
1/2 - 1 Mile
Higher

HI WELLS **HI8000000001594**

Objectid:	3532	Wid:	6-5430-003
Island:	Maui	Well name:	Waiehu TH-E
Old name:	Not Reported		
Yr drilled:	1976		
Driller:	CONTINENTAL		
Quad map:	5		
Long83dd:	-156.510277778		
Lat83dd:	20.9013888889		
Gps:	-1	Utm:	0
Owner user:	Wailuku Agribusiness Co., Inc.	Old number:	Not Reported
Well type:	Not Reported	Casing dia:	3
Ground el:	415		
Well depth:	580		
Solid case:	Not Reported	Perf case:	Not Reported
Use:	OBS - Observation	Use year:	Not Reported
Init head:	14.4	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	0		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	0		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	TW		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	-165
Bot solid:	Not Reported	Bot perf:	Not Reported
Spec capac:	Not Reported		
Pump mgd:	0		

Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	(2) 3-3-002:001
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	01-JAN-76
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001594

F20
WSW
1/2 - 1 Mile
Higher

HI WELLS **HI8000000001559**

Objectid:	3452	Wid:	6-5330-006
Island:	Maui	Well name:	Mokuhau TH 1
Old name:	Not Reported		
Yr drilled:	1950		
Driller:	E MAUI IRRIG		
Quad map:	5		
Long83dd:	-156.509722		
Lat83dd:	20.89		
Gps:	0	Utm:	-1
Owner user:	Maui DWS	Old number:	15-C TH
Well type:	ROT	Casing dia:	1
Ground el:	310		
Well depth:	431		
Solid case:	391	Perf case:	431
Use:	OBS - Observation	Use year:	Not Reported
Init head:	27.3	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	280		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	0		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	TW		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	-121
Bot solid:	-81	Bot perf:	-121
Spec capac:	Not Reported		
Pump mgd:	0		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	(2) 3-4-035:023
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	01-JAN-50
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001559

21
SE
1/2 - 1 Mile
Lower

HI WELLS **HI8000000001555**

Objectid:	3430	Wid:	6-5329-005
Island:	Maui	Well name:	Baldwin High School
Old name:	Not Reported		
Yr drilled:	1971		
Driller:	Not Reported		
Quad map:	5		
Long83dd:	-156.48925		
Lat83dd:	20.889167		
Gps:	0	Utm:	-1
Owner user:	Maui Parks & Recreation	Old number:	19-B
Well type:	Not Reported	Casing dia:	Not Reported
Ground el:	120		
Well depth:	0		
Solid case:	Not Reported	Perf case:	Not Reported
Use:	IRR - Schools	Use year:	Not Reported
Init head:	Not Reported	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	0		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	280		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	THO		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	Not Reported
Bot solid:	Not Reported	Bot perf:	Not Reported
Spec capac:	Not Reported		
Pump mgd:	0		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	(2) 3-8-007:055
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	30-DEC-99
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001555

G22
NW
1/2 - 1 Mile
Higher

HI WELLS **HI8000000001603**

Objectid:	3530	Wid:	6-5430-001
Island:	Maui	Well name:	Waiehu Heights 1
Old name:	514		
Yr drilled:	1975		
Driller:	WAT RES INTL		
Quad map:	5		
Long83dd:	-156.508889		
Lat83dd:	20.905278		
Gps:	-1	Utm:	0
Owner user:	Maui DWS	Old number:	Not Reported
Well type:	ROT	Casing dia:	14
Ground el:	337		
Well depth:	675		
Solid case:	337	Perf case:	367
Use:	MUN - County	Use year:	Not Reported
Init head:	18	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	52		
Test date:	4/21/1975	Test gpm:	1300
Test ddown:	6.5	Test chlor:	51

Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	700		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	TW		
Pump yr:	2007		
Draft yr:	Not Reported	Bot hole:	-338
Bot solid:	0	Bot perf:	-30
Spec capac:	200		
Pump mgd:	1.008		
Draft mgd:	Not Reported	Pump elev:	-22
Pump depth:	359	Tmk:	(2) 3-3-002:028
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	01-MAY-75
Pir:	10/16/2007	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001603

G23
NW
1/2 - 1 Mile
Higher

FRDS PWS HI0000212

PWS ID: HI0000212
Date Initiated: Not Reported Date Deactivated: Not Reported
PWS Name: DWS WAILUKU
WAILUKU, MAUI, HI 96793

Addressee / Facility: System Owner/Responsible Party
MR. DAVID CRADDOCK, DIRECTOR
DEPARTMENT OF WATER SUPPLY
P.O. BOX 1109
WAILUKU, HI 96793

Addressee / Facility: Laboratory
MS. CARI CERIZO
DEPARTMENT OF WATER SUPPLY
614 PALAPALA DRIVE
KAHULUI, MAUI, HI 96732

Facility Latitude:	20 53 12.0000	Facility Longitude:	156 32 14.0000
Facility Latitude:	20 53 29.0000	Facility Longitude:	156 30 55.0000
Facility Latitude:	20 54 40.0000	Facility Longitude:	156 31 1.0000
Facility Latitude:	20 54 40.0000	Facility Longitude:	156 31 2.0000
Facility Latitude:	20 54 44.0000	Facility Longitude:	156 31 4.0000
Facility Latitude:	20 54 32.0000	Facility Longitude:	156 30 44.0000
Facility Latitude:	20 54 30.0000	Facility Longitude:	156 30 44.0000
Facility Latitude:	20 53 9.0000	Facility Longitude:	156 32 30.0000
Facility Latitude:	20 53 30.0000	Facility Longitude:	156 30 54.0000
City Served:	WAILUKU		
Treatment Class:	Treated	Population:	41691

Violations information not reported.

ENFORCEMENT INFORMATION:

Truedate:	03/31/2009	Pwsid:	HI0000212
Pwsname:	WAILUKU		
Retpopsrvd:	52200	Pwstypecod:	C
Vioid:	10101	Contaminant:	COLIFORM (TCR)
Viol. Type:	MCL, Monthly (TCR)		
Complperbe:	10/1/2000 0:00:00		
Complperen:	10/31/2000 0:00:00	Enfdate:	10/16/2000 0:00:00
Enf action:	State Violation/Reminder Notice		
Violmeasur:	Not Reported		

Truedate:	03/31/2009	Pwsid:	HI0000212
Pwsname:	WAILUKU		
Retpopsrvd:	52200	Pwstypecod:	C
Vioid:	10101	Contaminant:	COLIFORM (TCR)
Viol. Type:	MCL, Monthly (TCR)		
Complperbe:	10/1/2000 0:00:00		
Complperen:	10/31/2000 0:00:00	Enfdate:	10/16/2000 0:00:00
Enf action:	State Public Notif Requested		
Violmeasur:	Not Reported		

Truedate:	03/31/2009	Pwsid:	HI0000212
Pwsname:	WAILUKU		
Retpopsrvd:	52200	Pwstypecod:	C
Vioid:	10101	Contaminant:	COLIFORM (TCR)
Viol. Type:	MCL, Monthly (TCR)		
Complperbe:	10/1/2000 0:00:00		
Complperen:	10/31/2000 0:00:00	Enfdate:	10/19/2000 0:00:00
Enf action:	State Public Notif Issued		
Violmeasur:	Not Reported		

Truedate:	03/31/2009	Pwsid:	HI0000212
Pwsname:	WAILUKU		
Retpopsrvd:	52200	Pwstypecod:	C
Vioid:	10201	Contaminant:	COLIFORM (TCR)
Viol. Type:	MCL, Acute (TCR)		
Complperbe:	10/1/2000 0:00:00		
Complperen:	10/31/2000 0:00:00	Enfdate:	10/16/2000 0:00:00
Enf action:	State Violation/Reminder Notice		
Violmeasur:	Not Reported		

Truedate:	03/31/2009	Pwsid:	HI0000212
Pwsname:	WAILUKU		
Retpopsrvd:	52200	Pwstypecod:	C
Vioid:	10201	Contaminant:	COLIFORM (TCR)
Viol. Type:	MCL, Acute (TCR)		
Complperbe:	10/1/2000 0:00:00		
Complperen:	10/31/2000 0:00:00	Enfdate:	10/16/2000 0:00:00
Enf action:	State Public Notif Requested		
Violmeasur:	Not Reported		

Truedate:	03/31/2009	Pwsid:	HI0000212
Pwsname:	WAILUKU		
Retpopsrvd:	52200	Pwstypecod:	C
Vioid:	10201	Contaminant:	COLIFORM (TCR)
Viol. Type:	MCL, Acute (TCR)		
Complperbe:	10/1/2000 0:00:00		
Complperen:	10/31/2000 0:00:00	Enfdate:	10/19/2000 0:00:00
Enf action:	State Public Notif Issued		
Violmeasur:	Not Reported		

System Name:	WAILUKU		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/01/00 - 10/31/00		
Violation ID:	10101		
Enforcement Date:	10/16/00	Enf. Action:	State Public Notif Requested

ENFORCEMENT INFORMATION:

System Name:	WAILUKU		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/01/00 - 10/31/00		
Violation ID:	10101		
Enforcement Date:	10/16/00	Enf. Action:	State Violation/Reminder Notice
System Name:	WAILUKU		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/1/2000 0:00:00 - 10/31/2000 0:00:00		
Violation ID:	10101		
Enforcement Date:	10/19/2000 0:00:00	Enf. Action:	State Public Notif Issued
System Name:	WAILUKU		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/1/2000 0:00:00 - 10/31/2000 0:00:00		
Violation ID:	10101		
Enforcement Date:	10/16/2000 0:00:00	Enf. Action:	State Public Notif Requested
System Name:	WAILUKU		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/1/2000 0:00:00 - 10/31/2000 0:00:00		
Violation ID:	10101		
Enforcement Date:	10/16/2000 0:00:00	Enf. Action:	State Violation/Reminder Notice
System Name:	WAILUKU		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/01/00 - 10/31/00		
Violation ID:	10101		
Enforcement Date:	10/19/00	Enf. Action:	State Public Notif Issued
System Name:	WAILUKU		
Violation Type:	MCL, Acute (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/1/2000 0:00:00 - 10/31/2000 0:00:00		
Violation ID:	10201		
Enforcement Date:	10/16/2000 0:00:00	Enf. Action:	State Public Notif Requested
System Name:	WAILUKU		
Violation Type:	MCL, Acute (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/1/2000 0:00:00 - 10/31/2000 0:00:00		
Violation ID:	10201		
Enforcement Date:	10/16/2000 0:00:00	Enf. Action:	State Violation/Reminder Notice
System Name:	WAILUKU		
Violation Type:	MCL, Acute (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/1/2000 0:00:00 - 10/31/2000 0:00:00		
Violation ID:	10201		
Enforcement Date:	10/19/2000 0:00:00	Enf. Action:	State Public Notif Issued
System Name:	WAILUKU		
Violation Type:	MCL, Acute (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/01/00 - 10/31/00		
Violation ID:	10201		
Enforcement Date:	10/16/00	Enf. Action:	State Public Notif Requested

ENFORCEMENT INFORMATION:

System Name:	WAILUKU		
Violation Type:	MCL, Acute (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/01/00 - 10/31/00		
Violation ID:	10201		
Enforcement Date:	10/16/00	Enf. Action:	State Violation/Reminder Notice
System Name:	WAILUKU		
Violation Type:	MCL, Acute (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	10/01/00 - 10/31/00		
Violation ID:	10201		
Enforcement Date:	10/19/00	Enf. Action:	State Public Notif Issued

CONTACT INFORMATION:

Name:	WAILUKU	Population:	52200
Contact:	ENG, JEFFREY	Phone:	808-270-7816
Address:	Department of Water Supply		
Address 2:	200 South High Street		
	WAILUKU, HI 96793		

G24
NW
1/2 - 1 Mile
Higher

FED USGS **USGS40000269188**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205430156304401		
Monloc name:	6-5430-01 Waiehu Heights 1, Maui, HI		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.9051236
Longitude:	-156.5094	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	337.07
Vert measure units:	feet	Vertacc measure val:	.01
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19750416	Welldepth:	675
Welldepth units:	ft	Wellholedepth:	675
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1975-06-24	319.64	

Map ID Direction Distance Elevation	Database	EDR ID Number
H25 **WSW** **1/2 - 1 Mile** **Higher**	**FED USGS**	**USGS40000269160**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205336156305201		
Monloc name:	6-5330-07 Mokuhau Test Hole Ex-2, Maui, HI		
Monloc type:	Well: Test hole not completed as a well		
Monloc desc:	alternate well name 15D		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8901248
Longitude:	-156.5116222	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	484.23
Vert measure units:	feet	Vertacc measure val:	.01
Vert accmeasure units:	feet		
Vertcollection method:	Reported		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19510514	Welldepth:	585.4
Welldepth units:	ft	Wellholedepth:	585.4
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 0

Map ID Direction Distance Elevation	Database	EDR ID Number
26 **ESE** **1/2 - 1 Mile** **Lower**	**HI WELLS**	**HI8000000001565**

Objectid:	3445	Wid:	6-5329-020
Island:	Maui	Well name:	Maui Cent Park 2
Old name:	Not Reported		
Yr drilled:	1997		
Driller:	WAILANI DRLG		
Quad map:	5		
Long83dd:	-156.486111		
Lat83dd:	20.891944		
Gps:	0	Utm:	-1
Owner user:	Maui Parks & Recreation	Old number:	Not Reported
Well type:	ROT	Casing dia:	10
Ground el:	71		
Well depth:	110		
Solid case:	80	Perf case:	95
Use:	IRR - Parks	Use year:	Not Reported
Init head:	1.9	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	260		
Test date:	12/4/1997	Test gpm:	300
Test ddown:	6.3	Test chlor:	260

Test temp:	23.9	Test unit:	C
Pump gpm:	230		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	THO		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	-39
Bot solid:	-9	Bot perf:	-24
Spec capac:	48		
Pump mgd:	.331		
Draft mgd:	Not Reported	Pump elev:	-12
Pump depth:	83	Tmk:	(2) 3-8-007:001
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	04-DEC-97
Pir:	2/10/1998	Surveyor:	S D DUPONTE
T:	60357	Site id:	HI8000000001565

H27
WSW
1/2 - 1 Mile
Higher

HI WELLS HI8000000001558

Objectid:	3453	Wid:	6-5330-007
Island:	Maui	Well name:	Mokuhau TH 2
Old name:	Not Reported		
Yr drilled:	1951		
Driller:	E MAUI IRRIG		
Quad map:	5		
Long83dd:	-156.511667		
Lat83dd:	20.89		
Gps:	0	Utm:	-1
Owner user:	Maui DWS	Old number:	15-D TH
Well type:	ROT	Casing dia:	1
Ground el:	484		
Well depth:	585		
Solid case:	549	Perf case:	570
Use:	OBS - Observation	Use year:	Not Reported
Init head:	23.7	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	0		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	0		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	TW		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	-101
Bot solid:	-65	Bot perf:	-86
Spec capac:	Not Reported		
Pump mgd:	0		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	(2) 3-3-017:066
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	01-JAN-51
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001558

Map ID Direction Distance Elevation	Database	EDR ID Number
G28 **NW** **1/2 - 1 Mile** **Higher**	**HI WELLS**	**HI8000000001606**

Objectid:	3531	Wid:	6-5430-002
Island:	Maui	Well name:	Waiehu Heights 2
Old name:	514		
Yr drilled:	1975		
Driller:	WAT RES INTL		
Quad map:	5		
Long83dd:	-156.509167		
Lat83dd:	20.905556		
Gps:	-1	Utm:	0
Owner user:	Maui DWS	Old number:	Not Reported
Well type:	ROT	Casing dia:	14
Ground el:	337		
Well depth:	543		
Solid case:	337	Perf case:	367
Use:	MUN - County	Use year:	Not Reported
Init head:	18	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	20		
Test date:	5/29/1975	Test gpm:	1300
Test ddown:	21	Test chlor:	20
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	1250		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	TW		
Pump yr:	1998		
Draft yr:	Not Reported	Bot hole:	-206
Bot solid:	0	Bot perf:	-30
Spec capac:	62		
Pump mgd:	1.8		
Draft mgd:	Not Reported	Pump elev:	-23
Pump depth:	360	Tmk:	(2) 3-3-002:028
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	18-MAY-75
Pir:	10/26/2011	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001606

G29 **NW** **1/2 - 1 Mile** **Higher**	**FED USGS**	**USGS40000269190**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205432156304401		
Monloc name:	6-5430-02 Waiehu Heights 2, Maui, HI		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.9054013
Longitude:	-156.5094	Sourcemap scale:	24000

Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	337
Vert measure units:	feet	Vertacc measure val:	1
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19750425	Welldepth:	543
Welldepth units:	ft	Wellholedepth:	543
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 0

I30
ESE
1/2 - 1 Mile
Lower

FED USGS **USGS40000269145**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205323156291001		
Monloc name:	6-5329-19 Maui Central Park 1, Maui, HI		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8897222
Longitude:	-156.486111	Sourcemap scale:	24000
Horiz Acc measure:	3	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from Digital Map		
Horiz coord refsys:	NAD83	Vert measure val:	60
Vert measure units:	feet	Vertacc measure val:	40
Vert accmeasure units:	feet		
Vertcollection method:	Interpolated from topographic map		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19971118	Welldepth:	95
Welldepth units:	ft	Wellholedepth:	110
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 0

J31
WSW
1/2 - 1 Mile
Higher

FED USGS **USGS40000269154**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205331156305301		
Monloc name:	6-5330-08 W15E		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8887361
Longitude:	-156.5119	Sourcemap scale:	24000

Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	364.00
Vert measure units:	feet	Vertacc measure val:	5
Vert accmeasure units:	feet		
Vertcollection method:	Interpolated from topographic map		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19520101	Welldepth:	466
Welldepth units:	ft	Wellholedepth:	Not Reported
Wellholedepth units:	Not Reported		

Ground-water levels, Number of Measurements: 0

J32
SW
1/2 - 1 Mile
Higher

HI WELLS HI8000000001545

Objectid:	3457	Wid:	6-5330-011
Island:	Maui	Well name:	Mokuhau 3
Old name:	Not Reported		
Yr drilled:	1967		
Driller:	LAYNE INTL		
Quad map:	5		
Long83dd:	-156.511667		
Lat83dd:	20.888333		
Gps:	-1	Utm:	0
Owner user:	Maui DWS	Old number:	15-F
Well type:	ROT	Casing dia:	18
Ground el:	354		
Well depth:	605		
Solid case:	Not Reported	Perf case:	Not Reported
Use:	MUN - County	Use year:	Not Reported
Init head:	Not Reported	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	30		
Test date:	Not Reported	Test gpm:	4584
Test ddown:	13.4	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	4250		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	TW		
Pump yr:	1997		
Draft yr:	Not Reported	Bot hole:	-251
Bot solid:	Not Reported	Bot perf:	Not Reported
Spec capac:	342		
Pump mgd:	6.12		
Draft mgd:	Not Reported	Pump elev:	-7
Pump depth:	361	Tmk:	(2) 3-3-002:024
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	01-JAN-67
Pir:	10/10/2011	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001545

Map ID Direction Distance Elevation		Database	EDR ID Number
J33 **WSW** **1/2 - 1 Mile** **Higher**		**HI WELLS**	**HI8000000001548**

Objectid:	3454	Wid:	6-5330-008
Island:	Maui	Well name:	Mokuhau TH 3
Old name:	Not Reported		
Yr drilled:	1952		
Driller:	E MAUI IRRIG		
Quad map:	5		
Long83dd:	-156.511944		
Lat83dd:	20.888611		
Gps:	0	Utm:	-1
Owner user:	Maui DWS	Old number:	15-E TH
Well type:	ROT	Casing dia:	1
Ground el:	364		
Well depth:	466		
Solid case:	364	Perf case:	Not Reported
Use:	OBS - Observation	Use year:	Not Reported
Init head:	Not Reported	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	0		
Test date:	Not Reported	Test gpm:	Not Reported
Test ddown:	Not Reported	Test chlor:	Not Reported
Test temp:	Not Reported	Test unit:	Not Reported
Pump gpm:	0		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	TW		
Pump yr:	0		
Draft yr:	Not Reported	Bot hole:	-102
Bot solid:	0	Bot perf:	Not Reported
Spec capac:	Not Reported		
Pump mgd:	0		
Draft mgd:	Not Reported	Pump elev:	Not Reported
Pump depth:	Not Reported	Tmk:	(2) 3-3-017:068
Aqui code:	60102		
Latest hd:	Not Reported	Wcr:	01-JAN-52
Pir:	Not Reported	Surveyor:	Not Reported
T:	Not Reported	Site id:	HI8000000001548

I34 **ESE** **1/2 - 1 Mile** **Lower**		**HI WELLS**	**HI8000000001556**

Objectid:	3444	Wid:	6-5329-019
Island:	Maui	Well name:	Maui Cent Park 1
Old name:	Not Reported		
Yr drilled:	1997		
Driller:	WAILANI DRLG		
Quad map:	5		
Long83dd:	-156.486111		
Lat83dd:	20.889444		
Gps:	0	Utm:	-1
Owner user:	Maui Parks & Recreation	Old number:	Not Reported

Well type:	ROT	Casing dia:	10
Ground el:	76		
Well depth:	110		
Solid case:	80	Perf case:	95
Use:	IRR - Parks	Use year:	Not Reported
Init head:	2.5	Init head2:	Not Reported
Init head3:	Not Reported		
Init cl:	240		
Test date:	11/18/1997	Test gpm:	300
Test ddown:	1	Test chlor:	260
Test temp:	23.9	Test unit:	C
Pump gpm:	230		
Draft mgy:	Not Reported	Head feet:	Not Reported
Max chlor:	Not Reported	Min chlor:	Not Reported
Geology:	THO		
Pump yr:	1998		
Draft yr:	Not Reported	Bot hole:	-34
Bot solid:	-4	Bot perf:	-19
Spec capac:	300		
Pump mgd:	.331		
Draft mgd:	Not Reported	Pump elev:	-7
Pump depth:	83	Tmk:	(2) 3-8-007:001
Aqui code:	60301		
Latest hd:	Not Reported	Wcr:	18-NOV-97
Pir:	2/12/1998	Surveyor:	S D DUPONTE
T:	267200	Site id:	HI8000000001556

J35
WSW
1/2 - 1 Mile
Higher

FED USGS USGS40000269152

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205330156305401		
Monloc name:	6-5330-11 Mokuhau Pump 3, Maui, HI		
Monloc type:	Well		
Monloc desc:	former local no. W15F		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8884583
Longitude:	-156.5121778	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	354
Vert measure units:	feet	Vertacc measure val:	1
Vert accmeasure units:	feet		
Vertcollection method:	Interpolated from topographic map		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19670101	Welldepth:	580
Welldepth units:	ft	Wellholedepth:	Not Reported
Wellholedepth units:	Not Reported		

Ground-water levels, Number of Measurements: 0

Map ID Direction Distance Elevation	Database	EDR ID Number
J36 **SW** **1/2 - 1 Mile** **Higher**	**FED USGS**	**USGS40000269149**

Org. Identifier:	USGS-HI		
Formal name:	USGS Hawaii Water Science Center		
Monloc Identifier:	USGS-205329156305502		
Monloc name:	6-5330-09 Mokuhau Pump 2, Maui, HI		
Monloc type:	Well		
Monloc desc:	former local well no. W15A		
Huc code:	20020000	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	20.8880556
Longitude:	-156.5120278	Sourcemap scale:	24000
Horiz Acc measure:	.5	Horiz Acc measure units:	seconds
Horiz Collection method:	Global positioning system (GPS), uncorrected		
Horiz coord refsys:	NAD83	Vert measure val:	353.2
Vert measure units:	feet	Vertacc measure val:	.1
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	HILOCAL	Countrycode:	US
Aquifername:	Hawaii volcanic-rock aquifers		
Formation type:	Wailuku Volcanic Series, Lava Flows		
Aquifer type:	Not Reported		
Construction date:	19530501	Welldepth:	600
Welldepth units:	ft	Wellholedepth:	600
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 52

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
2004-08-18		6.93			
Note: A nearby site that taps the same aquifer was being pumped.					
2004-07-12		6.28			
Note: A nearby site that taps the same aquifer was being pumped.					
2004-05-13		7.08			
Note: A nearby site that taps the same aquifer was being pumped.					
2004-04-02		9.33			
Note: A nearby site that taps the same aquifer was being pumped.					
2004-02-10		8.69			
Note: A nearby site that taps the same aquifer was being pumped.					
2004-01-05		7.62			
Note: A nearby site that taps the same aquifer was being pumped.					
2003-11-13		8.19			
Note: The site had been pumped recently.					
2003-10-02		6.13			
Note: A nearby site that taps the same aquifer was being pumped.					
2003-08-19		5.60			
Note: A nearby site that taps the same aquifer was being pumped.					
2003-07-10		7.6			
Note: A nearby site that taps the same aquifer was being pumped.					
2003-05-14		7.30			
Note: A nearby site that taps the same aquifer was being pumped.					
2003-03-31		8.32			
Note: A nearby site that taps the same aquifer was being pumped.					

Ground-water levels, continued.

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
2003-02-11		9.21			
Note: Other conditions existed that would affect the measured water level.					
2003-01-07		9.91			
Note: Other conditions existed that would affect the measured water level.					
2002-11-19		7.10			
Note: Other conditions existed that would affect the measured water level.					
2002-10-01		6.68			
Note: A nearby site that taps the same aquifer was being pumped.					
2002-08-20		4.30			
Note: A nearby site that taps the same aquifer was being pumped.					
2002-07-02		8.11			
Note: A nearby site that taps the same aquifer was being pumped.					
2002-05-14		8.82			
Note: A nearby site that taps the same aquifer was being pumped.					
2002-04-02		10.73			
2002-02-21		9.50			
Note: A nearby site that taps the same aquifer was being pumped.					
2002-01-08		10.61			
Note: A nearby site that taps the same aquifer was being pumped.					
2001-12-04		9.84			
Note: A nearby site that taps the same aquifer had been pumped recently.					
2001-10-16		6.61			
Note: A nearby site that taps the same aquifer was being pumped.					
2001-08-21		5.74			
Note: A nearby site that taps the same aquifer was being pumped.					
2001-07-03		4.22			
Note: A nearby site that taps the same aquifer was being pumped.					
2001-05-15		7.26			
Note: A nearby site that taps the same aquifer was being pumped.					
2001-01-09		7.43			
Note: A nearby site that taps the same aquifer was being pumped.					
2000-12-07		7.39			
Note: A nearby site that taps the same aquifer was being pumped.					
2000-10-03		6.24			
Note: A nearby site that taps the same aquifer was being pumped.					
2000-08-24		6.42			
Note: A nearby site that taps the same aquifer was being pumped.					
2000-07-06		6.59			
2000-05-16		5.82			
Note: A nearby site that taps the same aquifer was being pumped.					
2000-04-04		8.61	2000-02-16		9.31
2000-01-04		7.89	1999-11-22		4.74
1999-10-01		3.97	1999-08-24		3.88
1999-07-30		4.62	1999-07-30		4.69
1999-07-01		4.75	1999-05-18		10.34
1999-03-30		11.50	1999-03-05		12.03
1999-01-05		12.04	1998-12-01		11.16
1998-09-29		9.12	1998-08-11		9.25
1998-06-19		9.53	1998-04-03		9.86
1998-01-07		10.07			

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

Federal EPA Radon Zone for MAUI County: 3

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for Zip Code: 96793

Number of sites tested: 11

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.291 pCi/L	100%	0%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	Not Reported	Not Reported	Not Reported	Not Reported

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

HYDROGEOLOGIC INFORMATION

AQUIFLOW[R] Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Services, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Well Index Database
Source: Commission on Water Resource Management
Telephone: 808-587-0214
CWRM maintains a Well Index Database to track specific information pertaining to the construction and installation of production wells in Hawaii

OTHER STATE DATABASE INFORMATION

RADON

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

Earthquake Fault Lines: The fault lines displayed on EDR’s Topographic map are digitized quaternary faultlines, prepared in 1975 by the United State Geological Survey

PHYSICAL SETTING SOURCE RECORDS SEARCHED

STREET AND ADDRESS INFORMATION