VOLUME II OF II
(Appendices A to F)

Final Environmental Assessment

KAHULUI HARBOR HAWAIIAN CEMENT FACILITY RELOCATION KAHULUI, MAUI, HAWAI‘I
(TMK NOs. (2)3-7-010:003(por.), 009(por.), 034, and 035(por.))

Prepared for:
Hawaiian Cement

Approving Agency:
Maui Planning Commission

January 2021

MUNEKIYO HIRAGA

Planning. Project Management. Sustainable Solutions.

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List of Appendices (VOLUME II OF II)

Appendix A. Preliminary Development Plans
Appendix A-1. Best Management Practices Checklist
Appendix B. Biological Resources Survey
Appendix C. Archaeological Literature Review and Field Inspection
Appendix D. Cultural Impact Assessment
Appendix E. Traffic Assessment
Appendix F. Preliminary Engineering Report and Drainage Report

APPENDIX

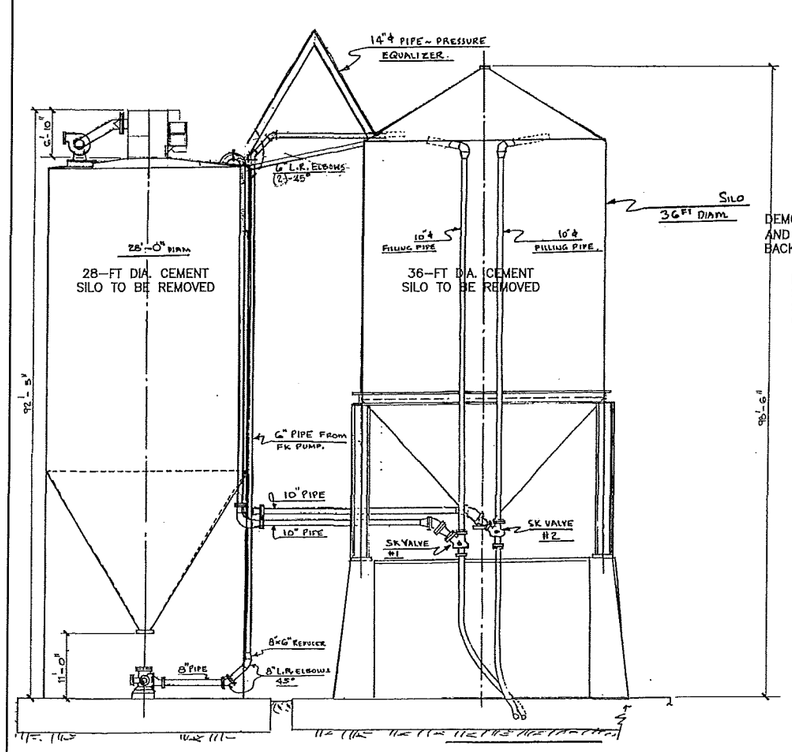
A

PRELIMINARY DEVELOPMENT PLANS

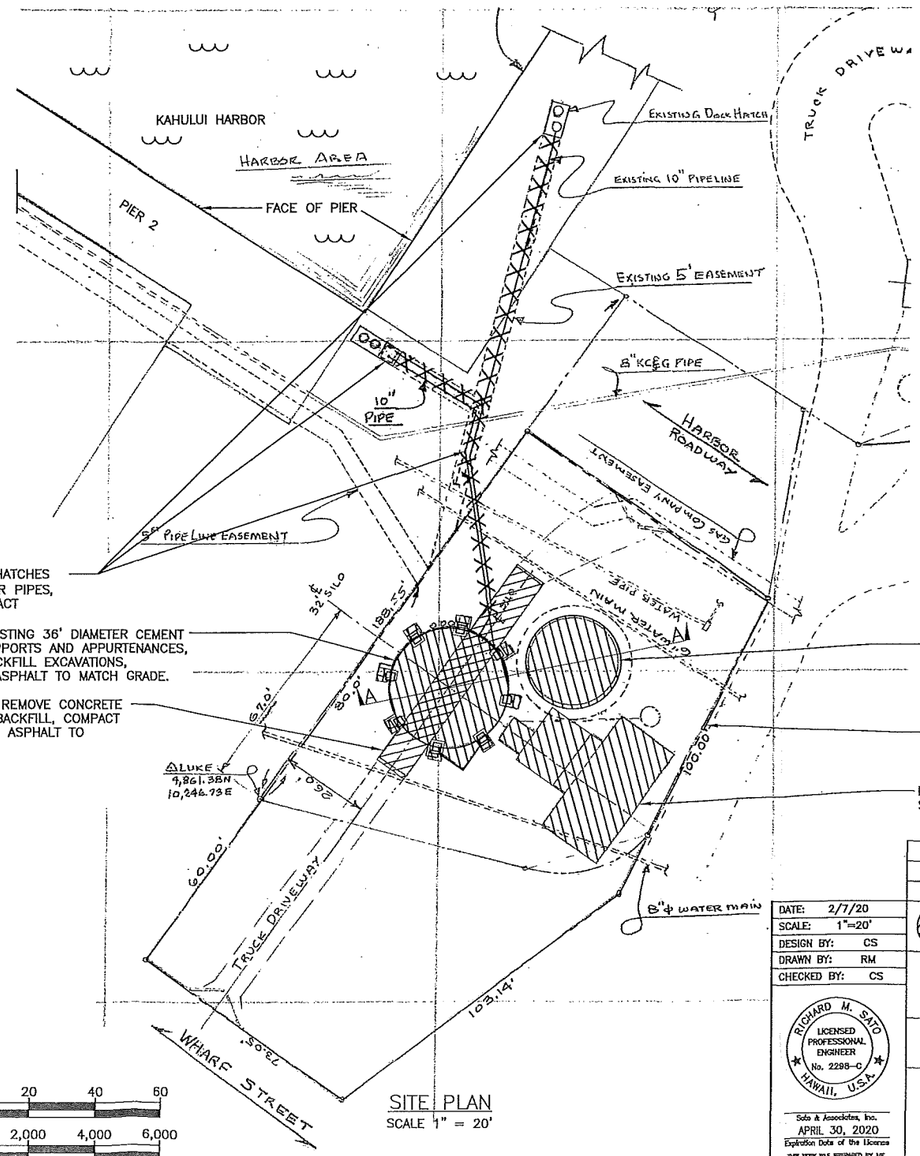
DEMOLITION PLAN FOR EXISTING CEMENT FACILITY

DEMOLITION NOTES

1. BACKGROUND TOPO IS FROM A SCANNED DRAWING. CONTRACTOR SHALL VERIFY AND CHECK ALL DIMENSIONS AND EXISTING CONDITIONS AND ANY DISCREPANCIES SHALL BE REPORTED IN WRITING TO THE ENGINEER.
2. ALL PORTABLE EQUIPMENT, CONTAINERS, TRASH, ETC. SHALL BE REMOVED FROM SITE PRIOR TO COMMENCING DEMOLITION.
3. DEMOLISH AND REMOVE ELEVATED CEMENT STORAGE TANK AND SILO TO GRADE.
4. DEMOLISH AND REMOVE ALL OTHER IMPROVEMENTS WITHIN THE HAWAIIAN CEMENT LEASED AREA TO GRADE.
5. UNDERGROUND UTILITIES NOT INDICATED TO BE DEMOLISHED SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION.
6. FILL CUT-OFF PIPING AT GRADE WITH CONCRETE, FLUSH TO GRADE.
7. WHERE DEMOLITION WORK EXTENDS BELOW CONCRETE OR ASPHALT SLAB GRADE, RESTORE CONCRETE SLAB OR ASPHALT PAVING TO MATCH SURROUNDING GRADE.
8. OBTAIN WRITTEN FINAL APPROVAL OF DEMOLITION AND SITE RESTORATION FROM HARBORS DIVISION.



SECTION A-A
NOT TO SCALE



DEMOLISH AND REMOVE DOCK HATCHES AND 10" DIA. CEMENT TRANSFER PIPES, BACKFILL TO GRADE AND COMPACT

DEMOLISH AND REMOVE EXISTING 36' DIAMETER CEMENT STORAGE SILO, PIPING, SUPPORTS AND APPURTENANCES, SEE DETAIL THIS SHT. BACKFILL EXCAVATIONS, COMPACT AND PAVE WITH ASPHALT TO MATCH GRADE.

DEMOLISH AND REMOVE CONCRETE TRUCK RAMP, BACKFILL, COMPACT AND PAVE WITH ASPHALT TO MATCH GRADE.

DEMOLISH AND REMOVE EXISTING 28-FT. DIAMETER SILO, PIPING, SUPPORTS AND ALL APPURTENANCES TO GRADE, SEE DETAIL THIS SHT. BACKFILL EXCAVATIONS, COMPACT AND PAVE WITH ASPHALT TO MATCH GRADE.

DEMOLISH AND REMOVE PERIMETER SECURITY FENCE

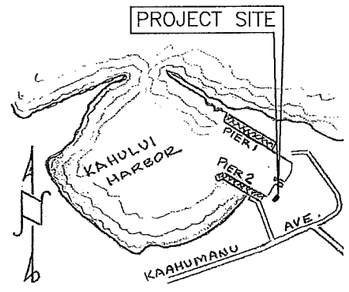
DEMOLISH AND REMOVE EXISTING BUILDING, SUPPORTS AND ALL APPURTENANCES TO GRADE

GRAPHIC SCALES

1"=20' 20 0 20 40 60

1"=2,000' 2,000 0 2,000 4,000 6,000

SITE PLAN
SCALE 1" = 20'



LOCATION MAP
SCALE 1" = 2,000'

DATE: 2/7/20
SCALE: 1"=20'
DESIGN BY: CS
DRAWN BY: RM
CHECKED BY: CS

RICHARD M. SATO LICENSED PROFESSIONAL ENGINEER No. 2298-C HAWAII, U.S.A.

Sato & Associates, Inc.
APRIL 30, 2020
Expiration Date of the License
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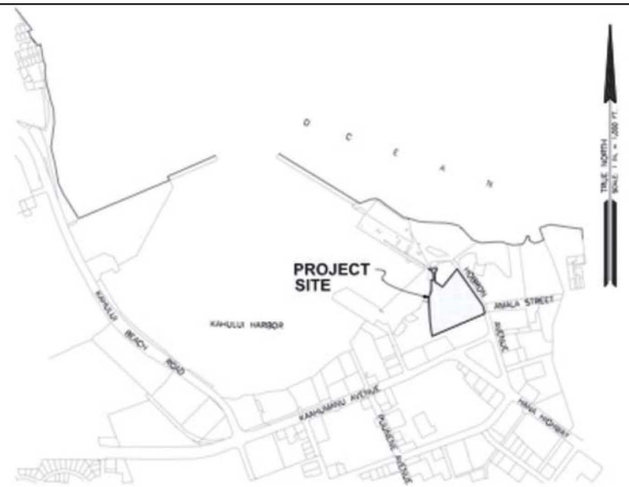
HAWAIIAN CEMENT
KAHULUI HARBOR FACILITIES
KAHULUI, MAUI, HAWAII

DEMOLITION SITE PLAN

SHEET 1 OF 1 SHEETS

Proj. No. 18008-00
Jan 30, 2020 - 4:01pm
R:\18005-00 Hawaiian Cement\Demo Plan.dwg

DEMOLITION PLANS FOR EXISTING SUGAR-RELATED FACILITIES ON PARCEL 009 and Parcel 035



VICINITY MAP
NOT TO SCALE

NOTES
1. BACKGROUND REFERENCE: FUKUMOTO ENGINEERING, INC., ALTA/NSPS LAND TITLE SURVEY DATED 8/8/2017.
2. AZIMUTHS AND RECORD COORDINATES REFERENCED TO GOVERNMENT SURVEY TRIANGULATION STATION "LUKE".
3. THIS PLAN SHOWS EXTENT OF DEMOLITION ONLY. ENCROACHMENTS AND EASEMENTS ARE NOT SHOWN.
4. ABOVE- AND BELOW-GRADE UTILITY LINES NOT SHOWN HEREON EXIST IN THE WORK AREA. CONTRACTOR SHALL CONSULT WITH ALEXANDER AND BALDWIN TO ASSESS LINE LOCATIONS. POWER LINES TO BE REMOVED OR RELOCATED AS NEEDED. ANY UTILITY LINE DAMAGE SHALL BE IMMEDIATELY REPORTED TO THE UTILITY OWNER, AND REPAIR SHALL BE AT THE CONTRACTOR'S EXPENSE.
5. DEMOLITION SHALL ONLY OCCUR AFTER COMPLETION OF LEAD-CONTAINING PAINT REMOVAL, ASBESTOS ABATEMENT, REMOVAL OF PCB-CONTAINING LIGHTING EQUIPMENT AND REMOVAL OF ELECTRICAL TRANSFORMERS HAS BEEN COMPLETED AND WASTES GENERATED BY THAT WORK HAVE BEEN DISPOSED OFFSITE.
6. EXTENT OF DEMOLITION SHALL INCLUDE CONVEYORS, THE OLD SCALE HOUSE, TRANSFER TOWER AND ASSOCIATED ABOVE- AND BELOW-GRADE EQUIPMENT. CONCRETE FOUNDATIONS AND SLABS AT GRADE SHALL REMAIN IN PLACE.
7. ELEVATED EQUIPMENT TO BE DEMOLISHED SHALL BE CUT INTO SECTIONS AND LOWERED TO THE GROUND USING A CRANE, FOLLOWED BY ON-GROUND DISASSEMBLY.
8. ALL DEMOLITION SHALL BE ACCOMPLISHED BY METHODS WHICH FACILITATE WASTE SEGREGATION FOR COLLECTION, TRANSPORT AND DISPOSAL OFFSITE.
9. POST-DEMOLITION WORK SHALL INCLUDE CONSTRUCTION OF CLOSURE BARRIERS NOT SHOWN ON THIS PLAN, WHERE CONVEYORS ENTERED SUGAR WAREHOUSES 1, 2 AND 3.
10. BEST MANAGEMENT PRACTICES INCLUDING WATER SPRAY, PROVISION OF COMPOST FILTER SOCKS AROUND DRAINAGE INLETS AND WHERE RUNOFF MAY EXIT THE WORK AREA, AND DUST SCREENS AND FENCES NOT SHOWN ON THIS PLAN SHALL BE EMPLACED, INSPECTED WEEKLY AND REPAIRED AS MAY BE FOUND NEEDED.

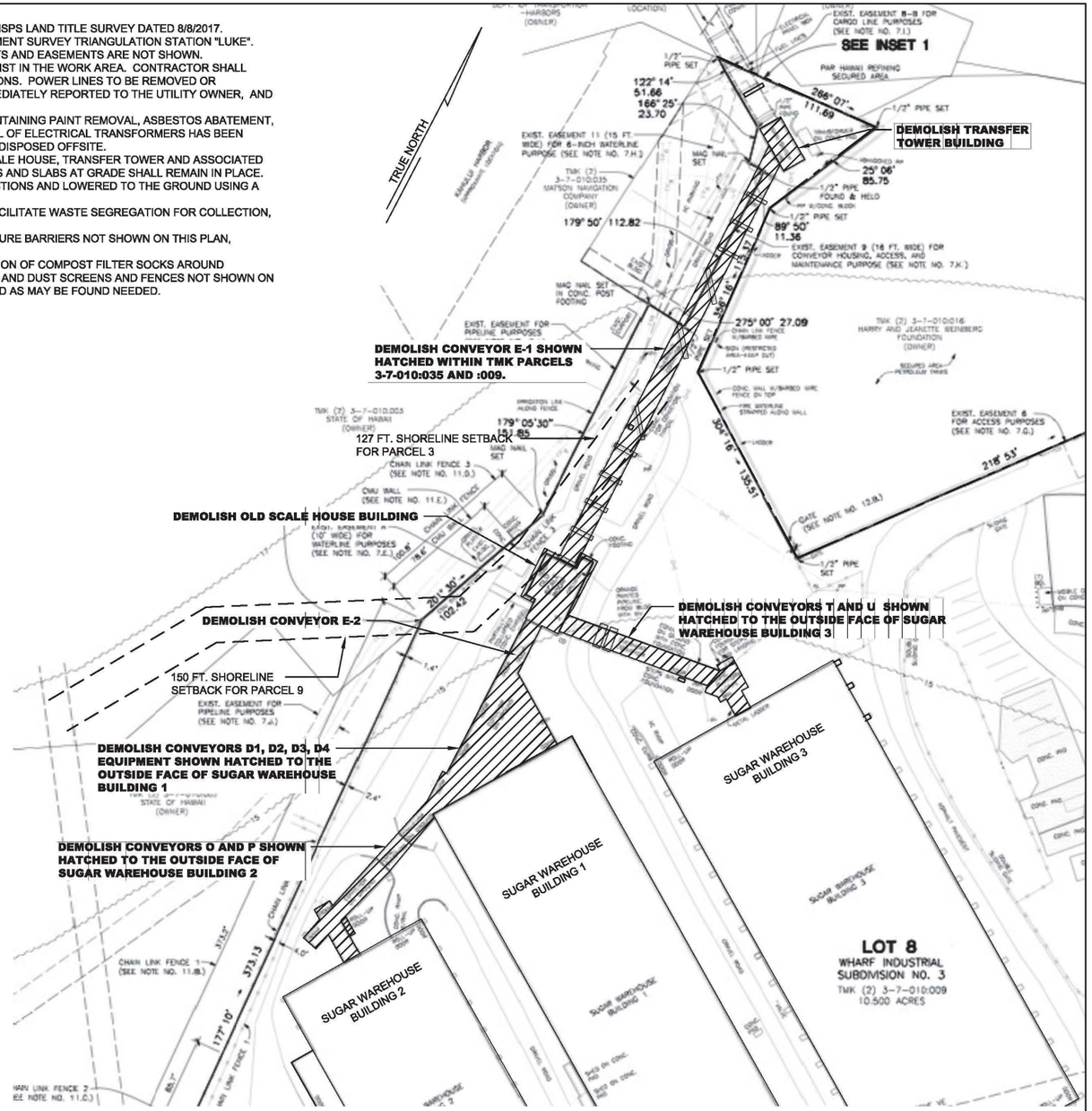
(VIEW TO SOUTH) DEMOLISH AND REMOVE TRANSFER TOWER AND CONVEYOR E WITHIN HATCHED AREA

(VIEW TO WEST) DEMOLISH AND REMOVE OLD SCALE HOUSE, CONVEYORS E1 AND E2 WITHIN HATCHED AREA

(VIEW TO SOUTH) DEMOLISH AND REMOVE CONVEYOR U BETWEEN OLD SCALE HOUSE (AT LEFT) AND SUGAR WAREHOUSE 3 (AT RIGHT) WITHIN HATCHED AREA

(VIEW TO NORTH) DEMOLISH AND REMOVE CONVEYORS O AND P AT REAR OF SUGAR WAREHOUSE 2 (AT RIGHT) WITHIN HATCHED AREA

SELECTED DEMOLITION PHOTOS
NOT TO SCALE:



DEMOLITION PLAN
SCALE: 1" = 40'

	1"=20'
DESIGN BY:	CS
DRAWN BY:	RM
CHECKED BY:	CS

RICHARD M. SATO
LICENSED PROFESSIONAL ENGINEER
No. 2298-C
HAWAII, U.S.A.

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KAHULUI SUGAR TERMINAL
FACILITIES DEMOLITION
KAHULUI HARBOR, MAUI, HAWAII

CONVEYOR DEMOLITION SITE PLAN

SHEET 1 OF 1 SHEETS

Proj. No. 18008-00
May 21, 2020 – 4:44pm
R:\@GMT-2020.05.21-18.00.04\18005-00 Hawaiian Cement\HCS Demo Plan\Conveyor Demo Plan.dwg

Proposed Partial Demolition of Kahului Sugar Terminal

Facility Description

The Kahului Sugar Terminal was formerly operated by Kahului Trucking and Storage, Inc. (KT&S) to receive, store, and transfer to vessels at Kahului Harbor for shipment raw sugar produced by Hawaiian Commercial and Sugar Company (HC&S). The terminal ceased operation in 2017 after closure of the HC&S sugar plantation.

The terminal consists of three large warehouses, a receiving/weigh station where sugar was unloaded from trucks transporting sugar from the HC&S Puunene Sugar Mill, a system of conveyors for moving the sugar from the receiving/weigh station into and within the warehouses, a system of conveyors for moving the sugar from the warehouses to Pier 1 at Kahului Harbor, and a conveyor and gantry system at Pier 1 for loading sugar onto vessels for shipment off-island.

The conveyor system from the warehouses to Pier 1 consists of a total of eleven conveyor segments and two transfer towers (one of which contains a former scale house, known as the "old scale house") located on the makai side of the warehouses. Conveyor E-2 carried the sugar from all three warehouses to the "old scale house", where it was transferred onto Conveyor E-1. Conveyor E-1 carried the sugar to a second transfer tower near the edge of the harbor property, where it was transferred onto Conveyor F and carried to Pier 1. Conveyor E-2 was fed by Conveyors D-1, D-2, D-3, and D-4 from Warehouse 1, Conveyors O and P from Warehouse 2, and Conveyors T and U from Warehouse 3. Conveyors U, E-1, and F are elevated above ground level by wooden or steel trestles on concrete footings, while the remaining conveyors are located at or below ground level.

Scope of Planned Demolition

Conveyor F between the last transfer tower and Pier 1 has already been demolished and removed, and removal of the remaining portion of this conveyor within the Pier 1 building is in progress. Plans call for the demolition and removal of all of the remaining conveyors between the warehouses and Pier , along with the two transfer towers, in order to make room for construction of a new concrete storage facility by Hawaiian Cement.

Demolition work will include the following:

1. Abatement of hazardous materials from structures to be demolished, including but not limited to lead-based paint (LBP), lead-containing paint (LCP), asbestos-containing materials, and mercury- and/or PCB-containing lighting waste.
2. Removal and disposal of electrical equipment located atop the concrete structure housing Conveyor T and elsewhere throughout the conveyor system, and removal of disused power lines and power poles.
3. Removal and demolition of elevated Conveyors E-1 and U, including removal of steel and wooden support trestles. Removal of these conveyors will be accomplished by cutting the conveyors into sections and lowering them to the ground using a crane, followed by on-the-ground demolition/disassembly of the conveyor structures.
4. Demolition/disassembly of two transfer towers and ground-level structures housing Conveyors D-1 through D-4, E-2, O, P, and T, including removal of conveyor equipment from below-ground portions of the conveyors. Demolition will be accomplished by a

combination of heavy equipment and hand demolition methods to facilitate waste segregation.
5. Segregation of demolition waste (i.e., into scrap metal and other demolition waste) for transportation and disposal off-site.
6. Construction of barriers over exposed conveyor openings into the warehouses to prevent unauthorized access.

Initial demolition activities will be limited to demolition and removal of above-ground portions of the conveyors and related structures only, along with removal of conveyor equipment from below-ground conveyor foundations. No grading, grubbing, or other ground-disturbing activities will be conducted during the initial phase of demolition. Removal of slabs, conveyor support footings, and other below-ground portions of the conveyor structures will be conducted during the initial site work for the new Hawaiian Cement storage facility after the required grading permit and associated Best Management Practices are in place.

Demolition Best Management Practices

Best Management Practices will be implemented during the demolition work to minimize the potential for environmental impacts from demolition activities. These include, but are not limited to the following.

1. Proper abatement and management of hazardous materials – Prior to the start of demolition work, hazardous materials will be abated to the maximum extent possible. This work will include removal and proper disposal of lighting waste, abatement of asbestos-containing materials, abatement of loose and flaking lead-based paint/lead-containing paint, and abatement of all LBP/LCP in areas painted wood or steel structures are to be cut or painted concrete structures will be cut or demolished. A comprehensive hazardous materials survey of the structures to be demolished has been completed to identify areas requiring abatement. All abatement work will be conducted by properly trained and certified environmental professionals and in strict compliance with applicable environmental regulations. Detailed work plans will be developed and implemented for the abatement activities, and all abatement work will be overseen by a qualified Project Monitor. Air monitoring will be conducted during abatement activities to ensure that applicable standards are met at all times.
2. Dust control – Dust will be minimized during demolition activities through a combination of the demolition practices uses and, where necessary, the use of water sprays. For work in close proximity to occupied areas (e.g., at the back of the Matson office building), installation of dust screens on the existing harbor fence will be considered.
3. Runoff control – The project area is largely sandy soil, and runoff from the site is not expected to be a concern. Prior to the start of work, appropriate control measures (e.g., silt screen or filter socks) will be installed in or around storm drains located near the project area.

PLANS FOR RELOCATED CEMENT FACILITY

Plot date: 19-Oct-2020

Full Size Plot

150' SHORELINE SETBACK

LEASE LOT
25,000 SF

51.66'
111.68'
23.70'
11.38'
85.75'

PIER 3
BULKHEAD
SEA WALL
9+00
8+00
PM 6
HARBOR FORCE MAIN
NEW SEWER LINE
EX PUMP
WATER EASEMENT
OUT FUEL LINE
EX FA
EX ELEC
EX TEL
EX GAS
NEW 2-12" UNDERGROUND PIPES
NEW WAREHOUSE
EXIST'G RAMP
EXIST'G WAREHOUSE #3
EXIST'G WAREHOUSE #1
EXIST'G WAREHOUSE #2
EXIT
ENTRY
HOBRON STREET
BASE FLOOD ELEV
637.28'
373.13'
538.59'
23.99'
819.25'
101.36'
10.27'
20.24'
AMALA STREET
OVERHEAD
ZONE VE
ZONE AE
EW 4
EW 6
EW 7
15
17
18

OVERALL SITE PLAN

1"=40'

NORTH

40 20 0 40 80
Graphic Scale in Feet (Scale: 1"=40')

TAX MAP KEY (2) 3-7-010:009 AND 003

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CONSULTING ENGINEERS CIVIL & STRUCTURAL
HONOLULU, OAHU, HAWAII WAILUKU, MAUI, HAWAII

NEW SILOS
& WAREHOUSE
for
HAWAIIAN
CEMENT CO

KAHULUI HARBOR
KAHULUI, MAUI, HI
TMK: 3-7-010: 009

OVERALL
SITE PLAN

OCT. 19, 2020

SK-1

G:/16005 HI Cement/Drawings/Me10/SK-1_Overall-Site

Plot date: 19-Oct-2020

Full Size Plot

150' SHORELINE SETBACK
FOR PARCEL 9

LEASE LOT
= 25,000 SQ. FT.

127' SHORELINE SETBACK
FOR PARCEL 3

SHORELINE

EXIST
UNDERGROUND
FUEL PIPE

SEA WALL

BULKHEAD

PIER 3

KAHULUI HARBOR

CUT FUEL LINE

HARBOR FORCE MAIN

EX. PUMP

NEW SEWER LINK

WATER
EASEMNT

LANDSCAPE STRIP

FINISH FLOOR EL. 30.0

NEW SILO

NEW WAREHOUSE

NEW 2-12"
UNDERGROUND
PIPES

EXIST
WAREHOUSE #3

EXIST
WAREHOUSE #1

BASE FLOOD ELEV

15

17

TP 7.0

TP 6.0

TP 8.0

SITE & GRADING PLAN

SCALE: 1" = 20'-0"

NORTH

TAX MAP KEY (2) 3-7-010:009 AND 003

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

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HONOLULU, OAHU, HAWAII WAILUKU, MAUI, HAWAII

NEW SILOS & WAREHOUSE for HAWAIIAN CEMENT CO

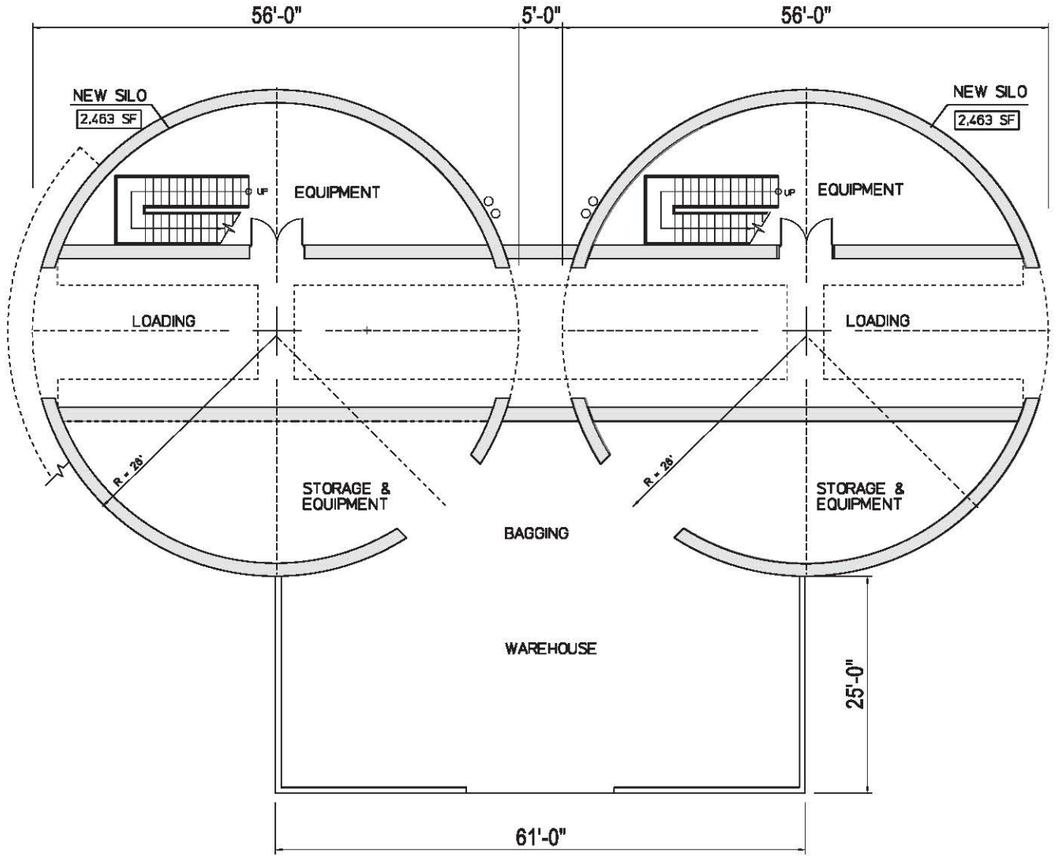
KAHULUI HARBOR
KAHULUI, MAUI, HI
TMK: 3-7-010: 009

SITE & GRADE PLAN

OCT. 19, 2020

SK-2

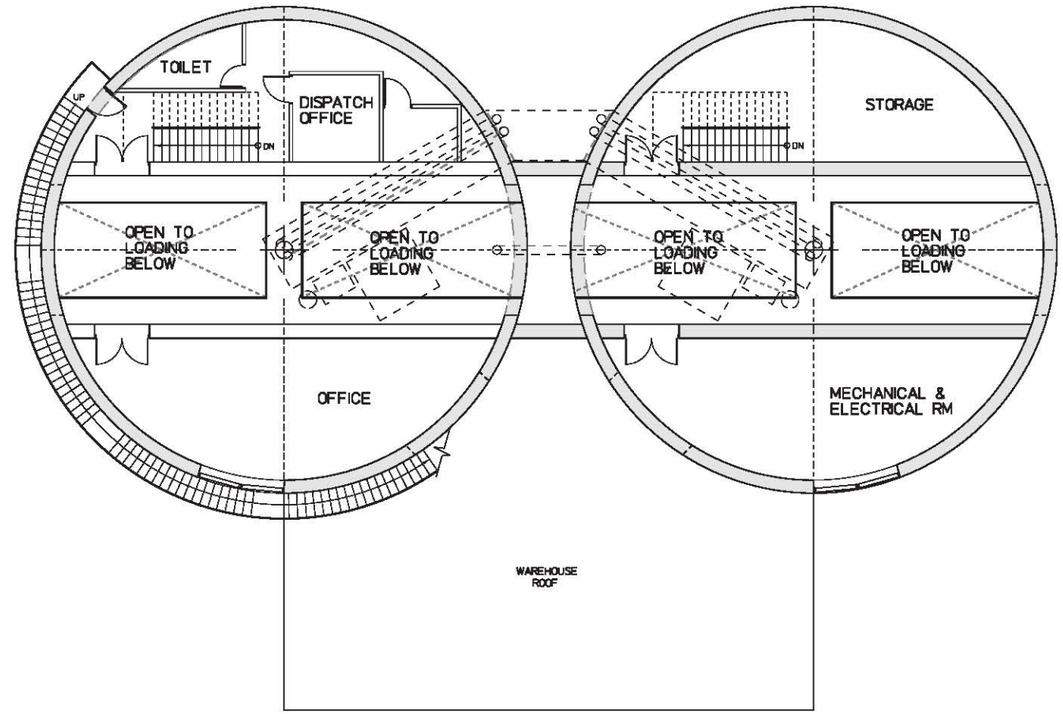
8 / 18005 HI Cement / Drawings / Me10 / SK-2_Site-Grade



GROUND FLOOR PLAN

1/8"=1'-0"

NORTH



SECOND FLOOR PLAN

1/8"=1'-0"

NORTH

GRAPHIC SCALE:

1/8"=1'-0" 5' 0' 5' 10' 15' 20' 25'

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HONOLULU, OAHU, HAWAII WAILUKU, MAUI, HAWAII

AREA TABULATION:

WAREHOUSE/BAGGING.....	1,958 SF
EQUIPMENT ROOMS.....	3,056 SF
LOADING AREA.....	1,956 SF
TOTAL	6,970 SF

LOADING SPACE

REQUIRED: 1 - 8.5' x 19'
1 - 12' x 25'

PROVIDED: 2 - 12' x 25'

PARKING ANALYSIS:

REQUIRED PARKING AREA:

GROUND FLOOR
WAREHOUSE & BAGGING... 1,958 SF

SECOND FLOOR
OFFICE..... 1,528 SF
TOTAL 3,486 SF

PARKING REQUIRED: 3,486/600 = 5.8 OR 6 REQUIRED

AREA TABULATION:

OFFICE/DISPATCH.....	1,528 SF
EQUIPMENT.....	1,528 SF
TOTAL	3,056 SF

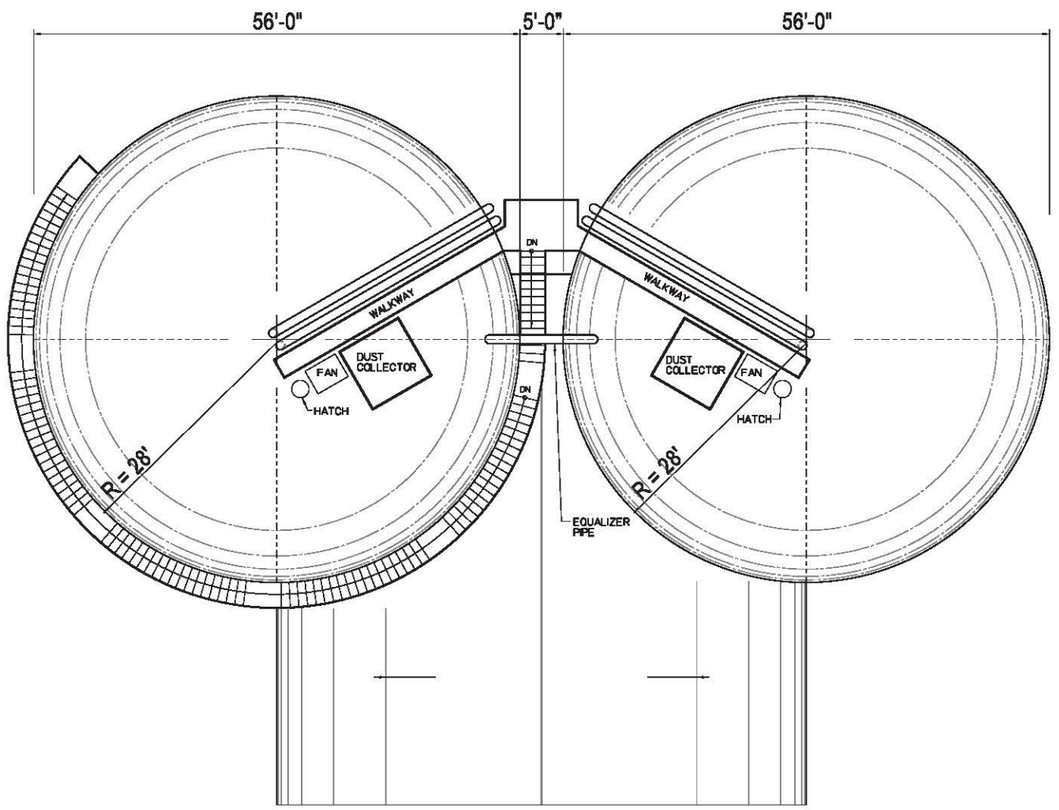
NEW SILOS & WAREHOUSE for HAWAIIAN CEMENT CO

KAHULUI HARBOR
KAHULUI, MAUI, HI
TMK: 3-7-010: 009

FLOOR PLAN

OCT. 19, 2020

SK-3



NORTH

ROOF PLAN

1/8"=1'-0"

GRAPHIC SCALE:

1/8"=1'-0" 5' 0' 5' 10' 15' 20' 25'

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HONOLULU, OAHU, HAWAII WAILUKU, MAUI, HAWAII

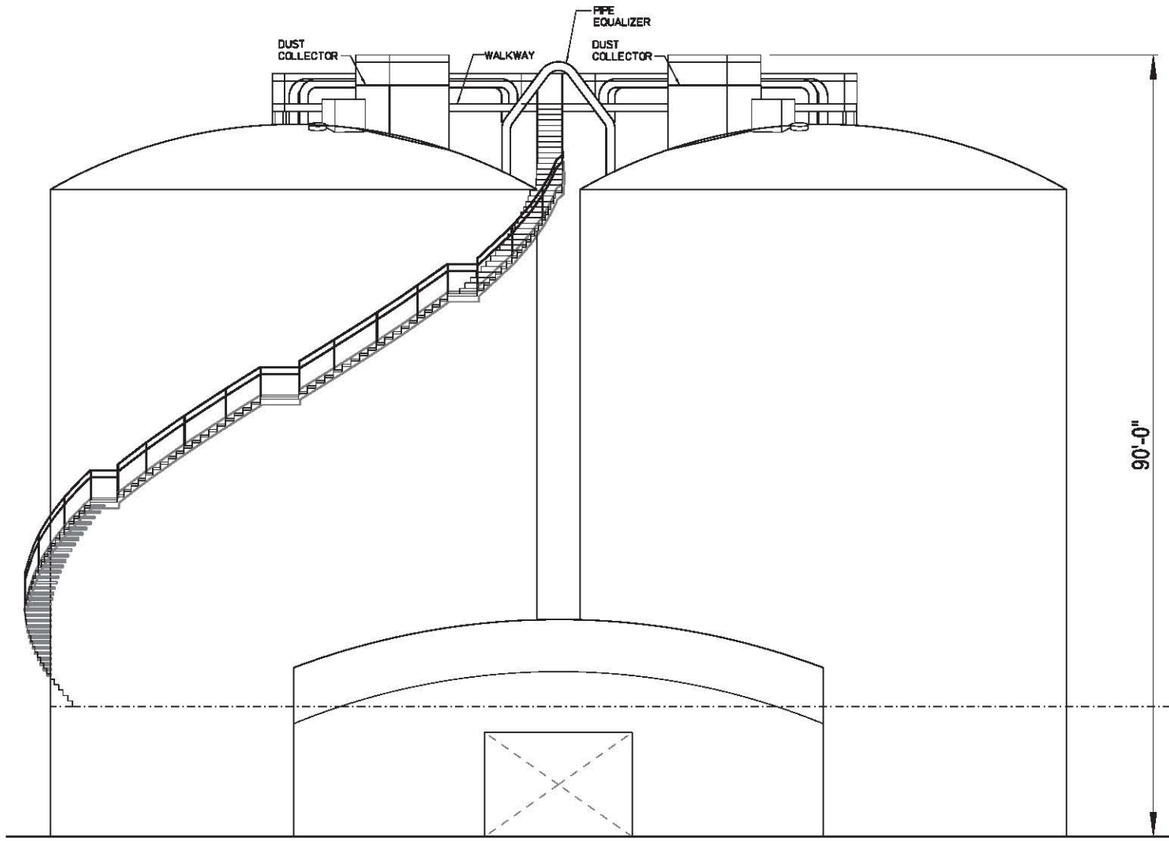
NEW SILOS
& WAREHOUSE
for
HAWAIIAN
CEMENT CO

KAHULUI HARBOR
KAHULUI, MAUI, HI
TMK: 3-7-010: 009

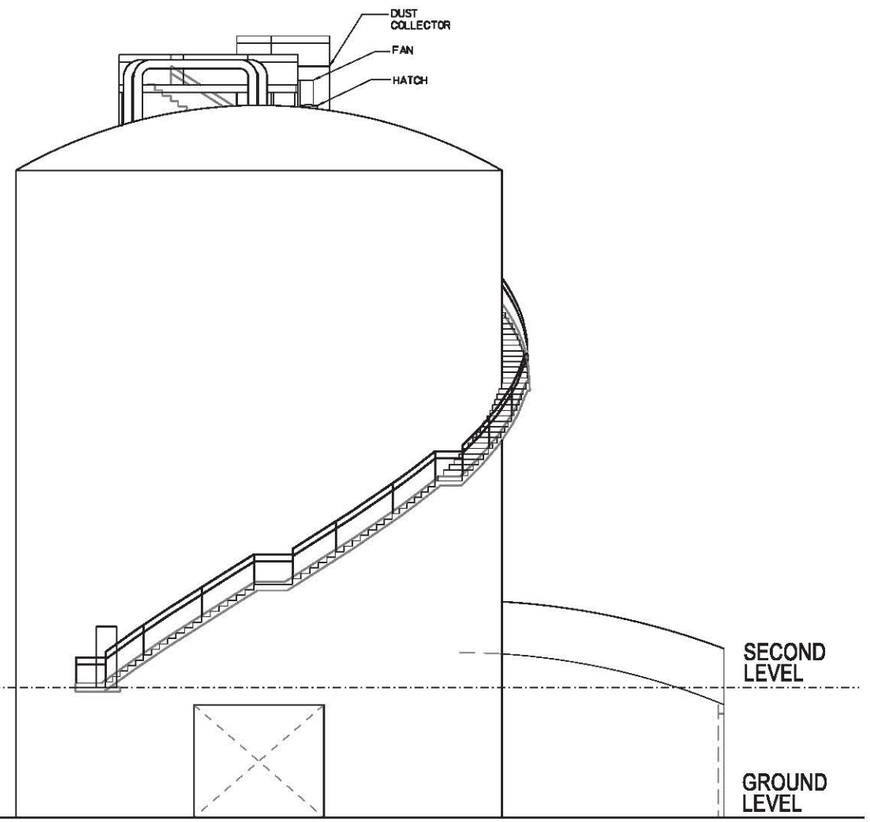
ROOF PLAN

OCT. 19, 2020

SK-3A



EAST ELEVATION



SOUTH ELEVATION

EXTERIOR ELEVATIONS

1/8"=1'-0"

GRAPHIC SCALE:

1/8"=1'-0" 5' 0' 5' 10' 15' 20' 25'

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HONOLULU, OAHU, HAWAII WAILUKU, MAUI, HAWAII

NEW SILOS
& WAREHOUSE
for
HAWAIIAN
CEMENT CO

KAHULUI HARBOR
KAHULUI, MAUI, HI
TMK: 3-7-010: 009

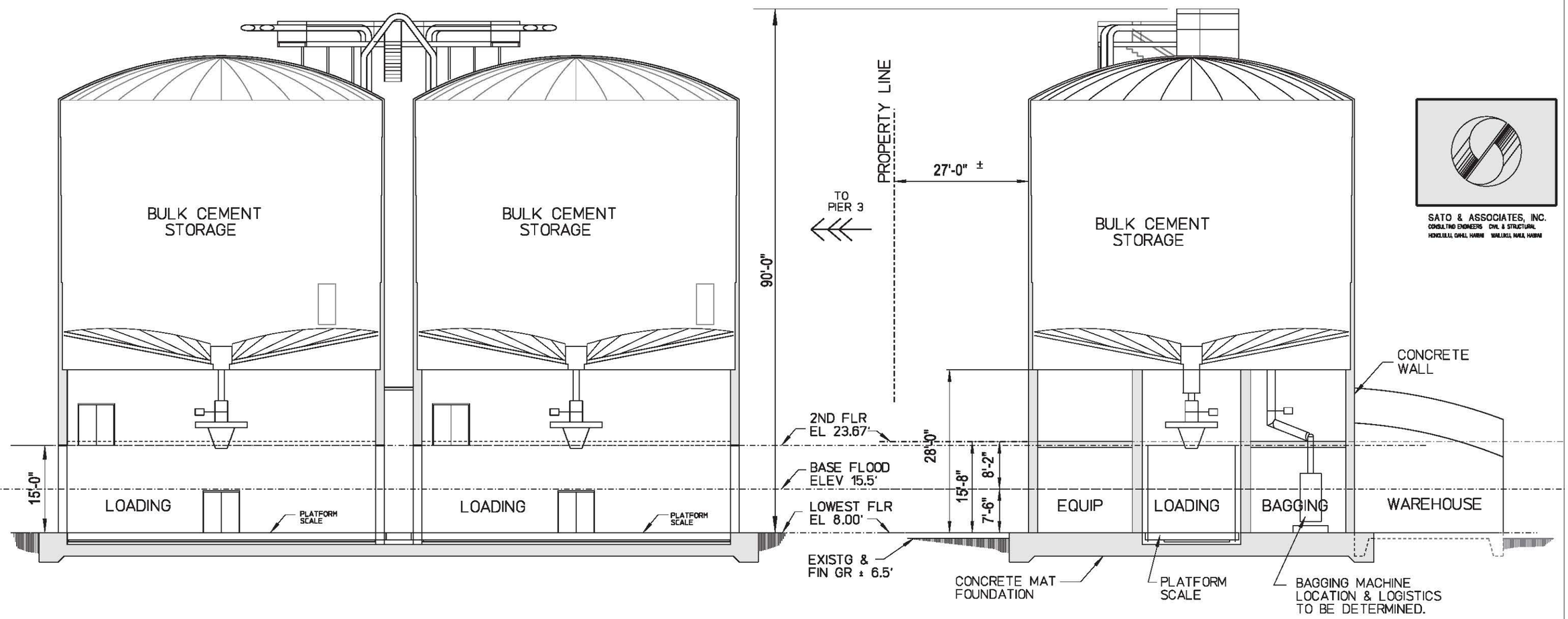
EXTERIOR ELEVATIONS

OCT. 19, 2020

SK-4

Plot date: 19-Oct-2020

Full Size Plot

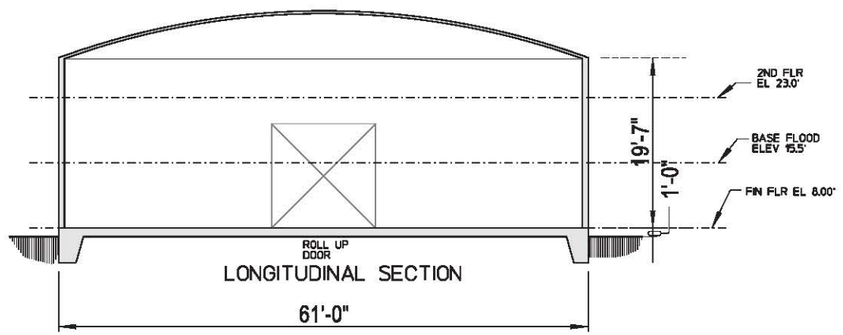


LONGITUDINAL SECTION

1/8"=1'-0"

CROSS SECTION

1/8"=1'-0"



WAREHOUSE

1/8"=1'-0"

NEW SILOS & WAREHOUSE for HAWAIIAN CEMENT CO

KAHULUI HARBOR
KAHULUI, MAUI, HI
TMK: 3-7-010: 009

SILO & WAREHOUSE SECTIONS

OCT. 19 2020

SK-5

GRAPHIC SCALES

1/8"=1'-0" 5' 0' 5' 10' 15' 20' 25'

G:/16005 HI Cement/Drawings/Me10/SK-5 Geol

Plot date: 19-Oct-2020

Full Size Plot

SHORELINE

SHORELINE

SEA WALL

PIER 3

BULKHEAD

CUT-FUEL LINE

EX F6

EX W2 1/2

EX ELEC

EX D18

EX D60

EX D24

127' SHORELINE SETBACK FOR PARCEL 3

NEW 2-12" UNDERGROUND PIPES

FM 6

8+00

17

MAIN

EX PUMP

NEW SEWER LINK

HARBOR

WATER EASEMNT

Ground Cover: `Ae`ae
(Bacopa monnieri)
Rooted Cuttings at 12" O.C.
7,000 SQ. FT.

Kou
(Cordia subcordata)
25 gal., 8'ht.,
4'sp., 1-1/2" ca.

1,000 SQ. FT.

TP 7.0

TP 8.0

TP 8.4

R=50'

FINISH FLOOR EL = 8.0

NEW SILO

NEW SILO

NEW WAREHOUSE

1,800 SQ. FT.

Ground Cover: `Ae`ae
(Bacopa monnieri)
Rooted Cuttings at 12" O.C.

200 SQ. FT.

EXIST'G RAMP

EXIST'G WAREHOUSE #2

EXIST'G WAREHOUSE #1

15 BASE FLOOD ELEV

15 BASE FLOOD ELEV

NOTE:

ALL PLANTED AREAS TO BE IRRIGATED WITH
``AUTOMATICALLY-CONTROLLED DRIP IRRIGATION SYSTEMS
WITH APPROVED BACKFLOW PREVENTION DEVICE.

NORTH

LANDSCAPE PLAN

SCALE: 1" = 20'-0"

TAX MAP KEY (2) 3-7-010:009 AND 003

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

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HONOLULU, OAHU, HAWAII WAILUKU, MAUI, HAWAII

NEW SILOS & WAREHOUSE for HAWAIIAN CEMENT CO

KAHULUI HARBOR
KAHULUI, MAUI, HI
TMK: 3-7-010: 009

LANDSCAPE PLAN

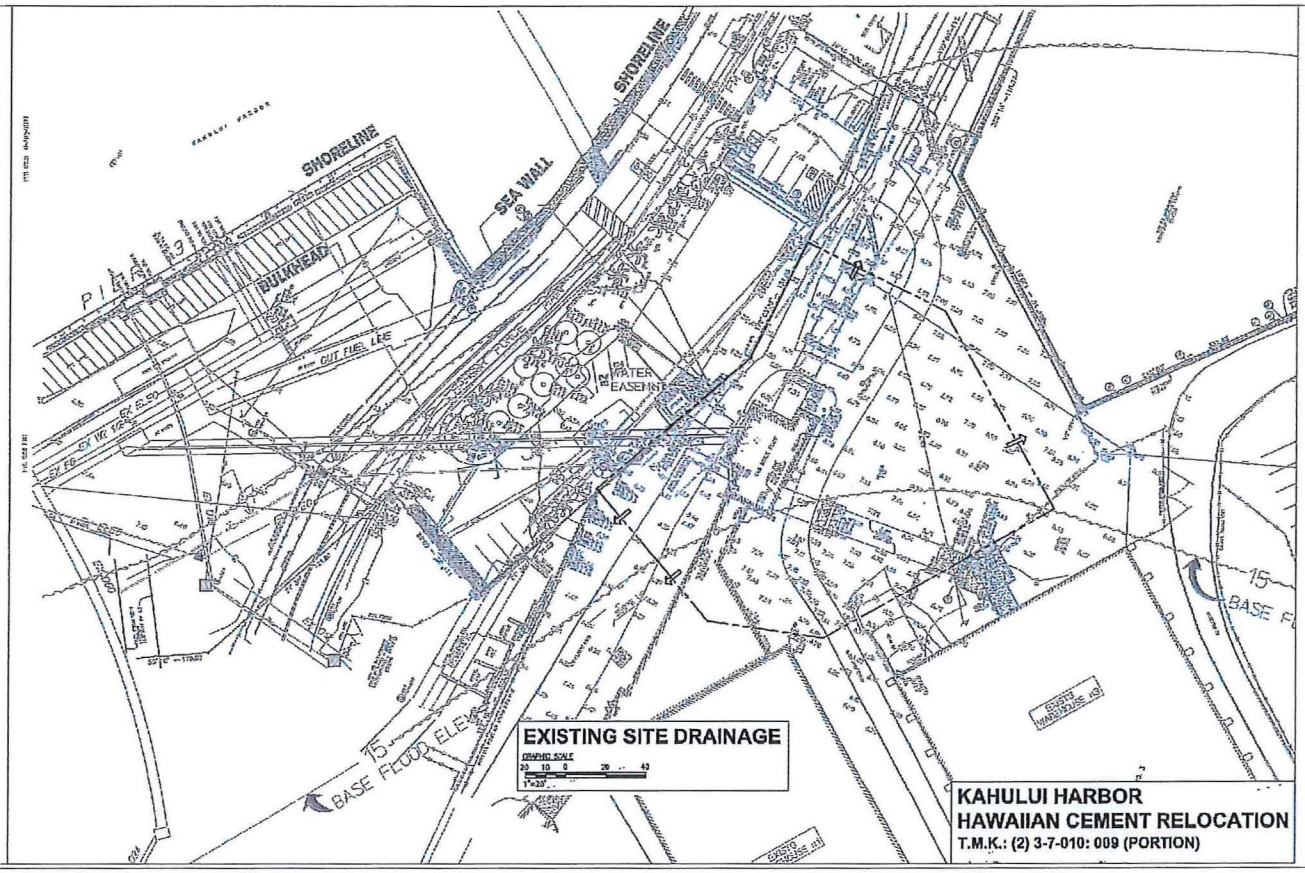
OCT. 19, 2020

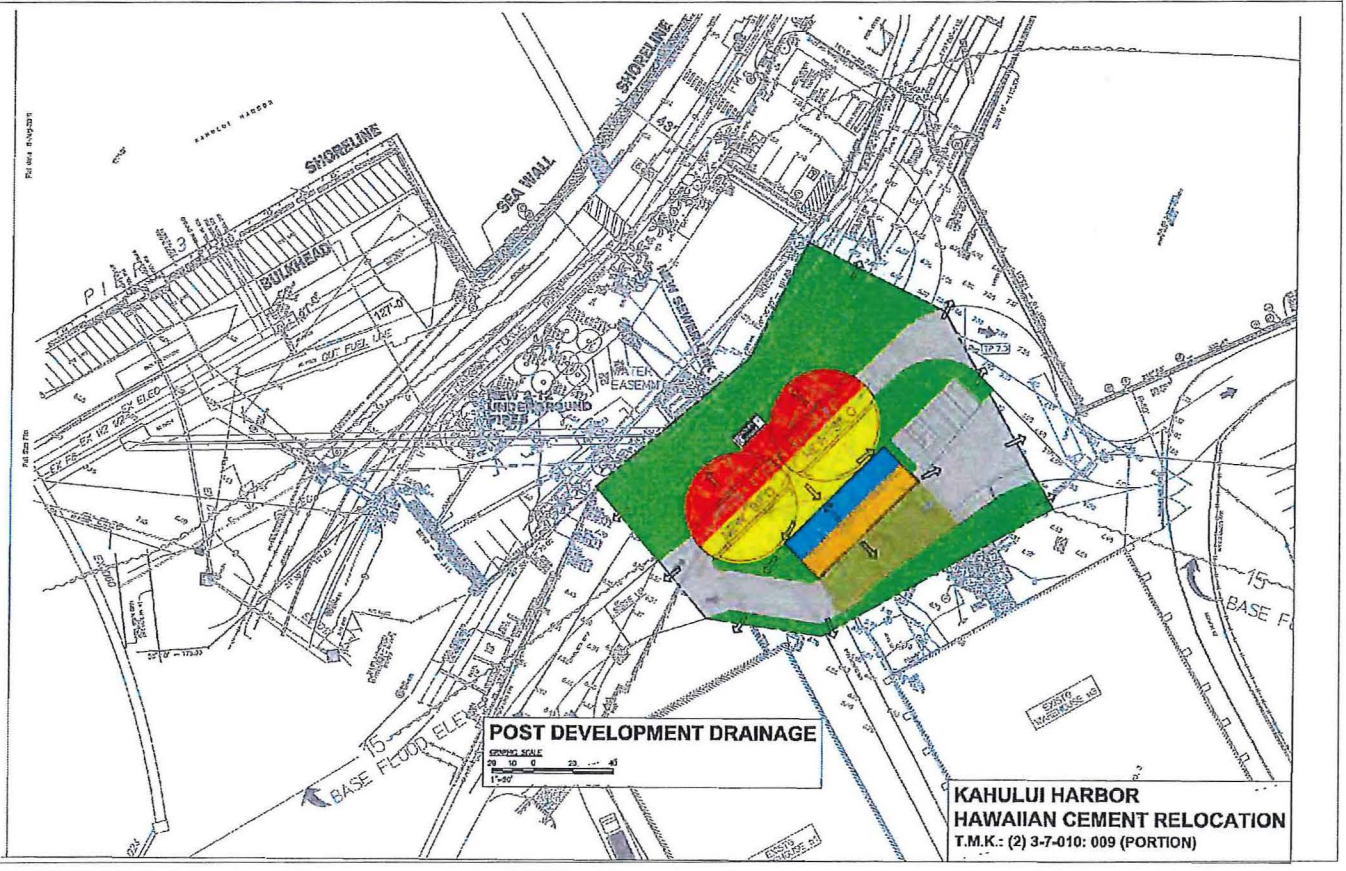
SK-6

S:\16005 HI Cement\Drawings\Me10\SK-6_Landscape-plan

DRAINAGE PLANS FOR RELOCATED CEMENT FACILITY

APPENDIX D
DRAINAGE PLAN





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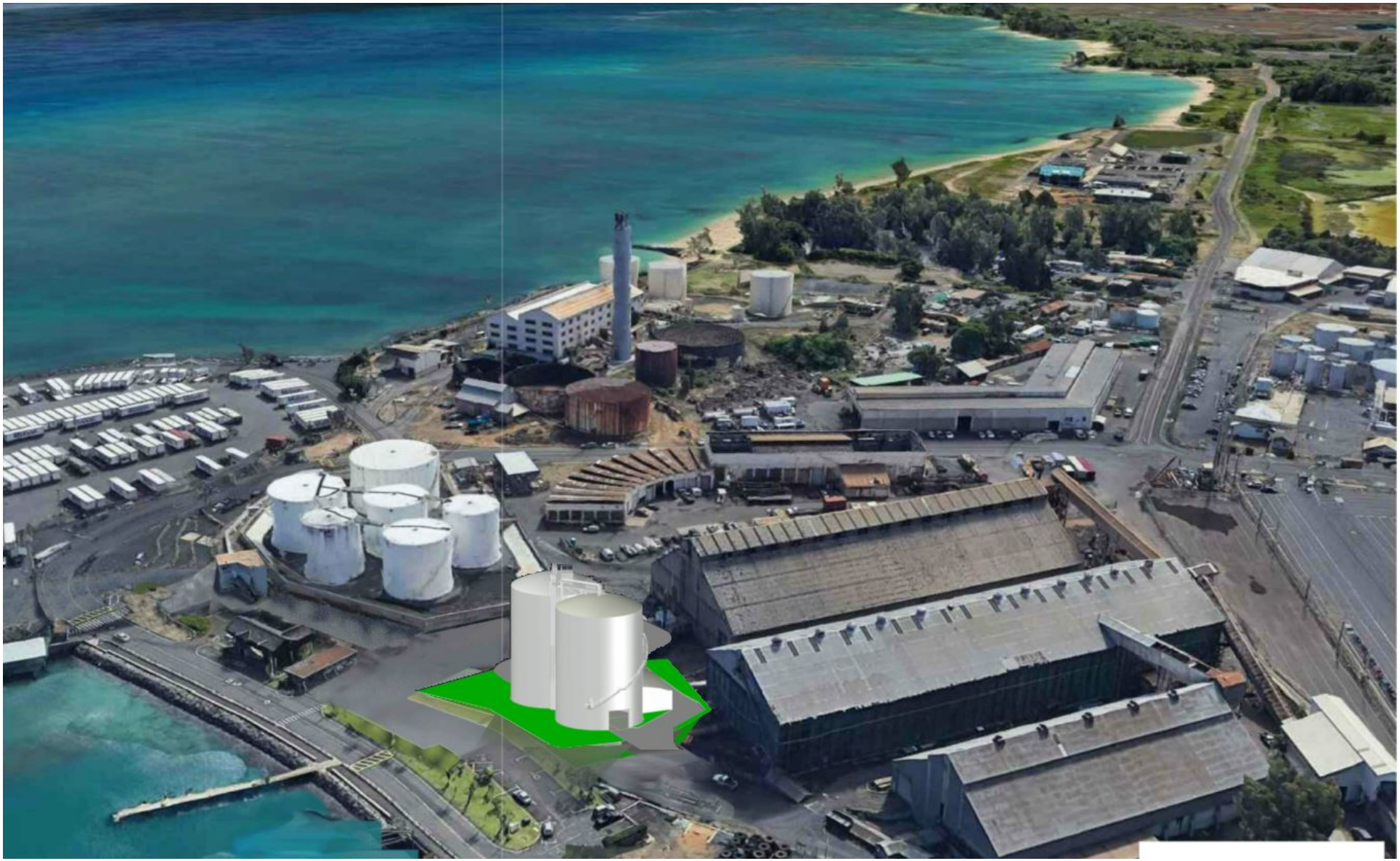
VISUAL RENDERINGS OF RELOCATED CEMENT FACILITY

Visual Rendering

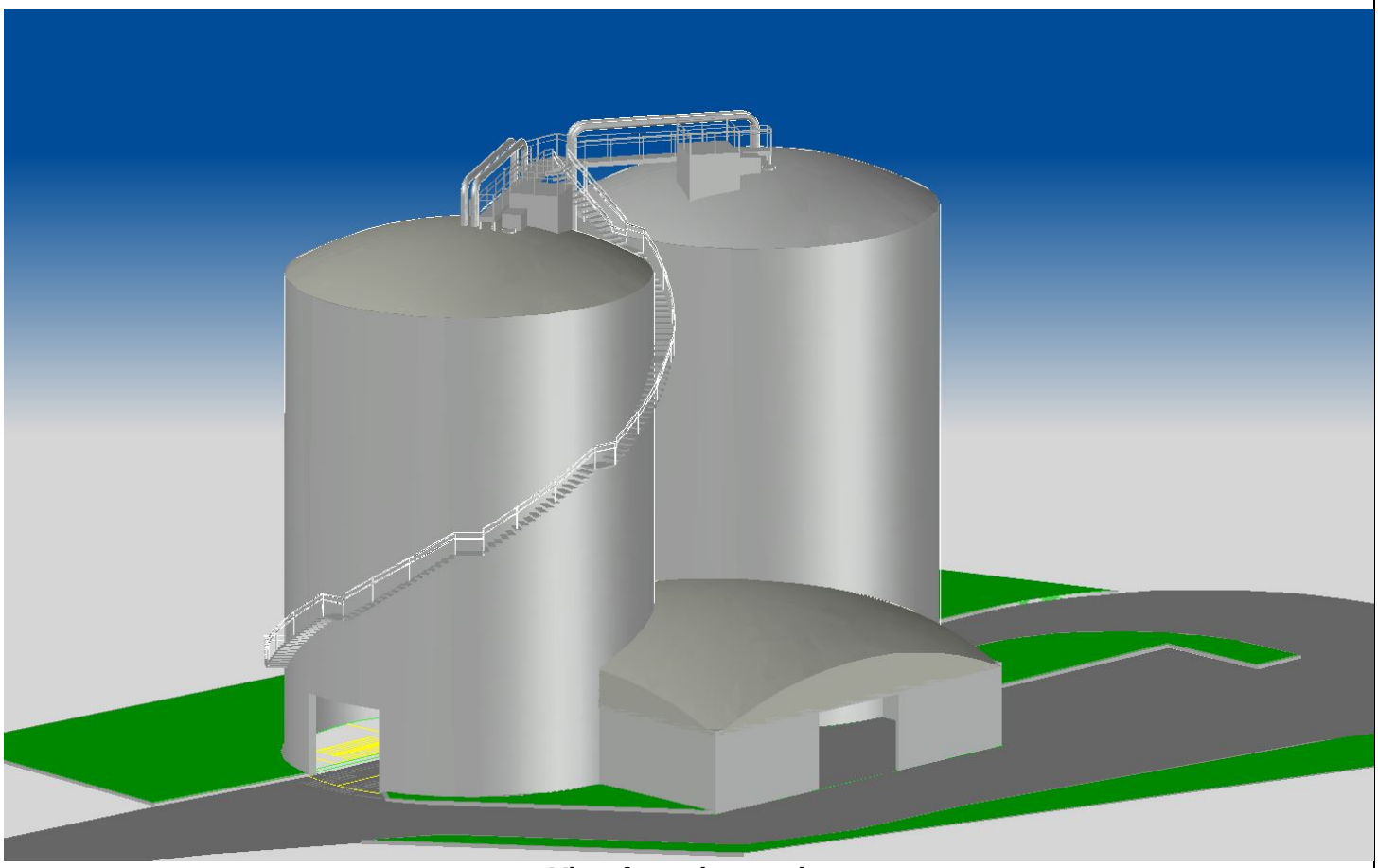


View Analysis

View from across the harbor

View from Hobron Street

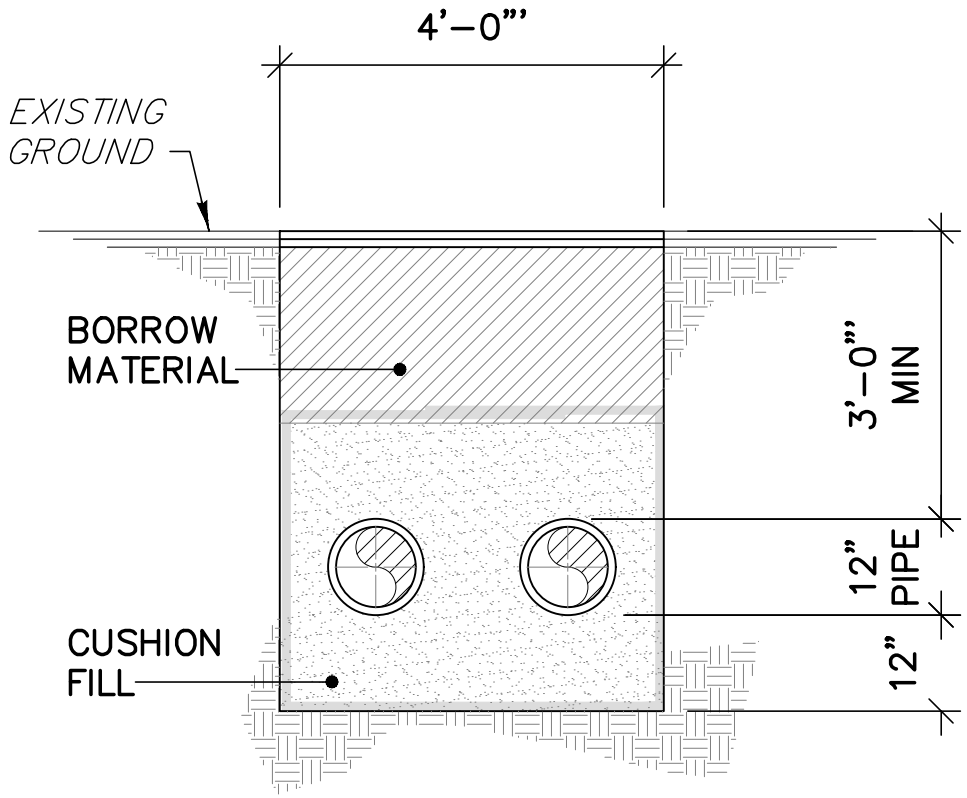
View from Kaahumanu Avenue/Wharf Street
(across Maui Mall)



View from the south

View from the west

CROSS SECTION OF UNDERGROUND PIPELINES



CROSS SECTION OF PIPELINE

SCALE: NOT TO SCALE

Hawaiian Cement
Kahului, Maui

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APPENDIX

A-1

BEST MANAGEMENT PRACTICES CHECKLIST

BEST MANAGEMENT PRACTICES CHECKLIST

1. Perimeter Controls

Sediment fences or barriers shall be used at the perimeter of all disturbed areas where there is potential for runoff to flow off the project site, barriers may include gravel bags, sand bags, fiber rolls, silt fences, compost socks, or an equivalent BMP that intercepts runoff.

2. Dust Control

Use one of the following to control dust:

1) Mulching to a depth of one inch or more
2) Sprinkling exposed soils with water to maintain moistness
3) Vertical dust barriers

3. Concrete Waste Management

Conduct washout off-site or perform onsite in a designated area, away from water bodies, channels, or storm drains. Construct and maintain washout to contain all liquid and concrete waste generated.

4. Stockpile Management

Locate stockpiles away from drainage ways or other areas of concentrated flows. Use a barrier around stockpiles and cover if they will not be actively used within seven (7) days.

5. Vehicle Tracking Control

Restrict vehicle traffic to properly designated areas and remove sediment from vehicle tires prior to exiting the project site. All sediments that are tracked or discharged off-site must be swept or vacuumed at the end of each day.

6. Material Delivery, Storage and Use Management

Minimize the storage of potential pollutants onsite, store materials in a designated area, and install secondary containment. Do not store materials in buffer areas, near areas of concentrated flow, or areas abutting the City storm drainage system, receiving waters, or drainage improvement that discharge off-site.

7. Spill Prevention and Control

Keep ample supply of cleanup materials onsite. Clean up spills immediately, using dry clean-up methods where possible, and dispose of used materials properly.

8. Solid Waste Management

Provide designated waste collection areas for solid waste or construction and demolition waste, collect trash daily, and dispose at authorized disposal areas.

9. Portable Toilets (Sanitary/Septic Waste Management)

Temporary and portable sanitary and septic waste systems shall be mounted or staked in well-maintained and scheduled for regular waste disposal and servicing.

10. Liquid Waste Management BMPs

Contain liquid wastes in a holding pit, sediment basin, roll-off bin, or portable tank of sufficient volume to contain the liquid wastes generated.

11. Vehicle and Equipment Cleaning, Fueling, and Maintenance

Prevent pollutants in storm water from vehicle and equipment cleaning, fueling and maintenance by using off-site facilities when feasible, performing work in designated areas only, using spill pads under vehicles and equipment, checking for leaks and spills, and containing and cleaning up spills immediately.

12. Hazardous Waste Management

Prevent or reduce the discharge of pollutants to storm water from hazardous waste through proper material use and waste disposal.

13. Contaminated Soil Management

Not anticipated.

APPENDIX

B

BIOLOGICAL RESOURCES SURVEY

BIOLOGICAL RESOURCE SURVEY
KAHULUI HARBOR HAWAIIAN CEMENT
FACILITY RELOCATION PROJECT
KAHULUI, MAUI

by

Robert W. Hobdy
Environmental Consultant
Kokomo, Maui
September 2019

Prepared for:
Hawaiian Cement
P.O. Box 488
Kahului, Maui, Hawaii 96732

BIOLOGICAL RESOURCE SURVEY
KAHULUI HARBOR HAWAIIAN CEMENT
FACILITY RELOCATION PROJECT
KAHULUI, MAUI

INTRODUCTION

The Kahului Harbor Hawaiian Cement Facility Relocation project is situated on approximately 0.3 acres of land just west of Hobron Avenue on TMK (2) 3-7-010:009 portion (see Figure 1). This survey and assessment was initiated by the owners in fulfillment of environmental requirements of the planning process.

SITE DESCRIPTION

The project area lies within an industrial complex surrounding the Kahului Harbor. The project area sits on filled land consisting of calcareous coral fragments and sand that was deposited along the shoreline in 1910 when Kahului Harbor was dredged and developed (Foote et al, 1972). The land is level and at an elevation of approximately 10 feet. Rainfall here averages about 24 inches per year, with most occurring during the winter months (Armstrong, 1983). Vegetation is sparse as it is frequently maintained at a very low level.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Kahului Harbor Hawaiian Cement Facility Relocation project which was conducted in September 2019.
The objectives of the survey were to:

1. Document what plant, bird and animal species occur on the property or may likely occur in the existing habitat.

2. Document the status and abundance of each species.

3. Determine the presence or likely occurrence of any native flora and fauna, particularly any that are Federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.

4. Determine if the project area contains any special habitats which if lost or altered might result in a significant negative impact on the flora and fauna in this part of the island.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used covering the entire project area. Notes were made on plant species, their distribution and abundance, as well as the terrain and substrate.

DESCRIPTION OF THE VEGETATION

The vegetation is sparse with much bare ground. Species present consist of hardy grasses and herbaceous plants. A few plants that have the potential of becoming larger shrubs or trees have never been allowed to reach such size. A total of 39 plant species were recorded during the survey. No species were abundant or common in the project area. Nine non-native species were of uncommon occurrence: swollen fingergrass (*Chloris barbata*), spiny amaranth (*Amaranthus spinosus*), four-spike heliotrope (*Heliotropium procumbens*), wild spider flower (*Cleome gynandra*), obscure morning glory (*Ipomoea obscura*), little bell (*Ipomoea triloba*), bitter melon (*Momordica charantia*), prostrate spurge (*Euphorbia prostrata*) and creeping indigo (*Indigofera spicata*). The remaining thirty species were all rare here.

Just three indigenous species were recorded in the project area: kīpūkai (*Heliotropium curassavicum*), ākulikuli (*Sesuvium potulacastrum*) and koali kuahulu (*Merremia aegyptia*). These are all rare in the project area, but otherwise are widespread and common in Hawaii.

DISCUSSION AND RECOMMENDATION

The vegetation in the project area is mostly made up by non-native species. Just three native species were found, the ākulikuli, the kīpūkai and the koali kuahulu. These are indigenous species that are widespread in Hawaii and are also found in other tropical parts of the Pacific. They are of no special conservation concern. No federally listed Endangered or Threatened (USFWS, 2019) plant species were found in or around the project area.

Because there are no federally protected species in the project area there is little of botanical concern and the proposed project is not expected to have a significant negative impact on the botanical resources in this part of Maui.

No special recommendations with reference to the flora are deemed necessary.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within two groups: Monocots and Dicots. Taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999).

For each species, the following information is provided:

1. Scientific name with author citation

2. Common English or Hawaiian name.

3. Bio-geographical status. The following symbols are used:

   endemic = native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.
   indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).
   non-native = all those plants brought to the islands intentionally or accidentally after western contact.

4. Abundance of each species within the project area:

   abundant = forming a major part of the vegetation within the project area.
   common = widely scattered throughout the area or locally abundant within a portion of it.
   uncommon = scattered sparsely throughout the area or occurring in a few small patches.
   rare = only a few isolated individuals within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MONOCOTS			
POACEAE (Grass Family)			
Cenchrus echinatus L.	common sandbur	non-native	rare
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	uncommon
Dactloctenium aegyptium (L.) Willd.	beach wiregrass	non-native	rare
Eragrostis amabilis (L.) Wight & Arnott	Japanese lovegrass	non-native	rare
DICOTS			
AIZOACEAE (Fig Marigold Family)			
Sesuvium portulacastrum (L.) L.	'ākulikuli	indigenous	rare
AMARANTHACEAE (Amaranth Family)			
Amaranthus spinosus L.	spiny amaranth	non-native	uncommon
Amaranthus viridis L.	slender amaranth	non-native	rare
Dysphania ambrosioides (L.) Mosyakin & Clemants	Mexican wormseed	non-native	rare
Dysphania carinata (R.Br.) Mosyakin & Clemants	keeled wormseed	non-native	rare
APOCYNACEAE (Dogbane Family)			
Calotropis procera (Aiton) Aiton	small crownflower	non-native	rare
ASTERACEAE (Sunflower Family)			
Conyza bonariensis (L.) Cronq.	hairy horseweed	non-native	rare
Cyanthillium cinereum (L.) H. Rob.	little ironweed	non-native	rare
Flaveria rinervia (Spreng.) C. Mohr	clustered yellowtops	non-native	rare
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	rare
Tridax procumbens L.	coat buttons	non-native	rare
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	non-native	rare
BORAGINACEAE (Borage Family)			
Heliotropim cruassavicum L.	kīpukai	indigenous	rare
Heliotropium procumbens Mill.	four-spike	non-native	uncommon
BRASSICACEAE (Mustard Family)			
Lepidium virginicum L.	Virginia pepperwort	non-native	rare
CASUARINACEAE (She-oak Family)			
Casuarina equisetifolia L.	common ironweed	non-native	rare
CLEOMACEAE (Cleome Family)			
Cleome gynandra L.	wild spider flower	non-native	uncommon
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea obscura (L.) Ker-Gawl.)	obscure morning glory	non-native	uncommon
Ipomoea triloba L.	little bell	non-native	uncommon

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Merremia aegyptia (L.) Urb.	koali kuahulu	indigenous	rare
CUCURBITACEAE (Gourd Family)			
Momordica charantia L.	bitter melon	non-native	uncommon
EUPHORBIACEAE (Spurge Family)			
Euphorbia hirta L.	hairy spurge	non-native	rare
Euphorbia hypericifolia L.	graceful spurge	non-native	rare
Euphorbia prostrata Aiton	prostrate spurge	non-native	uncommon
FABACEAE (Pea Family)			
Crotalaria incana L.	fuzzy rattlepod	non-native	rare
Indigofera spicata Forssk.	creeping indigo	non-native	uncommon
Leucaena leucocephala (Lam.) de Wit	koa haole	non-native	rare
Macroptilium atropurpureum (DC.) Urb.	siratro	non-native	rare
Macroptilium lathyroides (L.) Urb.	wild bean	non-native	rare
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	non-native	rare
MALVACEAE (Mallow Family)			
Malva parviflora L.	cheese weed	non-native	rare
Malvastrum coromandelianum (L.) Garcke	false mallow	non-native	rare
PORTULACACEAE (Purslane Family)			
Portulaca oleracea L.	pig weed	non-native	rare
SOLANACEAE (Nightshade Family)			
Solanum americanum Mill.	pōpolo	indigenous	rare
ZYGOPHYLLACEAE (Creosote Bush Family)			
Tribulus terrestris L.	puncture vine	non-native	rare

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the project area were covered. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species abundance, activities and location as well as observations of trails, tracks, scat and signs of feeding. In addition, an evening visit was made to the area to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

RESULTS

MAMMALS

No mammals were found in the project area during two site visits.

A special effort was made to look for the native Hawaiian hoary bat by making an evening survey of the area. When present in an area these bats can be easily identified as they forage for insects, their distinctive flight patterns clearly visible in the glow of twilight. In addition, a bat detector (Batbox IIID) device was used, set on the known frequency of 27,000 to 28,000 hertz typical of the Hawaiian hoary bat, to search for these animals. No evidence of such activity was observed though visibility was excellent and plenty of flying insects were seen.

BIRDS

Birdlife was sparse in this small project area. Four non-native bird species were observed during two site visits: the common myna (*Acridotheres tristis*), the house sparrow (*Passer domesticus*), the common chicken (*Gallus gallus*) and the zebra dove (*Geopelia striata*). Taxonomy and nomenclature follow American Ornithologists Union (2019). All of these were uncommon or rare in the project area.

Some other non-native birds could occasionally occur in this area but the habitat is unsuitable for any water, sea or forest birds.

INSECTS

Just three non-native insects were observed in the project area: the dung fly (*Musca sorbens*) which was abundant, the mud dauber wasp (*Sceliphorn caementharium*) and the long-tailed blue butterfly (*Lampides boeticus*). Nomenclature and taxonomy follow Nishida et al, (1972). No native insects were found in the project area.

MOLLUSKS

One non-native mollusk was found in the project area, the giant African snail (*Achatina fulica*).

DISCUSSION AND RECOMMENDATIONS

All animal species found in this small project area were non-native in Hawaii and of no conservation concern. No native species were seen and none would be expected to occur in this habitat.

This proposed project is not expected to have any significant negative impact on the fauna resources in this part of Maui.

No recommendations with regard to fauna species or their habitat were deemed necessary.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within three groups: Mammals, Birds and Mollusks. For each species the following information is provided:

1. Common name.

2. Scientific name.

3. Bio-geographical status. The following symbols are used:

endemic = native only to Hawaii; not naturally occurring anywhere else in the world.

indigenous = native to the Hawaiian Islands and, also to one or more other geographic area(s).

non-native = all those animals brought to Hawaii intentionally or accidentally after western contact.

migratory = spending a portion of the year in Hawaii and a portion elsewhere. In Hawaii the migratory birds are usually in the overwintering/non-breeding phase of their life cycle.

4. Abundance of each species within the project area:

abundant = many flocks or individuals seen throughout the area at all times of day.
common = a few flocks or well scattered individuals throughout the area.
uncommon = only one flock or several individuals seen within the project area.
rare = only one or two seen within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
BIRDS			
COLUMBIDAE (Dove Family)			
Geopelia striata L.	zebra dove	non-native	rare
PASSERIDAE (Passerine Bird Family)			
Passer domesticus L.	house sparrow	non-native	uncommon
PHASIANIDAE (Pheasant Family)			
Gallus gallus L.	common chicken	non-native	uncommon
STURNIDAE (Starling Family)			
Acridotheres tristis L.	common myna	non-native	uncommon
INSECTS			
Order DIPTERA - flies			
MUSCIDAE (Housefly Famil)			
Musca sorbens Wiedemann	dung fly	non-native	abundant
Order HYMENOPTERA - bees, wasps, ants			
SPHECIDAE (Thread-waisted Wasp Family)			
Sceliphron caementarium Fabricius	mud dauber wasp	non-native	rare
Order LEPIDOPTERA - butterflies, moths			
LYCAENIDAE (Gossamer-winged Butterfly Family)			
Lampides boeticus L.	long-tailed blue butterfly	non-native	rare
MOLLUSKS			
ACHATINIDAE (Achatinid Snail Family)			
Achatina fulica Ferussac	giant African snail	non-native	uncommon

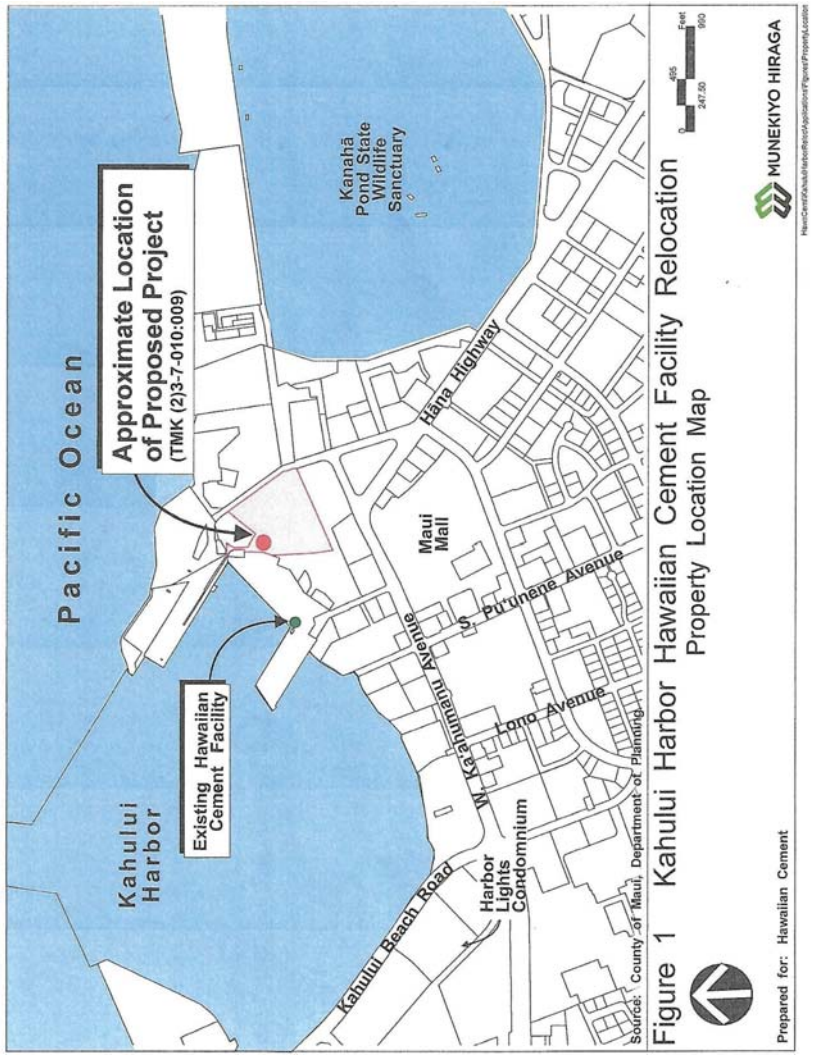

Figure 1. Kahului Harbor Hawaiian Cement Facility Relocation project.

Literature Cited

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APPENDIX

C

ARCHAEOLOGICAL LITERATURE REVIEW AND FIELD INSPECTION

Archaeological Literature Review and Field Inspection for the Hawaiian Cement Facilities Relocation Project at Kahului Harbor, Wailuku Ahupua‘a, Wailuku District, Maui Island, TMKs: [2] 3-7-010:003, 009, and 034

Prepared for
Hawaiian Cement

Prepared by
Layne Krause, M.A.,
Jay Rapoza, B.A.,
Angela L. Yates, B.S.,
Robert Hill, B.A.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawai‘i, Inc.
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(Job Code: WAILUKU 39)

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Management Summary

Reference	Archaeological Literature Review and Field Inspection for the Hawaiian Cement Facilities Relocation Project at Kahului Harbor, Wailuku Ahupua‘a, Wailuku District, Maui Island, TMKs: [2] 3-7-010:003, 009, and 034 (Krause et al. 2020)
Date	March 2020
Project Number	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: WAILUKU 39
Investigation Permit Number	CSH completed the archaeological literature review and field inspection (LRFI) under archaeological fieldwork permit number 19-07, issued by the Hawai‘i State Historic Preservation Division (SHPD) per Hawai‘i Administrative Rules (HAR) §13-13-282.
Agencies	SHPD; State of Hawai‘i Department of Transportation (HDOT)
Land Jurisdiction	Government: State of Hawai‘i Private: A&B Properties Inc.
Project Funding	Hawaiian Cement
Project Location	The project area is located on the east side of Kahului Harbor, bounded on the west by Wharf Street, and bounded on the east by Hobron Avenue. It is directly northwest of the East Ka‘ahumanu Avenue and Hana Highway intersection. The project area is comprised of three separate land parcels (TMKs: [2] 3-7-010:003, 009, and 034) and is depicted on portions of the 1997 Paia and Wailuku quadrangles.
Project Description	In accordance with the HDOT Harbors Division Kahului Harbor Development Plan and Kahului Commercial Harbor 2025 Master Plan improvements, Hawaiian Cement proposes relocation of their current facility at Kahului Harbor. The relocated facility will consist of two silos, a warehouse building, underground pipelines from the pier to the new silos, as well as other site improvements. In addition, the existing Hawaiian Cement facility in Parcel 034 will be demolished as well as part of the conveyor system and the intake dump bin. Project-related ground disturbance will likely include coring and drilling for soils exploration; excavations for the installation of the underground pipeline; footing excavations under the silos and warehouse; excavations associated with new sewer lines and septic system; and excavations to install base course under new pavement surfaces.
Project Acreage	The project area is comprised of three adjacent land parcels totaling 22.34 acres (9.04 hectares).
Document Purpose	This investigation was designed—through detailed historical, cultural, and archaeological background research and a field inspection of the project area—to determine the likelihood that historic properties may be affected by the project, and, based on findings, consider cultural resource management recommendations. This document is intended to

	facilitate the project's planning and support the project's historic preservation and environmental review compliance. This investigation does not fulfill the requirements of an archaeological inventory survey investigation, per HAR §13-13-276. Consultation for the Hawaiian Cement Facilities Relocation Project is currently being conducted and will be described in detail in a companion Cultural Impact Assessment (CIA).
Fieldwork Effort	Fieldwork was accomplished between 30 September and 2 October 2019 by Jay Rapoza, B.A., and Trevor Yucha, B.S., under the general supervision of Hallett H. Hammatt, Ph.D. This work required approximately 9 person-days to complete.
Results Summary	Two contributing components of SIHP # 50-50-04-1607 (Kahului Historic District) are located within the project area. The components include the Kahului Railroad roundhouse building and the adjoining Kahului Railroad machine shop annex. The project area is located within the boundaries of SIHP # 50-50-04-2953, the Kahului Commercial Harbor (which also may be part of the Kahului Historic District). CSH did not identify potential historic properties related to SIHP # -2953 within the project area. In addition to the two known components of SIHP # -1607, CSH has documented four other structures that may be considered significant historic properties of historic architecture. These structures include three storage warehouses and a conveyor system with associated dump bin that have been temporarily designated CSH 1 through CSH 4, respectively. Each of the structures were related to the Kahului Railroad Company and early efforts by Hawaiian Commercial and Sugar Company (HC&S) to modernize the process of transporting and exporting unrefined sugar, reflecting a key piece of the industrial history of Kahului. These structures are all believed to be more than 50 years old.
Recommendations	CSH recommends consultation with the SHPD Architecture Branch be initiated to determine the historic preservation requirements for the buildings and structures (SIHP # -1607, -2953, and CSH 1 through CSH 4) that are located within the project area. This LRFI is designed to support this consultation. Architectural recordation by an architectural historian may be appropriate in order to assess the significance of historic architecture and provide recommendations for appropriate mitigation, per HAR §13-13-281-5. CSH also recommends consultation with the SHPD Archaeology Branch to determine historic preservation requirements related to project-related ground disturbance. This LRFI is designed to support this consultation. No archaeological sites were observed by CSH during

	a pedestrian inspection of the project area. A preliminary GPR survey found no evidence of buried railroad tracks or other potential anomalies within the project area (apart from a metal utility line). Based on the amount of previous ground disturbance within the project area, including commercial construction and natural tidal events, subsurface in situ cultural deposits are unlikely to be present within the project area. Nonetheless, CSH recommends on-site archaeological monitoring during project-related ground disturbance to ensure the identification and proper treatment of any inadvertently discovered historic property.

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Section 1 Introduction

1.1 Project Background

At the request of Hawaiian Cement, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this Archaeological Literature Review and Field Inspection (LRFI) report for the Hawaiian Cement Facilities Relocation Project at Kahului Harbor, Wailuku Ahupua‘a, Wailuku District, Maui Island, TMKs: [2] 3-7-010:003, 009, and 034. The project area is located on the east side of Kahului Harbor, directly northwest of the East Ka‘ahumanu Avenue and Hana Highway intersection. It is bounded on the west by Wharf Street and bounded on the east by Hobron Avenue. The project area is depicted on portions of the 1997 Paia and Wailuku U.S. Geological Survey (USGS) 7.5-minute topographic quadrangles (Figure 1), a tax map plat (Figure 2), and a 2013 aerial photograph (Figure 3).

The project area is comprised of three adjacent land parcels totaling 22.34 acres (9.04 hectares). In accordance with the HDOT Harbors Division Kahului Harbor Development Plan, Hawaiian cement proposes to relocate their facility at Kahului Harbor from its present location to the current project area. This relocation is part of Kahului Commercial Harbor 2025 Master Plan improvements and involves the construction of two silos, a warehouse building, and the installation of underground pipelines to connect the pier to the new silos, as well as other site improvements (Figure 4). In addition, the existing Hawaiian Cement facility in Parcel 034 will be demolished, as well as part of the conveyor system and the intake dump bin. Ground disturbing activities for this project will likely include coring and drilling for soils exploration, open excavations for the installation of the underground pipeline, footing excavations under the silos and warehouse, excavations associated with new sewer line and septic system, and excavations to install base course under new pavement surfaces.

1.2 Document Purpose

This investigation was designed—through detailed historical, cultural, and archaeological background research and a field inspection of the project area—to determine the likelihood that historic properties may be affected by the project, and, based on findings, consider cultural resource management recommendations. This document is intended to facilitate the project’s planning and support the project’s historic preservation and environmental review compliance. This investigation does not fulfill the requirements of an archaeological inventory survey investigation, per Hawai‘i Administrative Rules (HAR) §13-13-276.

Consultation for the Hawaiian Cement Facilities Relocation Project is currently being conducted and will be described in detail in a companion Cultural Impact Assessment (CIA).

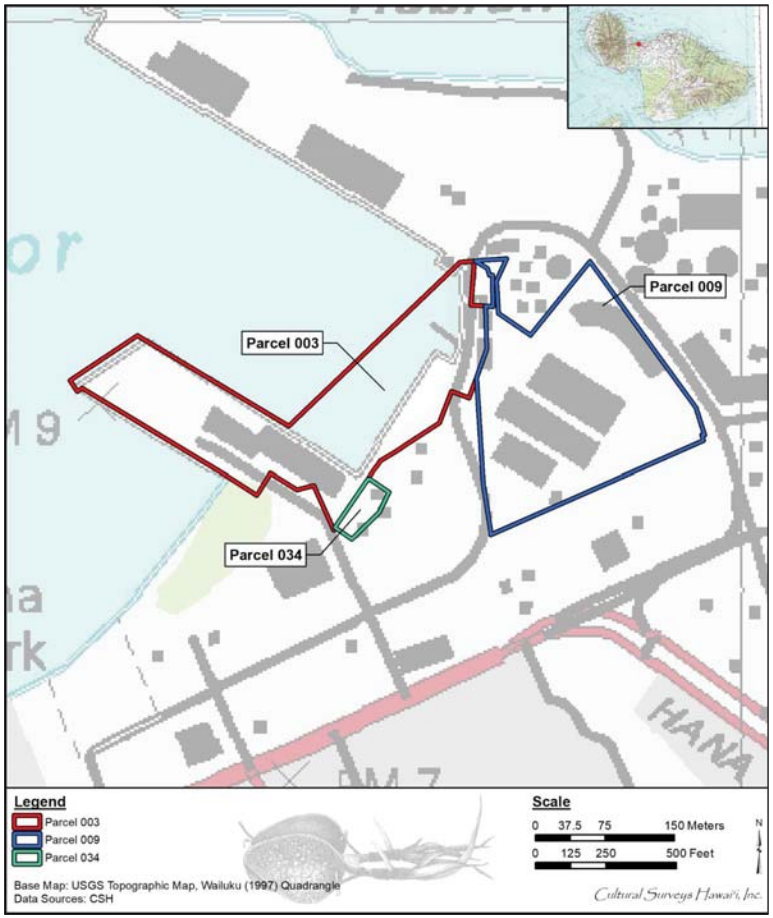


Figure 1. Portion of the 1997 Wailuku and Paia USGS 7.5-minute topographic quadrangles showing the location of the project area (U.S. Geological Survey 1997a, 1997b)

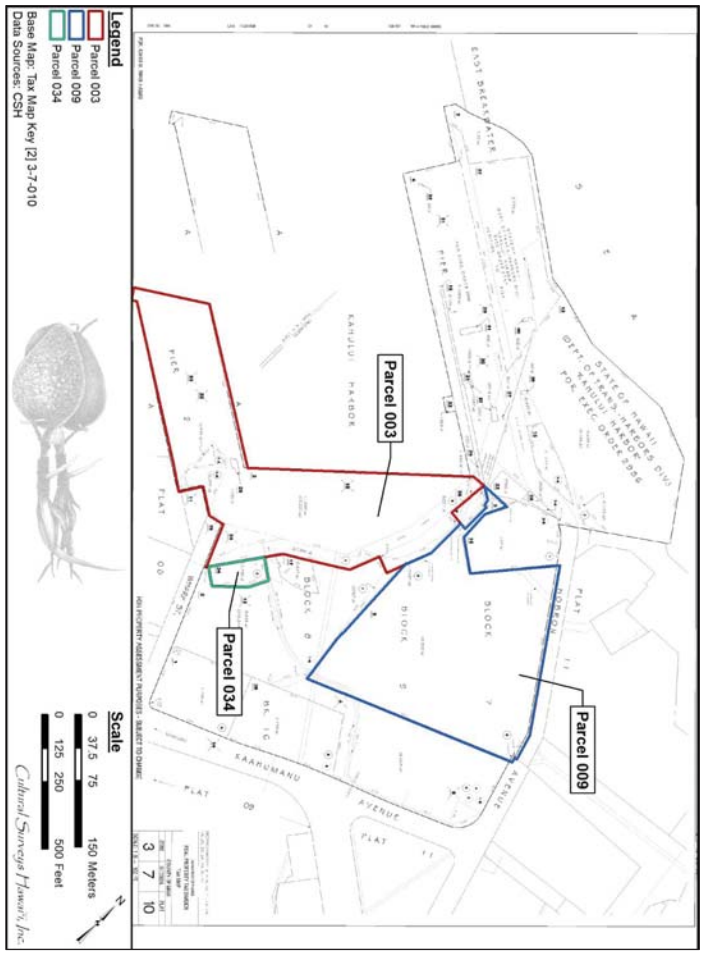


Figure 2. Tax Map Key (TMK) [2] 3-7-010 showing the project area in parcels 003,009, and 034 (Hawaii TMK Service 2014)

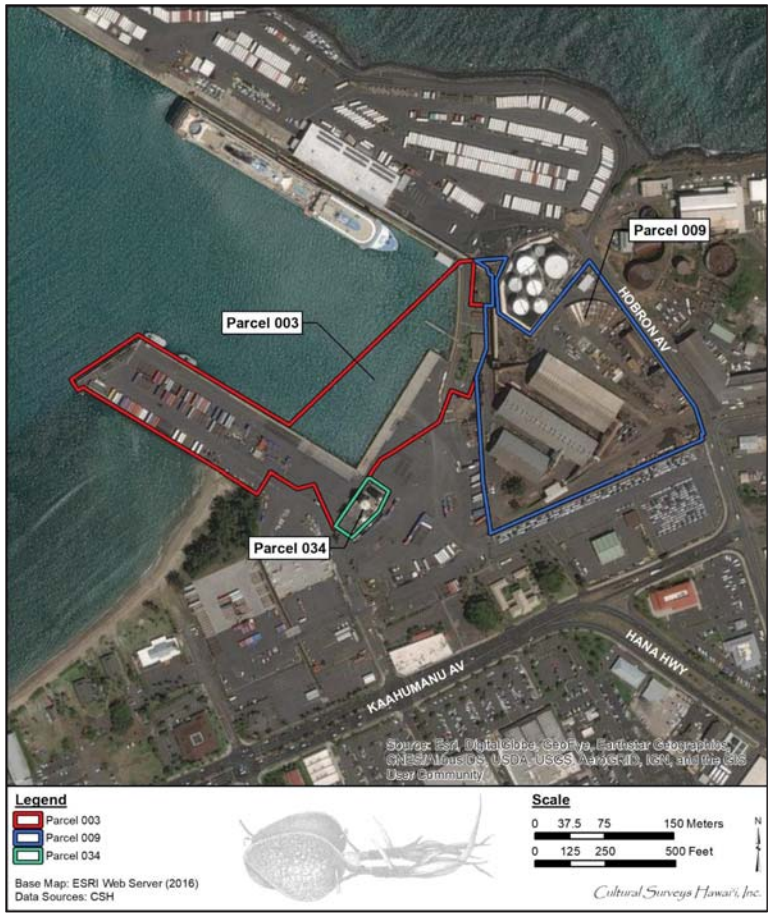


Figure 3. Aerial photograph of the project area (Esri 2016)

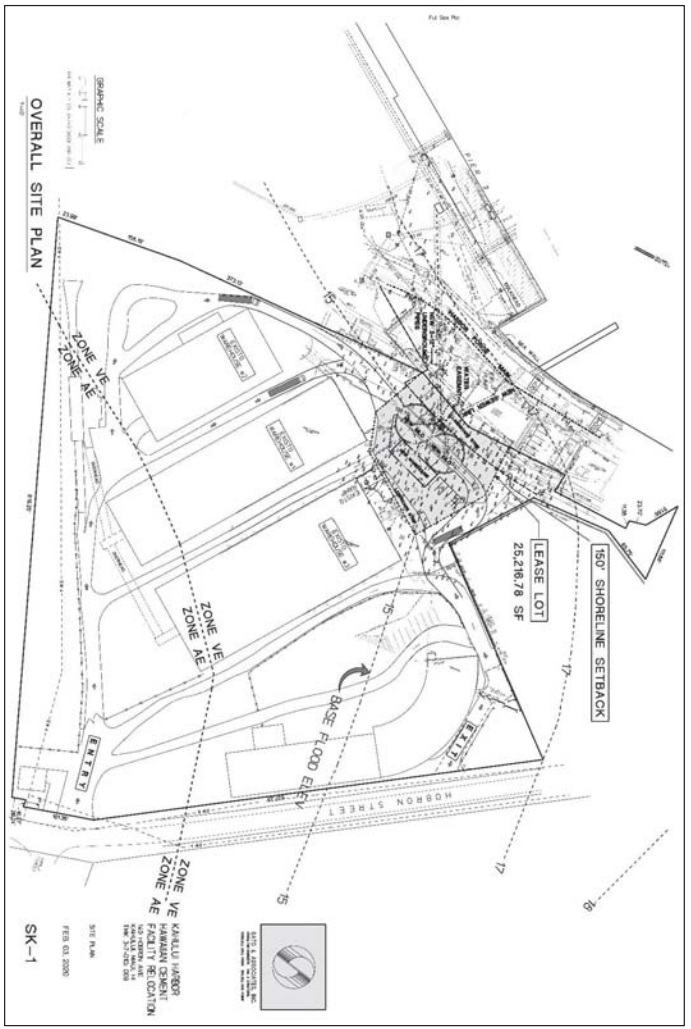


Figure 4. Kahului Harbor Hawaiian Cement Facility Relocation Overall Site Plan (provided by client)

1.3 Environmental Setting

1.3.1 Natural Environment

The project area is located along the northern coastline of the isthmus formed between Maui's two major volcanoes: West Maui and East Maui (Haleakalā) (MacDonald et al. 1990). Land within the project area is flat with an elevation of 4 m (13 ft) above mean sea level (amsl). The project area is situated along the east side of Kahului Bay, which is between where ‘Īao Stream (approximately 2 km [1 mile] northwest) and Kalialinui Gulch stream (approximately 2.0 km east) empty into the Pacific Ocean.

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), soils within the project area consist entirely of Fill land (Fd) (Figure 5), which is generally described as consisting of "areas filled with material from dredging, excavation from adjacent uplands, garbage, and bagasse and slurry from sugar mills" (Foote et al. 1972:31). Fill land present within the current project area is specifically described as follows:

> This land type consists mostly of areas filled with bagasse and slurry from sugar mills. A few areas are filled with material from dredging and from soil excavations. Generally, these materials are dumped and spread over marshes, low-lying areas along 'the coastal flats, coral sand, coral limestone, or areas shallow to bedrock.
>
> This land type is used mostly for the production of sugarcane. (Foote et al. 1972:31)

Beginning in the mid-1870s, dredged material from wharf construction was deposited at the shoreline to fill in a natural wetland area and compacted to accommodate the construction of railroads, lumber storage and freight warehousing. The landscape of the project area has been heavily modified by the historic dredging. All vicinity of the harbor north of Ka‘ahumanu Avenue has been compacted to support industrial operations along the waterfront.

Approximately 50 m (164 ft) northeast of the project area, soils described by Foote et al. (1972) as Beaches (BS) occur along the coastline (see Figure 5).

> Beaches occur as sandy, gravelly, or cobbly areas on all the islands in the survey area. They are washed and rewashed by ocean waves. The beaches consist mainly of light-colored sands derived from coral and seashells. A few of the beaches, however, are dark colored because their sands are from basalt and andesite.
>
> Beaches have no value for farming. Where accessible and free of cobblestones and stones, they are highly suitable for recreational uses and resort development. (Foote et al. 1972:28)

In 2014, the average monthly air temperature for the project area ranged from 21.72°C (71.10°F) in February to 25.77°C (78.39°F) in August, while the average annual air temperature was approximately 23.78°C (74.80°F) (Giambelluca et al. 2014). Rainfall accumulation within the project area averages around 15 inches per year with the heaviest rainfall occurring during the winter months (December through February) and little to no rainfall during the summer months (June through August) (Giambelluca and Schroeder 1996). According to the University of Hawai‘i 2011 Rainfall Atlas of Hawaii, the project area received a mean annual rainfall of 413.0 mm (16.3

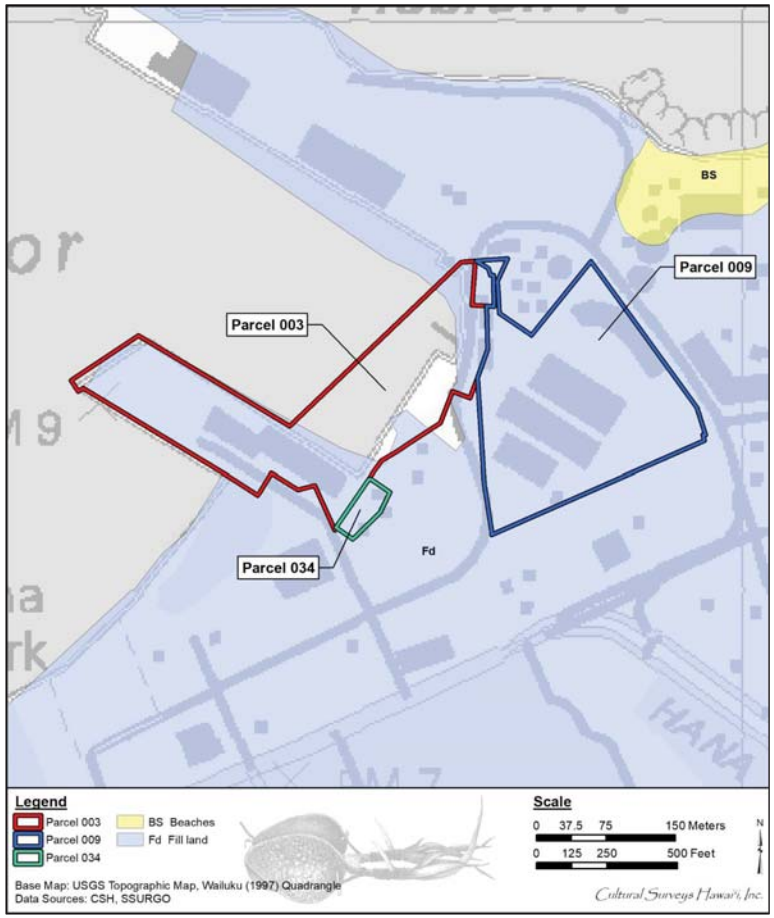


Figure 5. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (U.S. Department of Agriculture Soils Survey Geographic Database [SSURGO] 2001)

in) between 1978 and 2007 (Giambelluca et al. 2013). The mean monthly rainfall varies between 5.3 mm (0.2 in) in June and 83.2 mm (3.3 in) in January (Giambelluca et al. 2013). In 2014, the average annual air temperature for the project area was

Prior to industrial development of the current project area, this pattern of rainfall and low annual precipitation rate once sustained a lowland, dry shrub land and grassland native ecosystem (Pratt and Gon III 1998). In the adjacent waterfront areas, vegetation occurs as an occasional ironwood tree (*Casuarina equisetifolia*), or as introduced groundcover around office buildings such as wedelia (*Sphagneticola trilobata*). Northeast of the present project parcel the area is heavily forested with *hao* (*Rauvolfia sandwicensis*), ironwood (*Casuarina equisetifolia*), brown-tufted *‘ahu‘awa* grass (*Cyperus javanicus*), tree heliotrope (*Tournefortia argentea*), mango (*Mangifera indica*), coconut and *kou haole* (*Cordia sebestena*).

1.3.2 Built Environment

The built environment within the project area mostly consists of paved asphalt and existing historic structures built by Kahului Railroad Company and formerly used for Hawaiian Commercial and Sugar Company commercial sugar operations (HC&S 2009). These structures include a railroad roundhouse, three bulk sugar storage warehouses, and a conveyor system. In addition, administrative facilities associated with the Harbors Division of the HDOT and docking areas, including Pier 2, are present within the current project area.

The built environment in the immediate vicinity of the project area consists almost entirely of paved parking lots and access roadways, including East Ka’ahumanu Avenue, just south of the project area, and Hobron Avenue, bounding the project area to the east. Lands immediately surrounding the project area are under the jurisdiction of the Harbors Division of the HDOT and contain HDOT storage lots and intermodal freight and bulk freight storage for Saltchuk Resources, Inc., Young Brothers Ltd., and Hawaiian Tug and Barge Service. Lands south of the project area parcels and Ka‘ahumanu Avenue have been developed as the Maui Mall regional shopping center.

Section 2 Methods

2.1 Field Methods

CSH completed the fieldwork component of this LRFI under archaeological permit number 14-04, issued by the SHPD pursuant to HAR §13-13-282. Fieldwork was conducted between 30 September and 2 October 2019 by CSH archaeologist Jay Rapoza, B.A., and Project Manager, Trevor Yucha, B.S., under the general supervision of Principal Investigator, Hallett H. Hammatt, Ph.D. This work required approximately 9 person-days to complete.

In general, fieldwork included 100% pedestrian inspection of the project area, GPS data collection, GPR survey, and a photographic documentation of the surface and related findings.

2.1.1 Pedestrian Survey

A reconnaissance-level pedestrian inspection of all accessible portions of the project area was completed. Systematic sweeps were not possible due to the presence of standing structures throughout the project area. The interior of the structures within the project area were not inspected as many of the structures are unstable. The portion of the project area that is within the ocean was also not inspected.

2.1.2 GPR Survey

The targeted GPR survey included four survey locations that were completed in six GPR survey grids (Grids 1 through 6). A GPR survey grid was established at each location using pin flags and/or marking paint to delineate each parallel transect. GPR transects were spaced every 25 cm. The survey was completed in one direction (normal mode) from the X-axis traveling along the Y-axis using the GSSI Quick3D collection mode for 3D scans of each survey grid.

The GPR survey was performed using a Geophysical Survey Systems, Inc. (GSSI) SIR-3000 system equipped with a 400 MHz antenna. This is a bistatic system in which electromagnetic energy in the radar frequency range is transmitted into the ground via a sending antenna. Radar energy is reflected off the subsurface matrix, then received by another, paired antenna. Reflected energy is sampled, and the travel time (in nanoseconds) of the individual reflection waves is recorded. Wave propagation speed varies depending on the nature of the subsurface medium. Any changes in density or electromagnetic properties within the stratigraphic column may cause observable variations in reflection intensity. Reflection features may include discrete objects, stratigraphic layering, or other natural and/or man-made subsurface anomalies.

GPR data collection parameters were held constant throughout the survey under the assumption that soil characteristics were relatively consistent throughout the survey area. The maximum depth of interest was set at 3.0 m. Scans per unit was set at 50 scans per meter. The settings used for this survey were based on the recommendations of GSSI (GPR manufacturer) for this soil type.

Post-processing of the data was completed using GSSI RADAN 7 software to produce a 3D grid file or GPR profile slice for each location. Post-processing included an adjustment of the Time-Zero line to eliminate the GPR signal that is recorded between the base of the antenna and the ground surface as well as changes to the display gain. No other post-processing techniques were utilized.

Documentation during the GPR survey included descriptions and photographs of the locations of each GPR survey area, including sediment types, vegetation types and densities, and the field methodology completed by the survey crew for each GPR grid location (starting points, ending points, direction of travel, and transect/grid boundary recording).

2.1.3 GPS Data Collection

Following the completion of each GPR survey area, the corners of each grid were recorded using a Trimble Geo XH mapping grade GPS unit with real-time differential correction yielding post-processed horizontal accuracy between 0.3 and 0.5 m. All points of interest or potential historic properties locations were recorded with the GPS unit and uploaded to ArcGIS for inclusion on project maps.

2.2 Research Methods

Analysis of historic materials was undertaken using standard archaeological laboratory and archival techniques during the preparation of this report. Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawai‘i State Archives, the HC&S Sugar Museum, and the Bishop Museum Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina (2000) database.

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of historic properties in the project area which were confirmed with the 100% pedestrian survey and GPR study.

Section 3 Background Research

3.1 Traditional and Historical Background

The division of Maui’s lands into political districts occurred during the rule of Kaka‘alaneo, under the direction of his *kahuna*, Kalaiha‘ōhi‘a (Beckwith 1970:383). This division resulted in twelve districts, or *moku,* on the island of Maui during traditional times: Kula, Honua‘ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko‘olau, Hāmākua Loa, Hāmākua Poko, Wailuku, Kā‘anapali, and Lāhainā (Sterling 1998:Preface). The *moku o loko*, or *moku* as it is most commonly called, literally means “to cut across, divide, separate” (Lucas 1995:77). When used as a term of traditional land tenure, a *moku* is akin to a political district, an overall land division that can contain smaller divisions of land such as ‘*okana, kalana, ahupua‘a, ‘ili,* and *mo‘o*. The current project area is located in coastal Kahului within the traditional boundaries of the *‘īli* of Kalua, just south-east of Mauna Kahalawai [West Maui Mountains] in the *ahupua‘a* of Wailuku.

The lands of Wailuku are traditionally known as the “locality of flying clouds” (Fornander 1916-1917:286). The *ahupua‘a* of Wailuku, Waikapū, Waiehu, and Waihe‘e were collectively referred to as “Nā wai ‘ehā” or “The Four Waters” (Handy et al. 1991:496). Nā wai ‘ehā consisted of four deep valley streams that watered four distinct areas of *kalo* (taro) land, which spread out fanwise to the shoreline (Handy et al. 1991:272). According to Kame‘eleihiwa (1992:241), the combined area of these four *ahupua’a* was once known as “Pu‘ali Komohana,” which means “western sun-setting isthmus (Andrews 1865:73). Much of the historical and traditional information for the Kahului region comes from portions of Wailuku *Ahupua‘a* with populations located in the uplands, along the streams and valleys of Mauna Kahalawai.

3.1.1 Traditional Accounts

A *mo‘olelo* (traditional story) concerning a beautiful woman named Luahinepii, takes its setting in the ‘Īao valley of Wailuku and mentions Paukakalo beach area, which is approximately 2.5 m (1.6 miles) northwest of the current project area. According to Field (1912:149) in Sterling (1998):

> At the base of this noble perpetual sentinel to Iao Canyons [*Kukaemoku—‘Iao Needle*] lived, a few centuries ago, a most beautiful maiden. Her figure and form
>
> were so near perfection that a Raphael or a Michael Angelo [*sic*] might have selected her for a model representing a Hawaiian Venus. Her name was Luahinepii (climbing old woman), a name most unsuitable to a maiden so beautifully fair. She possessed, however, a voice so unpleasant and hideous that other maidens, jealous of her unsurpassed natural beauty, made fun of her.
>
> Luahinepii had a lover who lived at the beach near Paukukalo. Other maidens looked upon him as a possible suitor, but like all true lovers he turned a deaf ear to their entreaties.
>
> The rival belles met and agreed to circulate a report to this wise: “Ua lohe-ia ko leo kapu e ko ipo i Moealoha” (Your sacred voice has been heard by your lover at Lover’s-Dream). This soon reached the ear of Luahinepii. She felt deeply these to her, most humiliating words. In her frantic moments she sought to end her life and to free herself from the cares and woes of this deceptive world. …Luahinepii scaled

> to the top of Kukaemoku, called Nanahoa, and from its dizzy height dashed herself headlong to the valley beneath, and the waters of Iao were made incarnadine with her blood. (W. H. Field in Sterling 1998:83)

A traditional account regarding the construction and dedication of the fish ponds named Mau‘oni and Kanahā at Kahului appears in Sterling (1998). According to the story, Kapi‘ioho‘okalani, one-time ruler of O‘ahu and half of Moloka‘i, began building the pond walls, but Kamehamehanui, *mō‘ī (king*) of Maui in the mid-1700s, finished the construction. Kapi‘ioho‘okalani was killed in battle before he could complete the construction of the pond walls. After Kamehamehanui finished building the walls, he placed a *kapu* (taboo) on the bank, or *kuapā*, dividing the two ponds. The chiefess Kahamaluihi was born of such high rank that she was able to break the *kapu* by walking on the center *kuapā* of the ponds. Following this act, Kamehamehanui allowed her to name them. She named Kanahā for her brother, and Mau‘oni for the identity she travelled by to protect her status as a high chiefess. Sterling (1998) also noted two references by Samuel Kamakau (1992), which credit Kihapi‘ilani as having originally built the stonework separating the two ponds at a much earlier time than the work performed by Kamehamehanui.

Mau‘oni Pond is located about 300 m (0.19 mile) east of the current project area, and Kanahā Pond is approximately 400 m (0.25 mile) to the southeast. These ponds were the subject of many legends and sayings. In one legend concerning a Hawaiian couple who lived near the ponds, the origin of the name Wailuku is explained:

> One day Kapoi’s wife went out to gather ‘*ūhini* (grasshoppers) and found an owl’s nest with seven eggs. Thinking they were duck eggs, she took them and gave them to Kapoi. He realized what they were, but refused to give them back to the owl who appeared and requested their return. Kapoi then smashed the eggs against the stone wall surrounding the house. Infuriated over the senseless loss, ‘A‘apueo, the mother owl, and her mate, Pueokaia, gathered owls from all the islands. All of the men and chiefs of the area, including Kapoi and his wife, were destroyed. The place mauka of the ponds where the cruel breaking of ‘A‘apueo’s eggs was avenged was called Wailuku “water (of) destruction.” (Clark 1989:8)

3.1.2 Place Names

While the traditional accounts of the Kahului area are relatively scarce, an analysis of the place name meanings for the region surrounding the project area may yield some insight into the patterns of life in the area. In the preface of *Place Names of Hawaii*, Pukui et al. (1974:x) cite Samuel Elbert’s description of the relationship of names-to-places in Hawai‘i:

> Hawaiians named taro patches, rocks and trees that represented deities and ancestors, sites of houses and heiau, canoe landings, fishing stations in the sea, resting places in the forests, and the tiniest spots where miraculous or interesting events are believed to have taken place.
>
> Place names are far from static… names are constantly being given to new houses and buildings, land holdings, airstrips, streets, and towns and old names are replaced by new ones… it is all the more essential, then to record the names and the lore associated with them now. (Pukui et al. 1974:x).

Inherent in the statements of Elbert is the knowledge that the oldest place names held meaning and told the story of an area prior to Western contact. Literal translations of several of the place names for land areas and divisions near the project area are listed in Table 1. Unless otherwise noted, the translations in the table are taken from Pukui et al. (1974).

3.1.3 Habitation and Subsistence

The relative scarcity of recorded coastal place names for Kahului may be an indication of a population that was widely spread out between settlements with denser populations at Wailuku and settlements further east beginning at Hāmākua Loa. The upland portion of Wailuku Ahupua‘a was resplendent with vast taro fields fed by the ‘Īao Stream. The fertile valleys of four major perennial streams of windward West Maui Mountains formed the largest continuous area of wet-taro cultivation in the Hawaiian Islands (Handy 1940:496). The high degree of cultivation within Wailuku Ahupua‘a, along the flood plain of ‘Īao Stream, gives evidence that a substantial population would have been established in the region during the pre-Contact period.

During an 1828 tour around Maui, missionaries Richards and Green noted the fertility of the Wailuku region. In an excerpt from a letter penned in 1830 and published in the Missionary Herald in 1831, Richards and Green (1831:182) described Wailuku as “a populous and fertile district on the windward side of the island, … a very desirable place for a new station…” They further relayed their observations as follows:

> No district of equal extent on the islands, produces more abundantly the necessaries of life, than Wailuku. Indeed, many districts on Maui and some parts of Hawaii depend for sustenance on this favored valley. It contains of course a numerous population… The district of Wailuku would furnish sustenance for an immense population. (Richards and Green 1831:182)

Beyond the alluvial sediments of the stream valley as the lower elevations lead into the central isthmus of Maui, the landscape was once dominated by windswept Pleistocene sand dune deposits. The following excerpt of a newspaper article published in *Pacific Commercial Advertiser* distinguishes the differences between the two areas:

> The isthmus of Waikapu [and Wailuku] lies but little above the level of the sea, and is composed of dry sand. Since the goats and cattle have been allowed to run there, they have destroyed the vines and bushes which served to confine the sand on the windward side, and the “dunes” have been driven nearly to the leeward beach, and will soon usurp the whole of the lower part of the isthmus. The wind here rushes across in fierce gusts between the two divisions of the island, and renders the navigation of the bay at times quite dangerous. On the western slope of the isthmus, and towards the windward side, lie the cultivated portions of Waikapu and Wailuku, which, with the valleys behind them, are very fertile. (Anonymous 1858:409)

Traditional habitation and cultural activities centered on 'Iao Valley and present-day Wailuku Town vicinity. However, most Wailuku Ahupua‘a lands lay in the large eastern extension, which includes Kahului Harbor (current project area) and continues east beyond Spreckelsville. This approximately 24,000-acre eastern portion of Wailuku Ahupua'a, known as *Ke Kula o Kama'oma'o* and also referred to as Wailuku Commons, differs pronouncedly from the western portion of the *ahupua‘a* in the virtual absence of permanent habitations until the very late nineteenth century.

Table 1. Place names and meanings within the project area vicinity

Hale ki'i (*Heiau*)	*Lit.,* "image house." A *heiau* (Walker Site 44) located in Wailuku at the Pihana *heiau* complex (see subsections 3.1.4.1 and 3.2.1), along the 'Īao Stream in the region of Paukūkalo. According to Kamakau, Maui chief Kekaulike was brought here to die in 1736.
'Īao (Stream)	*Lit.,* "cloud supreme." 'Īao Stream brings the water of 'Īao Valley to the ocean at Paukūkalo, a point just northwest of Kahului Harbor.
Ka'a (Point)	*Lit.,* "rolling." A shoreline promontory just east of Kahului Bay.
Ka'ahumanu (Avenue)	*Lit.,* "the bird [feather] cloak." Avenue named in honor of Queen Ka'ahumanu, favorite wife of Kamehameha I, who became *kuhina nui* (regent) to Kamehameha II and Kamehameha III and an ardent supporter of the Protestant mission in the Hawaiian Islands. She died in 1832, at Mānoa, on the island of O'ahu (Kamakau 1992).
Kahului (Kaihuwa'a)	*Lit*., "the winning". According to Malo (1951:268), "the Kahului was a disposition or order of battle in which the main body of the soldiers were drawn up in the form of a crescent, with the horns pointing forwards." This formation was "undoubtedly derived from the place of the same name," a "flat and treeless" region (Malo 1903: page268)
Kalialinui (Gulch)	Possible literal translation: "large tree or plant used for medicine" (Malo 1951). Kalialinui Gulch is within 2 km west of the project area.
Kalua (*'Ili*)	*Lit.,* "the pit." *'Ili* that includes much of the commercial hotel land of the Kahului Harbor, the Kaiser clinics, Maui Memorial Medical Center, Queen Ka'ahumanu Center, and the Maui Mall.
Kanahā (Pond)	*Lit.,* "the shattered (thing)"." Sterling (1998) notes that salt was gathered at Kanahā and that the pond was named by high ranking chiefess, Kahamaluihi (see subsection 3.1.1). Name of pond, wildlife sanctuary, and beach, all east of the current project area. Kanahā Pond is designated SIHP # 50-50-04-1783 and is located about 400 m southeast of the project area.
Mauna Kahalawai	*Lit*., "the gathering of waters". West Maui Mountains (Pellegrino 2009).
Mau'oni (Pond)	One of the two fishponds located at the shore of Kanahā. This pond is approximately 300 m east of the project area.
Nehe (Point)	*Lit.,* "rustle." Point of land along the Waiehu coastline. (Pellegrino 2009).
'Owā (*'Ili*)	Cry of the *'aukuʻu*, heron, which suggests *ʻowā*; to cry thus. A measurement equal to half the width of a finger, of fishing nets (*Mākahi a ʻowā*; the width of one and a half fingers). *'Ili* where the Sand Hills, Baldwin High School, the Maui Arts & Cultural Center and the U.H. Maui College are situated.

Paukūkalo	*Lit.,* "taro piece." This present-day shoreline community is located at the northernmost region of the Kahului Harbor. 'Īao Stream reaches the ocean at Paukūkalo, a region reported to have once been heavily planted in *kalo* (wetland taro).
Pihana (*Heiau*)	*Lit.,* "fullness." Stories of this Paukūkalo *heiau* include it being built in a single night by the legendary race of *Menehune*, who brought the stones from Paukūkalo Beach. Pukui also states that the construction of this *heiau* has been attributed to the Maui chief, Kahekili. It is listed as Walker Site 43. The Pihana Heiau is a sacred place located within the *'ili* of Paukūkalo.
Pu'ali Komohana	Translated by Andrews (1856:73) as "western sun-setting isthmus." Combined area of Wailuku, Waikapū, Waiehu, and Waihe'e *ahupua'a*.
Pu'unēnē	*Lit.,* "goose hill." A land area named after a cinder cone, once located just inland of Papa'ula, mined for its gravel during WWII to construct the runways at the U.S. Naval Air Station Kahului (Fornander 1916). Pu'unēnē Avenue extends from the Kahului Harbor's west border to Pu'unēnē Town, which is within 3 km south of the project area.
Wailuku (*Ahupua'a*)	*Lit*., "water of destruction", a reference to the battle which took place at 'Īao between the forces of Kamehameha I and the Maui chiefs. Sterling (1998) states that Pukui et al. (1974) believes the name is older than the famous battle. Westervelt (Saito 2011) makes special reference to the waters of Wailuku in 'Īao (*Lit.,* "asking for clouds") emptying into the Kahului Harbor. Fornander recorded that Wailuku was the place of flying clouds (Westervelt 1910).

A description of Wailuku Ahupua'a configuration was given by W. D. Alexander in *A Brief History of Land Titles in the Hawaiian Kingdom*: "On Maui the lands of Waikapu and Wailuku appropriated almost the whole of the isthmus so as to cut off half of the lands in the district of Kula from access to the sea" (Alexander 1890:106). A possible explanation for this might include an effort by the politically powerful Wailuku to secure valued resources in the eastern portion of greater Kahului Bay. In addition to common marine resources, drift resources, such as drift logs from the Pacific Northwest, ivory from drifting whale carcasses, and iron embedded in drifting ships or flotsom, may have also been collected in Kahului Bay due to its exposure to trade winds.

Another possible explanation is that the northeastern portion of the isthmus was held by Wailuku for political purposes. Ross Cordy (1981:198-200) suggested a "buffer zone" extended across the central portion of Maui Island., which presumably served as a relatively unoccupied border or "no man's land" between the two powerful competing societies of Maui (West Maui and East Maui) until the unification of Maui under the ruling chief Pi'ilani circa 1600. Cordy's theory suggests that Wailuku held the northeastern portion of the isthmus in order to minimize conflict with the forces of East Maui. Evidence suggests that the Hawaiians of Wailuku were not particularly interested in living in the eastern portion of the *ahupua 'a,* strongly favoring the vicinity of 'Iao Stream instead. Economic reasons certainly would have existed for excluding Kula people, particularly by reserving access to marine resources. Politically, by limiting coastal access, the population of Kula was kept low, and tensions with East Maui were minimized.

Notably, the sandy plains of Ke Kula o Kama‘oma‘o were known by Hawaiians in traditional times as a wandering place of the souls (Beckwith 1970), a place where dead spirits waited for a friendly escort, perhaps a family *‘aumakua* (guardian spirit embodying an animal form), to show them the way to eternity:

> The worst fate that can befall a soul is to be abandoned by its aumakua and left to stray, a wandering spirit (kuewa) in some barren and desolate place, feeding upon spiders and night moths. Such spirits are believed to be malicious and to take delight in leading travelers astray; hence the wild places which they haunt on each island are feared and avoided. Such are the plains of Kama‘oma‘o on the island of Maui. (Beckwith 1970:154)

According to Helen P. Hoyt (1976), Kama‘oma‘o is also a region where the “Marchers of the Night,” or *Ka huaka‘i o ka Po*, are sometimes heard and seen. When these spiritual “Night Marchers” appear, according to Beckwith (1932:199), “It is said that such a sight is fatal unless one has a relative among the dead to intercede for him.”

> The marchers carried candlenut torches which burned brightly even on a rainy night. They might even be seen in broad daylight and were followed by whirlwinds such as come one after another in columns. They cried “Kapu o moe!” as a warning to stragglers to get out of the way or to prostrate themselves with closed eyes until the marchers passed. (Beckwith 1932:199)

Such beliefs and residential patterns were likely mutually reinforcing. Because people did not live in any numbers in areas such as Kama'oma'o, these locales became associated with *po'e auana wale* (spirits of the dead). The cultural association with these spirits discouraged subsequent residence in such places. Conceptions of abodes of the dead were not so much ideas of discrete

specific spots but were rather perceptions of vast desolate areas which might extend over tens of thousands of acres.

The current project area is located along the shores of Kahului Bay, which is just east of the northern extent of Wailuku Sand Hills (Figure 6). The Sand Hills comprise a significant portion of Kama‘oma‘o and are traditionally, historically, and archaeologically known for the presence of numerous Hawaiian burials.

3.1.3.1 Fishing

The Kahului Harbor area traditionally was known for its fishing grounds. Inland of the Kahului Harbor are the fishponds described by Ashdown as “Kahana and Ma‘oni at Kahului.” The traditional fishing culture of this region includes the belief that “Ai‘ai [who had been bequeathed with] his magic fishhook named Mana-i‘a-ka-lani,” caused the schools of fish known to this region to proliferate as long as those who used the fisheries made the proper use of fishing shrines erected along the shoreline, which were dedicated to the father of Ai‘ai – Ku-ula (Ashdown 1970:24). The *ko‘a o Ku-ula* (the fishing shrines of Ku-ula) of this region, as well as all of East Maui, were reputedly constructed by Ai‘ai in ancient times (Ashdown 1970:24).

The type of fishing performed at Kahului was net fishing, according to Kahā‘ulelio (Kahā‘ulelio 2006:163), as he observed this type of fishing in 1874, the fishermen utilized *kolo* nets, and the process was described:

> …at Kahului fishing with draw nets for *‘ō‘io* [*Albula vulpes*] was done. The nets were like the *papa* net, from a fine mesh smaller than a fingertip to two, three and four fingers’ width. Long curtain nets were affixed to the sides.” (Kahā‘ulelio 2006:163)

Successful fishing occurred along the coastline of Kahului, Kaunoa, and Pā‘ia because of the shallow, ancient, consolidated calcareous reef that provided shelter for octopus and juvenile stages of large pelagic fish, such as the ‘*ulua* or island trevally (*Carangoides orthogrammus* and *Carangoides ignobilis*).

3.1.4 Heiau

In addition to the myriad of traditional land boundaries for taro *lo‘i* arranged along the flow of ‘Īao Stream, two *heiau*, Haleki‘i and Pihana, were constructed atop a low ridge immediately west of the ‘Īao Stream in Paukūkalo, overlooking the fertile coastal plains of Wailuku, Waihe‘e, and Waiehu (Kirch 1997:67). Both Haleki‘i and Pihana were *luakini heiau* with important traditional linkages to famous chiefs (Kirch 1997). Pihana is noted as the birthplace of *tabu* chiefess Keōpuōlani (born 1778), sacred wife of Kamehameha I (Kamakau 1992; Mookini 1998). She gave birth to two male heirs of Kamehameha I, Liholiho (Kamehameha II [Reign: 1819-1824]) and Kauikeaouli (Kamehameha III [Reign: 1825-1854]) and a daughter.

Based on traditional accounts, initial construction of the Pihana-Haleki‘i *heiau* complex occurred during the reign of Kaka‘e, or about AD 1510 (Sterling 1998). Radio-carbon dated samples from the *heiau* complex returned a date range between AD 1400-1600 (Kirch 2010), which supports the construction time-frame provided through traditional stories. In later centuries, the *heiau* complex was rebuilt and rededicated by succeeding chiefs, most notably Kamehameha following his success at the battle of *Ke pani wai o ‘Īao* in 1790 (Fornander 1880). Remnants of

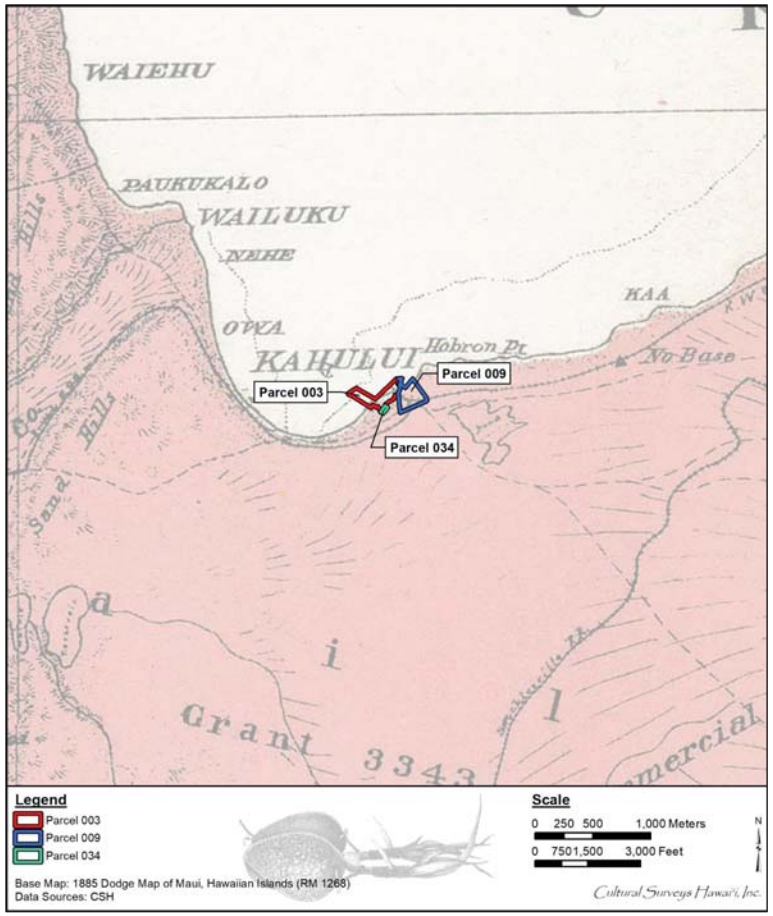


Figure 6. Portion of Dodge (1885) map showing Sand Hills west of the project area and Land Grant 3343 encompassing the entire project area and surrounding vicinity

Pihana and Haleki'i *heiau* remain at the top side of a lithified sand dune overlooking the entrance to Kahului Harbor from approximately 2.5 km (1.6 miles) northeast of the current project area.

Additional, though less historically prominent, *heiau* existed in relative abundance within Pu'ali Komohana, including, in Wailuku, 11 additional *heiau*: Kaluli, Keahuku, Olokua, Olopio, Malena, Pohakuokahi, Lelemako, Kawelowelo, Kaulupala, Palamaihiki, and Oloolokalani. These *heiau* were reputedly consecrated by Liholiho in his tour of Maui in 1801 but destroyed in the following century by agrarian development across the central isthmus.

3.1.5 Politics and Warfare

The presence of ceremonial structures, such as *heiau*, provides evidence that Wailuku was a place of political stability. The agricultural region of Wailuku was the most politically important division of all the *Na Wai 'Eha*. The royal compound of the chiefs of Wailuku once lay at the foot of 'Īao Valley. From this region, the chiefs of Wailuku ruled Maui for 15 centuries. According to Kamakau (1991) the earliest of the chiefs of 'Īao was perhaps Kaha'i. In the 1450s, the chief Pi'ilani ruled over all of Maui and the islands of Lāna'i and Moloka'i. He was succeeded by his son, Kihapi'ilani, followed by his son, Kamalālāwalu; a chief so highly regarded that ever since his time, the island has been spoken of with esteem as "Maui o Kama" or "Royal Maui". Chief Kekaulike remained in power until the chiefdom was passed to his son Kamehameha-nui in 1690 (Fornander 1880:314). By the second half of the eighteenth century, Maui *ali'i* - including the ruling chief Kahekili – reportedly had been residing at Wailuku enjoying the surf of Kehu and Ka'akau (Kamakau 1992).

The *moku* of Wailuku and Hāna comprised the two rival societies on Maui Island. During the mid-sixteenth century and the reign of Wailuku Chief Pi'ilani, "Hana chiefs finally acknowledged the West Maui king's rule" (Cordy 1981). While the chiefly intra-island rivalry between East and West Maui was settled, the political rivalry between the *ali'i* of Hawai'i Island and Maui Island continued. Where Hāna had been the primary stage of battle, Wailuku would come to take a central role in the fight for political gain during the latter half of the eighteenth century. It was in the sand hills of Wailuku that Kahekili and his forces from O'ahu and Maui would do battle with the armies of Kalani'opu'u, chief of Hawai`i, that had invaded Maui.

Between the years 1775 to 1779 there was continual fighting between Kalani'opu'u of Hawai'i and Kahekili of Maui (Kamakau 1992:84). King Kahekili had become a renowned warrior. Kahekili was the son of Kekaulike and younger brother of Kamehameha-nui (Kamakau 1992:87). His army of hand-picked warriors were known by their tattoos; half their bodies were tattooed black, even the inside of their eyelids and their gums. Following a losing battle at Kaupō in 1775, Kalani'opu'u dedicated several war *heiau* on Hawai'i Island to aid in the defeat of Kahekili. Upon hearing this news, Kahekili sent for the *kahuna* Kaleopu'upu'u, who directed construction of the *heiau* of Kaluli and Pu'uohala on the north side of Wailuku. When Kaluli Heiau was completed, Kaleopu'upu said to Kahekili, "This is the house of your god; open the sluice gate that the fish may enter" (Kamakau 1992:85).

In 1776, Kalani'opu'u's warriors landed at Keoneo'o'io, with war canoes extending all the way to Mākena:

> There, the invading army proceeded to ravage the countryside. Kalani'opu'u then landed with additional forces at Kīhepuko'a at Kealia, (at the area where the

> Waikapū Stream meets the ocean) with his invading force beached along the Mā‘alaea coastline. His advance regiment of 800 men made ready to battle Kahekili, chief of Maui, at his stronghold across the isthmus at Wailuku. The invading army was “eager to drink the waters of the Wailuku [Stream].”
>
> Across the plains of Pu‘u‘ainako and Kama‘oma‘o shone the feather cloaks of the soldiers… Ka-hekili was at Kalanihale just below Kihahale and above the plateau of Ka‘ilipoe at Pohakuokahi… Kaleopu‘upu‘u [said] to Ka-hekili, “The fish have entered the sluice; draw in the net.” (Kamakau 1992:85)

The forces of Kahekili descended on and destroyed the soldiers of Kalaniopu‘u, slaying the elite soldiers of Kalaniopu‘u on the sand hills at the southeast of Kalua:

> ...the Maui army had the advantage of a well-chosen position. The Hawaiians had to fight uphill or else drift down to the sand hills. In either case advance was difficult… There was a full day of savage fighting, marked by inhuman acts of awful brutality. The native account of the battle says: “It was not a war characterized by deeds of princely courtesy.” Many noted names of valiant chiefs were never again mentioned in Hawaiian story. The story and the life ended together in this Wailuku battle. (Westervelt 1977:139-140)

The battle that took place received the name “The furious destruction at Kakanilua,” named after the sand hills below Wailuku. Only two men escaped to Kīheipuko‘a [Kīhei] to tell Kalaniopu‘u the news of their defeat. After a second day of warfare, Kalaniopu‘u sued for peace and was granted such by Kahekili and his messengers. Kalaniopu‘u then returned home to Hawai‘i Island (Kamakau 1992:88-89).

Kahekili was at Wailuku when Captain James Cook and his ships *Resolution* and *Discovery* encountered Maui. Cook first sighted the island on 26 November 1778 with his ship *Resolution* positioned three miles off the Wailuku shore. Cook recorded the encounter in his logbook:

> In the country was an elevated saddle hill, whose summit appeared above the clouds. From this hill, the land fell in a gentle slope, and terminated in a steep rocky coast, against which the sea broke in a dreadful surf. Finding that we could not weather the island, I bore up, and ranged along the coast to the Westward. It was not long before we saw people on several parts of the shore, and some houses and plantations. The country seemed to be both well wooded and watered; and running streams were seen falling into the sea in various places. (Speakman 1978)

Cook records that the Hawaiians who came out in canoes to trade for supplies appeared “to be of the same nation with the inhabitants of the islands more to leeward [i.e., O‘ahu and Kaua‘i] which we had already visited [ten months earlier in January 1778]; and… they knew of our having been there” (in Speakman 1978:23-24).

3.1.6 Early Historic Period

By early 1786, Maui chief Kahekili had defeated the forces of O‘ahu and consolidated his control over all of the islands except Hawai‘i. Peace did not prevail for long. In 1790, ‘Īao Valley was the site of the last great conflict on Maui. Kamehameha I of the island of Hawai‘i landed at Kahului, in Wailuku, to battle the army commanded by Kahekili’s son Kalanikūpule.

Kamehameha’s warriors used small cannons, muskets, and ammunition obtained from an American trading ship to rout the Maui defenders. Kamehameha’s modern weapons struck terror into the hearts of the Maui warriors. The Maui defenders were swept across the isthmus from Pu‘unēnē to Wailuku, and were destroyed at ‘Īao Valley. The battle that followed was so great that ‘Īao Stream was said to have been choked with the corpses of the vanquished defenders, giving the campaign the name “Battle of Kepaniwai,” (the damming of the waters). The high chiefs and royalty of Maui fled to other islands. Kamehameha I went on to defeat the combined forces of Kahekili and Kalanikupule at Nu‘uanu, on O‘ahu in 1795. (Alexander 1899:129).

With the death of Kamehameha I in 1819, warfare between the ranking Hawaiian chiefs was set aside by powerful changes within traditional Hawaiian society. Four decades of interaction with American, Russian, British, and French traders had opened the way for Christianity. The establishment of a system of schools throughout the islands was vigorously pursued by the governing kings and queens of Hawai‘i, aided by the newly-arrived American Protestant missionaries beginning in 1820 (Kuykendall 1938).

Estimates of the early nineteenth century population of Kahului are difficult to find. In regions where Protestant missionaries had been stationed, statistical records were updated often, but the missionary out-station region of Kahului appeared to have received scant attention during the early years of the Protestant missions. In 1830, Protestant missionaries recorded school attendance figures for the out-stations of Wailuku as: Waihu [Waihe‘e] at 612 students, Waikepu [Waikapū] at 329 students, and Waiehu at 103 students, with no mention of Kahului (Richards and Green 1831). In 1831, the missionaries stationed on Maui began to advocate for the conversion of the Wailuku branch-station of the Lahaina Mission to a standalone mission station. In this same year, Auwae the *konohiki* (overseer of an *ahupua‘a*) at that time, began collecting materials for a “good stone and lime meeting-house” (Richards et al. 1832:251). In 1832, 12 years after the arrival of the first missionaries in Hawai‘i (American Board of Commissioners for Foreign Missions 1820; Bennet 1893:14) and nine years following the establishment of the Lahaina Mission Station (The Friend 1878), the official Wailuku Mission Station was formed by the Reverend Jonathan Smith Green (Tracy et al. 1894:231). A larger meeting house with a thatched roof was erected by the congregation in 1834, and in 1836, under the direction of Reverend Jonathan Green, the construction of a stone meeting house designed by Reverend Edward Baily was started and subsequently brought to completion in 1840 (Cummins and Fox 1973).

The initial documentation of life in Wailuku during the first half of the nineteenth century was recorded by Protestant missionaries from their station at Wailuku in 1832. The missionary census of 1831-1832 recorded a total population of 2,256 in Wailuku Ahupua‘a: 918 adult males, 860 adult females, and 478 children (Schmitt 1973). By the 1840 census, Wailuku population had dropped to 1,364, representing a diminution of 892 in just four years (Schmitt 1973).

In January 1836, Princess Nahi‘ena‘ena and her husband Leleiohoku went to live in Wailuku. The Princess died less than a year later during the birth of a child, and she was buried in Lāhainā. In the years following the loss of Princess Nahi‘ena‘ena, the remaining chiefs and *ali‘i* of Maui continued to make Lāhainā their official residence (Kamakau 1992:340-349).

Use of the northern coastline landing at Kahului by early Europeans must have been difficult, for far more records exist of early explorers and merchant ships at anchor off the southern, more protected coastline of Maui than along the exposed, northern coast. In 1840, American scientists

aboard U.S. Navy ship “*Vicennes*” landed at Lāhainā and travelled overland to the district of Wailuku, where they noted that native Hawaiian timber grew in sizes suitable for the construction of canoes (Wilkes 1845). Of the central isthmus they commented, “it is too dry to be fit for cultivation: it is in extent about twenty by fifteen miles. During nine months of the year it is a fine grazing country, and feeds large herds of cattle, that are mostly owned by foreigners” (Wilkes 1845).

James Jackson Jarves, first editor of *The Polynesian*, the third English-language newspaper in the Hawaiian Islands, included news about events in Kahului. He noted a “remarkable oscillation of the ocean” that occurred at Kahului on 7 November 1837:

> At Maui, the sea retired about 20 fathoms, and returned with great speed, in one immense wave, which swept before it houses, trees, canoes, and all else exposed to its fury. At the village of Kahului, the inhabitants, as at Honolulu, followed with rapturous delight the retreating wave, when suddenly it turned upon them, rising like a steep wall, rushed forward to the shore, burying the natives in its foam, and destroying the whole hamlet (Jarves 1843:19-20).

An account by one of the missionaries in Wailuku, Rev. Richard Armstrong, gives a vivid picture of the same tsunami at Kahului where an entire village was carried away; in his journal entry on November 8th, Armstrong recorded:

> A strange phenomenon appeared last evening in our neighborhood. About seven o'clock in the evening, the waves of the ocean just opposite our station, at a small harbor [*i.e.* Kahului], gradually receded from the shore to a distance of some 15 or 20 rods leaving multitudes of fishes upon the ground, so that the children observing it ran and picked up some of them; leaving a small schooner also, which was at anchor in the harbor, without sufficient water to float her completely, and the wave slowly formed itself as it were into an embankment, or as the natives said, a “steep precipice.” Then, as if having collected strength enough for the onset, the wave rushed back upon the beach, overflowed the banks, and carried away the entire village of 26 native grass houses with all their effects and inhabitants, some 40 or 50 rods inland, throwing most of the wrecks of houses, broken canoes, fowls, beasts, men, women, and children into a small lake of perhaps three miles circumference, which lay immediately inland from the village.
>
> The rush of the wave was so sudden and unexpected, that the inhabitants of the village, unlike Lot in Sodom, had no warning whatever, except a few who seeing the sea receding from the shore suspected a corresponding reflux, and fled inland in season. But it is not easy for water to baffle a Hawaiian, this being the element with which he is most familiar. Some swam single handed with the waves. Others took their children in their arms. Others the sick on their backs and bore them up until the waters ceased from the earth. One man took his old mother on his back and swam with her until he reached the dry land, but, laying her down on the ground, he found she was dead. Another poor old woman, having no one to assist her, and it being dark got into the small lake and was drowned. These are all the lives that were lost. (*Maui News* Nov. 10, 1937)

Three years later, Armstrong reported on the first effort to grow sugar at Wailuku in a letter dated 7 July 1840:

> By request of the King I have taken some part in inducing the people about me to plant sugar cane. A fine crop of 60 or 70 acres is now on the ground ripe, and a noble water mill set up by a Chinaman is about going into operation to grind it. I keep one plow a-going constantly with a view to the support of the schools. We shall get in 10 acres of cane the present season. (*Maui News* March 22, 1941)

One of the schools to be supported was likely the girls' school, which had opened at Wailuku in 1836 (Kamakau 1992).

According to the diary of the Catholic priest, Father Favens, he first visited Wailuku on 15 June 1846. By the end of 1847, a small Catholic chapel had been constructed at Wailuku. Stormy weather soon destroyed this native-style frame chapel. The first solid-frame church at Wailuku was constructed by the Mission Brothers of Honolulu and dedicated to St. Anthony on 5 March 1854 (Schoofs 1978:291-292). The St. Anthony School held classes as early as 1848, and by 1855, the school had its own resident priest. The large premises of St. Anthony’s Church and School were the center of Catholic life in Wailuku.

3.1.7 The Mahele and the Kuleana Act

The most significant change in land-use patterns and land allocation came with the Māhele and the privatization of land in Hawai‘i. The establishment in 1839 by Kamehameha III (Kauikeaouli) of a Bill of Rights for the people of Hawai‘i, followed by a formal constitution in 1840, hastened the shift of the Hawaiian economy from subsistence-based to market-based. During the Māhele, all of the lands in the Kingdom of Hawai‘i were divided between the *mō‘ī* (king), *ali‘i* (royalty), *konohiki* (overseer of an *ahupua‘a*), and *maka‘āinana* (common people/tenants of the land) and passed into the Western land tenure model of private ownership (Chinen 1958). On 8 March 1848, Kauikeaouli (Kamehameha III) further divided his personal holdings into lands he would retain as private holdings and parcels he would give to the government. This act paved the way for government land sales to foreigners. In 1850, the legislature granted resident aliens the right to acquire fee simple land rights (Moffat and Fitzpatrick 1995). Wailuku was declared as “Crown Land” to be used to support the Kingdom of Hawai‘i (Zambucka 1977:48).

Ruth Ke‘elikolani, half-sister of Kamehameha V (Lot Kapuāiwa), inherited the *ahupua‘a* of Wailuku from Lot Kapuāiwa on his death in 1872. Ruth Ke‘elikolani then sold a portion of her Wailuku land holdings to the sugar-industrialist Claus Spreckels in 1882. Spreckels subsequently received Land Grant 3343 from King Kalakaua, that consisted of 24,000 acres of the southeastern portion of the Wailuku Ahupua‘a (Zambucka 1977:48). Spreckels’ acquisition of the 24,000-acre parcel in fee simple occurred when he agreed to purchase a part-interest in Crown Lands of the Kingdom of Hawai‘i from Princess Ruth Ke‘elikolani. This agreement allowed the Commission of Crown Lands to exchange Spreckels’ part-interest for the fee-simple title to central Maui lands he had previously leased from the Kingdom in 1877 (Daws 1968). The current project area is located within Land Grant 3343 (see Figure 6)

Although almost 300 subsequent awards to individuals were awarded by the Land Commission for *kuleana* lands within the *ahupua‘a* of Wailuku, a majority of these claims represented lands located in the upland portion of the *ahupua‘a* focused along the flood plain of the ‘Īao Valley

Stream, as well as *mauka* of the area identified as the “Sand Hills”. The disposition of these awards may reflect a continuation into the post-Contact era of the traditional Hawaiian settlement of Wailuku and avoidance of the Sand Hills area.

3.1.8 Mid to Late 1800s

As land sales by the Government of Hawai‘i to Claus Spreckels would indicate, the second half of the nineteenth century is marked by commercial development of the Wailuku and Kahului area. During the American Civil War in the 1860s, Hawaiian sugar prices rose significantly, leading to the formation of 12 large sugar plantations on the island of Maui; the most of any Hawaiian Island.

The Wailuku Sugar Company was organized in 1862 by James Robinson & Company, Thomas Cummins, J. Fuller, and agent C. Brewer & Company. The Catholic Mission agreed to give the Wailuku Sugar Company a right-of-way across their property for a railroad. In this manner, the enterprise laid a railway line to Waiehu and Waihe‘e, by way of Lower Wailuku (Condé and Best 1973:267). Among the early government grants in the upland area of Wailuku Ahupua‘a were lands set aside for the Wailuku Sugar Company.

With the success of sugar and with Wailuku’s economic expansion came the need for the importation of foreign labor. In short order, Portuguese, Japanese, and Filipinos increased the population of the district, which made the need for development and larger churches necessary. The first western-style structure in Kahului was a warehouse built in 1863, and a nearby store was recorded as having been built in 1873. The Catholic St. Anthony Church in Wailuku became the first stone church erected in central Maui. It was dedicated on 3 May 1873 (Schoofs 1978).

The success of sugar grown in the region also resulted in a second large plantation, in Waihe‘e, producing over 757 tons of sugar and 45,000 gallons of molasses in 1865. The Waihe‘e mill manager was Samuel T. Alexander, and the mill’s head foreman was Henry P. Baldwin, both of whom would later resign to establish a small sugar enterprise of their own in upper Pā‘ia (Abner Blanks Gilmore 1936). In 1869, on land located just west of Pā‘ia, a small *kuleana* of 11.94 acres was purchased by Alexander and Baldwin, both eager to apply their agricultural experience to their own plantation. This initial land purchase was the beginning of the development of the entire central isthmus for sugar cultivation. In rapid succession, the partnership of Alexander & Baldwin (A&B) expanded its operations by purchasing other small *kuleanas,* setting up a mill, and attracting more investment capital (Dean 1950).

In 1876, a treaty was signed between the Kingdom of Hawai‘i and the United States, which opened larger and more lucrative markets for Hawaiian sugar. Plans were immediately drawn up by the Alexander & Baldwin partnership to finance a ditch to bring water from the Hāna region of East Maui into the dry plains of Pā‘ia. The Kingdom of Hawai‘i issued a lease for the construction right-of-way, and in 1879, the successful venture delivered millions of gallons of water to the Pā‘ia region via the Hamakua Ditch (Wilcox 1996).

Competition was supplied by Claus Spreckels, who engineered a similar irrigation ditch from Honomanū in East Maui to lands located just inland of Kahului, where the Spreckelsville mill (Figure 7) and plantation camp were built. Spreckels invested three million dollars in the Hawaiian Commercial & Sugar Company (HC&S), and competed for sugar lands, warehouse space, railway lines, and shipping schedules with the Alexander & Baldwin venture (Dorrance and Morgan 2000).

By 1881, Spreckels had installed electric lighting in his mill to grind cane at night; the first of his many innovations to make sugar more profitable. Following his success in building the Honomanū Ditch linking East Maui water sources with his sugar fields in the central isthmus, Spreckels engineered the Waihe‘e Ditch (also named the Spreckels Ditch) in 1882, to tap water resources from West Maui. The 15-mile-long ditch started at the 435-ft elevation of Waihe‘e Stream, and carried 60 million gallons of water (per 24-hour day) to the Wai‘ale Reservoir at the 214-ft elevation of Wailuku. Spreckels became the first plantation owner to irrigate his fields with mountain water from both East and West Maui. By 1888, the Spreckels plantation covered 28,000 acres, making it the largest sugar plantation in the world (Wilcox 1996).

During this period, the major enterprise out of Kahului was the Kahului Railroad Company. In 1879, the Kahului Railroad Company was formed by Thomas H. Hobron, William O. Smith and William H. Bailey. The first rails were laid at a small wharf at Kahului on 30 June 1879. Three miles of track to the village of Wailuku were completed by 10 September 1879. By 1881, the Kahului Railroad was carrying raw sugar to the port of Kahului from both the Wailuku Sugar Company and from the Alexander & Baldwin mills in Pā‘ia and Hāmākua Poko (Figure 8 and Figure 9). In 1884, Kahului Railroad became a freight forwarder and subsidiary of Wilder Steamship Company (Best 1978).

By 1897, the Spreckels-owned HC&S Company attempted a blockade of the Kahului wharf to drive the Wilder Steamship Company out of business. To circumvent the blockade, the directors of Alexander & Baldwin purchased the disputed 5.47-acre harbor-front parcel owned by Spreckels and created a partnership of other plantations to drive Spreckels out of business. By 1898, financial pressures forced Spreckels to give up control of HC&S to a partnership headed by Samuel T. Alexander and Henry P. Baldwin after a long and fierce battle. In less than a year, the Alexander and Baldwin-owned HC&S Company was shipping sugar from landings at Pā‘ia, Huelo, Kīhei and Nāhiku to the newly-formed California & Hawaiian Sugar Refining Company in California. By 1899, Alexander & Baldwin had successfully taken over the sugar interests of Claus Spreckels and had negotiated a friendly purchase of the Kahului Railroad Company (Dean 1950).

The HC&S Company’s Lowrie Ditch project began in 1898. This project brought an additional source of water to the arid plains south of Kahului. William J. Lowrie’s plan was to begin the ditch at the Pāpa‘a‘ea Reservoir, deep in East Maui at the 1,000 ft elevation, and maintain a 4-ft drop per mile following the ditch’s initial plunge from the Kailua reservoir. Steep mountain gulches were traversed using the force of the constant weight of water flowing in a series of siphons. The Halehaku Gulch, at 250 ft deep, and the Māliko Gulch, at over 350 ft deep, were both crossed by giant siphons fabricated of three-eighths-inch iron pipelines that were set in place by Japanese laborers. The allocation of water began at a weir located above Pā‘ia. The first tenth of the water flow in the Lowrie Ditch was divided out to the Pā‘ia Plantation (an 11/20ths share) and the Ha‘ikū Plantation (a 9/20ths share). The distance traveled, from Kailua to the plantation’s Kīhei boundary, was 21.9 miles (Thrum 1900:155-157).

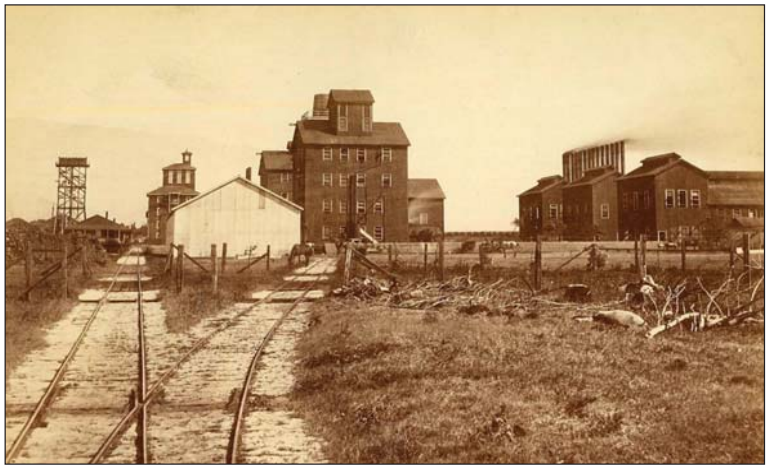


Figure 7. The Spreckelsville sugar mill in the 1880s (Robert Hill Private Collection)

Figure 8. Bringing hand-cut cane from the fields to the Spreckelsville mill aboard the HC&S railroad, circa 1882 (Conde 1993)

Figure 9. The *Claus Spreckels* locomotive leaving Kahului and approaching Paia (courtesy of HC&S Sugar Museum)

3.1.9 Early to Mid-1900s

The bubonic plague broke out in Kahului in the year 1900. The first recorded death caused by the plague occurred on Saturday, February 4th. An article in the *Maui News* from 17 February 1900 documents effects of the plague at the time.

> The plague has reached Maui. Six deaths have occurred and the whole of Chinatown [in Kahului] is a heap of ashes. The people of Maui are aroused to action and feel confident of being able to control and stamp out the pest in a short time...
>
> ...Sheriff Baldwin at once established a strict quarantine at Kahului which is still maintained. The Maui Board of Health met at once and selected a site for a pest house and one for a detention camp, the latter being established at the race track of the Maui Racing Association...
>
> ...by noon on Monday [Feb. 13] the detention camp was ready for its occupants. Over 200 Chinese, Japs and natives were fumigated and dressed in new suits, and at two o'clock the procession quickly moved out to their new quarters. Scarcely had they reached their destination before everything was prepared for the destruction of their old quarters. At three o'clock a cloud of dust and broken timbers leaped into the air, accompanied by the savage roar of dynamite; then another and another, being the exterior houses of the doomed district. Soon dense volumes of smoke, through which pierced yellow shafts of flame, told that the work of destruction was begun. In two hours, the whole block from the Kahului saloon to the Custom House was a heap of glowing ashes. The breeze was from the sea and no trouble was experienced in holding the fire within the prescribed district. Kahului town was entirely cordoned off with corrugated iron fences and, before the year was out, the plague had been eradicated. (Bartholomew 1985)

Prior to 1900, development in the port town of Kahului was likened to a “squatter’s town.” After the bubonic plague outbreak led to the decision to burn most of Kahului, the street alignments were rebuilt as “blocks.” By 1905, dredged harbor coral had been used to fill and level much of the Kahului water-front to create a more orderly and sanitary business district. Early structures constructed within this waterfront business district included the Baldwin National Bank of Maui (constructed in 1906) and the Pu‘unene Store at Kahului (constructed in 1908) (Burns 1991).

In 1901, a well-drilling company from Honolulu, operated by the McCandless Brothers, was retained by the HC&S plantation to drill 12 wells at the site for a new mill at Pu‘unēnē. The water was to be used for mill operations as well as for irrigation. All 12 wells were successes, according to the records of the head engineer, James Sutton McCandless (McCandless 1936). The new sugar mill at Pu‘unēnē (Figure 10) began operations in 1902 (Dean 1950), supplementing the work done by the Pā‘ia Mill. Both mills, and the network of railroad lines connecting the company’s fields and villages, continued to grow. Between 1900 and 1905, acreage harvested doubled, from 2,484 to 4,827 acres, and sugar production more than doubled, from 17,857 to 39,411 tons (A. B. Gilmore 1936). The adoption of heavier rails and a wider rail gauge caused HC&S to completely renovate the plantation railroad (Condé and Best 1973).

The plantation villages of the Pu‘unēnē area grew quickly to surround the new mill (Figure 11 and Figure 12). Between a huge influx of immigrant workers in 1909, and the burning of village

Figure 10. Pu‘unēnē Mill circa 1935 (courtesy of A&B Sugar Museum)

Figure 11. Pu‘unēnē Mill and camps (foreground); Kahului Bay and Harbor in left background (courtesy of A&B Sugar Museum)

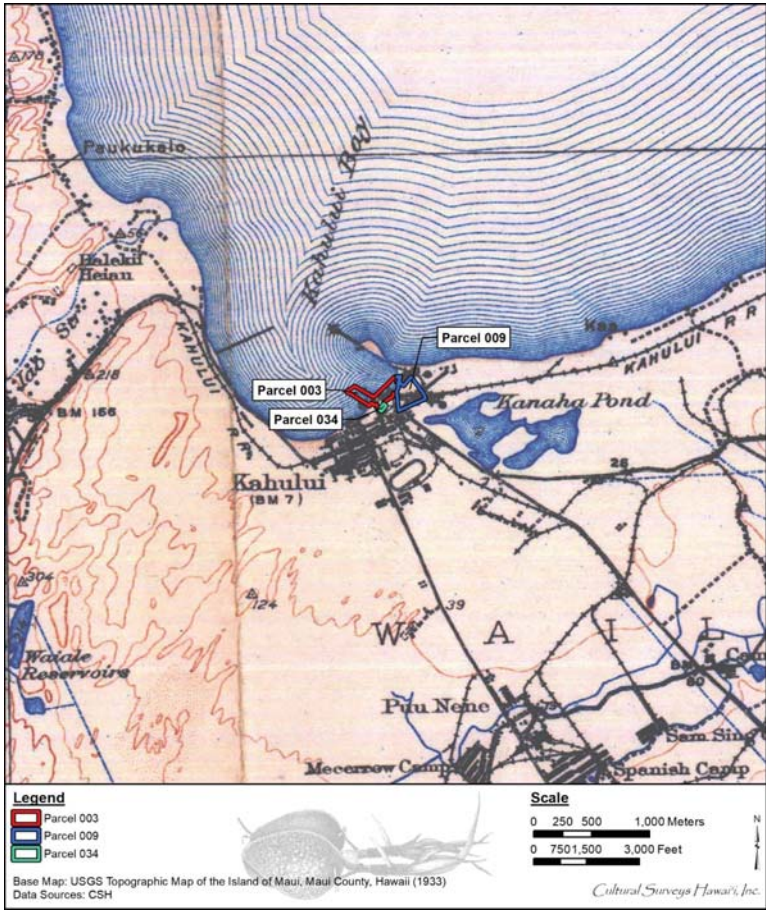


Figure 12. Portion of 1933 USGS topographic map showing Pu'unēnē Mill camps southeast (right bottom) of the project area; note railway system within and surrounding project area (U.S. Geological Survey 1933)

areas of Pā'ia and Kahului to control smallpox in 1910, changes to the camp system were in full swing. The plantation workforce continued to expand until 1917, when the United States entered World War I, and the accompanying draft seriously depleted the labor pool. By 1919, postwar requirements for sugar had driven the price to $471.40 per ton: an all-time high (Burns 1991). Nine main camps were in place across the Pu'unēnē plains by the 1920's, including MeGerrow Camp, Yung Hee Camp, Afong Camp, Spanish B Camp, Alabama Camp, Green Camp, Camp 4, Sam Sing Camp and Camp 8.

Increased production of sugar by HC&S and its subsidiaries required large improvements to the harbor facilities at Kahului. The Kahului Railroad Company began construction on the east breakwater soon after Hawai'i's annexation by the United States in 1898. Expenses for the 1,800-ft breakwater and dredging had risen to about $335,000 by 1910, at which time the federal government assumed responsibility for continuing improvements to the harbor (Best 1978). The superintendent of the Kahului Railroad Company, Richard Walther Filler, worked to redesign railroad access to the harbor following the demise of Spreckels' operations at the waterfront (Condé and Best 1973). All of the early infrastructure of the Kahului Harbor had been constructed and financed by the Kahului Railroad Company, but by 1910, under the terms of annexation as a Territory of the United States, a Board of Harbor Commissioners was appointed to supervise the territorial harbor development program in Hawai'i. From this point on, Lyman Herbert Bigelow, Territorial Superintendent of Public Works, took charge of on-going modernization plans for the Kahului Harbor well into the 1920s (Nellist 1925). By 1910, over 300,000 cubic yards of fill had been deposited on the windward side of the breakwater, creating a landfill area of over 12 acres. Dredging at the harbor entrance and in the area alongside the pier continued to a depth of 35 ft (United States Army 1913).

At the turn of the century, freight and passengers were handled by small rowboats, or lighters, transferring goods between the Kahului derrick and lighter landing to large freighters anchored further offshore. A 200-ft long wharf, allowing ships with a draft of 20 ft to tie up directly alongside, was largely completed by the Kahului Railroad Company about 1905 and improved again in 1909. It was named the Claudine Wharf, after the Inter-Island Steam Navigation Company ship of the same name (Territory of Hawaii 1910). The subsequent increase in shipping required the territorial government to establish a collector of customs at the port of Kahului. Between the years 1904 and 1912, Worth Osbun Aiken served in this capacity. Following the death of Henry P. Baldwin in 1911, his son Frank F. Baldwin became president of both the HC&S Company and the Kahului Railroad. William Walsh was made superintendent of the Kahului Railroad in 1913, having spent the previous twelve years with the railway. A worldwide increase in demand for sugar and pineapple followed the end of World War I. Shipping at the port of Kahului had risen to 81 vessels with an annual gross tonnage of over 370,500 entering and leaving the port by 1920 (Bigelow 1920).

Work to reinforce both breakwaters and dredge the harbor interior was almost continuous from 1910 to 1931. Two competing inter-island passenger service and shipping lines merged in 1905, and by 1925, the Inter-Island Steam Navigation Company passenger traffic at the Kahului Harbor numbered almost 25,000 (Schmitt 1977). The east breakwater was completed in 1913 and the dredged basin and west breakwater in 1919. Both breakwaters were extended with additional dredging completed in 1925.

The construction of a modern concrete wharf at the east breakwater began in 1910 with various additions continuing until completion in 1923 (Figure 13 and Figure 14). Originally known as the Territorial Wharf, the 500-ft structure was topped with a single-story transit shed of steel frame construction measuring 375 by 100 ft. It was equipped with two electrically operated sugar conveyors, each capable of handling 250 tons of raw sugar per hour. The Kahului Railroad Company had three tracks on the wharf, two running the length of the wharf and one running to the transit shed. Oil pipelines allowed for both offloading and loading. Molasses pipelines delivered molasses from storage tanks located along the harbor property. Other pipelines were available for gasoline, kerosene and water (Taylor 1926). In 1924, the Claudine Wharf was purchased by the Board of Harbor Commissioners for the Territory of Hawaii, giving the territorial government sole ownership of all harbor facilities at the Kahului port. Partly due to the tidal wave damage, and partly because additional wharf space was required by a new pineapple cannery at Kahului, a project to entirely replace the Claudine Wharf with a modern concrete pier was completed in 1927 (Dean 1950).

Over the intervening years, the Kahului Railroad Company retained ownership of most of the land adjacent to the harbor. Construction in the town of Kahului continued to expand the port city (Figure 15). In 1916, the race track and grandstand (Figure 16) of the Kahului Fairgrounds (Figure 17) and Kahului Store were constructed. Kahului Theater (Figure 18) at the corner of Pu‘unēnē and Ka‘ahumanu Avenues replaced the former Kahului Lyceum Theater that had burned down in 1917. Other structures built inland from the harbor included the Kahului School (Figure 19 and Figure 20) built in 1922 and Christ the King Church built in 1932 (Bartholomew 1985). In 1936, construction of the present Ka‘ahumanu Avenue linking Wailuku and Kahului was finished. Completion of the roadway initiated the development along its route during subsequent decades.

3.1.10 **World War II**

During World War II, the shoreline west of Pier 2 contained 20 buildings constructed by the U.S. Navy as a base of operations for military shipping (Figure 21 and Figure 22). Nine structures were built by U.S. Navy Construction Battalion (SeaBee) workers, and eleven structures were refurbished for military service (NARA 2008). Supplies for military bases including the 4th Marine Division camp at Kokomo, the 10th Amphibious Training Battalion at Mā‘alaea, the Underwater Demolition Team training base at Kīhei, Naval Air Station Puunene and Naval Air Station Kahului were either transferred directly to each base, stored at the 18th Service Battalion Storage Depot at Kahului Harbor, or stored at an ammunition depot located above Makawao town.

On 16 November 1942, grading and construction work commenced on NAS Kahului (Figure 23) by Pacific Naval Advanced Base (PNAB) personnel, who were soon replaced by the 39th SeaBees. By 20 September 1943, the first aircraft of VC-23 (Composite Squadron 23) landed with personnel and gear on hand for duty. Carrier Air Service Unit 32 assumed responsibility for modifying and maintaining the aircraft of each visiting training squadron for combat duty in the Pacific Theater of Operations (Eggertsen 1945). The 39th SeaBees built 19 concrete ammunition storage magazines in Kanahā Pond, structures that remain today as storage bunkers for the County of Maui and the State of Hawai‘i. Construction of the base continued in mid-June 1944 with the 142nd SeaBees (U.S. Navy 1947). Aircraft carriers were modified for combat in the Pacific Theater of Operations at Pearl Harbor Navy Yard, while their air groups were flown to one of nine Navy airfields in Hawai‘i for advanced training—NAS Kahului being the most modern of these airfields.

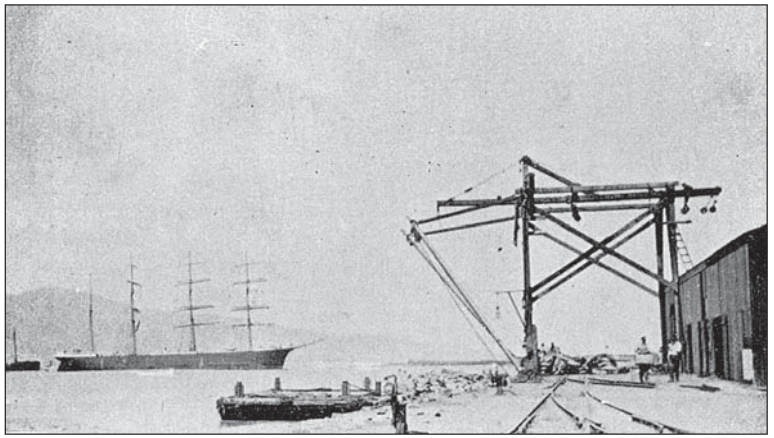


Figure 13. Kahului Landing east breakwater shortly after construction (Hawai‘i Harbor Commission 1910)

Figure 14. Artist rendition of Kahului Harbor, circa 1920 (Hilo Drug Company c. 1920)

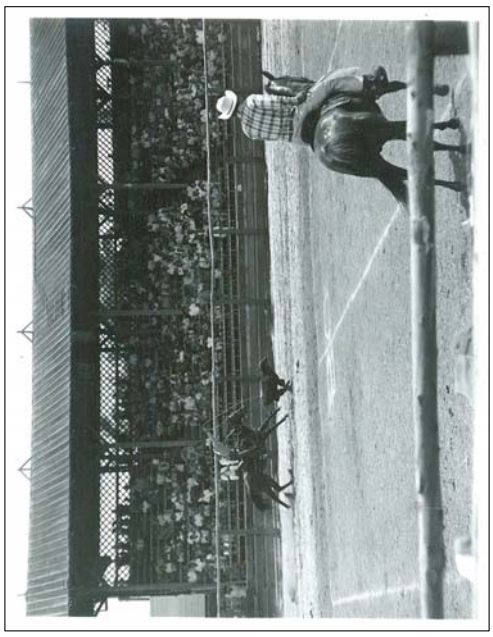


Figure 16. 1961 Maui County Fair Rodeo at the fairgrounds grandstand (courtesy of A&B Sugar Museum)

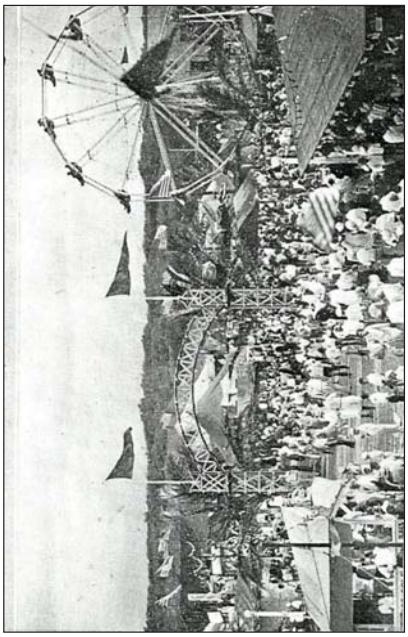


Figure 17. Maui County Fairgrounds on Pu'unēnē Avenue (Pictorial Hawaii 1929)

Figure 15. Aerial photo of the Kahului Harbor facilities and inland development in 1919 (courtesy of A&B Sugar Museum)

Figure 18. Kahului Theater (courtesy of A&B Sugar Museum)

Figure 19. Kahului School, constructed in 1922; the main school building seen here was demolished in the late 1970s, leaving a large empty lot east of the present Ka‘ahumanu Shopping Center that remains undeveloped today (courtesy of A&B Sugar Museum)

Figure 20. Aerial photo of Kahului School (foreground) in relation to Kahului Harbor (upper right) (courtesy of A&B Sugar Museum)

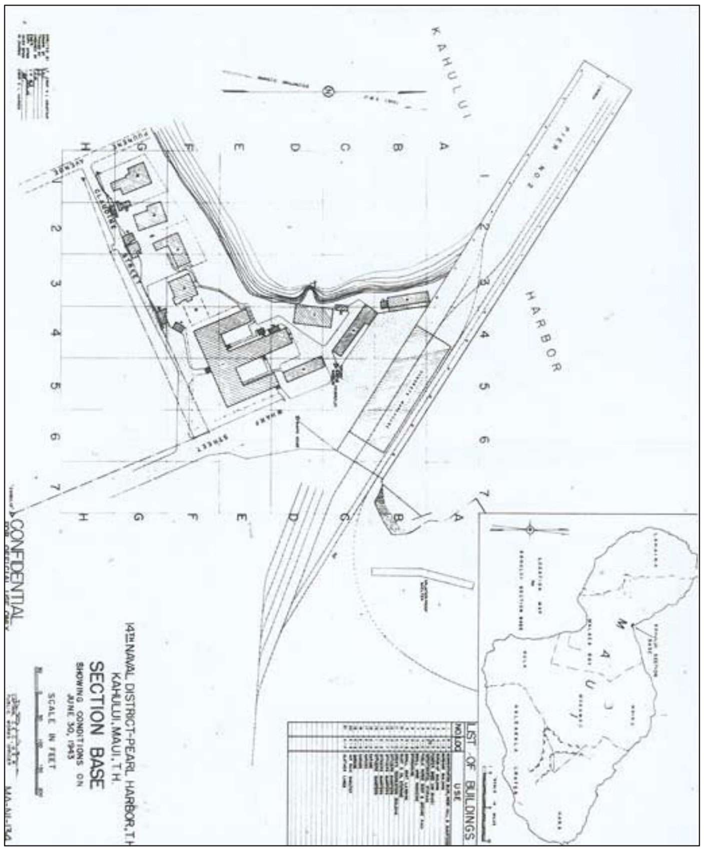


Figure 21. Plan view of U.S. Navy Section Base at Kahului Harbor during WWII adjacent to Pier No. 2 (U.S. Navy 1943)

Figure 22. Marines of the 14th Regiment, 4th Marine Division leave Maui Island aboard aircraft carrier U.S.S. Fanshaw Bay, October 1945; buildings of the U.S. Navy Kahului Section Base adjacent to Pier 2 are visible in the background (U.S. Marine Corps 1945)

Figure 23. Naval Air Station at Kahului in 1944; three symmetrical rows of ammunition storage are visible in Kanahā Pond (top right), view to southwest (State of Hawai‘i 1944)

In full operation, both NAS Puunene and NAS Kahului were themselves virtual cities. Each employed hundreds of civilian clerical and maintenance workers and provided housing for thousands of U.S. military personnel. At NAS Kahului, Construction Battalion Maintenance Unit (CBMU) personnel from CBMU 563 arrived on December 29, 1943. The unit was responsible for the continued operation of refrigeration, water purification, and electrical components in kitchens, hospitals, churches, barracks, and offices. The open coastline at NAS Kahului allowed for live-fire training areas, where gunners practiced firing machine guns from turrets constructed to duplicate those aboard scout-bombers and torpedo bombers. A series of open-air ammunition storage areas (Figure 24) were developed by the U.S. Navy in an uninhabited area of Maui northwest of the Kahului Harbor. The site was surrounded by a wire fence, ringed with 40-foot tall watch towers and guarded by a U.S. Marine Corps Tank Battalion Camp (NARA 2008).

Beginning in 1943, the 48th SeaBees and the 127th SeaBees constructed 40 corrugated steel Quonset huts arranged in a straight line along the western coastline of Kahului Harbor. Each structure was supported by a foundation of poured concrete and raised above grade on 4-foot concrete walls. Supplies arriving at Kahului Harbor were delivered to this depot by rail.

Newsletters published by 39th Seabees (“Shore Lines”) and 48th Seabees (“Trade Wind”) were joined by an official NAS Kahului newspaper, “The Fly Paper” (later renamed “The Flyer” 20 September 1945). The publisher of *Maui News*, Maui’s leading civilian newspaper, printed a companion weekly named “The Valley Islander,” which incorporated military news from all branches of military based on Maui, including the 4th Marine Division (Sanford 2009). Military news in these papers was censored, but personnel changes, “scuttlebutt” gossip columns, and sports highlights featuring teams organized within military leagues on Maui attracted an avid readership.

Immediately following the August 1945 surrender of Japan to the military forces of the United States, additional facilities essential to the operation of NAS Kahului were removed from NAS Puunene. A bowling alley, bakery, and other specialized structures at NAS Puunene were relocated to NAS Kahului, only to be partially or entirely destroyed by a series of tidal waves that struck NAS Kahului facilities in 1946. On 1 April 1946, the Kahului Harbor and NAS Kahului suffered serious damage after a tidal wave generated in the Aelutian Islands, Alaska, struck the north coast of the island of Maui (Figure 25). Kahului Harbor was left empty when the water receded. The Coast Survey tide gage recorded 5 waves with heights in excess of 9 feet during the first 90 minutes of the tsunami, two of the waves being greater than 11 feet (Green 1946).

By 30 June 1947, the transfer of NAS Kahului to the Civilian Aviation Authority for the Territory of Hawai‘i was well underway. Virtually all military equipment of NAS Kahului had been shipped to military installations on Guam, Okinawa or at Midway Island (U.S. Navy 1947).

3.1.11 Post-World War II into the Modern Era

Following World War II, buildings erected during reconstruction of Kahului in the 1910s and 1920s slowly gave way to postwar modernization. HC&S Company camp housing for the Kahului Store, including housing along Mill Street and Pu‘unēnē Avenue for stevedores and railroad workers, began to be dismantled. Areas once occupied by the military returned to cattle ranching, pineapple, and sugar cultivation.

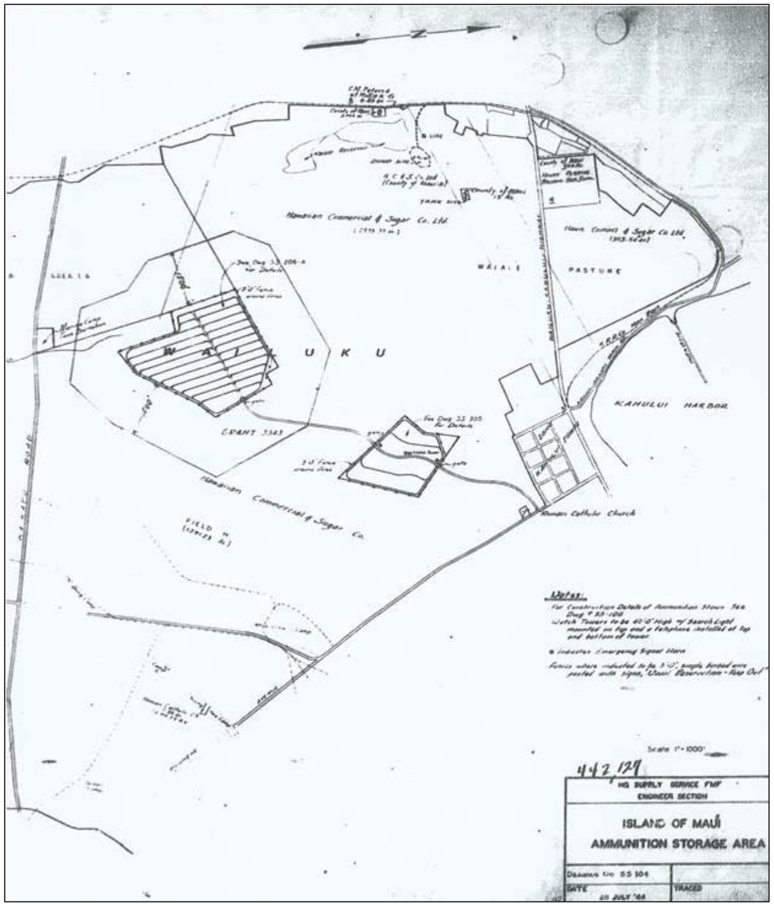
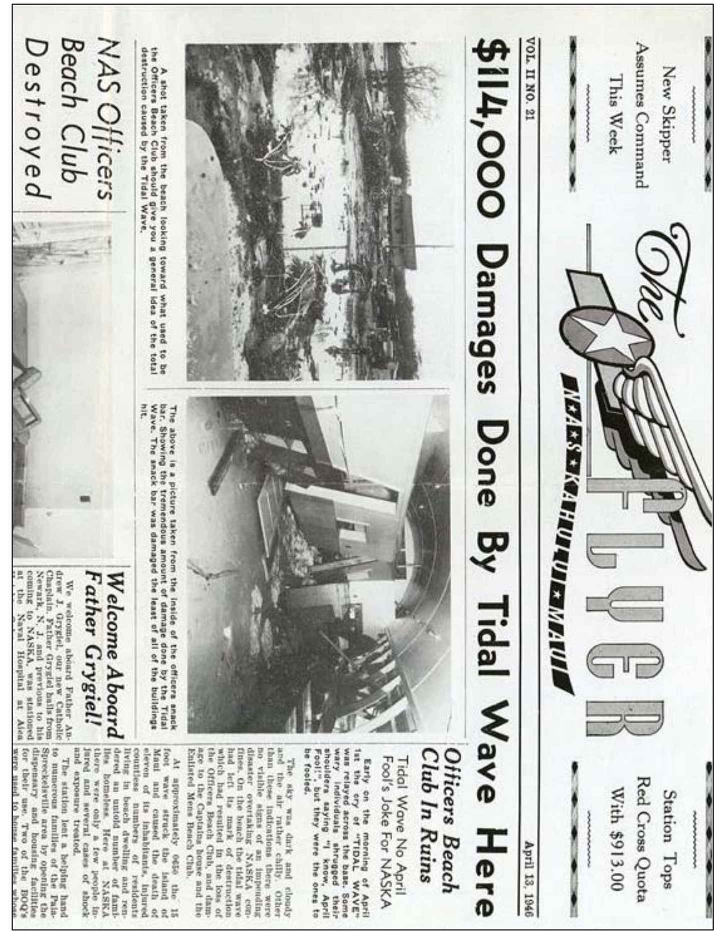


Figure 24. Plan view of the ammunition storage area for the U.S. Navy in Central Maui; Kahului Harbor is located to the right of the storage areas (U.S. Navy 1944)



New Skipper Assumes Command This Week

The FLYER
NAS KAHULUI MAUI

Station Tops Red Cross Quota With $913.00

VOL. II NO. 21 April 13, 1946

$114,000 Damages Done By Tidal Wave Here

A shot taken from the beach looking toward what used to be the Officers Beach Club should give you a general idea of the total destruction caused by the Tidal Wave.

The above is a picture taken from the inside of the officers snack bar. Showing the tremendous amount of damage done by the Tidal Wave. The snack bar was damaged the least of all of the buildings hit.

NAS Officers Beach Club Destroyed

Welcome Aboard Father Grygiel!

Officers Beach Club In Ruins

Tidal Wave No April Fool's Joke For NASKA

Figure 25. 1 April 1946 tidal wave reported on front page of *The Flyer*, a Kahului based newspaper (Robert Hill Private Collection)

The pace of social change began to accelerate. The political power base of the County of Maui began to include *Nisei*, second-generation Japanese Americans who had returned from service in Europe during World War II. Their involvement in county politics began to swing political power from the large agribusiness owners to the union leaders representing plantation workers eager for a change (Speakman 1978)

Trucks and buses had replaced passenger transportation once provided by railroads. Cars that had been set up on blocks and stripped of their rubber tires as a wartime rationing measure were back on Maui's roads (Bartholomew and Bailey 1994). By 1950, Kahului Railroad Company locomotives had been relegated to shuttling dockside cargo, such as fertilizer, between the Pacific Chemical and Fertilizer Company warehouses along the Kahului Harbor (Gilmore 1954). A modern drive-in movie theater was constructed in the *kiawe* and sand dunes just west of Raw Fish Camp, which was located just inland and north of the present-day Harbor Lights Condominiums.

Early postwar years (1946-1950) saw the construction of H. P. Baldwin High School and Maui Memorial Hospital in Wailuku. In 1947, plans began for wholesale development of Kahului as a master-planned community providing fee-simple ownership of single-family homes (The Honolulu Advertiser 1956). The majority of the homes, located between Baldwin High School and Pu‘unēnē Avenue, were purchased by plantation employees and servicemen returning from duty overseas. This trend continued throughout the 1950s, with plantation camp populations falling in the outlying communities, including Pu‘unēnē, and rising in the central town site of Kahului's new "Dream City" (Dean 1950).

In the years during the Korean War (1950-1953), the modernization of the workforce and stronger unions brought a host of changes to the central region of Maui. Gone were the railroads of the prewar age, replaced by trucks and mechanized sugar and pineapple harvesters. The modernization of Kahului Harbor meant that canned pineapple, bulk sugar (Figure 26 and Figure 27), and molasses could be loaded onto ships faster.

The Kahului Shopping Center opened in 1951 to serve the needs of the area's new residents. The first two hotels built in Kahului, the Maui Palms (Figure 28) and the Maui Hukilau, both opened in the mid-1950s, sharing a thin stretch of beach along the harbor, west of the former military buildings of the Kahului Section Base. Kanahā Pond Wildlife Sanctuary (SIHP # 50-50-04-1783), a former royal fishpond, was established in 1952 to protect the cultural remains of the original fish pond wall structure and three endangered wetland bird species: the Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), and Hawaiian duck (*Anas wyvilliana*) (James 2002). Also in 1952, Commercial airline operations began at the Maui Airport.

Both beach-side hotels, Kahului Store (Figure 29), Kahului School, the Kahului Shopping Center, and other businesses and residences were heavily damaged when a tidal wave originating along the coast of Chile hit the Kahului area on 23 May 1960. A tidal wave generated in Prince William Sound, Alaska, hit the Kahului area 28 March 1964, causing localized flooding, but far less damage than the 1960 event (Lander and Lockridge 1989)

On 12 March 1959, Hawai‘i became the 50th State of the Union. With labor costs for both sugar and pineapple steadily rising in the post-war years, driven primarily by labor union demands, both industries responded by adopting new technical innovations. Containerized shipping revolutionized the freight industry in the early 1960s, leading to the redesign of gantry systems and hardstand support areas to facilitate the moving and storage of the new containers at the

Figure 26. Bulk sugar being prepared for transport circa 1940s (courtesy of A&B Sugar Museum)

Figure 27. Sugar stored inside warehouse at HC&S bulk sugar plant circa 1952 (courtesy of A&B Sugar Museum)

Figure 28. Maui Palms Hotel (Paradise of the Pacific 1960)

Figure 29. Kahului Store workers cleaning 1960 tidal wave damage (courtesy of A&B Sugar Museum)

at the Kahului Harbor. The Matson Navigation Company, a subsidiary of Alexander & Baldwin, became the leader in the development of an industry-wide standard for intermodal containers (Dean 1950).

The Kahului Railroad Company sold off its locomotives and rolling stock and became the Kahului Trucking and Storage Company in 1966. The Haleakala Storage & Transfer Company, a privately-owned company, took over much of the specialized freight-forwarding operations once done by the railroad (Hawaii Business and Industry 1966).

Also in 1966, new construction began on the Kahului campus of Maui Community College, following the transfer of the former vocational school from the State Department of Education to the University of Hawai‘i. Funded by a fixed percentage of Hawai‘i state revenues, construction spending at the Kahului campus accelerated through the mid-1970s (Roth 1992). The second of three regional shopping centers to serve the Kahului area, the Maui Mall, opened in 1971, this retail space replaced a sprawling HC&S Company lumber yard. It was joined a year later by the Ka‘ahumanu Shopping Center. Alexander & Baldwin Inc., the largest landowner in Kahului, continued to expand residential housing in the “Dream City” incrementally between 1970 and 1990 (Hooser and Stewart 1995). Large-scale construction projects in Central Maui, such as The Maui Arts and Cultural Center (MACC) (constructed in 1993), Keopuolani Park (constructed in 1999), the Maui Lani Dunes golf course (constructed in 1989) and the residential build-out of Maui Lani (1996-present) were precursors for light industrial development in the Wailuku Town portion of the *ahupua‘a*.

Following the closing of the Wailuku Sugar Company mill in 1989, much of the former agricultural land along the eastern banks of the ‘Īao Stream was developed as the Iao Parkside Condominium: a development consisting of 47 buildings constructed in phases between 1992 and 2002, with large-scale light industrial development utilizing much of the remainder of the former sugar lands of Wailuku along the western bank of the ‘Īao Stream (Hooser and Stewart 1995).

Design of a new Kahului Airport Terminal Complex began in 1985. Consisting of three phases, the $36.5 million complex took five years to complete. Work included additions and alterations to existing structures, roads, parking areas, aprons, a new terminal, taxiways, runways, landscaping, cargo terminal and relocation of the FAA tower. Support facilities included a new helipad and cargo terminal (Schlapak and Kali 2006). By 1995, after the completion of these facilities, the Kahului Airport was ranked as one of the busiest small airports in the United States, logging over 4 million passengers (Hooser and Stewart 1995). By 2005, the number of passengers travelling through the Kahului Airport had more than doubled, to 8.5 million (Hawaii Small Business Development Center Network 2006).

Kahului area has continued to expand commercially. HC&S closed Pu‘unēnē Mill, its last operable mill and the last sugar plantation in Hawaii in 2016 (Cataluna 2016). Surrounding former sugar cane lands are primarily fallow with some new commercial development and plans for renewed agricultural production.

3.1.12 Harbor Development

The importance of Maui as a center for the pacific whaling industry encouraged the construction of numerous modern wharves, landings and harbors throughout the island, many of which have been improved and are still in use to this day. While Kahului Harbor was not the first of these to be constructed, it was the first port on Maui with structures built to allow for ships to moor directly within the harbor. This allowed ships to transfer freight in the protection of the breakwaters rather than anchoring offshore and transporting cargo via smaller craft (Rush 1957).

In its original condition, the bay was a natural inlet surrounded and supported by a large coral reef. While the reef offered its own protection, the bay itself was largely exposed to powerful surf, rendering it useless to seafaring merchants. Engineers struggled for decades to design a harbor that could withstand the severe storms and northeast trade winds that frequently impact the northwestern shores of Maui.

Under the influence of Alexander and Baldwin, construction of the first breakwaters at Kahului Bay began in 1898. Kahului Railroad Company began construction of the eastern breakwater by depositing large boulders extracted from plantation fields on top of the eastern reef, providing some protection to moored ships. The eastern breakwater was completed in 1913 (Figure 30), and the western breakwater was completed in 1919, both under similar methods of construction (Taylor 1926). In addition, the interior of the harbor was dredged to a depth of 35 feet to accommodate large vessels looking to moor in the harbor. The protection offered by the original harbor infrastructure proved inadequate, needing near constant maintenance, repair, and extension in the decades following its construction. By 1926, the United States Army Corps of Engineers had already spent $755,580 on improvements to the harbor (Taylor 1926), an amount that when adjusted for inflation would equal nearly $11,000,000 in 2019.

Even after extensive investments, further improvements were still needed to the harbor. By 1931, both breakwaters had been extended and enlarged, and two wharfs had been constructed, Pier 1 for large vessels and Pier 2 for smaller craft. Pier 2 is within the Parcel 003 portion of the current project area (Figure 31). By 1941, the bulk sugar system had been constructed by HC&S (see Figure 31), including sugar storage warehouses (see Figure 27) and an advanced freight handling system that utilized conveyors and lifts to transport unrefined sugar automatically (Figure 32 through Figure 36). The construction of the bulk sugar conveyor system marked the last large-scale improvement to Kahului Harbor infrastructure and is still standing to this day. In 1960, this system was damaged by a devastating tidal wave that swept through the harbor and surrounding Kahului (Figure 37 through Figure 40), suggesting the harbor is still vulnerable to tidal events and heavy storms.

Early construction surrounding Kahului Bay consisted primarily of small buildings associated with the budding railroad and plantation enterprises of Alexander and Baldwin, with the most intense period of development covering the first few decades of the twentieth century. However, industrial and commercial development persisted throughout later decades, as well (Figure 41 through Figure 47).Today the harbor is a hub for industrial and mixed-use businesses (Figure 48 through Figure 50).

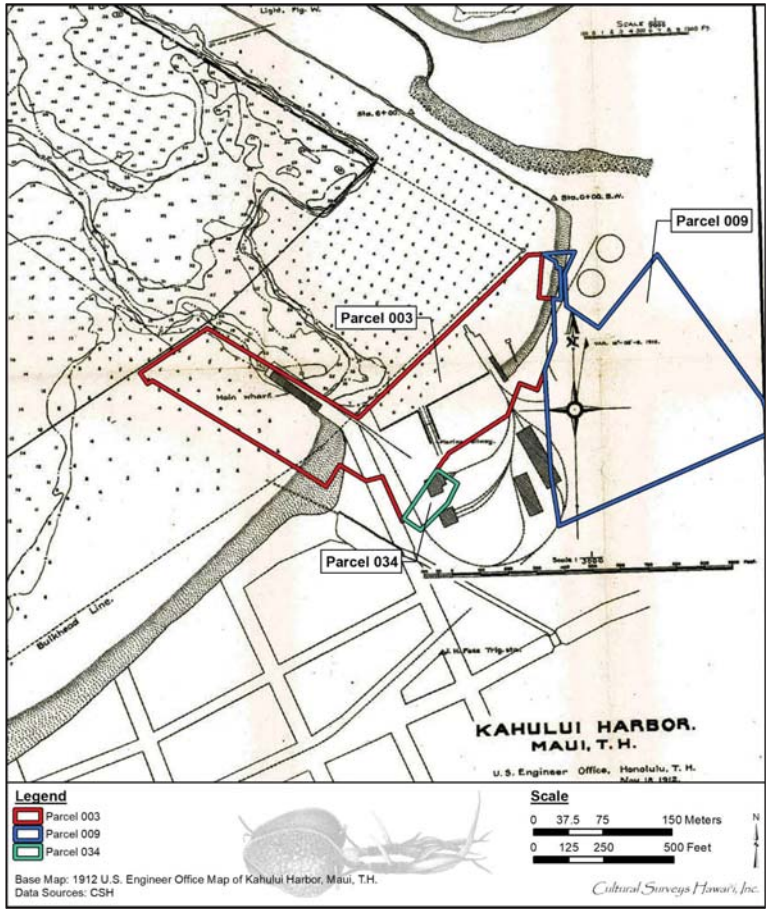


Figure 30. Portion of a 1912 U.S. Engineer Office map of Kahului Harbor showing early plans for the eastern breakwater and other facilities (U.S. Engineer Office 1912)

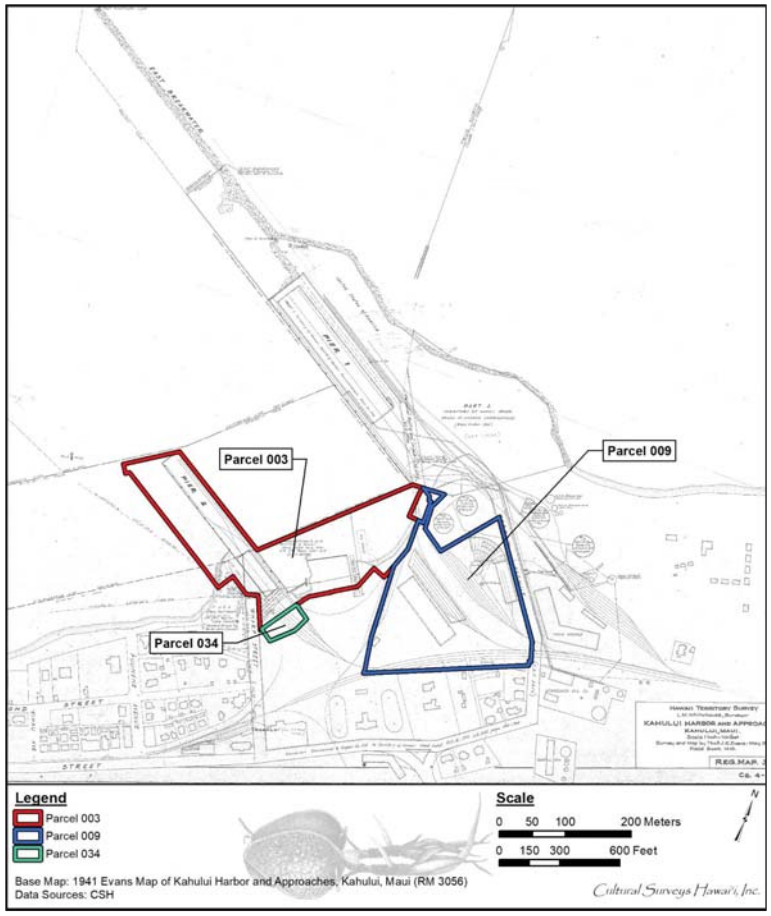


Figure 31. Map of Kahului Harbor showing the current project area after construction of Pier 1, Pier 2, the bulk sugar warehouse system, and surrounding developments (Evans 1941)

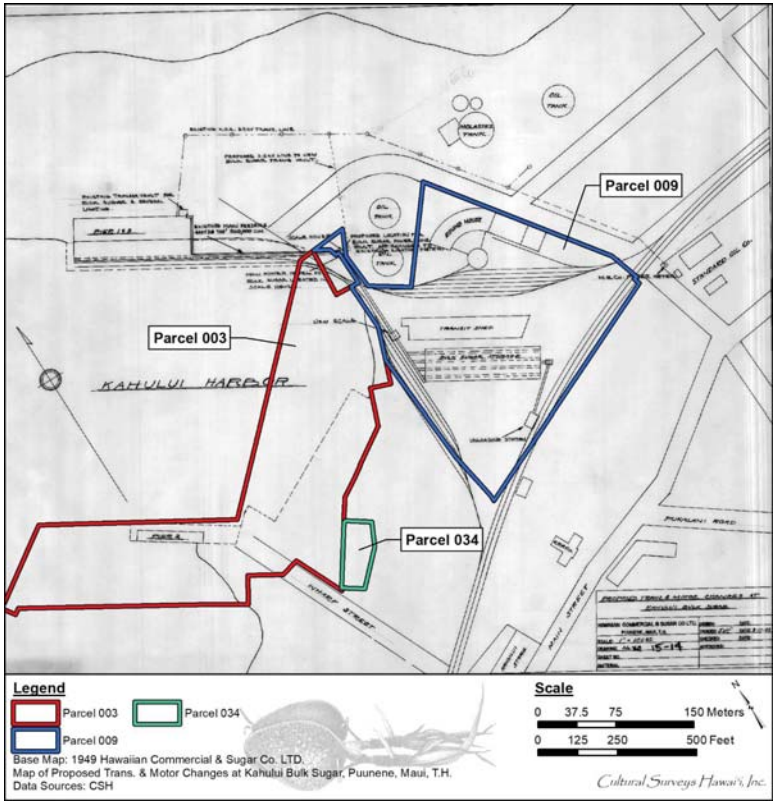


Figure 32. 1949 HC&S map showing then proposed changes to the transportation and infrastructure for the bulk sugar plant; note CSH 2 in center, and CSH 4 extending along the wharf (HC&S 1949)

Figure 33. Bulk sugar being loaded into transport trucks to be carried to the bulk sugar plant storehouses, circa 1940s; conveyor system (CSH4) visible in background (photo courtesy of HC&S Sugar Museum)

Figure 34. Interior of storehouse (CSH 2) while in operation circa 1950s, showing bulk unrefined sugar being transported to the storehouse from the intake conveyor system (photo courtesy of HC&S Sugar Museum)

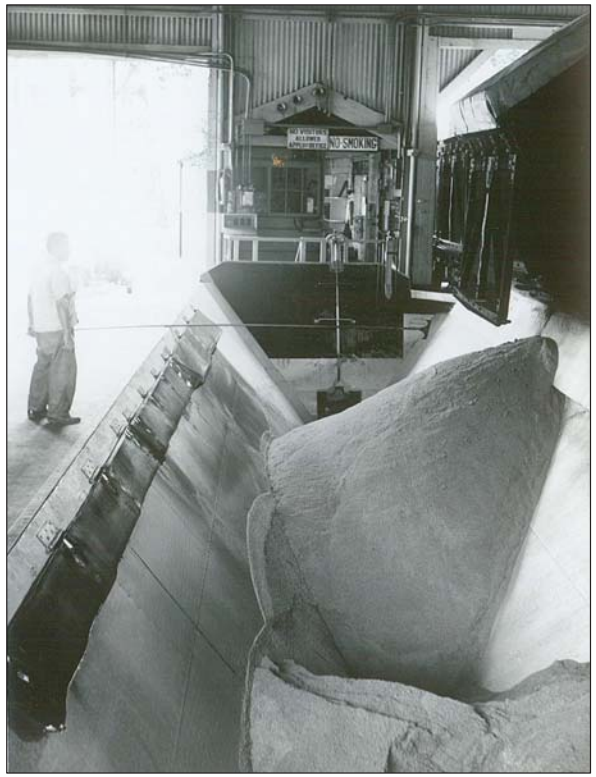


Figure 35. Interior of sugar storehouse (CSH 2) while still in operation circa 1950s and a portion of the conveyor system (CSH 4) connection (upper left) (photo courtesy of HC&S Sugar Museum)

Figure 36. Kahului Harbor with all components of the conveyor system (CSH 4), including the dump bin, the first of the bulk sugar storehouses (CSH 2), and the conveyor connecting each to Pier 1, circa 1940s (photo courtesy of HC&S Sugar Museum)

Figure 37. Historic photo of the bulk sugar conveyor system after the concrete foundation was undermined by a 1960 tidal wave (photo courtesy of HC&S Sugar Museum)

Figure 38. Photograph (1960) of damage to bulk sugar conveyor system at Kahului Harbor following a tidal wave; note extensive ground utilities under pavement surface to support the harbor infrastructure (photo courtesy of HC&S Sugar Museum)

Figure 39. Photo of utilities exposed at Kahului Harbor Bulk Sugar plant following a 1960 tidal wave (photo courtesy of HC&S Sugar Museum)

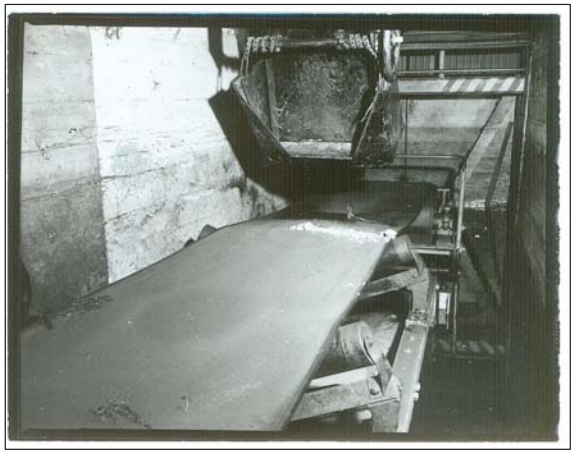


Figure 40. Photo of interior water damage to the bulk sugar conveyor system at Kahului Harbor caused by the 1960 tidal wave (photo courtesy of HC&S Sugar Museum)

Figure 41. Aerial photograph of Kahului Harbor showing industrial development in 1954 (photo courtesy of HC&S Sugar Museum)

Figure 42. Aerial photograph of Kahului Harbor showing industrial development in 1954 (photo courtesy of HC&S Sugar Museum)

Figure 43. Aerial photograph of Kahului Harbor, showing industrial development in 1956 (photo courtesy of HC&S Sugar Museum)

Figure 44. Aerial photograph of Kahului Harbor showing industrial development in 1957 (photo courtesy of HC&S Sugar Museum)

Figure 45. Aerial of Kahului Harbor showing industrial development in 1962; West Maui Mountains and ‘Iāo Valley in background (photo courtesy of HC&S Sugar Museum)

Figure 46. Aerial of Kahului Harbor (1960s) showing industrial development circa 1960s (photo courtesy of HC&S Sugar Museum)

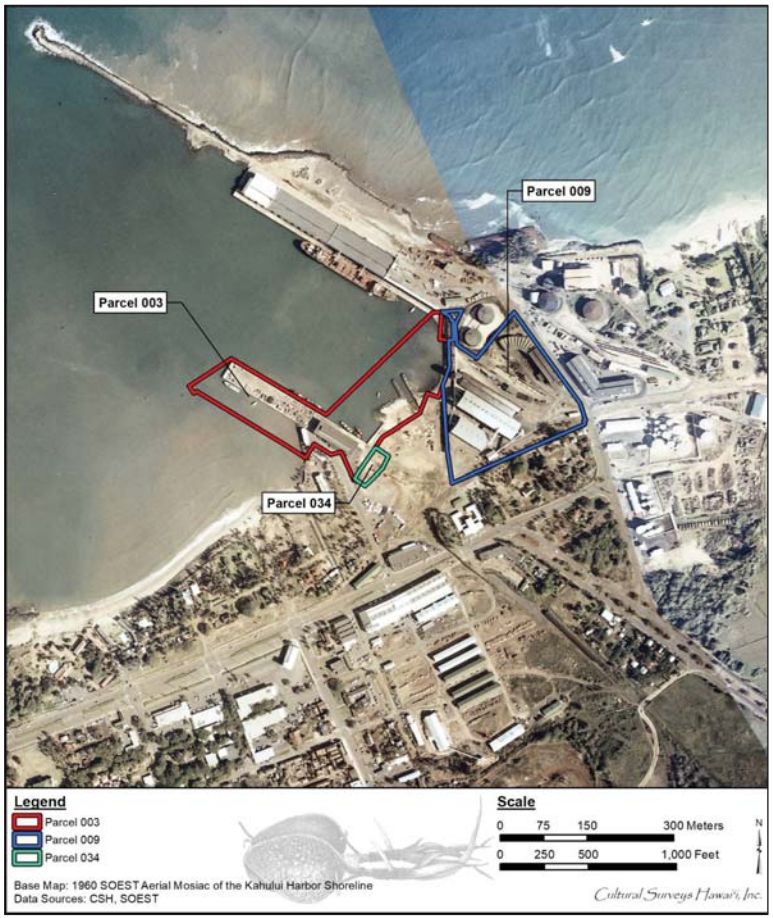


Figure 47. 1960 aerial photograph of the current project area showing the bulk sugar storage and conveyor system at Kahului Harbor and development in the vicinity (School of Ocean and Earth Science Technology [SOEST] 1960)

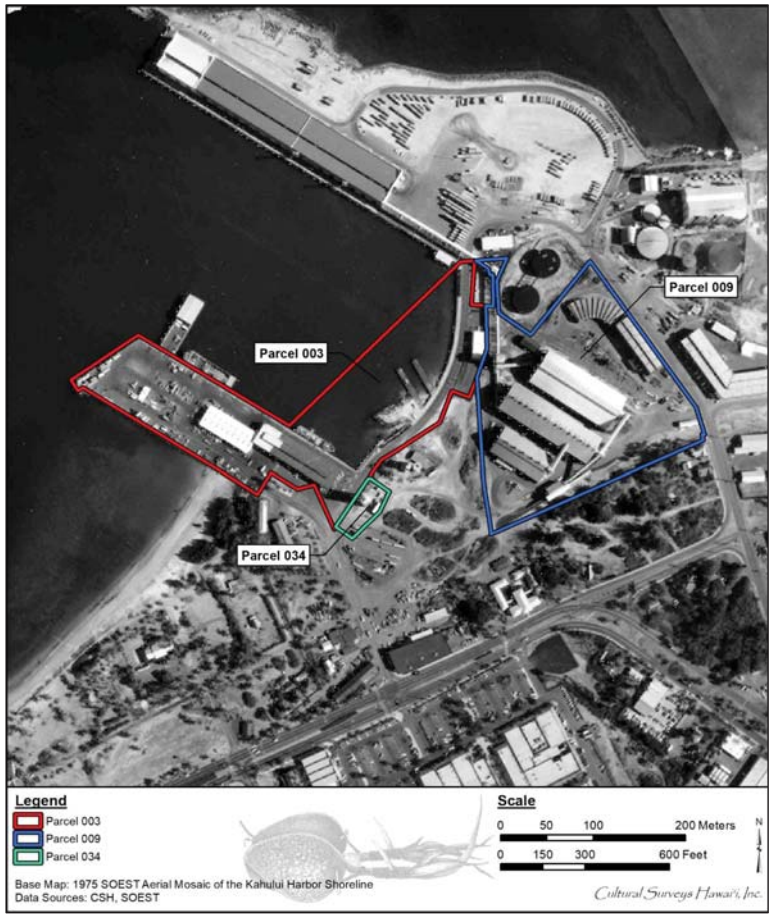


Figure 48. 1975 aerial photograph showing the current project area and surrounding development (School of Ocean and Earth Science Technology [SOEST] 1975)

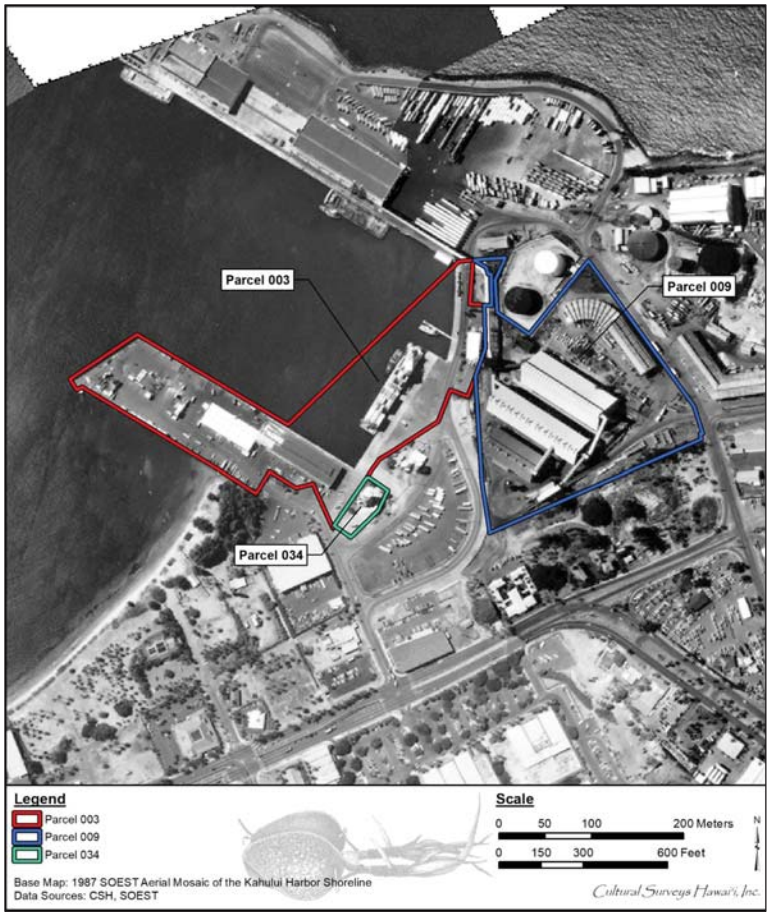


Figure 49. 1987 aerial photograph of the current project area and surrounding industrial and commercial growth (School of Ocean and Earth Science Technology [SOEST] 1987)

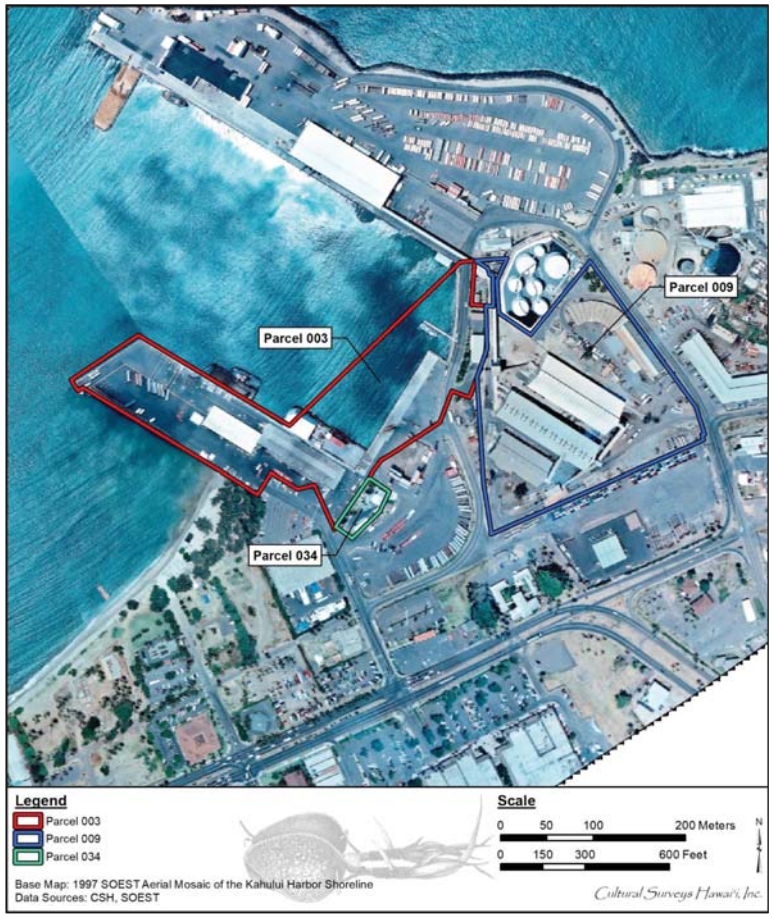


Figure 50. 1997 aerial photograph of Kahului Harbor and the surrounding industrial and commercial growth and development (School of Ocean and Earth Science Technology [SOEST] 1997)

3.2 Previous Archaeological Research

Between 1931 and 1976, only sporadic archaeological studies were undertaken in the area. Following passage of the National Historic Preservation Act in 1966 and HRS Chapter 6E, which established the historic preservation program in 1976, archaeological studies occurred as a condition of development on a more frequent basis. Under guidelines established by national and state legislation, lands surrounding the current project area have been subject to a variety of studies, including archaeological inventory surveys (AIS), archaeological assessments (AA), and archaeological monitoring programs (Table 2 and Figure 51). Historic properties previously identified near the project area include a likely pre-Contact paving, and historic districts, foundation, and burial (see Table 2; Figure 52).

3.2.1 Early Studies

The earliest archaeological studies on the island of Maui were part of island-wide surveys conducted in the early 1900s (Stokes 1917; Walker 1931), which focused on generating descriptive lists of large scale architectural features or traditional ceremonial *heiau* sites. No *heiau* were documented in the immediate vicinity of the current project area. Walker reported that 16 *heiau* once existed around Wailuku and Kahului towns (Sites 42-57), but he was able to relocate only two (Pihana and Haleki‘i) during the survey. Pihana and Haleki‘i Heiau are located on the west side of ‘Īao Stream, approximately 2.5 km (1.6 miles) northwest of the current project area. Walker’s detailed notes for Pihana Heiau (Walker Site 43) and for Haleki‘i Heiau (Walker Site 44) included scale plan-view drawings of the *heiau* foundations. The main terraces of Pihana Heiau measure 300 feet long by 100 feet wide and each of the four terrace levels appeared to be about four feet in height and were set on a lithified sandstone dune some 60 feet above the ‘Īao Stream. When first encountered by Stokes (1916), the northeast and east portion of the *heiau* were in ruins, having fallen down the slope as a result of erosion from ‘Īao Stream.

Walker (1931) measured Haleki‘i Heiau as a larger, more intact structure, some 300 feet by 150 feet, with slightly taller intact wall structures and the remains of enclosures, previously referred to by Stokes as “compartments,” integral to the design of the topmost terrace (Walker 1931:147). In 1958, the Bishop Museum undertook the partial restoration of the platform of Haleki‘i Heiau in Wailuku. According to Emory (1972), the clearing and restoration of both the Pihana and Haleki‘i Heiau revealed a series of habitation platforms along the base of Haleki‘i Heiau toward ‘Īao Stream and several habitation sites between them.

3.2.2 Donham (1990)

On 14, 15, and 18 June 1990, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological inventory survey of the 4.6-acre Maui Palms Hotel property (Donham 1990). The study included a surface survey and the excavation of 40 auger cores at 34 locales. One surface site was identified and referred to as Site 852-1. Site 852-1 consisted of a 120-square-meter late twentieth century artifact and midden scatter within the shoreline setback area at the northwestern corner of the hotel property. Modern and/or historic subsurface cultural materials were identified at 16 locations, likely all in secondary fill deposits. One historic artifact concentration, identified across approximately 450 square meters within the southeastern corner of the parcel, was labeled Site 852-2 and interpreted as a secondary deposit of habitation refuse and structural debris. Neither Site 852-1 nor 852-2 were deemed significant; consequently, no further work was recommended

Table 2. Previous Archaeological Studies in the Vicinity of the Project Area

Reference	Type of Study	Location	Results (SIHP # 50-50-04)
Donham (1990)	AIS	Maui Palms Hotel; TMK: [2] 3-7-003	No significant historic properties identified; identified secondary deposits of isolated modern and/or historic artifacts and midden scatter
Eblé and Carlson (1996)	AIS	Hobron Triangle; TMK: [2] 3-7-011:003	No historic properties identified: identified isolated modern/ historic artifacts
Wade et al. (1997)	AIS	Kahului Harbor; TMK: [2] 3-7-008:001, 002, 003, 004 & 006	No significant historic properties identified; identified two isolated historic artifacts and a historic pit feature
Burgett and Spear (1998)	Archaeological monitoring	Kahului Harbor; TMK: [2] 3-7-010; includes southern border of the current project area at parcel 009	No historic properties identified; encountered a pit feature possibly associated with historic harbor activities
Fredricksen and Fredericksen (1999)	Archaeological monitoring	Kahului Harbor; TMK: [2] 3-7-008:006, 004, 003 & 001	Identified SIHP # -4753, waterworn coral and basalt pebble paving with a 63.2-gram shellfish midden inclusion
Fredericksen (2004)	Archaeological monitoring	Kahului Harbor; TMK: [2] 3-7-008:006	No historic properties identified; recorded waterworn pebbles within geologic cores at the same depth as previously identified SIHP# -4753
Hunt et al. (2006)	AIS	Kahului Harbor; TMK: [2] 3-7-008:006 por. and 004	Identified SIHP # -5773, historic burial, and additional components (isolated artifacts) of SIHP # -1607 (Kahului Historic District)
Guerriero et al. (2014)	Archaeological assessment	TMK: [2] 3-7-009:005 and 004 pors.	No historic properties identified; encountered one isolated artifact (a railroad spike).
Royalty and Hammatt (2017)	Archaeological monitoring	TMK: [2] 3-4-001, 011, 012, 013, 018 & [2] 3-7-002, 003, 004, 008, 010, and 011, [2] 3-8-007 and 046	Identified SIHP # -8498, historic concrete foundation or sidewalk; isolated historic artifacts; and four previously identified historic properties: SIHP # -1541, Ka‘ahumanu Avenue-Naniloa Drive Overpass; SIHP # -1607, Ka‘ahumanu Church; SIHP # -1630, H.P. Baldwin High School; and SIHP # -1633, Waiale Drive Bridge

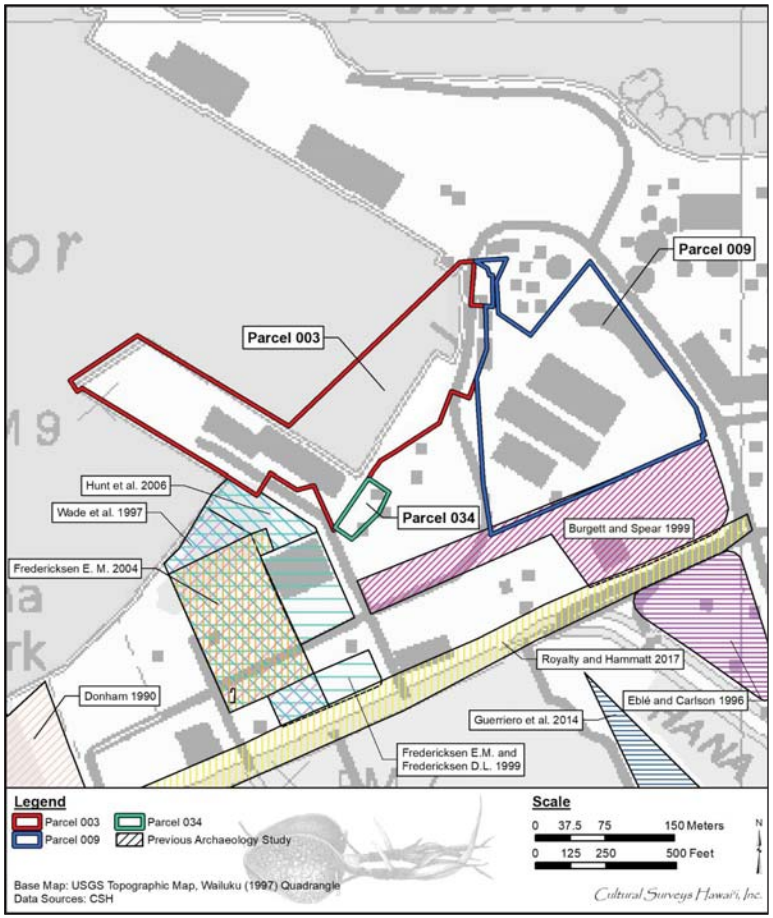


Figure 51. Portion of the Wailuku topographic quadrangle (U.S. Geological Survey 1997) showing the location of earlier studies surrounding the current project area

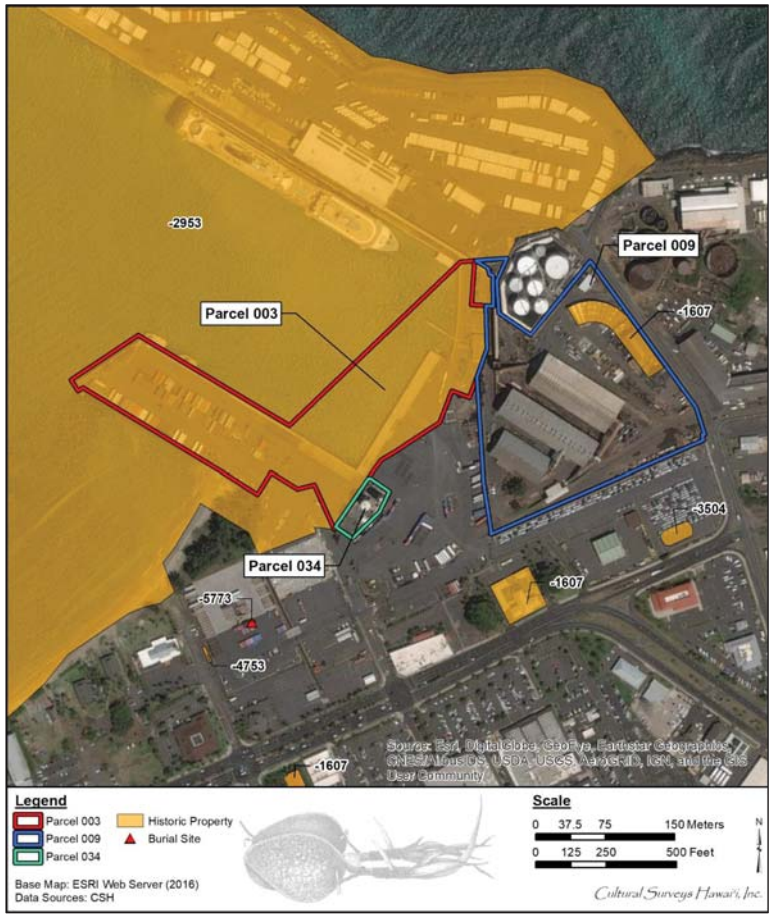


Figure 52. Aerial photograph (2016) showing the location of historic properties and archaeological sites within and around the project area (ESRI web server)

for these sites. However, archaeological monitoring was recommended for future project-related ground disturbing activities at the study area.

3.2.3 Eblé and Carlson (1996)

In November 1995, BioSystems Analysis, Inc. (BioSystems) conducted an archaeological inventory survey for retail development of Hobron Triangle (Eblé and Carlson 1996). Fieldwork included a subsurface testing strategy focused on areas proposed for underground utility installation. Of the 16 backhoe-excavated test trenches, cultural materials were encountered in only two, Trenches 7 and 11. Trench 7 contained modern and historic nails; historic metal, glass, and ceramic; and a wooden beam, all in a disturbed context. One artifact, a historic glass bottle dated to possibly the late nineteenth century, was identified in Trench 11. Fill sediment was apparent throughout the study area. No significant historic properties were identified. Archaeological monitoring was recommended for any project-related ground disturbance that would extend below existing fill layers.

3.2.4 Wade et al. (1997)

From 9 through 12 September 1997, Garcia and Associates, Inc., (GANDA) in association with Aki Sinoto Consulting, conducted an archaeological inventory survey of the Barge Terminal Improvement Project at Kahului Harbor (Wade et al. 1997). Fieldwork included a pedestrian survey and a subsurface testing program consisting of 11 backhoe-excavated test trenches. No surface remains were identified and only isolated historic artifacts (white porcelain fragment, one complete bottle, and a pit feature containing a sparse amount of marine shell and dense charcoal concentration) were observed in three of the test trenches. No historic properties were identified, therefore results of the study were published in an archaeological assessment report. Due to the observed presence of deep sandy deposits, future monitoring work was recommended for all ground disturbing activities on this parcel.

3.2.5 Burgett and Spear (1998)

Between 24 March and 15 April 1998, Scientific Consultant Services, Inc. (SCS) conducted archaeological monitoring for proposed improvements of the storage yards at Kahului Harbor on a 3.3-acre parcel (Burgett and Spear 1998). This study area includes the southern border of the Parcel 009 portion of the current project area. Monitored ground disturbance included 278.5 meters of trenching for water lines or drainage and approximately 178 m of electrical trenching. No historic properties were identified during this monitoring program. However, a large rock-filled pit was encountered extending to 89 centimeters below surface (cmbs) in Waterline Trench #2 in association with a previously disturbed layer of fill, suggesting the pit was part of old harbor facility operations. No associated artifacts were observed with this pit. Burgett and Spear (1998) also note that SIHP # -3508, a brick and mortar foundation footing with nineteenth and twentieth century artifacts in a coralline sand layer, was previously identified at the study area by the SHPD in 1993.

In general, soil observed during monitoring at this study area consisted of two to four layers of fill overlying natural sand. Natural sand strata were encountered from approximately 20 to 56 cmbs and extended to the base of excavations, which were from approximately 100 to 180 cmbs. In some areas, natural beach sands were observed associated with coral pieces, while other observed sands were identified in conjunction with gleyed sands.

3.2.6 Fredericksen and Fredericksen (1999)

From November 1998 to February 1999, Xamanek Researches conducted archaeological monitoring for the Kahului Barge Terminal Improvements Project at Kahului Harbor (Fredricksen and Fredericksen 1999). This project area included a parcel bordering the west side of the Parcel 003 portion of the current project area. Fredericksen and Fredericksen (1999) note that soils appeared relatively undisturbed 20 to 40 cmbs in the northwestern portion of the study area, and beach and dune sand deposits were present in the northern portion of the project area, while soils consisted of fill throughout the remainder of the monitored area.

One historic property, SIHP # -4753, was identified within an excavation along Pu‘unene Avenue for a landscaping palm tree. Limited manual test excavations at SIHP # -4753 determined it to be a subsurface stone platform at least 10 m (33 ft) long and 20 to 24 cm (7.9 to 9.4 in) thick, comprised of levelled and sorted waterworn basalt pebbles with occasional waterworn coral cobbles. Additionally, 63.2 grams of shellfish midden were observed within this feature. While function, extent, and age were not definitively interpreted, Fredericksen and Fredericksen (1999) suggest SIHP # -4753 is a pre-Contact feature. Data recovery was recommended for SIHP # -4753, and archaeological monitoring was recommended for any future improvements requiring subsurface disturbance at the study area.

3.2.7 Fredericksen (2004)

In March 2004, Xamanek Researches conducted archaeological monitoring during soil testing prior to scheduled improvements to the Pu’unene Container Yard Facility at Kahului Harbor (Fredericksen 2004). Twelve soil cores were drilled and monitored during soil testing. Analysis of the core samples indicated that sand deposits underly all sampled portions of the Pu’unene Container Yard project area. Concentrations of waterworn pebbles were identified in four of the core samples. While directly investigating soil core areas underlying the modern paved surface was not possible, Fredericksen (2004) notes that these concentrations occurred at approximately the same depth as SIHP# -4753, a paved surface comprised entirely of waterworn cobbles and pebbles previously identified by Fredericksen and Fredericksen (1999) in an adjacent parcel. Constraints of the soil coring methodology did not allow for determining if the pebbles present in the coring samples represented a continuation of SIHP # -4753 or a naturally occurring feature.

3.2.8 Hunt et al. (2006)

From 13 December 2005 through 20 July 2006, SCS intermittently conducted archaeological monitoring for three phases of construction improvements to the Pu‘unene Container Yard facility at Kahului Harbor (Hunt et al. 2006). The northeast corner of this study area borders a section of the western edge the current project at Parcel 003. During monitoring on 13 January 2006, one partially *in situ* historic human burial was identified northeast of the center of the container yard. Several associated glass and shell beads “appeared to lie around the individual’s upper body, suggesting that the body was adorned in jewelry or *lei* when interred” (Hunt et al. 2006:29). The burial was designated SIHP # -5773, disinterred, and curated at the Maui SHPD office. In addition, isolated traditional, historic, and modern artifacts were encountered during monitoring. Traditional artifacts included a basalt bread loaf sinker, basalt core, octopus lure, worked basalt cobble, a poi pounder, basalt hammer stones, shell sinkers, and a chopping stone. Some of the historic artifacts identified include a brass hinge, a metal nail, porcelain pieces, ceramic shards, glass bottles, fired clay, and saw-cut faunal remains. The isolated artifacts were included as additional components

of SIHP # -1607, Kahului Historic District. Full-time archaeological monitoring was recommended for any future subsurface work.

3.2.9 Guerriero et al. (2014)

From 2 through 4 June 2014, Archaeological Services Hawaii, LLC (ASH) conducted an archaeological inventory survey of the southwestern portion of the Maui Mall Shopping Center parking lot prior to construction of the TJ Maxx store (Guerriero et al. 2014). Although, this project area is within SIHP # -1607 (Kahului Historic District), no historic buildings belonging to the historic district were identified within the study area. Ten test trenches were excavated by backhoe with a focus on areas where new drain lines and water utilities would be installed. No historic properties were identified. A single artifact, a railroad spike unearthed in Trench 7, was identified during the subsurface testing. Guerriero et al. (2014) note the artifact as archaeologically insignificant, though indicative of the cultural history of Kahului Harbor as an industrial port. Archaeological monitoring was recommended for ground disturbance associated with the construction of TJ Maxx.

3.2.10 Royalty and Hammatt (2017)

Between 28 September 2015 and 19 July 2016, Cultural Surveys Hawaii (CSH) conducted archaeological monitoring for the Main Street and Ka‘ahumanu Avenue Resurfacing Project from High Street to Hobron Avenue (Royalty and Hammatt 2017). Four previously identified state and nationally recognized historic properties were within the study area: SIHP # 50-50-04-1633/ NRHP #98001287, Waiale Drive Bridge; SIHP # -1541/NRPH # 08001065, Ka‘ahumanu Avenue-Naniloa Drive Overpass; SIHP # -1630/ NHRP # 00000667, H.P. Baldwin High School; and SIHP # -1607/ NHRP #75000622, Ka‘ahumanu Church. One historic property, SIHP # -8498, was newly identified during the monitoring program. SIHP # -8498 represents an *in situ* historic era concrete foundation or sidewalk, which was buried with base course for a new sidewalk and not impacted adversely during the project. Several isolated artifacts were also encountered during montoring, including an assemblage of ceramic sherds and glass bottles. These artifacts were not considered significant. None of the identified historic properties are in the immediate vicinity of the current project area.

Section 4 Results of Fieldwork

Between 30 September and 2 October 2019, CSH completed a reconnaissance-level field inspection of the project area and a targeted GPR survey of portions of the project area with potential to contain buried railroad tracks. Fieldwork was completed by Jonas Madeus, B.A., Jay Rapoza, B.A., and Trevor Yucha, B.S., under the general supervision of Hallett H. Hammatt, Ph.D. This work required approximately 9 person-days to complete.

4.1 Pedestrian Inspection

The reconnaissance-level pedestrian inspection was completed in order to identify the types and locations of potential historic properties within the project area. During the field inspection, CSH identified two components of SIHP # -1607 (Kahului Railroad roundhouse and machine shop annex) and four other structures that may be considered significant architectural historic properties (Figure 53). These structures include three storage warehouses and a conveyor system with associated dump bin that have been temporarily designated CSH 1 through CSH 4, respectively (see Figure 53). Each of the structures were related to the Kahului Railroad Company and early efforts by A&B to modernize the process of transporting and exporting unrefined sugar, reflecting a key piece of the industrial history of Kahului. These structures are all believed to be more than 50 years old. Documentation included photographs, background research, and GPS locations of each potential historic property. A description of each structure is presented in Section 5.

The project area is located within the boundaries of SIHP # 50-50-04-2953, the Kahului Commercial Harbor (which also may be part of the Kahului Historic District). CSH did not identify potential historic properties related to SIHP # -2953 within the project area.

4.2 GPR Survey

The targeted GPR survey included four survey locations that were completed in six GPR survey grids (Grids 1 through 6). The survey locations were selected to target potential buried railroad tracks that were once present on the surface of the project area (Figure 55). There have been instances throughout the State where, instead of removing the rails, the rails were buried or paved over with asphalt. No buried railroad rails were identified by the GPR, however, changes in stratigraphy and a possible filled trench were visible that may relate to former land use. A metal utility line was also identified.

4.2.1 GPR Grids 1&2

GPR Grids 1&2 are two contiguous grids that were placed in an open gravel area in the northwestern portion of Parcel 9 (Figure 56 and Figure 57). Grid 1 measured 15.0 m by 12.0 m and Grid 2 measured 16.5 m by 12.0 m. The area was selected for the potential to contain buried railroad tracks that are shown on the surface in a 1941 map of the project area (see Figure 55). No anomalies were identified by the GPR in Grids 1&2. The GPR recorded a consistent change in reflection at approximately 0.8 to 1.0 m below surface in Grid 1 (Figure 58). The reflection may be indicative of a change in stratigraphy. The change in reflection was not observed in Grid 2 (Figure 59). Signal attenuation observed at approximately 2.0 m below surface likely indicates the presence of water saturation or the water table.

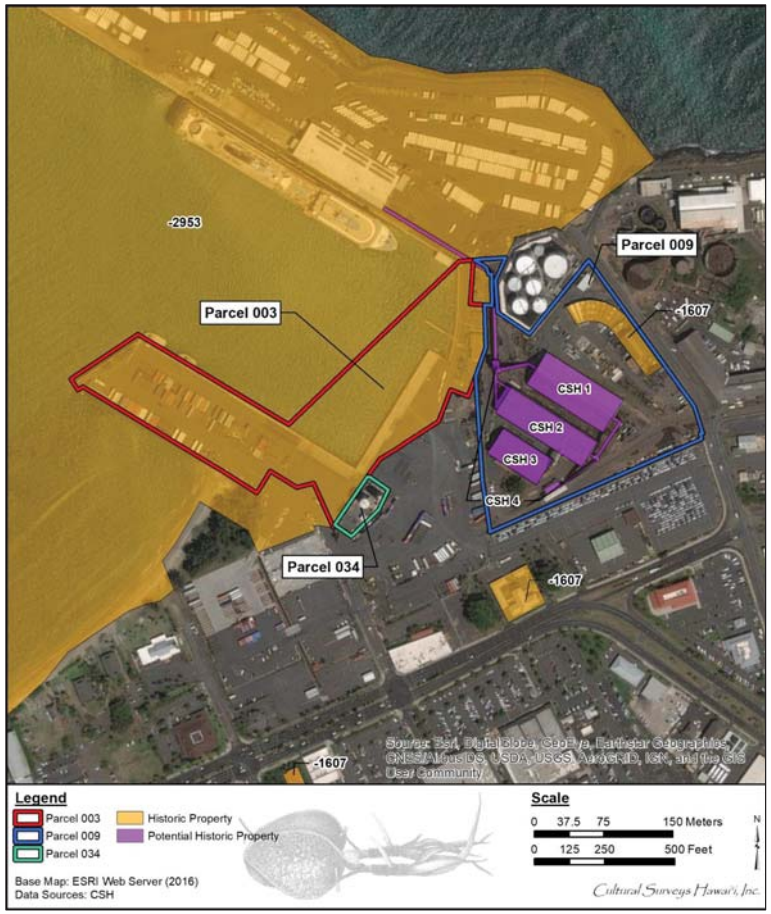


Figure 53. Aerial photograph showing the location of historic properties identified within the project area (Esri 2016)

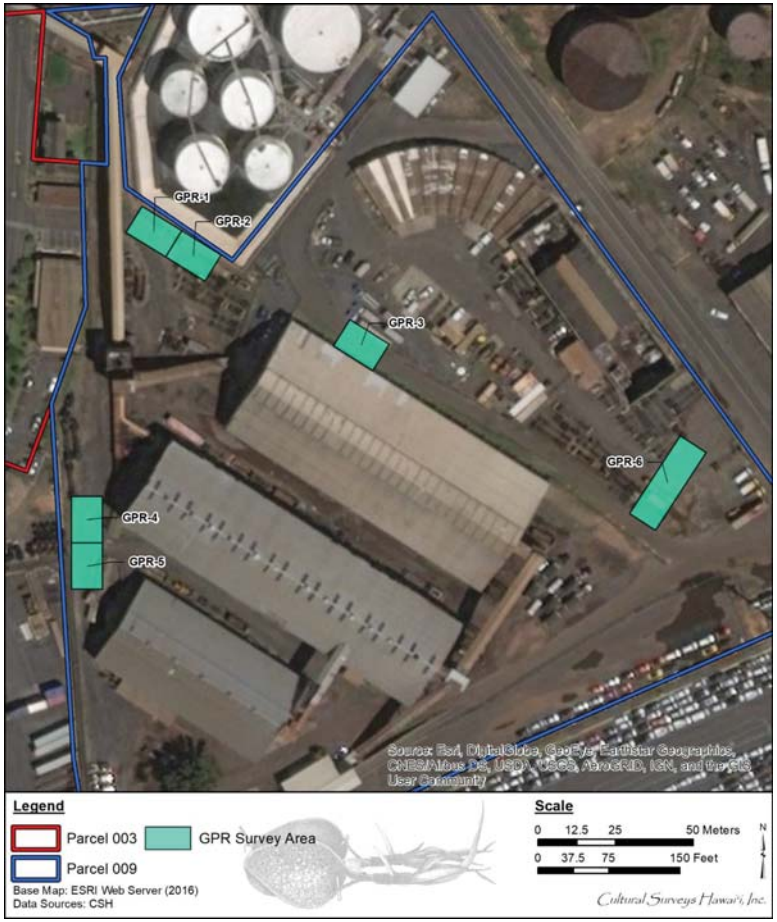


Figure 54. Aerial photograph showing the location of GPR survey grids within the project area (Esri 2016)

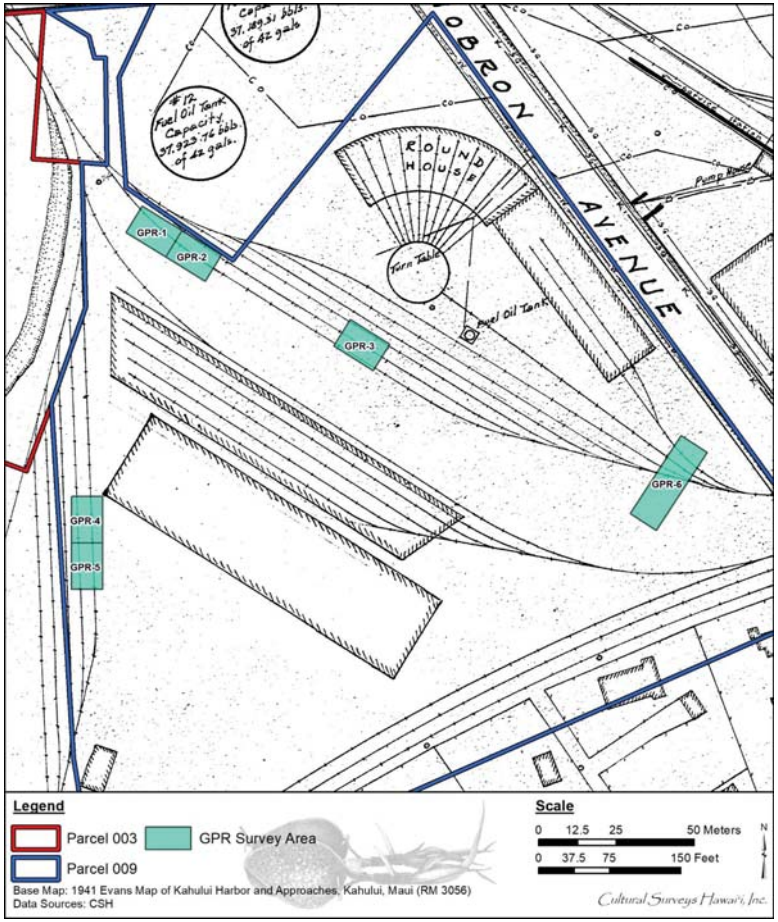


Figure 55. Portion of a 1941 map of Kahului Harbor and Approaches (RM 3056) (Evans 1941)

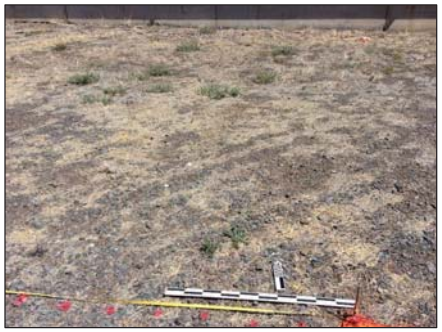


Figure 56. General view of the location and surface of GPR Grid 1, view to north

Figure 57. Overview showing the location of the contiguous GPR Grid 1 (in background) and Grid 2 (in foreground) in the northwestern portion of the project area, view to west

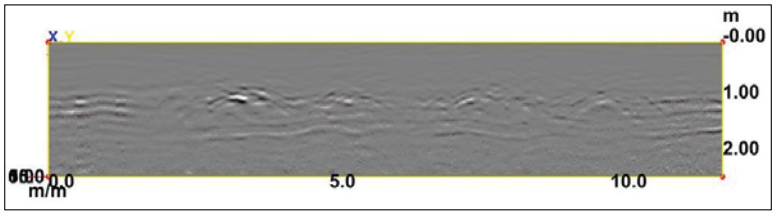


Figure 58. GPR Grid 1 reflection profile at 12.75 m from the grid origin showing a change in reflection at approximately 0.8 to 1.0 m below surface

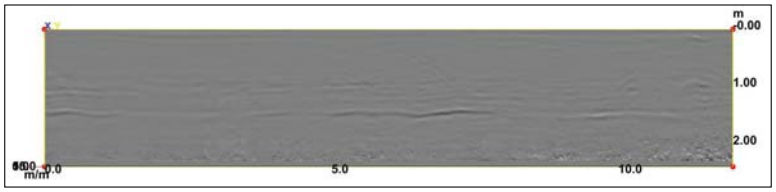


Figure 59. GPR Grid 2 reflection profile at 10.00 m from the grid origin showing consistent reflection to approximately 2.0 m below surface

4.2.2 GPR Grid 3

GPR Grid 3 was placed along an asphalt road surface located in the central portion of Parcel 9 and adjacent to the northeastern edge of one of the bulk sugar warehouses (CSH 1) within the project area (Figure 60). Grid 3 measured 15.0 m by 5.0 m. The area was selected for the potential to contain buried railroad tracks that are shown on the surface in a 1941 map of the project area (see Figure 55). There was no indication of buried metal tracks within the GPR survey area. The GPR identified a consistent reflection pattern to approximately 1.0 m below surface (Figure 61). Signal attenuation observed at 1.0 m below surface is likely indicative of the presence of water saturation or the water table.

4.2.3 GPR Grids 4&5

GPR Grids 4&5 are two contiguous grids that were placed in an open gravel area along the western edge of Parcel 9 (Figure 62). Grid 4 measured 15.5 m by 10.0 m and Grid 5 measured 14.5 m by 10.0 m. The area was selected for the potential to contain buried railroad tracks that are shown on the surface in a 1941 map of the project area (see Figure 55). A possible disturbed area was observed in a portion of GPR Grid 4 including what could be a filled trench based on the abrupt changes in reflection observed in profile (Figure 63). A linear anomaly was identified in Grid 5 near the surface in both plan and reflection profile (Figure 64 and Figure 65). The linear anomaly does not follow the orientation of the former rail lines in this area (see Figure 54 and Figure 64). The anomaly is interpreted as a possible small metal utility line.

4.2.4 GPR Grid 6

GPR Grid 6 was placed in an asphalt paved access lane located in the southeastern portion of Parcel 9 (Figure 66). Grid 6 measured 6.0 m by 20.0 m. The area was selected for the potential to contain buried railroad tracks that are shown on the surface in a 1941 map of the project area (see Figure 55). There was no indication of buried metal tracks within the GPR survey area. The GPR identified an area of compaction in the lane used by semi-trucks (Figure 67).

Figure 60. General view of the location of GPR Grid 3, view to west

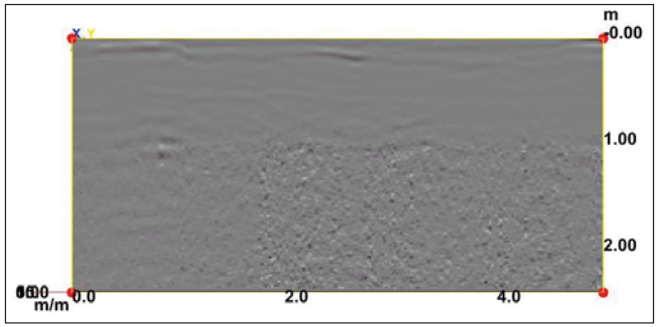


Figure 61. GPR Grid 3 reflection profile at 6.0 m from the grid origin showing signal attenuation at approximately 1.0 m below surface indicative of the presence of water saturation or the water table

Figure 62. Overview showing the location of the contiguous GPR Grid 4 (in foreground) and Grid 5 (in background) along the western edge of Parcel 9, view to south

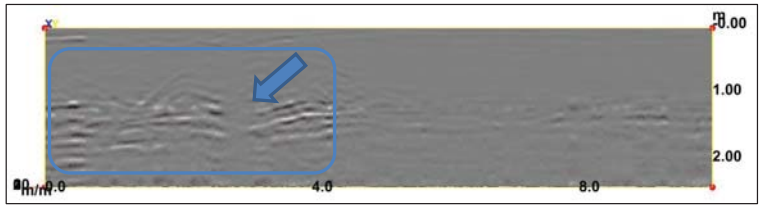


Figure 63. GPR Grid 4 reflection profile at 12.0 m from the grid origin showing a possible disturbed area between 0-4.0 m (blue box) including what could be filled trench (blue arrow)

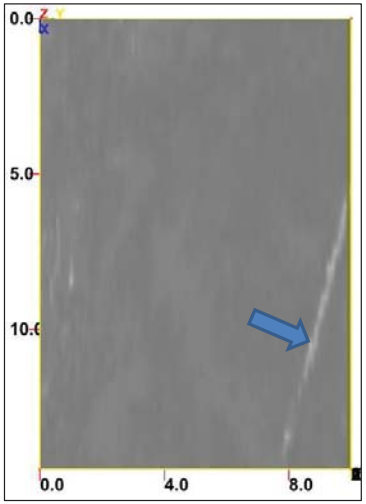


Figure 64. GPR Grid 5, 0.2 m surface oriented to north, showing linear anomaly that is interpreted as a possible small metal utility line (blue arrow)

Figure 65. GPR Grid 5 reflection profile at 8.0 m from the origin showing the hyperbola reflection generated by the linear anomaly observed near the surface of the grid (blue arrow)

Figure 66. General view of the location of GPR Grid 6, view to north

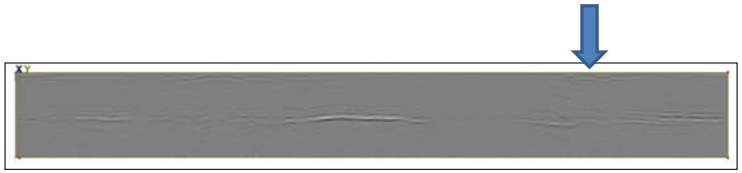


Figure 67. GPR Grid 6 reflection profile at 6.0 m from grid origin showing compaction along semi-truck access lane (blue arrow)

Section 5 Site Descriptions

A previously discussed, one previously documented historic property (SIHP # 50-50-04-1607) and four potential historic properties were identified during the field inspection (see Figure 53 and Table 3).

Table 3. Sites Identified within the Current Project Area

Site Number	Formal Type	Function
SIHP # 50-50-04-1607	Kahului Historic District	Business & Industry; Transportation
CSH 1	Building	Storage
CSH 2	Building	Storage
CSH 3	Building	Storage
CSH 4	Structure	Commercial (Transportation of Goods)

5.1 SIHP # 50-50-04-1607

FORMAL TYPE:	Kahului Historic District
FUNCTION:	Business & Industry; Transportation
NUMBER OF FEATURES:	7
AGE:	Historic
TAX MAP KEY:	Multiple
PREVIOUS DOCUMENTATION:	(Wright 1974)

SIHP # 50-50-04-1607 is the Kahului Historic District, a non-contiguous district that includes at least seven contributing elements: First Hawaiian Bank building; Kahului School; auditorium and grandstand at the fairgrounds; and Kahului Railroad roundhouse, machine shop annex, and office. The district is described in a 1974 Hawai‘i Register of Historic Places (HRHP) nomination form that evaluates the district under reserve status (Wright 1974) (see Appendix A for HRHP form and historic district description).

Two of the structures that were described as part of the district are located within a portion of the current project area (TMK: [2] 3-7-010:009) and include the Kahului Railroad roundhouse building and the Kahului Railroad machine shop annex (Figure 68 through Figure 73). The buildings were erected in 1926 to serve as a storage and maintenance yard for locomotives and rail cars The railroad shop annex, which is attached to the southeastern end of the roundhouse, is described in the HRHP form the as follows:

> The railroad shop (constructed in 1926) is a large concrete brick building with a pedimented façade. Large areas of glass fill each bay and surface decoration consists of applied moldings. The office building was built in 1923 and is a one-story concrete structure with a hip-roof, and a hip-roofed entrance supported by heavy piers, two to a side. Applied plaster serves as decoration. (Wright 1974)

In its current state, the roundhouse and shop are approximately 125 m long by 23 m wide. The machine shop maintenance structure is still attached to the railroad roundhouse (see Figure 69). The roundhouse once had a large turntable (see Figure 70) where train cars transporting sugar to the HC&S bulk store houses could be disconnected, reoriented, stored, and mechanically maintained. According to the records of the Kahului Railroad Company, the original turntable was a Pencoyd Standard 60-foot diameter unit, manufactured by the Pencoyd Iron Works of Philadelphia, Pennsylvania (Pencoyd Iron Works 1900). While the roundhouse structure has been preserved and reutilized as a series of service bays for small business use, the original turntable structure is no longer present. Additionally, the original railroad ties connecting the structure to the Kahului Railroad lines have either been removed or paved over. However, the floor of the machine shop does contain an original set of railroad ties inlaid into the surface layer of concrete, which represents the last remnant of the terminus of the old Kahului Railroad line at Kahului Harbor. In addition to its current use as a series of service bays, the roundabout was also utilized during the restoration of the historic locomotive “Claus Spreckels” by the HC&S Company in the late 1980s (Robert Hill, personal communication; see Figure 9)

According to the HRHP form, the district is described as occupied status in good condition with altered integrity. Accessibility is noted as restricted. The importance of the district as an example of a site type is considered moderate and the susceptibility to interpretation is considered poor. Research potential is noted as moderate and local attitudes about the site are noted as moderate value.

Figure 68. Circa 1920s photograph of the Kahului Railroad roundhouse (courtesy of HC&S Sugar Museum)

Figure 69. Present-day photograph of the Kahului Railroad roundhouse; portion of the machine shop annex seen at right, view to north

Figure 70. Historic photograph of the original Pencoyd Ironworks turntable at the Kuhului Railroad roundhouse (courtesy of HC&S Sugar Museum)

Figure 71. Machine shop building constructed in 1926 by Kahului Railroad Company, view to north

Figure 72. General view of the east end of the roundhouse showing machine shop (foreground) and service bays (background), view to northwest

Figure 73. General view of east end of the roundhouse building, view to northwest

5.2 CSH 1

FORMAL TYPE:	Building (Bulk Sugar Warehouse)
FUNCTION:	Storage
NUMBER OF FEATURES:	1
AGE:	Historic (1970)
TAX MAP KEY:	TMK: [2] 3-7-010:009
PREVIOUS DOCUMENTATION:	N/A

CSH 1 is a building that was constructed in 1970 for bulk sugar warehouse storage (Figure 74 through Figure 81). The building is the third to be constructed in a set of three adjacent warehouses designed to increase the storage capacity for bulk sugar at Kahului Harbor, as well as streamline and improve the process of transferring unrefined sugar to ships waiting in Kahului Harbor. These improvements began in 1941 with the construction of the first bulk sugar warehouse building at Kahului Harbor (CSH 2). Prior to these improvements, HC&S used a system of bags to transport the unrefined sugar. The new system circumvented the need for bags by utilizing a system of conveyors and elevators (CSH 4) to transport bulk sugar between the rail intake, storehouses, and transport ships in the harbor. The conveyer system adjoins CSH 1 to its neighboring store houses CSH 2 and CSH 3 (see Figure 76) and extends along the eastern pier (Pier 1) of Kahului Harbor.

CSH 1 is located directly to the west of the Kahului Railroad roundhouse (see Figure 70). The construction method of CSH 1 is slightly different than the neighboring storehouse CSH 2. While CSH 2 was constructed using post-tensioned concrete and wood framing (see subsection 5.3), CSH 1 was constructed using a rigid steel frame and concrete columns to support the structure (see Figure 79), reflecting refinement and advancement in the construction processes at Kahului Harbor following the initial construction of the bulk sugar plant in 1941. Corrugated steel sheeting is bolted over the steel frame, with steel beams used for additional support and bracing. This type of construction is typical for industrial buildings built during the 1970s. The adjoining walkways and conveyors are also supported by the steel frames. CSH 1 is partially intact, but at the time of this survey was no longer in use.

Figure 74. Historic photograph of CSH 1 shortly after construction in 1970 (courtesy of HC&S Sugar Museum)

Figure 75. Present-day photograph of the exterior of CSH 1, view to northeast

Figure 76. General view of the east ends of CSH 1 (right) and CSH 2 (left) connected by the conveyor belt (CSH 4), view to west

Figure 77. General view of the east end of CSH 1 showing steel framing supporting a bulk sugar conveyor system (CSH 4), view to west

Figure 78. General view of the west end of CSH 1, showing the bulk sugar conveyor system (CSH 4) on the west-facing side of the structure, view to the east

Figure 79. General view of the south side of CSH 1, showing the south side with concrete columns supporting the steel framing, view to northwest

Figure 80. General view of the west end of CSH 1, view to southeast

Figure 81. General view of the west end of CSH 1; CSH 2 visible to the right, view to east

5.3 CSH 2

FORMAL TYPE:	Building (Bulk Sugar Warehouse)
FUNCTION:	Storage
NUMBER OF FEATURES:	1
AGE:	Historic (1941)
TAX MAP KEY:	TMK: [2] 3-7-010:009
PREVIOUS DOCUMENTATION:	N/A

CSH 2 is a building that was constructed in 1941 by the Kahului Railroad Company for bulk sugar warehouse storage by HC&S (Figure 82 through Figure 89). The building is the first to be constructed in a set of three adjacent warehouses designed to increase the storage capacity for bulk sugar at Kahului Harbor, as well as streamline and improve the process of transferring unrefined sugar to ships waiting in Kahului Harbor. The new system circumvented the need for bags by utilizing a system of conveyors and elevators (CSH 4) to transport bulk sugar between the rail intake, storehouses, and transport ships in the harbor. The conveyer system adjoins CSH 2 to its neighboring store houses CSH 1 and CSH 3.

CSH 2 is constructed using the method of post-tension and wood timber construction which is rare in Hawai‘i. Post-tensioning is a way to reinforce concrete by prestressing it, making it more resilient to foundational shifts, the pressure of heavy loads, or other forces that might affect a storage facility. During the process, the concrete components are cast with steel reinforcing strands, which are installed in a way that protects them from bonding with the concrete. Concrete on its own is resilient to compression but not lateral movement or tension. Fitting the concrete with pretensioned strands of steel gives the concrete structure the ability to withstand forces of tension as well as compression. This practice also gives building designers the flexibility to create thinner sections of concrete than with traditional techniques. These post-tension components and wood timber supports (see Figure 86) are still preserved to this day (Portland Cement Association 2019) (Figure 87 through Figure 89).

CSH 2 is currently standing but in various stages of disrepair and not currently being utilized for any industrial purpose. The timber framing remains intact, though potions of the wood have weathered and decomposed. The building is set on a concrete foundation that remains largely intact, likely due to the pre-tensioning techniques (see Figure 88). An intact metal corrugated roof, wooden stairs, metal railings, and the connections to the corrugated metal conveyor structure comprising CSH 4 were also observed (see Figure 82, Figure 85, Figure 87, and Figure 89).

Figure 82. View of exterior of CSH 2 showing architectural methods, view to northwest

Figure 83. View of the 1941 stamp on the exterior of CSH 2 denoting the year of its construction as the first storehouse of the new bulk sugar system, view to east

Figure 84. Circa 1940s photograph of CSH 2 shortly after construction (courtesy of HC&S Sugar Museum)

Figure 85. General view showing the current condition of CSH 2, view to northeast

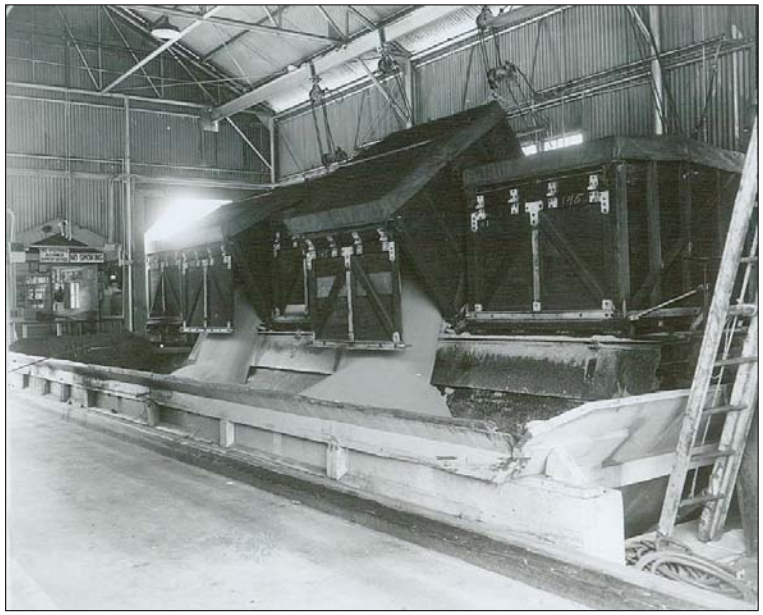


Figure 86. Circa 1950s photograph of the interior CSH 2 while still in operation; note framing; unrefined sugar is being transported into the storehouse via the conveyor system (courtesy of HC&S Sugar Museum)

Figure 87. General view of the east end of CSH 2, view to northwest

Figure 88. General view of the east side of CSH 2 showing CSH 1 (right) and pretensioned concrete foundation, view to northwest

Figure 89. General view of the west side of CSH 2; conveyor housing structure in foreground, view to east

5.4 CSH 3

FORMAL TYPE:	Building (Bulk Sugar Warehouse)
FUNCTION:	Storage
NUMBER OF FEATURES:	1
AGE:	Historic (1955)
TEST EXCAVATIONS:	N/A
TAX MAP KEY:	TMK: [2] 3-7-010:009
PREVIOUS DOCUMENTATION:	N/A

CSH 3 is a building that was constructed in 195 by the Kahului Railroad Company for bulk sugar warehouse storage by HC&S (Figure 90 through Figure 95). The building is the second to be constructed in a set of three adjacent warehouses designed to increase the storage capacity for bulk sugar at Kahului Harbor, as well as streamline and improve the process of transferring unrefined sugar to ships waiting in Kahului Harbor. The new system circumvented the need for bags by utilizing a system of conveyors and elevators (CSH 4) to transport bulk sugar between the rail intake, storehouses, and transport ships in the harbor. The conveyer system adjoins CSH 3 to its neighboring store houses CSH 1 and CSH 2.

CSH 3 is connected to the primary conveyor system that transported bulk sugar from the storehouses to the wharf via an underground tunnel on the building’s west end (see Figure 95). CSH 3 is also connected tangentially to CSH 2 via a suspended extension at its southeast end (see Figure 90 and Figure 91). A second structure just south of CSH 3 was built as part of the sugar conveyor system and acted as the original intake dump bin for bulk sugar coming into the plant from the plantations. This bin is linked by a conveyer to the main sugar warehouse (CSH 2). From there, material was added to the sugar storehouses and subsequently funneled into the conveyor system connecting the storehouses to the wharf. Though near CSH 3, the dump bin was designated as part of the conveyor system (CSH 4).

The construction method of CSH 3 is rigid steel frame. Corrugated steel sheeting is bolted over the steel frame, with steel beams used for additional support and bracing, which represents a precursor to the construction methods later used to erect the third storehouse (CSH 1). The adjoining walkways and conveyors are also supported by the steel frames. CSH 3 is still largely intact, except for some slight damage to the southwest corner of the building (Figure 92 through Figure 95). CSH 3 was not in use at time of this study.

Figure 90. General view of CSH 3 and suspended conveyor system extending to CSH 2, view to southwest

Figure 91. General view of the east end of CSH 3 showing the conveyor belt connecting CSH 3 to CSH 2, view to northwest

Figure 92. General view of the south side of CSH 3 showing architectural features, including concrete columns supporting steel structure, view to north

Figure 93. General view of the southwest side of CSH 3 showing architectural features, including concrete columns supporting steel structure and conveyor, view to southwest

Figure 94. General view of the west end of CSH 3 showing the conveyor belt at this end, view to southeast

Figure 95. General view of the west end of CSH 3 showing the conveyor belt tunneling underground, view to southeast

5.5 CSH 4

FORMAL TYPE:	Structure (Conveyor System)
FUNCTION:	Commercial (Transportation of Goods)
NUMBER OF FEATURES:	1
AGE:	Historic (1941-1970)
TAX MAP KEY:	TMK: [2] 3-7-010:009
PREVIOUS DOCUMENTATION:	N/A

CSH 4 is a structure that is was used to mechanically transport sugar from bulk storage warehouses within the project area (CSH 1 through CSH 3) to ships moored in Kahului Harbor (Figure 96 through Figure 102). The system, which was constructed in 1941 and updated through 1970, is comprised of a series of lifts and conveyor belts

At the time of its construction, the utilization of CSH 4 as the primary mode of transporting bulk sugar was the most advanced port technology in all the Hawaiian Islands, outstripping even those in use in Honolulu (Welch et al. 2004). CSH 4 was part of the original construction of the bulk sugar plant, which was completed between 1941 and 1942 along with CSH 2, the first of the three remaining storehouses (see Figure 33). The plant was designed and built by Kahului Railroad Company and utilized for shipping and transportation by HC&S. Construction of this system marked the last major construction milestone at Kahului Harbor.

CSH 4 is still standing though in various forms of disrepair and not currently being used for any industrial activities (Figure 98 through Figure 102). CSH 4 is composed of a corridor of corrugated steel siding and roofing that is elevated by steel beams resting on pre-tensioned concrete footings. The exterior construction techniques are contemporaneous with those used in the construction of CSH 2. The conveyor system links all three sugar warehouses to the rail intake yard and extends north along Ala Luina Street until reaching Pier 1 where the conveyor system kinks at a 45-degree angle to run along the south side of the pier until it reaches the mooring (see Figure 96 and Figure 97). Also included under designation CSH 4 is a small structure directly southeast of CSH 3, which acted as the original intake dump bin for bulk sugar coming into the plant from the plantations (Figure 103 and Figure 104). This bin is linked by a conveyer to the first of the sugar warehouses (CSH 2). From there, material was added to the sugar storehouses, and subsequently funneled into the conveyor system connecting the storehouses to the pier.

Figure 96. Circa 1940s photograph showing CSH 4 extending along Pier 1; the conveyor system extends from the storehouse to the foreground; CSH 2 is the large dark structure in the background (courtesy of HC&S Sugar Museum)

Figure 97. Present-day photograph of CSH 4 extending along Pier 1 (left) and connecting to the bulk sugar storehouses (right), present day, view to east

Figure 98. View of conveyor portion of CSH 4 connected to the CSH 2 warehouse, view to northwest

Figure 99. General view of CSH 4 conveyor belt structures, view to northwest

Figure 100. General view of CSH 4; CSH 2 visible in the left background, view to southwest

Figure 101. General view of CSH 4, CSH 1 in the background (left), view to southeast

Figure 102. Interior view of CSH 4 showing a portion of the conveyor belt system, view to north

Figure 103. View of the dump system structure of CSH 4 where unrefined sugar was off-loaded onto the conveyor system, view to south

Figure 104. View of the truck ramp portion of the bulk sugar dump house, view to west

Most of the structures making up CSH 4 were built between 1941 and 1942 during the original construction of the bulk sugar plant. A third section of CSH 4 was built in 1970, connecting the most recent of the sugar storehouses (CSH 1) to the pre-existing conveyor system.

In addition to the sections of the conveyor that connect the storehouses and served to transport sugar along the western side of Pier 1, a small structure was built just southeast of CSH 3, which acted as the intake dump bin for unrefined sugar coming in to the plant for storage and export (see Figure 103 and Figure 104). The dump bin is of similar construction to the housing around the conveyor belt, which is constructed using steel and wood framing surrounded by corrugated steel siding and a corrugated steel roof. The building used a series of elevated conveyors and high-speed electric motors to transport sugar into the bulk warehouses. The structure is comprised of three separate components, including a long concrete ramp, the dump structure itself, and the internal conveyors and transportation components. In the 1940s, the dump house was configured for deliveries by railroad. The connecting railroad ties have since been removed and the building converted to receive shipments via tank trucks. The dump bin remains standing as originally constructed.

In March 2020, CSH was informed that the portion of CSH 4 that extends from the KT&S property to Pier 1 (described as Sugar Conveyor F) was demolished.

Section 6 Summary and Recommendations

At the request of Hawaiian Cement, CSH has prepared this LRFI report for the Hawaiian Cement Facilities Relocation Project at Kahului Harbor, Wailuku Ahupua‘a, Wailuku District, Maui Island, TMKs: [2]-3-7-010:003, 009, and 034. As part of Kahului Commercial Harbor 2025 Master Plan improvements, Hawaiian Cement proposes to relocate their facility at Kahului Harbor from its present location to within the current project area. The project will involve the construction of two silos, a warehouse building, and the installation of underground pipelines to connect the pier to the new silos, as well as other site improvements. In addition, the existing Hawaiian Cement facility will be demolished, as well as part of the conveyor system and the intake dump bin. Associated ground disturbance will likely include coring for soils exploration, open excavations for installation of underground pipeline, footing excavations, excavations associated with a new septic system, and excavations to install base course under new pavement surfaces.

The project area is located at the east side of Kahului Harbor, along the northern coastline of the isthmus of Maui. It is bounded on the west by Wharf Street and the east by Hobron Avenue, directly northwest of the East Ka‘ahumanu Avenue and Hana Highway intersection. According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), the project area’s soils consist of fill land (Fd). Beginning in the mid-1870s, dredged material from wharf construction was deposited at the shoreline to fill in a natural wetland area and compacted to accommodate the construction of railroads, lumber storage, and freight warehousing. The landscape of the project area has been heavily modified by commercial and industrial operations along the waterfront.

The Kahului Harbor area traditionally was known for its fishing grounds. Kanahā and Ma‘oni fishponds are within 400 m (0.25 mile) east of the project area. Kanahā Pond Wildlife Sanctuary (SIHP # 50-50-05-1783) was established in 1952 to protect the cultural remains of the original fishpond wall structure and three endangered wetland bird species.

Historic records show consistent commercial interest in the region surrounding Kahului Harbor, especially those related to enterprises of Alexander and Baldwin: Kahului Railroad Company and Hawaiian Commercial & Sugar Company (HC&S). The Kahului Railroad Company began construction on the east breakwater soon after Hawai‘i’s annexation by the United States in 1898. Work to reinforce both breakwaters and dredge the harbor interior was almost continuous from 1910 to 1931. The east breakwater was completed in 1913 and the dredged basin and west breakwater in 1919. Both breakwaters were extended with additional dredging completed in 1925. The construction of a modern concrete wharf at the east breakwater began in 1910 with various additions continuing until completion in 1923. Due to tidal wave damage and the need for additional wharf space required by a new pineapple cannery at Kahului, a project to entirely replace the Claudine Wharf with a modern concrete pier was completed in 1927 (Dean 1950). Over the intervening years, the Kahului Railroad Company retained ownership of most of the land adjacent to the harbor. Construction in the town of Kahului continued to expand the port city.

During World War II, the shoreline west of Pier 2 contained 20 buildings constructed by the U.S. Navy as a base of operations for military shipping (see Figure 21 and Figure 22**).** Nine structures were built by U.S. Navy Construction Battalion (SeaBee) workers, and eleven structures were refurbished for military service (NARA 2008). Supplies for various military bases on Maui

were sometimes stored at the 18th Service Battalion Storage Depot at Kahului Harbor. On 1 April 1946, a tidal wave seriously damaged the Kahului Harbor and NAS Kahului (see Figure 25). Kahului Harbor was left empty when the water receded. By 30 June 1947, virtually all military equipment of NAS Kahului had been shipped to military installations on Guam, Okinawa, or Midway Island (U.S. Navy 1947).

By 1941, the bulk sugar system at the current project area had been constructed by HC&S, which included an advanced freight handling system that utilized conveyors and lifts to transport unrefined sugar automatically (see Figure 31). The construction of the bulk sugar conveyor system marked the last large-scale improvement to Kahului Harbor infrastructure and is still standing to this day. In 1960, this system was damaged by a devastating tidal wave that swept the harbor and surrounding Kahului, suggesting the harbor is still vulnerable to tidal events and heavy storms.

Following World War II, buildings erected at Kahului in the 1910s and 1920s slowly gave way to postwar modernization. Areas once occupied by the military returned to cattle ranching, and pineapple and sugar cultivation. Trucks and buses had replaced passenger transportation once provided by railroads. By 1950, Kahului Railroad Company locomotives had been relegated to shuttling dockside cargo, such as fertilizer, between the Pacific Chemical and Fertilizer Company warehouses along the Kahului Harbor (Gilmore 1954).

From 1950 through 1953, modernization of the workforce and stronger unions brought a host of changes to the central region of Maui, including railroads being replaced by trucks and mechanized sugar and pineapple harvesters. The modernization of Kahului Harbor meant that canned pineapple, bulk sugar, and molasses could be loaded onto ships faster. With labor costs for both sugar and pineapple steadily rising in the post-war years, both industries responded by adopting new technological innovations. Containerized shipping revolutionized the freight industry in the early 1960s, leading to the redesign of gantry systems and hardstand support areas to facilitate the moving and storage of the new containers at the Kahului Harbor. The Matson Navigation Company, a subsidiary of Alexander & Baldwin, became the leader in the development of an industry-wide standard for intermodal containers (Dean 1950). The Kahului Railroad Company sold off its locomotives and rolling stock and became the Kahului Trucking and Storage Company in 1966. The Haleakala Storage & Transfer Company took over much of the specialized freight-forwarding operations once done by the railroad (Hawaii Business and Industry 1966).

Early construction surrounding Kahului Bay consisted primarily of small buildings associated with budding railroad and plantation enterprises, with the most intense period of development covering the first few decades of the twentieth century. However, industrial and commercial development persisted throughout later decades. Today the harbor area is a hub for industrial and mixed-use businesses.

Previous archaeological studies conducted in the immediate vicinity of the project area have identified components of Kahului Historic District (SIHP # -1607), traditional and historic artifacts and midden materials, historic paving and foundation features, and one historic burial (see subsection 3.2 and Figure 52). In addition, the portion of the current project area comprised of Parcel 003 is within the boundaries of a historic district (SIHP #-2953) consisting of the piers, wharves, breakwaters, and associated structures that make up the active harbor facility.

Only one previous archaeological study has been conducted that includes any portion of the current project area. In 1998, Scientific Consultant Services (SCS) carried out an archaeological

monitoring program for the proposed improvements of the storage yards at Kahului Harbor on a 3.3-acre parcel (Burgett and Spear 1998). This study area includes the southern border of the Parcel 009 portion of the current project area. No historic properties were identified during this monitoring program. However, a large rock-filled pit was encountered extending to 89 centimeters cmbs in association with a previously disturbed layer of fill, suggesting the pit was part of old harbor facility operations. No associated artifacts were observed within this pit. Burgett and Spear (1998) also note that SIHP # -3508, a brick and mortar foundation footing with nineteenth and twentieth century artifacts in a coralline sand layer, was previously identified at the study area by the SHPD in 1993. In general, soil observed at this study area consisted of two to four layers of fill overlying natural sand. Natural sand strata were encountered from approximately 20 to 56 cmbs and extended to the base of excavations, which were from approximately 100 to 180 cmbs. These sand deposits were identified further inland than the current project area, which was historically located in a dynamic shoreline environment and partially underwater.

As part of the LRFI study, CSH completed a targeted GPR survey that included four survey locations that were completed in six GPR survey grids (Grids 1 through 6). The survey locations were selected to target potential buried railroad tracks that were once present on the surface of the project area. No buried railroad rails were identified by the GPR, however, changes in stratigraphy and a filled trench were visible that may relate to former land use. A metal utility line was also identified.

CSH completed an archaeological field inspection of the current project area that identified existing components of the Kahului Historic District (SIHP# -1607) and four potential historic properties temporarily designated as CSH 1 through CSH 4 that are related to the development of bulk sugar exporting at Kahului Harbor beginning in 1941. These buildings and structures were documented with written descriptions including historic context and photographs. The project area is located within the boundaries of SIHP # 50-50-04-2953, the Kahului Commercial Harbor (which also may be part of the Kahului Historic District). CSH did not identify potential historic properties related to SIHP # -2953 within the project area.

CSH recommends consultation with the SHPD Architecture Branch be initiated to determine the historic preservation requirements for the buildings and structures (SIHP # -1607, -2953, and CSH 1 through CSH 4) that are located within the project area. This LRFI is designed to support this consultation. Architectural recordation by an architectural historian may be appropriate in order to assess the significance of historic architecture and provide recommendations for appropriate mitigation, per HAR §13-13-281-5.

CSH also recommends consultation with the SHPD Archaeology Branch to determine historic preservation requirements related to project-related ground disturbance. This LRFI is designed to support this consultation. No archaeological sites were observed by CSH during a pedestrian inspection of the project area. A preliminary GPR survey found no evidence of buried railroad tracks or other potential anomalies within the project area (apart from a metal utility line). Based on the amount of previous ground disturbance within the project area, including commercial construction and natural tidal events, subsurface in situ cultural deposits are unlikely to be present within the project area. Nonetheless, CSH recommends on-site archaeological monitoring during project-related ground disturbance to ensure the identification and proper treatment of any inadvertently discovered historic property.

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Appendix A SIHP # -1607 HRHP Form

ARCHAEOLOGICAL COVER SHEET

HAWAII REGISTER OF HISTORIC PLACES

50 - 50 - 04 - 1607
1 2 3 4 5 6 7 8 9
SITE IDENTIFICATION NUMBER

2 1 6 1920
10 11 12 13 14 15 16 17 18 19 20
CARD No. DATE/PERIOD

PRESENT LAND USES: Industrial - Commercial

SITE NAME/TYPE: KAHULUI DISTRICT
DISTRICT: WAILUKU
AREA: NA square s
CATEGORY: Single Feature X Complex Places
OWNERSHIP: Public X Private
PHOTOGRAPHS: X Yes No (Temp/Tech)
KNOWN PRESSURES ON SITE: NONE

DESTRUCTION: X No Known Future Danger Possible Future Danger Future Danger Certain
Present Danger Presently Being Destroyed
STATUS: X Occupied Unoccupied CONDITION: Excellent X Good Fair Deteriorated
INTEGRITY: Unaltered, Orig Loc Unaltered, Moved X Altered, Orig Loc Altered, Moved
ACCESSIBILITY: Unrestricted X Restricted Inaccessible

LEGENDARY MATERIALS KNOWN: Yes X No WRITTEN HISTORICAL MATERIALS: X Yes No
IMPORTANCE AS EXAMPLE OF TYPE SITE: Good X Moderate Poor
SUSCEPTABILITY TO INTERPRETATION: Good Moderate X Poor
RESEARCH POTENTIAL: Good X Moderate Poor
LOCAL ATTITUDES ABOUT SITE: Valuable X Moderate Value Low Value Ambivalent Unknown
BRIEF DESCRIPTION (Columns 21-80): District including railroad roundhouse, a bank, a school and the fairgrounds

STAFF EVALUATION: High Value Valuable X Reserve Marginal
SUGGESTED THEMES: Economic - Business & Industry ; Transportation

DATE SUBMITTED TO REVIEW BOARD:

REVIEWER'S RECORD AND EVALUATION

NAME: DATE REVIEWED
CATEGORY: High Value Valuable Reserve Marginal
SIGNIFICANCE: National State Local
RECOMMENDED DISPOSITION: Nominate National Register State Register Staff Files
RECOMMENDED THEMES:
REVIEWER'S COMMENTS:

REVIEW BOARD EVALUATION RECORD

DATE REVIEWED: RECORDER:
OFFICIAL CATEGORY: High Value Valuable Reserve Marginal
OFFICIAL SIGNIFICANCE: National State Local
OFFICIAL THEMES:
OFFICIAL DISPOSITION: National Register Nomination State Register Staff Files
REVIEW BOARD COMMENTS:

VOTING RECORD: Daws Hormann Jackson Kikuchi
Lind Mark Nagata Paglinawan
Roche Tuggle

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF STATE PARKS
P. O. BOX 621
HONOLULU, HAWAII 96809

50 / 04 / 1607
Island Quad Site No.

HAWAII REGISTER OF HISTORIC PLACES
SHORT FORM

SITE NAME/TYPE: Kahului District

LOCATION: Kahului, Maui

OWNER: Various

MERIT: X Architectural X Historical

INFORMATION: Written No X Yes:

Informant No Yes:

(1) Maui News, 3/3/1900; 9/9/19; 11/23/17.
(2) Hawaiian Annual, 1879, 1908.
(3) Hungerford, John B., Hawaiian Railroads, Reseda, 1963.
(4) Adler, Jacob, Claus Spreckels, Honolulu, 1966.

GENERAL DESCRIPTION AND STATEMENT OF SIGNIFICANCE:

Kahului, always a seaport but with marginal early facilities and exposure to weather, began to develop slowly when the first structure of modern historic times was built in 1883 by Thomas Hogar (or T.H. Hobron), who erected a warehouse. Ten years later, Kimble's Store was built nearby. In 1879 Kahului was made a port of entry, and in five years was second only to Honolulu in volume of imports and exports. A customhouse was built in 1881, and the first Hawaiian railroad was started at Kahului in 1879 by T.H. Hobron. This line became the Kahului Railroad Company, and was the last railroad to operate in the islands, playing an important part in the commercial and industrial development of Maui for 80 years.

Kahului received its greatest impetus with the development by Claus Spreckels of the Hawaiian Commercial and Sugar Company, at Spreckelsville, which by 1892 was called the largest sugar estate in the world.

In 1900 leaseholders and property owners in Kahului met, and leases were surrendered preparatory to "laying out the town on modern lines.". Private work was done on a breakwater and harbor dredging, both awaiting government assistance for further work. In the 1920's port and harbor facilities were vastly improved, and most cargo was shipped and received through Kahului.

In Kahului town, virtually nothing is left of the older structures, destroyed in a fire in 1917. New construction is giving the town a new vitality and economic importance.

Remnants of the Kahului Railroad are visible in three structures, the roundhouse, shop and office. The shop was built in 1926 and is a large concrete brick building with a pedimental facade. Large areas of glass fill each bay and surface decoration consists of applied mouldings. The office building was built in 1923 and is a one-story concrete structure with a hip roof. A hip-roofed entrance portico is supported on heavy piers, two to a side. Applied pilasters serve as decorative features.

The First Hawaiian Bank is a two-story reinforced concrete building with a hip tile roof. It was designed by C.W. Dickey and has his trademarks, the copper water catchments, tile roof and ceramic detail.

The school was built around 1912 and is from stock plans now in the possession of the Maui County Engineer's office. It is a two-story concrete structure with a hip roof and side wings.

REASON FOR USE OF SHORT FORM: District

SURVEYED BY John C. Wright RECOMMENDATION Reserve

DATE OF SURVEY February 1974 TAX KEY 3-7: 04,09,10,12

LOCATION MAP IS DRAWN ON OPPOSITE SIDE OF SHORT FORM

HRHP-4-73A

50-50-04-1607

HAWAII REGISTER OF HISTORIC PLACES

HISTORICAL SITES INFORMATION AND REVIEW FORM---CONTINUATION SHEET Page One

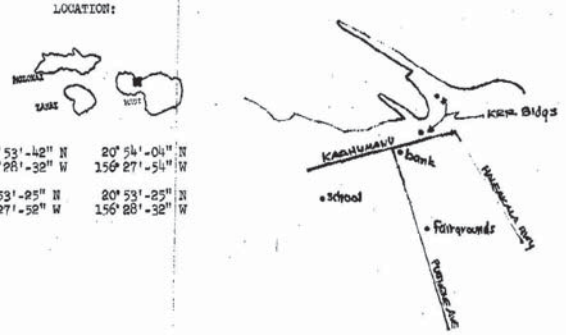
Please note subject heading (Statement of Significance, etc.; use separate sheet for each heading).

Kahului District - continued:

The fairgrounds consist of an auditorium and grandstand. The buildings were constructed in 1919 for $13,370. It is the site of the oldest continuing fair in the islands. The auditorium is a two-story wood frame structure with a gable roof and ventilator on the ridge. One-story flat-roofed porch areas are located on the front and side, and a porte-cochere is also part of the front design. Windows are double-hung two-light.

The grandstand is a wooden structure with diagonal bracing which forms a lattice network design used for wall surfaces, bracketing, and on the gable ends. Horizontal siding is also used and there is a gable-roofed entrance way.

LOCATION:



20° 53'-42" N 156° 28'-32" W
20° 54'-04" N 156° 27'-54" W
20° 53'-25" N 156° 27'-52" W
20° 53'-25" N 156° 28'-32" W

FORM CS-1

Number 80-04-1607

Name Kahului District

Review

31 Jul 79 originals sent to state

Review Board Action

Files

Original _____

Certification _____

Working _____

Certification _____

Form 51 ✓

Comment Not yet received (ltr 20 Aug 79)

APPENDIX

D

CULTURAL IMPACT ASSESSMENT

FINAL
Cultural Impact Assessment for the Hawaiian Cement Relocation at Kahului Harbor Project, Wailuku Ahupua‘a, Wailuku District, Maui Island TMKs: [2] 3-7-010:003, 009, and 034

Prepared for
Munekiyo Hiraga,
on behalf of
Hawaiian Cement

Prepared by
Kellen Tanaka, B.S.
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawai‘i, Inc.
Kailua, Hawai‘i
(Job Code: WAILUKU 40)

August 2020

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Ph.: (808) 242-9882
Fax: (808) 244-1994

Management Summary

Reference	Cultural Impact Assessment (CIA) for the Hawaiian Cement Relocation Project at Kahului Harbor, Wailuku Ahupua‘a, Wailuku District, Maui Island TMKs: [2] 3-7-010:003, 009, and 034 (Tanaka and Hammatt 2020)
Date	August 2020
Project Number(s)	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: WAILUKU 40
Agencies	State of Hawai‘i, Department of Health, Office of Environmental Quality Control (DOH/OEQC)
Land Jurisdiction	Government: State of Hawai‘i Private: A&B Properties Inc.
Project Location	The project area is located on the east side of Kahului Harbor, bounded on the west by Wharf Street, and bounded on the east by Hobron Avenue. It is directly northwest of the East Ka‘ahumanu Avenue and Hana Highway intersection. The project area is comprised of three separate land parcels (TMKs: [2] 3-7-010:003, 009, and 034) and is depicted on portions of the 1997 Paia and Wailuku quadrangles.
Project Description	Hawaiian Cement is proposing to relocate their existing cement terminal facility at Kahului Harbor as part of the State of Hawai‘i Department of Transportation Harbors Division’s *Kahului Harbor Development Plan*. The new facility will be located on an approximately 25,000 square foot portion of Parcel 9. The relocated facility will be comprised of two (2) silos, a warehouse building, underground pipelines from the pier to the silos, and related site improvements. The two (2) silos and warehouse building will incorporate reinforced concrete walls and be flood-proof. Staging areas for all project-related activities will be contained within Parcel 9. The project will also include work on the adjacent parcel (Parcel 3) to install a new underground pipeline from the harbor pier to the new silos. Ground disturbing activities will likely involve the following: • Coring and drilling for soils exploration by the geotechnical engineer (soils engineer). • Open excavation for the installation of an underground pipeline from the pier to silos at a depth of approximately three feet below surface. • Footing excavation at a depth of approximately three (3) to four (4) feet below surface, under the silos and warehouse. • Excavation associated with the installation of a new sewer line or septic tank system. • Excavation at a depth of approximately 1.5 feet below pavements to install base course under pavement.

	The proposed project also includes the demolition of the existing Hawaiian Cement facility following the completion of the new relocated facility. The existing Hawaiian Cement facility is located on TMK [2] 3-7-010:034 (Parcel 34).
Project Acreage	The project area is comprised of three adjacent land parcels totaling 22.34 acres
Document Purpose	This CIA was prepared to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the proposed project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts to cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*) which may include traditional cultural properties (TCPs). These TCPs may be significant historic properties under State of Hawai‘i significance Criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance Criterion e refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6 and §13-284-6). The document will likely also support the project’s historic preservation review under HRS §6E and HAR §13-275 and §13-284. The document is intended to support the project’s environmental review and may also serve to support the project’s historic preservation review under HRS §6E-8 and HAR §13-284.
Results of Background Research	Background research for this study yielded the following results, presented in approximate chronological order: 1. The *ahupua‘a* (traditional land division usually extending from the mountain to the sea) of Wailuku is located in the larger *moku* (district) of Wailuku on the central isthmus of the island of Maui. 2. The story *The Wind Gourd of La‘amaomao* identifies four distinct winds associated with Wailuku: Kololio, I‘a-iki, ‘O‘opu, and Kaua‘ula (Nakuina 1992:63). 3. Names of rain referencing the *ahupua‘a* and *moku* of Wailuku include Hō‘eha‘ili, the skin-hurting rain of Waiehu (Akana and Gonzalez 2015:36); Kili, a delicate gentle rain associated with Waihe‘e (Akana and Gonzalez 2015:81); and Kili‘o‘opu found at Waihe‘e, Waiehu, Wailuku, and Waikapū (Akana and Gonzalez 2015:83).

	4. Wailuku Ahupua‘a was included in the traditional *‘okana* (subdistrict) of Nā Wai ‘Eha, or “The Four Waters.” This area is home to the four largest streams found on the windward coast of Maui. 5. In Pukui and Curtis’s *The Water of Kāne* (1994), the naming of Wailuku is recounted in the *mo‘olelo* (story) of *The Battle of the Owls*. Following a fierce battle between the owls of the Hawaiian Islands and a cruel man, Wailuku earned its name meaning, “Water-of-killing” (Pukui and Curtis 1994:189). 6. Ke Kula o Kama‘oma‘o, or the Plains of Kama‘oma‘o, is the name given to a region of sandy plains between Kahului and Wailuku, Maui (Emerson 1915:76). This area was known by Hawaiians in traditional times as a wandering place of the souls (Beckwith 1970:154), a place where dead spirits waited for a friendly escort, perhaps an *‘aumakua* (family god), to show them the way to eternity. 7. On the north shore of the central isthmus in Wailuku Ahupua‘a lie the *loko i‘a* (fishponds) named Mau‘oni and Kanahā. According to traditional accounts, an O‘ahu chief began construction on the walls but Kamehamehanui, king of Maui, completed it in the mid-1700s. 8. In ancient times Wailuku, specifically the area around Kahului Bay, was known as a chosen gathering and residential site for Maui *ali‘i* (royalty) and chiefs (James 2002). Handy and Handy (1972) add that, “in ancient times [Wailuku District] was the largest continuous area of wet-taro cultivation in the islands” (Handy and Handy 1972:496). 9. In 1776, Kalani‘ōpu‘u, ruling chief of Hawai‘i, and his elite army of *‘Ālapa* and *Pi‘ipi‘i* warriors, 800 men strong, were defeated by Kahekili of Maui and his forces in what was called *Ahulau Ka Pi‘ipi‘i i Kakanilua* or Slaughter-of-the-Pi‘ipi‘i-at-Kakanilua (Kamakau 1992:86). 10. The 1790 invasion of Maui by Kamehameha I of Hawai‘i Island, is referenced by many place names within Wailuku. In one example, The Battle of ‘Īao is also known as the Battle of Kepaniwai, meaning the “Dammed Stream.” 11. Following the Great Māhele of 1848, the *ahupua‘a* of Wailuku was declared Crown Land. Ruth Ke‘elikōlani, half-sister to Lot, King Kamehameha V, inherited the *ahupua‘a* from him following his death in 1872. Spreckels subsequently received Land Grant 3343, which consisted of 24,000 acres of the southeastern portion of the Wailuku Ahupua‘a, from King Kalākaua (Zambucka 1977:48) following an agreement to purchase a part-interest in Crown Lands of the Kingdom of Hawai‘i from Princess Ruth Ke‘elikolani. This agreement

	allowed the Commission of Crown Lands to exchange Spreckels' part-interest for the fee-simple title to central Maui lands he had previously leased from the Kingdom in 1877 (Daws 1968:288). Although almost 300 individual parcels were awarded by the Land Commission for Kuleana Lands within the *ahupua‘a* of Wailuku, these claims represented lands which were located in the upland portion of the *ahupua‘a*. 12. A common crop on nearly all major Hawaiian Islands was sugar cane. Among the early government grants in the upland area of Wailuku Ahupua‘a were lands set aside for the Wailuku Sugar Company, a plantation first organized in 1862 by James Robinson & Company, Thomas Cummins, J. Fuller, and agent C. Brewer & Company. 13. In 1901, Kahului Railroad Company, then headed by Henry P. Baldwin, began organizing a project to develop a modern harbor at Kahului. The essential structure of and facilities for Kahului Harbor were completed in 1931. By the 1940s, Kahului Harbor was handling more than 500,000 tons of inter-island and trans-Pacific freight. 14. In the early 1940's, the harbor town of Kahului was transformed from a sleepy plantation mercantile area to an important military defense depot. Following the entry of the United States in World War II, the rapid construction of military defensive structures demanded the immediate use of plantation wharf space, heavy equipment, and operators. Plantation employees from Wailuku and Kahului were pressed into emergency service until military construction personnel arrived in the Hawaiian Islands. 15. The current land-use of the corridor connecting Kahului with Wailuku includes a mix of residential, warehousing, light industrial and commercial, with retail sales centered primarily in Kahului. Until December 2016 when HC&S announced its closure, most of the land area of Wailuku Ahupua‘a was in sugar cultivation.
Results of Community Consultation	CSH attempted to contact 90 Native Hawaiian Organizations (NHOs), agencies, and community members. Of the 19 people that responded, three *kama‘āina* (Native-born) and/or *kūpuna* (elders) provided written testimony and two participated in formal interviews for more in-depth contributions to the CIA. Below is a list of individuals who shared their *mana‘o* (thoughts, opinion) and *‘ike* (knowledge) about the project area. CSH completed the community consultion in July 2020. 1. William J. Aila, Jr., Chairman, Hawaiian Homes Commission 2. Scott Fisher, Chief Conservation Officer, Hawaiian Islands Land Trust

	3. Jay Carpio, *kama‘āina*, Wailuku Community Managed Makai Area (CMMA) 4. Holly Buland, Museum Director of Alexander & Baldwin Sugar Museum 5. Al Lagunero, renowned artist, Native Hawaiian cultural practitioner, and Vice-President of Olowalu Cultural Reserve
Impacts and Recommendations	Based on information gathered from the cultural and historical background and the community consultation, CSH has identified the following potential impacts and makes the following preliminary recommendations: 1. Dr. Scott Fisher stated that the area has a high potential for early habitation sites. He noted that although Kanahā Pond is not in the immediate project area, "there could possibly be some impact or there might be some residual artifacts or cultural sites around that area." He recommends that data recovery should be conducted on "anything that's found." 2. Dr. Fisher recommended mitigating any potential loss of habitat for fish in Kahului Harbor. He mentioned that there are "people who really rely on the marine resources in the area," noting that the *akule* (Big-eyed or goggle-eyed scad fish; *Trachurops crumenophthalmus*) are very abundant in Kahului Harbor. He stressed that project proponents "really have to take steps to make sure that there's not discharge into the ocean that would reduce the quality of the habitat because people do rely on it." 3. Dr. Fisher expressed his concerns regarding the discovery of *iwi kūpuna* (ancestral remains) during construction related activities. Dr. Fisher is a member of the Maui/Lana‘i Island Burial Council. He mentioned that pre-Contact burials were discovered along the coast in the western portion of Kahului Harbor on land owned by the Hawaiian Islands Land Trust. He also noted that a large number of burials were found on the adjacent property, which is owned by the Nisei Veterans Memorial Center and additional burials were also found at Keōpuōlani Park. He mentioned that while he doesn't personally know of any burial in "close proximity of the area," he recalled that *iwi kūpuna* may have been found "somewhere in this area." Dr. Fisher recommends having an archaeological monitoring plan as well as having an archaeological monitor on site during construction of the proposed project. 4. On 27 January 2020, Dr. Fisher was notified about a modification to the proposed project area to include the demolition of the existing Hawaiian Cement facility following the completion of the new relocated facility. He stated that if the proposed project "will involve more ground disturbance than

	previously projected," he would "certainly recommend archaeological monitoring […] to ensure that iwi kupuna or any cultural sites are not unnecessarily damaged, modified or altered." 5. Mr. Al Lagunero recommended consulting with Kupuna Waiola Hana‘ike who is "well informed as to the Kahului and Wailuku areas," as well as canoe clubs that consistently use Kahului Harbor. CSH reached out to Kupuna Waiola Hana‘ike's *‘ohana* and the Hawaiian Canoe Club. 6. He also expressed his concerns regarding "how cement dust will affect the air in the area as it is subject to coastal, trade and north winds affecting the area." He noted that Hale Nanea, a community use center which has been in place "since and before 1960," is located close to the intended relocation of the Hawaiian Cement facility. 7. Mr. Lagunero also expressed his concerns regarding "coring activities involved in the relocation of the cement plant" noting it should be questioned further. He added that, "Octopus and squid are affected in great numbers as their young float-up to the harbor shores dead during the birthing season once signaled by the appearance of sugar-cane tassels in the fields mauka (from Kahului to Peahi (I forget the season of the year, Welo or Kauwela)." 8. He also expressed concern regarding the management of resources including sand. He noted that "sand from these areas were being shipped to Honolulu and possibly resisted by community activists." 9. He also noted that the "projected use over the next 20 to 50 years should be analyzed." He mentioned "Bank Analysts reports on television news that the growth of tourism is needing increased management systems by the State." 10. Project construction workers and all other personnel involved in the construction and related activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. In the event that any potential historic properties are identified during construction activities, all activities will cease and the SHPD will be notified pursuant to HAR §13-280-3. In the event that *iwi kūpuna* are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended.

	11. In the event that *iwi kūpuna* and/or cultural finds are encountered during construction, project proponents should consult with cultural and lineal descendants of the area to develop a reinterment or preservation plan for proper cultural protocol, curation, and long-term maintenance.

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Section 1 Introduction

1.1 Project Background

On behalf of Hawaiian Cement, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this cultural impact assessment (CIA) in support of an environmental assessment being prepared for the Hawaiian Cement Facilities Relocation Project at Kahului Harbor, Wailuku Ahupua‘a, Wailuku District, Maui Island, Tax Map Key (TMK) Parcel Nos. [2] 3-7-010:003 (Parcel 3), 009 (Parcel 9), and 034 (Parcel 34). The project area is depicted on a portion of the 2017 Paia and Wailuku U.S. Geological Survey (USGS) 7.5-minute topographic quadrangles (Figure 1), a tax map plat (Figure 2), and a 2016 aerial photograph (Figure 3).

Hawaiian Cement is proposing to relocate their existing cement terminal facility at Kahului Harbor as part of the State of Hawai‘i Department of Transportation Harbors Division’s *Kahului Harbor Development Plan*. The new facility will be located on an approximately 25,000 square foot portion of Parcel 9. The relocated facility will be comprised of two (2) silos, a warehouse building, underground pipelines from the pier to the silos, and related site improvements. The two (2) silos and warehouse building will incorporate reinforced concrete walls and be flood-proof. Staging areas for all project-related activities will be contained within Parcel 9. The project will also include work on the adjacent parcel (Parcel 3) to install a new underground pipeline from the harbor pier to the new silos. Ground disturbing activities will likely involve the following:

- Coring and drilling for soils exploration by the geotechnical engineer (soils engineer).
- Open excavation for the installation of an underground pipeline from the pier to silos at a depth of approximately three feet below surface.
- Footing excavation at a depth of approximately three (3) to four (4) feet below surface, under the silos and warehouse.
- Excavation associated with the installation of a new sewer line or septic tank system.
- Excavation at a depth of approximately 1.5 feet below pavements to install base course under pavement.

The proposed project also includes the demolition of the existing Hawaiian Cement facility following the completion of the new relocated facility. The existing Hawaiian Cement facility is located on TMK [2] 3-7-010:034 (Parcel 34).

1.2 Document Purpose

The purpose of this CIA is to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts on cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*), which may include traditional cultural properties (TCPs). These TCPs may be significant historic properties under State of Hawai‘i significance Criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance Criterion e refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group

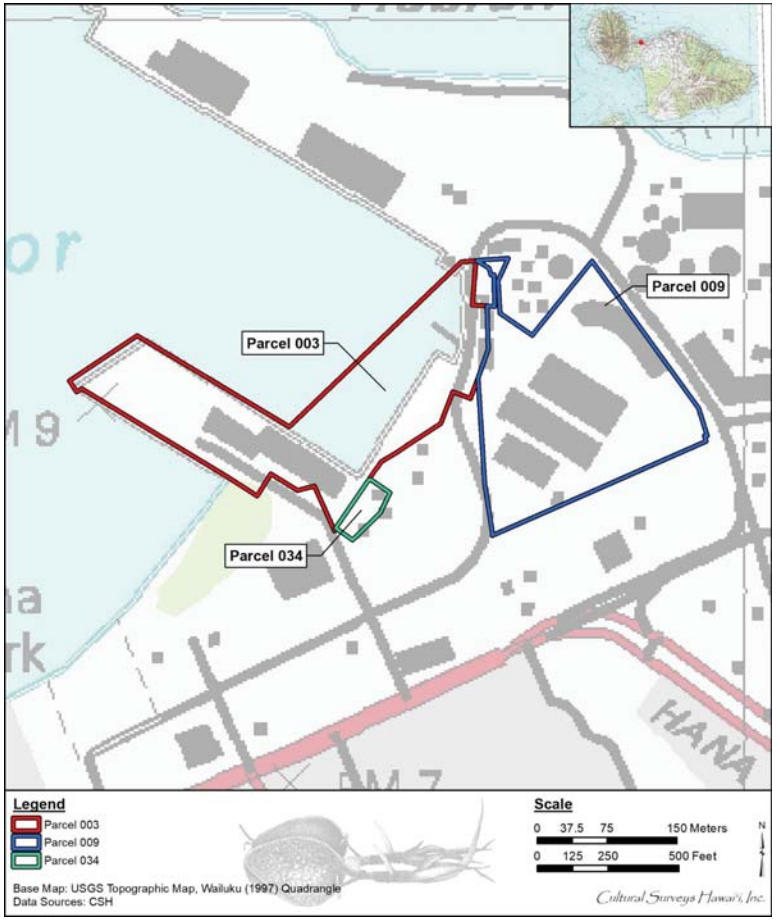


Figure 1. Portion of the 1997 Wailuku and Paia USGS 7.5-minute topographic quadrangles showing the location of the project area (U.S. Geological Survey 1997a, 1997b)

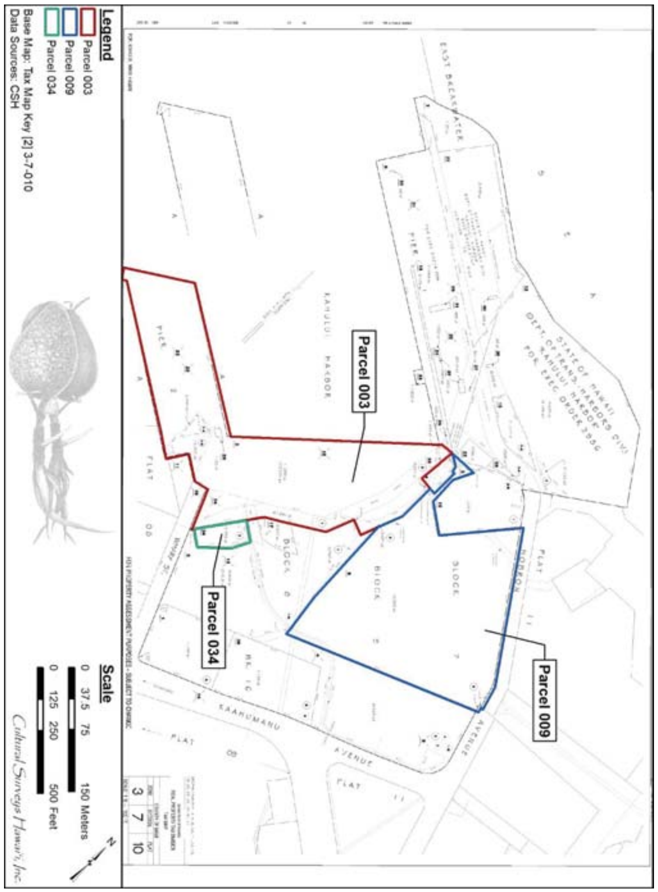


Figure 2. Tax Map Key (TMK) [2] 3-7-010 showing the project area in parcels 003, 009 and 034 (Hawaii TMK Service 2014)

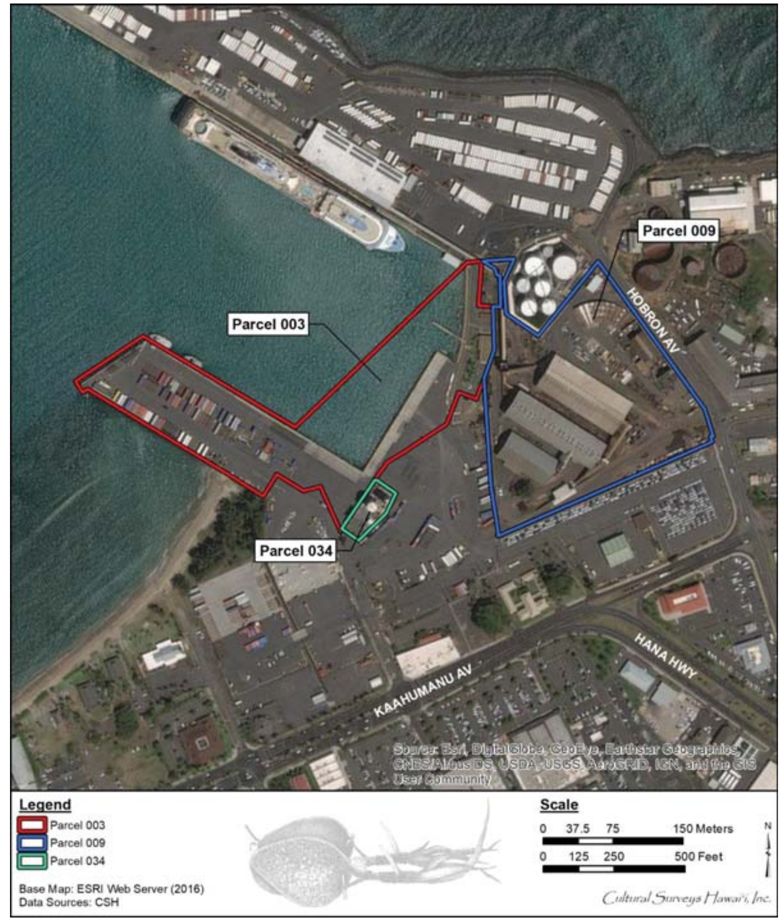


Figure 3. Aerial photograph of the project area (ESRI 2016)

of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity" (HAR §13-275-6 and §13-284-6). The document will likely also support the project's historic preservation review under HRS §6E and HAR §13-275 and §13-284. The document is intended to support the project's environmental review and may also serve to support the project's historic preservation review under HRS §6E-8 and HAR §13-284.

1.3 Scope of Work

The scope of work for this cultural component includes the following:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

1.4 Environmental Setting

1.4.1 Natural Environment

The project area is situated in the *ahupua'a* of Wailuku which is located in the larger *moku* of Wailuku on the central isthmus of the island of Maui. Van James provides the following description of Wailuku District:

> The present-day land division of Wailuku includes all of the Central Valley between east and west Maui, as well as ʻĪao Valley and the northern portion of Kīhei. It is the only land area in the Hawaiian Islands bordered by mountains on two opposite sides and the sea on the other two sides. [James 2002:56]

The notably large and sprawling *ahupua'a* of Wailuku is home to the urban centers of Kahului and Wailuku as well as the sacred ʻĪao Valley.

1.4.2 *Ka Lepo* (Soils)

According to the U.S. Department of Agriculture Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), the only soil within the project area is Fill land (Fd). Figure 4 illustrates the soil sediments in and within the vicinity of the project area.

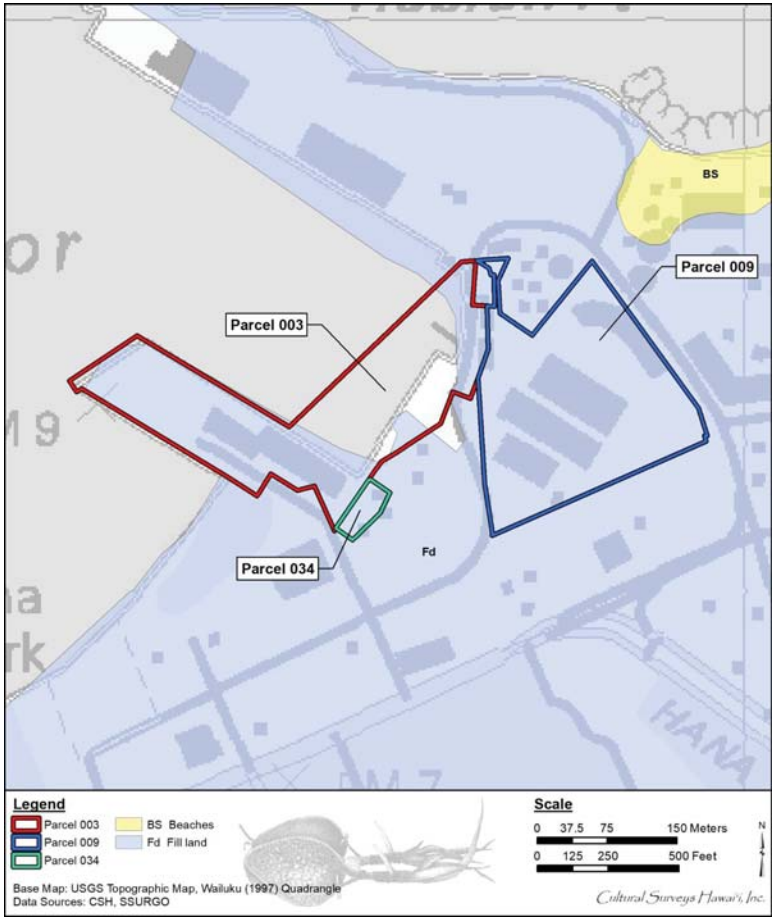


Figure 4. Overlay of Soil Survey of the State of Hawaii (Foote et al. 1972), indicating sediment types within and surrounding the project area (U.S. Department of Agriculture Soils Survey Geographic Database [SSURGO] 2001)

Soils of the Fill Series are described as follows:

> This land type consists mostly of areas filled with bagasse and slurry from sugar mills. A few areas are filled with material from dredging and from soil excavations. Generally, these materials are dumped and spread over marshes, low-lying area along the coastal flats, coral sand, coral limestone, or areas shallow to bedrock. [Foote et al. 1972:31]

Historic maps and photographs indicate that the southern portion of Parcel 9 may have included a portion of the original shoreline. This dynamic environment would likely have included shifting coralline sands at and near the water table overlying a basalt substrate. It should be noted that no ground disturbance or impacts are planned for the southern portion of Parcel 9. Proposed project-related ground disturbance will occur in Fill (primarily land reclamation fill) that has been deposited and compacted over a shallow water harbor environment.

1.4.3 *Makani* (Wind)

The Hawaiian word for wind is *makani*. *The Wind Gourd of La‘amaomao* tells the story of Pāka‘a and his son Kuāpāka‘a who are descendants of the wind goddess La‘amaomao. With their possession of this special wind gourd, they could control and call forth the winds of Hawai‘i. Pāka‘a’s chant traces the *makani* of Wailuku, Maui. The four winds associated with Wailuku are Kololio, I‘a-iki, ‘O‘opu, and Kaua‘ula. Pāka‘a’s chant is listed below:

Kololio mai o Waikapu,	Kololio is of Waikapū,
He i‘a iki ko Wailuku,	I‘a-iki is of Wailuku,
He oopu ko Waihee,	‘O‘opu is of Waihe‘e,
Pa ka makani Kauaula,	The Kaua‘ula wind blows,

[Nakuina 1902:68;1992:63]

Additionally, the four winds of the Wailuku Moku are also recounted in Sterling (1998) by an informant who relates:

> Wailuku’s wind is the Makani-lawe-malie, the wind that takes it easy.
>
> Waiehu’s wind is the Makani-hoo‘eha-ili, the wind that hurts the skin.
>
> Waikapu’s wind is the Makani-ko-kololio, the gusty wind.
>
> Waihee’s wind is the Makani-kili-‘o‘opu.
>
> [Sterling 1998:62]

1.4.3.1 Maui Vortex

Pāka‘a’s wind chant recognizes an upwardly circulating wind pattern in the following lines: “*He pelu ka makani no kai, He kupa he okea ka makani*” which translates to “The wind that doubles up is of the lowlands, Kupa and Okea are the winds” (Nakuina 1902:69; Nakuina 1992:64). In the iteration of the chant found in Sterling (1998:7), *okea* is written as ‘*ōke’e*, meaning, “To veer, as the wind, to change, as direction; to eddy” (Pukui and Elbert 1986:281).

The Maui Vortex is a diurnal weather pattern, dissipating in the evening when the slopes of Haleakalā cool. It was modeled in 1949 by Luna Leopold, Chief Meteorologist at the Pineapple Research Institute (Leopold 1949:312-320), and again in 1966 by the National Weather Service (Peterson 1966).

1.4.4 *Ka Ua* (Rains)

Rain is a major component of the water cycle and is responsible for depositing *wai* (water) on local flora. Pre-Contact *kānaka maoli* (Native Hawaiians) recognized two distinct annual seasons. The first, known as *kau* (period of time, especially summer) lasts typically from May to October and is a season marked by a high-sun period corresponding to warmer temperatures and steady trade winds. The second season, *ho‘oilo* (winter, rainy season) continues through the end of the year from November to April and is a much cooler period when trade winds are less frequent, and widespread storms and rainfall become more common (Giambelluca et al. 1986:17). Typically, the maximum rainfall occurs in January and the minimum in June (Giambelluca et al. 1986:17). Handy and Pukui describe this seasonal change as follows:

> The season of storm and rain was termed Ho‘oilo, including roughly the period of November through March. It commenced with ‘Ikuwa (October-November) whose name means “Loud-voice,” when Lono’s thunder resounds over uplands and plain. Now the long drought of summer, when the intense heat of radiation of sun on black lava combined with the steady tradewinds made the *kula kai* [sea] seared and dry as a black tropical desert and the *kula uka* [upland] brown and arid, gives way to moisture-laden southern warm fronts pressing inshore, as tradewinds lapse. November is a noisy month with variable strong winds; and with the winds comes the roaring and pounding surf […] Commencing now, and continuing through the rainy months until March, there was and is little deep-sea fishing, and inshore fishing depended on those occasions when the sea was not too rough. [Handy and Pukui 1977:23]

Rains were named to show their action toward plants or the supposed effects on people or their possessions (Pukui and Elbert 1986:361). Each small geographic area on Maui had a Hawaiian name for its own rains. Akana and Gonzalez (2015) elaborate, saying:

> Our kupuna [elders] had an intimate relationship with the elements. They were keen observers of their environment, with all of its life-giving and life-taking forces. They had a nuanced understanding of the rains of their home. They knew that one place could have several different rains, and that each rain was distinguishingable from another. They knew when a particular rain would fall, its color, duration, intensity, the path it would take, the sound it made on the trees, the scent it carried, and the effect it had on people. [Akana and Gonzalez 2015:XV]

Wailuku was no exception in this naming practice. The subsections below lists rains closely associated with the *moku* of Wailuku as they appeared in historical texts. These included Hō‘eha‘ili, Kili, Kili‘o‘opu, ‘Ulalena, and Uhiwai.

1.4.4.1 Hō‘eha‘ili Rain

The Hō‘eha‘ili rain is associated with Waiehu, Maui, the neighbor to Wailuku Ahupua‘a. It is known as “the skin hurting rain of Waiehu” (Akana and Gonzalez 2015:36-37). It is mentioned below in a *kanikau* (lamentation) for Hawaiian scholar, Joseph Nāwahīokalani‘ōpu‘u.

He aloha, he lihaliha, he kūmākena	*Loving, heartsick, grief-stricken*
He ‘ū iā ‘oe	*Mourning for you*
E Hon. Iosepa Kaho‘oluhi Nāwahīokalani‘ōpu‘u	*O Hon. Joseph Nāwahīokalani‘ōpu‘u*
A ha‘o ē!	*We shall truly miss you!*
I uē ‘ia mai nei ‘oe e Nā Wai ‘Ehā	*You have been mourned by the lands of the four waters*
E ka makani Kili‘o‘opu o Waihe‘e	*By the Kili‘o‘opu wind of Waihe‘e*
Ka ua Hō‘eha‘ili o Waiehu	*And the Hō‘eha‘ili rain of Waiehu*

[Akana and Gonzalez 2015:37]

1.4.4.2 Kili Rain

The Kili rain is associated with Waihe‘e, Maui. It is known as, “A beloved fine, light rain” (Akana and Gonzalez 2015:81). The Kili rain is mentioned in a *mele inoa* (name chant) written for Erisapeka.

He poli aloha ka makua lā	*The father has a loving heart*
Ka iki hone o ke kanaka lā	*The soft sweetness of man*
I ka ua Kili o Waihe‘e lā	*In the drizzling Kili rain of Waihe‘e*
E wiki, e lohi ‘o ia ala lā	*He should make haste before it’s too late*

[Akana and Gonzalez 2015:81]

1.4.4.3 Kili‘o‘opu Rain

The Kili‘o‘opu rain is associated exclusively with Wailuku, Maui. Kili‘o‘opu is used as the name for both rain and wind. The two *mele* (song) below, a *mele kanikau* and *mele ‘āina* (song of the land), mention the Kili‘o‘opu rain. This *mele kanikau* translated by Wiliama was for Kamakaokalani.

Ku‘u kāne mai ka ua Kili‘o‘opu o Waihe‘e	*My dear husband from the Kili‘o‘opu rain of Waihe‘e*
‘Au‘au ka ‘uhane i ka wai o Nī‘aukawa	*The spirit bathes in the water of Nī‘aukawa*

[Akana and Gonzalez 2015:83]

The *mele ‘āina* titled Nani Lahaina mentions the Kili‘o‘opu of Wailuku.

He loa Pu‘ukoa‘e	*Expansive is Pu‘ukoa‘e*
He pāpā‘ōlelo na ka makani	*A conversation held by the wind*
Makani lū ‘ino i nā lehua o Kaukini	*Wind that violently scatters the lehua blossoms of Kaukini*
Polipoli Pūlehu i ka ua Kili‘o‘opu o Waihe‘e	*Pūlehu is polished by the Kili‘o‘opu of Waihe‘e*
Me ka ua nā māmala ‘ino a ka wai	*With the rain come hard strokes of the water*

[Akana and Gonzalez 2015:83]

1.4.4.4 ‘Ulalena Rain

The ‘Ulalena rain was mentioned briefly in a *mele māka‘ika‘i* (travel chant) for Queen ‘Emalani Kaleleonālani. The song also mentions Kama‘oma‘o, the great plain believed to be the place where spirits wander.

Pau ‘ole ko‘u mahalo i ka laulā o Kama‘oma‘o	*My admiration is endless for the expanse of Kama‘oma‘o*
Ka hālana maika‘i a Keālia	*The fine rising of the waters of Keālia*
Ka hemolele o ka ua ʻUlalena	*The perfection of the ‘Ulalena rain*
Lena ka pua o ka māmane pala luhiehu i ka lā	*Yellow are the blossoms of the māmane, soft and lovely in the sun*

[Akana and Gonzalez 2015:267]

1.4.4.5 Uhiwai Mist

Uhiwai is a heavy fog that means “water covering” (Akana and Gonzalez 2015:254) and is closely associated with ‘Īao. The following proverb mentions this mist of ‘Īao.

Nae iki ‘Īao i ka uhiwai.	*(Mount) ‘Īao is barely breathing in the heavy mist.*

[Akana and Gonzalez 2015:255]

1.4.5 *Nā Kahawai* (Streams)

Wailuku Ahupua‘a was included in the traditional *‘okana* of Nā Wai ‘Ehā, or “The Four Waters.” This area is home to the four largest streams found on the windward coast of Maui which are Waikapu, Waiehu, Wailuku, and Waihe‘e. The streams of Wailuku include the perennial ‘Īao Stream also known as Wailuku River. Edward Handy and Elizabeth Handy describe Wailuku River saying, “Wailuku is partly landbound, but its stream flows into Kahului Bay, which has been eroded by the ocean out of what was formerly the stream mouth” (Handy and Handy 1972:496). Wailuku River drains from the heights of the western Maui uplands through the deep gorges of ‘Īao Valley (Figure 5). Tributaries that flow into Wailuku River include Nākalaloa, Po‘onāhoahoa, Kinihāpai, and Ae streams.

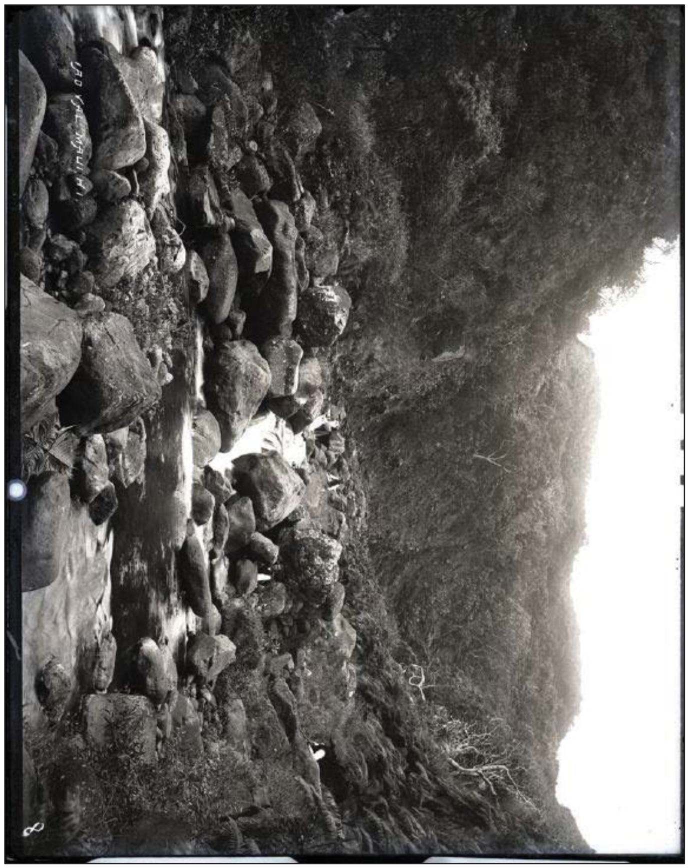


Figure 5. A stream of ʻĪao Valley, taken between 1883 and 1905 (Brother Bertram Photo Collection)

1.4.6 *Ke Kai a me ka Moana* (The Seashore and Ocean)

The *makai* (toward the sea) region provided a variety of fish and ocean invertebrates for consumption. Traditionally, the seashore and ocean areas were vitally important for resource extraction in the early days of settlement, and fishermen along the coast maintained a respected status within traditional Hawaiian society. Kanahele (1995:17) asserts that "early Hawaiians regarded fishing as the oldest, and hence the most prestigious of professions."

The project area is located along the eastern shore of Kahului Harbor, a deep-draft harbor consisting of a 2,315-foot west breakwater, a 2,760-foot east breakwater, and a 600-foot-wide entrance channel between the two (Clark 1989:8). Except for two sections of beach, the shoreline consists of artificial structures. Harbor operations are currently occurring on the east side of the harbor, while the west side of the harbor is characterized by recreational activities (State of Hawai'i Department of Transportation 2012:1). The area of Kahului Harbor which is also known as Kahului Breakwater Park is "frequented by primarily by fishermen, surfers, boaters, and limu gatherers" (Clark 1989:8). During times of heavy surf, waves often break on the reef just outside the ramp which draw in a crowd of surfers (Clark 1989:8).

West of Kahului Harbor is Paukūkalo Beach which is "composed entirely of boulders, many of which are covered with *kauna'oa* [*Vermetidae*; mollusk]" (Clark 1989:6). The offshore bottom is also very rocky. Paukūkalo Beach is "frequented primarily by fishermen and beachcombers" (Clark 1989:6).

In ancient times, the area around Kahului Bay was a favorite gathering place and residential site for Maui's *ali'i* (James 2002:56). Along the shore were groves of coconut trees, as well as, the "thatched *hale* [house] of fishermen and those concerned with the high chief's war canoes" (James 2002:56). The beaches of Wailuku, Paukūkalo, and Waiehu were also popular surfing spots amongst the chiefs of Maui (James 2002:56).

East of Kahului Harbor lie the *loko i'a* named Mau'oni and Kanahā. According to tradition, Kapi'iohookalani, an O'ahu chief, began construction of the pond walls but was killed by Alapa'inui before its completion. The pond was finished by Kamehamehanui, king of Maui, in the mid-1700s (Sterling 1998:87).

In 1952, the State of Hawai'i established the Kanahā Pond Wildlife Sanctuary (SIHP 50-50-05-1783) to protect the cultural remains of the original fish pond wall structure, and three endangered wetland bird species: the Hawaiian stilt (*Ae'o*; *Himantopus mexicanus knudseni*), Hawaiian coot (*'Alae kea*; *Fulica alai*), and Hawaiian duck (*Koloa*; *Anas wyvilliana*). Over fifty species of birds have been observed here, including herons, geese, ducks, owls, plovers, sandpipers, *'ūlili* (tattlers; *Heteroscelus incanus*), *'alae ke'oke'o* (Coot; *Fulica alai*), pheasants (*Lophura leucomelanos*) and doves (James 2002:69-70).

1.4.7 Built Environment

The built environment within the project area mostly consists of paved asphalt and existing historic structures built by Kahului Railroad Company and formerly used for Hawaiian Commercial and Sugar Company commercial sugar operations (HC&S 2009). These structures include a railroad roundhouse, three bulk sugar storage warehouses, and a conveyor system. In addition, administrative facilities associated with the Harbors Division of the HDOT and docking areas, including Pier 2, are present within the current project area.

The built environment in the immediate vicinity of the project area consists almost entirely of paved parking lots and access roadways, including East Ka‘ahumanu Avenue, just south of the project area, and Hobron Avenue, bounding the project area to the east. Lands immediately surrounding the project area are under the jurisdiction of the Harbors Division of the HDOT and contain HDOT storage lots and intermodal freight and bulk freight storage for Saltchuk Resources, Inc., Young Brothers Ltd., and Hawaiian Tug and Barge Service. Lands south of the project area parcels and Ka‘ahumanu Avenue have been developed as the Maui Mall regional shopping center.

Section 2 Methods

2.1 Archival Research

Research centers on Hawaiian activities including *ka‘ao* (legends), *wahi pana* (storied places), *‘ōlelo no‘eau* (proverbs), *oli* (chants), *mele*, traditional *mo‘olelo* (stories), traditional subsistence and gathering methods, ritual and ceremonial practices, and more. Background research focuses on land transformation, development, and population changes beginning with the early post-Contact era to the present day.

Cultural documents, primary and secondary cultural and historical sources, historic maps, and photographs were reviewed for information pertaining to the study area. Research was primarily conducted at the CSH library. Other archives and libraries including the Hawai‘i State Archives, the Bishop Museum Archives, the University of Hawai‘i at Mānoa’s Hamilton Library, Ulukau, The Hawaiian Electronic Library (Ulukau 2014), the State Historic Preservation Division (SHPD) Library, the State of Hawai‘i Land Survey Division, the Hawaiian Historical Society, and the Hawaiian Mission Houses Historic Site and Archives are also repositories where CSH cultural researchers gather information. Information on Land Commission Awards (LCAs) were accessed via Waihona ‘Aina Corporation’s Māhele database (Waihona ‘Aina 2000), the Office of Hawaiian Affairs (OHA) Papakilo Database (Office of Hawaiian Affairs 2015), and the Ava Konohiki Ancestral Visions of ‘Āina website (Ava Konohiki 2015).

2.2 Community Consultation

2.2.1 Scoping for Participants

We begin our consultation efforts with utilizing our previous contact list to facilitate the interview process. We then review an in-house database of *kūpuna*, *kama‘āina*, cultural practitioners, lineal and cultural descendants, Native Hawaiian Organizations (NHOs; includes Hawaiian Civic Clubs and those listed on the Department of Interior’s NHO list), and community groups. We also contact agencies such as SHPD, OHA, and the appropriate Island Burial Council where the proposed project is located for their response on the project and to identify lineal and cultural descendants, individuals and/or NHO with cultural expertise and/or knowledge of the study area. CSH is also open to referrals and new contacts.

2.2.2 “Talk Story” Sessions

Prior to the interview, CSH Cultural Researchers explain the role of a CIA, how the consent process works, the project purpose, the intent of the study, and how their ‘*ike* and *mana‘o* will be used in the report. The interviewee is given an Authorization and Release Form to read and sign.

“Talk Story” sessions range from the formal (e.g. sit down and *kūkākūkā* [consultation, discussion] in participants choice of place over set interview questions) to the informal (e.g. hiking to cultural sites near the study area and asking questions based on findings during the field outing). In some cases, interviews are recorded and transcribed later.

CSH also conducts group interviews, which ranges in size. Group interviews usually begin with set, formal questions. As the group interview progresses, questions are based on interviewee’s answers. Group interviews are always transcribed and notes are taken. Recorded interviews assist

the Cultural Researcher in 1) conveying accurate information for interview summaries, 2) reducing misinterpretation, and 3) missing details to *mo‘olelo*.

CSH seeks *kōkua* (assistance) and guidance on identifying past and current traditional cultural practices of the study area. Those aspects include: general history of the *ahupua‘a*; past and present land use of the study area; knowledge of cultural sites (for example, *wahi pana*, archaeological sites, and burials); knowledge of traditional gathering practices (past and present) within the study area; cultural associations (*ka‘ao* and *mo‘olelo*); referrals; and any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the study area.

2.2.3 Completion of Interview

After an interview, CSH Cultural Researchers transcribe and create an interview summary based on information provided by the interviewee. Cultural Researchers give a copy of the transcription and interview summary to the interviewee for review and ask to make any necessary edits. Once the interviewee has made those edits, we incorporate their *‘ike* and *mana‘o* into the report. When the draft report is submitted to the client, Cultural Researchers then prepare a finalized packet of the participant’s transcription, interview summary, and any photos that were taken during the interview. We also include a thank you card and honoraria. This is for the interviewee’s records.

It is important to CSH Cultural Researchers to cultivate and maintain community relationships. The CIA report may be completed, but CSH Researchers continuously keep in touch with the community and interviewees throughout the year—such as checking in to say hello via email or by phone, volunteering with past interviewees on community service projects, and sending holiday cards to them and their *‘ohana* (family). CSH Researchers feel this is an important component to building relationships and being part of an *‘ohana* and community.

“*I ulu no ka lālā i ke kumu*—the branches grow because of the trunk,” an *‘ōlelo no‘eau* (#1261) shared by Mary Kawena Pukui with the simple explanation: “Without our ancestors we would not be here” (Pukui 1983:137). As Cultural Researchers, we often lose our *kūpuna* but we did not lose their wisdom and words. We routinely check obituaries and gather information from other informants if we have lost our *kūpuna*. CSH makes it a point to reach out to the *‘ohana* of our fallen *kūpuna* and pay our respects including sending all past transcriptions, interview summaries, and photos for families to have on file for genealogical and historical reference.

Section 3 *Ka‘ao* and *Mo‘olelo* (Legends and Stories)

Hawaiian storytellers of old were greatly honored; they were a major source of entertainment and their stories contained teachings while interweaving elements of Hawaiian lifestyles, genealogy, history, relationships, arts, and the natural environment (Pukui and Green 1995:IX). According to Pukui and Green (1995), storytelling is better heard rather than read for much becomes lost in the transfer from the spoken to the written word and *ka‘ao* are often full of *kaona* or double meanings.

Ka‘ao are defined by Pukui and Elbert (1986:108) as a “legend, tale […], romance, [and/or], fiction.” *Ka‘ao* may be thought of as oral literature or legends, often fictional or mythic in origin, and have been “consciously composed to tickle the fancy rather than to inform the mind as to supposed events” (Beckwith 1970:1). Conversely, Pukui and Elbert (1986:254) define *mo‘olelo* as a “story, tale, myth, history, [and/or] tradition.” The *mo‘olelo* are generally traditional stories about the gods, historic figures or stories which cover historic events and locate the events with known places. *Mo‘olelo* are often intimately connected to a tangible place or space.

In differentiating *ka‘ao* and *mo‘olelo* it may be useful to think of *ka‘ao* as expressly delving into the *wao akua* (realm of the gods), discussing the exploits of *akua* (gods) in a primordial time. *Mo‘olelo* on the otherhand, reference a host of characters from *ali‘i*, to *akua* and *kupua* (supernatural beings), to finally *maka‘āinana* (commoners), and discuss their varied and complex interactions within the *wao kānaka* (realm of man). Beckwith elaborates, “In reality, the distinction between *ka‘ao* as fiction and *mo‘olelo* as fact cannot be pressed too closely. It is rather in the intention than in the fact” (Beckwith 1970:1). Thus, a so-called *mo‘olelo*, which may be enlivened by fantastic adventures of *kupua*, “nevertheless corresponds with the Hawaiian view of the relation between nature and man” (Beckwith 1970:1).

Both *ka‘ao* and *mo‘olelo* provide important insight into a specific geographical area, adding to a rich fabric of traditional knowledge. The preservation and passing on of these stories through oration remains a highly valued tradition. Additionally, oral traditions associated with the study area communicate the intrinsic value and meaning of a place, specifically its meaning to both *kama‘āina* as well as others who also value that place.

The following sections seek to present traditional accounts of ancient Hawaiians living in the vicinity of the project area. The *ka‘ao* in and around the study area shared below are some of the oldest Hawaiian stories that have survived and still speak to the characteristics and environment of the area and its people.

3.1 *Ka‘ao* and *Mo‘olelo*

3.1.1 The Battle of the Owls

One traditional account relates the naming of the *moku* of Wailuku and of a local hill named Pueokaia. In Pukui and Curtis’s *The Water of Kāne* (1994), the naming of Wailuku is recounted in the *mo‘olelo* of *The Battle of the Owls*. Mistaking owl eggs for duck eggs, a woman of Maui brings home seven owl eggs to her husband Kapoi. Kapoi, in disgust, proclaims that the eggs are of an owl and no good to eat. At this moment the mother owl, to whom the eggs belonged, appears and appeals to the husband that the eggs be returned to her nest. The husband who was a cruel man

laughed as he smashed the seven owl eggs, leaving the mother owl with only bits of shell (Pukui and Curtis 1994:188-189).

In *Sites of Maui*, Sterling (1998:89) cites W.H. Uaua (1871) who recounts the reaction of the mother owl:

> The owl gathered up the broken shells and the yokes that were dashed against the stone wall and took them all. She flew with them in tears, to the presence of Pueokaia on the western side of Wailuku. He was her husband and the seven eggs that were mercilessly smashed by Kapoi were theirs. [W.H. Uaua in Sterling 1998:89]

According to Pukui and Curtis (1994), this travesty toward their offspring would not be tolerated:

> Her mate was very angry. “Cruel man!” he shouted.
> “We shall punish him!”
> “What can two owls do against a man?”
> “Two owls? Four hundred owls! Four thousand owls! Fly to the west and tell all owls of this cruel deed. I shall fly to Hawai‘i. Let us gather the owls of every island to our aid.”
> The owls of every island came. Those of Ni‘ihau and Kaua‘i met the owls of O‘ahu. Flying together in a great flock they joined the owls of Moloka‘i, Lāna‘i, and Kaho‘olawe. When they were united with the flocks from Hawai‘i and from Maui their numbers filled the sky and shut out the sun’s light. A fierce battle followed. [Pukui and Curtis 1994:188-189]

Following the unification of their flocks, Uaua (1871) recounts the ensuing Battle of the Owls:

> “…the battle began at Wailuku. …How the owls and men fought! The men and chiefs were destroyed; many men of the Four-Waters. Kapoi and his wife were also killed. Because the owls caused such destruction the place was called Wai-luku (Water-of-destruction) to this day. [W.H. Uaua in Sterling 1998:74]

The home of the father owl, Pueokaia, was rumored to be on a small hill above a place named Awau in Wailuku, and the hill still bears the owl’s name to this day (W.H. Uaua in Sterling 1998:89).

3.1.1 Luahinepi‘i

‘Īao Valley is the subject of a number of *ka‘ao* and *mo‘olelo*. One legend tells of a woman named Luahinepi‘i who came to her end after jumping from Kūkaemoku, the 2,250 foot peak also known as the ‘Īao Needle (Figure 6). Sterling (1998) recounted the story of Luahinepi‘i:

> At the base of this noble perpetual sentinel to Iao Canyons [*Kukaemoku - ‘Iao Needle*] lived, a few centuries ago, a most beautiful maiden. Her figure and form was so near perfection that a Raphael or a Michael Angelo might have selected her for a model representing a Hawaiian Venus. Her name was Luahinepii (climbing old woman), a name most unsuitable to a maiden so beautifully fair. She possessed, however, a voice so unpleasant and hideous that other maidens, jealous of her unsurpassed natural beauty, made fun of her.

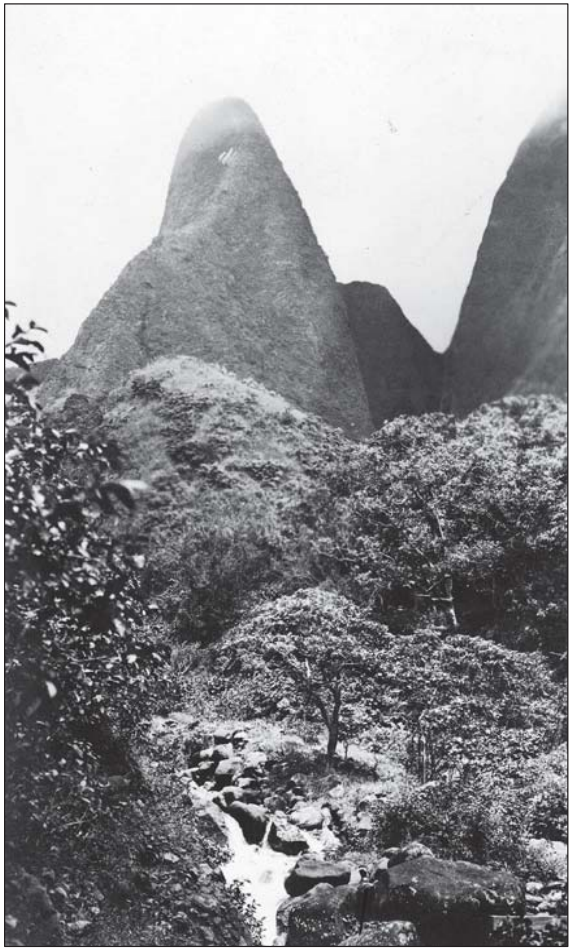


Figure 6. Kūkaemoku, the 2,250-foot peak also known as the ‘Īao Needle (USC Pierce Collection).

> Luahinepii had a lover who lived at the beach near Paukukalo. Other maidens looked upon him as a possible suitor, but like all true lovers he turned a deaf ear to their entreaties.
>
> The rival belles met and agreed to circulate a report to this wise: “Ua lohe- ia ko leo kapu e ko ipo i Moealoha” (Your sacred voice has been heard by your lover at Lover’s-dream). This soon reached the ear of Luahinepii. She felt deeply these to her, most humiliating words. In her frantic moments she sought to end her life and to free herself from the cares and woes of this deceptive world […] Luahinepii scaled to the top of Kukaemoku, called Nanahoa, and from its dizzy height dashed herself headlong to the valley beneath, and the waters of Iao were made incarnadine with her blood. [Sterling 1998:83]

3.1.2 Pu‘uokamoa and ‘Īao

Pu‘uokamoa was a half-man, half-fish god, who fell in love with ‘Īao, the beautiful daughter of the demi-god Maui. Pu‘uokamoa lived in a pool near ‘Īao’s home. After becoming suspicious of ‘Iao’s frequent absences from home, Maui asked a *kahuna* (priest) to discover the truth. According to legend, when Maui learned that his daughter was in love with Pu‘uokamoa, he became angry and captured Pu‘uokamoa and planned to burn him to death. The volcano goddess, Pele, a friend of Pu‘uokamoa, convinced Maui not to burn him but instead transformed him into a pillar of stone which is now known as the ‘Īao Needle (Denham et al. 1992:9).

3.1.3 Lepeamoa

In the legend of Lepeamoa, Wailuku was the name of a chiefess. She was the wife of Mauinui, the chief of Maui, and was sister to Kākuhihewa, chief of O‘ahu. According to the *mo‘olelo*, Mauinui challenges Kākuhihewa to a cockfight where the winner receives all property and the life of the opponent. With the assistance of two demi-gods, Lepeamoa and Kauilani, Kākuhihewa is victorious. Following his victory, Kākuhihewa refuses to take Mauinui’s life and peace between the two kingdoms is established (Westervelt 1963:204-245).

3.1.4 The Wicked Chief, Hua

Wailuku is known as the death place of the Maui chief Hua. According to the *mo‘olelo*, Hua was a wicked chief who condemned his *kahuna* to death. In retaliation, the *kahuna* brought a severe drought to the islands. Fornander wrote:

> 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 1918-19a:V:III:516]

3.1.5 Wakalana and the Wonderful Iron Knife

King David Kalākaua (Kamehameha IV), in his collection of Hawaiian oral traditions *The Legends and Myths of Hawai‘i*, recounts a “remarkable event [that] had occurred at Wailuku” during the late fourteenth or fifteenth centuries when Wakalana, the principal chief of West Maui, was in residence there. According to Kalākaua (1990:182) there was an “appearance in the

[Hawaiian] group of a vessel bearing people of a strange race, described by tradition as ‘white, with bright, shining eyes.’”

> It was a Japanese vessel that had been dismantled by a typhoon, driven toward the North American coast until it encountered the northwest trade-winds, and then helplessly blown southward to the coast of Maui... It was hazardous to approach the wreck too nearly, but Wakalana succeeded in rescuing from the waves and returning to Wailuku with five persons, but not before he saw the last fragment of the wreck disappear in the abyss of raging waters. [Kalākaua 1990:183]

The rescued foreigners were believed to be Japanese and the captain of the ship possessed a sword which was unlike any ever seen in the islands. The sword became known as “the long wonderful iron knife” and was a “tremendously effective weapon, when matched with wooden daggers and war clubs” (Westervelt 1977:95-96).

After Kalaunuiohua, chief of Hawai‘i, and his army invaded the island of Maui, the sword became the possession of a Hawaiian warrior, Kualu, who hid the sword on the island of Moloka‘i. Following successful battles with the islands of Maui, Moloka‘i, and O‘ahu, Kalaunuiohua attempted to invade Kaua‘i where his army was defeated and he was taken captive by Kukona, chief of Kaua‘i. The sword, also known as “the lost knife of Wailuku,” was eventually exchanged for the life and return of Kalaunuiohua (Kalākaua 1990:177-205).

3.1.6 Iwikauikaua

Iwikauikaua, a chief originally from the island of Hawai‘i, visited the island of Maui where his sister, Kapukini, was wife of the ruling chief Kauhiakama. Following the death of Kauhiakama, who was slain in battle on O‘ahu, a council of Maui chiefs had gathered to debate going to war with O‘ahu. Iwikauikaua advised the Maui chiefs to refrain from retailiation, stating “the chiefs of Oahu are united, and a war upon them means a conflict with the whole island” (Kalākaua 1990:344). A chief of Wailuku disagreed with Iwikauikaua and expressed his desire to have the Maui forces take up arms against the O‘ahu king.

> Several remarks of a sneering character had been dropped within his hearing, and finally a chief from Wailuku, glancing insultingly toward him [Iwikauikaua], declared that the chiefs of Maui were “not afraid to use their spears.” [Kalākaua 1990:345]

3.2 Wahi Pana (Legendary or Storied Places)

Wahi pana are legendary or storied places of an area. These legendary or storied places may include a variety of natural or human-made structures. Oftentimes dating to the pre-Contact period, most *wahi pana* are in some way connected to a particular *mo‘olelo*, however, a *wahi pana* may exist without a connection to any particular story. Davianna McGregor outlines the types of natural and human-made structures that may constitute *wahi pana*:

> Natural places have mana [spiritual power], and are sacred because of the presence of the gods, the akua, and the ancestral guardian spirits, the ‘aumakua. Human-made structures for the Hawaiian religion and family religious practices are also sacred. These structures and places include temples, and shrines, or heiau, for war, peace, agriculture, fishing, healing, and the like; pu‘uhonua, places of refuge and

> sanctuaries for healing and rebirth; agricultural sites and sites of food production such as the lo‘i pond fields and terraces slopes, ‘auwai irrigation ditches, and the fishponds; and special function sites such as trails, salt pans, holua slides, quarries, petroglyphs, gaming sites, and canoe landings. [McGregor 1996:22]

As McGregor makes clear, *wahi pana* can refer to natural geographic locations such as streams, peaks, rock formations, ridges, offshore islands, and reefs, or they can refer to Hawaiian land divisions such as *ahupua‘a* or *‘ili* (land division within an *ahupua‘a*), and man-made structures such as fishponds. In this way, the *wahi pana* of Wailuku tangibly link the *kama‘āina* of Wailuku to their past. It is common for places and landscape features to have multiple names, some of which may only be known to certain *‘ohana* or even certain individuals within an *‘ohana*, and many have been lost, forgotten or kept secret through time. Place names also convey *kaona* and *huna* (secret) information that may even have political or subversive undertones. Before the introduction of writing to the Hawaiian Islands, cultural information was exclusively preserved and perpetuated orally. Hawaiians gave names to literally everything in their environment, including individual garden plots and *‘auwai* (ditch, canal), house sites, intangible phenomena such as meteorological and atmospheric effects, *pōhaku* (rock, stone), *pūnāwai* (freshwater springs), and many others. According to Landgraf (1994), Hawaiian *wahi pana* “physically and poetically describes an area while revealing its historical or legendary significance” (Landgraf 1994:v).

3.2.1 Place Names of Wailuku

An analysis of the place name meanings (Table 1) for the region surrounding the project area may yield some insight into the patterns of life in an area. Literal translations of several of the place names for land areas and divisions near to the project area are listed below. Unless otherwise noted, the translations are taken from Pukui et al. (1974).

Table 1. Place Name Meanings of Wailuku Moku in the Vicinity of the Project Area

Name	Translation
Haleki‘i (*Heiau*)	*Lit.,* “image house.” A *heiau* (Walker Site 44) located in Wailuku at the Pihana Heiau complex (see subsection 3.2.4), along the ‘Īao Stream in the region of Paukūkalo. According to Kamakau, Maui chief Kekaulike was brought here to die in 1736.
‘Īao (Stream)	*Lit.,* “cloud supreme.” ‘Īao Stream brings the water of ‘Īao Valley to the ocean at Paukūkalo, a point just northwest of Kahului Harbor.
Ka‘a (Point)	*Lit.,* “rolling.” A shoreline promontory just east of Kahului Bay.
Ka‘ahumanu (Avenue)	*Lit.,* “the bird [feather] cloak.” Avenue named in honor of Queen Ka‘ahumanu, favorite wife of Kamehameha I, who became *kuhina nui* (regent) to Kamehameha II and Kamehameha III and an ardent supporter of the Protestant mission in the Hawaiian Islands. She died in 1832, at Mānoa, on the island of O‘ahu (Kamakau 1992).
Kahului (Kaihuwa‘a)	*Lit*., “the winning”. According to Malo (1951:268), “the Kahului was a disposition or order of battle in which the main body of the soldiers were drawn up in the form of a crescent, with the horns pointing forwards.” This formation was “undoubtedly derived from the place of the same name,” a “flat and treeless” region (Malo 1951:268).

Name	Translation
Kalialinui (Gulch)	Possible literal translation: “large tree or plant used for medicine” (Malo 1951). Kalialinui Gulch is within 2 km west of the project area.
Kalua (*‘Ili*)	*Lit.,* “the pit.” *‘Ili* that includes much of the commercial hotel land of the Kahului Harbor, the Kaiser clinics, Maui Memorial Medical Center, Queen Ka’ahumanu Center, and the Maui Mall.
Kanahā (Pond)	*Lit.,* “the shattered (thing).” Sterling (1998) notes that salt was gathered at Kanahā and that the pond was named by high ranking chiefess, Kahamaluihi (see subsection 3.2.3). Name of pond, wildlife sanctuary, and beach, all east of the current project area. Kanahā Pond is designated SIHP # 50-50-04-1783 and is located about 400 m southeast of the project area.
Mauna Kahalawai	*Lit.,* “the gathering of waters.” West Maui Mountains (Pellegrino 2009)
Mau‘oni (Pond)	One of the two fishponds located at the shore of Kanahā. This pond is approximately 300 m east of the project area.
Nehe (Point)	*Lit.,* “rustle.” Point of land along the Waiehu coastline. (Pellegrino 2009).
‘Owā (*‘Ili*)	Cry of the *‘auku‘u*, heron, which suggests *‘owā*; to cry thus. A measurement equal to half the width of a finger, of fishing nets (*Mākahi a ‘owā*; the width of one and a half fingers). *‘Ili* where the Sand Hills, Baldwin High School, the Maui Arts & Cultural Center and the U.H. Maui College are situated.
Paukūkalo	*Lit.,* “taro piece.” This present-day shoreline community is located at the northernmost region of the Kahului Harbor. ‘Īao Stream reaches the ocean at Paukūkalo, a region reported to have once been heavily planted in *kalo* (wetland taro).
Pihana (*Heiau*)	*Lit.,* “fullness.” Stories of this Paukūkalo *heiau* include it being built in a single night by the legendary race of Menehune, who brought the stones from Paukūkalo Beach. Pukui also states that the construction of this *heiau* has been attributed to the Maui chief, Kahekili. It is listed as Walker Site 43. The Pihana Heiau is a sacred place located within the *‘ili* of Paukūkalo.
Pu‘ali Komohana	Translated by Andrews (1856:73) as “western sun-setting isthmus.” Combined area of Wailuku, Waikapū, Waiehu, and Waihe‘e *ahupua‘a*.
Pu‘unēnē	*Lit.,* “goose hill.” A land area named after a cinder cone, once located just inland of Papa‘ula, mined for its gravel during WWII to construct the runways at the U.S. Naval Air Station Kahului (Fornander 1916). Pu‘unēnē Avenue extends from the Kahului Harbor’s west border to Pu‘unēnē Town, which is within 3 km south of the project area.

Name	Translation
Wailuku (*Ahupua‘a*)	*Lit.,* “water of destruction,” a reference to the battle which took place at ‘Īao between the forces of Kamehameha I and the Maui chiefs. Sterling (1998) states that Pukui et al. (1974) believes the name is older than the famous battle. Westervelt (Saito 2011) makes special reference to the waters of Wailuku in ‘Īao (*Lit.,* “asking for clouds”) emptying into the Kahului Harbor. Fornander (1916-17b:IV:II:304) recorded that Wailuku was the place of flying clouds (Westervelt 1910).

3.2.2 Kama‘oma‘o: A Wandering Place of Spirits

Ke Kula o Kama‘oma‘o, or the Plains of Kama‘oma‘o, is the name given to a region of sandy plains between Kahului and Wailuku, Maui (Emerson 1915:76). This area was known by Hawaiians in traditional times as a wandering place of the souls (Beckwith 1970:154), a place where dead spirits waited for a friendly escort, perhaps a family *‘aumakua* (personal family gods), to show them the way to eternity:

> The worst fate that can befall a soul is to be abandoned by its aumakua and left to stray, a wandering spirit (*kuewa*) in some barren and desolate place, feeding upon spiders and night moths. Such spirits are believed to be malicious and to take delight in leading travelers astray; hence the wild places which they haunt on each island are feared and avoided. Such are the plains of Kama‘oma‘o on the island of Maui, the rough country of Kaupea at Pu‘uloa on Oahu, Uhana on Lanai, Maohelaia on Molokai, Mana on Kauai, Halali‘i on Ni‘ihau. In these desolate places lost spirits wander until some friendly *aumakua* takes pity upon them. [Beckwith 1970:154]

According to Helen P. Hoyt (1976), Kama‘oma‘o is also a region where the “Marchers of the Night,” or *Ka huaka‘i o ka Po*, are sometimes heard and seen. When these spiritual “Night Marchers” appear, according to Beckwith (1932:198), “It is said that such a sight is fatal unless one has a relative among the dead to intercede for him.”

> The marchers carried candlenut torches which burned brightly even on a rainy night. They might even be seen in broad daylight and were followed by whirlwinds such as come one after another in columns. They cried “Kapu o moe!” as a warning to stragglers to get out of the way or to prostrate themselves with closed eyes until the marchers passed. [Beckwith 1932:199]

The eternity that the souls of the dead seek is a place known as *Pō*. Beckwith (1970:163) elaborates on the significance of *Pō*, “Each human being is formed in the spring of water within the uterus of the mother and emerges from it into human life. At death he returns to the Pō again” (Beckwith 1970:163).

The Plains of Kama‘oma‘o are also cited as a home to owl deities, considered one of the oldest *‘aumakua* in Hawaiian mythology. The endemic *pueo* (Hawaiian short-eared owl; *Asio flammeus sandwichensis*) was once worshiped by early Hawaiians as a god (Titcomb and Gagne 1976:123). Pueonuiakea was the name of an owl deity who traversed the Plains of Kama‘oma‘o and restored life to wandering souls (Beckwith 1970:124).

Abraham Fornander recalls the story of Pumaia who was a heroic young man that fell to the hands of a spirit. This spirit, Puukolea, had a dual body, capable of shape-shifting in ways the mere human, Pumaia, could not. After falling to Puukolea, Pumaia’s spirit returned home but continued to be chased by Puukolea. Pumaia fled till he reached the Plains of Kama‘oma‘o. There an owl diety by the name of Pueonuiokona began battling Puukolea and ultimately killed him, his entrails were scattered about the plains (Fornander 1918-19b:VI:III:550-554).

3.2.3 Mau‘oni and Kanahā Loko I‘a

East of Kahului Harbor, on the north shore of the central isthmus in Wailuku Ahupua‘a lie the *loko i‘a* of Mau‘oni and Kanahā (Figure 7 through Figure 9). A traditional story concerning their construction appears in Sterling (1998:87-88), based on an interview with Mrs. Rosalie Blaisdell in 1923 by J.F.G. Stokes (BPBM Anthropology Department archives, Grp 7, 10.10.C9). According to tradition, construction of the pond walls was initiated by an O‘ahu chief, but finished by Kamehamehanui, king of Maui in the mid-1700s. Kapi‘iohookalani was the original architect of the two ponds and one-time king of O‘ahu and half of Moloka‘i. He was killed in battle before he could complete the construction of the pond walls. His daughter, Kahamaluihiikeaoihilani, sought her brother, Kanahaokalani, and searched Moloka‘i and Maui for him. The pond walls were finished by Kamehamehanui, who placed a *kapu* (taboo) on the bank, and built a *kuapā* (wall of a fish pond), dividing the two ponds. The chiefess Kahamaluihiikeaoihilani was born of such high rank that she was able to break the *kapu* by walking on the center *kuapā* of the ponds. Following this act, Kamehamehanui allowed her to name the ponds. She named Kanahā for her brother, and Mau‘oni for the identity she travelled by to protect her status as a chiefess of the highest rank. Sterling (1998:88) also noted two references by Samuel Kamakau (1992:42) stating that Kihapi‘ilani had built the stonework separating the two ponds at a much earlier time than the work performed by Kamehamehanui.

These ponds were the subject of many legends and sayings. In one legend concerning a Hawaiian couple who lived near the ponds, the origin of the name Wailuku is explained:

> One day Kapoi’s wife went out to gather ‘*unihi* (grasshoppers) and found an owl’s nest with seven eggs. Thinking they were duck eggs, she took them and gave them to Kapoi. He realized what they were, but refused to give them back to the owl who appeared and requested their return. Kapoi then smashed the eggs against the stone wall surrounding the house. Infuriated over the senseless loss, ‘A‘apueo, the mother owl, and her mate, Pueokaia, gathered owls from all the islands. All of the men and chiefs of the area, including Kapoi and his wife, were destroyed. The place mauka of the ponds where the cruel breaking of ‘A‘apueo’s eggs was avenged was called Wailuku “water (of) destruction.” [Clark 1989:8-9]

In traditional times, Kanahā and Mauoni ponds were used as fishponds. Fish from Kanahā were generally reserved for *ali‘i* and the *kuapa* dividing the ponds was *kapu* to *maka‘āinana* (James 2002:69). The ponds also provided *kama‘āina* of Kahului with mullet (*‘anae*; full sized *‘ama‘ama*; *Mugil cephalus*) during the season when fishing in the sea was *kapu*. Mullet flourished in Kanahā and Mau‘oni Fishpond until the early 1900s when large sections of the pond was filled with materials dredged from Kahului Harbor blocking it’s outlet to the sea (Bartholomew and Bailey 1994:132).

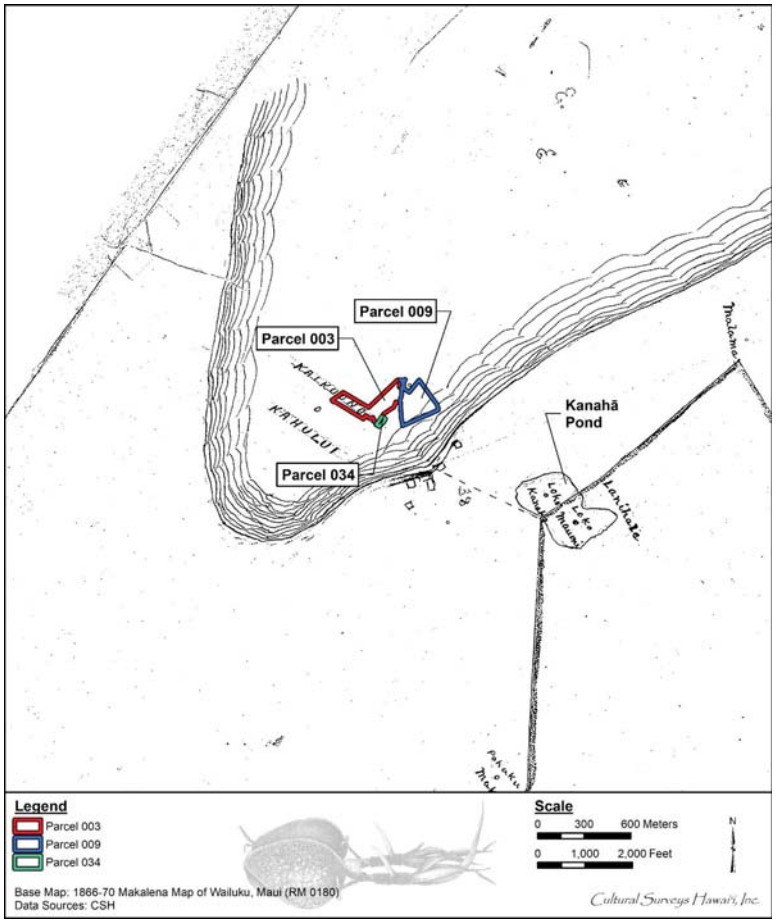


Figure 7. 1866-70 Makalena Map of Wailuku, Maui (RM 0180); note Kanahā Pond to the east of the project area

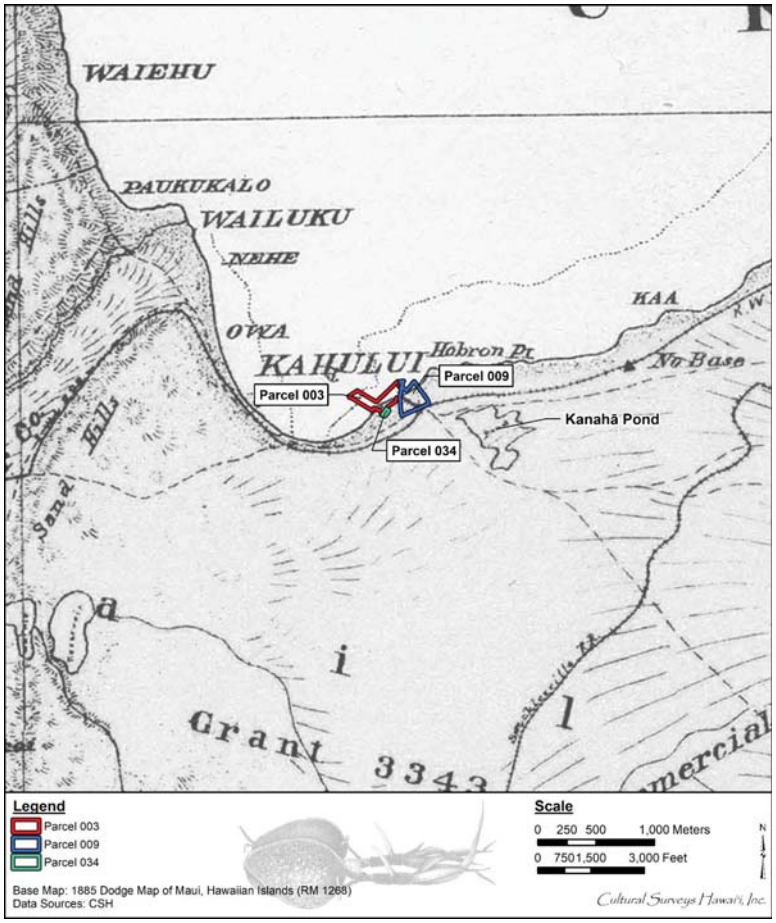


Figure 8. 1885 Dodge Map of Maui, Hawaii, Hawaiian Islands (RM 1268); note Kanahā Pond to the east of the project area

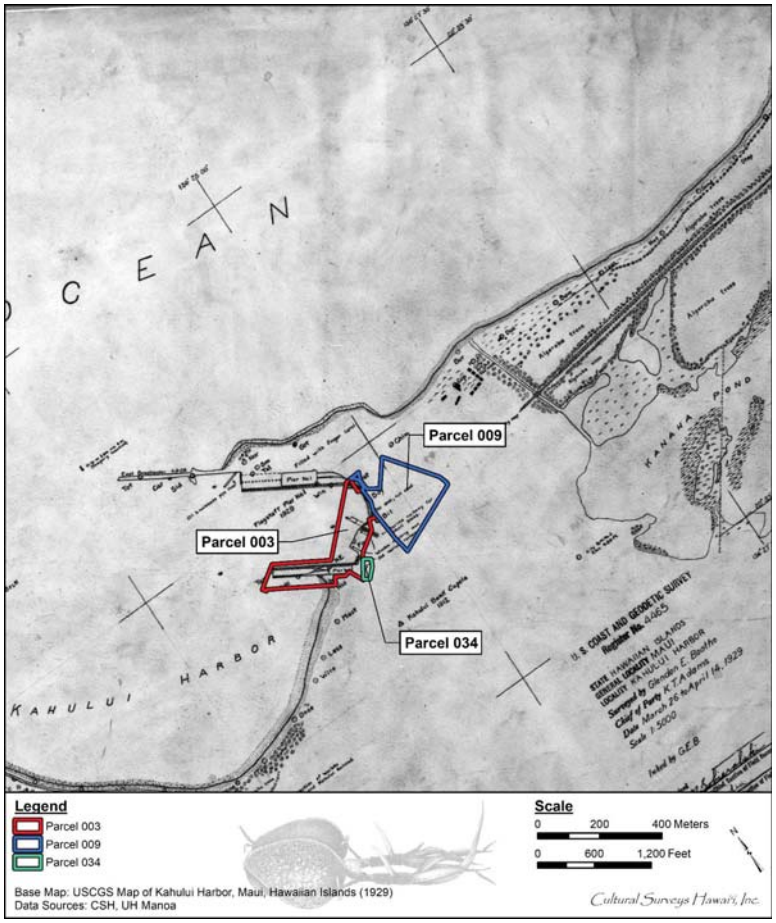


Figure 9. 1929 U.S. Coast and Geodetic Survey (USCGS) Register No. 4465 depicting the project area and Kanahā Pond to the east

For many years, Kanahā Pond was controlled by a sugar plantation (Figure 10) until World War II, when Kanahā Pond was controlled by the United States Navy (Clark 2002:9). In the 1940s, land within Kanahā Pond was altered by the U.S. Navy for the construction of Naval Station (NAS) Kahului (Army Corps of Engineers 2012:4) (Figure 11). In 1952, Kanahā State Wildlife Sanctuary (SIHP 50-50-05-1783) was established, providing a home for over fifty species of birds including three endangered wetland bird species: *ae'o* (Hawaiian stilt), *'alae kea* (Hawaiian coot), and *koloa* (Hawaiian duck) (James 2002:69-70). In 1971, Kanahā Pond was declared a Registered National History Landmark (Figure 12).

In an interview with CSH, Dr. Scott Fisher, Chief Conservation Officer for the Hawaiian Islands Land Trust (HILT), stated that Kanahā Pond was originally fed by Wailuku River, however, this connection was blocked by formation of the sand dunes. He noted that Kanahā Pond is now fed by East Maui springs. Dr. Fisher also stated that Kanahā Pond might have been a *loko pu'uone* (pond near the shore, connected to the sea by a stream or ditch) because it did not have constant flow of water into the pond, adding that Kanahā Pond consists of a lentic environment because "in terms of wetlands, it was non-flowing."

3.2.4 Pihana Heiau Complex

The Pihana Heiau complex was built in the time of Kakae, *mō'ī* (king) of Maui in the early sixteenth century (Figure 13). Pihana Heiau was located on the west side of 'Īao Stream crested upon a sand ridge across from the modern-day Wailuku Sugar Co. mill. The Pihana Heiau complex consists of a *luapa'u* (refuse pit), burials, a cave, and adjacent *heiau* (pre-Christian place of worship). The *wahi pana* of Pihana Heiau is illustrated in Sterling's *Sites of Maui* (1998):

> Tradition relates. Kiikewa, the high chief who lived at "the time of Kakae; the king of West Maui, built the Heiau of Pihana-every rebellious high chieftains of Maui were sacrificed at this heiau, but, no alii whose lineage was tainted were sacrificed on its alter; Liliha is the name of the Luapa'u (offal pit). Halekii is the heiau reserved for the females of high rank and is situated on the makai side of the bluff-Kalola is another name. The whole combined in general is Pihana. It is said there is a cave beneath Pihana, and Liliha is the mouth of the cave. [Sterling 1998:75-76]

Pihana Heiau is classified as a *luakini*, or sacrificial heiau, where "human sacrifices were performed only on the most important occasions" at this "heiau of the highest class" (Sterling 1998:77). According to Thrum (1908), Pihana Heiau was once used for sacrifices by Kamehameha I before defeating Maui forces in the Battle of Kepaniwai, also known as the Battle of 'Īao:

> It is said of Pihana that on Kamehameha's invasion of Maui, in 1790, with an army of warriors which resulted in the defeat of Kalanikupule's forces in the celebrated battle of Pani-wai-o-Iao, the conqueror invoked the blessing of his war god Kukailimoku the great, and sacrificed upon its altars. [Thrum 1908:46]

According to Kirch (1997), both Haleki'i and Pihana had important traditional linkages to famous chiefs. Pihana is noted as the birthplace of Keōpuōlani in 1778, a woman descended from a lineage of *tabu* chiefs of divine rank, and raised in Wailuku, Olowalu, and Hāmākua on Maui (Kamakau 1992:259). She gave birth to two royal male heirs of Kamehameha I, Liholiho (Kamehameha II [Reign: 1819-1824]) and Kauikeaouli (Kamehameha III [Reign: 1825-1854]). Within Wailuku alone stood eleven additional *heiau*: Kaluli, Keahuku, Olokua, Olopio, Malena,

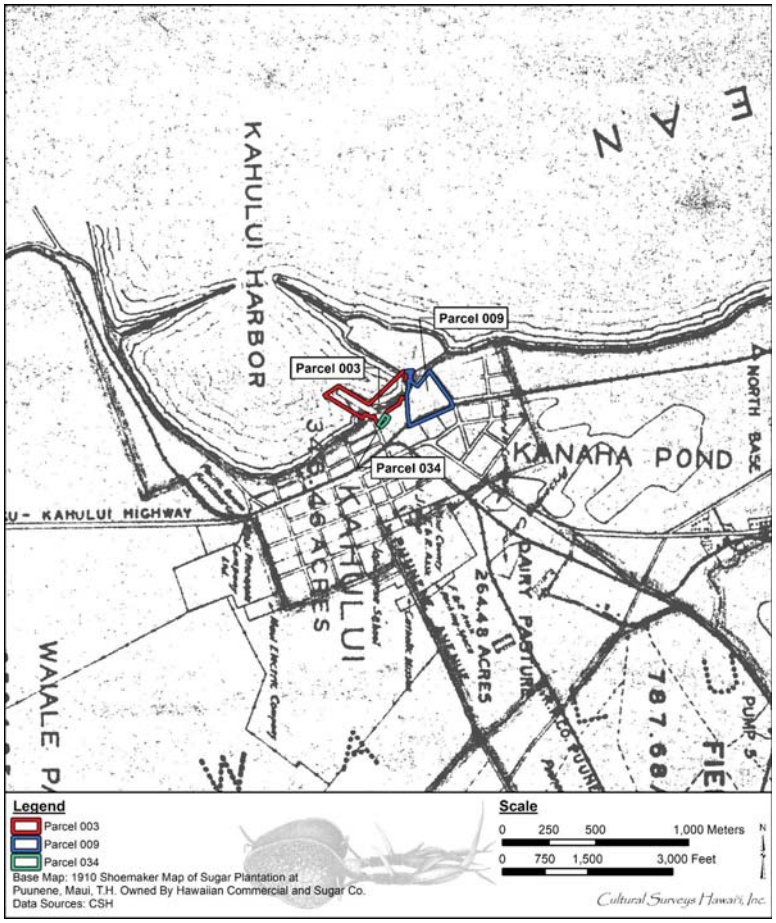


Figure 10. 1910 Shoemaker map depicting lands owned by Hawaiian Commercial and Sugar Company including Kanahā Pond

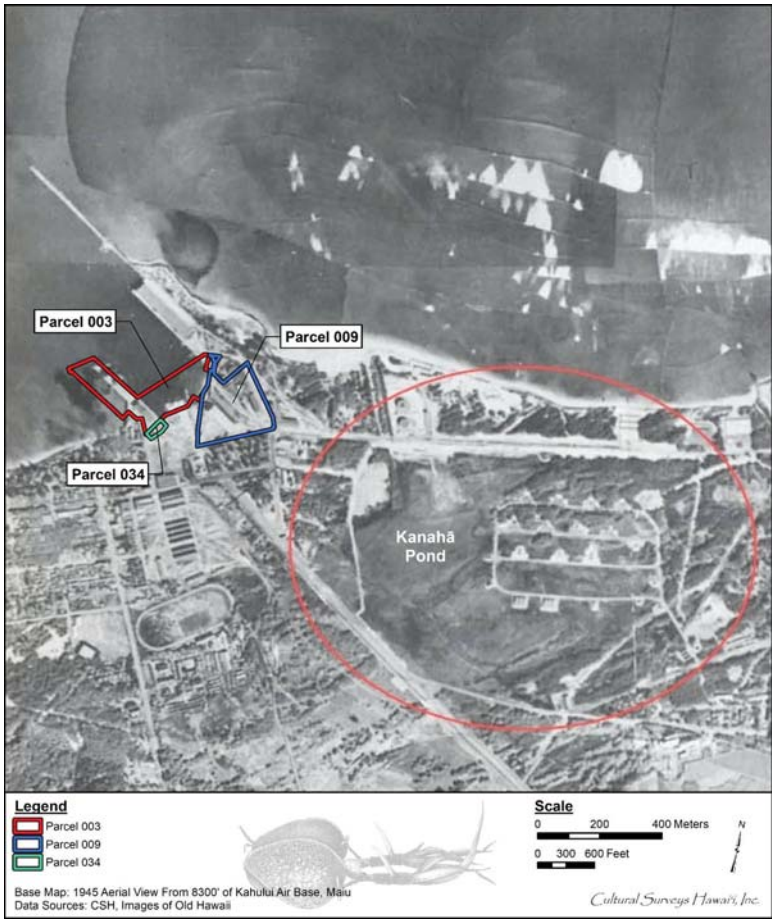


Figure 11. 1945 aerial photograph of Kahului Air Base, Maui (Images of Old Hawaii n.d.)

Figure 12. Plaque noting Kanahā Pond's designation as a natural landmark by U.S. Department of the Interior National Park Service in 1971 (Images of Old Hawaii n.d.)

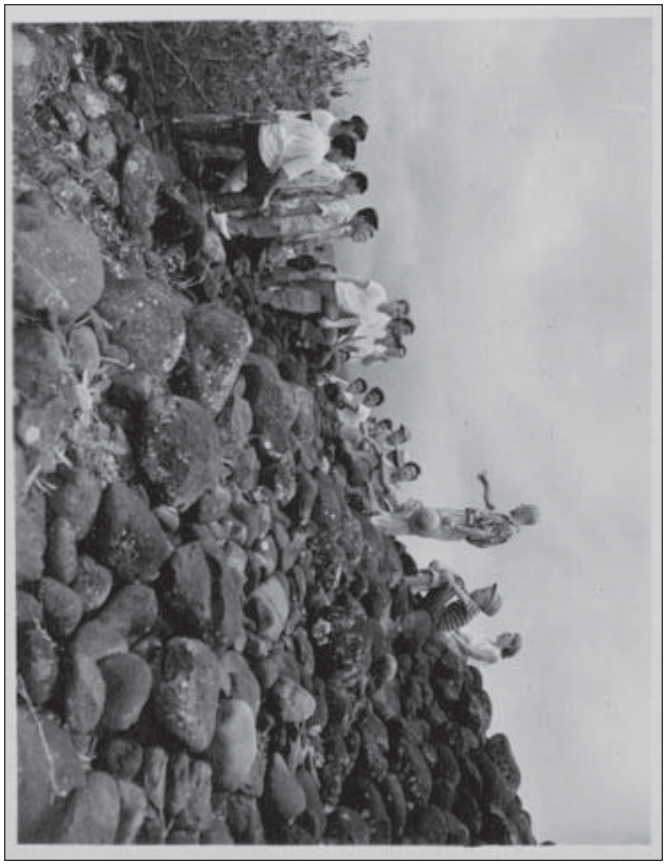


Figure 13. A lecture at Pihana Heiau in 1957. Photo taken before site restoration (Hawai'i State Archives)

Pohakuokahi, Lelemako, Kawelowelo, Kaulupala, Palamaihiki, and Oloolokalani. These *heiau* were said to have been consecrated by Liholiho (Kamehameha II) in his tour of Maui in 1801 but were destroyed in the following century by agrarian development across the central isthmus.

According to Sterling (1998:75), oral traditions place the initial construction of the Pihana-Haleki'i Heiau complex in the sand dunes of east Wailuku as having occurred during the reign of Kaka'e, or about AD 1510. Radio-carbon dates from the *heiau* complex, giving a date range of between AD 1400-1600 (Kirch 2010:164-165), appear to agree with the time-frame of traditional stories consistent with the chronology of Fornander (1919a). In later centuries, the *heiau* complex was rebuilt and rededicated by succeeding chiefs, most notably Kamehameha following his success at the battle of *Ke pani wai o 'Īao* in 1790 (Fornander 1880).

3.2.5 Kalanihale

Wailuku was the site of Kalanihale, the royal palace of the ruling chief of Maui, Kahekili. Following the defeat of Hawai'i's forces, Kalani'ōpu'u, the ruling chief of Hawai'i, proposed that his wife, Kolola, who was also the sister of Kahekili, sue for peace, however, Kalola refused, proposing that her son and prince, Kīwala'ō, be sent as ambassador.

> 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. [Westervelt 1977:141-142]

3.2.6 'Īao Valley

The 'Īao Valley was once a site of royal burials. Pukui et al. (1972:109) explains that, "infinite caution surrounded the bones of an *ali'i*. High rank brings powerful enemies, and a chief's bones were especially in danger of being profaned." 'Īao Valley was referred to as a "place for chiefly corpses" (Kamakau 1992:29). Those recorded as being buried at 'Īao include the following:

> Kapawa, born at Kukaniloko, died at Lahaina and buried in Iao.
>
> Aikanaka, born in Holonokiu, Muolea, Hana, Maui, died in Oneuli, Puuolai, Honuaula, buried in Iao.
>
> Kahai, born in Halulukahi, Wailuku, Maui, died in Kailikii, Kau and buried in Iao.
>
> Laka, born in Haili, Hilo, Hawaii, died in Kualoa, Oahu, buried at Iao.
>
> Hua, born in Kahomaikanaha, Lahaina, Maui, died in Kehoni, Waiehu, Maui, and buried in Iao.
>
> Pau (Kama [child of] Pau), born in Ohikilolo, Waianae, Oahu, died in Lanai, buried in Iao.

> Paumakua, born in Kuaaohe, Kailua, Oahu and buried in Iao [Fornander 1919-20a:VI:III:319].

Walker (1931) elaborates on the lore and secrecy of royal 'Īao Valley burials saying:

> Iao Valley is reputed by legend as a place of royal sepulturer for many of the ancient kings of Maui and neighboring islands. But the locations of all such burials are kept carefully secret so that even the late King Kalakaua was unable to find any of them in spite of the extensive investigations which were instigated by him. [Walker 1931:296]

The Kapela Burial Cave, located in 'Īao Valley, is where numerous Maui *ali'i* and other prominent persons were laid to rest. An article published in Hawaiian newspaper *Ke Au Hou* on 28 June 1911 which appears in Sterling's *Site of Maui*, discusses the Kapela Burial Cave:

> The secret cave of Kapela in Iao was Maui's noted burial place and is situated at Olopio, close beside the cliff of Kakae at Kalahiki. It is said that the entrance is under water and another one is on the sheer precipice on the left side. There the well known ruling chiefs, those with supernatural traits, strong men and famous persons who served their chiefs in a marvelous way were buried […] There also were put the important chiefs of Maui, namely: Heleipawa, Aikanaka, Kahaianuia, Hema, Luanuu, Kamea, Hua, Pau, Paumakua, Haho, Palena, Hanalaaiku, Kakaalaneo, Kekaulike, Kamehameha-nui and Laka and last of all Kalanikuihonoikamoku who died in 1736. The very last chiefs that were laid there, according to reports, were Kaeokulani, Keopuolani, Nahienaena, and Keokianapauokalani but some said that the last three were hidden away in the sea, several hundred ruling chiefs were placed in this secret cave and many valuables of every description. [Sterling 1998:80]

In the article *Iao Valley*: *The Yosemite of Hawaii* which appears in *The Mid-Pacific Magazine* from February 1912, W.H. Field also discussed the Kapela Burial Cave.

> Perhaps Kapela, the highest peak of the Lihau ridge, overlooking Olowalu, is the most interesting one in Iao. Among its dark recesses, is the cave containing the bones of the kings and chiefs of Maui. In this cave were supposed to have been hidden the bones of Kahekili, King of Maui, and Kalanikupule, his son, and other royal personages of Maui. There is no doubt that this cave known as Kapela-kapu-o-na-lii, contains treasures of untold value. Not only bones of high chiefs and chiefesses were hidden for fear of being made into fish hooks, etc., but feather cloaks or royal ahuulas belonging to King Kahekili and other Maui rulers may be there still. [Field 1912:151]

Additional chiefs buried in the Valley of 'Īao includes the Maui chiefs Pi'ilani (Ashdown 1971:7) and Kauholanuimahu (Ashdown 1971:24). The Maui chief Kekaulike "died in 1736 at Lelekea Gulch near Kaupo and was carried to Iao where he was the final *ali'i* to be interred in that Sacred Valley of Kings" (Ashdown 1971:54-55).

3.3 *‘Ōlelo No‘eau* (Proverbs)

Hawaiian knowledge was shared by way of oral histories. Indeed, one’s *leo* (voice) is oftentimes presented as *ho‘okupu* (“to cause growth,” a gift given to convey appreciation, to strengthen bonds); the high valuation of the spoken word underscores the importance of the oral tradition (in this case, Hawaiian sayings or expressions), and its ability to impart traditional Hawaiian “aesthetic, historic, and educational values” (Pukui 1983:vii). Thus, in many ways these expressions may be understood as inspiring growth within reader or between speaker and listener:

> They reveal with each new reading ever deeper layers of meaning, giving understanding not only of Hawai‘i and its people but of all humanity. Since the sayings carry the immediacy of the spoken word, considered to be the highest form of cultural expression in old Hawai‘i, they bring us closer to the everyday thoughts and lives of the Hawaiians who created them. Taken together, the sayings offer a basis for an understanding of the essence and origins of traditional Hawaiian values. The sayings may be categorized, in Western terms, as proverbs, aphorisms, didactic adages, jokes, riddles, epithets, lines from chants, etc., and they present a variety of literary techniques such as metaphor, analogy, allegory, personification, irony, pun, and repetition. It is worth noting, however, that the sayings were spoken, and that their meanings and purposes should not be assessed by the Western concepts of literary types and techniques. [Pukui 1983:vii]

Simply, *‘ōlelo no‘eau* may be understood as proverbs. The Webster dictionary notes a proverb as “a phrase which is often repeated; especially, a sentence which briefly and forcibly expresses some practical truth, or the result of experience and observation.” It is a pithy or short form of folk wisdom. Pukui equates proverbs as a treasury of Hawaiian expressions (Pukui and Green 1995:xii). Oftentimes within these Hawaiian expressions or proverbs are references to places. This section primarily draws from the collection of author and historian Mary Kawena Pukui and her knowledge of Hawaiian proverbs describing *‘āina* (land), chiefs, plants, and places. The following proverbs concerning the larger area of Wailuku come from Mary Kawena Pukui’s *‘Ōlelo No‘eau* (Pukui 1983) and Henry P. Judd’s *Hawaiian Proverbs and Riddles* (Judd 1933).

3.3.1 *‘Ōlelo No‘eau* #1481

The subsequent *‘ōlelo no‘eau* all pertain to the plains of Kama‘oma‘o in Wailuku which were famous for it‘s connection to wandering spirits.

> *Kama‘oma‘o, ka ‘āina huli hana.*
>
> At Kama‘oma‘o, land of activities.
>
> Ghosts who do not go to the *pō* of their ancestors often wander about in certain areas. Kama‘oma‘o, Maui is such a place. The activities of such ghosts usually annoy the living. [Pukui 1983:160]

3.3.2 *‘Ōlelo No‘eau* #1514

> *Ka ‘ōlohe puka awakea o Kama‘oma‘o.*
>
> The bare one of Kama‘oma‘o that appears at noonday.
>
> The plain of Kama‘oma‘o, Maui, is said to be the haunt of ghosts (*‘ōlohe*) who appear at night or at noon. Also a play on *‘ōlohe* (nude), applied to one who appears unclothed. [Pukui 1983:164]

3.3.3 *‘Ōlelo No‘eau* #1761

> *Ke kula o Kama‘oma‘o ka ‘āina huli hana.*
>
> The plain of Kama‘oma‘o – that is the place where plenty of work is to be found.
>
> A taunt to one who talks of looking for work but does not do it. The plain of Kama‘oma‘o, Maui was said to be the haunt of ghosts whose activities were often terrifying. [Pukui 1983:189]

3.3.4 *‘Ōlelo No‘eau* #1711

This *‘ōlelo no‘eau* references Wailuku in relation to battles that took place between warring chiefs on Maui.

> *Ke inu aku la paha a‘u ‘Ālapa i ka wai o Wailuku.*
>
> My ‘Ālapa warriors must now be drinking the water of Wailuku.
>
> Said when an expected success has turned into a failure. This was a remark made by Kalaniōpu‘u to his wife Kalola and son Kiwala‘ō, in the belief that his selected warriors, the ‘Ālapa, were winning in their battle against Kahekili. Instead they were utterly destroyed. [Pukui 1983:184]

3.3.5 *‘Ōlelo No‘eau* #2300

The following *‘ōlelo no‘eau* describes the four main water sources on Maui.

> *Na wai ‘ehā.*
>
> The four waters.
>
> A poetic term for these places on Maui: Wailuku, Waiehu, Waihe‘e, Waikapū, each of which has a flowing water (*wai*). [Pukui 1983:251]

3.3.6 *‘Ōlelo No‘eau* #2578

The following *‘ōlelo no‘eau* describes two ponds in Kahului, Maui: Mau‘oni and Kanahā.

> *Pākāhi ka nehu a Kapi‘ioho.*
>
> The *nehu* of Kapi‘ioho are divided, one to a person.
>
> Kapi‘ioho, ruler of Moloka‘i, had two ponds, Mau‘oni and Kanahā, built on his land at Kahului, Maui. The men who were brought from Moloka‘i and O‘ahu to build the ponds were fed on food brought over from Moloka‘i. The drain on that island was often so great that the men were reduced to eating *nehu* fish, freshwater *‘ōpae* and *poi*. The saying is used when *poi* is plentiful but fish is scarce and has to be carefully rationed. [Pukui 1983:284]

3.3.7 *‘Ōlelo No‘eau* #2647

The following *‘ōlelo no‘eau* plays on the word *luku* (massacre, slaughter) in Wailuku.

Pili ka hanu o Wailuku.

Wailuku holds its breath.

Said of one who is speechless or petrified with either fear or extreme cold. There is a play on *luku* (destruction). Refers to Wailuku, Maui. [Pukui 1983:290]

3.3.8 *‘Ōlelo No‘eau* #2912

Wailuku is spoke of as a place of shelter and refuge in the succeeding proverb.

Wailuku i ka malu he kuawa.

Wailuku in the shelter of the valleys.

Wailuku, Maui, reposes in the shelter of the clouds and the valley. [Pukui 1983:319]

3.3.9 Hawaiian Proverbs and Riddles #693

The following proverb from Judd's *Hawaiian Proverbs and Riddles* also speaks of Wailuku as a place of shelter.

Wailuku i aloha nui ia o ka malu hekuawa.

Wailuku of the westering shade, greatly loved.

Wailuku is always shady in the afternoon. [Judd 1933:56]

3.4 *Oli* (Chants)

Oli, according to Mary Kawena Pukui (Pukui 1995:xvi–xvii), are often grouped according to content. Chants often were imbued with *mana* (spiritual power); such *mana* was manifested through the use of themes and *kaona*. According to Pukui, chants for the gods (*pule*; prayers) came first, and chants for the *ali‘i*, "the descendants of the gods," came second in significance. Chants "concerning the activities of the earth peopled by common humans," were last in this hierarchy (Pukui 1995:xvi–xvii). Emerson conversely states:

> In its most familiar form the Hawaiians–many of whom [were lyrical masters]–used the oli not only for the songful expression of joy and affection, but as the vehicle of humorous or sarcastic narrative in the entertainment of their comrades. The dividing line, then, between the oli and those other weightier forms of the mele, the inoa [name], the kanikau (threnody), the pule, and that unnamed variety of mele in which the poet dealt with historic or mythologic subjects, is to be found almost wholly in the mood of the singer. [Emerson 1965:254]

While *oli* may vary thematically, subject to the perspective of the *ho‘opa‘a* (chanter), it was undoubtedly a valued art form used to preserve oral histories, genealogies, and traditions, to recall special places and events, and to offer prayers to *akua* and *‘aumākua* alike. Perhaps most importantly, as Alameida (1993:26) writes, "chants […] created a mystic beauty […] confirming the special feeling for the environment among Hawaiians: their one *hānau* (birthplace), their *kula iwi* (land of their ancestors)."

3.4.1 Hi‘iaka and Wailuku

The goddess Hi‘iaka, the sister of volcano goddess Pele, passed through Wailuku, Maui during her epic journey throughout the Hawaiian Islands. When Hi‘iaka's *aikāne* (close friend) Wahine‘ōma‘o complained of hunger during their travels along a *kaha* (hot dry shore) portion of northern Maui, Hi‘iaka offered the following chant:

Ke kahulihuli a ka papa o Wailuku;	As trembles the plank at Wailuku (So trembles the fate of the king):
He ole ke kaha kuai ai, e:	There's no market where to buy meat;
Ho-mai he ai;	Give the stranger, then, something to eat:
Ho-mai ana ua ai, e!	Give us, I pray, of your meat.

[Emerson 1915:74]

Hi‘iaka and Wahine‘ōma‘o were met with little hospitality after their appeal for food was largely ignored by the areas residents. Hi‘iaka then offered the following chant making "known her wish, concluding her appeal with ominous threats against the life of the king, in case her demands were not met" (Emerson 1915:75-76).

E Wai-hinano, wahine a ka po‘ipo‘i, e,	O Waihinano, thou soul-grabber,
Ua make ke alii, ka mea nona nei moku.	Dead is the king of this island;
He pua‘a kau ka uku no Moloka‘i;	Moloka‘i shall offer a boar;
He ilio lohelohe Lana‘i;	Lana‘i's a half-baked dog;
A pale ka A-a ka Kanaloa;	Kanaloa fends off the A-a;
He puo‘a kai Molokini:	Molokini buffets the waves.
Huli ka ele o na Hono;	The ship of state turns turtle:
Haki kepakepa na moku;	What wailing and beating of breast!
Pa‘iauma ka aina;	Wild anguish of child and of ghost
Uwē kamali‘i, uwē ka hanehane —	O'er the sandy plain of Kama‘o.
Ke uwē la i ka pili,	The districts are frenzied with grief
I ke kula o Ka-ma‘o-ma‘o;	Tearing of hair and breaking of teeth
Ka‘a kumakena o Maui, e!	One wail that lifts to heaven.
la wai Maui?	Who shall be heir to this Maui land?

[Emerson 1915:75-76]

3.4.2 The Mirage of Mana

Wailuku is mentioned within the *oli* "The Mirage of Mana" which appears in the *Story of Lonoikamakahiki* (Fornander 1916-17b:IV:III:256-363). According to the *mo‘olelo*, Kākuhihewa challenges Lonoikamakahiki, ruling chief of Hawai‘i, to recite the *oli* "The Mirage of Mana."

Kākuhihewa believes the *oli* was written in honor of his name, however, Ohaikawiliula, a chiefess from Kaua‘i, had already imparted the *oli* to Lonoikamakahiki. Lonoikamahiki then recites the *oli* defeating Kākuhihewa. The *oli* recites the five divisions of Wailuku from land sections, gulches, bays, beaches and fishing cites.

O na Mahele i Wailuku.	Of the division in Wailuku.
Ka umi-	The tenth.
Kahi Koolau-e,	One is Koolau,
Kahi Wailuku-e	One is Wailuku,
Kahi Paie,	One is Paie,
Kahi Kahookuli ke haele:	One is Kahookuli in going.
Elua-	Two-
Elua ku mai,	Two stand up.
Elua-	Two-
Elua noho ae,	Two sit down.
Elua-	Two-
Elua Pili wale i Keaahala,	Two are inclining against Keaahala.
Elua-	Two-
Elua Nuailua,	Two Nuailua.
Ekolu-	Three-
Ekolu Makaiwa,	Three Makaiwa.
Ekolu-	Three-
Ekolu Papa,	Three foundations.
Eha-	Four-
Eha Waipio	Four Waipio.
Eha-	Four-
Eha ka uka i Halehaku	There are four in the uplands of Halehaku.
Elima-	Five-
Elima Pauewela,	There are five Pauwela.
Elima-	Five-
Elima Huleia.	Five Huleia.
Elima-	Five-
Elima na kanaka,	There are five people.

Alualu o ke kaha wale i Paie,	Chasing each other on the lonely coast of Paie.
He oi ahiku,	The one in the lead is the seventh.
Ehiku Pulehu,	There are seven Pulehu
Ehiku Mana,	There are seven Mana,
Ehiku ka ohia i Paukauwila:	The Ohia of Paukauwila is the seventh.

[Fornander 1916-17b:IV:III:284-285]

The *oli* is also recited by Kaikilani, Lonoikamakahiki's wife, upon her arrival in Kailua, O‘ahu from Hawai‘i (Fornander 1916-17b:IV:III:302-303). Both *oli* contain variations of the following lines:

Kahua aolelo Wailuku-e	Wailuku is the locality of flying clouds.
He Aha Kula-loa?	What is board Kula?
Kaupaka Lanakila.	It is open upland.
Kaluianui o Kaluanui,	Kaluanui of Kaluanui,
Ke ku la i na puu mahoe;	It stands by the twin hills,
Na hale loulu a Kane,	The palm houses of Kane,
I ako no‘u Auwahi.	Which were thatched for me at Auwahi

[Fornander 1916-17b:IV:III:284-85]

3.4.3 Ke‘elikōlani

In an *oli* to Ke‘elikōlani composed by Pipi (Fornander 1919-20b:VI:III486-487), Wailuku is mentioned in relation to "*malu kuawa*" which translates to "shelter of the valley" (Pukui & Elbert 1986:158). Also mentioned in the *oli* is the I‘a-iki wind.

Kapukoaku, kai kohola ka lani.	The standing coral of the shallow sea, the chief.
Kai luu o ke kai uli hohonu,	Overturning waves of the dark deepsea,
E kihe ai ka ihu, me he naia la.	Diving its crest there as a porpoise
E no ai I ke kapu o lakou,	According to their kapu.
5. Kanahae makawalu nono o ke ‘lii	5. Diminishing numerous noise of the chief.
Kahiki wahie aloaloa,	Kahiki scattering timber
Loaloanui ia ka lani	Exceedingly long is the chief
Kaumakamano, he mano he naha na ‘lii	Kaumakamano, a shark, a shark for chiefs.

Hookahi lau konahala ke kapu;	In one season the kapu passed;
10. Kapu hoi paha Kekelaokalani;	10. May be Kekelaokalani was kapu also.
Ka auhuhu hoi ia e lena ai ke kai,	The poison plant it was, yellowing the seas.
E onioni ai ka ia, make i ka hola;	Stupifying the fish, deadened by the intoxicating plant;
E kapalili ai i ka ili o ke kai,	Fluttering on the surface of the sea,
He kai hoonee; he kai oki apu,	A moving sea; a cross, chasing sea.
15. Kahiwalele kapu kalani, o Keelikolani la.	15. Kahiwalele kapued the chief Keelikolani;
Ku Kauiki pa kohana i ka makani,	Kauiki stands bare in the wind,
Hoohalulu i ke kai o Kaihalulu	Trembling by the sea of Kaihalulu
Ke oi a lau i ka makani,	Greatly increased by the wind,
E kali ana i ka ua Paiolopawa,	Waiting for the piolopawa rain
20. I ka hili kua ia e ke Koholalele,	20. On the stricken back of the Koholalele.
Lele ka hauli o Nalualele i kai	The dark shadow of Nalualele leaps seaward.
Ke komi komi'a iho la e ka lau awa,	Reducing gradually the lauawa [wind].
Wai kea hana na huli ka amau,	Hana was water-whitened as the fern changed
O na malo o Kama i Kualihau e!	The malos of Kama in Kualihau.
25. ae paha aohe wahahee, aho o koe aku e!	25. Perhaps so, without falsehood, be patient till more follows.
Koe Auhi, pakele aku o Kahikihui,	Excepting Auhi, Kahikinui escaped,
Lilo aku la i na lima o ka naulu,	Taken by the force of the naulu [wind];
Ulu ae la Kalupua e ka makani,	Grown are the flowers scattered by the wind;
Lomi'a iho la na maka o ke aalii,	Destroyed are the shoots of the aalii,
30. Enaena wela I ka la.	30. Scorced by the sun.
O Lualailua i ke kula la,	Lualailua of the plain,
Welo Waiahualele, lele ke ahi o kula maalo i ka maka;	Waiahualele fluttering, the fire of kula attracts the eye,

Weli oaka, a i uka o Koanaulu e!	Suddenly brightened up above Koanaulu!
Ae paha, oahe wahahee e hookoe aku e!	Yes, perhaps, without falsehood to be set aside.
35. Koe Wailuku i ka malu Kuawa,	35. Except Wailuku in the shade of Kuawa
Ke hoopaio la me Kaiaiki, me ke Kaahaaha.	In the contentions of Kaiaiki with Kaahaaha.
Anu o Niua, hamo ke kilioopu ka o kai,	Niua was cold; the grass waved towards the sea.
Pohu ke kaha maloko o Hupukoa,	Calm was the channel within Hupukoa,
Hoopaaia i ka uwahi a ke kai,	Withheld was the spray of the sea;
40. He uwahi kai no Papale.	40. A sea-spray for Papale
Kailiu ke hoale la, i ike kumu o ka maomao e!	Stirred up by the salt sea seeking [the] roots of green verdure,
Ae paha, aohe wahahee e hookoe aku e!	Perhaps so, without falsehood to be set aside.

[Fornander 1919-20b:VI:III:486-487]

The phrase "*malu kuwawa*" also appears in Lahainaluna Chants, a dirge composed for L. L. Ua, a Lahainaluna teacher, by his students following his death in February of 1854 (Fornander 1919-20c:VI:III:525). The English translation defines "*malu kuwawa*" as "dark clouds."

60. Malamalama kea lo pouli ke kua.	60. Before was the light and darkness at the rear.
Papale na maka i ke aloha.	Close thy eyes with love.
Ke hoi nei ka uhane I ka malu niu o Lele;	The soul is returning to the coconut grove of Lele;
I ka malu kuwawa o Wailuku;	To the dark clouds of Wailuku;
I ka ua naulu noe anu o Kula;	To the cold misty rain of Kula;

[Fornander 1919-20c:VI:III:525]

3.5 *Mele* (Songs)

The following section draws from the Hawaiian art of *mele*, poetic song intended to create two styles of meaning.

> Words and word combinations were studied to see whether they were auspicious or not. There were always two things to consider the literal meaning and the *kaona*, or 'inner meaning.' The inner meaning was sometimes so veiled that only the people to whom the chant belonged understood it, and sometimes so obvious that anyone

> who knew the figurative speech of old Hawai‘i could see it very plainly. There are but two meanings: the literal and the *kaona*, or inner meaning. The literal is like the body and the inner meaning is like the spirit of the poem. [Pukui 1949:247]
>
> The Hawaiians were lovers of poetry and keen observers of nature. Every phase of nature was noted and expressions of this love and observation woven into poems of praise, of satire, of resentment, of love and of celebration for any occasion that might arise. The ancient poets carefully selected men worthy of carrying on their art. These young men were taught the old *meles* and the technique of fashioning new ones. [Pukui 1949:247]

There exist a number of *mele* that concern or mention Wailuku. These particular *mele* may also be classified as *mele wahi pana* (songs for legendary or historic places).

3.5.1 Na Wai ‘Ehā O Maui

This *mele* was composed by Alice Namakelua in 1940 for the Kamehameha Day Celebration in Honolulu. The four waters of Maui, including that of Wailuku, are mentioned in this *mele*.

E Maui nui o Kama	Great Maui of Kama
‘Āina ua kaulana	Famous land
O ka heke i‘o no ‘oe	You are truly superior
Ua lohe ‘ia ‘a puni ka honua	Heard around the earth
‘Āina ‘oe ua wehi	You are the land adorned
Ua ‘ohu e ka roselani	Adorned by the rose
He pua ho‘i nāu e lei	A flower for you to wear as an adornment
A e ha‘aheo mau ai ‘oe	And continue to wear in pride
Kaulana nā wai ‘ehā	Famous are the four waters
He puana he inoa he ha‘ina	A refrain, a name, an answer
Waikapū, Wailuku, Waiehu	Waikapū, Wailuku, Waiehu
A‘o Waihe‘e iho ia wai	Water descends in Waihe‘e
He inoa nēia nou	This is a name chant for you
E Maui nui o Kama	Great Maui of Kama
Ha‘aheo ‘oe i ka roselani	You are cherished with pride because of the rose
E ō mai i kou inoa	Reply to your name

[Huapala n.d.a]

3.5.2 No Na Wai ‘Ehā

This twentieth century *mele* composed by Scott Hai references Wailuku and other locations on Hai’s beloved island home of Maui.

I Waikapū ke aloha	My love is at Waikapū
Ka makani Kokololio	The gusty wind named Kokololio
Pili i ka poli nahenahe	Held close to the soft bosom
He ‘īnikiniki mālie	Gently pinching
I Wailuku iho ‘oe	You went down to Wailuku
I ka piko a‘o ‘Īao	To the summit of ‘Īao
Lihilihi o ka pua rose	Petals of the roses
He ‘īnikiniki mālie	Gently pinching
I Waiehu iho ‘oe	You went down to Waiehu
Ka makani Hō‘ehaili	Hō‘ehaili, the wind that pierces the skin
Me ka uhi wai a‘o uka	With the thick fog of the upland
He ‘īnikiniki mālie	Gently pinching
I Waihe‘e kāua	We were at Waihe‘e
Ka makani Kili‘o‘opu	The wind named Kili‘o‘opu
Me ka wai a‘o Eleile	And the water of Eleile
He ‘īnikiniki mālie	Gently pinching
I Lahaina iho ‘oe	You went down to Lahaina
Ka makani Kaua‘ula	Kaua‘ula, the strong mountain wind
Me ka malu ulu a‘o Lele	Amid the shade of the breadfruit trees of Lele
He ‘īnikiniki mālie	Gently pinching
Ha‘ina mai ka puana	Tell the refrain
No na wai ‘ehā	Of the four water
E ho‘i no e pili	Return and let us be together
He ‘īnikiniki mālie	Gently pinching

[Huapala n.d.b]

3.5.3 Waikapū/‘Iniki Mālie

This song describes the winds of the four water-lands in Maui: Waikapū, Wailuku, Waiehu, and Waihe‘e. The meaning of each name is described below by Pukui et al. (1974). Waikapū, water of the conch. A conch found in a cave in this area could be heard anywhere throughout the Hawaiian Islands. It was stolen by a supernatural dog named Puapualenalena whose name meant yellow tail feathers. Wailuku, water of destruction. Wailuku was the battle site where Kalani‘ōpu‘u’s army was nearly annihilated by Kahekili. Waiehu, meaning water spray and Waihe‘e, meaning slipping water.

Waikapū makani Kokololio,	Waikapū wind in gusts,
He makani houhou ‘ili ‘inisinisi	Skin-stinging wind gently pinching.
(‘inikiniki) mālie.	
Wailuku makani Lawemālie,	Wailuku wind becoming gentle,
He makani houhou ‘ili ‘inisinisi	Skin-stinging wind gently pinching.
(‘inikiniki) mālie.	
Waiehu makani Hō‘eha‘ili	Waiehu wind paining the skin,
He makani houhou ‘ili ‘inisinisi	Skin-stinging wind gently pinching
(‘inikiniki) mālie.	
Waihe‘e makani Kili‘o‘opu	Waihe‘e graceful wind,
He makani houhou ‘ili ‘inisinisi	Skin-stinging wind gently pinching.
(‘inikiniki) mālie.	
Ha‘ina mai ana ka puana,	Tell the refrain,
He makani houhou ‘ili ‘inisinisi	Skin-stinging wind gently pinching.
(‘inikiniki) mālie.	

[Huapala n.d.c]

Section 4 Historical Background

4.1 Pre-Contact to Early Post-Contact Period

The division of Maui’s lands into political districts occurred during the rule of Kaka‘alaneo, under the direction of his *kahuna*, Kalaiha‘ōhi‘a (Beckwith 1970:383). This division resulted in twelve districts, or *moku*, on the island of Maui during traditional times: Kula, Honua‘ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko‘olau, Hāmākua Loa, Hāmākua Poko, Wailuku, Kā‘anapali, and Lāhainā (Sterling 1998:Preface). The *moku o loko*, or *moku* as it is most commonly called, literally means “to cut across, divide, separate” (Lucas 1995:77). When used as a term of traditional land tenure, a *moku* is akin to a political district, an overall land division that can contain smaller divisions of land such as *‘okana*, *kalana* (division of land smaller than a moku; county), *ahupua‘a*, *‘ili*, and *mo‘o* (narrow strip of land, smaller than an *‘ili*). The current project area is located in coastal Kahului within the traditional boundaries of the *‘īli* of Kalua, just south-east of Mauna Kahalawai [West Maui Mountains] in the *ahupua‘a* of Wailuku.

The lands of Wailuku are traditionally known as the “locality of flying clouds” (Fornander 1916-17b:IV:III:286). The *ahupua‘a* of Wailuku, Waikapū, Waiehu, and Waihe‘e were collectively referred to as “Nā Wai ‘Ehā” or “The Four Waters” (Handy et al. 1991:496). Nā Wai ‘Ehā consisted of four deep valley streams that watered four distinct areas of *kalo* (taro) land, which spread out fanwise to the shoreline (Handy et al. 1991:272). According to Kame‘eleihiwa (1992:241), the combined area of these four *ahupua’a* was once known as “Pu‘ali Komohana,” which means “western sun-setting isthmus (Andrews 1865:73). Much of the historical and traditional information for the Kahului region comes from portions of Wailuku Ahupua‘a with populations located in the uplands, along the streams and valleys of Mauna Kahalawai.

4.1.1 Habitation and Subsistence

The relative scarcity of recorded coastal place names for Kahului may be an indication of a population that was widely spread out between settlements with denser populations at Wailuku and settlements further east beginning at Hāmākua Loa. The upland portion of Wailuku Ahupua‘a was resplendent with vast taro fields fed by the ‘Īao Stream. The fertile valleys of four major perennial streams of windward West Maui Mountains formed the largest continuous area of wet-taro cultivation in the Hawaiian Islands (Handy 1940:496). The high degree of cultivation within Wailuku Ahupua‘a, along the flood plain of ‘Īao Stream, gives evidence that a substantial population would have been established in the region during the pre-Contact period.

Kalo was perhaps the most distinguished plant within traditional Hawaiian horticulture and society. This is echoed in pre-Contact descriptions of agricultural cultivation in Wailuku which are dominated by passages illustrating the prominence of *kalo*. Handy and Handy describe the multifaceted role taro played in the pre-Contact era and its significance in the socio-cultural order:

> The function and nature of the taro plant, its cultivation and use, were responsible not only for its primal place in mythology but for the fact that the cult associated with it, namely that of the male god Kane (= Wakea) as first procreator, and of *Ka-wai-‘ola-a-Kane* or “The-life-giving-water-of Kane,” although less elaborated than that of the rain-father Lono, was more fundamental, not only in Hawaii but

> throughout Polynesia. It was, in fact, the basic cult of the primal procreator of nature and man, out of the union of Sky and Earth.
>
> Actually the course of fresh-water streams and ditches patterned the entire subsistence economy, and through this, the whole round and cycle of individual and social activity. The streams and ditches were the regulators, the law givers, in communal relationship; not directly, but because upon their water depended the taro, and upon the taro depended man.
>
> The requirements of labor, in connection with building and maintenance of dams, ditches, terraces, and embankments, and the planting, tending, and harvesting of the taro, determined the ordering of cooperative work and relationships between individuals and families within the community. This cooperation in turn was responsible for the obligations in the matter of work required of individuals and the right of individuals and families to a share in the products.
>
> Finally, taro in its habit of growth established a biological prototype of the form in which heredity and relationship were conceived. The taro growth supplied one of the terms in which the family system of the civilization was framed: *‘ohana*, meaning the dispersed biological family group as a whole. *‘Oha* means a shoot or sucker from the base of a plant, but essentially and primarily was applied to the buds from the corm of the taro that were broken off and replanted by the gardener. With the substantive suffix added, *‘oha-na* literally means “offshoots,” or “that which is composed of offshoots.” The family stock, then, budding and branching from parent stocks, was conceived of in terms of the habit of reproduction of the taro. [Handy and Handy 1972:76]

During an 1828 tour around Maui, missionaries Richards and Green noted the fertility of the Wailuku region. In an excerpt from a letter penned in 1830 and published in the Missionary Herald in 1831, Richards and Green (1831:182) described Wailuku as “a populous and fertile district on the windward side of the island, … a very desirable place for a new station…” They further relayed their observations as follows:

> No district of equal extent on the islands, produces more abundantly the necessaries of life, than Wailuku. Indeed, many districts on Maui and some parts of Hawaii depend for sustenance on this favored valley. It contains of course a numerous population… The district of Wailuku would furnish sustenance for an immense population. [Richards and Green 1831:182]

Handy et al. (1991) describe the stream of Wailuku as the great torrent that drains the highest cloud-capped uplands of western Maui through the deep ‘Īao Valley. The agricultural landscape of much of the upper section of present-day Wailuku is built on old terrace sites:

> Along the broad stream bed of Īao Valley, extending several miles up and inland, the carefully leveled and stone encased terrace 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… It is significant that here, as at Waihe‘e, the old terrace were adapted to market gardening (Chinese bananas, vegetables, and flowers) by Japanese and Portuguese gardeners. [Handy et al. 1991:497]

The well-watered ‘Īao Valley also provided ample shrimp, taro, and fish but was only accessible to commoners during the season of *Makahiki* (James 2002:62). *Makahiki* is the ancient festival beginning about the middle of October and lasting for about four months incorporating sports, religious festivities, and taboo on war.

Two named Native Hawaiian ‘*auwai*, Kalaniauwai and Kamaauwai, were constructed for irrigating *kalo* on the alluvial plains that stretch both north and south of the Wailuku River (Lonoaea v. Wailuku Sugar Co. [9 Haw. 654], the latter of which is a contributing feature to Maui Historic District 3 and still in existence. Beyond the alluvial sediments of the stream valley as the lower elevations lead into the central isthmus of Maui, the landscape was once dominated by windswept Pleistocene sand dune deposits. The following excerpt of a newspaper article published in Pacific Commercial Advertiser distinguishes the differences between the two areas:

> The isthmus of Waikapu [and Wailuku] lies but little above the level of the sea, and is composed of dry sand. Since the goats and cattle have been allowed to run there, they have destroyed the vines and bushes which served to confine the sand on the windward side, and the “dunes” have been driven nearly to the leeward beach, and will soon usurp the whole of the lower part of the isthmus. The wind here rushes across in fierce gusts between the two divisions of the island, and renders the navigation of the bay at times quite dangerous. On the western slope of the isthmus, and towards the windward side, lie the cultivated portions of Waikapu and Wailuku, which, with the valleys behind them, are very fertile. [Anonymous 1858:409]

Traditional habitation and cultural activities centered on ‘Īao Valley and present-day Wailuku Town vicinity. However, most Wailuku Ahupua‘a lands lay in the large eastern extension, which includes Kahului Harbor (current project area) and continues east beyond Spreckelsville. This approximately 24,000-acre eastern portion of Wailuku Ahupua‘a, known as Ke Kula o Kama‘oma‘o and also referred to as Wailuku Commons, differs pronouncedly from the western portion of the *ahupua‘a* in the virtual absence of permanent habitations until the very late nineteenth century.

A description of Wailuku Ahupua‘a configuration was given by W. D. Alexander in *A Brief History of Land Titles in the Hawaiian Kingdom*: “On Maui the lands of Waikapu and Wailuku appropriated almost the whole of the isthmus so as to cut off half of the lands in the district of Kula from access to the sea” (Alexander 1890:106). A possible explanation for this might include an effort by the politically powerful land division of Wailuku to secure valued resources in the eastern portion of greater Kahului Bay. In addition to common marine resources, drift resources, such as drift logs from the Pacific Northwest, ivory from drifting whale carcasses, and iron embedded in drifting ships or flotsom, may have also been collected in the great bay of Kahului due to its exposure to trade winds.

Another possible explanation is that the northeastern portion of the isthmus was held by Wailuku for political purposes. Ross R. H. Cordy (1981:198-200) suggested a “buffer zone” extended across the central portion of Maui Island., which presumably served as a relatively unoccupied border or “no man’s land” between the two powerful competing societies of Maui

(West Maui and East Maui) until the unification of Maui under the ruling chief Pi‘ilani circa 1600. Cordy’s theory suggests that Wailuku held the northeastern portion of the isthmus in order to minimize conflict with the forces of East Maui. Evidence suggests that the Hawaiians of Wailuku were not particularly interested in living in the eastern portion of the *ahupua‘a*, strongly favoring the vicinity of ‘Īao Stream instead. Economic reasons certainly would have existed for excluding Kula people, particularly by reserving access to marine resources. Politically, by limiting coastal access, the population of Kula was kept low, and tensions with East Maui were minimized.

The current project area is located along the shores of Kahului Bay, which is just east of the northern extent of Wailuku Sand Hills (Figure 14). The Sand Hills comprise a significant portion of Kama‘oma‘o and are traditionally, historically, and archaeologically known for the presence of numerous Hawaiian burials.

4.1.1.1 Fishing

The Kahului Harbor area traditionally was known for its fishing grounds. In 1837, the entire population of Kahului lived in “twenty-six pili grass houses” and relied upon the ocean for much of their food (Bartholomew and Bailey 1994:133). In an account published in *Paradise of the Pacific* in September 1900, a “native of considerable age” also noted that the “shores of Kahului harbor, from Waihee Point to Haiku, were surrounded with the grass huts of the fishermen […]” (*Paradise of the Pacific*, September 1900 in Silva n.d.:10).

Inland of the Kahului Harbor are the fishponds described by Ashdown as “Kahana and Ma‘oni at Kahului.” The traditional fishing culture of this region includes the belief that “Ai‘ai [who had been bequeathed with] his magic fishhook named Mana-i‘a-ka-lani,” caused the schools of fish known to this region to proliferate as long as those who used the fisheries made the proper use of fishing shrines erected along the shoreline, which were dedicated to the father of Ai‘ai – Ku-ula (Ashdown 1970:24). The *ko‘a o Ku-ula* (the fishing shrines of Ku-ula) of this region, as well as all of East Maui, were reputedly constructed by Ai‘ai in ancient times (Ashdown 1970:24).

The type of fishing performed at Kahului was net fishing, according to Kahā‘ulelio (Kahā‘ulelio 2006:163), as he observed this type of fishing in 1874, the fishermen utilized *kolo* (to pull) nets, and the process was described:

> …at Kahului fishing with draw nets for *‘ō‘io* [*Albula vulpes*] was done. The nets were like the papa net, from a fine mesh smaller than a fingertip to two, three and four fingers’ width. Long curtain nets were affixed to the sides.” [Kahā‘ulelio 2006:163]

Successful fishing occurred along the coastline of Kahului, Kaunoa, and Pā‘ia because of the shallow, ancient, consolidated calcareous reef that provided shelter for octopus and juvenile stages of large pelagic fish, such as the *‘ulua* or island trevally (*Carangoides orthogrammus* and *Carangoides ignobilis*).

Interviewee Dr. Fisher noted that the area along the coastline of Kahului Harbor was “a popular place, it was fairly, relatively, densely populated area or at least there was early habitation sites all along here.” He mentioned that early inhabitants constructed *loko i‘a* (fishponds) which were either *loko kalo i‘a* (taro fishponds) or *loko pu‘uone*. He also mentioned that the fishing village of Ka‘a was located not far from Kanahā Pond. He added that Ka‘a Village had a “fairly large

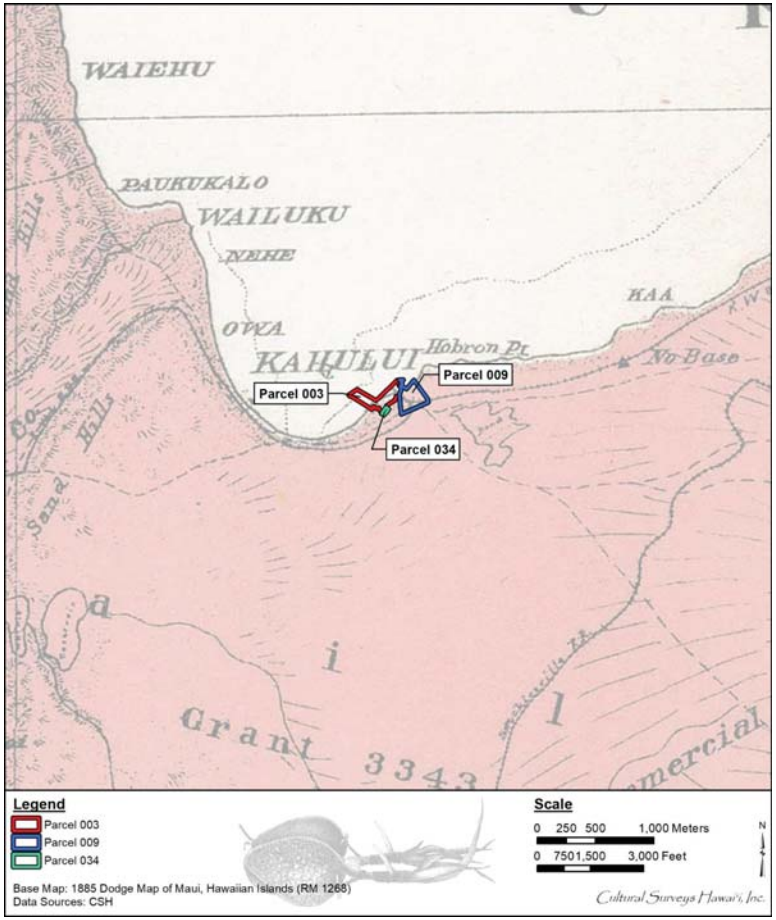


Figure 14. Portion of Dodge (1885) map showing Sand Hills west of the project area and Land Grant 3343 encompassing the entire project area and surrounding vicinity

population," however, by the late 1930s or 1940s, the village was mostly eliminated due to the construction of NAS Kahului.

4.1.2 Politics and Warfare

By the second half of the eighteenth century, Maui *ali‘i* - including the ruling chief Kahekili – reportedly had been residing at Wailuku enjoying the surf of Kehu and Ka‘akau (Kamakau 1992:83).

While the chiefly intra-island rivalry between East and West Maui was settled, the political rivalry between the *ali‘i* of Hawai‘i Island and Maui Island continued. Where Hāna had been the primary stage of battle, Wailuku would come to take a central role in the fight for political gain during the latter half of the eighteenth century. It was in the sand hills of Wailuku that Kahekili and his forces from O‘ahu and Maui would do battle with the armies of Kalani‘opu‘u, chief of Hawai‘i, that had invaded Maui.

Between the years 1775 to 1779 there was continual fighting between Kalani‘opu‘u of Hawai‘i and Kahekili of Maui (Kamakau 1992:84). King Kahekili, the son of Kekaulike and younger brother of Kamehameha-nui, had become a renowned warrior (Kamakau 1992:87). His army of hand-picked warriors were known by their tattoos; half their bodies were tattooed black, even the inside of their eyelids and their gums. Following a losing battle at Kaupō in 1775, Kalani‘opu‘u dedicated several war *heiau* on Hawai‘i Island to aid in the defeat of Kahekili. Upon hearing this news, Kahekili sent for the *kahuna* Kaleopu‘upu‘u, who directed construction of the *heiau* of Kaluli and Pu‘uohala on the north side of Wailuku. When Kaluli Heiau was completed, Kaleopu‘upu said to Kahekili, "This is the house of your god; open the sluice gate that the fish may enter" (Kamakau 1992:85).

4.1.2.1 Battle of Kakanilua

In 1776, the army of Kalani‘ōpu‘u landed at Keone‘ō‘io, with war canoes extending all the way to Mākena, and proceeded to ravage the countryside. Kalani‘ōpu‘u then landed with additional forces at Kīheipuko‘a at Keālia to Kapa‘ahu (Kamakau 1992:85). Here his elite army of *‘Ālapa* and *Pi‘ipi‘i* warriors, 800 men strong, landed ready for war. It was alleged that these men were of equal stature and all carried spears of identical length. Their appearance is related as a being a "magnificent spectacle" marching across the plains of Kama‘oma‘o wearing their feather cloaks and helmets. They were ready to battle, Kahekili at his stronghold across the isthmus at Wailuku. Their army was said to be eager to drink the waters of the Wailuku Stream (Fornander 1880:152-153).

Samuel Kamakau recounts the invasion of Kalani‘ōpu‘u:

> Across the plains of Pu‘u‘ainako (Cane-trash-hill) and Kama‘oma‘o shone the feather cloaks of the soldiers, woven in ancient pattern and colored like the hues of the rainbow in red, yellow and green, with helmets on their heads whose arcs shone like a night in summer when the crescent lies within the moon. Kahekili was at Kalanihale just below Kihahale and above the plateau of Ka‘ilipoe at Pohakuaokahi. Said Kaleopu‘upu‘u to Ka-hekili, "The fish have entered the sluice; draw in the net." [Kamakau 1992:85]

The forces of Kahekili descended on and destroyed the soldiers of Kalaniopu‘u, slaying the elite soldiers of Kalaniopu‘u on the sand hills at the southeast of Kalua (Sterling 1998:88):

> ...the Maui army had the advantage of a well-chosen position. The Hawaiians had to fight uphill or else drift down to the sand hills. In either case advance was difficult… There was a full day of savage fighting, marked by inhuman acts of awful brutality. The native account of the battle says: "It was not a war characterized by deeds of princely courtesy." Many noted names of valiant chiefs were never again mentioned in Hawaiian story. The story and the life ended together in this Wailuku battle. [Westervelt 1977:139-140]

The battle that took place received the name "The furious destruction at Kakanilua," named after the sand hills below Wailuku. Only two men escaped to Kīheipuko‘a [Kīhei] to tell Kalaniopu‘u the news of their defeat. After a second day of warfare, Kalaniopu‘u sued for peace and was granted such by Kahekili and his messengers. Kalaniopu‘u then returned home to Hawai‘i Island (Kamakau 1992:88-89).

Furthermore, Kamakau specifies that:

> The great battle took place between Waikapu and Wailuku. Ka-lani-‘opu‘u expected to enter Wailuku at Kakanilua, but Ka-hekili's men rose at dawn and occupied the sandhills of Kama‘oma‘o, and a portion of them took their stand on the side toward Waikapu turn, so that the forces of Ka-lani-‘opu‘u, who had supposed that the battle would be at Kakanilua, found a divided front from which spears, javelins, and other missiles poured like water. Death-dealing weapons poured down like a swift rainstorm beating the sides of the fisherman's canoe and agitating the surface of the sea like a cloudburst over the deep ocean. The terrified soldiers were surrounded and took to flight; they were driven by Ka-hekili‘s men like leaves before a whirlwind. The plains of Kama‘oma‘o became like a fishpond through whose sluice gate the sea flooded, Ka-lani-‘opu‘u‘s men [became] like the mullet driven by the sound of beating into the sluice gate of ‘Uko‘a; and the sea rose up to the walls. Like the fiery petals of the lehua blossoms of Pi‘iholo were the soldiers of Ka-hekili, red among the leaves of the *koa* trees of Liliko‘i or as one glimpses them through the *kukui* trees of Ha‘iku. Like the creeping branches of the *‘ulei,* so moved the cloaked warriors, young and middle-aged, over the *‘ilima*-covered plain of Paholei. A chill seized Ka-lani-‘opu‘u as he crouched in the canoe, mourning the dead who lay like fish stupefied by the poison spread by the great fisherman, Ka-hekili. Like grasshoppers on the plain, easily to be caught by women, so they lay in the heat of the sun snuggled close to the blossoms of the grasses. [Kamakau 1992:87]

Kalani‘ōpu‘u's army was annihilated in what was called *Ahulau Ka Pi‘ipi‘i i Kakanilua* or Slaughter-of-the-Pi‘ipi‘i-at-Kakanilua (Kamakau 1992:86), one of the most legendary battles of pre-Contact Hawai‘i.

4.1.3 Captain Cook's Arrival in Maui

When Captain James Cook and his ships *Resolution* and *Discovery* first encountered the island of Maui on 26 November 1778; his ship *Resolution* was positioned three miles off Kahului. He recorded in his logbook:

> In the country was an elevated saddle hill, whose summit appeared above the clouds. From this hill, the land fell in a gentle slope, and terminated in a steep rocky coast, against which the sea broke in a dreadful surf. Finding that we could not weather the island, I bore up, and ranged along the coast to the Westward. It was not long before we saw people on several parts of the shore, and some houses and plantations. The country seemed to be both well wooded and watered; and running streams were seen falling into the sea in various places. [Speakman 1978:23]

Cook records that the Hawaiians who came out in canoes to trade for supplies appeared "to be of the same nation with the inhabitants of the islands more to leeward [i.e., O‘ahu and Kaua‘i] which we had already visited [ten months earlier in January 1778]; and… they knew of our having been there" (Speakman 1978:23-24).

4.2 Early Historic Period

4.2.1 The Battle of ‘Īao

By early 1786, Maui chief Kahekili had defeated the forces of O‘ahu, and consolidated his control over all of the islands except Hawai‘i. Peace did not prevail for long. In 1790, ‘Īao Valley was the site of the last great conflict on Maui. Kamehameha I of the island of Hawai‘i landed at Kahului, in Wailuku, to battle the army commanded by Kahekili's son Kalanikūpule. Kamehameha's warriors used small cannons, muskets, and ammunition obtained from an American trading ship to rout the Maui defenders. Kamehameha's modern weapons struck terror into the hearts of the Maui warriors.

The 1790 invasion of Maui by Kamehameha I is memorialized in many place names within Wailuku. The Battle of ‘Īao is also known as the Battle of Kepaniwai, meaning the "Dammed Stream." Prior to the Battle of ‘Īao, Kahekili had gained control of O‘ahu, Lāna‘i and Moloka‘i. However, in 1790, the defining battle establishing Kamehameha's supremacy over the army defending Maui began at Pu‘unēnē. Crossing the channel from the island of Hawai‘i with his war fleet, Kamehameha I overwhelmed the Maui forces in Hāna en-route to engaging the main island defense force gathered along Maui's northern coastline. Kamehameha I assembled his invasion forces at Kahului. With Kahekili on O‘ahu, the defense of Maui fell to his son, Kalanikūpule. The Maui forces were swept across the isthmus and destroyed at ‘Īao Valley, above Wailuku. The high chiefs and royalty of Maui fled to other islands, and Kamehameha I went on to defeat the combined forces of Kahekili and Kalanikūpule at Nu‘uanu, on O‘ahu in 1795 (Alexander 1899:129).

The Battle of ‘Īao is said to have been one of the most bitter battles fought by Kamehameha I in his bid to control the Hawaiian Islands. The following passage recounts the Battle of ‘Īao and Kamehameha's triumph in detail, citing his arrival to Maui and route through parts of the *ahupua‘a* and *moku* of Wailuku.

> One tradition indicates that Kamehameha's war canoes landed at Kalepolepo near Keālia Pond from where he proceeded inland toward Wailuku. The four streams of this region tell the story of the unfolding battle. Kamehameha placed a *kapu* on the first stream he came to, reserving it for *ali‘i*. Waikapū ("water of the conch") was where the sacred conch shell was blown sounding the call to war. At Wailuku ("water of destruction") Stream, the battle became fierce and many warriors were killed. The Maui armies were routed and took flight by way of the third stream, Waiehu ("water spray"), kicking up the water in a frenzied dash to get away. By Waihe‘e ("squid liquid") Stream the Maui army was utterly defeated and simply melted away like the ink of a fleeing octopus.
>
> However, another description of this decisive battle speaks of a landing at the Kawela area of Kahului Bay, perhaps a second wave, where two days of fighting into ‘Īao Valley took place. Here, with the help of a cannon, a terrible slaughter of commoners took place and in such great numbers that the dead bodies dammed up the water of Wailuku Stream. It has since been referred to as Kepaniwai, or "the water dam." From here people fled to Kauwa‘upali ("precipice climbers" or "clawed of the cliff") and ‘Īao Needle, scrambling up the steep cliffs to escape. Women, children, and the elderly fled up the gulch called A‘i, now known as Black Gorge. Chief Kalanikūpule and other Maui *ali‘i* are said to have escaped over the *pali* (cliff) to Lahaina, where they secured canoes and fled to O‘ahu.
>
> Facing the valley entrance, Mauna Kane is the peak on the right, named after one of the major Hawaiian gods. On the left is Mauna Leo, meaning "voice mountain," which, according to one source was changed to Lī‘ō ("terror") after the invasion by Kamehameha. This fight between the armies of Hawai‘i and those of Maui is now known as the Battle of ‘Īao. [James 2002:62-63]

4.2.2 Observations of Early Explorers and Visitors

With the death of Kamehameha I in 1819, warfare between the ranking Hawaiian chiefs was set aside by powerful changes within traditional Hawaiian society. Four decades of interaction with American, Russian, British, and French traders had opened the way for Christianity. The establishment of a system of schools throughout the islands was vigorously pursued by the governing kings and queens of Hawai‘i, aided by the newly-arrived American Protestant missionaries beginning in 1820 (Kuykendall 1938:106).

Estimates of the early nineteenth century population of Kahului are difficult to find. In regions where Protestant missionaries had been stationed, statistical records were updated often, but the missionary out-station region of Kahului appeared to have received scant attention during the early years of the Protestant missions. In 1830, Protestant missionaries recorded school attendance figures for the out-stations of Wailuku as: Waihu [Waihe‘e] at 612 students, Waikepu [Waikapū] at 329 students, and Waiehu at 103 students, with no mention of Kahului (Richards and Green 1831). In 1831, the missionaries stationed on Maui began to advocate for the conversion of the Wailuku branch-station of the Lahaina Mission to a standalone mission station. In this same year, Auwae the *konohiki* (overseer of an *ahupua‘a*) at that time, began collecting materials for a "good stone and lime meeting-house" (Richards et al. 1829:251). In 1832, 12 years after the arrival of the first missionaries in Hawai‘i (American Board of Commissioners for Foreign Missions 1820; Bennet 1893:14) and nine years following the establishment of the Lahaina Mission Station (The Friend 1878), the official Wailuku Mission Station was formed by the Reverend Jonathan Smith

Green (Tracy et al. 1894:231). A larger meeting house with a thatched roof was erected by the congregation in 1834, and in 1836, under the direction of Reverend Jonathan Green, the construction of a stone meeting house designed by Reverend Edward Bailey was started and subsequently brought to completion in 1840 (Cummins and Fox 1973).

The initial documentation of life in Wailuku during the first half of the nineteenth century was recorded by the Protestant missionaries from their station at Wailuku in 1832. The missionary census of 1831-1832 recorded a total population of 2,256 in Wailuku Ahupua'a, comprising 918 adult males, 860 adult females, and 478 children (Schmitt 1973:18). By the time of the 1840 census, the Wailuku population had dropped to 1,364, representing a diminution of 892 in just four years (Schmitt 1973:38).

Use of the northern coastline landing at Kahului by early Europeans must have been difficult, for far more records exist of early explorers and merchant ships at anchor off of the southern, more protected coastline of Maui than along the exposed, northern coast. An account by the American missionary Rufus Anderson (1864) portrays the obstacle of landing in Wailuku District:

> We were bound to Wailuku, situated near the western side of the isthmus connecting West and East Maui. After crossing the channel the wind increased, and so rough was the sea that our landing seemed not quite safe. Mr. Alexander met us on the shore, but in such a stand-storm that we were obliged to veil our faces. We breasted the gale for a dozen miles, and near Wailuku were wet to the skin by a storm of rain. [Anderson 1864:176]

In 1840, American scientists aboard the U.S. Navy ship "*Vicennes*" landed at Lāhainā and travelled overland to the district of Wailuku, where they noted that native Hawaiian timber grew in sizes suitable for the construction of canoes (Wilkes 1845:251). Of the central isthmus they commented, "it is too dry to be fit for cultivation: it is in extent about twenty by fifteen miles. During nine months of the year it is a fine grazing country, and feeds large herds of cattle, that are mostly owned by foreigners" (Wilkes 1845:251).

James Jarves (1844), the first editor of *The Polynesian*, the third English-language newspaper in the Hawaiian Islands, included news about events in Kahului. He noted a "remarkable oscillation of the ocean" that occurred at Kahului on November 7, 1837:

> At Maui, the sea retired about 20 fathoms, and returned with great speed, in one immense wave, which swept before it houses, trees, canoes, and all else exposed to its fury. At the village of Kahului, the inhabitants, as at Honolulu, followed with rapturous delight the retreating wave, when suddenly it turned upon them, rising like a steep wall, rushed forward to the shore, burying the natives in its foam, and destroying the whole hamlet. [Jarves 1843:19-20]

An account by one of the missionaries in Wailuku, Rev. Richard Armstrong, gives a vivid picture of a tsunami at Kahului where the "entire village of 26 native grass houses" was carried away; in his journal entry of Nov. 8, 1837, Armstrong records:

> A strange phenomenon appeared last evening in our neighborhood. About seven o'clock in the evening, the waves of the ocean just opposite our station, at a small harbor [*i.e.* Kahului], gradually receded from the shore to a distance of some 15 or 20 rods leaving multitudes of fishes upon the ground, so that the children observing

> it ran and picked up some of them; leaving a small schooner also, which was at anchor in the harbor, without sufficient water to float her completely, and the wave slowly formed itself as it were into an embankment, or as the natives said, a "steep precipice." Then, as if having collected strength enough for the onset, the wave rushed back upon the beach, overflowed the banks, and carried away the entire village of 26 native grass houses with all their effects and inhabitants, some 40 or 50 rods inland, throwing most of the wrecks of houses, broken canoes, fowls, beasts, men, women, and children into a small lake of perhaps three miles circumference, which lay immediately inland from the village.
>
> The rush of the wave was so sudden and unexpected, that the inhabitants of the village, unlike Lot in Sodom, had no warning whatever, except a few who seeing the sea receding from the shore suspected a corresponding reflux, and fled inland in season. But it is not easy for water to baffle a Hawaiian, this being the element with which he is most familiar. Some swam single handed with the waves. Others took their children in their arms. Others the sick on their backs and bore them up until the waters ceased from the earth. One man took his old mother on his back and swam with her until he reached the dry land, but, laying her down on the ground, he found she was dead. Another poor old woman, having no one to assist her, and it being dark got into the small lake and was drowned. These are all the lives that were lost. [*Maui News* Nov. 10, 1937]

Armstrong also recorded that the "overflow was confined to less than two miles of coast" and noted a report that "a similar overflow occurred shortly after the death of Kamehameha I, but no houses were destroyed or lives lost."

Three years later, Armstrong reported on the first effort to grow sugar at Wailuku; in a letter dated 7 July 1840 he wrote:

> By request of the King I have taken some part in inducing the people about me to plant sugar cane. A fine crop of 60 or 70 acres is now on the ground ripe, and a noble water mill set up by a Chinaman is about going into operation to grind it. I keep one plow a-going constantly with a view to the support of the schools. We shall get in 10 acres of cane the present season. [*Maui News* March 22, 1941]

One of the schools to be supported was likely the girls' school which had opened at Wailuku in 1836 (Kamakau 1992:405).

According to the diary of the Catholic priest, Father Favens, he first visited Wailuku on 15 June 1846. By the end of 1847, a small Catholic chapel had been constructed at Wailuku. Stormy weather soon destroyed this native-style frame chapel. The first solid-frame church at Wailuku was constructed by the Mission Brothers of Honolulu and dedicated to St. Anthony on 5 March 1854 (Schoofs 1978:291-292). The St. Anthony School held classes as early as 1848, and by 1855, the school had its own resident priest. The large premises of St. Anthony's Church and School were the center of Catholic life in Wailuku.

During the early and middle 1800s, the Hawaiian demography was affected by two dramatic factors: radical depopulation resulting from Western disease and nucleation around the developing port towns. Traditional Hawaiian populations lived in a largely dispersed settlement pattern.

Although there were royal centers and areas of more concentrated population, these areas never came close to rivaling the populations of the historic port towns that developed on Hawai‘i’s shorelines during the 1800s. Kuykendall (1938) notes that from 1830 to 1854:

> The commercial development during this period, by magnifying the importance of a few ports, gave momentum and direction to a townward drift of population; the population of the kingdom as a whole was steadily going down, but the population of Honolulu, Lahaina and Hilo was growing. [Kuykendall 1938:313]

4.2.3 The Māhele and the Kuleana Act

The most significant change in land-use patterns and land allocation came with the Māhele and the privatization of land in Hawai‘i. The establishment in 1839 by Kamehameha III (Kauikeaouli) of a Bill of Rights for the people of Hawai‘i, followed by a formal constitution in 1840, hastened the shift of the Hawaiian economy from subsistence-based to market-based. During the Māhele, all of the lands in the Kingdom of Hawai‘i were divided between the *mō‘ī*, *ali‘i*, *konohiki*, and *maka‘āinana* and passed into the Western land tenure model of private ownership (Chinen 1958). On 8 March 1848, Kauikeaouli (Kamehameha III) further divided his personal holdings into lands he would retain as private holdings and parcels he would give to the government. This act paved the way for government land sales to foreigners. In 1850, the legislature granted resident aliens the right to acquire fee simple land rights (Moffat and Fitzpatrick 1995). Wailuku was declared as “Crown Land” to be used to support the Kingdom of Hawai‘i (Zambucka 1977:48).

Ruth Ke‘elikolani, half-sister of Kamehameha V (Lot Kapuāiwa), inherited the *ahupua‘a* of Wailuku from Lot Kapuāiwa on his death in 1872. Ruth Ke‘elikolani then sold a portion of her Wailuku land holdings to the sugar-industrialist Claus Spreckels in 1882. Spreckels subsequently received Land Grant 3343 from King Kalākaua, that consisted of 24,000 acres of the southeastern portion of the Wailuku Ahupua‘a (Zambucka 1977:48). Spreckels’ acquisition of the 24,000-acre parcel in fee simple occurred when he agreed to purchase a part-interest in Crown Lands of the Kingdom of Hawai‘i from Princess Ruth Ke‘elikolani. This agreement allowed the Commission of Crown Lands to exchange Spreckels’ part-interest for the fee-simple title to central Maui lands he had previously leased from the Kingdom in 1877 (Daws 1968:288). The current project area is located within Land Grant 3343.

Although almost 300 subsequent awards to individuals were awarded by the Land Commission for *kuleana* lands within the *ahupua‘a* of Wailuku, a majority of these claims represented lands located in the upland portion of the *ahupua‘a* focused along the flood plain of the ‘Īao Valley Stream, as well as *mauka* of the area identified as the “Sand Hills.” The disposition of these awards may reflect a continuation into the post-Contact era of the traditional Hawaiian settlement of Wailuku and avoidance of the Sand Hills area.

4.3 Mid- to Late 1800s

Activities associated with missionary endeavors and the cultivation of sugar cane in the mid to late nineteenth century offer detailed accounts of Wailuku during this time. In 1863 Samuel Thomas Alexander started a theological seminary in Wailuku where he taught for nine years before partnering with Henry Perrine Baldwin to create the sugar company known as Alexander and Baldwin, Inc (Alexander 1953:328). An account of the geography, agriculture, and irrigation

engineering of mid-nineteenth century Wailuku is given by Missionary Rufus Anderson who states:

> The soil of Wailuku is rich and deep, and the sugar cane 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. Upland taro is cultivated on Hawaii but the taro is grown in water. This vegetable seemed to me equal to the Irish potato, and better than the large sweet potato of the Islands. [Anderson 1864:177]

In a publication by Bowser (1880) titled *The Hawaiian Kingdom Statistical and Commercial Directory and Tourists’ Guide*, it is said that three roads connected Wailuku to Lāhainā. One treacherous road that connected Lāhainā to Wailuku via ‘Īao Valley is said to have been traversed by “adventurous residents” and “visitors” alike. Bowser describes this passage saying,

> The tract leads right over the mountain, the ascent being made through a great gulch that lies close to Lahaina up to what is known as the Wailuku Pass, and thence down the Iao Valley, of which I have already spoken […] it is perhaps the very best way of all by which to approach the wonder and beauties of the great gorge of the Iao. [Bowser 1880:525-526]

Government censuses document the growth of the population of Wailuku during the decades of the later nineteenth century: in 1853 the total population was recorded as 4,463, in 1872 it had dropped to 4,060, in 1878 it had risen to 4,186, in 1890 it was 6,708, and by 1900 the population was 7,953 (Schmitt 1977:12-13).

An early engraving circa 1883 of the view from the Wailuku sand hills shows sugar cane fields encompassing all sides of the town of Wailuku with St. Anthony’s Church in the foreground and ‘Īao Valley in the background (Figure 15).

Also, during this period, “Kepoikai, the father of Senator A.N. Kepoikai of Wailuku, owned and conducted the fishing right at Kahului, his residence being further up the beach toward Wailuku” (*Maui News* March 3, 1900).

4.3.1 The Sugar Industry

Understanding the emergence of the Hawaiian sugar industry during the late eighteenth century provides insight into the role Hawaiian plantation industrialists played in the establishment and expansion of global consumer capitalism. Missionary ideologies concerning life, labor and property bred the foundation for plantation economics, which began a process of massive cultural and ecological change, not just for Hawai‘i, but for the world over, and represents the first iteration of our current global market system (MacLennan 2014:2). The most important shifts in the Hawaiian cultural and environmental landscape occurred between 1840 and 1940, where, following major contests between Native Hawaiians, sugarcane workers, and plantation industrialists, the Hawaiian sugar industry emerged to dominate social and political life in Hawai‘i (MacLennan 2014:3). Hawai‘i’s sugar industry arose at a time of great technological change, when

the imperial economic designs of the United States and Europe sought to satisfy ballooning markets for Hawaiian sugar. This ensured that large scale industrial agriculture, aided by new technologies and processes, would permanently and drastically mark the Hawaiian Islands both culturally and environmentally.

In general, plantation agriculture has acted as a colonizing force in Hawai‘i, as Hawaiian sugar interests created an expansive system of monocrop production driven largely by the rhythm of the factory, where imported and transplanted peoples, plants, and animals came largely to replace Native ones (MacLennan 2014:4). By the late nineteenth century, sugar plantations and their surrounding towns began to resemble the industrial centers of the United States and Europe, with dense populations, mills, and refineries coming to dominate the local landscape. Throughout this transformation, land, water, labor relations, public policy, and forest resources remained almost entirely under the influence of just five sugar companies (Castle & Cooke, Alexander & Baldwin, C. Brewer & Co., American Factors, and Theo H. Davies & Co.). These five companies, known colloquially as “the Big 5,” maintained complete control over Hawai‘i’s economic and environmental future for nearly one hundred years, and by 1920 the Big 5 controlled 94 percent of all sugar production in Hawai‘i (MacLennan 2014:82). This consolidation of political and commercial power ensured that many of Hawai‘i’s emerging social and commercial institutions operated largely for the benefit of the corporate sugar industry, with plantations, utility companies, shipping companies, railroads, and banks all held either directly by the Big 5, or as part of their interlocking network of boards of directors (MacLennan 2014:83). As such, an explosion of industrial and commercial development occurred in the late nineteenth and early twentieth centuries in Hawai‘i, all tied to plantation activities. On Maui, this transitional boom was most clearly seen in Wailuku and Kahului, especially surrounding Kahului Harbor.

As land sales by the Government of Hawai‘i to Claus Spreckels would indicate, the second half of the nineteenth century is defined by the commercial development of Wailuku and Kahului that accompanied the shift to plantation economics. During the American Civil War in the 1860s, Hawaiian sugar prices rose significantly, leading to the formation of 12 large sugar plantations on the island of Maui; the most of any Hawaiian Island. The Wailuku Sugar Company was organized in 1862. The Catholic Mission agreed to give the Wailuku Sugar Company a right-of-way across their property for a railroad. In this manner, the enterprise laid a railway line to Waiehu and Waihe‘e, by way of Lower Wailuku (Condé and Best 1973:267). Among the early government grants in the upland area of Wailuku Ahupua‘a were lands set aside for the Wailuku Sugar Company, a plantation first organized by James Robinson & Company, Thomas Cummins, J. Fuller, and agent C. Brewer & Company. The success of sugar grown in the region resulted in a second large plantation, in Waihe‘e, producing over 757 tons of sugar and 45,000 gallons of molasses in 1865. The Waihe‘e mill manager was Samuel T. Alexander, and the mill’s head foreman was Henry P. Baldwin, both of whom would resign in the late 1860s to establish a small sugar enterprise of their own in upper Pā‘ia (Gilmore 1936). With the success of sugar and with Wailuku’s economic expansion came the need for the importation of foreign labor. In short order, Portuguese, Japanese and Filipinos increased the population of the district, which made the need for development and larger churches necessary. The first western-style structure in Kahului was a warehouse built in 1863, and a nearby store was recorded as having been built in 1873. The Catholic St. Anthony church in Wailuku became the first stone church erected in central Maui. It was dedicated on 3 May 1873 (Schoofs 1978:293).

Figure 15. View of Wailuku from Wailuku sand dune showing sugar cane fields and St. Anthony's Church, pre-1883 (Bishop Museum Archives)

In 1869, on land located just west of Pā‘ia, a small *kuleana* of 11.94 acres was purchased by Alexander and Baldwin, both eager to apply their agricultural experience to their own plantation. This initial land purchase was the beginning of the development of the entire central isthmus for sugar cultivation. In rapid succession, the partnership of Alexander & Baldwin expanded its operations by purchasing other small *kuleanas,* setting up a mill, and attracting more investment capital (Dean 1950:13).

In 1876, a treaty was signed between the Kingdom of Hawai‘i and the United States, which opened larger and more lucrative markets for Hawaiian sugar. Plans were immediately drawn up by the partnership of Alexander & Baldwin to finance a ditch to bring water from the Hāna region of East Maui into the dry plains of Pā‘ia. The Kingdom of Hawai‘i issued a lease for the construction right-of-way, and in 1879, the successful venture delivered millions of gallons of water to the Pā‘ia region via the Hamakua Ditch (Wilcox 1996:16).

Competition was supplied by Claus Spreckels, who engineered a similar irrigation ditch from Honomanū in East Maui to lands located just inland of Kahului, where the Spreckelsville mill and plantation camp were built (Figure 16). Spreckels invested three million dollars in the Hawaiian Commercial & Sugar Company (HC&S), and competed for sugar lands, warehouse space, railway lines, and shipping schedules with the Alexander & Baldwin venture (Dorrance and Morgan 2000:68-69).

By 1881, Spreckels had installed electric lighting in his mill to grind cane at night; the first of his many innovations to make sugar more profitable. Following his success in building the Honomanū Ditch linking East Maui water sources with his sugar fields in the central isthmus, Spreckels engineered the Waihe‘e Ditch (also named the Spreckels Ditch) in 1882, to tap water resources from West Maui. The 15-mile-long ditch started at the 435-ft elevation of Waihe‘e Stream, and carried 60 million gallons of water (per 24-hour day) to the Wai‘ale Reservoir at the 214-ft elevation of Wailuku. Spreckels became the first plantation owner to irrigate his fields with mountain water from both East and West Maui. By 1888, the Spreckels plantation covered 28,000 acres, making it the largest sugar plantation in the world (Wilcox 1996:63).

In a report appearing in *Harper’s Weekly,* Meriwether (1888:849) stated the Spreckels plantation “yielded as much as 14,000 tons in one year; the average yearly yield is from six to eight thousand, or several thousand tons more than the highest yield of the Khedive’s plantation [in Egypt].” The same article also describes expenses of the Spreckels plantation:

> Planks of which the flumes are constructed are all brought from the forests of California and Oregon, three thousand miles away… The expense of importing the lumber from America is not the main expense of flume-building. It costs thousands of dollars to keep the flumes and ditches in order. The head ‘ditch-minder’ on the Spreckels plantation is paid $115 a month and furnished a horse and board besides. His twenty assistants each receive $60. [Meriwether 1888:849]

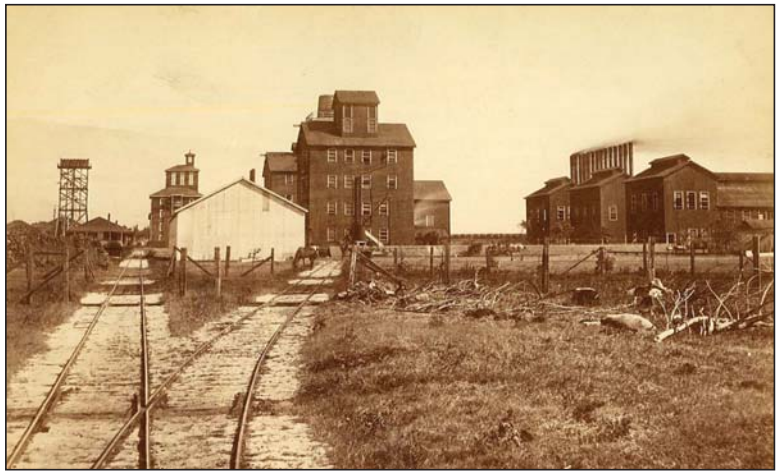


Figure 16. The Specklesville sugar mill in the 1880s (Robert Hill Private Collection)

During this period the major enterprise out of Kahului was the Kahului Railroad Company. Begun in 1879, the Kahului Railroad Company was formed by Thomas H. Hobron, William O. Smith and William H. Bailey. The first rails were laid at a small wharf at Kahului, 30 June 1879. Three miles of track to the village of Wailuku were completed by 10 September 1879. By 1881, the Kahului Railroad was carrying raw sugar to the port of Kahului from both the Wailuku Sugar Company and from the Alexander & Baldwin mills in Pā‘ia and Hāmākua Poko (Figure 17 and Figure 18). In 1884, the Kahului Railroad became a freight forwarder and subsidiary of the Wilder Steamship Company (Best 1978).

By 1897, the Spreckels-owned HC&S Company attempted a blockade of the Kahului wharf to drive the Wilder Steamship Company out of business. To circumvent the blockade, the directors of Alexander & Baldwin purchased the disputed 5.47-acre harbor-front parcel owned by Spreckels and created a partnership of other plantations to drive Spreckels out of business.

By 1898, financial pressures forced Spreckels to give up control of HC&S to a partnership headed by Samuel T. Alexander and Henry P. Baldwin after a long and fierce battle. In less than a year, the Alexander & Baldwin-owned HC&S Company was shipping sugar from landings at Pā‘ia, Huelo, Kīhei and Nāhiku to the newly-formed California & Hawaiian Sugar Refining Company in California. By 1899, Alexander & Baldwin had successfully taken over the sugar interests of Claus Spreckels and had negotiated a friendly purchase of the Kahului Railroad Company (Dean 1950).

The HC&S Company’s Lowrie Ditch project, begun in 1898, brought an additional source of water to the arid plains south of Kahului. William J. Lowrie’s plan was to begin the ditch at the Pāpa‘a‘ea Reservoir, deep in East Maui at the 1,000 ft elevation, and maintain a 4-ft drop per mile following the ditch’s initial plunge from the Kailua reservoir. Steep mountain gulches were traversed using the force of the constant weight of water flowing in a series of siphons. The Halehaku Gulch, at 250 ft deep, and the Māliko Gulch, at over 350 ft deep, were both crossed by giant siphons fabricated of three-eighths-inch iron pipelines that were set in place by Japanese laborers. The allocation of water began at a weir located above Pā‘ia. The first tenth of the water flow in the Lowrie Ditch was divided out to the Pā‘ia Plantation (an 11/20ths share) and the Ha‘ikū Plantation (a 9/20ths share). The distance traveled, from Kailua to the plantation’s Kīhei boundary, was 21.9 miles (Thrum 1900:155-157).

4.3.2 Kahului Railroad Company

The Kahului Railroad Company, founded by Thomas Hobron, was incorporated on 1 July 1881. By 1886, with a terminal established at Kahului, the railroad comprised a line from Kahului to lower Pā‘ia and from Kahului to the town of Wailuku. In 1886, the railroad company was sold to Wilder Steamship Company which subsequently applied for and received, in 1889, authorization from the Hawaiian government to engage in maritime shipping operations. Ten years later, in 1899, the railroad company was once again sold, this time to the Hawaiian Commercial & Sugar Company, headed by Henry P. Baldwin.

Figure 17. The *Claus Spreckels* locomotive leaving Kahului and approaching Pā‘ia (photo courtesy of HC&S Sugar Museum)

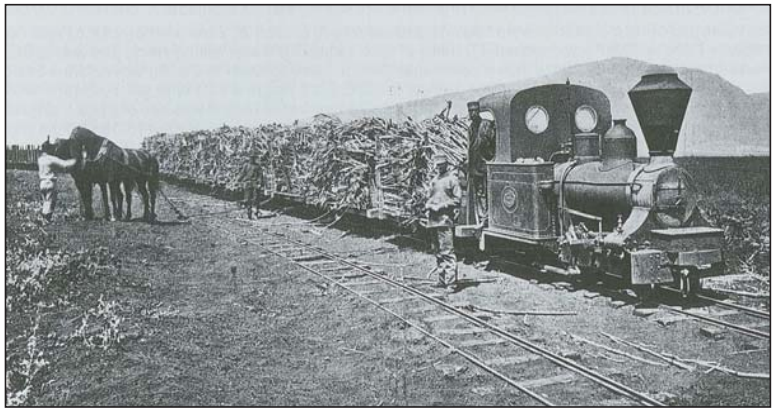


Figure 18. Bringing hand-cut cane from the fields to the Spreckelsville mill aboard the HC&S railroad, circa 1882 (photo from Conde 1993)

The Kahului Railroad berm (Site 50-50-04-3112) was part of the network laid by the Kahului Railroad Company. By the early decades of the twentieth century, the branch of the railroad between Kahului and Wailuku handled transportation of all freight to and from the Wailuku Sugar Company, Libby McNeill & Libby's pineapple plantation, and the businesses within Wailuku town. Additionally, it served as transport for the community, with students and other commuters riding the railway until Kahului Railroad implemented a bus service for its passengers in the mid-1930s (Bartholomew and Bailey 1994:79). The company was responsible for the development of Kahului Harbor; in addition to its work on the breakwaters, the company improved upon the existing docks in order to provide a sturdier wharf for the shipping of its cargo. This improvement facilitated the harbor's growth as a major shipping port.

The railroad continued to operate until 1966, making it not only the first but also the last operating railroad in Hawai‘i. In 1970, a part of the Kahului Railroad was brought to life as a portion of its deserted tracks were laid down in Lāhainā and the surrounding area to serve as a scenic, historic railway for tourists and residents (Bartholomew and Bailey 1994:80).

4.4 1900s

By 1900, Wailuku had a system drawing water from ‘Īao Valley to a reservoir in town, a newspaper, three hotels, and a power plant was planned for Kahului to supply electricity to Wailuku. But, 1900 was also the year in which the bubonic plague broke out in Kahului, the first death recorded as caused by the plague occurred on Saturday, 4 February. D.A. Carmichael, Surgeon General of the U.S. Marine-Hospital Service, noted that seven cases of bubonic plague were reported in Kahului between 30 January and 10 February 1900 (Carmichael 1900a). These cases all occurred in the Chinese quarter, originating from "a store where Chinese food stuffs imported from the Orient, via Honolulu, were sold" (Carmichael 1900a). Residents of the Chinese quarter were roused from their homes and relocated to a detention camp while Kahului was surrounded by U.S. soldiers (Carmichael 1900a; 1900b). To prevent the spread of the plague, the Kingdom of Hawai‘i's Board of Health ordered the controlled burning of Kahului's Chinatown (Maui News 2020). The bodies of those who died from the plague were also burned (Carmichael 1900a). An article in the *Maui News* from 17 February 1900 documents effects of the plague at the time.

> The plague has reached Maui. Six deaths have occurred and the whole of Chinatown [in Kahului] is a heap of ashes. The people of Maui are aroused to action and feel confident of being able to control and stamp out the pest in a short time...
>
> ...Sheriff Baldwin at once established a strict quarantine at Kahului which is still maintained. The Maui Board of Health met at once and selected a site for a pest house and one for a detention camp, the latter being established at the race track of the Maui Racing Association...
>
> ...by noon on Monday [Feb. 13] the detention camp was ready for its occupants. Over 200 Chinese, Japs and natives were fumigated and dressed in new suits, and at two o'clock the procession quickly moved out to their new quarters. Scarcely had they reached their destination before everything was prepared for the destruction of their old quarters. At three o'clock a cloud of dust and broken timbers leaped into the air, accompanied by the savage roar of dynamite; then another and

> another, being the exterior houses of the doomed district. Soon dense volumes of smoke, through which pierced yellow shafts of flame, told that the work of destruction was begun. In two hours, the whole block from the Kahului saloon to the Custom House was a heap of glowing ashes. The breeze was from the sea and no trouble was experienced in holding the fire within the prescribed district. Kahului town was entirely cordoned off with corrugated iron fences and, before the year was out, the plague had been eradicated. [Bartholomew 1985]

Prior to 1900, development in the port town of Kahului was likened to a “squatter’s town” (Figure 19). After the bubonic plague outbreak led to the decision to burn most of Kahului, the street alignments were rebuilt as “blocks.” By 1905, dredged harbor coral had been used to fill and level much of the Kahului water-front to create a more orderly and sanitary business district. Early structures constructed within this waterfront business district included the Baldwin National Bank of Maui (constructed in 1906) and the Pu‘unene Store at Kahului (constructed in 1908) (Burns 1991).

An account of Wailuku in 1901 states that the newly constructed railroad linking the Kahului wharf to Wailuku, Sprecklesville, and Pā‘ia allowed new opportunities in the marketing of fish from Kahului to inland locations (Maly and Maly 2003:452). The fish market of Wailuku sold fish caught in Kahului and was described as, “a small affair with only 5 stalls, which are run by 2 Chinese and 5 natives, and is owned by a private individual” (Maly and Maly 2003:433) (Figure 20).

The growth of Wailuku, which was named the county seat in 1903, continued during the first decades of the twentieth century. An early photograph, *ca.* early 1900s, taken from the Wailuku sand hills shows the town expanding into former cane fields (Figure 21).

4.4.1 Kahului Harbor

In 1901, a well-drilling company from Honolulu, operated by the McCandless Brothers, was retained by the HC&S plantation to drill 12 wells at the site for a new mill at Pu‘unēnē. The water was to be used for mill operations as well as for irrigation. All 12 wells were successes, according to the records of the head engineer, James Sutton McCandless (McCandless 1936:66). The new sugar mill at Pu‘unēnē (Figure 22) began operations in 1902 (Dean 1950), supplementing the work done by the Pā‘ia Mill. Both mills, and the network of railroad lines connecting the company’s fields and villages, continued to grow. Between 1900 and 1905, acreage harvested doubled, from 2,484 to 4,827 acres, and sugar production more than doubled, from 17,857 to 39,411 tons (Gilmore 1936). The adoption of heavier rails and a wider rail gauge caused HC&S to completely renovate the plantation railroad (Condé and Best 1973).

The plantation villages of the Pu‘unēnē area grew quickly to surround the new mill (Figure 23 and Figure 24). Between a huge influx of immigrant workers in 1909, and the burning of village areas of Pā‘ia and Kahului to control smallpox in 1910, changes to the camp system were in full swing. The plantation workforce continued to expand until 1917, when the United States entered World War I, and the accompanying draft seriously depleted the labor pool. By 1919, postwar requirements for sugar had driven the price to $471.40 per ton: an all-time high (Burns 1991). Nine main camps were in place across the Pu‘unēnē plains by the 1920’s, including MeGerrow Camp, Yung Hee Camp, Afong Camp, Spanish B Camp, Alabama Camp, Green Camp, Camp 4, Sam Sing Camp and Camp 8.

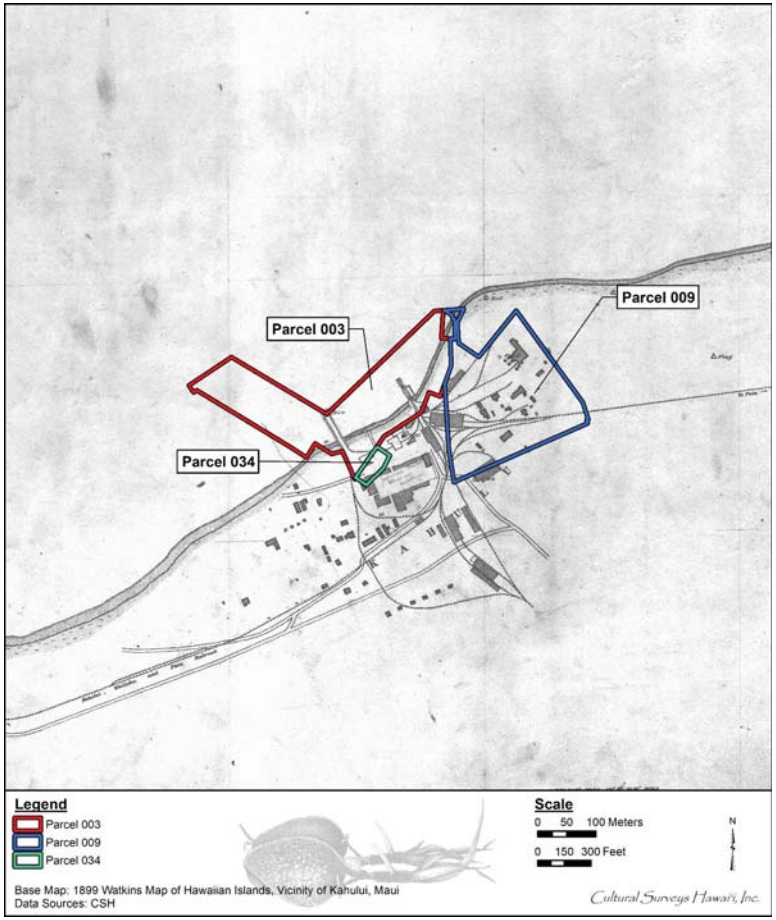


Figure 19. 1899 Watkins map of Kahului depicting the project area

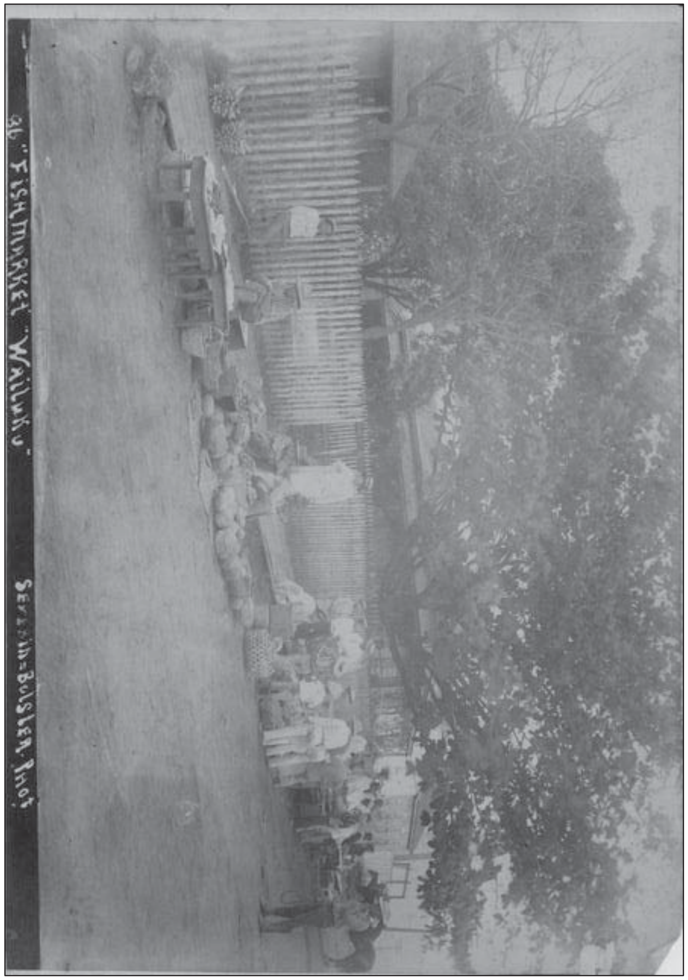


Figure 20. Wailuku Fish Market circa 1886 (Hawaii State Archives)

Figure 21. View toward 'Īao Valley from Wailuku sand hills showing Wailuku Town, ca. early 1900s (Bishop Museum Archives)

Figure 22. Pu‘unēnē Mill circa 1935 (courtesy of A&B Sugar Museum)

Figure 23. Pu‘unēnē Mill and camps (foreground); Kahului Bay and Harbor in left background (courtesy of A&B Sugar Museum)

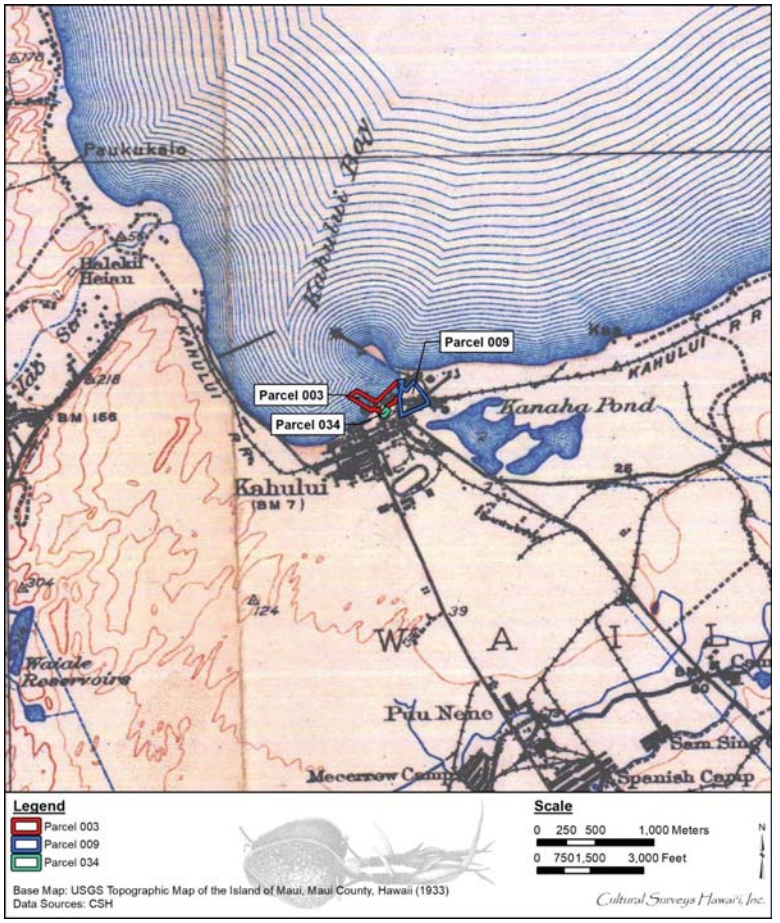


Figure 24. Portion of 1933 USGS topographic map showing Pu‘unēnē Mill camps southeast (right bottom) of the project area; note railway system within and surrounding project area (U.S. Geological Survey 1933)

Increased production of sugar by HC&S and its' subsidiaries required large improvements to the harbor facilities at Kahului. The Kahului Railroad Company began construction on the East Breakwater soon after Hawai‘i's annexation by the United States in 1898. Expenses for the 1,800-ft breakwater and dredging had risen to about $335,000 by 1910, at which time the federal government assumed responsibility for continuing improvements to the harbor (Best 1978). The superintendent of the Kahului Railroad Company, Richard Walther Filler, worked to redesign railroad access to the harbor following the demise of Spreckels' operations at the waterfront (Condé and Best 1973). All of the early infrastructure of the Kahului Harbor had been constructed and financed by the Kahului Railroad Company (Figure 25), but by 1910, under the terms of annexation as a Territory of the United States, a Board of Harbor Commissioners was appointed to supervise the territorial harbor development program in Hawai‘i. From this point on, Lyman Herbert Bigelow, Territorial Superintendent of Public Works, took charge of on-going modernization plans for the Kahului Harbor well into the 1920s (Nellist 1925). By 1910, over 300,000 cubic yards of fill had been deposited on the windward side of the breakwater, creating a landfill area of over 12 acres. Dredging at the entrance to the harbor and in the area alongside the pier continued to a depth of 35 ft (United States Army 1913).

At the turn of the century, freight and passengers were handled by small rowboats, or lighters, transferring goods between the Kahului derrick and lighter landing to large freighters anchored further offshore (Figure 26). A 200-ft long wharf, allowing ships with a draft of 20 ft to tie up directly alongside, was largely completed by the Kahului Railroad Company about 1905 and improved again in 1909. It was named the Claudine Wharf, after the Inter-Island Steam Navigation Company ship of the same name (Territory of Hawaii 1910) (Figure 27 and Figure 28). The subsequent increase in shipping required the territorial government to establish a collector of customs at the port of Kahului. Between the years 1904 and 1912, Worth Osbun Aiken served in this capacity. Following the death of Henry P. Baldwin in 1911, his son Frank F. Baldwin became president of both the HC&S Company and the Kahului Railroad. William Walsh was made superintendent of the Kahului Railroad in 1913, having spent the previous twelve years with the railway. A worldwide increase in demand for sugar and pineapple followed the end of World War I. Shipping at the port of Kahului had risen to 81 vessels with an annual gross tonnage of over 370,500 entering and leaving the port by 1920 (Bigelow 1920).

Work to reinforce both breakwaters and dredge the harbor interior was almost continuous from 1910 to 1931. Two competing inter-island passenger service and shipping lines merged in 1905, and by 1925, the Inter-Island Steam Navigation Company passenger traffic at the Kahului Harbor numbered almost 25,000 (Schmitt 1977:455). The east breakwater was completed in 1913 and the dredged basin and west breakwater in 1919. Both breakwaters were extended with additional dredging completed in 1925.

The construction of a modern concrete wharf at the east breakwater began in 1910 with various additions continuing until its completion in 1923 (Figure 29 through Figure 32). Originally known as the Territorial Wharf, the 500-ft structure was topped with a single-story transit shed of steel frame construction measuring 375 by 100 ft. It was equipped with two electrically operated sugar conveyors, each capable of handling 250 tons of raw sugar per hour. The Kahului Railroad Company had three tracks on the wharf, two running the length of the wharf and one running to

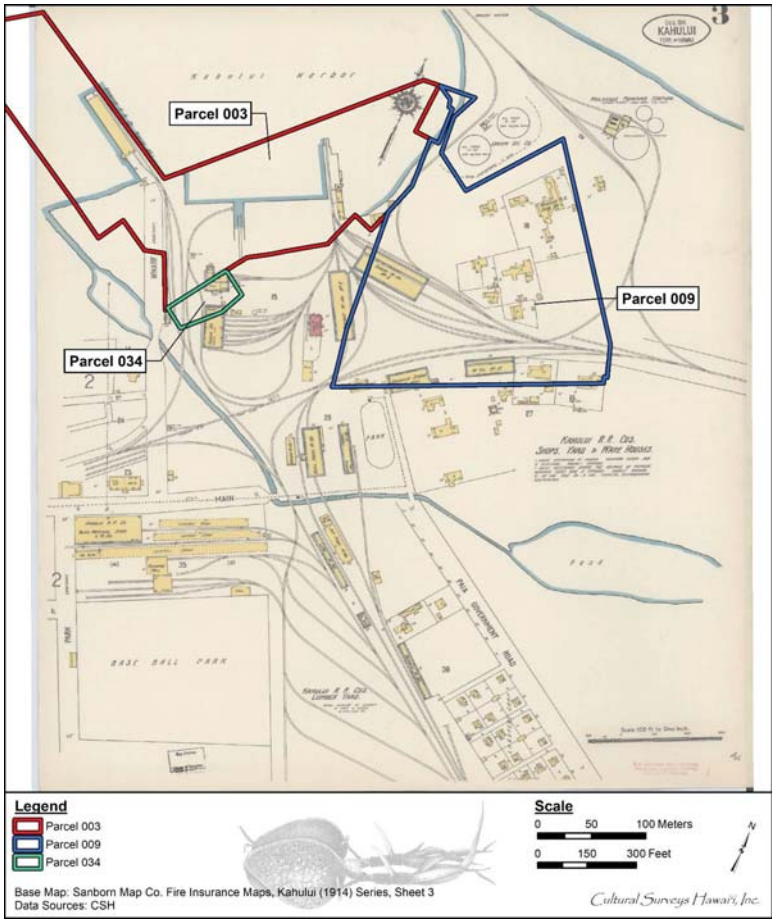


Figure 25. 1914 Sanborn Map Co. Fire Insurance map depicting Kahului Railroad Company shops, yards, and warehouses

Figure 26. Early photo of Kahului Landing (Courtesy of Hawai'i State Archives)

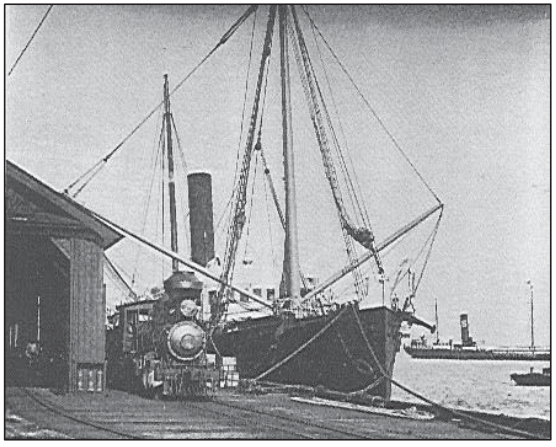


Figure 27. Photo of SS Claudine docked at Claudine Wharf (Images of Old Hawaii n.d.)

Figure 28. Photo of Claudine Wharf, Maui, Hawaii. Photo from the collection of the Vallejo Naval and Historical Museum (Images of Old Hawaii n.d.)

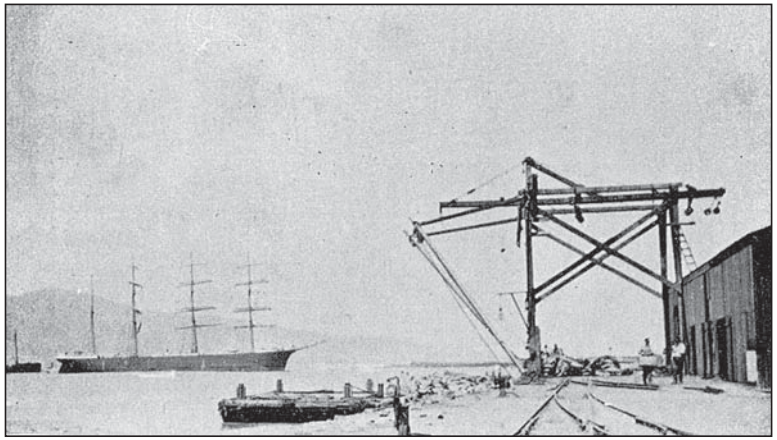


Figure 29. Kahului Landing east breakwater shortly after construction (Hawai'i Harbor Commission 1910)

Figure 30. Artist rendition of Kahului Harbor, circa 1920 (Hilo Drug Company c. 1920)

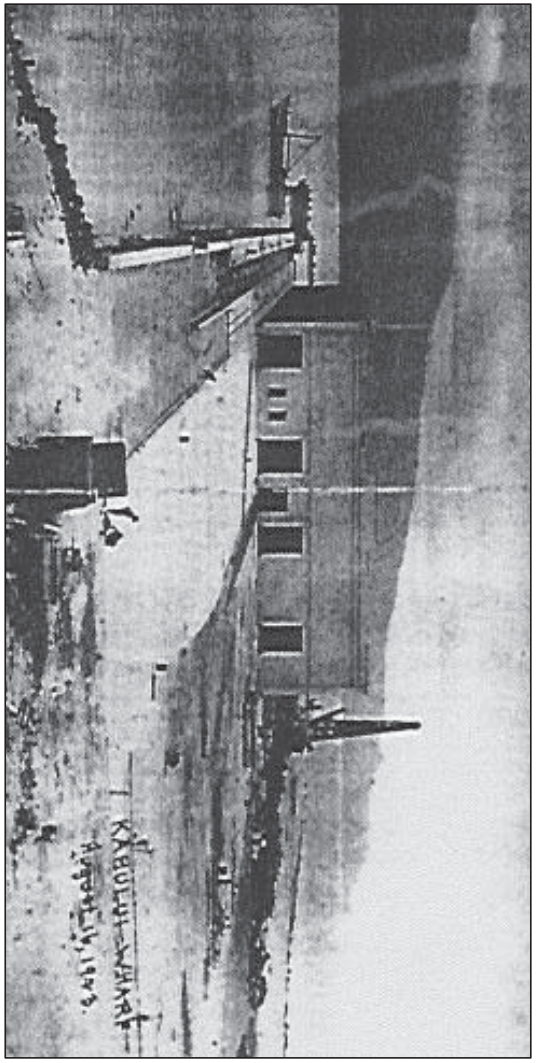


Figure 31. Photo of Kahului Wharf, August 16, 1923 (Images of Old Hawaii n.d.)

Figure 32. Kahului Wharf. Photo from Brigham Young University Hawaii Archives and Special Collections. (Images of Old Hawaii n.d.)

the transit shed. Oil pipelines allowed for both offloading and loading. Molasses pipelines delivered molasses from storage tanks located along the harbor property. Other pipelines were available for gasoline, kerosene and water (Taylor 1926). Large-scale repairs to the Claudine Wharf were required following a tidal wave on 3 February 1923. In 1924, the Claudine Wharf was purchased by the Board of Harbor Commissioners for the Territory of Hawai‘i, giving the territorial government sole ownership of all harbor facilities at the Kahului port. Partly due to the tidal wave damage, and partly because additional wharf space was required by a new pineapple cannery at Kahului, a project to entirely replace the Claudine Wharf with a modern concrete pier was completed in 1927 (Dean 1950).

Over the intervening years, the Kahului Railroad Company retained ownership of most of the land adjacent to the harbor. Construction in the town of Kahului continued to expand the port city (Figure 33). In 1916, the race track and grandstand (Figure 34) of the Kahului Fairgrounds (Figure 35) and Kahului Store were constructed. Kahului Theater (Figure 36) at the corner of Pu‘unēnē and Ka‘ahumanu Avenues replaced the former Kahului Lyceum Theater that had burned down in 1917. Other structures built inland from the harbor included the Kahului School (Figure 37 and Figure 38) built in 1922 and Christ the King Church built in 1932 (Bartholomew 1985). In 1936, construction of the present Ka‘ahumanu Avenue linking Wailuku and Kahului was finished. Completion of the roadway initiated the development along its route during subsequent decades.

In a research paper for the University of Hawai‘i at Mānoa Romanzo Adams Social Research Laboratory (RASRL) titled, *“Sociological Study of Kahului Maui,” mid- to late 1930s*, H.M.I described the town of Kahului in the 1930s. She stated that Kahului was “on a plantation scheme and ruled with a rather autocratic iron hand,” noting that “Kahului, the Railroad Company’s Camp and Village [are] under the management of Mr. William Walsh who is controlled by the H.C. & S. Co. [Hawaiian Commercial & Sugar Company]” (RASRL n.d.).

H.M.I. described Kahului as “a R.R. [rail road] village,” which was divided into “the Camp and the Town” (RASRL n.d.) (Figure 39 and Figure 40). The residence of William Walsh, manager of Kahului Railroad, was located along the beachfront of Kahului Bay on First Street. On Second Street were “the better homes of the Haole population—beach bungalows and palaces occupying the block—the front yards facing First [S]treet (a path along the beach line) and spacious backyards […]” (RASRL n.d.). Above Third Street and across Likelike Street was a camp occupied by mostly middle-class Japanese laborers including truck drivers, some stevedores, clerks, and bus drivers. The “camp bath house” which was “public and free for R.R. people” was also located on Third Street. Near the “camp bath house” was the “camp mess hall” where the stevedores had their meals (RASRL n.d.). “Koreans, Hawaiians and Japanese” occupied whitewashed houses located near the lumberyard, the Kanahā Camp, and the camp at the left end of Fifth Street (RASRL n.d.).

The Japanese *luna* (boss) and stevedore “gang heads” and their families lived at the C.P.C (California Packing Corporation) Camp which was located near Kahului School (RASRL n.d.). The K.R.R. (Kahului Roadroad) Camp was located near the quarry and occupied by quarry workers, railroad watchmen and flagmen, as well as “youthful strong stevedores and their families [and] the higher white collared second generation clerks (living near the public school in the new newest larger houses) and bookkeepers and first generation lunas” (RASRL n.d.). An area facing Main Street, which H.M.I. referred to as “Porrikee Camp,” was occupied by Portuguese, Spanish,

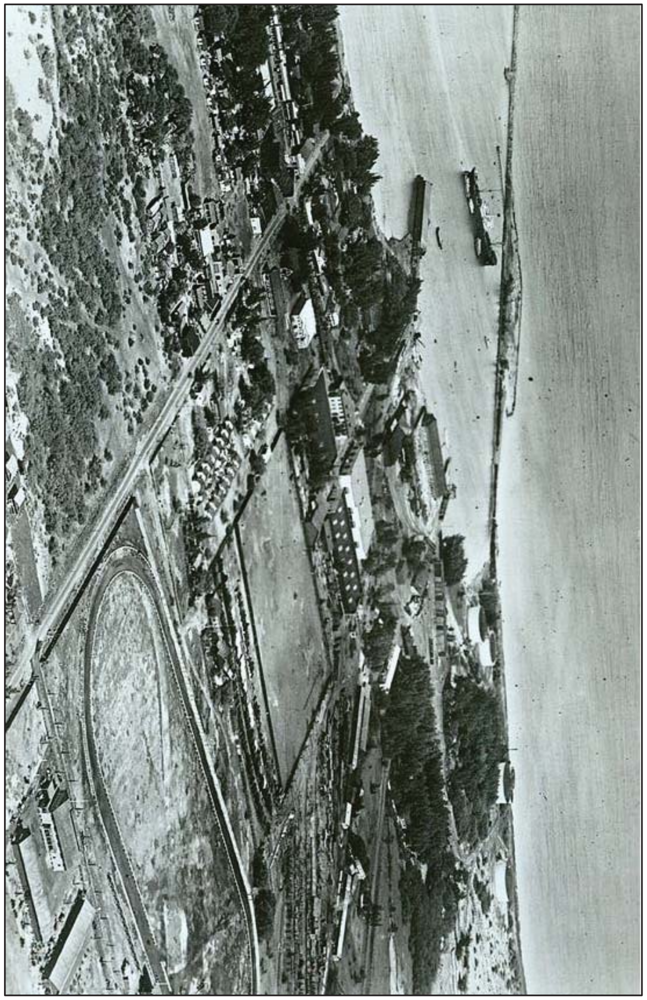


Figure 33. Aerial photo of the Kahului Harbor facilities and inland development in 1919 (courtesy of A&B)

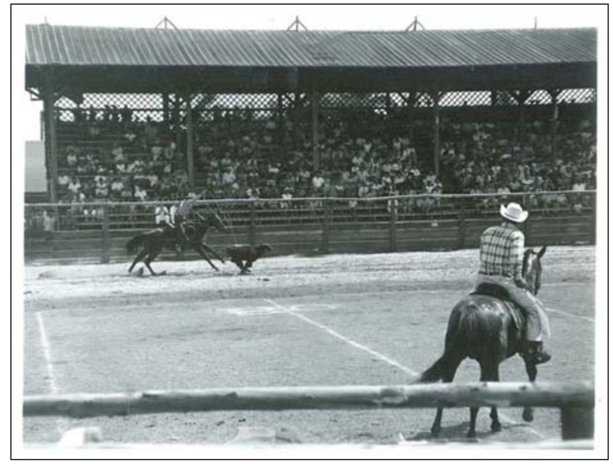


Figure 34. 1961 Maui County Fair Rodeo at the fairgrounds grandstand (courtesy of A&B Sugar Museum)

Figure 35. Maui County Fairgrounds on Pu'unēnē Avenue (Pictorial Hawaii 1929)

Figure 36. Kahului Theater (courtesy of A&B Sugar Museum)

Figure 37. Kahului School, constructed in 1922; the main school building seen here was demolished in the late 1970s, leaving a large empty lot east of the present Ka‘ahumanu Shopping Center that remains undeveloped today (courtesy of A&B Sugar Museum)

Figure 38. Aerial photo of Kahului School (foreground) in relation to Kahului Harbor (upper right) (photo courtesy of A&B Sugar Museum)

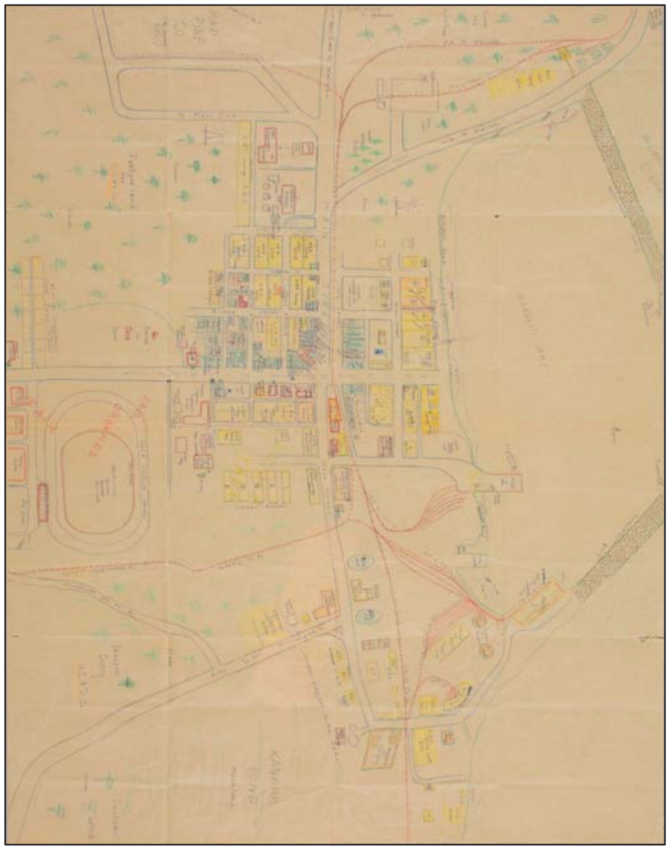


Figure 39. Map of Kahului in the 1930s, hand drawn by H.M.I. (RASRL n.d.)

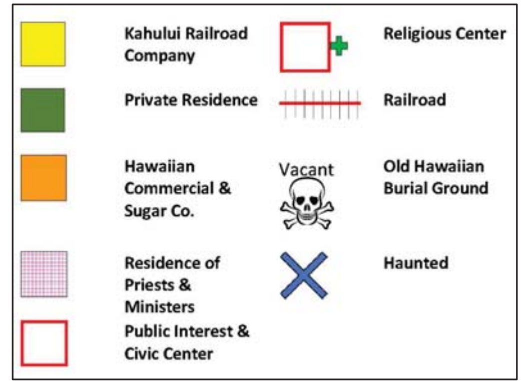


Figure 40. Legend for map of Kahului in 1930s, hand drawn by H.M.I (RASRL n.d.)

and Hawaiian-Caucasian residents who worked for the train and truck department families lived in (RASRL n.d.). "Hawaiian and part-Hawaiian laborers" who "spend their afternoons fishing and huki kolo […] at the beach front of their homes" occupied the Raw Fish Camp which was located near Huki kolo Beach. Huki kolo Beach may have been the name for the site where *hukilau* (seine) nets were stored (RASRL n.d.)

H.M.I noted that Japanese employees and laborers made up 40% of Kahului's population, which combined with the "town Japanese," totaled 1,451 in 1935. The rest of Kahului's population consisted of a few *haole* managers, Chinese, Filipinos, Portuguese, and "mixed people" (RASRL n.d.).

4.4.2 World War II

During World War II, the area along the shoreline west of Pier 2 contained 20 buildings constructed by the U.S. Navy as a base of operations for military shipping (Figure 41 and Figure 42). Nine structures were built by U.S. Navy Construction Battalion (SeaBee) workers, and eleven structures were refurbished for military service (NARA 2008). Supplies for military bases including the 4th Marine Division camp at Kokomo, the 10th Amphibious Training Battalion at Mā'alaea, the Underwater Demolition Team training base at Kīhei, Naval Air Station (NAS) Puunene and Naval Air Station Kahului were either transferred directly to each base, stored at the 18th Service Battalion Storage Depot (see below) at Kahului Harbor, or stored at an ammunition depot located above Makawao town.

By 1941, the bulk sugar system at the current project area had been constructed by HC&S, which included an advanced freight handling system that utilized conveyors and lifts to transport unrefined sugar automatically. This system drastically improved the output and loading times of unrefined sugar to cargo vessels in the harbor, which allowed sugar to play a pivotal role in the outcome of World War II. Not only was sugar important to the war effort in terms of sustenance for soldiers, Hawaiian sugar was also converted into industrial alcohol to make explosives and gunpowders. To emphasize the the importance of Hawaiian sugar to the war effort, that the Maui Planters Association publicly proclaimed:

> "Uncle Sam's Fighting men and the Sugar Industry are Comrades against the Axis!" [Bartholomew and Bailey 1994]

The construction of the bulk sugar conveyor system marked the last large-scale improvement to Kahului Harbor infrastructure and is still standing to this day.

On 16 November 1942, grading and construction work commenced on NAS Kahului (Figure 43) by Pacific Naval Advanced Base (PNAB) personnel, who were soon replaced by the 39th SeaBees. By 20 September 1943, the first aircraft of VC-23 (Composite Squadron 23) landed with personnel and gear on hand for duty. Carrier Air Service Unit 32 assumed responsibility for modifying and maintaining the aircraft of each visiting training squadron for combat duty in the Pacific Theater of Operations (Eggertsen 1945). The 39th SeaBees built 19 concrete ammunition storage magazines in Kanahā Pond, structures that remain today as storage bunkers for the County of Maui and the State of Hawai'i. Construction of the base continued in mid-June 1944 with the 142nd SeaBees (U.S. Navy 1947).

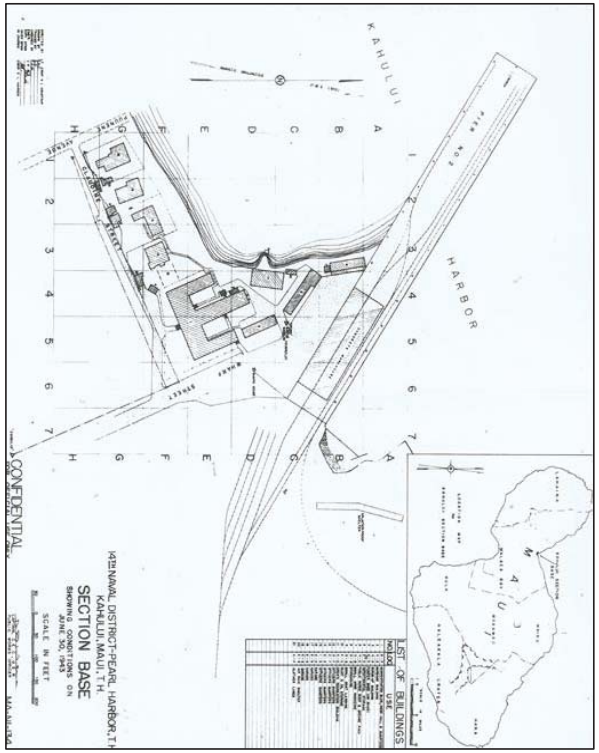


Figure 41. Plan view of U.S. Navy Section Base at Kahului Harbor during WWII adjacent to Pier No. 2 (U.S. Navy 1943)

Figure 42. Marines of the 14th Regiment, 4th Marine Division leave Maui Island aboard the aircraft carrier U.S.S. Fanshaw Bay, October 1945. Buildings of the U.S. Navy Kahului Section Base adjacent to Pier 2 are visible in the background (U.S. Marine Corps 1945)

Figure 43. Naval Air Station at Kahului, 1944; three symmetrical rows of ammunition storage are visible in Kanahā Pond (top right), view to southwest (State of Hawai‘i 1944)

In full operation, both NAS Puunene and NAS Kahului were virtual cities in themselves. Each employed hundreds of civilian clerical and maintenance workers and provided housing to thousands of U.S. military personnel. At NAS Kahului, Construction Battalion Maintenance Unit (CBMU) personnel from CBMU 563 arrived on 29 December 1943. The unit was responsible for the continued operation of refrigeration, water purification and electrical components in kitchens, hospitals, churches, barracks and offices. The open coastline at NAS Kahului allowed for live-fire training areas, where gunners practiced firing machine guns from turrets constructed to duplicate those aboard scout-bombers and torpedo bombers. A series of open-air ammunition storage areas (Figure 44) were developed by the U.S. Navy in an uninhabited area of Maui northwest of the Kahului Harbor. The site was surrounded by a wire fence, ringed with 40-foot tall watch towers and guarded by a U.S. Marine Corps Tank Battalion Camp (NARA 2008).

During World War II, local residents were outnumbered by military personnel with “200,000 soldiers, sailors, marines, and Seabees” stationed in Maui for training, as well as, rest between missions (Bartholomew and Bailey 1994:146). Interviewee Dr. Fisher also noted that the population of Maui had “more than doubled” following the construction of the Naval Air Station (NAS) Kahului and NAS Pu‘unēnē, as well as the arrival of the 4th Marine Division. He added that during World War II, the United States military used Kahului Harbor as a “transit point,” including the 4th Marine Division who used the harbor following their arrival in Maui after the Battle of Roi Namur in 1944.

Beginning in 1943, the 48th SeaBees and the 127th SeaBees constructed 40 corrugated steel Quonset huts arranged in a straight line along the western coastline of Kahului Harbor. Each structure was supported by a foundation of poured concrete and raised above grade on 4-foot concrete walls. Supplies arriving at Kahului Harbor were delivered to this depot by rail.

Newsletters published by the 39th Seabees (“Shore Lines”) and the 48th Seabees (“Trade Wind”) were joined by an official NAS Kahului newspaper, “The Fly Paper” (Later renamed “The Flyer” September 20, 1945). The publisher of the “Maui News,” Maui’s leading civilian newspaper, printed a companion weekly named “The Valley Islander,” which incorporated military news from all branches of the military based on Maui, including the 4th Marine Division (Sanford 2009). All military news in these papers was censored, but personnel changes, “scuttlebutt” gossip columns, and sports highlights featuring teams organized within military leagues on Maui attracted an avid readership.

On 15 and 31 December 1941, Kahului Harbor was shelled by Japanese submarines which prompted return fire from U.S. shoreline artillery forces (Bartholomew and Bailey 1994:149). On 15 December, two shells landed in the waters of Kahului Harbor while three shells “grazed the Maui Pineapple Company cannery” resulting in minor property damage and the death of a chicken (Bartholomew and Bailey 1994:149). On 31 December, Japanese attempts at shelling Kahului were unsuccessful when Kahului Town was missed again by shells which were undershot and landed in Kahului Harbor and shells which were overshot in the direction of Pu‘unēnē (Bartholomew and Bailey 1994:149).

Interviewee Dr. Fisher stated that the *Royal T. Frank*, a United States Army Transport (USAT), was docked at Kahului Harbor when a Japanese I-1 submarine surfaced off the coast of Maui and fired shells at the ship. Dr. Fisher added that although these shells missed the *Royal T. Frank*, many

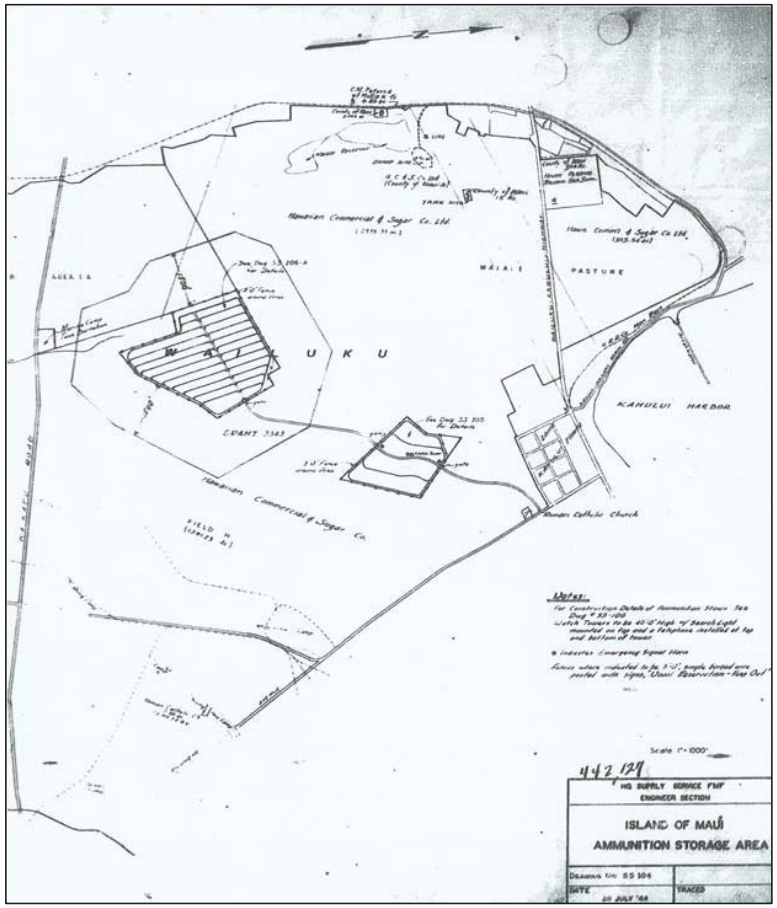


Figure 44 . Plan view of the ammunition storage area for the U.S. Navy in Central Maui; Kahului Harbor is located to the right of the storage areas (U.S. Navy 1944)

landed in Kahului. He described how the *kama'āina* of Kahului panicked and ran into the streets before the boy scouts stopped them and notified them that it was not an invasion.

Captain Omae of the Japanese Imperial Navy stated that the purpose of the coastal attacks, including the shelling of Kahului Harbor, were done for harassment, to "keep Americans worried about coastal attacks so that aircraft that might have been used overseas would be kept home" (Clark 1989:7).

Immediately following the August 1945 surrender of Japan to the military forces of the United States, additional facilities essential to the operation of NAS Kahului were removed from NAS Puunene. A bowling alley, bakery, and other specialized structures at NAS Puunene were relocated to NAS Kahului, only to be partially or entirely destroyed by a series of tidal waves that struck NAS Kahului facilities in 1946. On 1 April 1946, the Kahului Harbor and NAS Kahului suffered serious damage after a tidal wave generated in the Aleutian Islands, Alaska, struck the north coast of the island of Maui (Figure 45). Kahului Harbor was left empty when the water receded. The Coast Survey tide gage recorded 5 waves with heights in excess of 9 ft during the first 90 minutes of the tsunami, two of the waves being greater than 11 ft (Green 1946).

By 30 June 1947, the transfer of NAS Kahului to the Civilian Aviation Authority for the Territory of Hawai'i was well underway. Virtually all military equipment of NAS Kahului had been shipped to military installations on Guam, Okinawa or at Midway Island (U.S. Navy 1947).

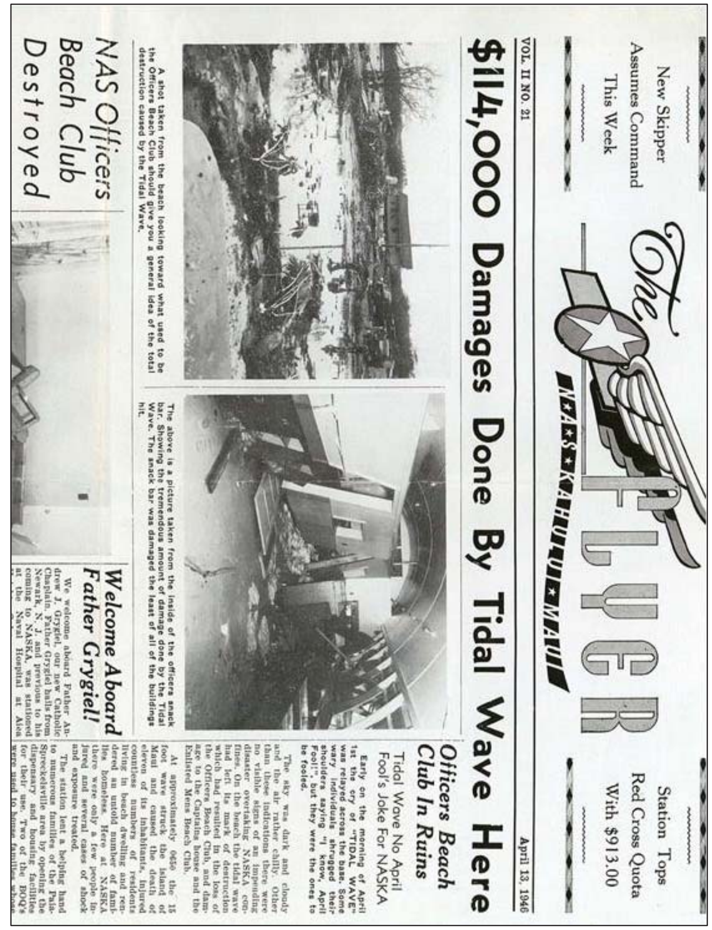
4.4.3 Post-World War II

Following World War II, buildings erected during reconstruction of Kahului in the 1910s and 1920s slowly gave way to postwar modernization. HC&S Company camp housing for the Kahului Store, including housing along Mill Street and Pu'unēnē Avenue for stevedores and railroad workers, began to be dismantled. Areas once occupied by the military returned to cattle ranching, and pineapple, and sugar cultivation.

The pace of social change began to accelerate. The political power base of the County of Maui began to include Nisei, second-generation Japanese Americans who had returned from service in Europe during World War II. Their involvement in county politics began to swing political power from the large agribusiness owners to the union leaders representing plantation workers eager for a change (Speakman 1978)

Trucks and buses had replaced passenger transportation once provided by railroads. Cars that had been set up on blocks and stripped of their rubber tires as a wartime rationing measure were back on Maui's roads (Bartholomew and Bailey 1994). By 1950, Kahului Railroad Company locomotives had been relegated to shuttling dockside cargo, such as fertilizer, between the Pacific Chemical and Fertilizer Company warehouses along the Kahului Harbor (Gilmore 1954). A modern drive-in movie theater was constructed in the *kiawe* (Algaroba tree; *Prosopis pallida*) and sand dunes just west of Raw Fish Camp, which was located just inland and north of the present-day Harbor Lights Condominiums.

Early postwar years (1946-1950) saw the construction of H. P. Baldwin High School and Maui Memorial Hospital in Wailuku. In 1947, plans began for wholesale development of Kahului as a master-planned community providing fee-simple ownership of single-family homes (The Honolulu Advertiser 1956). The majority of the homes, located between Baldwin High School and Pu'unēnē Avenue, were purchased by plantation employees and servicemen returning from duty overseas. This trend continued throughout the 1950s, with plantation camp populations falling in


New Skipper Assumes Command This Week

The FLYER

Station Tops Red Cross Quota With $913.00

VOL. II NO. 21 April 13, 1946

$114,000 Damages Done By Tidal Wave Here

A shot taken from the beach looking toward what used to be the Officers Beach Club should give you a general idea of the total destruction caused by the Tidal Wave.

The above is a picture taken from the inside of the officers snack bar. Showing the tremendous amount of damage done by the Tidal Wave. The snack bar was damaged the least of all of the buildings hit.

Officers Beach Club In Ruins

Tidal Wave No April Fool's Joke For NASKA

NAS Officers Beach Club Destroyed

Welcome Aboard Father Grygiel!

Figure 45. 1 April 1946 tidal wave reported on front page of *The Flyer*, a Kahului based newspaper (Robert Hill Private Collection)

the outlying communities, including Pu‘unēnē, and rising in the central town site of Kahului’s new “Dream City” (Dean 1950).

In the years during the Korean War (1950-1953), the modernization of the workforce and stronger unions brought a host of changes to the central region of Maui. Gone were the railroads of the prewar age, replaced by trucks and mechanized sugar and pineapple harvesters. The modernization of Kahului Harbor meant that canned pineapple, bulk sugar, and molasses could be loaded onto ships faster (Figure 46 and Figure 47).

The Kahului Shopping Center opened in 1951 to serve the needs of the area’s new residents. The first two hotels built in Kahului, the Maui Palms (Figure 48) and the Maui Hukilau, both opened in the mid-1950s, sharing a thin stretch of beach at the south shore of the harbor west of the former military buildings of the Kahului Section Base. Kanahā Pond Wildlife Sanctuary (SIHP 50-50-05-1783), formerly a royal fishpond, was established in 1952 to protect the cultural remains of the original fish pond wall structure and three endangered wetland bird species: the Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), and Hawaiian duck (*Anas wyvilliana*) (James 2002). Also in 1952, Commercial airline operations began at the Maui Airport.

Both beach-side hotels, as well as residences, Kahului Store (Figure 49) and other businesses, Kahului School, and structures of the Kahului Shopping Center were heavily damaged when a tidal wave originating along the coast of Chile hit the Kahului area on 23 May 1960. A tidal wave generated in Prince William Sound, Alaska, hit the Kahului area 28 March 1964, causing localized flooding, but far less damage than the 1960 event (Lander and Lockridge 1989)

On 12 March 1959, Hawai‘i became the 50th State of the Union. With labor costs for both sugar and pineapple steadily rising in the postwar years, driven primarily by labor union demands, both industries responded by adopting new technical innovations. Containerized shipping revolutionized the freight industry in the early 1960s, leading to the redesign of gantry systems and hardstand support areas to facilitate the moving and storage of the new containers and the appropriate funds for a new terminal building at the Kahului Airport in 1964. Dedication ceremonies for the new terminal took place on 25 June 1966, with further plans to accommodate the new generations of jet aircraft (State of Hawai‘i 2019).

The Kahului Railroad Company sold off its locomotives and rolling stock and became the Kahului Trucking and Storage Company in 1966. The Haleakala Storage & Transfer Company, a privately-owned company, took over much of the specialized freight-forwarding operations once done by the railroad (Hawaii Business and Industry 1966).

Also in 1966, new construction began on the Kahului campus of Maui Community College, following the transfer of the former vocational school from the State Department of Education to the University of Hawai‘i. Funded by a fixed percentage of Hawai‘i state revenues, construction spending at the Kahului campus accelerated through the mid-1970s (Roth 1992). The second of three regional shopping centers to serve the Kahului area, the Maui Mall, opened in 1971, this retail space replaced a sprawling HC&S Company lumber yard. It was joined a year later by the Ka‘ahumanu Shopping Center. Alexander & Baldwin Inc., the largest landowner in Kahului, continued to expand residential housing in the “Dream City” incrementally between 1970 and 1990 (Hooser and Stewart 1995). Large-scale construction projects in Central Maui, such as The Maui Arts and Cultural Center (MACC) (constructed in 1993), Keōpuōlani Park (constructed in 1999), the Maui Lani Dunes golf course (constructed in 1989) and the residential build-out of Maui

Figure 46. Bulk sugar being prepared for transport circa 1940s (photo courtesy of A&B Sugar Museum)

Figure 47. Sugar stored inside warehouse at HC&S bulk sugar plant circa 1952 (photo courtesy of A&B Sugar Museum)

Figure 48. Maui Palms Hotel (Paradise of the Pacific 1960)

Figure 49. Kahului Store workers cleaning 1960 tidal wave damage (photo courtesy of HC&S Sugar Museum)

Lani (1996-present) were precursors for light industrial development in the Wailuku Town portion of the *ahupua‘a*.

Following the closing of the Wailuku Sugar Company mill in 1989, much of the former agricultural land along the eastern banks of the ‘Īao Stream was developed as the Iao Parkside Condominium: a development consisting of 47 buildings constructed in phases between 1992 and 2002, with large-scale light industrial development utilizing much of the remainder of the former sugar lands of Wailuku along the western bank of the ‘Īao Stream (Hooser and Stewart 1995).

Design of a new Kahului Airport Terminal Complex began in 1985. Consisting of three phases, the $36.5 million complex took five years to complete. Work included additions and alterations to existing structures, roads, parking areas, aprons, a new terminal, taxiways, runways, landscaping, cargo terminal and relocation of the FAA tower. Support facilities included a new helipad and cargo terminal (Schlapak and Kali 2006). By 1995, after the completion of these facilities, the Kahului Airport was ranked as one of the busiest small airports in the United States, logging over 4 million passengers (Hooser and Stewart 1995). By 2005, the number of passengers travelling through the Kahului Airport had more than doubled, to 8.5 million (Hawaii Small Business Development Center Network 2006).

Kahului area has continued to expand commercially. HC&S closed Pu‘unēnē Mill, its last operable mill and the last sugar plantation in Hawai‘i in 2016 (Cataluna 2016). Surrounding former sugar cane lands are now either fallow or in some stage of commercial development.

4.4.4 Harbor Development

The importance of Maui as a center for the pacific whaling industry encouraged the construction of numerous modern wharves, landings and harbors throughout the island, many of which have been improved and are still in use to this day. While Kahului Harbor was not the first of these to be constructed, it was the first port on Maui with structures built to allow for ships to moor directly within the harbor. This allowed ships to transfer freight in the protection of the breakwaters rather than anchoring offshore and transporting cargo via smaller craft (Rush 1957).

In its original condition, the bay was a natural inlet surrounded and supported by a large coral reef. While the reef offered its own protection, the bay itself was largely exposed to powerful surf, rendering it useless to seafaring merchants. Engineers struggled for decades to design a harbor that could withstand the severe storms and northeast trade winds that frequently impact the northwestern shores of Maui.

Under the influence of Alexander and Baldwin, construction of the first breakwaters at Kahului Bay began in 1898. Kahului Railroad Company began construction of the eastern breakwater by depositing large boulders extracted from plantation fields on top of the eastern reef, providing some protection to moored ships, but destroying the natural reef in the process. The eastern breakwater was completed in 1913 (Figure 50), and the western breakwater was completed in 1919, both under similar methods of construction (Taylor 1926). In addition, the interior of the harbor was dredged to a depth of 35 feet to accommodate large vessels looking to moor in the harbor. Despite the cost of the breakwaters and dredging in terms of finances, labor, and environmental destruction, the protection offered by the original harbor infrastructure proved inadequate, needing near constant maintenance, repair, and extension in the decades following its construction. By 1926, the United States Army Corps of Engineers had already spent $755,580 on

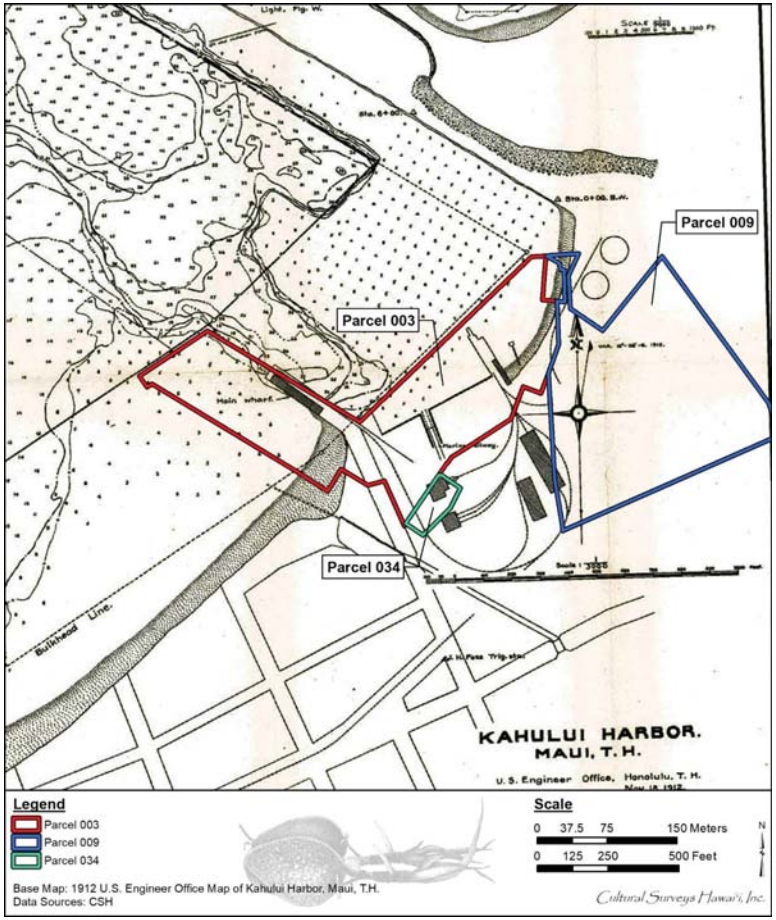


Figure 50. Portion of a 1912 U.S. Engineer Office map of Kahului Harbor showing early plans for the eastern breakwater and other facilities (U.S. Engineer Office 1912)

improvements to the harbor (Taylor 1926), an amount that when adjusted for inflation would equal nearly $11,000,000 in 2019.

Even after extensive investments, further improvements were still needed to the harbor. By 1931, both breakwaters had been extended and enlarged, and two wharfs had been constructed, Pier 1 for large vessels and Pier 2 for smaller craft. Pier 2 is within the Parcel 009 portion of the current project area (Figure 51). By 1941, the bulk sugar system had been constructed by HC&S (see Figure 51), including sugar storage warehouses (see Figure 47) and an advanced freight handling system that utilized conveyors and lifts to transport unrefined sugar automatically (Figure 52 through Figure 56). The construction of the bulk sugar conveyor system marked the last large-scale improvement to Kahului Harbor infrastructure and is still standing to this day. In 1960, this system was damaged by a devastating tidal wave that swept the harbor and surrounding Kahului (Figure 57 through Figure 60), suggesting the harbor is still vulnerable to tidal events and heavy storms.

Early construction surrounding Kahului Bay consisted primarily of small buildings associated with the budding railroad and plantation enterprises of Alexander and Baldwin, with the most intense period of development covering the first few decades of the twentieth century. However, industrial and commercial development persisted throughout later decades, as well (Figure 61 through Figure 67). Today the harbor is a hub for industrial and mixed-use businesses (Figure 68 through Figure 70).

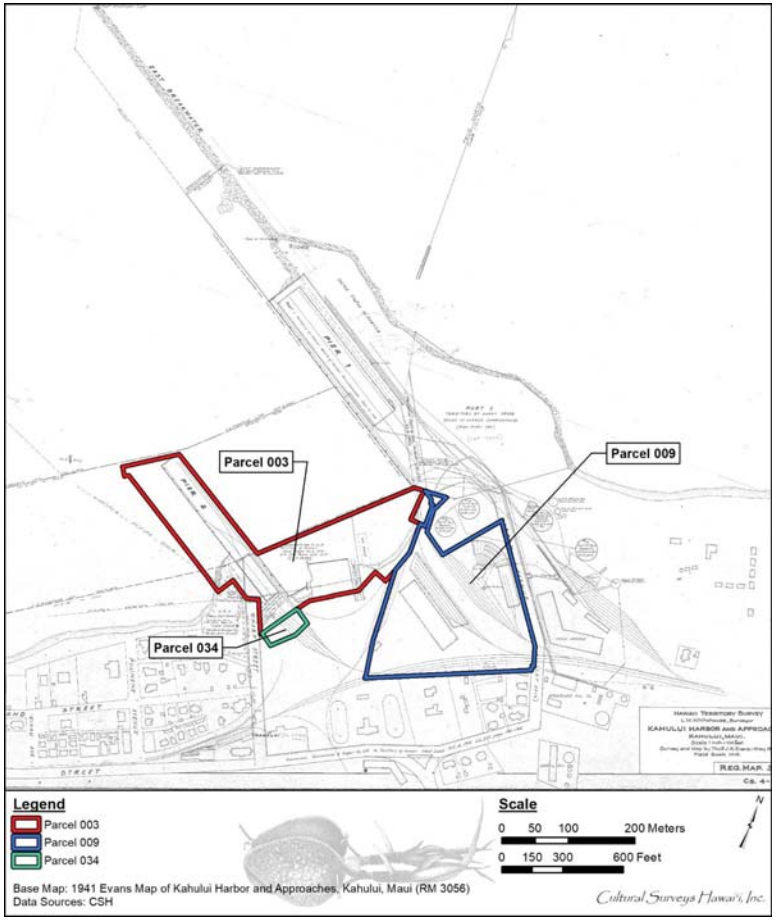


Figure 51. Map of Kahului Harbor showing the current project area after construction of Pier 1, Pier 2, the bulk sugar warehouse system, and surrounding developments (Evans 1941)

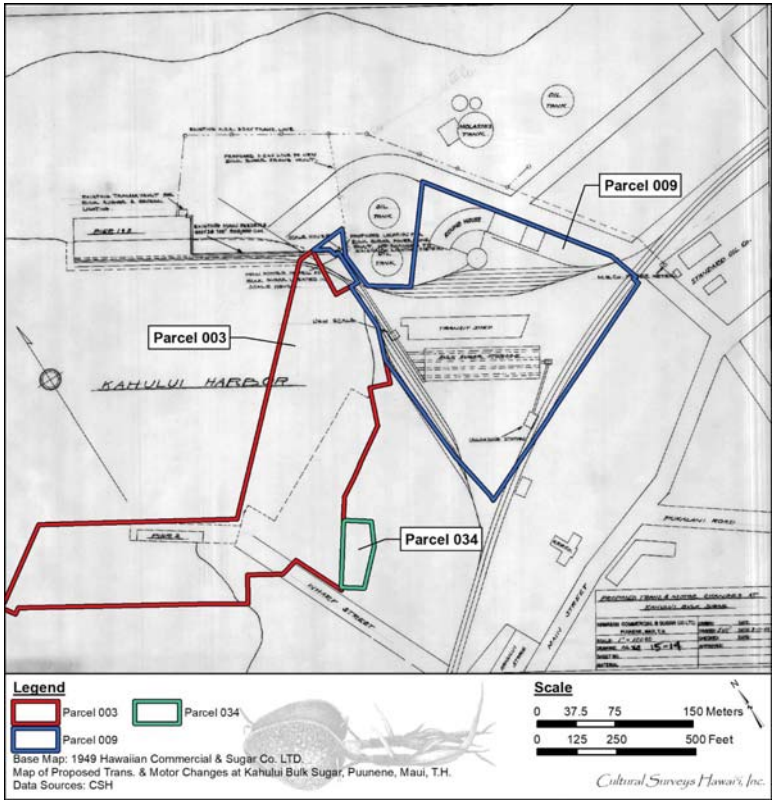


Figure 52. 1949 HC&S map showing then proposed changes to the transportation and infrastructure for the bulk sugar plant; note CSH 2 in center, and CSH 4 extending along the wharf (HC&S 1949)

Figure 53. Bulk sugar being loaded into transport trucks to be carried to the bulk sugar plant storehouses, circa 1940s; conveyor system (CSH4) visible in background (photo courtesy of HC&S Sugar Museum)

Figure 54. Interior of storehouse (CSH 2) while in operation circa 1950s, showing bulk unrefined sugar being transported to the storehouse from the intake conveyor system (photo courtesy of HC&S Sugar Museum)

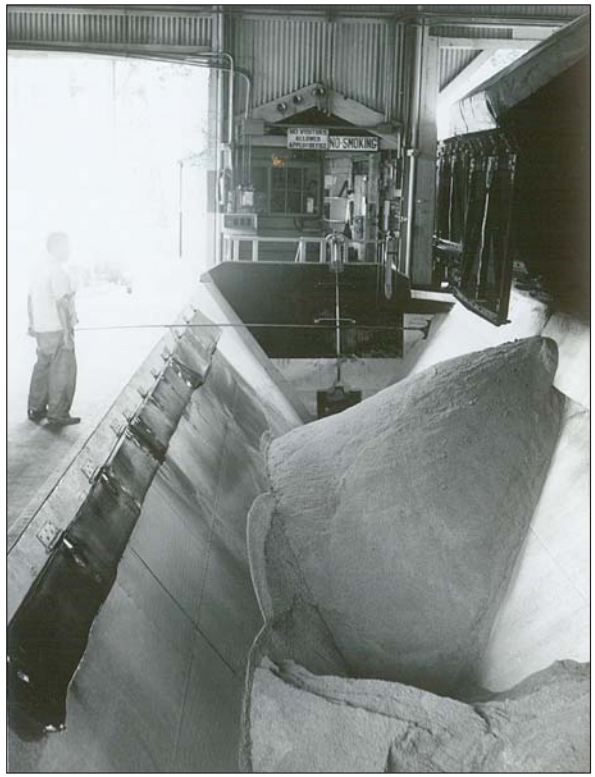


Figure 55. Interior of sugar storehouse (CSH 2) while still in operation circa 1950s and a portion of the conveyor system (CSH 4) connection (upper left) (photo courtesy of HC&S Sugar Museum)

Figure 56. Kahului Harbor with all components of the conveyor system (CSH 4), including the dump bin, the first of the bulk sugar storehouses (CSH 2), and the conveyor connecting each to Pier 1, circa 1940s (photo courtesy of HC&S Sugar Museum)

Figure 57. Historic photo of the bulk sugar conveyor system after the concrete foundation was undermined by a 1960 tidal wave (photo courtesy of HC&S Sugar Museum)

Figure 58. Photograph (1960) of damage to bulk sugar conveyor system at Kahului Harbor following a tidal wave; note extensive ground utilities under pavement surface to support the harbor infrastructure (photo courtesy of HC&S Sugar Museum)

Figure 59. Photo of utilities exposed at Kahului Harbor Bulk Sugar plant following a 1960 tidal wave (photo courtesy of HC&S Sugar Museum)

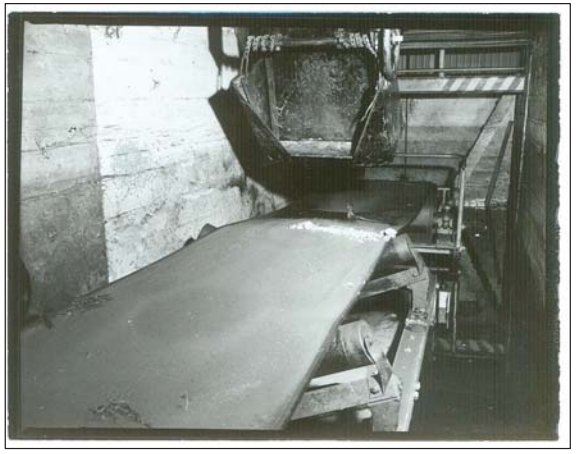


Figure 60. Photo of interior water damage to the bulk sugar conveyor system at Kahului Harbor caused by the 1960 tidal wave (photo courtesy of HC&S Sugar Museum)

Figure 61. Aerial photograph of Kahului Harbor showing industrial development in 1954 (photo courtesy of HC&S Sugar Museum)

Figure 62. Aerial photograph of Kahului Harbor showing industrial development in 1954 (photo courtesy of HC&S Sugar Museum)

Figure 63. Aerial photograph of Kahului Harbor, showing industrial development in 1956 (photo courtesy of HC&S Sugar Museum)

Figure 64. Aerial photograph of Kahului Harbor showing industrial development in 1957 (photo courtesy of HC&S Sugar Museum)

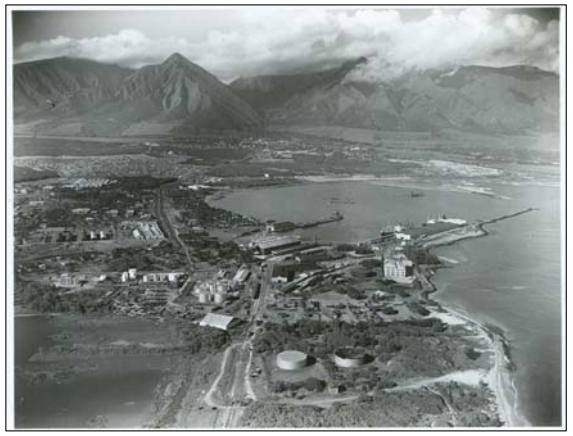


Figure 65. Aerial photograph of Kahului Harbor showing industrial development in 1962; West Maui Mountains and ‘Iāo Valley in background (photo courtesy of HC&S Sugar Museum)

Figure 66. Aerial photograph of Kahului Harbor (1960s) showing industrial development circa 1960s (photo courtesy of HC&S Sugar Museum)

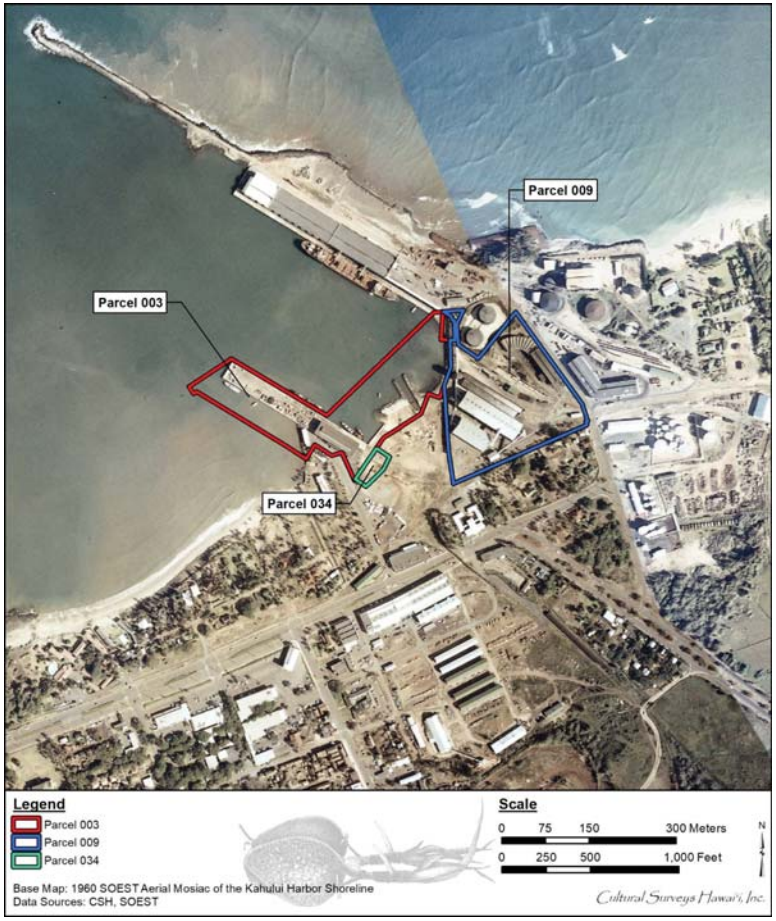


Figure 67. 1960 aerial photograph of the current project area showing the bulk sugar storage and conveyor system at Kahului Harbor and development in the vicinity (School of Ocean and Earth Science Technology [SOEST] 1960)

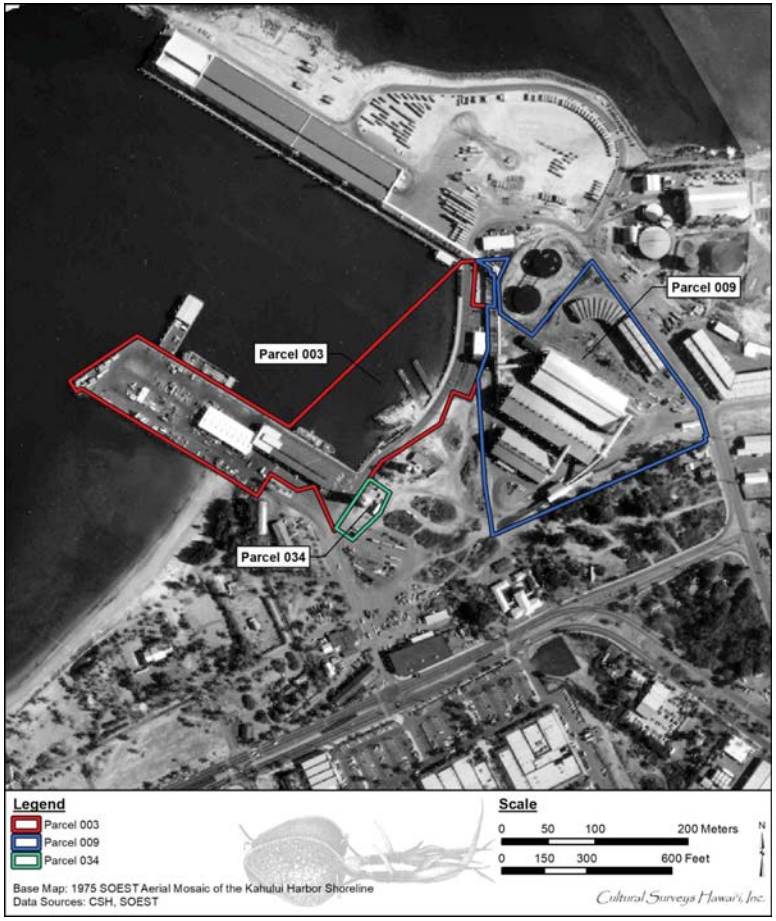


Figure 68. 1975 aerial photograph showing the current project area and surrounding development (School of Ocean and Earth Science Technology [SOEST] 1975)

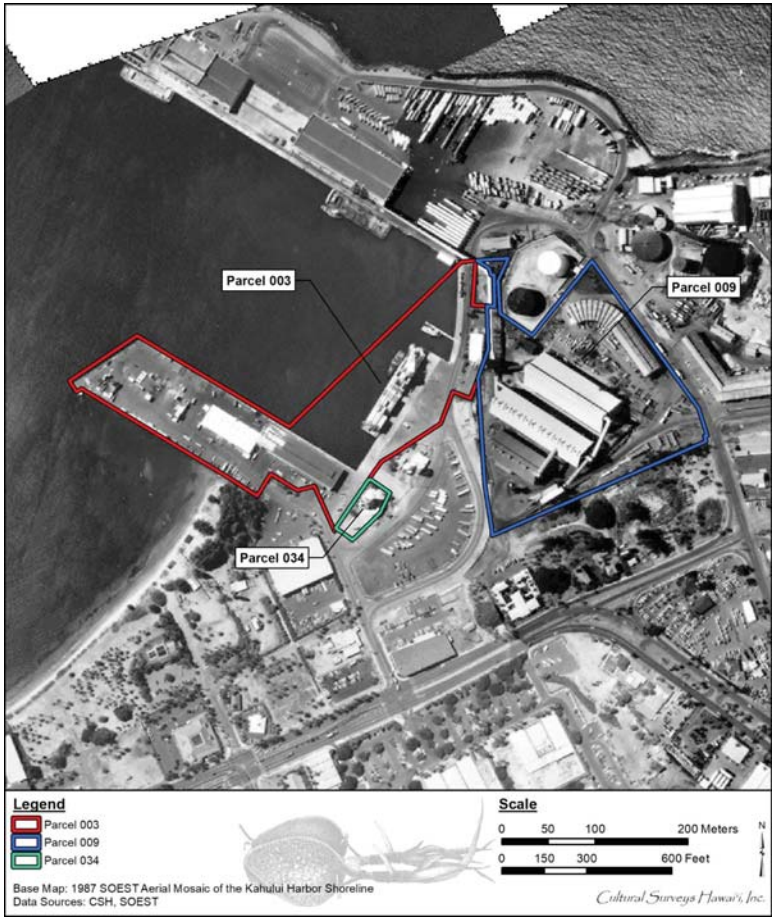


Figure 69. 1987 aerial photograph of the current project area and surrounding industrial and commercial growth (School of Ocean and Earth Science Technology [SOEST] 1987)

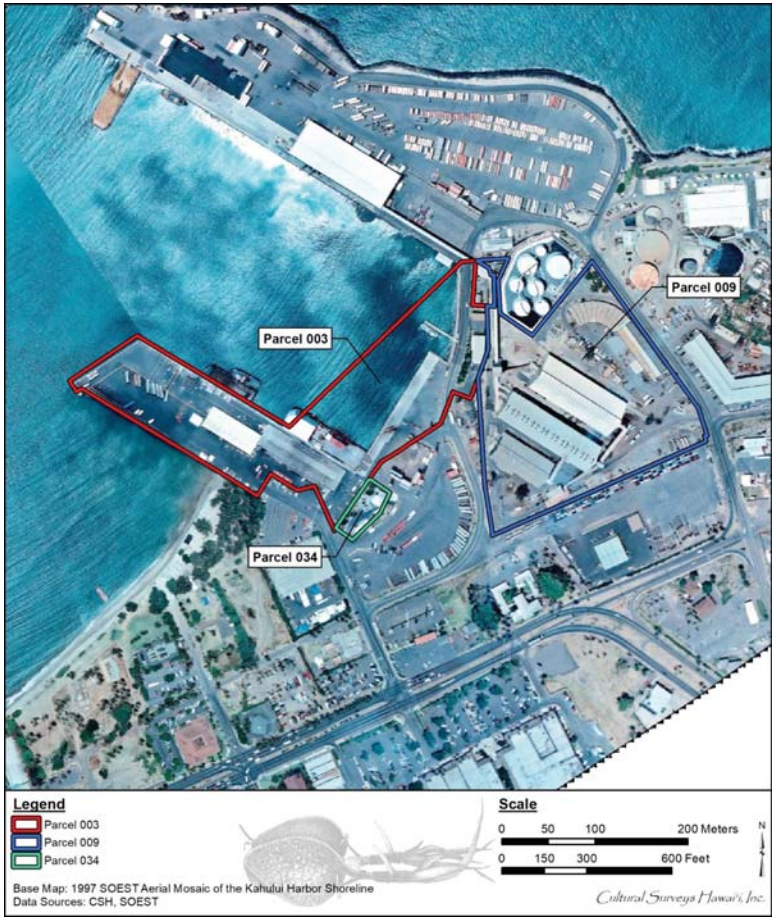


Figure 70. 1997 aerial photograph of Kahului Harbor and the surrounding industrial and commercial growth and development (School of Ocean and Earth Science Technology [SOEST] 1997)

Section 5 Previous Archaeological Research

Between 1931 and 1976, only sporadic archaeological studies were undertaken in the area. Following the passage of the National Historic Preservation Act in 1966 and HRS Chapter 6E, which established the historic preservation program in 1976, archaeological studies occurred as a condition of development on a more frequent basis. Under the guideline established by national and state legislation, the lands surrounding the current project area have been subject to a variety of studies including archaeological assessments (AA), archaeological inventory surveys (AIS), archaeological data recovery, literature reviews and field inspections (LRFI), and archaeological monitoring programs. The previous studies conducted near the current project area are described in the following subsections and depicted in Figure 71. Findings from previous studies conducted in the area are synopsized in Table 2 and are depicted in Figure 72.

5.1 Early Studies

The earliest archaeological studies on the island of Maui were part of island-wide surveys conducted in the early 1900s (Stokes 1917; Walker 1931), which focused on generating descriptive lists of large scale architectural features or traditional ceremonial *heiau* sites. No *heiau* were documented in the immediate vicinity of the current project area. Walker reported that 16 *heiau* once existed around Wailuku and Kahului towns (Sites 42-57), but he was able to relocate only two (Pihana and Haleki‘i) during the survey. Pihana and Haleki‘i Heiau are located on the west side of ‘Īao Stream, approximately 2.5 km (1.6 miles) northwest of the current project area. Walker’s detailed notes for Pihana Heiau (Walker Site 43) and for Haleki‘i Heiau (Walker Site 44) included scale plan-view drawings of the *heiau* foundations. The main terraces of Pihana Heiau measure 300 feet long by 100 feet wide and each of the four terrace levels appeared to be about four feet in height and were set on a lithified sandstone dune some 60 feet above the ‘Īao Stream. When first encountered by Stokes (1917), the northeast and east portion of the *heiau* were in ruins, having fallen down the slope as a result of erosion from ‘Īao Stream.

Walker (1931) measured Haleki‘i Heiau as a larger, more intact structure, some 300 feet by 150 feet, with slightly taller intact wall structures and the remains of enclosures, previously referred to by Stokes (1917) as “compartments,” integral to the design of the topmost terrace. In 1958, the Bishop Museum undertook the partial restoration of the platform of Haleki‘i Heiau in Wailuku. According to Emory (1972), the clearing and restoration of both the Pihana and Haleki‘i Heiau revealed a series of habitation platforms along the base of Haleki‘i Heiau toward ‘Īao Stream and several habitation sites between them.

5.2 Donham (1990)

On 14, 15, and 18 June 1990, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological inventory survey of the 4.6-acre Maui Palms Hotel property (Donham 1990). The study included a surface survey and the excavation of 40 auger cores at 34 locales. One surface site was identified and referred to as Site 852-1. Site 852-1 consisted of a 120-square-meter late twentieth century artifact and midden scatter within the shoreline setback area at the northwestern corner of the hotel property. Modern and/or historic subsurface cultural materials were identified at 16 locations, likely all in secondary fill deposits. One historic artifact concentration, identified across approximately 450 square meters within the southeastern corner of the parcel, was labeled

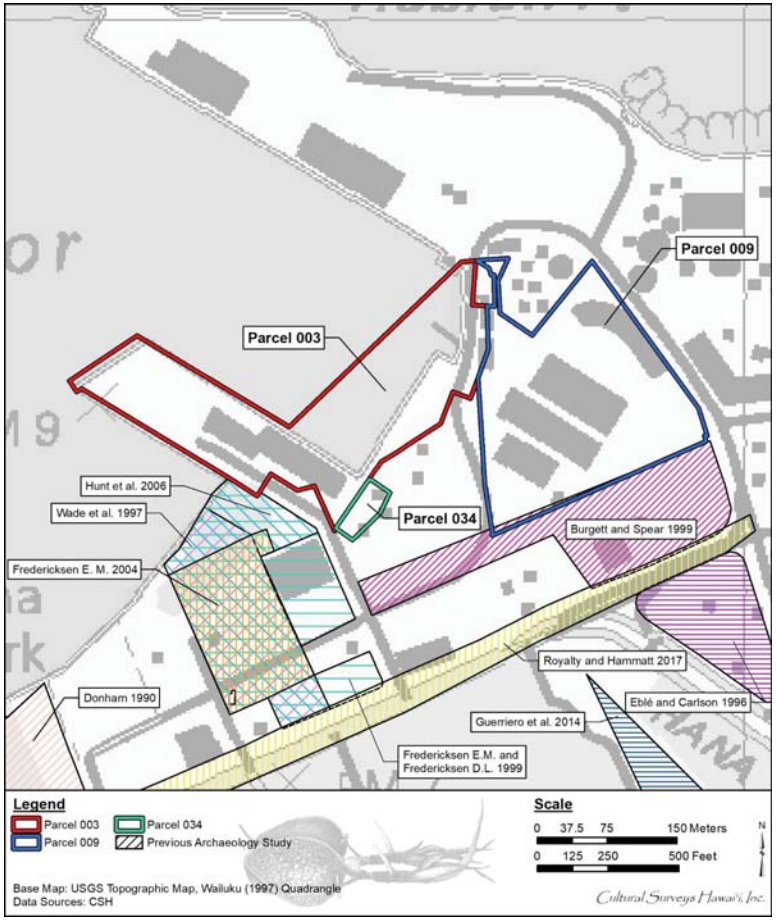


Figure 71. Portion of 1997 Wailuku USGS topographic quadrangles showing the location of earlier studies surrounding the project area

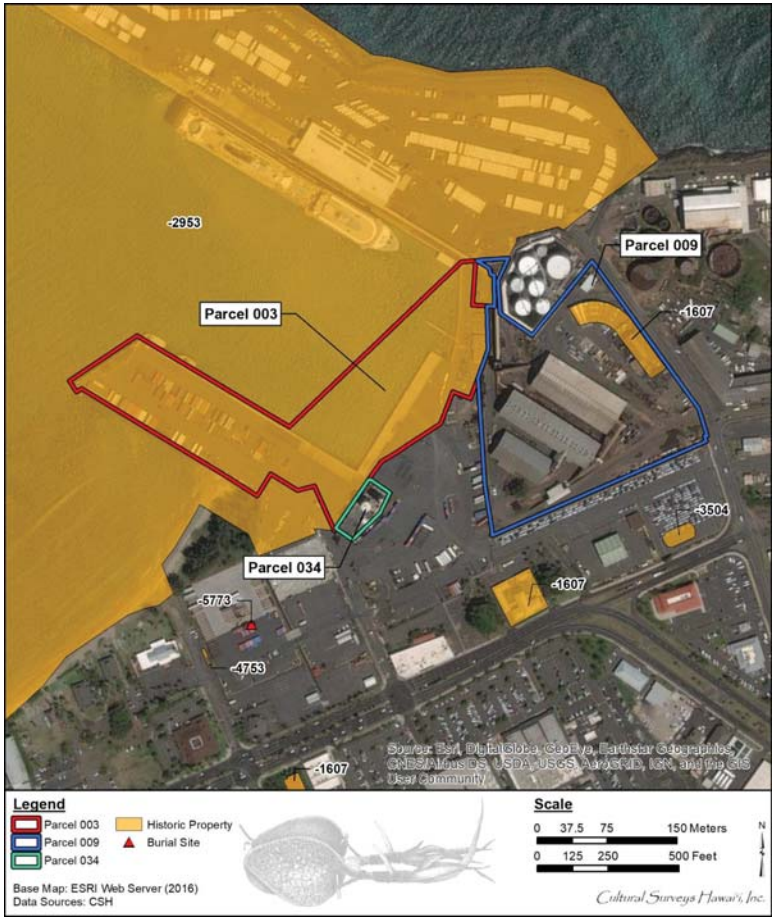


Figure 72. Portion of 1997 Wailuku USGS topographic quadrangle showing historic properties near the current project area

Table 2. Previous Archaeological Studies in the Vicinity of the Project Area

Reference	Type of Study	Location	Results
Donham (1990)	AIS	Maui Palms Hotel; TMK: [2] 3-7-003	No significant historic properties identified; identified secondary deposits of isolated modern and/or historic artifacts and midden scatter
Eblé and Carlson (1996)	AIS	Hobron Triangle; TMK: [2] 3-7-011:003	No historic properties identified: identified isolated modern/ historic artifacts
Wade et al. (1997)	AIS	Kahului Harbor; TMK: [2] 3-7-008:001, 002, 003, 004 & 006	No significant historic properties identified; identified two isolated historic artifacts and a historic pit feature
Burgett and Spear (1998)	Archaeological Monitoring	Kahului Harbor; TMK: [2] 3-7-010; includes southern border of the current project area at parcel 009	No historic properties identified; encountered a pit feature possibly associated with historic harbor activities
Fredericksen and Fredericksen (1999)	Archaeological Monitoring	Kahului Harbor; TMK: [2] 3-7-008:006, 004, 003 & 001	Identified SIHP # -4753, waterworn coral and basalt pebble paving with a 63.2-gram shellfish midden inclusion
Fredericksen (2004)	Archaeological Monitoring	Kahului Harbor; TMK: [2] 3-7-008:006	No historic properties identified; encountered a pit feature possibly associated with historic harbor activities
Hunt et al. (2006)	AIS	TMK: [2] 3-7-008:por. 006; 3-7-008: 004	Identified SIHP # -5773, historic burial, and additional components (isolated artifacts) of SIHP # -1607 (Kahului Historic District)
Guierrierro et al. 2014	Archaeological Assessment	TMK: [2] 3-7-009:005 and 004 pors.	No historic properties identified; encountered one isolated artifact (a railroad spike).
Royalty and Hammatt 2017	Archaeological Monitoring	TMK: [2] 3-4-001, 011, 012, 013, 018 & [2] 3-7-002, 003, 004, 008, 010, and 011, [2] 3-8-007 and 046	Identified SIHP # -8498, historic concrete foundation or sidewalk; isolated historic artifacts; and four previously identified historic properties: SIHP # -1541, Ka'ahumanu Avenue-Naniloa Drive Overpass; SIHP # -1607, Ka'ahumanu Church; SIHP # -1630, H.P. Baldwin High School; and SIHP # -1633, Waiale Drive Bridge

Site 852-2 and interpreted as a secondary deposit of habitation refuse and structural debris. Neither Site 852-1 nor 852-2 were deemed significant; consequently, no further work was recommended for these sites. However, archaeological monitoring was recommended for future project-related ground disturbing activities at the study area.

5.3 Eblé and Carlson (1996)

In November 1995, BioSystems Analysis, Inc. (BioSystems) conducted an archaeological inventory survey for retail development of Hobron Triangle (Eblé and Carlson 1996). Fieldwork included a subsurface testing strategy focused on areas proposed for underground utility installation. Of the 16 backhoe-excavated test trenches, cultural materials were encountered in only two, Trenches 7 and 11. Trench 7 contained modern and historic nails; historic metal, glass, and ceramic; and a wooden beam, all in a disturbed context. One artifact, a historic glass bottle dated to possibly the late nineteenth century, was identified in Trench 11. Fill sediment was apparent throughout the study area. No significant historic properties were identified. Archaeological monitoring was recommended for any project-related ground disturbance that would extend below existing fill layers.

5.4 Wade et al. (1997)

From 9 through 12 September 1997, Garcia and Associates, Inc., (GANDA) in association with Aki Sinoto Consulting, conducted an archaeological inventory survey of the Barge Terminal Improvement Project at Kahului Harbor (Wade et al. 1997). Fieldwork included a pedestrian survey and a subsurface testing program consisting of 11 backhoe-excavated test trenches. No surface remains were identified and only isolated historic artifacts (white porcelain fragment, one complete bottle, and a pit feature containing a sparse amount of marine shell and dense charcoal concentration) were observed in three of the test trenches. No historic properties were identified, therefore results of the study were published in an archaeological assessment report. Due to the observed presence of deep sandy deposits, future monitoring work was recommended for all ground disturbing activities on this parcel.

5.5 Burgett and Spear (1998)

Between 24 March and 15 April 1998, Scientific Consultant Services, Inc. (SCS) conducted archaeological monitoring for proposed improvements of the storage yards at Kahului Harbor on a 3.3-acre parcel (Burgett and Spear 1998). This study area includes the southern border of the Parcel 009 portion of the current project area. Monitored ground disturbance included 278.5 meters of trenching for water lines or drainage and approximately 178 m of electrical trenching. No historic properties were identified during this monitoring program. However, a large rock-filled pit was encountered extending to 89 centimeters below surface (cmbs) in Waterline Trench #2 in association with a previously disturbed layer of fill, suggesting the pit was part of old harbor facility operations. No associated artifacts were observed with this pit. Burgett and Spear (1998) also note that SIHP # -3508, a brick and mortar foundation footing with nineteenth and twentieth century artifacts in a coralline sand layer, was previously identified at the study area by the SHPD in 1993.

In general, soil observed during monitoring at this study area consisted of two to four layers of fill overlying natural sand. Natural sand strata were encountered from approximately 20 to 56 cmbs

and extended to the base of excavations, which were from approximately 100 to 180 cmbs. In some areas, natural beach sands were observed associated with coral pieces, while other observed sands were identified in conjunction with gleyed sands.

5.6 Fredericksen and Fredericksen (1999)

From November 1998 to February 1999, Xamanek Researches conducted archaeological monitoring for the Kahului Barge Terminal Improvements Project at Kahului Harbor (Fredricksen and Fredericksen 1999). This project area included a parcel bordering the west side of the Parcel 003 portion of the current project area. Fredericksen and Fredericksen (1999) note that soils appeared relatively undisturbed 20 to 40 centimeters below surface (cmbs) in the northwestern portion of the study area, and beach and dune sand deposits were present in the northern portion of the project area, while soils consisted of fill throughout the remainder of the monitored area.

One historic property, SIHP # -4753, was identified within an excavation along Pu‘unene Avenue for a landscaping palm tree. Limited manual test excavations at SIHP # -4753 determined it to be a subsurface stone platform at least 10 m (33 ft) long and 20 to 24 cm (7.9 to 9.4 in) thick, comprised of levelled and sorted waterworn basalt pebbles with occasional waterworn coral cobbles. Additionally, 63.2 grams of shellfish midden were observed within this feature. While function, extent, and age were not definitively interpreted, Fredericksen and Fredericksen (1999) suggest SIHP # -4753 is a pre-Contact feature. Data recovery was recommended for SIHP # -4753, and archaeological monitoring was recommended for any future improvements requiring subsurface disturbance at the study area.

5.7 Fredericksen (2004)

In March 2004, Xamanek Researches conducted archaeological monitoring during soil testing prior to scheduled improvements to the Pu‘unene Container Yard Facility at Kahului Harbor (Fredericksen 2004). Twelve soil cores were drilled and monitored during soil testing. Analysis of the core samples indicated that sand deposits underly all sampled portions of the Pu’unene Container Yard project area. Concentrations of waterworn pebbles were identified in four of the core samples. While directly investigating soil core areas underlying the modern paved surface was not possible, Fredericksen (2004) notes that these concentrations occurred at approximately the same depth as SIHP# -4753, a paved surface comprised entirely of waterworn cobbles and pebbles previously identified by Fredericksen and Fredericksen (1999) in an adjacent parcel. Constraints of the soil coring methodology did not allow for determining if the pebbles present in the coring samples represented a continuation of SIHP # -4753 or a naturally occurring feature.

5.8 Hunt et al. (2006)

From 13 December 2005 through 20 July 2006, SCS intermittently conducted archaeological monitoring for three phases of construction improvements to the Pu‘unene Container Yard facility at Kahului Harbor (Hunt et al. 2006). The northeast corner of this study area borders a section of the western edge the current project at Parcel 003. During monitoring on 13 January 2006, one partially in situ historic human burial was identified northeast of the center of the container yard. Several associated glass and shell beads “appeared to lie around the individual’s upper body, suggesting that the body was adorned in jewelry or lei when interred” (Hunt et al. 2006:29). The burial was designated SIHP # -5773, disinterred, and curated at the Maui SHPD office. In addition,

isolated traditional, historic, and modern artifacts were encountered during monitoring. Traditional artifacts included a basalt bread loaf sinker, basalt core, octopus lure, worked basalt cobble, a *poi* pounder, basalt hammer stones, shell sinkers, and a chopping stone. Some of the historic artifacts identified include a brass hinge, a metal nail, porcelain pieces, ceramic shards, glass bottles, fired clay, and saw-cut faunal remains. The isolated artifacts were included as additional components of SIHP # -1607, Kahului Historic District. Full-time archaeological monitoring was recommended for any future subsurface work.

5.9 Guerriero et al. (2014)

From 2 through 4 June 2014, Archaeological Services Hawaii, LLC (ASH) conducted an archaeological inventory survey of the southwestern portion of the Maui Mall Shopping Center parking lot prior to construction of the TJ Maxx store (Guerriero et al. 2014). Although, this project area is within SIHP # -1607 (Kahului Historic District), no historic buildings belonging to the historic district were identified within the study area. Ten test trenches were excavated by backhoe with a focus on areas where new drain lines and water utilities would be installed. No historic properties were identified. A single artifact was identified during the subsurface testing, which was a railroad spike unearthed in Trench 7. Guerriero et al. (2014) note the artifact as archaeologically insignificant, though indicative of the cultural history of Kahului Harbor as an industrial port. Archaeological monitoring was recommended for ground disturbance associated with the construction of TJ Maxx.

5.10 Royalty and Hammatt (2017)

Between 28 September 2015 and 19 July 2016, Cultural Surveys Hawaii (CSH) conducted archaeological monitoring for the Main Street and Ka‘ahumanu Avenue Resurfacing Project from High Street to Hobron Avenue (Royalty and Hammatt 2017). Four previously identified state and nationally recognized historic properties were within the study area: SIHP # 50-50-04-1633/ NRHP #98001287, Waiale Drive Bridge; SIHP # -1541/NRPH # 08001065, Ka‘ahumanu Avenue-Naniloa Drive Overpass; SIHP # -1630/ NHRP # 00000667, H.P. Baldwin High School; and SIHP # -1607/ NHRP #75000622, Ka‘ahumanu Church. One historic property, SIHP # -8498, was newly identified during the monitoring program. SIHP # -8498 represents an in situ historic era concrete foundation or sidewalk, which was buried with base course for a new sidewalk and not impacted adversely during the project. Several isolated artifacts were also encountered during montoring, including an assemblage of ceramic sherds and glass bottles. These artifacts were not considered significant. None of the identified historic properties are in the immediate vicinity of the current project area.

Section 6 Community Consultation

6.1 Introduction

Throughout the course of this assessment, an effort was made to contact and consult with Native Hawaiian Organizations (NHO), agencies, and community members including descendants of the area, in order to identify individuals with cultural expertise and/or knowledge of the *ahupua‘a* of Wailuku. CSH initiated its outreach effort in August 2019 through letters, email, telephone calls, and in-person contact. CSH completed the community consultion in July 2020.

6.2 Community Contact Letter

Letters (Figure 73 and Figure 74) along with a map and an aerial photograph of the project were mailed with the following text:

> On behalf of Hawaiian Cement, Cultural Surveys Hawai‘i, Inc. (CSH) is conducting a cultural impact assessment (CIA) in support of an environmental assessment being prepared for the Hawaiian Cement Facilities Relocation Project at Kahului Harbor, Wailuku Ahupua‘a, Wailuku District, Maui Island, Tax Map Key (TMK) Parcel Nos. [2] 3-7-010:009 (Parcel 9) and [2] 3-7-010:003 (Parcel 3). The project site is shown in the attached figures (see Figure 1 and Figure 2).
>
> Hawaiian Cement is proposing to relocate their existing cement terminal facility at Kahului Harbor as part of the State of Hawai‘i Department of Transportation Harbors Division’s *Kahului Harbor Development Plan*. The new facility will be located on an approximately 25,000 square foot portion of Parcel 9. The relocated facility will be comprised of two (2) silos, a warehouse building, underground pipelines from the pier to the silos, and related site improvements. The two (2) silos and warehouse building will incorporate reinforced concrete walls and be flood-proof. Staging areas for all project-related activities will be contained within Parcel 9. The project will also include work on the adjacent parcel (Parcel 3) to install a new underground pipeline from the harbor pier to the new silos Ground disturbing activities will likely involve the following:
>
> - Coring and drilling for soils exploration by the geotechnical engineer (soils engineer).
> - Open excavation for the installation of an underground pipeline from the pier to silos at a depth of approximately three feet below surface.
> - Footing excavation at a depth of approximately three (3) to four (4) feet below surface, under the silos and warehouse.
> - Excavation associated with the installation of a new sewer line or septic tank system.
> - Excavation at a depth of approximately 1.5 feet below pavements to install base course under pavement.
>
> The purpose of this CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are

Cultural Surveys Hawai'i, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President

P.O. Box 1114 Kailua, Hawai'i 96734 Ph: (808) 262-9972 Fax: (808) 262-4950

Job code: WAILUKU 40 ktanaka@culturalsurveys.com www.culturalsurveys.com

August 2019

Aloha,

On behalf of Hawaiian Cement, Cultural Surveys Hawai'i, Inc. (CSH) is conducting a cultural impact assessment (CIA) in support of an environmental assessment being prepared for the Hawaiian Cement Facilities Relocation Project at Kahului Harbor, Wailuku Ahupua'a, Wailuku District, Maui Island, Tax Map Key (TMK) Parcel Nos. [2] 3-7-010:009 (Parcel 9) and [2] 3-7-010:003 (Parcel 3). The project site is shown in the attached figures (see Figure 1 and Figure 2).

Hawaiian Cement is proposing to relocate their existing cement terminal facility at Kahului Harbor as part of the State of Hawai'i Department of Transportation Harbors Division's *Kahului Harbor Development Plan*. The new facility will be located on an approximately 25,000 square foot portion of Parcel 9. The relocated facility will be comprised of two (2) silos, a warehouse building, underground pipelines from the pier to the silos, and related site improvements. The two (2) silos and warehouse building will incorporate reinforced concrete walls and be flood-proof. Staging areas for all project-related activities will be contained within Parcel 9. The project will also include work on the adjacent parcel (Parcel 3) to install a new underground pipeline from the harbor pier to the new silos Ground disturbing activities will likely involve the following:

- Coring and drilling for soils exploration by the geotechnical engineer (soils engineer).
- Open excavation for the installation of an underground pipeline from the pier to silos at a depth of approximately three feet below surface.
- Footing excavation at a depth of approximately three (3) to four (4) feet below surface, under the silos and warehouse.
- Excavation associated with the installation of a new sewer line or septic tank system.
- Excavation at a depth of approximately 1.5 feet below pavements to install base course under pavement.

The purpose of this CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area in order to assess potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the proposed project. We are seeking your *kōkua* and guidance regarding the following aspects of our study:

- **General history as well as present and past land use of the project area**
- **Knowledge of cultural sites which may be impacted by future development of the project area—for example, historic and archaeological sites, as well as burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**

Figure 73. Community Consultation Letter Page One

- **Cultural associations of the project area, such as *mo'olelo* and traditional uses.**
- **Referrals of *kūpuna* or elders and *kama'āina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua'a* lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

In advance, we appreciate your assistance in our research effort. If you are interested in participating in this study, please contact Kellen Tanaka at ktanaka@culturalsurveys.com. We are also available by phone at (808) 262-9972.

Mahalo nui loa,

Kellen Tanaka
Cultural Researcher

Figure 74. Community Consultation Letter Page Two

knowledgeable about this area in order to assess potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the proposed project. We are seeking your *kōkua* and guidance regarding the following aspects of our study:

- **General history as well as present and past land use of the project area**
- **Knowledge of cultural sites which may be impacted by future development of the project area—for example, historic and archaeological sites, as well as burials.**
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- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

In January 2020, CSH was notified about a change to the project area, which includes demolition of the existing Hawaiian Cement facility following the completion of the new relocated facility. The existing Hawaiian Cement facility is located on TMK [2] 3-7-010:034. Revised letters (Figure 75 and Figure 76) along with a map and aerial photograph of the project area were mailed with the following revised text.

> In August and November 2019, Cultural Surveys Hawai‘i, Inc. (CSH), on behalf of Hawaiian Cement, reached out to the Wailuku community regarding a cultural impact assessment (CIA) for the Hawaiian Cement Facilities Relocation Project at Kahului Harbor, Wailuku Ahupua‘a, Wailuku District, Maui Island, Tax Map Key (TMK) Parcel Nos. [2] 3-7-010:009 (Parcel 9) and [2] 3-7-010:003 (Parcel 3). As the project area has changed slightly, we are seeking additional input as part of the CIA consultation process.
>
> As detailed in the previous consultation letter, Hawaiian Cement is proposing to relocate their existing cement terminal facility at Kahului Harbor as part of the State of Hawai‘i Department of Transportation Harbors Division’s *Kahului Harbor Development Plan*. The new facility will be located on an approximately 25,000 square foot portion of Parcel 9. The relocated facility will be comprised of two (2) silos, a warehouse building, underground pipelines from the pier to the silos, and related site improvements. The two (2) silos and warehouse building will incorporate reinforced concrete walls and be flood-proof. Staging areas for all project-related activities will be contained within Parcel 9. The project will also include work on the adjacent parcel (Parcel 3) to install a new underground pipeline from the harbor pier to the new silos. Ground disturbing activities will likely involve the following:

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Job code: WAILUKU 40 ktanaka@culturalsurveys.com www.culturalsurveys.com

January 2020

Aloha,

In August and November 2019, Cultural Surveys Hawai‘i, Inc. (CSH), on behalf of Hawaiian Cement, reached out to the Wailuku community regarding a cultural impact assessment (CIA) for the Hawaiian Cement Facilities Relocation Project at Kahului Harbor, Wailuku Ahupua‘a, Wailuku District, Maui Island, Tax Map Key (TMK) Parcel Nos. [2] 3-7-010:009 (Parcel 9) and [2] 3-7-010:003 (Parcel 3). As the project area has changed slightly, we are seeking additional input as part of the CIA consultation process.

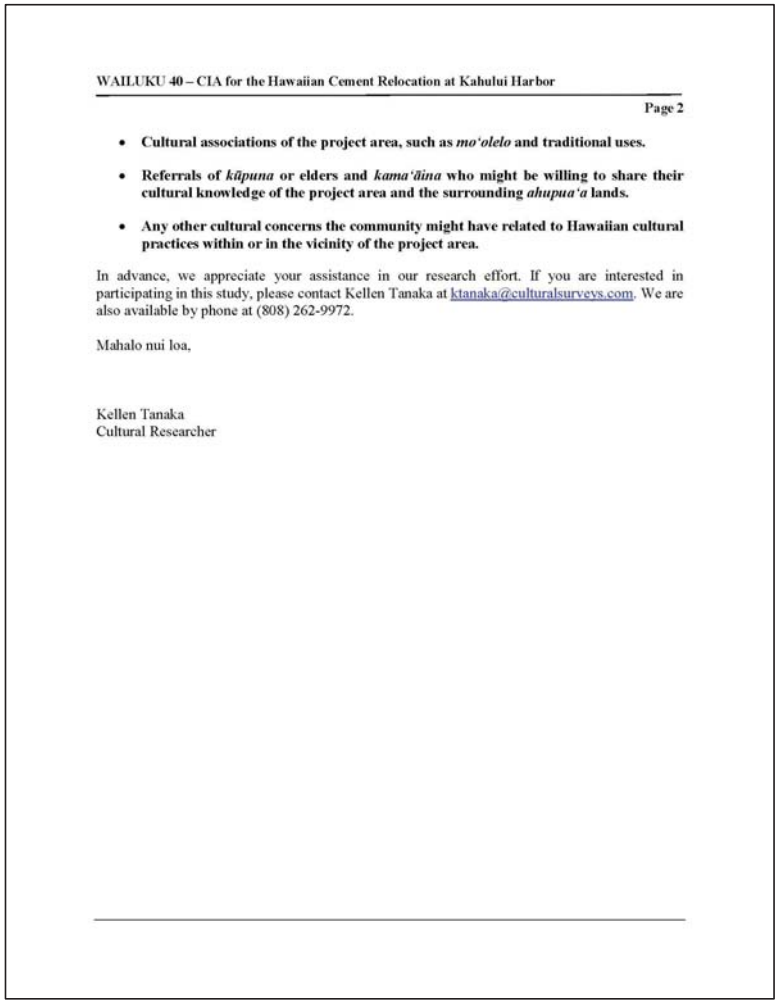
As detailed in the previous consultation letter, Hawaiian Cement is proposing to relocate their existing cement terminal facility at Kahului Harbor as part of the State of Hawai‘i Department of Transportation Harbors Division’s *Kahului Harbor Development Plan*. The new facility will be located on an approximately 25,000 square foot portion of Parcel 9. The relocated facility will be comprised of two (2) silos, a warehouse building, underground pipelines from the pier to the silos, and related site improvements. The two (2) silos and warehouse building will incorporate reinforced concrete walls and be flood-proof. Staging areas for all project-related activities will be contained within Parcel 9. The project will also include work on the adjacent parcel (Parcel 3) to install a new underground pipeline from the harbor pier to the new silos. Ground disturbing activities will likely involve the following:

- Coring and drilling for soils exploration by the geotechnical engineer (soils engineer).
- Open excavation for the installation of an underground pipeline from the pier to silos at a depth of approximately three feet below surface.
- Footing excavation at a depth of approximately three (3) to four (4) feet below surface, under the silos and warehouse.
- Excavation associated with the installation of a new sewer line or septic tank system.
- Excavation at a depth of approximately 1.5 feet below pavements to install base course under pavement.

Recently, CSH was notified of a slight modification to the project area to include the demolition of the existing Hawaiian Cement facility following the completion of the new relocated facility. The existing Hawaiian Cement facility is located on TMK [2] 3-7-010:034 (Parcel 34 on Figure 3 and Figure 4). Both the original project area and the revised project area are depicted in the attached figures (please refer to Figure 1 and Figure 2 noting the “Original Project Area” and Figure 3 and Figure 4 noting the “Revised Project Area”). There have been no changes to the proposal for the new relocated facility.

The purpose of this CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area in order to assess

Figure 75. Revised Community Consultation Letter Page One



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Page 2

- **Cultural associations of the project area, such as *mo‘olelo* and traditional uses.**
- **Referrals of *kūpuna* or elders and *kama‘āina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua‘a* lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

In advance, we appreciate your assistance in our research effort. If you are interested in participating in this study, please contact Kellen Tanaka at ktanaka@culturalsurveys.com. We are also available by phone at (808) 262-9972.

Mahalo nui loa,

Kellen Tanaka
Cultural Researcher

Figure 76. Revised Community Consultation Letter Page Two

- Coring and drilling for soils exploration by the geotechnical engineer (soils engineer).
- Open excavation for the installation of an underground pipeline from the pier to silos at a depth of approximately three feet below surface.
- Footing excavation at a depth of approximately three (3) to four (4) feet below surface, under the silos and warehouse.
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The purpose of this CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area in order to assess potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the proposed project. We are seeking your kōkua and guidance regarding the following aspects of our study:

- **General history as well as present and past land use of the project area**
- **Knowledge of cultural sites which may be impacted by future development of the project area—for example, historic and archaeological sites, as well as burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as *mo‘olelo* and traditional uses.**
- **Referrals of *kūpuna* or elders and *kama‘āina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua‘a* lands.**
- **Any other cultural concerns the community might have related to Hawaiian or other ethnic cultural practices within or in the vicinity of the project area.**

In most cases, two or three attempts were made to contact individuals, organizations, and agencies. Community outreach letters were sent to a total of 90 individuals or groups, 19 responded, and three of these *kama‘aina* and/or *kupuna* provided written testimony and two

participated in formal interviews for more in-depth contributions to the CIA. The results of the community consultation process are presented in Table 3.

6.3 Community Contact Table

Below in Table 3 are names, affiliations, dates of contact, and comments from NHOs, individuals, organizations, and agencies contacted for this project. Results are presented below in alphabetical order.

Table 3. Community Contact Table

Name	Affiliation	Comments
Ahia, Jennifer Noelani	Malama Kakanilua	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Abraham, Ka‘au	Maui Nui Education and Outreach Coordinator for the Hawaiian Islands Humpback Whale National Marine Sanctuary	Letters and figures sent via email 2 August 2019 Email undeliverable
Adams, Mark	Wai‘ehu Kou Phase II	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Alu Like, Inc.		Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Ampong, Foster	Wailuku Moku Representative	Recommended by Kyle Nakanelua and Ke‘aumoku Kapu Letters and figures sent via email 2 August 2019 Mr. Ampong replied via email 3 August 2019: *Mahalo for the outreach. Yes. I will contact you next week.* CSH replied via email 6 August 2019: *Mahalo for your response. We look forward to hearing from you.* Revised letters and figures sent via email 27 January 2020
Apana, Clare	Cultural Practitioner; Malama Kakanilua; Aha Moku Council Burial Committee	Letters and figures sent via email 2 August 2019 Ms. Apana replied via email 2 August 2019: *Sounds a little odd location. I will look at the info.* CSH replied via email 6 August 2019: *Mahalo for your response. We look forward to hearing from you.* Revised letters and figures sent via email 27 January 2020

Artates, Perry	Waiohuli Hawaiian Homesteaders Association	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Mail returned Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Bisgard, Bill	Former engineer, Hawaiian Commercial and Sugar Company (HC&S)	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Mail returned
Buland, Holly	Museum Director, Alexander & Baldwin Sugar Museum	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020 Ms. Buland replied via email 28 January 2020: *The only information the Sugar Museum may have I have attached. You can find more information here: https://www.localciting.com/mapping-the-territory/kahului-maui-a-railroad-town/* CSH replied via email 31 January 2020: *Mahalo for your response and the information you provided. There is a lot of great information in there.* Summary sent for approval via email 13 February 2020 Summary approved via email 13 February 2020
Carpio, Jay	Wailuku Community Managed Makai Area	Letter and figures sent via email 19 August 2019 Mr. Carpio replied via telephone 20 August 2019: *Mr. Carpio expressed interest in participating in the study and requested additional maps to get familiar with the project*. CSH met with Mr. Carpio on 3 September 2019 Interview summary sent for approval 7 November 2019 Revised letters and figures sent via email 27 January 2020 Interview summary sent for approval 27 January 2020 Interview summary sent for approval 16 March 2020 Mr. Carpio replied via email 17 March 2020: *I'll review tonight.* CSH replied via email 17 March 2020: *Mahalo, Jay*. CSH followed up with Mr. Carpio 1 July 2020: *Aloha Jay, Have you had a chance to review your summary for the Hawaiian Cement Facilities Relocation project at Kahului Harbor? We are aiming to finalize the report around July 15 and submit it to client by the end of the month. I attached a copy of your summary to this email. Please let me know if you approve the summary or if you have any comments or revisions. Mahalo for your help,*

Central Maui Soil & Water Conservation District		Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Daniels, Roland	*Kama‘āina*	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Mail returned
Delima, Carol-Marie Kaonohi‘okala		Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Eaton, Antoinette “Toni”	Maui District Supervisor, Department of Hawaiian Home Lands	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 William Aila, Jr., Chairman of Hawaiian Home Commission replied on behalf of Department of Hawaiian Home Lands via USPS 9 September 2019 (see Appendix A) Revised letters and figures sent via USPS 24 January 2020
Enomoto, Kekoa	Pa‘upena Community Development Inc.	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020 Ms. Enomoto replied via email 28 January 2020: *My mana‘o is we should receive $125/hour at a site/date/time TBD because consultants get paid thousands/million(s) to produce these assessments that require community resource people to share their knowledge/expertise. Pls advise;* CSH replied via email 3 February 2020: *We appreciate you taking the time to respond to our request for consultation. Regrettably, we are not able to compensate you at the rate you suggested. We do provide a small honoraria and makana to those who meet with us and share their mana‘o.*
Farden, Hailama	President, Association of Hawaiian Civic Clubs	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Feiteira, Blossom	Executive Director of Friends of Moku‘ula	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020

Fisher, Scott	Chief Conservation Officer, Hawaiian Islands Land Trust (HILT)	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Dr. Fisher replied via email 2 August 2019: *I would be happy to help in any way I can with this project; please let me know when you are on Maui, or if there is some other way you’d like to meet (phone, Skype, etc.). I look forward to meeting with you.* Mail returned CSH met with Dr. Fisher 3 September 2019 Interview summary sent for approval 8 November 2019 Dr. Fisher approved summary 16 December 2019 Revised letters and figures sent via email 27 January 2020 Dr. Fisher replied via email 27 January 2020: *Mahalo for your message, and for making me aware of the scope of the work. Please correct me if I am wrong, but it seems that this project will involve more ground disturbance than previously projected. Please let me know if this is the case. If this is the case, I would certainly recommend archaeological monitoring, which I believe I also suggested, to ensure that iwi kupuna or any cultural sites are not unnecessarily damaged, modified or altered.* CSH replied via email 30 January 2020: *Mahalo for your quick response. Yes, the removal of the former facility will require some degree of ground disturbance. As part of CSH’s archaeological consultation, we are recommending on-site archaeological monitoring for all project-related ground disturbance.*
Fujishiro, Paul K.	*Kama‘aina*	Letters and figures sent via USPS 2 August 2019 Mail returned
Hall, Dana	*Hui Alanui o Makena*	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Hau, Skippy	*Kama‘āina*; Aquatic Biologist, DLNR Division of Aquatic Resources	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Hawaiian Canoe Club		Recommended by Ikaika Nakahasi, Jerome K. Yasuhara, and Al Lagunero Letter and figures sent via email 19 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Hewahewa, Koa	Forestry Manager, Hōkūnui Maui	Recommended by Ke‘aumoku Kapu Revised letters and figures sent via email 28 January 2020

Hokoana, Lui K.	President, Central Mui Hawaiian Civic Club; University of Hawai‘i Maui College’s chancellor	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Holt-Padilla, Hokulani	*Kumu Hula*, Pā‘ū o Hi‘iaka/Cultural Specialist	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Hussey, Sylvia	Chief Executive Officer, Office of Hawaiian Affairs (OHA)	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Johnson, L.		Recommended by Ke‘aumoku Kapu Revised letters and figures sent via email 28 January 2020
Kahalehau, Clyde		Recommended by Ke‘aumoku Kapu Revised letters and figures sent via email 28 January 2020
Kama, Natalie A.	President, Keokea Hawaiian Homes Farmers Association	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Kamai, Sir David	Ali‘i ‘Aimoku, Royal Order of Kamehameha I, Chapter IV Heiau O Kahikili (Maui)	Letters and figures sent via USPS 2 August 2019 Mail returned Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Kamaunu, Johanna	Maui/Lana‘i Burial Council - Wailuku	Recommended by Ke‘eaumoku Kapu Letters and figures sent via email 2 August 2019 Ms. Kamaunu replied via email 5 August 2019: *We want to learn more about this project. This week is busy but lets set up a meeting date, time and place week day mornings are usually better. Please email us details, map & overlays of the project asap to expedite discussion.* CSH replied via email 6 August 2019 Ms. Kamaunu replied via email 6 August 2019: *Your email has been forwarded to me by Andrew Phillips of SHPD. I am a mrmber if the Maui Lanai Island Burial Council and a resident of Waihe‘e Valley. Currently, I chair the Land Committee of Aha Moku o Wailuku and*

		your project is a matter which the Aha may have kuleana for. *Give me a few days to gather descendants and residents from the area for discussion before we meet with you. To expedite matters please provide a map of the project area, any grading permits, land conveyance history, any previous AIS, EIS, CIA, BTP that may have been completed. The more we know about what you have the easier to explain history and or support recommendations.* CSH replied via email 6 August 2019: *Mahalo for your response. I will work on getting the information you requested and get back to you* Ms. Kamaunu replied via email 6 August 2019: *I noticed your attachment had maps and some detail of the project. It is helpful to the 2nd part of our discussion.* *We are curious about the red parcel dimensions. Does this mean you will be extending the pier and posts? What activity is it dedicated to?* *Per your letter the blue parcel below grade work to a maximum 3 ft depth. Is that for all structures at that site? What activity/activities is it dedicated to?* *Hobron has produced iwi about 5 or 6 years ago. What plans do you have for monitoring ground disturbing activity in this project? Is there a grading permit? Will there be removal of substrates? How much?* *Will there be a dredging of the harbor?* *These questions address concerns for different types of fishing in and around the harbor as well as the ability to access the area. In this harbor there are several fishing koa. You may call me anytime to discuss and clarify our questions.* CSH replied via email 9 August 2019: *I forwarded your questions to our client. Regarding the archaeological work, CSH is planning to conduct an archaeological inventory survey (AIS) of the project area later this year but has not yet received notice to proceed by our client. The AIS will likely include a combination of a 100% surface survey, the use of ground penetrating radar, and subsurface testing. Archaeological monitoring may also be recommended. We look forward to consulting with you throughout this work. Feel free to contact Trevor Yucha at tyucha@culturalsurveys.com who will be overseeing the archaeological requirements for this project.*

		Ms. Kamaunu replied via email 6 August 2019: *Appreciate the update Kellen. I am very familiar with Trevor. It will be nice to consolidate projects under one arch company.* CSH replied via email 9 August 2019: *The client has provided answers to your questions. The answers are in red.* *We are curious about the red parcel dimensions. Does this mean you will be extending the pier and posts? What activity is it dedicated to?* *No, there will not be extensions to the pier and posts in Parcel 3.* *Per your letter the blue parcel below grade work to a maximum 3 ft depth. Is that for all structures at that site? What activity/activities is it dedicated to?* *Ground disturbance includes excavation for foundation, installation of buried pipe line, sewer line, and water lines (estimated maximum depth of 4 ft.). Also includes minor grading for paved areas.* *Hobron has produced iwi about 5 or 6 years ago. What plans do you have for monitoring ground disturbing activity in this project? Is there a grading permit? Will there be removal of substrates? How much?* *CSH is planning to conduct an archaeological inventory survey (AIS) of the project area later this year but has not yet received notice to proceed by our client. The AIS will likely include a combination of a 100% surface survey, the use of ground penetrating radar, and subsurface testing. Archaeological monitoring may also be recommended.* *The project will require a building permit.* *Will there be a dredging of the harbor?* *No, there will be no dredging.* *Feel free to contact me if you have any more questions.* Revised letters and figures sent via email 27 January 2020
Kamaunu, Kaniloa	Aha Moku Council Wailuku Representative; Aha Moku Council Burial Committee	Recommended by Ke'aumoku Kapu, Annalise Kehler, and Kyle Nakanelua Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Kamaunu, Skye		Recommended by Ke'aumoku Kapu Revised letters and figures sent via email 28 January 2020
Kamaunu Basbas,		Recommended by Ke'aumoku Kapu Revised letters and figures sent via email 28 January 2020

Marcial Pualani		
Kamekona, Carol Lee	Ahahui Kaahumanu - Wailuku	Letters and figures sent via USPS 2 August 2019 Mail returned
Kapahulehua, Leonard Kimokeo	Founder, Kimokeo Foundation	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Kapu, Ke'eaumoku	Chair, Aha Moku o Maui Inc.	Recommended by Ikaika Nakahashi Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Mr. Kapu replied via email 4 August 2019: *Thank you for the information. I will inform the moku committee island rep for the moku of wailuku and see if we can schedule a meeting to go over the project. Kaniloa Kamaunu is also a person you may want to get with I included him to this thread as well and his wife Johanna. They both sit on the Aha moku advisory for that moku.* CSH replied via email 6 August 2019: *Mahalo for your response. We look forward to hearing from you.* Revised letters and figures sent via email 27 January 2020 Mr. Kapu replied via email 27 January 2020: *Mahalo for reaching out, let's hope we can get you hooked up.* *I have included individuals that are to me considered viable resource kanaka. Some affiliated to aha moku o Wailuku and others from different organizations.* *Suggest you reach out and get the ball rolling. Tag me in all corrispondance please.* CSH replied via email 28 January 2020: *Mahalo for your quick response and your suggestions. We have previously reached out to a few of them. We will continue our outreach to the rest of them and cc you on the email.*
Kapu, Uilani	Treasurer, Na Aikane O Maui	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Kawaa, Luana		Recommended by Ke'aumoku Kapu Revised letters and figures sent via email 28 January 2020
Kehler, Annalise	County Cultural Resource Planner	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Ms. Kehler replied via email 13 November 2019: *I suggest reaching out to the Wailuku representative of*

		Aha Moku O Maui to start with. Aha Moku O Maui's website lists several contacts for Wailuku moku. These folks might be able to provide you with the information you're seeking. They also might provide you with contacts for cultural and lineal descendants of this particular ahupuaa. CSH replied via email 13 November 2019: *Mahalo for your response and your suggestion to contact the Aha Moku O Maui. We have reached out to a few of the members listed on the Aha Moku website.* Revised letters and figures sent via email 27 January 2020
Kekahuna, Janice	Paukukalo Hawaiian Homestead Community Association	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Kekona, Thomas J.	*Kama'āina* (Kailihou Ohana)	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Kim, Duane	Maui District Manager, Maui District Commercial Harbors	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Kua‘āina Ulu ‘Auamo	Community group associated with fishpond projects and *limu* practitioners; partner with Maui Nui Makai Network	Letters and figures sent via USPS 2 August 2019 Mr. Wally Ito responded on behalf of Kua‘āina Ulu ‘Auamo requesting letter and figures via email on 21 August 2019 CSH sent letter and figures to Mr. Ito via email Mr. Ito forwarded letter and figures Revised letters and figures sent via USPS 24 January 2020
Kubota, Gaylord	Retired Director/Founder, Alexander & Baldwin Sugar Museum	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Kuloloio, Leslie Apiu Aipalena	*Kupunakāne*, Kuloloi‘a Lineage – I ke Kai ‘o Kuloloi‘a	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020

Kuloloio, Manuel	Cultural Descendant	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Lagunero, Al		Recommended by Ke‘aumoku Kapu Revised letters and figures sent via email 28 January 2020 Mr. Lagunero replied via email 29 January 2020: *Hobron Point attracts large numbers of turtles that come in from the direction of Kahakuloa. They appear to bask in the outflow of waters from conduits along that shoreline from the industrial area.* *The numbers vary from 10/15/20 in various sizes or stages of growth. I've personally fed them and see tourists from the boats also enjoying them along the trail in the area above the waters.* *Hale Nanea, a community use center has been in place, from my experience, since and before 1960. It is located in close to the intended re-location. It is difficult to say how cement dust will affect the air in the area as it is subject to coastal, trade, and north winds affecting the area.* *Incoming tides from the north sea pose challenges to canoe practices located in the Kahului Bay area.* *It is questionable whether raw sewage is still being dumped from an area near Y. Hata buildings close to the Paukukalo turn-off from Lower Main and how the effulgence may affect the food chain still accessed by local families even toward the Hobron Point area. Hobron Point Baldwin Beach Park provided large quantities of limu waewaei'ole (as did the area near Y.Hata) - traditional gathering areas for he'e and lamalama at low tides. Coring activities involved in the relocation of the cement plant should be questioned further as the Kahului Bay Area, in its name alone provided many forms of edibles to the community at large for generations (i.e., the Hului fishing techniques). Octopus and squid are affected in great numbers as their young float-up to the harbor shores dead during the birthing season once signaled by the appearance of sugar-cane tassels in the fields mauka (from Kahului to Peahi (I forget the season of the year, Welo or Kauwela). What are the resources close-by for the production of cement? Sand? Where from? Paukukalo? Wailuku - Sand hills area? The relocation activities should not be the only focused concern, but, resource and resource*

		management by the State's mineral rights-to-control use of the resources have in recent years been questionable as sand from these areas were being shipped to Honolulu and possibly resisted by community activists. *Kanaha Pond, a loko i'a, has greatly been diminished from native disuse and displacement and is a notable feature in the area adjacent to the industrial areas in the Hobron quadrant.* *As the relocation appears to be a harmless business activity, a projected use over the next 20 to 50 years should be analyzed as it seems production will increase due to the County's General Plan for Residential Development skirts Kahului and Wailuku to start, and Tourism growth is at maximum capacity, noted by Bank Analysts reports on television news that the growth of tourism is needing increased management systems by the State.* *Kupuna Waiola Hana'ike, now perhaps in her mid-80's, is well informed as to the Kahului and Wailuku areas. I recommend that she be interviewed personally and be assisted by her ohana Crystal Alboro noted in the cc address of this email. Please, contact Crystal.* *Canoe Clubs along the Hamakua coast are an important group to be interviewed as they have consistently used Kahului Bay to Maliko as training and competition routes, and their water use has come under use-permits extended to windsurfers and fishermen as well.* CSH replied via email 31 January 2020: *Mahalo for your response and all the information you provided. Your comments and concerns will be included in our report. I also relayed your question regarding the "resources close-by for the production of cement" and they provided us with an answer:* *The proposed facility will only handle cement, which is a grey powder manufactured in factories outside of the State. The proposed facility will not handle any local minerals.* *Concrete is produced at other locations using cement, sand, aggregate, and water.* *Feel free to contact me if you have any more questions.* *We have also reached out to Ms. Alboro regarding consulting with Kupuna Waiola Hana'ike. We look forward to hearing from her.* Summary sent for approval via email 13 February 2020

		Mr. Lagunero approved summary via email 16 March 2020: *Thank you. It's okay with me. I hope Aunty Waiola was contacted*. CSH replied via email 16 March 2020: *Mahalo for your quick response. Yes, we have been in contact with Crystal Smythe about meeting with Kupuna Waiola. We were hoping to schedule a meeting with her in March and include her mana'o in the final draft of the CIA, however, due to the situation regarding COVID-19, Cultural Surveys has temporarily halted travel for staff, so unfortunately, I will not be able to travel to Maui to meet with her at this time.*
Lake-Farm, Sissy	Executive Director, Maui Museum/ Kumu Hula, Nā Hanona Kūlike ‘o Pi‘ilani	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Lay, Ivan	Vice-Chair, Maui County Cultural Resources Commission	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Lightfoot, Roslyn	Former Director, Alexander & Baldwin Sugar Museum	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Lindsey III, Edwin "Ekolu"	President, Maui Cultural Lands	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Maio, Bernie		Recommended by Ke‘aumoku Kapu Revised letters and figures sent via email 28 January 2020
Maluo-Pearson, Kahulu	Cultural Programs Director, Maui Arts & Cultural Center	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Manuel, Kaleo M.	Former DHHL Planner Deputy of State Water Commision	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Martin, Martha	President, Native Hawaiian Plant Society	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020

Maui Nui Makai Network – Wailuku CMMA	*Kama‘āina* group restoring the Kahului Harbor Fisheries Management Area	Letters and figures sent via USPS 2 August 2019
Maui Ocean Center		Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Molitau, Kapono‘ai	Owner, Native Intelligence	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Moore, Cheryl	Waiohuli Undivided Interest Lessees	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Nakahashi, Ikaika	Cultural Historian, SHPD	Recommended by Hinano Rodrigues Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Mr. Nakahashi replied via email 13 August 2019: *Mahalo for contacting me regarding the CIA for the proposed Hawaiian Cement Facilities Relocation Project at Kahului Harbor, in the ahupua‘a of Wailuku, in the Moku of Wailuku, Maui.* *I recommend CSH to utilize the media (e.x. OHA’s Ka Wai Ola, Maui News, etc.) to solicit additional information for this CIA.* *I recommend CSH to meet with:* • *Ke‘eaumoku Kapu – ‘Aha Moku o Maui Inc.,* • *Hawaiian Canoe Club* *I recommend CSH to meet with the native tenants and people that currently live or previously lived in the ahupua‘a of Wailuku on Maui for information about the cultural resources and practices for this CIA.* *Please let me know if I can assist with anything else.* CSH replied via email 15 August 2019: *Mahalo for your response and the information you provided. We will continue our outreach to those mentioned below.* Revised letters and figures sent via email 27 January 2020 Mr. Nakahashi replied via email 6 February 2020: *Mahalo for contacting me regarding the CIA for the proposed Hawaiian Cement Facilities Relocation*

		Project at Kahului Harbor, in the ahupua‘a of Wailuku, in the Moku of Wailuku, Maui. *I recommend CSH to utilize the media (e.x. OHA’s Ka Wai Ola, Maui News, etc.) to solicit additional information for this CIA.* *I recommend CSH to meet with:* • *Ke‘eaumoku Kapu – ‘Aha Moku o Maui Inc.,* • *Hawaiian Canoe Club* *I recommend CSH to meet with the native tenants and people that currently live or previously lived in the ahupua‘a of Wailuku on Maui for information about the cultural resources and practices for this CIA.* *Please let me know if I can assist with anything else.* CSH replied via email 7 February 2020: *Mahalo for your response and the recommendations you provided. We have reached out Ke‘eaumoku Kapu and Hōkūao Pellegrino.*
Nakanelua, Kyle	Aha Moku o Maui	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Mr. Nakanelua replied via email 8 November 2019: *Mahalo for contacting me, Within the Aha Moku System, I am the Ko‘olau representative. There are two people that I know of that live in the Moku of Wailuku and are knowledgable of that area. Their names are Kaniloa Ka Mau’u and Foster Ampong. I will forward your letter to them.* CSH replied via email 8 November 2019: *Mahalo for your quick response and forward our request to Kaniloa Ka Mau‘u and Foster Ampong. We look forward to hearing from them.* Revised letters and figures sent via email 27 January 2020
Nakihei, Sarah	Maui Homestead Farmers and Ranchers Association	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Namau‘u, Kili	*Kahu*, Punana Leo O Maui	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Mail returned
Newbold, Robin	Chair, Maui Nui Marine Resource Council	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020

Newhouse, Robin	Keokea Homestead Farm Lots Association	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Nishiyama, Patty	Member, Nā Kūpuna o Maui	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Oliveira, Roy Kalani	President, Waiehu Kou Phase 3 Association	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Ornellas, Daniel L.	Vice President, Waiehu Kou Phase 3 Association	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Pa‘ahana, Rodney	Villages of Leialii Association	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Pang, Lorrin	Department of Health	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Pellegrino, Hokuao	Nohoana Farm Owner; Manager and Land Education Specialist for Kamehameha Schools Maui	Recommended by Ke‘aumoku Kapu and Ikaika Nakahashi Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020 Revised letters and figures sent via email 28 January 2020
Phillips, Kealana	Burial Sites Specialist (Maui, Molokai, and Lanai)	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Mr. Phillips replied via email 12 November 2019: *I’ve cc’d the Wailuku Representative of the Maui / Lanai Islands Burial Council (Johanna Kamaunu) to this email. She may be able to provide you with information.* CSH replied via email 12 November 2019: *Mahalo for your response. We look forward to hearing from her.* Revised letters and figures sent via email 27 January 2020 Mr. Philips replied via email 29 January 2020: *Aloha. I’ve forward e-mail to Maui burial council members and a few prominent community members from area that may be able to help.* CSH replied via email 29 January 2020: *Mahalo for your quick response and for forwarding the email to others who may be able to help. We look forward to hearing from them.*

Pua‘a, Mikiala and Kau	*Kama‘āina*, Kalo Farmer	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Pyle, Bill	Former HC&S employee	Letters and figures sent via email 2 August 2019 Email undeliverable
Raymond, Ki‘ope	Hawaiian Studies Teacher, University of Hawaii Maui College	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Mr. Raymond replied via email 7 November 2019: *I have no comments at this time.* CSH replied via email 8 November 2019: *Mahalo for your quick response.* Revised letters and figures sent via email 27 January 2020 Mr. Raymond replied via email 27 January 2020: *I have no comments at this time.* CSH replied via email 28 January 2020: *Mahalo for your quick response.*
Roback, William	Royal Order of Kamehameha	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Rodrigues, Hinano	SHPD, Interim History and Cultural Branch Chief (Oahu and Maui)	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Mr. Rodrigues replied via email 5 August 2019: *Here is the contact information for CIAs.* *Ni‘ihau, Kaua‘i and O‘ahu should be addressed to Ka‘ahiki Solis, Cultural Historian.* *Maui, Moloka’i, Lana’i and Hawai’i should be addressed to Ikaika Nakahashi, Cultural Historian.* *For record-keeping purposes, please submit all inquiries via our Intake process.* Mail returned
Royal Order of Kamehameha IV, Kahekili Chapter IV		Recommended by Jerome K. Yasuhara Letter and figures sent via email 19 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Ruggles, Clive	Has done archaeological work on Maui; specialist in archaeoastronomy	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020

Santos, Nani		Recommended by Ke‘aumoku Kapu Revised letters and figures sent via email 28 January 2020
Sherill, Tamara	Executive Director, Maui Nui Botanical Gardens	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via USPS 7 November 2019 Revised letters and figures sent via USPS 24 January 2020
Shimaoka, Thelma	Community Resources Coordinator, Office of Hawaiian Affairs	Letters and figures sent via USPS 2 August 2019 Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Smythe, Crystal		Recommended by Al Lagunero Revised letters and figures sent via email 31 January 2020 Ms. Smythe replied via email 31 January 2020: *Aloha and mahalo Kellen, I am scheduled to be with Viola Hanaike on Sunday; and will discuss this further with her. I will extend your respectful inquiry and respond accordingly.* CSH replied via email 31 January 2020: *Mahalo for your quick response. We look forward to hearing from you.* Ms. Smythe replied via email 6 February 2020: *Appreciative the opportunity to share stories and time. At this juncture, Kupuna Viola, age 82, would prefer to meet in person in Kahului.* CSH replied via email 10 February 2020: *Mahalo for getting back to us. I spoke with our project manager and we feel that Kupuna Viola’s mana‘o is very valuable and if she is still interested in meeting with us in person, please let us know a date and time that would be convenient for Kupuna Viola to meet and we can set something up. I will be available to travel to Maui. I look forward to meeting her.* Ms. Smythe replied via email 11 February 2020: *mahalo your consideration. As Kupuna will be traveling in Feb. May we please set a date after March 17th.* CSH replied via email 17 February 2020: *I apologize for the slow response. Yes, a date after March 17th should be fine. I will contact you in March and we can set up a time and place to meet that is convenient for Kupuna Viola.* Ms. Smythe replied via email 17 February 2020: *Mahalo Nui, appreciative.* CSH replied to Ms. Smythe via email 18 March 2020: *Hope all is well. We appreciate your help in setting up an interview with Kupuna Viola, however, due to the current situation with COVID-19, as a necessary precaution Cultural Surveys Hawaii (CSH) has halted in-person*

		consultation and off island travel for the foreseeable future. We would still like to meet with her once it is safe to meet in person and I will let you know when CSH resumes in-person consultation and off-island travel. We are also available to speak with her over the phone or by video chat and she may also provide written testimony if it’s more convenient. Feel free to contact me if you have any questions. Your patience and understanding during this quickly changing public health emergency is greatly appreciated. Ms. Smythe replied via email 18 March 2020: *Appreciative all, perhaps a series of questions and or concerns, I can open discussions, begin to jog her memories. She does have some written notes photos, that may better prepare her for your upcoming interview/consultation.* CSH replied via email 26 June 2020: *Hope all is well. I apologize for the short notice. We are aiming to finalize the Cultural Impact Assessment (CIA) for the proposed Hawaiian Cement Facilities Relocation Project at Kahului Harbor in July. Unfortunately, CSH has not resumed in-person consultation due to COVID-19 and as a precaution from any inadvertent exposure. If Kupuna Viola is still interested in participating in this study, we can speak with her over the phone or video chat. I attached a pdf with sample questions of the type of information we are looking for. A written statement is also acceptable if that is more convenient. Please let me know if Kupuna Viola is interested in speaking over the phone/video chat and is available to speak with us before July 15. Feel free to contact me if you have any questions.* Ms. Smythe replied via email 27 June 2020: *I will appropriate time to sit with Kupuna Viola Hanaike as soon as able; and forward responses.* CSH replied via 29 June 2020: *Mahalo for your help. We look forward to hearing from you.* CSH followed up with Ms. Smythe on 17 July 2020: *Have you had a chance to sit with Kupuna Viola? We are aiming to submit the final draft of the CIA for the Hawaiian Cement Facilities Relocation Project to our client on July 31 and would like to include her ‘ike and mana‘o. If she has any comments or concerns regarding the project, please let us know and so may include them in the report. Mahalo for your help, feel free to contact me if you have any questions.*

		Ms. Smythe replied via email 17 July 2020: *Aloha, I am traveling thru July 26th. Upon returning to Maui, I will facilitate responses.* CSH replied via email 21 July 2020: *Mahalo for getting back to me and for all of your help, we look forward to hearing from you.* CSH followed up with Ms. Smythe via email 5 August 2020: *Aloha Crystal, Hope all is well. Mahalo for your help in speaking with Kupuna Viola on our behalf. Unfortunately, we have reached our deadline and are currently finalizing the report to submit to our client by the end of the week. If Kupuna Viola has any comments or concerns regarding the project, please let us know by Friday (8/7) and we can include it in the report. Mahalo,* Ms. Smythe replied via email 5 August 2020: *Aloha, we are scheduled to meet and complete this Friday. I will forward that afternoon. Peace,* CSH replied via email 6 August 2020: *Mahalo Crystal, we look forward to hearing from you.* CSH followed up with Ms. Smythe via email 11 August 2020: *Aloha Crystal, Did you get to meet with Kupuna Viola last Friday? We are currently working to finalize the report in the next few days and are aiming to submit it to our client on Friday (8/14). Please let me know if she has any comments or concerns that she would like included in the report. Mahalo for all your help,*
Sousa, Keoki	President, Kahuna La‘au Lapa‘au o Maui	Letters and figures sent via USPS 2 August 2019 Mail returned
Spalding, Mike		Letters and figures sent via USPS 2 August 2019 Mail returned
Tanahy, Dalani	Kapa Maker	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Waiohuli-Keokea Association		Letters and figures sent via USPS 2 August 2019 Mail returned
Watanabe, Noelani	Maui, Vice-Chair, Native Hawaiian Historic Preservation Council (NHHPC)	Letters and figures sent via email 2 August 2019 Letters and figures sent via email 7 November 2019 Revised letters and figures sent via email 27 January 2020
Yasuhara, Jerome K.	Compliance Specialist, OHA	Mr. Yasuhara replied via email 14 August 2019: *Mahalo for your outreach with the Office of Hawaiian Affairs*

		(OHA) concerning the subject Cultural Impact Assessment (CIA) supporting an Environmental Assessment (EA) for the Hawaiian Cement Facilities Relocation at Kahului Harbor, Island of Maui. OHA submits the following knowledgeable entities for purposes of this CIA: *1. Royal Order of Kamehameha I, Kahekili Chapter IV […]; and* *2. Hawaiian Canoe Club […]* *Additionally, a search of DLNR-SHPD records provides some cursory background information, to "[…] indicate that the Kahului Commercial Harbor is listed in the Hawai'i Register of Historic Places (2953) and is directly associated with the Historic Kahului District (SIHP 1607)." "The Kanaha Pond (SIHP 1783), the Kahului Railroad Administration Building, and the Kahului Railroad Roundhouse are located within the historic district and are listed in the State Inventory of Historic Places (SIHP)." The project's area of potential effect (APE) could include or impact upon additional historic sites/cultural practices, properties and/or resources, which you may discern during this portion of the project. Let me know if you have further questions. Mahalo hou.* CSH replied via email 15 August 2019: *Mahalo for your response and the information you provided. We will continue our outreach to those mentioned below.* Revised letters and figures sent via email 27 January 2020

6.4 Written Testimony from Department of Hawaiian Home Lands

CSH contacted Antoinette Eaton, Maui District Supervisor of the Department of Hawaiian Home Lands (DHHL), via USPS on 2 August 2019. William Aila, Jr., Chairman of the Hawaiian Homes Commission replied on behalf of the DHHL via USPS on 9 September 2019 with the following statement (see Appendix A):

> The Department of Hawaiian Home Lands acknowledges receiving the request for comments on the above-cited project. After reviewing the materials submitted, the project is located in the vicinity of DHHL's Wailuku Moku land holdings, identified as the Central Region in the Maui Island Plan. DHHL offers the follow comments:
>
> The proposed project has the potential to impact DHHL's beneficiaries in Wailuku Moku. We highly encourage you to consult with Hawaiian Homestead community associations and other (N)native Hawaiian organizations when preparing the CIA to better assess potential impacts to cultural and natural resources, access and other rights of Native Hawaiians. A list of some of our DHHL homestead associations may be found at https://dhhl.hawaii.gov/heamestead-associations/.

In addition, we recommend you contact Blossom Feiteira, a Maui DHHL beneficiary with traditional cultural knowledge as a resource in the development of this CIA.

6.5 Written Testimony from Holly Buland

On 27 January 2020, CSH reached out to Holly Buland, Museum Director of Alexander & Baldwin Sugar Museum, requesting her *mana'o* (thoughts) regarding the cultural impact assessment for the Hawaiian Cement Facilities Relocation Project. Ms. Buland replied via email 28 January 2020 and provided CSH with a link to an online article titled, *Kahului, Maui, a Railroad Town* (RASRL n.d.). This article, which contains a wealth of information regarding the history of Kahului, highlights a research paper titled, *"Sociological Study of Kahului Maui," mid- to late 1930s*, written by H.M.I for the University of Hawai‘i at Mānoa Romanzo Adams Social Research Laboratory (RASRL).

H.M.I. described the town of Kahului in the 1930s:

> Kahului is a combined village, town and camp under a rather feudal system where business is protected and is within 'themselves' with no big, daring stock enterprises and companies. New stores and better two storied ones are not permitted. Kahului, being a port town and the center of all Maui in transportation facilities should have all its possibilities for expansion into a city. But the controlling and directing minds are in different hands. […] K.R.R. [Kahului Rail Road Company] is alert and always jealous of strong competition so they never allow any parallel or similar businesses to come into Kahului nor let people who work for those companies other than the R.R. and its affiliation have any say in living on R.R. land lease. [RASRL n.d.]

H.M.I. added that Kahului was "on a plantation scheme and ruled with a rather autocratic iron hand." She went on to note that "Kahului, the Railroad Company's Camp and Village [are] under the management of Mr. William Walsh who is controlled by the H.C. & S. Co. [Hawaiian Commercial & Sugar Company]" (RASRL n.d.). H.C. & S. Co. is owned by Alexander & Baldwin, one of Hawai‘i's Big Five which also included C. Brewer & Company, Theo H. Davis & Company, Amfac, and Castle & Cooke.

H.M.I. also discussed the settlement patterns of Kahului Town. She described Kahului as "a R.R. [rail road] village," which was divided into "the Camp and the Town." She noted the "camp with its varying degrees of newness of buildings or cottages keep the well-marked economic status well divided and distinct." She noted that "older houses" which she described as tenement-like, were inhabited by field hands and "bachelor stevedores" (RASRL n.d.).

She mentioned that located along the beachfront of Kahului Bay was First Street as well as "Haole Beach" and the "public" beach located to the right of it. The residence of William Walsh, manager of Kahului Railroad, was also located on First Street. H.M.I. noted that "all along the Second St. are the better homes of the Haole population—beach bungalows and palaces occupying the block—the front yards facing First [S]treet (a path along the beach line) and spacious backyards …" (RASRL n.d.).

A camp located above Third Street and across Likelike Street was occupied by mostly middle-class Japanese laborers including truck drivers, some stevedores, clerks, and bus drivers. H.M.I noted that this was the camp's gossip center where "[n]ews flies faster than fire here and spreads bigger and bigger and wider and when it reaches the extremities of town no head nor tail can be made of that tale." She also noted that the stevedores have their meals in "town restaurants or homemade at the camp mess hall near the camp bath house" on Third Street. The "camp bath house" was "public and free for R.R. people" (RASRL n.d.).

Whitewashed houses located near the lumberyard, the Kanahā Camp, and the camp at the left end of Fifth Street were "occupied by Koreans, Hawaiians and Japanese." H.M.I. also noted that the Japanese *luna* (boss) and stevedore "gang heads" and their families lived at the C.P.C (California Packing Corporation) Camp which was located near Kahului School (RASRL n.d.).

H.M.I noted that 40% of Kahului's population consisted of Japanese employees and laborers which, combined with the "town Japanese," totaled 1,451 in 1935. The rest of Kahului's population was made up of a few *haole* managers, Chinese, Filipinos, Portuguese, and "mixed people" (RASRL n.d.).

Quarry workers, railroad watchmen and flagmen, as well as "youthful strong stevedores and their families [and] the higher white collared second generation clerks (living near the public school in the new newest larger houses) and bookkeepers and first generation lunas," occupied the K.R.R. (Kahului Railroad) Camp located near the quarry (RASRL n.d.).

The Raw Fish Camp was occupied by "Hawaiian and part-Hawaiian laborers" who "spend their afternoons fishing and huki kolo […] at the beach front of their homes." To the southeast of Raw Fish Camp was Huki kolo Beach. Huki kolo Beach may have been the name for the site where *hukilau* (seine) nets were stored (RASRL n.d.).

Portuguese, Spanish, and Hawaiian-Caucasian residents who worked for the train and truck department families lived in an area that H.M.I. referred to as "Porrikee Camp" which was facing Main Street (RASRL n.d.).

There were also a number of businesses in Kahului in the 1930s.

> Kahului offers a full range of concerns, some of which enjoy a fair amount of competition: ten general merchandise and hardware stores and one drug store; seven restaurants, one coffee shop, and one confectionary; five markets (meat, grocery, fish); four tailors and one dressmaker; three barbers; two jewelers; two clothes cleaners; two service stations and two garages; two hotels and two poolrooms. Kahului, like any town worth its salt, has its own photography studio. [RASRL n.d.]

Kahului Market, the largest market in Kahului, was located on the corner of Main and Kinau streets. The market was managed by Mr. Ooka, a former employee of the H.C. & S. Co. at Kahului Store, who "started this Fish Market, Meat Market, Vegetable Stands, Fruit Stalls and grocery market all under one 'big top' with his own 'cash and carry' department predominant" (RASRL n.d.).

H.M.I also discussed the Kahului Japanese Young Men's Association. Their club house was located on Fourth Street. This organization had "a wide appeal for boys 15 to 35 years with the

purposes of civic interests.” Other “unique and interesting activities” the organization performed included the following:

> 1. managing and financing funerals of old bachelors with no family connections 2. acting as police guards and night watchmen during a frenzy over a ‘ball of fire’ and when there was a phobia of a loose convict from the Wailuku County Prison 3. amateur players and theatre guild -free and benefit movie entertainments [*sic*]. [RASRL n.d.]

6.6 Written Testimony from Al Lagunero

On 28 January 2020, CSH reached out to Mr. Al Lagunero, renowned artist, Native Hawaiian cultural practitioner, and Vice-President of Olowalu Cultural Reserve, requesting his *mana‘o* (thoughts) regarding the Hawaiian Cement Facilities Relocation Project. Mr. Lagunero replied via email 29 January 2020. Mr. Lagunero’s email response is included in its entirety in Table 3.

Mr. Lagunero discussed the marine resources of the Kahului Bay area. He noted the area has “provided many forms of edibles to the community at large for generations (i.e. the Hului [dragnet] fishing techniques).” He added that Hobron Point and Baldwin Beach Park provided “large quantities of *limu wawaei‘ole* [*Codium edule*],” as well as the “area near Y. Hata.” He added that these were also “traditional gathering areas for *he‘e* [octopus; *Polypus* sp.] and *lamalama* [torch fishing] at low tides.”

He also stated that “Hobron Point attracts large numbers of turtles that come in from the direction of Kahakuloa.” The number of turtles vary “from 10/15/20 in various sizes or stages of growth.” He added that they “appear to bask in the outflow of waters from conduits along that shoreline from the industrial area.” He recalled personally feeding them and seeing “tourists from the boats also enjoying them along the trail in the area above the waters.”

Mr. Lagunero shared that canoe clubs along the Hamakua Coast “have consistently used Kahului Bay to Maliko as training and competition routes.” He noted their water use is permitted under use-permits that are also extended to windsurfers and fishermen. He also noted that “incoming tides from the north sea pose challenges to canoe practices located in the Kahului Bay area.”

Mr. Lagunero noted the *loko i‘a* (fishpond), Kanahā Pond, is “a notable feature in the area adjacent to the industrial areas in the Hobron quadrant.” He said the *loko i‘a* has “greatly been diminished from native disuse and displacement.”

He also stated that Hale Nanea, a community use center which has been in place “since and before 1960,” is located close to the intended relocation of the Hawaiian Cement facility. He expressed his concerns regarding “how cement dust will affect the air in the area as it is subject to coastal, trade and north winds affecting the area.”

Mr. Lagunero also questioned whether “raw sewage is still being dumped from an area near Y. Hata buildings close to the Paukukalo turn-off from Lower Main and how the effulgence may affect the food chain still accessed by local families even toward the Hobron Point area.”

Mr. Lagunero expressed his concerns regarding “coring activities involved in the relocation of the cement plant” noting it should be questioned further. He added that

> Octopus and squid are affected in great numbers as their young float-up to the harbor shores dead during the birthing season once signaled by the appearance of sugar-cane tassels in the fields *mauka* (from Kahului to Peahi (I forget the season of the year, Welo [April] or Kauwela [summer]).

He also expressed concern regarding the management of resources including sand. He noted that “sand from these areas were being shipped to Honolulu and possibly resisted by community activists.”

> What are the resources close-by for the production of cement? Sand? Where from? Paukukalo? Wailuku - Sand hills area? The relocation activities should not be the only focused concern, but, resource and resource management by the State’s mineral rights-to-control use of the resources have in recent years been questionable as sand from these areas were being shipped to Honolulu and possibly resisted by community activists.

He also noted that the “projected use over the next 20 to 50 years should be analyzed.” He mentioned “Bank Analysts reports on television news that the growth of tourism is needing increased management systems by the State.”

> As the relocation appears to be a harmless business activity, a projected use over the next 20 to 50 years should be analyzed as it seems production will increase due to the County’s General Plan for Residential Development skirts Kahului and Wailuku to start, and Tourism growth is at maximum capacity, noted by Bank Analysts reports on television news that the growth of tourism is needing increased management systems by the State.

Mr. Lagunero also recommended that CSH consult with Kupuna Waiola Hana‘ike who is “well informed as to the Kahului and Wailuku areas,” as well as canoe clubs that consistently use Kahului Harbor. CSH reached out to Kupuna Waiola Hana‘ike’s *‘ohana* (family) and the Hawaiian Canoe Club.

6.7 *Kama‘āina* Interviews

The authors and researchers of this report extend our deep appreciation to everyone who took the time to speak and share their *mana‘o* and *‘ike* with CSH whether in interviews or brief consultations. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and in no way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s.

6.7.1 Scott Fisher

On 9 September 2019, Cultural Surveys Hawai‘i (CSH) met with Dr. Scott Fisher at Coffee Roasters in Kahului to discuss the Hawaiian Cement Facilities Relocation project at Kahului Harbor and to share his *‘ike* (knowledge) regarding the history of Kahului. Dr. Fisher is the Chief Conservation Officer for the Hawaiian Islands Land Trust (HILT), a 501(c)(3) land conservancy organization, which represents the combined skill and resources of four island-based organizations: Hawai‘i Island Land Trust, Maui Coastal Land Trust, O‘ahu Land Trust, and Kaua‘i Public Land Trust. Combined, HILT has “protected over 18,000 acres of Hawaii’s most precious

lands and natural resources from Kau [Ka‘ū] on Hawaii Island to Hanalei, Kauai" (Hawaiian Island Land Trust 2019a).

> HILT takes a Hawaiian and holistic approach to land conservation. We conserve lands that enable Hawai‘i’s long-term well-being, lands with *scenic views, agricultural resources, wildlife habitats, water resource areas, cultural and historical values, and outdoor recreation opportunities.* We seek to complement the stewardship others are providing for mountaintop watersheds by concentrating largely on needs and opportunities for coastal and agricultural lands. [Hawaiian Islands Land Trust 2019a]

Dr. Fisher’s family has lived on Maui for about 110 years. He stated that "a lot of the information I’m giving you is information I got from other *kūpuna*, other elders, and just general research that I’ve done on my own." He also noted that while he was in graduate school, he conducted "an oral history of Maui residents who were living here during World War II."

Dr. Fisher began by discussing "two ancient events" that contributed to the formation of Kahului Bay. He stated that approximately 21,000 years ago, at the beginning of the late Pleistocene Ice Age, also referred to as the Wisconsin Period of Glaciation, the sea level was lowered 300 feet (ft) exposing the sand and reef that had accumulated. Over the next 10,000 years the exposed reef disintegrated creating a dune network (Hawaiian Islands Land Trust 2019b). This dune network included the area where the proposed project is located. Dr. Fisher added that it was "right at the Pleistocene/Holocene transition, so 12,000 years ago was the formation of the dunes."

> […] what we know as Kahului Bay is shaped by two events, the more recent chronologically would have been the last Ice Age, what they call the Wisconsin Period of Glaciation or Wisconsin Period Ice Age, and what that did was it lowered the sea level 300 feet. Now, in lowering in 300 feet, all that sand that was out, that had accumulated, all the reef that accumulated over the last, little over a million years, 1.2, 1.3 million years blew up and basically made all this into sand dunes. So, this was a whole series, a dune network, including right in the project area originally.

The second ancient event was a "pretty major flank collapse" that occurred along the Kahakuloa coastline "100,000 years ago, maybe a little longer." He explained that "Hawaiian volcanoes, shield volcanoes have a tendency to basically slop off into the ocean." In an article for the Hawaiian Islands Land Trust, Dr. Fisher described the Kahakuloa flank collapse.

> The cliffs along this rugged coast are a reminder of the fragility of Hawaiian shield volcanoes. For many decades, geologists have known that Hawaiian shield volcanoes are prone to what is sometimes described as ‘flank failure.’ Simply put, massive chunks of the volcanoes that make up Hawaiian volcanoes will shear off into the ocean. The 300-400 foot cliffs along the Kahakuloa coast seem to be evidence of flank failure. [Hawaiian Islands Land Trust 2019b]

Dr. Fisher added that

> This was a much smaller one but the debris field may have washed all the way to Kahului, so what you see, you know when they’re doing their excavations, they ought to look for is evidence of a massive paleo tsunami. They should really keep an eye out for that. In fact, I would really love to kind of look for that because it could give us a lot of information on how tsunamis operate in this area.

Dr. Fisher stated that "when the Hawaiians arrived" around "950 A.D. or so," the area all along the coastline was "a popular place, it was fairly, relatively, densely populated area or at least there was early habitation sites all along here." He noted that Kahului was "not very densely populated" due to the "generally low productivity of the sand dunes," however, "the Nā Wai ‘Eha, from Waihe‘e down to Waikapū definitely would have been."

He mentioned that these early inhabitants began constructing *loko i‘a* (fishponds) which were either *loko kalo i‘a* (taro fishponds) or *loko pu‘uone* (pond near the shore, connected to the sea by a stream or ditch). He discussed the benefits of the *loko i‘a* which also "act as sediment retention basins."

> […] the benefit of those I should say, is they do act as sediment retention basins so all sediment that is accrued and is produced and deposited into streams and what not, from agricultural activities and land clearings and stuff like that, ultimately does not end up in the ocean, it ends up in these ponds.

Dr. Fisher discussed Kanahā Pond, which is located east of Kahului Harbor. He stated that Kanahā Pond originally consisted of two ponds, Mau‘oni and Kanahā, which were named after the children of Kapi‘iohookalani, the chief who oversaw the construction of the ponds.

> […] what we now called Kanahā Pond was actually two ponds, one known as Mau‘oni and the other known as Kanahā, and they were named after the chief’s children who built them or who had oversaw their construction and his name was Kapi‘ioho, I think it may be Kapi‘iohookalani, but chief Kapi‘ioho oversaw the construction of what we now call the Kanahā Ponds. But they were really two ponds. Kanahā, which from my understanding, is that most of what is extant today is Kanahā and then Mau‘oni went into right about where we are right now.

A version of the naming of Kanahā Pond appears in Sterling’s *Sites of Maui* (Sterling 1998:87–88). According to the *mo‘olelo*, which is based on an interview with Mrs. Rosalie Blaisdell in 1923 by J.F.G. Stokes, the original architect of the two ponds was Kapi‘iohookalani, king of O‘ahu and half of Moloka‘i, however, he was killed in battle before he could complete the construction of the pond walls. Construction of the pond walls was finished by Kamehamehanui, king of Maui, in the mid-1700s. Kamehamehanui placed a *kapu* (taboo) on the bank and built a *kuapā* (wall of a fishpond), dividing the two ponds.

Kapi‘iohookalani had two children, Kahamaluihiikeaoihilani and Kanahāokalani. Following Kapi‘iohokalani’s death, Kahamaluihiikeaoihilani, a chiefess from O‘ahu, searched Moloka‘i and Maui for her brother, Kanahaokalani. To protect her status as a chiefess of the highest rank, she travelled under the name Mau‘oni. Because of her high rank, Kahamaluihiikeaoihilani broke the *kapu* by walking on the center *kuapā* of the ponds. Following this act, Kamehamehanui allowed her to name the two ponds. She named one of the ponds Kanahā for her brother, and she named the other pond Mau‘oni for the identity she used as she travelled.

Dr. Fisher stated that Kanahā Pond might have been a *loko pu‘uone* because it did not have constant flow of water into the pond. He noted that Kanahā Pond was originally fed by Wailuku River, however, the formation of the sand dunes blocked the connection causing Wailuku River to

go “straight down into the ocean in what is now called Paukukalo.” He added that Kanahā Pond is now fed by East Maui springs.

He noted that Kanahā Pond consists of a lentic environment because “in terms of wetlands, it was non-flowing.” Merriam-Webster defines lentic as relating to still waters, such as lakes, ponds, or swamps (Merriam-Webster 2019a).

> Along the entire shore, it was a fishpond, it seems to have been of the type of fishpond, I’m guessing, that might be a *loko pu‘uone* because I don’t think that there was water flowing in perennially. I don’t think that Kalialinui which is the main gulch that would feed Kanahā, I don’t think that it was running all the time and because of that it would have been difficult to actually have. It was a lentic environment, in terms of wetlands, it was non-flowing and when you have that, the only thing that you can really do is fishpond.

He added that in “[…] other places along the Nā Wai ‘Eha, from Waihe‘e, Waiehu, Wailuku, and Waikapū,” where “you have that flow all the time, the constant flow, you could raise taro, so you could build *loko kalo i‘a* which was a different type, which was the type that raised taro, maybe they would raise taro and fish.”

He also noted that although Kanahā Pond is not in the immediate project area, “there could possibly be some impact or there might be some residual artifacts or cultural sites around that area.” He added that the area has a high potential for early habitation sites and he recommends that data recovery should be conducted on “anything that’s found.”

> This area has the potential for having very, very early habitation sites. It had a pond, it had water. There’s potential for early habitation sites is high. Not far away at all from this area is where the Nisei Veterans Memorial Center (NVMC) is, right across from the harbor is an early site, very early site.

He stated that there was a coastal fishing village called Ka‘a located not far from Kanahā Pond. He mentioned that Ka‘a Village had a “fairly large population,” however, the village was mostly eliminated by the late 1930s or 1940s due to the construction of Naval Air Station (NAS) Kahului.

Dr. Fisher discussed the naming of Kahului Bay. He mentioned that Kahului Bay received its name from the traditional Hawaiian battle formation that resembles the phalanx. Merriam-Webster defines a phalanx as “a body of heavily armed troops in ancient Greece formed in close deep ranks and files” (Merriam-Webster 2019b). Dr. Fisher noted that “when you’re standing on land, it roughly resembles what a phalanx would have looked like.” David Malo (1951:203) describes the Kahului battle formation as “a disposition, or order of battle, in which the main body of soldiers were drawn up in the form of a crescent, with the horns pointing forwards.” Dr. Fisher also discussed different types of battle formations used by the Hawaiians.

> So, Hawaiians fought in three major types of battle formations, the single/champion, it has a name but I’m just blanking on what that name is, then there was the *makawalu* [type of fighting on plains covered with brush, with irregularly grouped warriors] and that was a squad formation where they would kind of fight in squads, then I think for big battles on flat ground would have been the Kahului battle formation, and Kahului would have been the phalanx, what we would interpret as phalanx.

He also discussed Kahului Bay’s role in the war between the islands of Hawai‘i and Maui. He stated that when Kamehameha the Great, king of the island of Hawai‘i, invaded Maui with the Pelelu Fleet, the majority of the fleet landed in the area now called Kahului Harbor. He noted that the ships that landed in Kahului Bay spanned “all the way out to Waihe‘e to a spot called Kalae‘ili‘ili.”

> What was important about that was the majority of the fleet landed right in what is now Kahului Harbor, although it went all the way out to apparently, at least according to one source, all the way out to Waihe‘e to a spot called Kalae‘ili‘ili.

John H. Wise, owner and editor of the Hawaiian language newspaper, *Ke Au Hou* (Williams 2012:28), is cited in Sterling’s *Sites of Maui*, where he also described the abundance of Kamehameha the Great’s war canoes noting that “the sands of Kahului were covered with them and it was said that the canoes extended from this side of Kahului to Kalaeiliili at Waihee and below Puuhele and Kamakailima” (Sterling 1998:81).

From Kahului Bay, Kamehameha and his forces drove the army of Maui into ‘Īao Valley where they were defeated in the Battle of Kepaniwai.

> […] when they landed, although there were some skirmishes, most of them were able to get ashore, they were able to unload, get ashore, then Kamehemeha with Ke‘eaumoku drove the Maui army up into ‘Īao Valley and that’s when the great Battle of Kepaniwai took place, so that was the major battle, Kepaniwai. That really kind of started right here, you know.

In *Ruling Chiefs of Hawai‘i*, Samuel Kamakau described Kamehameha and his army as they landed the war canoes in Kahului Bay and proceeded to defeat the army of Maui in the battles of Ka‘uwa‘upali and Kepaniwai:

> 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. Had they fought face-to-face and hand-to-hand, as the custom was, they would have been equally matched. But the defensive was drawn up in a narrow pass in ‘Iao, and the offensive advanced from below and drew up the cannon as far as Kawelowelo‘ula and shot from there into ‘Iao and the hills about, and the men were routed. The victors pursued them and slew the vanquished as they scrambled up the cliffs. There was a great slaughter, but mostly among the commoners; no important chief was killed in this battle. ‘Clawed off the cliff’ (Ka-‘uwa‘u-pali) and ‘The damming of the waters’ (Ka-pani-wai) this battle was called […] [Kamakau 1992:81]

Dr. Fisher noted that most of the town of Kahului was built on top of fill which was dredged from Kahului Harbor in the “early twentieth century or like late nineteenth century.” He added that “people who are doing wetlands delineations, and what not, say that you can see that it’s all kind of sand fill from the construction of the harbor.”

Dr. Fisher also mentioned that “back in the day, there used to be camps” located along the coastline of Kahului Harbor. Much of this area is now occupied by “mostly parks and open space,

there is a few hotels." He noted that the area now occupied by the Harbor Lights Condominium used to be called "Raw Fish Camp."

He mentioned there are "people who really rely on the marine resources in the area," noting that the *akule* (Big-eyed or goggle-eyed scad fish, *Trachurops crumenophthalmus*) are very abundant in Kahului Harbor. He recommended mitigating any potential loss of habitat for fish in Kahului Harbor. He stressed that project proponents "really have to take steps to make sure that there's not discharge into the ocean that would reduce the quality of the habitat because people do rely on it."

Dr. Fisher also discussed the history of the United States military in Kahului during World War II. He noted that following the construction of the Naval Air Station (NAS) and NAS Pu‘unēnē, as well as the arrival of the 4th Marine Division, the population of Maui had "more than doubled."

> […] they had Naval Air Station Kahului, they had Naval Air Station Pu‘unēnē, and then, they had the Fourth Marine Division […] you're talking about, in terms of staffing, I think it more than doubled Maui's population, probably close to tripled with military personnel. Marines, Navy mostly, Navy and Marines mostly.

He stated that Kahului Harbor was used by the United States military as a "transit point" during World War II. He noted that when the Fourth Marine Division arrived in Maui following the Battle of Roi Namur in 1944, they used Kahului Harbor as their "transit point."

He also mentioned that "on the 15th of December and then the 31st of December [1941]," a Japanese submarine fired shells at Kahului Harbor. He stated that as the *Royal T. Frank*, a United States Army Transport (USAT), was docked at Kahului Harbor, a Japanese I-1 submarine surfaced off the coast of Maui and fired shells at the ship. Although these shells missed the *Royal T. Frank*, many of them landed in Kahului.

> […] so the submarine, say it was the I-1. I-1 surfaced and they had deck guns and their deck guns were like cannons, so they could fire at targets around here and completely missed […] it went over and landed in this area, landing by the cannery, this is where the old cannery was, roughly, and it did some damage around here, there was an old plantation camp and at least one of the times it landed among their chicken coops and killed chickens, so, no human life lost.

He added that the shelling of Kahului was not an invasion, but "just harassment." He described how the *kama‘āina* of Kahului panicked and ran into the streets before the boy scouts stopped them and notified them that it was not an invasion.

> It was sort of like the people started to panic and they're running out on Pu‘unēnē Avenue and the boy scouts got out right out there at the intersection, I think at Wakea [Avenue] and Pu‘unēnē [Avenue], and they stopped everybody, said it's just harassment. What they were doing, it was not really tactical, in terms of like, people thought they were invading, and the boy scouts stopped them and said that's not the case. What they were doing was just harassing, keeping people on alert, seeing if they could get one of these ships.

He went on to note that the *Royal T. Frank* was "later sunk in January of 1942," when it was "torpedoed between Hana and Upolu Point on the Big Island."

Dr. Fisher stated that "1946 is kind of a seminal date for the history of this area because that is when the tsunami came." He pointed out the remains of a rock crusher located on Kahului Beach Road. The rock crusher, which was built in 1923, was destroyed in 1946 when "it basically got knocked off its foundation by the tsunami."

> […] if you're driving down Kahului Beach Road […] you look to your left […] people think it's a pier cause it's kind of like a series of posts that says 1923 on it, that's actually a rock crusher. And it was built in 1923 but destroyed in 1946, April 1st 1946. It basically got knocked off its foundation by the tsunami.

He also pointed out that "there is the old railroad, remnants of the old railroad." He added that there is "not much left," noting that "the railroad is over 50 years old now, but it's not much over 50 years old, it's 1968, I think it closed down."

He also recalled that "in 1980, there was a big storm that hit Maui." This tropical depression lingered over Maui for "two or three days" causing "a crazy amount of flooding." He noted that

> […] it was like three feet of water so although they used a lot of material that they dredged to kind of like elevate this area so it wouldn't flood, in a big storm it can still flood pretty badly, so that's just something to think about. That it can. And again, that flooding, it can go out and still flood.

Dr. Fisher expressed his concerns regarding the discovery of *iwi kūpuna* (ancestral remains) during construction related activities. Dr. Fisher is a member of the Maui/Lana‘i Island Burial Council. He mentioned that while he doesn't personally know of any burial in "close proximity of the area," he recalled that *iwi kūpuna* may have been found "somewhere in this area."

> Along this coast, I don't personally know like in close proximity to the area, I don't know of any burial personally. Although I been on the burial council now since 2004 or 2005, I think I got on in 2005 and then I got off for a few years and then back on. […] they may have found some *iwi kūpuna* somewhere in this area, not in the immediate project site, somewhere adjacent, that was just an update and a very brief update, it was the state took care of it. I'm not 100% certain of that, just kind of vaguely remember.

He also stated that pre-Contact burials were discovered on land owned by the Hawaiian Islands Land Trust along the coast in the western portion of Kahului Harbor. He also noted that a large number of burials were found on the adjacent property, which is owned by the Nisei Veterans Memorial Center. He added that burials were also found at Keōpuōlani Park. Dr. Fisher recommends having an archaeological monitoring plan as well as having an archaeological monitor on site during construction of the proposed project.

> The thing to watch out for here is that we do find a lot of *iwi kūpuna* along the coast, so definitely I would recommend a monitor and a monitoring plan. Even though it's been heavily moved, things have been changed and modified a lot, it's always shocking to see how frequently *iwi kūpuna* can be found. We found areas where the military clearly built a range and there are still lots and lots of remains in there.

> I wouldn’t say they didn’t care but for lack of a better word they didn’t care and so they just kind of incorporated it. Even in areas where there’s an old elevated rail line, where they built up the rail line, just down the road, there is an in situ, flexed, still, I mean it can’t be too in situ cause it got bulldozed but it’s still intact, articulated set of human remains. It’s shocking. So I guess the thing is you just always got to be prepared for *iwi kūpuna* in that area, so definitely recommend it.

Dr. Fisher emphasized the area has a high potential for early habitation sites and pre-Contact burials have been discovered along the coast of Kahului Harbor. He recommended having an archaeological monitoring plan as well as having an archaeological monitor on site during construction of the proposed project. He also recommended that data recovery should be conducted on “anything that’s found.”

Dr. Fisher also stated there are “people who really rely on the marine resources in the area.” He recommended taking steps “to make sure that there’s not discharge into the ocean” which may result in the potential loss of habitat for fish in Kahului Harbor.

On 27 January 2020, CSH notified Dr. Fisher about a modification to the proposed project area to include the demolition of the existing Hawaiian Cement facility following the completion of the new relocated facility. Dr. Fisher replied via email 27 January 2020 noting that if the proposed project “will involve more ground disturbance than previously projected,” he would “certainly recommend archaeological monitoring […] to ensure that iwi kupuna or any cultural sites are not unnecessarily damaged, modified or altered.”

6.7.2 Jay Carpio

On 9 September 2019, Cultural Surveys Hawai‘i (CSH) met with Mr. James J.K. Carpio at CSH’s office in Wailuku to discuss the Hawaiian Cement Facilities Relocation project at Kahului Harbor and to share his *‘ike* regarding traditional gathering practices and the availability of marine resources within Kahului Harbor. A summary of the interview was sent to Mr. Carpio for review and approval on 7 November 2019, 27 January 2020, 16 March 2020, and 1 July 2020. CSH did not receive approval of the interview summary in the time allotted.

6.7.3 Viola Hana‘ike

Based on the recommendation from Al Lagunero, Cultural Surveys Hawai‘i (CSH) reached out to Ms. Crystal Smythe via email on 31 January 2020 in an attempt to consult with Kupuna Viola Hana‘ike regarding the Hawaiian Cement Facilities Relocation project at Kahului Harbor. Following the March 13, 2020 National COVID-19 Emergency Declaration (FEMA 2020) and statewide social distancing rules, CSH offered to consult with Kupuna Viola via telephone, Zoom video conference, or through written testimony. Ms. Smythe indicated that she would speak with Kupuna Viola on behalf of CSH and forward her responses. CSH followed up with Ms. Smythe via email on 26 June 2020, 17 July 2020, 5 August 2020, and 11 August 2020. CSH was not able to consult with Kupuna Viola Hana‘ike in the time allotted.

6.8 Summary of *Kama‘āina* Interviews

Based on consultation with Dr. Scott Fisher, Holly Buland, and Al Lagunero, the following is a synthesis of findings within Wailuku Ahupua‘a.

Dr. Fisher stated that the formation of Kahului Bay was shaped by “two ancient events.” He stated that approximately 21,000 years ago, at the beginning of the late Pleistocene Ice Age, also referred to as the Wisconsin Period of Glaciation, the sea level was lowered 300 feet (ft) exposing the sand and reef that had accumulated. Over the next 10,000 years the exposed reef disintegrated creating a dune network (Hawaiian Islands Land Trust 2019b) which includes the area where the proposed project is located. The second ancient event was a “pretty major flank collapse” that occurred along the Kahakuloa coastline “100,000 years ago, maybe a little longer.” He explained that “Hawaiian volcanoes, shield volcanoes have a tendency to basically slop off into the ocean.”

Dr. Fisher stated that “when the Hawaiians arrived” around “950 A.D. or so,” the area all along the coastline was “a popular place, it was fairly, relatively, densely populated area or at least there was early habitation sites all along here.” He also noted that Kahului was “not very densely populated” due to the “generally low productivity of the sand dunes,” however, “the Nā Wai ‘Eha, from Waihe‘e down to Waikapū definitely would have been.” He also stated that there was a coastal fishing village with a “fairly large population” called Ka‘a located not far from Kanahā Pond. However, the village was mostly eliminated by the late 1930s or 1940s due to the construction of Naval Air Station (NAS) Kahului.

Dr. Fisher mentioned that these early inhabitants began constructing *loko i‘a* which were either *loko kalo i‘a* or *loko pu‘uone*. He noted that Kanahā Pond, which is located east of Kahului Harbor, originally consisted of two ponds, Mau‘oni and Kanahā, which were named after the children of Kapi‘iohookalani, the chief who oversaw the construction of the ponds. He added that Kanahā Pond might have been a *loko pu‘uone* because it did not have constant flow of water into the pond. He noted that Kanahā Pond was originally fed by Wailuku River, however, the formation of the sand dunes blocked the connection causing Wailuku River to go “straight down into the ocean in what is now called Paukukalo.” He added that Kanahā Pond is now fed by East Maui springs.

He also noted that Kanahā Pond consists of a lentic environment because “in terms of wetlands, it was non-flowing.” He added that in “[…] other places along the Nā Wai ‘Eha, from Waihe‘e, Waiehu, Wailuku, and Waikapū,” where “you have that flow all the time, the constant flow, you could raise taro, so you could build *loko kalo i‘a* which was a different type, which was the type that raised taro, maybe they would raise taro and fish.”

He also noted that although Kanahā Pond is not in the immediate project area, “there could possibly be some impact or there might be some residual artifacts or cultural sites around that area.” He added that the area has a high potential for early habitation sites and he recommends that data recovery should be conducted on “anything that’s found.”

Mr. Lagunero also discussed Kanahā Pond, stating that it is “a notable feature in the area adjacent to the industrial areas in the Hobron quadrant.” He said the *loko i‘a* has “greatly been diminished from native disuse and displacement.”

Dr. Fisher discussed the naming of Kahului Bay. He mentioned that Kahului Bay received its name from the traditional Hawaiian battle formation that resembles the phalanx. Dr. Fisher noted that “when you’re standing on land, it roughly resembles what a phalanx would have looked like.” He also discussed Kahului Bay’s role in the war between the islands of Hawai‘i and Maui. He stated that when Kamehameha the Great and the Pelelu Fleet invaded Maui, the majority of the fleet landed in the area now called Kahului Harbor. He noted that the ships that landed in Kahului Bay spanned “all the way out to Waihe‘e to a spot called Kalae‘ili‘ili.” From Kahului Bay,

Kamehameha and his forces drove the army of Maui into ‘Īao Valley where they were defeated in the Battle of Kepaniwai.

Dr. Fisher stated that most of the town of Kahului was built on top of fill which was dredged from Kahului Harbor in the “early twentieth century or like late nineteenth century.” He added that “people who are doing wetlands delineations, and what not, say that you can see that it’s all kind of sand fill from the construction of the harbor.”

Holly Buland, Museum Director of Alexander & Baldwin Sugar Museum, provided CSH with a link to an online article titled, *Kahului, Maui, a Railroad Town* (RASRL n.d.) which highlights a research paper titled, *“Sociological Study of Kahului Maui,” mid- to late 1930s*, written by H.M.I for the University of Hawai‘i at Mānoa Romanzo Adams Social Research Laboratory (RASRL).

H.M.I. described the town of Kahului during the 1930s as “a combined village, town and camp under a rather feudal system where business is protected and is within ‘themselves’ with no big, daring stock enterprises and companies” (RASRL n.d.). She added that Kahului was “on a plantation scheme and ruled with a rather autocratic iron hand,” noting that “Kahului, the Railroad Company’s Camp and Village [are] under the management of Mr. William Walsh who is controlled by the H.C. & S. Co.” (RASRL n.d.).

H.M.I noted that 40% of Kahului’s population consisted of Japanese employees and laborers which, combined with the “town Japanese,” totaled 1,451 in 1935. The rest of Kahului’s population was made up of a few *haole* managers, Chinese, Filipinos, Portuguese, and “mixed people” (RASRL n.d.).

H.M.I. also discussed the settlement patterns of Kahului Town in the 1930s. She described Kahului as “a R.R. [rail road] village,” which was divided into “the Camp and the Town.” She noted the “camp with its varying degrees of newness of buildings or cottages keep the well-marked economic status well divided and distinct.” She noted that “older houses” which she described as tenement-like, were inhabited by field hands and “bachelor stevedores” (RASRL n.d.).

She mentioned that located along the beachfront of Kahului Bay was First Street as well as “Haole Beach” and the “public” beach located to the right of it. The residence of William Walsh, manager of Kahului Railroad, was also located on First Street. H.M.I. noted that “all along the Second St. are the better homes of the Haole population—beach bungalows and palaces occupying the block—the front yards facing First [S]treet (a path along the beach line) and spacious backyards …” (RASRL n.d.).

A camp located above Third Street and across Likelike Street was occupied by mostly middle-class Japanese laborers including truck drivers, some stevedores, clerks, and bus drivers. H.M.I noted that this was the camp’s gossip center where “[n]ews flies faster than fire here and spreads bigger and bigger and wider and when it reaches the extremities of town no head nor tail can be made of that tale.” She also noted that the stevedores have their meals in “town restaurants or homemade at the camp mess hall near the camp bath house” on Third Street. The “camp bath house” was “public and free for R.R. people” (RASRL n.d.).

Whitewashed houses located near the lumberyard, the Kanahā Camp, and the camp at the left end of Fifth Street were “occupied by Koreans, Hawaiians and Japanese.” H.M.I. also noted that the Japanese *luna* (boss) and stevedore “gang heads” and their families lived at the C.P.C (California Packing Corporation) Camp which was located near Kahului School (RASRL n.d.).

Quarry workers, railroad watchmen and flagmen, as well as “youthful strong stevedores and their families [and] the higher white collared second generation clerks (living near the public school in the new newest larger houses) and bookkeepers and first generation lunas,” occupied the K.R.R. (Kahului Railroad) Camp located near the quarry (RASRL n.d.).

The Raw Fish Camp was occupied by “Hawaiian and part-Hawaiian laborers” who “spend their afternoons fishing and huki kolo […] at the beach front of their homes.” To the southeast of Raw Fish Camp was Huki kolo Beach. Huki kolo Beach may have been the name for the site where *hukilau* (seine) nets were stored (RASRL n.d.).

Portuguese, Spanish, and Hawaiian-Caucasian residents who worked for the train and truck department families lived in an area that H.M.I. referred to as “Porrikee Camp” which was facing Main Street (RASRL n.d.).

Dr. Fisher also mentioned that “back in the day, there used to be camps” located along the coastline of Kahului Harbor including Raw Fish Camp which was located in the area now occupied by the Harbor Lights Condominium.

Dr. Fisher also mentioned that there are “people who really rely on the marine resources in the area,” noting that the *akule* are very abundant in Kahului Harbor. He recommended mitigating any potential loss of habitat for fish in Kahului Harbor. He stressed that project proponents “really have to take steps to make sure that there’s not discharge into the ocean that would reduce the quality of the habitat because people do rely on it.”

Mr. Lagunero also noted that the Kahului Bay area has “provided many forms of edibles to the community at large for generations (i.e. the Hului [dragnet] fishing techniques).” He added that Hobron Point and Baldwin Beach Park provided “large quantities of *limu wawaei‘ole*” as well as the “area near Y. Hata.” He added that these were also “traditional gathering areas for *he‘e* and *lamalama* at low tides.”

He also noted that “Hobron Point attracts large numbers of turtles that come in from the direction of Kahakuloa.” He added that the number of turtles vary “from 10/15/20 in various sizes or stages of growth” and they “appear to bask in the outflow of waters from conduits along that shoreline from the industrial area.” He recalled personally feeding them and seeing “tourists from the boats also enjoying them along the trail in the area above the waters.”

Mr. Lagunero questioned whether “raw sewage is still being dumped from an area near Y. Hata buildings close to the Paukukalo turn-off from Lower Main and how the effulgence may affect the food chain still accessed by local families even toward the Hobron Point area.”

He also expressed his concerns regarding “coring activities involved in the relocation of the cement plant” noting it should be questioned further. He added that “Octopus and squid are affected in great numbers as their young float-up to the harbor shores dead during the birthing season once signaled by the appearance of sugar-cane tassels in the fields *mauka* (from Kahului to Peahi (I forget the season of the year, Welo or Kauwela).”

Mr. Lagunero also stated that canoe clubs along the Hamakua Coast “have consistently used Kahului Bay to Maliko as training and competition routes.” He noted their water use is permitted under use-permits that are also extended to windsurfers and fishermen. He also noted that

“incoming tides from the north sea pose challenges to canoe practices located in the Kahului Bay area.”

Dr. Fisher also discussed the history of the United States military in Kahului during World War II. He noted that the population of Maui had “more than doubled” following the construction of the NAS Kahului and NAS Pu‘unēnē, as well as the arrival of the 4th Marine Division. He noted that during World War II, Kahului Harbor was used by the United States military as a “transit point,” adding that when the Fourth Marine Division arrived in Maui following the Battle of Roi Namur in 1944, they used Kahului Harbor as their “transit point.” He also mentioned that “on the 15th of December and then the 31st of December [1941],” as the *Royal T. Frank*, a United States Army Transport (USAT), was docked at Kahului Harbor, a Japanese I-1 submarine surfaced off the coast of Maui and fired shells at the ship. Although these shells missed the *Royal T. Frank*, many of them landed in Kahului. He added that the shelling of Kahului was not an invasion, but “just harassment.”

Dr. Fisher stated that “1946 is kind of a seminal date for the history of this area because that is when the tsunami came.” He pointed out the remains of a rock crusher which is located on Kahului Beach Road. Built in 1923, the rock crusher was destroyed in 1946 when “it basically got knocked off its foundation by the tsunami.” He also pointed out that “there is the old railroad, remnants of the old railroad,” however, he added that there is “not much left,” noting that “the railroad is over 50 years old now, but it’s not much over 50 years old, it’s 1968, I think it closed down.”

Dr. Fisher is a member of the Maui/Lana‘i Island Burial Council. He expressed his concerns regarding the discovery of *iwi kūpuna* during construction related activities. He mentioned that while he doesn’t personally know of any burial in “close proximity of the area,” he recalled that *iwi kūpuna* may have been found “somewhere in this area.” He also noted that pre-Contact burials were discovered along the coast in the western portion of Kahului Harbor on land owned by the Hawaiian Islands Land Trust. He also noted that a large number of burials were found on the adjacent property, which is owned by the Nisei Veterans Memorial Center. He added that burials were also found at Keōpuōlani Park. Dr. Fisher recommends having an archaeological monitoring plan as well as having an archaeological monitor on site during construction of the proposed project.

Mr. Lagunero expressed concern regarding the management of resources including sand. He noted that “sand from these areas were being shipped to Honolulu and possibly resisted by community activists.” He also expressed his concerns regarding “how cement dust will affect the air in the area as it is subject to coastal, trade and north winds affecting the area.” He mentioned that Hale Nanea, a community use center which has been in place “since and before 1960,” is located close to the intended relocation of the Hawaiian Cement facility.

He also noted that the “projected use over the next 20 to 50 years should be analyzed.” He mentioned “Bank Analysts reports on television news that the growth of tourism is needing increased management systems by the State.”

Section 7 Traditional Cultural Practices

Timothy R. Pauketat succinctly describes the importance of traditions, especially in regards to the active manifestation of one’s culture or aspects thereof. According to Pauketat,

> People have always had traditions, practiced traditions, resisted traditions, or created traditions […] Power, plurality, and human agency are all a part of how traditions come about. Traditions do not simply exist without people and their struggles involved every step of the way. [Pauketat 2001:1]

It is understood that traditional practices are developed within the group, in this case, within the Hawaiian culture. These traditions are meant to mark or represent aspects of Hawaiian culture that have been practiced since ancient times. As with most human constructs, traditions are evolving and prone to change resulting from multiple influences, including modernization as well as other cultures. It is well known that within Hawai‘i, a “broader “local” multicultural perspective exists” (Kawelu 2015:3). While this “local” multicultural culture is deservedly celebrated, it must be noted that it has often come into contact with “traditional Hawaiian culture.” This contact between cultures and traditions has undoubtedly resulted in numerous cultural entanglements. These cultural entanglements have prompted questions regarding the legitimacy of newly evolved traditional practices. The influences of “local” culture are well noted throughout this section, and understood to represent survivance or “the active sense of presence, the continuance of native stories, not a mere reaction, or a survivable name. Native survivance stories are renunciations of dominance, tragedy and victimry” (Vizenor 1999:vii). Acknowledgement of these “local” influences help to inform nuanced understandings of entanglement and of a “living [Hawaiian] contemporary culture” (Kawelu 2015:3). This section strives to articulate traditional Hawaiian cultural practices as were practiced within the *ahupua‘a* in ancient times, and the aspects of these traditional practices that continue to be practiced today; however, this section also challenges “tropes of authenticity,” (Cipolla 2013) and acknowledges the multicultural influences and entanglements that may “change” or “create” a tradition.

This section integrates information from Sections 3-6 in examining cultural resources and practices identified within or in proximity of the project area in the broader context of the encompassing Wailuku landscape. Excerpts from interviews are incorporated throughout this section where applicable.

7.1 Settlement and Habitation

The *ahupua‘a* of Wailuku, Waikapū, Waiehu, and Waihe‘e, collectively referred to as “Nā Wai ‘Ehā” or “The Four Waters” (Handy et al. 1991:496), consisted of four deep valley streams with well-developed field systems of *kalo lo‘i* (irrigated taro patch) which supported the royal court at Wailuku in the times when *ali‘i* ruled either from Ka‘uiki (Hāna), the court of Wailuku, or from the court at Lele (Lāhainā).

The high degree of cultivation within Wailuku Ahupua‘a and its near neighbors give evidence that a substantial population would have been established there during the pre-Contact period. Wailuku, specifically the area around Kahului Bay, was known as a chosen gathering and residential site for Maui *ali‘i* (James 2002:56).

West Maui, which includes the Wailuku district, and East Maui comprised two rival societies on Maui. By the second half of the eighteenth century, Maui *ali‘i* are reported to have been residing at Wailuku. Ruling chief, Kamehamehanui, died in Wailuku and was laid to rest at or near Pihana Heiau (Kamakau Kuokoa, Dec. 1, 1866). Ruling chief, Kahekili, lived at Pihana and Paukūkalo in Wailuku where “along with the chiefs, his favorites, his companions and his warriors” enjoyed the surf of Kehu and Ka‘akau (Kamakau 1992:83).

Dr. Scott Fisher stated that due to the “generally low productivity of the sand dunes,” Kahului was “not very densely populated.” However, he noted that “the Nā Wai ‘Eha, from Waihe‘e down to Waikapū definitely would have been.” He stated that “when the Hawaiians arrived” around “950 A.D. or so,” the area all along the coastline was “a popular place, it was fairly, relatively, densely populated area or at least there was early habitation sites all along here.” He also stated that there was a coastal fishing village called Ka‘a which was located not far from Kanahā Pond. He noted that Ka‘a had a “fairly large population;” however, the village was mostly eliminated by the late 1930s or 1940s due to the construction of NAS Kahului.

Dr. Fisher discussed the naming of Kahului Bay which he stated received its name from the traditional Hawaiian battle formation that resembles the phalanx. He noted that “when you’re standing on land, it roughly resembles what a phalanx would have looked like.” He also discussed Kahului Bay’s role in the war between the islands of Hawai‘i and Maui. He stated that when Kamehameha the Great and the Pelelu Fleet invaded Maui, the majority of the fleet landed in Kahului Bay, spanning “all the way out to Waihe‘e to a spot called Kalae‘ili‘ili.” From Kahului Bay, Kamehameha and his forces drove the army of Maui into ‘Īao Valley where they were defeated in the Battle of Kepaniwai.

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Dr. Fisher stated that “back in the day, there used to be camps” located along the coastline of Kahului Harbor. He stated that Raw Fish Camp was located in the area which is now occupied by the Harbor Lights Condominium.

7.2 Subsistence and Gathering

Traditionally, the production (and consumption) of *kalo* was vitally important to Wailuku Ahupua‘a as a whole. The cultivation of taro was noted by early visitors to Wailuku as noted in the following passage. “When the first Westerners arrived in the late 18th Century, the area [Wailuku] was home to a large community of Hawaiians who planted great tracts of taro and fished the waters of the nearby Pacific” (Engebretson 2000:2). Captain James King (1779) noted that “the natives of these islands are, in general, above the middle size and well made; they walk very gracefully, run nimbly and are capable of bearing great fatigue” (Shintani 1993:10). Accordingly, the high level of physical activity and physical fitness described by Captain King was a normal part of Hawaiian life, and largely attributable to the availability of plant and food resources such as *kalo*, *‘uala* (sweet potato), *mai‘a* (banana), *limu*, and *i‘a* (fish). Besides the observed contributions to stamina and health, *kalo* was also a revered staple food, believed to have derived from the first-born son of Wakea and Papa.

> […] the supreme god Kane in the form of Wakea (a form associated with the earth) produced two sequential offspring: the first became kalo (taro) plant, the second became Hāloa, the ancestor of man […] thus, in kinship terms, the taro is the elder brother and the senior branch of the family tree, mankind belongs to the junior branch, stemming from the younger brother.’ [Trask 2012:75]

According to Handy and Handy (1972:496), Wailuku Valley was included in the largest continuous area of wet taro cultivation in pre-Contact Maui. Old taro terraces often became repurposed in the historic era as cultivation areas for plantations. In addition to taro, *‘uala* was also extensively cultivated by early Hawaiians in Wailuku District.

> On the northeast coast of western Maui it was only the shores and adjacent flatlands below the taro terraces of Waihee and Waiehu that were favorable for the combined enterprises of planting potatoes and fishing. The flat north coasts, eastward from Wailuku, had fishing settlements here and there in ancient times and presumably sweet potato plantations. On the south side of western Maui the flat coastal plain all the way from Kihei and Maalaea to Honokahua, in old Hawaiian times, must have supported many fishing settlements and isolated fishermen’s houses, where sweet potatoes were grown in the sandy soil or red *lepo* near the shore […]
>
> […] From Waihee to Waikapu there is much good land below and bounding the ancient terrace area on the *kula* and in the lower valleys which would be ideal for sweet potato culture, but it is said that little was grown in this section because there was so much taro. [Sterling 1998:63]

In 1862, The Boundary Commission was established to delineate borders of *ahupua‘a* awarded during the Māhele (Maly and Maly 2003:vii). H. Kuihelani submitted testimony to the Boundary Commission giving detail descriptions of the Wailuku Ahupua‘a. His testimony tells of his family’s *kuleana* as overseers of Mau‘oni and Kanahā fishponds, which belonged to the *ali‘i* Kauikeaouli. The Mau‘oni and Kanahā *loko i‘a* were said to be stocked with large quantities of *nehu* and *‘ōpae* (Sterling 1998:87). The early Hawaiians of Wailuku supplemented the protein in their diet by raising and breeding fish in fishponds such as Mau‘oni and Kanahā. This helped to temper the often-unpredictable results of seasonal deep-sea fishing (Handy and Handy 1972:259). Additionally, the wetland taro *lo‘i* in Wailuku were utilized as fish rearing ponds (James 2002:69). Handy and Handy describe the practice of raising fish in taro *lo‘i* stating:

> In areas of wet-taro cultivation, young mullet were placed in the liquid mud of taro patches and there thrived. It is not unlikely that this latter custom came about as a result of placing the smaller fish in the *lo‘i* when a netful was caught, in order to keep them fresh. It was discovered that they not only kept fresh, but thrived and grew. The mullet (*‘ama‘ama*) is a grazing fish, and when the fingerlings (*pua ‘ama*) were put into *lo‘i* their stirring about and grazing helped keep the water fresh. [Handy and Handy 1972:262]

Salt was also gathered at Mau‘oni and Kanahā fishponds and given to the *ali‘i* according to Kuihelani’s Boundary Commission testimony. The gathering of salt from evaporated sea water was an important activity in early Hawai‘i. Salt was a staple in the traditional Hawaiian diet of *poi*, or sweet potato, and fish (Handy and Handy 1972:11). An additional account by Rebecca Nuuhiwa

in Sterling (1998) describes the salt pans of Kanahā, Wailuku. “In the olden days salt was gathered at Kanahā. When the sea rose the hollows in the rocks were filled (Sterling 1998:90)”.

Kuihelani goes on to mention the practice of *ma‘o* (Hawaiian cotton; *Gossypium tomentosum*) gathering at the Kama‘oma‘o Plain. The *ma‘ō* that was collected was given to *ali‘i* as it would scent their *kapa* clothing (Maly and Maly 2003:358). *Ma‘ō* was also gathered by early Hawaiians as a dye for *kapa* clothing. The leaves of the *ma‘ō* were purposed as a light green or red-brown dye while the flower petals of the *ma‘ō* plant produced a yellow dye (University of Hawai‘i 2009).

Dr. Fisher mentioned that early inhabitants began constructing *loko i‘a* which were either *loko kalo i‘a* or *loko pu‘uone*. He noted that Kanahā Pond might have been a *loko pu‘uone* because it did not have constant flow of water into the pond. He noted that Kanahā Pond was originally fed by Wailuku River, however, the formation of the sand dunes blocked the connection causing Wailuku River to go “straight down into the ocean in what is now called Paukūkalo.” He added that Kanahā Pond is now fed by East Maui springs. He also noted that Kanahā Pond consists of a lentic environment because “in terms of wetlands, it was non-flowing.” He added that in other places along the Nā Wai ‘Eha, which had a constant flow of water, people built *loko kalo i‘a* which was the type that raised taro and fish.

Dr. Fisher stated that there are “people who really rely on the marine resources in the area.” He noted that the *akule* are very abundant in Kahului Harbor. Dr. Fisher recommended mitigating any potential loss of habitat for fish in Kahului Harbor. He stressed that project proponents “really have to take steps to make sure that there’s not discharge into the ocean that would reduce the quality of the habitat because people do rely on it.”

Mr. Al Lagunero noted that the area has “provided many forms of edibles to the community at large for generations (i.e. the Hului fishing techniques).” He added that Hobron Point and Baldwin Beach Park provided “large quantities of *limu wawaei‘ole*,” as well as the “area near Y. Hata.” He added that these were also “traditional gathering areas for *he‘e* and *lamalama* at low tides.”

He also questioned whether “raw sewage is still being dumped from an area near Y. Hata buildings close to the Paukukalo turn-off from Lower Main and how the effulgence may affect the food chain still accessed by local families even toward the Hobron Point area.”

Mr. Lagunero also stated that “Hobron Point attracts large numbers of turtles that come in from the direction of Kahakuloa.” The number of turtles vary “from 10/15/20 in various sizes or stages of growth.” He added that they “appear to bask in the outflow of waters from conduits along that shoreline from the industrial area.” He recalled personally feeding them and seeing “tourists from the boats also enjoying them along the trail in the area above the waters.”

7.3 Wahi Pana

A Hawaiian *wahi pana* “physically and poetically describes an area while revealing its historical or legendary significance” (Landgraf 1994:v). Wailuku Ahupua‘a contains numerous *wahi pana* and associated *mo‘olelo* that place the specific project area within a broader cultural context.

In traditional times a region of sandy plains between Kahului and Wailuku, Ke Kula o Kama‘oma‘o, or the Plains of Kama‘oma‘o, was known by Hawaiians as a wandering place of the souls (Beckwith 1970:154), where dead spirits waited for a friendly escort, perhaps a family

‘aumakua to show them the way to eternity. Helen P. Hoyt (1976) also noted that Kama‘oma‘o is also a region where the “Marchers of the Night,” or *Ka huaka‘i o ka Po*, are sometimes heard and seen.

The Plains of Kama‘oma‘o are also cited as a home to owl deities, considered one of the oldest *‘aumakua* in Hawaiian mythology. Pueonuiakea was the name of an owl deity who traversed the Plains of Kama‘oma‘o and restored life to wandering souls (Beckwith 1970:124). Fornander (1918-19b) described the story of Pumaia, a heroic young man that fell to the hands of a spirit, Puukolea, who had a dual body and was capable of shape-shifting in ways the mere human, Pumaia, could not. After falling to Puukolea, Pumaia’s spirit fled till he reached the Plains of Kama‘oma‘o where an owl diety by the name of Pueonuiokona began battling Puukolea and ultimately killed him and scattering his entrails about the plains (Fornander 1918-19b:VI:III:550-554).

Dr. Fisher stressed the significance of Kanahā Pond, which is located east of Kahului Harbor. He noted that Kanahā Pond originally consisted of two ponds, Mau‘oni and Kanahā, which were named after the children of Kapi‘iohookalani, the chief who oversaw the construction of the ponds. According to the *mo‘olelo* which appears in Sterling (1998:87-88), Kapi‘iohookalani, one-time king of O‘ahu and half of Moloka‘i, was the original architect of the two ponds; however, before he could complete the construction of the pond walls, he was killed in battle. In the mid-1700s, Kamehamehanui, king of Maui, finished the pond walls, placed a *kapu* on the bank, and building a *kuapā* dividing the two ponds. Kapi‘iohookalani’s daughter, Kahamaluihiikeaoihilani, sought her brother, Kanahaokalani, and searched Moloka‘i and Maui for him. Due to her high rank, Kahamaluihiikeaoihilani was able to break the *kapu* by walking on the center *kuapā* of the pond. Following this act, Kamehamehanui allowed her to name the ponds. She named Kanahā for her brother, and Mau‘oni for the identity she travelled by to protect her status as a chiefess of the highest rank.

Dr. Fisher went on to state that although Kanahā Pond is not in the immediate project area, “there could possibly be some impact or there might be some residual artifacts or cultural sites around that area.” He added that the area has a high potential for early habitation sites and he recommends that data recovery should be conducted on “anything that’s found.”

Mr. Lagunero mentioned that Kanahā Pond is “a notable feature in the area adjacent to the industrial areas in the Hobron quadrant.” He added that the *loko i‘a* has “greatly been diminished from native disuse and displacement.”

7.4 Religious Practice and Burials

Heiau of Wailuku include the Pihana Heiau complex built in the time of Kakae, *mō‘ī* of Maui in the early sixteenth century. Pihana Heiau was located across from the modern-day Wailuku Sugar Co. mill crested upon a sand ridge on the west side of ‘Īao Stream. The Pihana Heiau complex consists of a *luapa‘u*, burials, a cave, and adjacent *heiau*. Pihana Heiau is classified as a *luakini*, or sacrificial heiau (Sterling 1998:77). Thrum (1909:46) noted that before defeating Maui forces in the Battle of Kepaniwai, also known as the Battle of ‘Īao, Kamehameha I used Pihana Heiau for sacrifices to invoke the blessings of his war god Kukailimoku.

The ‘Īao Valley was once a site of royal burials. Walker (1931:296) described ‘Īao Valley as a “place of royal sepulturer for many of the ancient kings of Maui and neighboring islands.”

Kamakau (1992:29) referred to ‘Īao Valley as a “place for chiefly corpses.” Celebrities buried in ‘Īao Valley include Kapawa, ‘Aikanaka, Kaha‘i, Laka, Hua, Pau, and Paumakua (Fornander 1919-20a:VI:II:319).

Dr. Fisher is a member of the Maui/Lana‘i Island Burial Council. He mentioned that pre-Contact burials have been discovered along the coast in the western portion of Kahului Harbor on land owned by the Hawaiian Islands Land Trust and on the adjacent property, which is owned by the Nisei Veterans Memorial Center. He also noted that burials were also found at Keōpuōlani Park. Although he doesn’t personally know of any burial in “close proximity of the area,” he recalled that *iwi kūpuna* may have been found “somewhere in this area.” Dr. Fisher recommends having an archaeological monitoring plan as well as having an archaeological monitor on site during construction of the proposed project.

Section 8 Summary and Recommendations

CSH undertook this CIA at the request of Munekiyo Hiraga. The research broadly covered the *ahupua‘a* of Wailuku, including the current project area.

8.1 Results of Background Research

Background research for this study yielded the following results, presented in approximate chronological order:

1. The *ahupua‘a* of Wailuku is located in the larger *moku* of Wailuku on the central isthmus of the island of Maui.
2. The story *The Wind Gourd of La‘amaomao* identifies four distinct winds associated with Wailuku: Kololio, I‘a-iki, ‘O‘opu, and Kaua‘ula (Nakuina 1992:63).
3. Names of rain referencing the *ahupua‘a* and *moku* of Wailuku include Hō‘eha‘ili, the skin-hurting rain of Waiehu (Akana and Gonzalez 2015:36); Kili, a delicate gentle rain associated with Waihe‘e (Akana and Gonzalez 2015:81); and Kili‘o‘opu found at Waihe‘e, Waiehu, Wailuku, and Waikapū (Akana and Gonzalez 2015:83).
4. Wailuku Ahupua‘a was included in the traditional *‘okana* of Nā Wai ‘Eha, or “The Four Waters.” This area is home to the four largest streams found on the windward coast of Maui.
5. In Pukui and Curtis’s *The Water of Kāne* (1994) the naming of Wailuku is recounted in the *mo‘olelo* of *The Battle of the Owls*. Following a fierce battle between the owls of the Hawaiian Islands and a cruel man, Wailuku earned its name meaning, “Water-of-killing” (Pukui and Curtis 1994:189).
6. Ke Kula o Kama‘oma‘o, or the Plains of Kama‘oma‘o, is the name given to a region of sandy plains between Kahului and Wailuku, Maui (Emerson 1915:76). This area was known by Hawaiians in traditional times as a wandering place of the souls (Beckwith 1970:154), a place where dead spirits waited for a friendly escort, perhaps an *‘aumakua* (family god), to show them the way to eternity.
7. On the north shore of the central isthmus in Wailuku Ahupua‘a lie the *loko i‘a* named Mau‘oni and Kanahā. According to traditional accounts, an O‘ahu chief began construction on the walls but Kamehamehanui, king of Maui, completed it in the mid-1700s.
8. In ancient times Wailuku, specifically the area around Kahului Bay, was known as a chosen gathering and residential site for Maui *ali‘i* and chiefs (James 2002). Handy and Handy (1972) add that, “in ancient times [Wailuku District] was the largest continuous area of wet-taro cultivation in the islands” (Handy and Handy 1972:496).
9. In 1776, Kalani‘ōpu‘u, ruling chief of Hawai‘i, and his elite army of *‘Ālapa* and *Pi‘ipi‘i* warriors, 800 men strong, were defeated by Kahekili of Maui and his forces in what was called *Ahulau Ka Pi‘ipi‘i i Kakanilua* or Slaughter-of-the-Pi‘ipi‘i-at-Kakanilua (Kamakau 1992:86).

10. The 1790 invasion of Maui by Kamehameha I of Hawai‘i Island, is referenced by many place names within Wailuku. In one example, The Battle of ‘Īao is also known as the Battle of Kepaniwai, meaning the “Dammed Stream.”
11. Following the Great Māhele of 1848, the *ahupua‘a* of Wailuku was declared Crown Land. Ruth Ke‘elikōlani, half-sister to Lot, King Kamehameha V, inherited the *ahupua‘a* from him following his death in 1872. Spreckels subsequently received Land Grant 3343, which consisted of 24,000 acres of the southeastern portion of the Wailuku Ahupua‘a, from King Kalākaua (Zambucka 1977:48) following an agreement to purchase a part-interest in Crown Lands of the Kingdom of Hawai‘i from Princess Ruth Ke‘elikolani. This agreement allowed the Commission of Crown Lands to exchange Spreckels’ part-interest for the fee-simple title to central Maui lands he had previously leased from the Kingdom in 1877 (Daws 1968:288). Although almost 300 individual parcels were awarded by the Land Commission for Kuleana Lands within the *ahupua‘a* of Wailuku, these claims represented lands which were located in the upland portion of the *ahupua‘a*.
12. A common crop on nearly all major Hawaiian Islands was sugar cane. Among the early government grants in the upland area of Wailuku Ahupua‘a were lands set aside for the Wailuku Sugar Company, a plantation first organized in 1862 by James Robinson & Company, Thomas Cummins, J. Fuller, and agent C. Brewer & Company.
13. In 1901, Kahului Railroad Company, then headed by Henry P. Baldwin, began organizing a project to develop a modern harbor at Kahului. The essential structure of and facilities for Kahului Harbor were completed in 1931. By the 1940s, Kahului Harbor was handling more than 500,000 tons of inter-island and trans-Pacific freight.
14. In the early 1940’s, the harbor town of Kahului was transformed from a sleepy plantation mercantile area to an important military defense depot. Following the entry of the United States in World War II, the rapid construction of military defensive structures demanded the immediate use of plantation wharf space, heavy equipment, and operators. Plantation employees from Wailuku and Kahului were pressed into emergency service until military construction personnel arrived in the Hawaiian Islands.
15. The current land-use of the corridor connecting Kahului with Wailuku includes a mix of residential, warehousing, light industrial and commercial, with retail sales centered primarily in Kahului. Until December 2016 when HC&S announced its closure, most of the land area of Wailuku Ahupua‘a was in sugar cultivation.

8.2 Results of Community Consultations

CSH attempted to contact 90 Native Hawaiian Organizations (NHOs), agencies, and community members. Of the 19 people that responded, three *kama‘āina* and/or *kūpuna* provided written testimony and two participated in formal interviews for more in-depth contributions to the CIA. Below is a list of individuals who shared their *mana‘o* and *‘ike* about the project area. CSH completed the community consultion in July 2020.

1. William J. Aila, Jr., Chairman, Hawaiian Homes Commission
2. Scott Fisher, Chief Conservation Officer, Hawaiian Islands Land Trust

3. Jay Carpio, *kama‘āina*, Wailuku Community Managed Makai Area (CMMA)
4. Holly Buland, Museum Director of Alexander & Baldwin Sugar Museum
5. Al Lagunero, renowned artist, Native Hawaiian cultural practitioner, and Vice-President of Olowalu Cultural Reserve

8.3 Impacts and Recommendations

Based on information gathered from the community consultation, participants voiced and framed their concerns in a cultural context.

1. Dr. Scott Fisher stated that the area has a high potential for early habitation sites. He noted that although Kanahā Pond is not in the immediate project area, “there could possibly be some impact or there might be some residual artifacts or cultural sites around that area.” He recommends that data recovery should be conducted on “anything that’s found.”
2. Dr. Fisher recommended mitigating any potential loss of habitat for fish in Kahului Harbor. He mentioned that there are “people who really rely on the marine resources in the area,” noting that the *akule* are very abundant in Kahului Harbor. He stressed that project proponents “really have to take steps to make sure that there’s not discharge into the ocean that would reduce the quality of the habitat because people do rely on it.”
3. Dr. Fisher expressed his concerns regarding the discovery of *iwi kūpuna* during construction related activities. Dr. Fisher is a member of the Maui/Lana‘i Island Burial Council. He mentioned that pre-Contact burials were discovered along the coast in the western portion of Kahului Harbor on land owned by the Hawaiian Islands Land Trust. He also noted that a large number of burials were found on the adjacent property, which is owned by the Nisei Veterans Memorial Center. He added that burials were also found at Keōpuōlani Park. He mentioned that while he doesn’t personally know of any burial in “close proximity of the area,” he recalled that *iwi kūpuna* may have been found “somewhere in this area.” Dr. Fisher recommends having an archaeological monitoring plan as well as having an archaeological monitor on site during construction of the proposed project.
4. On 27 January 2020, Dr. Fisher was notified about a modification to the proposed project area to include the demolition of the existing Hawaiian Cement facility following the completion of the new relocated facility. He stated that if the proposed project “will involve more ground disturbance than previously projected,” he would “certainly recommend archaeological monitoring […] to ensure that iwi kupuna or any cultural sites are not unnecessarily damaged, modified or altered.”
5. Mr. Al Lagunero recommended consulting with Kupuna Waiola Hana‘ike who is “well informed as to the Kahului and Wailuku areas,” as well as canoe clubs that consistently use Kahului Harbor. CSH reached out to Kupuna Waiola Hana‘ike’s *‘ohana* and the Hawaiian Canoe Club.
6. He also expressed his concerns regarding “how cement dust will affect the air in the area as it is subject to coastal, trade and north winds affecting the area.” He noted that Hale Nanea, a community use center which has been in place “since and before 1960,” is located close to the intended relocation of the Hawaiian Cement facility.

7. Mr. Lagunero also expressed his concerns regarding “coring activities involved in the relocation of the cement plant” noting it should be questioned further. He added that, “Octopus and squid are affected in great numbers as their young float-up to the harbor shores dead during the birthing season once signaled by the appearance of sugar-cane tassels in the fields mauka (from Kahului to Peahi (I forget the season of the year, Welo or Kauwela).”
8. He also expressed concern regarding the management of resources including sand. He noted that “sand from these areas were being shipped to Honolulu and possibly resisted by community activists.”
9. He also noted that the “projected use over the next 20 to 50 years should be analyzed.” He mentioned “Bank Analysts reports on television news that the growth of tourism is needing increased management systems by the State.”
10. Project construction workers and all other personnel involved in the construction and related activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. In the event that any potential historic properties are identified during construction activities, all activities will cease and the SHPD will be notified pursuant to HAR §13-280-3. In the event that *iwi kūpuna* are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended.
11. In the event that *iwi kūpuna* and/or cultural finds are encountered during construction, project proponents should consult with cultural and lineal descendants of the area to develop a reinterment plan or preservation plan for proper cultural protocol, curation, and long-term maintenance.

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n.d Aerial of Kahului Harbor (1960s) showing industrial development circa 1960s

Alexander & Baldwin (A&B) Sugar Museum
n.d Pu‘unēnē Mill circa 1935
n.d. Pu‘unēnē Mill and camps (foreground); Kahului Bay and Harbor in left background
n.d. Kahului Theater
n.d. Kahului School, constructed in 1922; the main school building seen here was demolished in the late 1970s, leaving a large empty lot east of the present Ka‘ahumanu Shopping Center that remains undeveloped today
n.d. Aerial photo of Kahului School (foreground) in relation to Kahului Harbor (upper right)
n.d Bulk sugar being prepared for transport circa 1940s
n.d Sugar stored inside warehouse at HC&S bulk sugar plant circa 1952
n.d Kahului Store workers cleaning 1960 tidal wave damage

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n.d. View toward ‘Īao Valley from Wailuku sand hills showing Wailuku Town, ca. early 1900s. Bishop Museum, Honolulu, Hawai‘i.

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n.d Bulk sugar being loaded into transport trucks to be carried to the bulk sugar plant storehouses, circa 1940s; conveyor system (CSH4) visible in background
n.d Interior of storehouse (CSH 2) while in operation circa 1950s, showing bulk unrefined sugar being transported to the storehouse from the intake conveyor system
n.d Interior of sugar storehouse (CSH 2) while still in operation circa 1950s and a portion of the conveyor system (CSH 4) connection (upper left)
n.d Kahului Harbor with all components of the conveyor system (CSH 4), including the dump bin, the first of the bulk sugar storehouses (CSH 2), and the conveyor connecting each to Pier 1, circa 1940s
n.d Historic photo of the bulk sugar conveyor system after the concrete foundation was undermined by a 1960 tidal wave
n.d Photograph (1960) of damage to bulk sugar conveyor system at Kahului Harbor following a tidal wave; note extensive ground utilities under pavement surface to support the harbor infrastructure
n.d Photo of utilities exposed at Kahului Harbor Bulk Sugar plant following a 1960 tidal wave
n.d Photo of interior water damage to the bulk sugar conveyor system at Kahului Harbor caused by the 1960 tidal wave
n.d Aerial photograph of Kahului Harbor showing industrial development in 1954
n.d Aerial photograph of Kahului Harbor showing industrial development in 1954
n.d Aerial photograph of Kahului Harbor showing industrial development in 1956
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Appendix A Letter from Department of Hawaiian Home Lands

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

JOSH GREEN
LT. GOVERNOR
STATE OF HAWAII

WILLIAM J. AILA, JR
CHAIRMAN
HAWAIIAN HOMES COMMISSION

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

September 5, 2019

In reply refer to: PO-19-175

Dr. Hallet H Hammatt, Ph.D., President
Cultural Surveys Hawaii, Inc.
Kailua, Hawai'i, 96734
Attn: Kellen Tanaka

Dear Dr., Hammatt:

Subject: Cultural Impact Assessment (CIA) for Hawaiian Cement Facilities Relocation Project Wailuku Moku, Maui

The Department of Hawaiian Home Lands acknowledges receiving the request for comments on the above-cited project. After reviewing the materials submitted, the project is located in the vicinity of DHHL's Wailuku Moku land holdings, identified as the Central Region in the Maui Island Plan. DHHL offers the follow comments:

The proposed project has the potential to impact DHHL's beneficiaries in Wailuku Moku. We highly encourage you to consult with Hawaiian Homestead community associations and other (N)native Hawaiian organizations when preparing CIA to better assess potential impacts to cultural and natural resources, access and other rights of Native Hawaiians. A list of some of our DHHL homestead associations may be found at https://dhhl.hawaii.gov/homestead-associations/.

In addition, we recommend you contact Blossom Feiteira, a Maui DHHL beneficiary with traditional and cultural knowledge as a resource in the development of this CIA.

Mahalo for the opportunity to provide comments. If you have any questions, please call Malia Cox, at 620-9485 or contact via email at malia.m.cox@hawaii.gov.

Aloha,

William J. Aila Jr., Chairman
Hawaiian Homes Commission

c: Blossom Feiteira via email

APPENDIX

E

TRAFFIC ASSESSMENT

AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS
CONTINUING THE ENGINEERING PRACTICE FOUNDED BY H. A. R. AUSTIN IN 1934

TERRANCE S. ARASHIRO, P.E.
ADRIENNE W.L.H. WONG, P.E., LEED AP
DEANNA M.R. HAYASHI, P.E.
PAUL K. ARITA, P.E.
ERIK S. KANESHIRO, L.P.L.S, LEED AP
MATT K. NAKAMOTO, P.E.
GARRETT K. TOKUOKA, P.E.

ADRIENNE W.L.H. WONG, P.E., LEED AP
Maui Branch Manager

#16-520

September 24, 2020

Ms. Tessa Munekiyo Ng, Vice President
Munekiyo Hiraga
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Ms. Ng:

Subject: Traffic Assessment for Hawaiian Cement
Kahului Harbor Facility Relocation
TMK: (2) 3-7-010:009
Kahului, Maui, Hawaii

Austin, Tsutsumi & Associates, Inc. (ATA) has conducted a Traffic Assessment (TA) for the relocation of the existing Hawaiian Cement Facility, hereinafter referred to as the 'Project', at the Kahului Harbor industrial site in Kahului, Maui, Hawaii.

Project Description

The current Hawaiian Cement facility is approximately 12,000 square feet (SF) and is located on the parcel identified by TMK: (2) 3-7-010:034 within the Kahului Harbor. Primary entrance into the site is provided via the unsignalized security Gate 9 access along Hobron Avenue, just south of Amala Place. When Gate 9 is closed, the site can be accessed via the signalized Kaahumanu Avenue/Wharf Street intersection, which provides both entry and exit to the site.

Hawaiian Cement plans to remain in the Kahului Harbor industrial area, but relocate its facility approximately 600 feet northeast of its current site, to the A&B parcel identified as TMK: (2) 3-7-010:009. Existing tenants of this A&B parcel will continue to operate and include Par Petroleum, A&B roundhouse tenants, KT&S, a trucking and towing tenant and Matson. No changes to these users or trips generated by existing tenants are anticipated. At this new A&B parcel, Hawaiian Cement will increase the size of the cement holding tanks, but this is not anticipated to generate additional daily average traffic beyond existing conditions. However, cement demand and Project vehicle trips will be dependent on the level of construction occurring on Maui.

Access to the Project will occur at two (2) existing accesses via Hobron Avenue. The Project proposes to enter only at the existing southeast end of the A&B parcel, across the Hobron Avenue/Amala Place intersection and just north of its current Gate 9 entrance and exit only at the northeast end of the A&B parcel. Circulation within the A&B site is subject to change and will depend on the future redevelopment of the A&B parcel, but Project access points on Hobron Avenue will not change regardless of internal circulation. A gate at the northwest corner of the

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OFFICES IN:
HONOLULU, HAWAII
WAILUKU, MAUI, HAWAII
HILO, HAWAII

site permits access to the adjacent parcel, but since this gate is rarely used, the two Project accesses will primarily service parcel traffic only. No intersection improvements are planned at either of the two existing Project accesses. Figure 1 shows the location of the Project, vehicle circulation and Project accesses along Hobron Avenue. Figure 2 shows the Project site plan. The Project anticipates completion by 2022.

Study Area

Kaahumanu Avenue is generally an east-west, two-way, four to six-lane divided principal arterial state roadway that provides access between Wailuku and Kahului. Kaahumanu Avenue begins in Wailuku at its connection with Main Street and continues east to Kahului where it terminates at its intersection with Hobron Avenue. The roadway has a posted speed limit of 30 miles per hour (mph) in the vicinity of the Project.

Hana Highway is generally a two-way, four-lane divided state highway that provides access between Kahului and Hana. Hana Highway begins in Kahului at its intersection with Kaahumanu Highway and travels along the coast to Hana before terminating at its connection with Piilani Highway in Kipahulu. The posted speed limit is 30 mph in the vicinity of the Project.

Kahului Beach Road is generally a north-south, two-way, four-lane divided state collector roadway that provides access between the Wailuku industrial area and Kahului. Kahului Beach Road begins in Wailuku at its intersection with Lower Main Street and Waiehu Beach Road and continues south to Kahului where it terminates at its intersection with Kaahumanu Avenue and Kane Street. The roadway has a posted speed limit of 35 mph in the vicinity of the Project.

Kamehameha Avenue is generally a two-way, two to four-lane county collector roadway serving the residential and commercial areas within Kahului. Kamehameha Avenue begins to the southwest at Pomaikai Elementary School and travels northeast where it terminates at its intersection with Hana Highway and Hobron Avenue. The roadway has a posted speed limit of 20 mph in the vicinity of the Project.

Hobron Avenue is generally a two-way, two-lane undivided state roadway that provides access to Kahului Harbor from Hana Highway. The roadway has a posted speed limit of 20 mph in the vicinity of the Project.

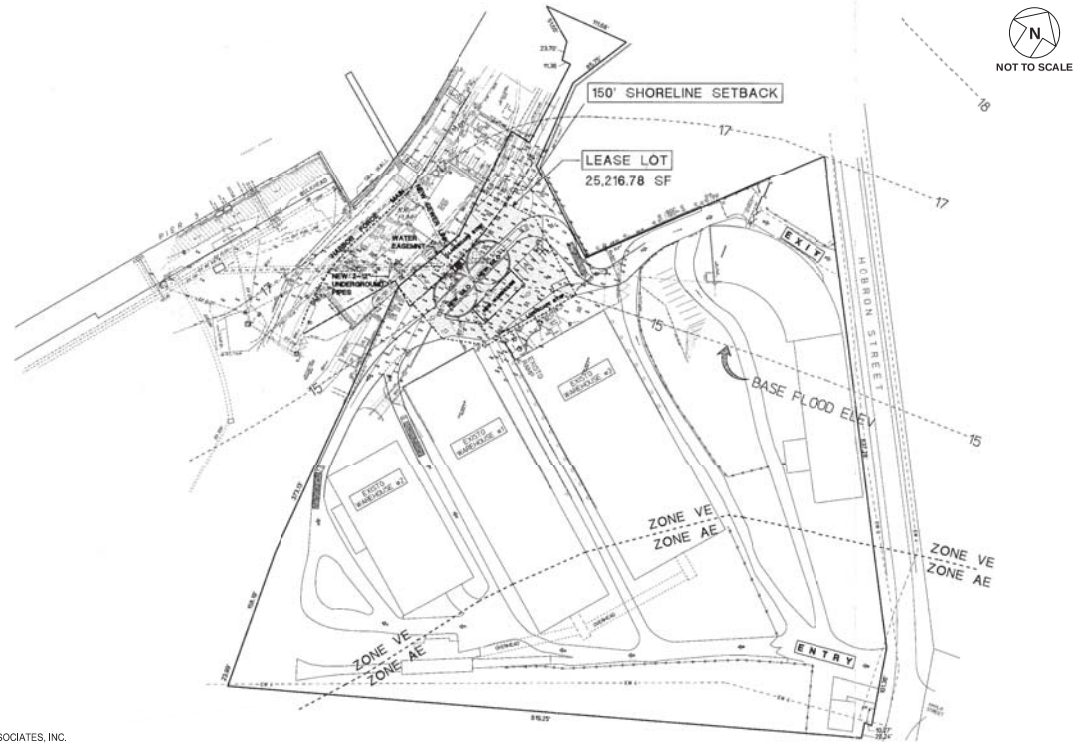
Study Scope

While Hawaiian Cement proposes an increase in the size of the cement holding tanks, traffic generated by the Project is not anticipated to increase from existing conditions. A worst-case scenario based on historical cement orders will be evaluated to conservatively increase traffic for the Project. The following intersections were studied based on their proximity to the Project.

- Kaahumanu Avenue/Kahului Beach Road/Kane Street
- Kaahumanu Avenue/Wharf Street
- Kaahumanu Avenue/Hana Highway
- Hana Highway/Kamehameha Avenue/Hobron Avenue
- Kaahumanu Avenue/Hobron Avenue
- Hobron Avenue/Gate 9 Access

HAWAIIAN CEMENT
KAHULUI HARBOR
FACILITY RELOCATION

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors



SOURCE: SATO & ASSOCIATES, INC.

FIGURE 2

PROJECT SITE PLAN

HAWAIIAN CEMENT
KAHULUI HARBOR
FACILITY RELOCATION

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

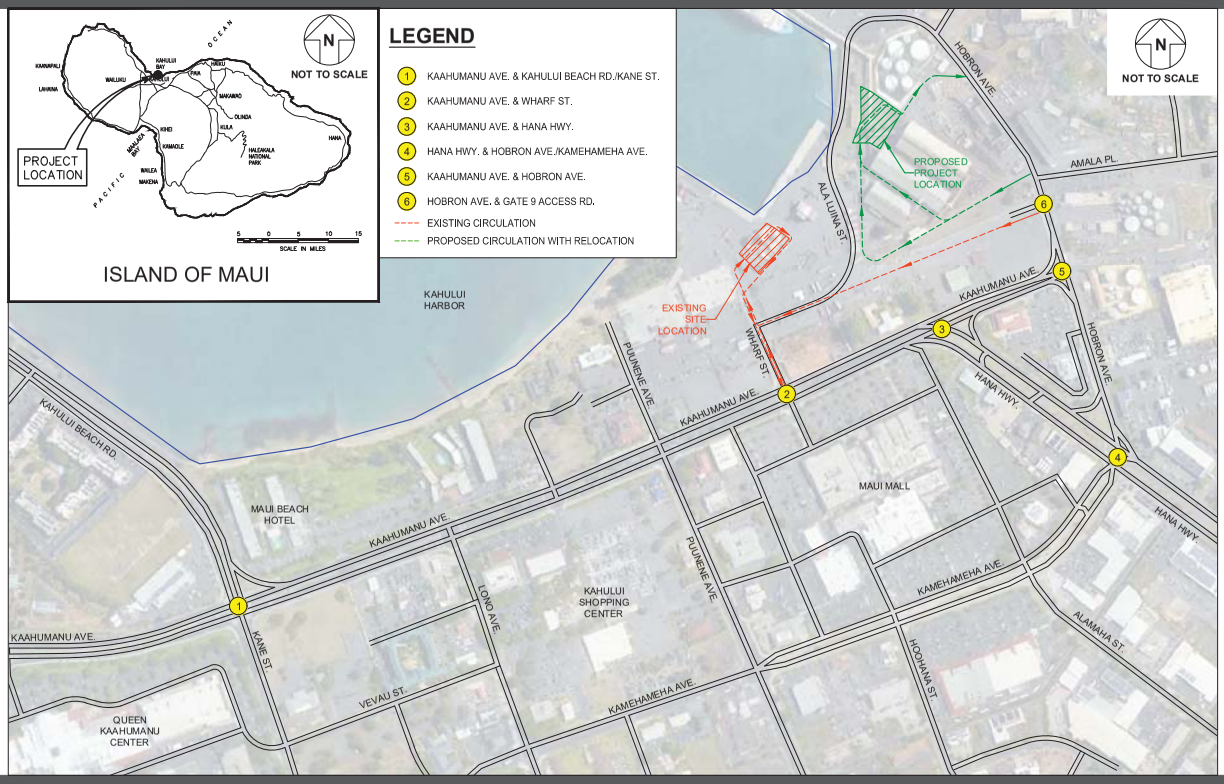


FIGURE 1

PROJECT LOCATION

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

Ms. Tessa Munekiyo Ng, Vice President
Munekiyo Hiraga

September 24, 2020

Existing Conditions

Traffic counts were conducted at the study intersections on Thursday, May 12, 2016. Following the initial 2016 data collection, turning movement counts were collected at the signalized Kaahumanu Avenue/Kahului Beach Road/Kane Street, Kaahumanu Avenue/Wharf Street and Hana Highway/Kamehameha Avenue/Hobron Avenue intersections on Tuesday May 8, 2018. Volumes at the remaining unsignalized intersections counted in 2016 were adjusted based on the 2018 data. This adjustment resulted in existing volume increases ranging from 10-30 vehicles for some individual movements. The weekday AM peak hour of traffic occurs between 7:15 AM and 8:15 AM and the weekday PM peak hour of traffic occurs between 3:15 PM and 4:15 PM. Traffic count data is provided in Enclosure 1.

There is currently little to no pedestrian and bike traffic along Hobron Avenue during the peak periods. An existing sidewalk is provided along the west side of Hobron Avenue from Kaahumanu Avenue/Hana Highway to Gate 9, but terminates along the Project frontage to the northern terminus of Hobron Avenue. When cruise ships are docked, cruise ship passengers use an existing pedestrian path within Kahului Harbor, west of the Project parcel, to get to/from the dock to Kaahumanu Avenue to visit Maui Mall and other nearby commercial uses. This pedestrian path does not conflict with any vehicles generated by the Project site along Hobron Avenue. No bus routes, bike lanes, bike paths or bike markings are provided along Hobron Avenue. The nearest bus stop is located near the Kamehameha Avenue/Hoohana Street intersection, about 0.5 mile from the Project site. It's our understanding that no roadway improvements or bus expansion is planned along Hobron Avenue.

Traffic was generally observed to operate smoothly along Kaahumanu Avenue and Hana Highway during the AM peak hour of traffic, with more congestion during the heavier PM peak hour. Eastbound commuter traffic during the PM peak hour resulted in some queues that required 2 cycles to clear. Signalized intersections along Kaahumanu Avenue and Hana Highway are currently coordinated as one network, with priority along the mainline traffic. As a result, some delays to the minor street and turning movements were observed at the signalized intersections as a result of the coordinated signal timings favoring the Kaahumanu Avenue/Hana Highway corridor.

Operations at the studied intersections were analyzed based on Level of Service (LOS). LOS is a qualitative measure used to describe the conditions of traffic flow at intersections with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6th Edition, includes methods for calculating volume to capacity ratios, delays and corresponding LOS that were utilized in this study. LOS definitions for signalized and unsignalized intersections are provided in Enclosure 2.

The Kaahumanu Avenue/Kahului Beach Road/Kane Street intersection was observed to experience the highest levels of congestion due to the high turning movement volumes along both the Kaahumanu Avenue and Kahului Beach Road approaches. As a result of the high volumes, various turning movements and minor street movements operated at LOS E or F with the southbound shared left-turn/through movement operating near capacity during both peak hours of traffic. Figure 3 illustrates the existing lane configurations, volumes and LOS for the study intersection movements. Table 1 summarizes the existing LOS at the study intersections. LOS worksheets are provided in Enclosure 3.

HAWAIIAN CEMENT
KAHULUI HARBOR
FACILITY RELOCATION

FIGURE 3

EXISTING LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

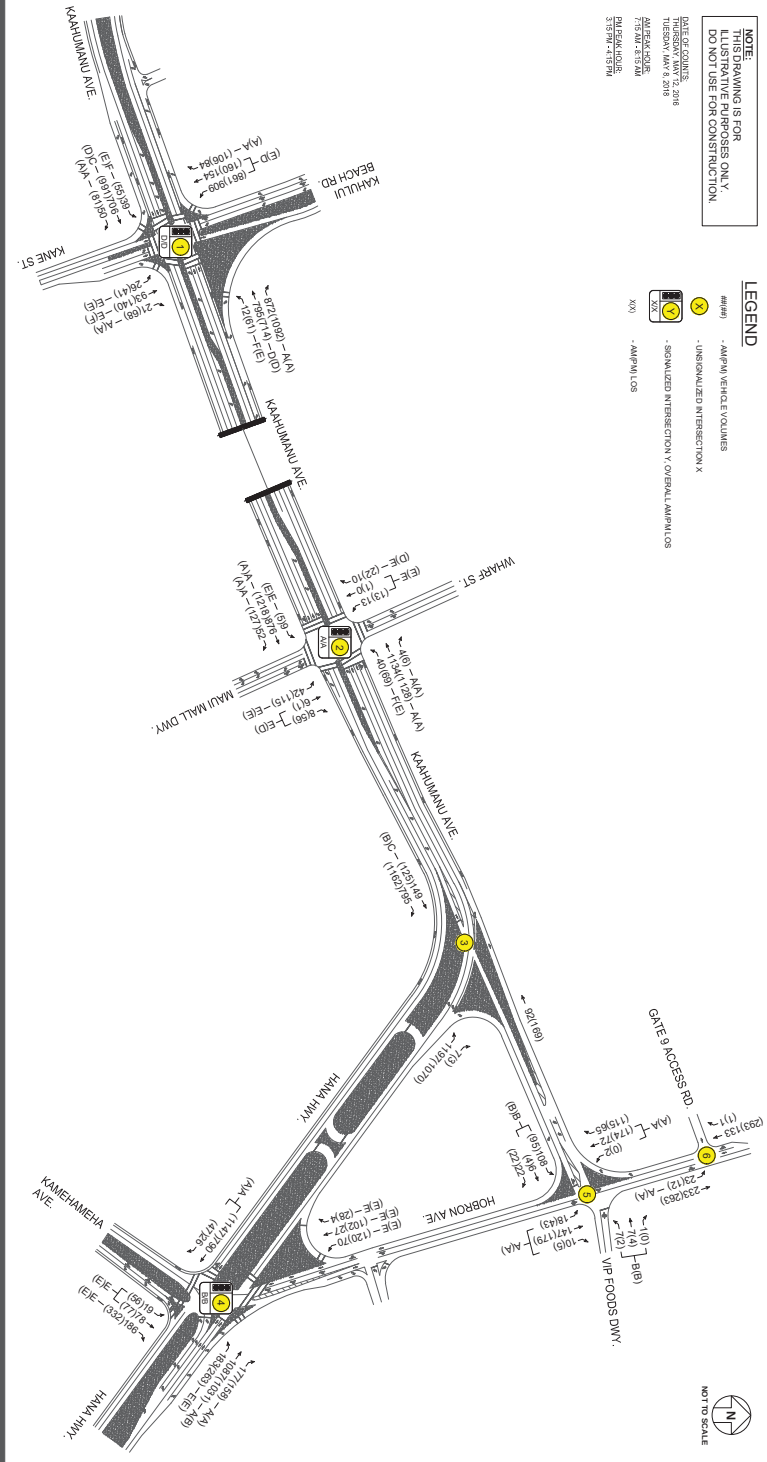


TABLE 1: LOS SUMMARY TABLE
EXISTING CONDITIONS

Intersection	Existing 2018 Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Kane St/Kahului Beach Rd & Kaahumanu Ave						
NB LT	58.0	0.22	E	57.5	0.26	E
NB TH	68.3	0.77	E	91.5	0.86	F
NB RT	0.0	0.00	A	0.0	0.00	A
EB LT	84.3	0.79	F	79.1	0.78	E
EB TH	28.8	0.51	C	40.5	0.78	D
EB RT	0.0	0.00	A	0.0	0.00	A
WB LT	124.5	0.84	F	76.7	0.78	E
WB TH	48.2	0.61	D	48.9	0.56	D
WB RT	0.0	0.00	A	0.0	0.00	A
SB LT/TH	50.7	0.92	D	58.8	0.94	E
SB RT	0.0	0.00	A	0.0	0.00	A
OVERALL	45.7	-	D	52.6	-	D
2: Maui Mall Dwy/Wharf St & Kaahumanu Ave						
NB LT	63.5	0.39	E	62.4	0.62	E
NB TH/RT	60.9	0.12	E	54.6	0.02	D
EB LT	74.5	0.48	E	68.9	0.44	E
EB TH	0.2	0.33	A	0.1	0.50	A
EB RT	0.0	0.03	A	0.0	0.08	A
WB LT	82.2	0.77	F	76.3	0.79	E
WB TH	2.4	0.28	A	4.3	0.30	A
WB TH/RT	2.6	0.28	A	4.5	0.30	A
SB LT/TH	61.6	0.13	E	55.2	0.08	E
SB RT	60.0	0.02	E	54.5	0.01	D
OVERALL	5.1	-	A	7.1	-	A
3: Kaahumanu Ave & Hana Hwy						
EB LT	15.5	0.32	C	12.9	0.23	B
OVERALL	1.1	-	-	0.7	-	-
4: Kamehameha Ave/Hobron Ave & Hana Hwy						
NB LT/TH	63.5	0.82	E	63.9	0.84	E
NB RT	55.0	0.03	E	55.5	0.09	E
EB TH/RT	1.2	0.41	A	3.6	0.66	A
WB LT	61.1	0.78	E	62.2	0.84	E
WB TH	8.3	0.46	A	11.0	0.47	B
WB RT	5.9	0.13	A	7.9	0.11	A
SB TH	58.9	0.28	E	60.9	0.67	E
SB LT/TH	63.4	0.72	E	62.8	0.78	E
SB RT	57.5	0.01	E	55.5	0.01	E
OVERALL	14.2	-	B	18.9	-	B
5: Hobron Ave & Kaahumanu Ave/VIP Foods Dwy						
NB LT/TH/RT	7.4	0.01	A	7.9	0.04	A
EB LT/TH	12.2	0.20	B	14.9	0.23	B
WB LT/TH/RT	11.5	0.03	B	12.8	0.01	B
SB LT/TH	8.1	0.00	A	0.0	0.00	A
OVERALL	3.9	-	-	3.0	-	-
6: Hobron Ave & Gate 9 Access Rd						
NB LT/TH	8.8	0.03	A	8.3	0.01	A
OVERALL	0.5	-	-	0.2	-	-

Ms. Tessa Munekiyo Ng, Vice President
Munekiyo Hiraga

September 24, 2020

Base Year 2022 Conditions

By Base Year 2022, traffic volumes are anticipated to increase along the major thoroughfares in the vicinity of the Project as a result of regional growth as well as other known developments planned in Kahului. Based on the Maui Regional Travel Demand Model (MRTDM) and counts collected by ATA, annual growth rates of 0.5%-3.4% were applied to the major movements along Kaahumanu Avenue, Hana Highway, Kahului Beach Road and Kamehameha Avenue. In addition, the following background developments were assumed to be constructed by Base Year 2022, and traffic generated by these developments was included as part of this study:

- Maui Palms Hotel Redevelopment is a planned redevelopment of the old Maui Palms Hotel site. This site is adjacent to the Maui Beach Hotel and is currently vacant. Current plans propose to develop a 136-room hotel spread across three (3) buildings. Access to the site will likely be provided from the existing Maui Beach Hotel accesses via School Street and Lono Avenue.
- Maui Bus Transit Hub Relocation is a planned relocation of the Maui Bus Transit hub from its existing location at the Queen Kaahumanu Center to the northwest quadrant of the Vevau Street/School Street intersection. The new hub will have storage space for six (6) buses and six (6) employee parking stalls. The relocation is anticipated to be completed by 2021.
- Kahului Lani Senior Housing is a planned development including 164 senior rentals, one (1) managers unit, approximately 2,500 square feet of recreational space and 5,000 square feet of office space for Catholic Charities of Hawaii. Phase 1 of the development, including 82 low income senior rental units, is expected to be completed by early 2020. Phase 2 is planned to start construction in early 2020.
- Keolani Triangle Retail Center proposes to develop an approximately 1,800 square-foot drive-through restaurant and approximately 3,000 square feet of retail space. The project is located at the northeast corner of the Haleakala Highway/Dairy Road/Keolani Place intersection and will be accessible from Haleakala Highway and a shared easement with the Courtyard by Marriott Hotel.
- Maui Business Park Phase II North Project Area is an approximately 33.5 acre site for light industrial and commercial uses that remains largely undeveloped. Of the 30 parcels on the site, only one (1) parcel has been developed for the Costco gas station and parking lot expansion. Of the remaining parcels, 11 have been either sold or reserved and were assumed to be developed by 2022 for the purposes of this TA. Plans for nine (9) of the parcels include the proposed 200-room Windward Hotel, Skyline Eco-Adventures' corporate office and baseyard and Huber Pools. Two (2) of the parcels were assumed to serve a light industrial use as plans were not known at the time of this report.
- Maui Business Park Phase II South Project Area is an approximately 121.2 acre site for light industrial and commercial uses with parcels in various stages of development. At the time of data collection in 2018, Puunene Shopping Center, BMW and Pacific Pipe were open and operating. However, Puunene Shopping Center had a vacancy of approximately 16%. Hookele Shopping Center, American Savings Bank, Servco Lexus, Kihei Auto Sales, Maui County Service Center and United Auto Parts are either planned,

Ms. Tessa Munekiyo Ng, Vice President
Munekiyo Hiraga

September 24, 2020

under construction or were completed after data collection for this Project, and were assumed to be developed by 2022. Plans for the remaining parcels within the Maui Business Park South Project Area were not known at the time of this report.

The background development locations are shown in Figure 4. Table 2 shows the anticipated volumes generated by the background developments.

By Base Year 2022, assuming no changes to current trips by the Project, traffic conditions at the study intersections are anticipated to operate similar to existing conditions. As in existing conditions, the Kaahumanu Avenue/Kahului Beach Road/Kane Street intersection is expected to experience the highest levels of congestion in the study area due to the high turning volumes. By Base Year 2022, the intersection is expected to worsen to an overall LOS E during the PM peak hour. However, all movements will continue to operate under capacity with the major through movements along Kaahumanu Avenue expected to operate at LOS D during both peak hours.

Figure 5 illustrates the Base Year 2022 lane configurations, volumes and LOS for the study intersection movements. Table 3 summarizes the Base Year 2022 LOS compared to existing LOS at the study intersections. LOS worksheets are provided in Enclosure 3.

HAWAIIAN CEMENT
KAHULUI HARBOR
FACILITY RELOCATION

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

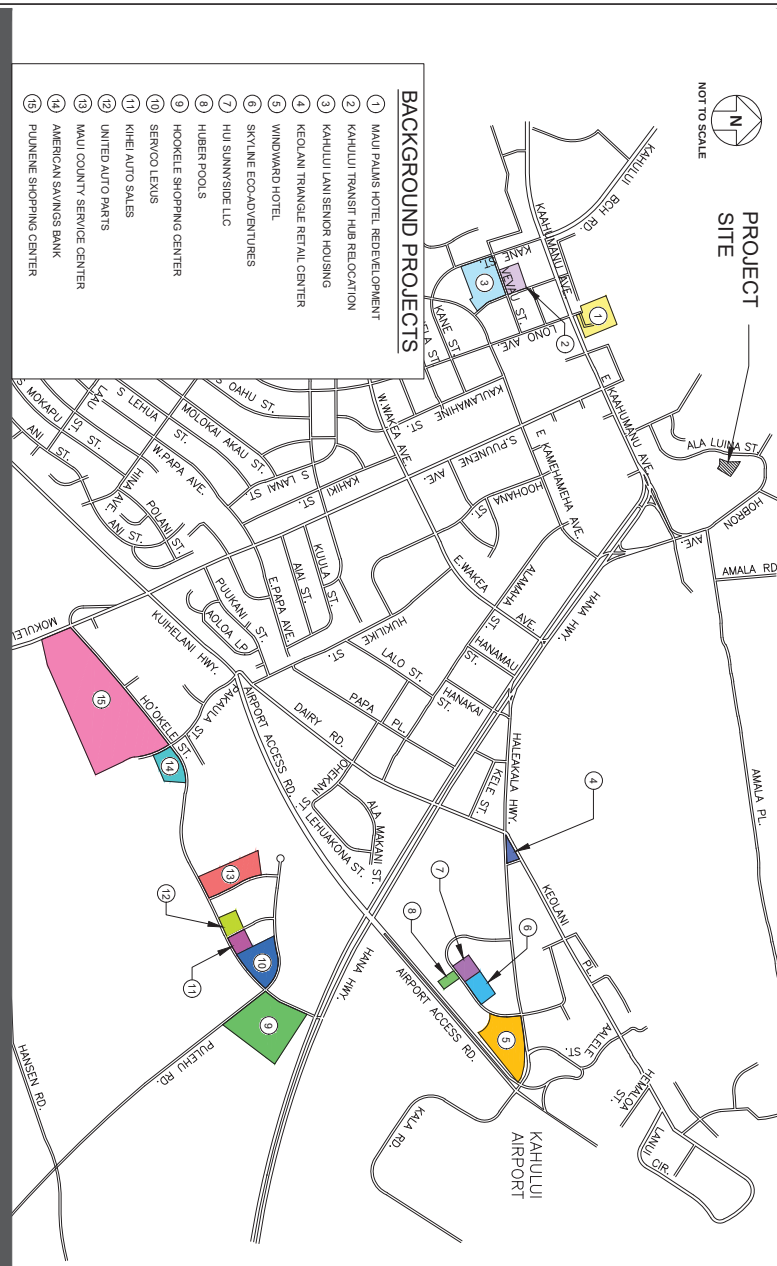


FIGURE 4

BACKGROUND DEVELOPMENTS

Table 2: Background Developments Trip Generation

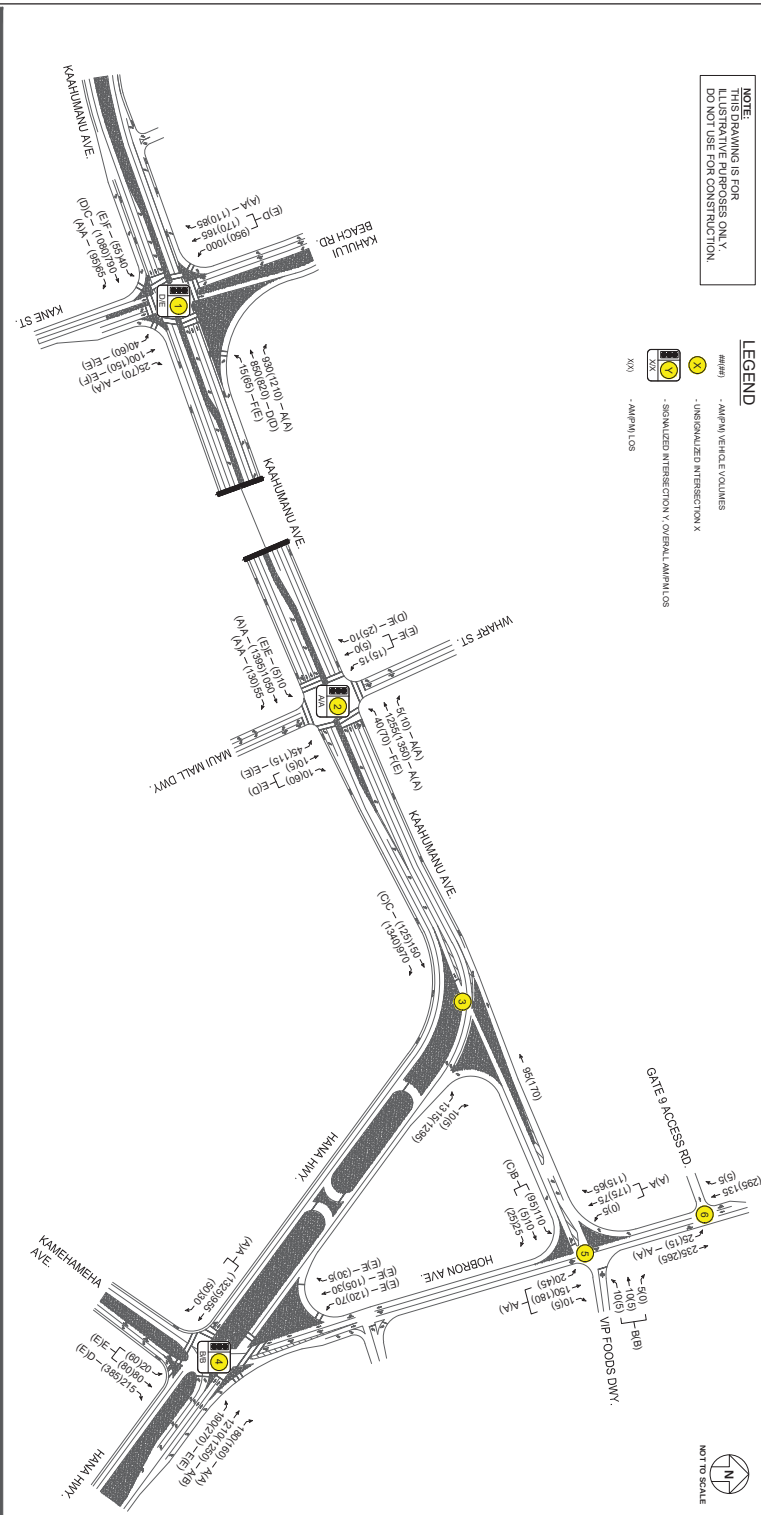
Development		Independent Variable	AM Peak Hour			PM Peak Hour		
			Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)
Maui Palms Hotel Redevelopment		136 Hotel Rooms	37	26	63	39	37	76
Kahului Transit Hub Relocation		6 Stall Employee Parking Lot	15	15	30	18	18	36
		6 Bus Storage Hub						
Kahului Lani Senior Housing		164 Senior Rental Units	35	24	59	29	50	78
		5,000 SF Office Building						
Keolani Triangle Retail Center		3,000 SF Shopping Center	39	37	76	46	54	100
		1,800 SF Fast Food with Drive Through						
MBP NPA [1]	Windward Hotel	200 Room Hotel	56	39	95	63	61	124
	Skyline Eco-Adventures	7,000 SF Office Building	27	3	30	6	33	39
		5,900 SF Baseyard	3	6	9	3	0	3
	Hui Sunnyside LLC [3]	46,000 SF Light Industrial	23	3	26	3	19	22
	Huber Pools	22,700 SF Showroom	13	2	15	2	12	14
	Maui Business Park North Parcel Area Subtotal		122	53	175	77	125	202
MBP SPA [2]	Hookele Shopping Center [4]	42,300 SF Shopping Center	197	150	347	224	347	571
	Servco Lexus [5]	22,000 SF Car Dealership	31	11	42	22	32	54
	Kihei Auto Sales [5]	9,100 SF Car Dealership	15	5	20	16	19	35
	United Auto Parts [5]	20,700 SF Automobile Parts Sales	30	24	54	49	53	102
	Maui County Service Center	60,000 SF Government Office Complex	114	14	128	53	117	170
	American Savings Bank	9,400 SF Bank	52	38	90	97	97	194
	Puunene Shopping Center [6,7]	92,000 SF Shopping Center	13	8	21	52	57	109
		18 Fueling Stations						
	Maui Business Park South Parcel Area Subtotal		422	226	648	464	669	1,133
Total External Background Trips [8]			**670**	**381**	**1,051**	**672**	**953**	**1,625**

Notes:
1. MBP NPA = Maui Business Park Phase II North Project Area
2. MBP SPA = Maui Business Park Phase II South Project Area
3. Light Industrial land use assumed in lieu of current plans for site.
4. Includes approximate 10% internal trip reduction and 20% pass-by trip reduction consistent with the ITE Trip Generation Handbook, 3rd Edition.
5. Building square footage for these developments estimated based on proportion of parcel acreage size.
6. Trips estimated based on vacant spaces within the Puunene Shoping Center at the time of this report.
7. Includes approximate 20% pass-by trip reduction consistent with the ITE Trip Generation Handbook, 3rd Edition.
8. Illustrates total external trips generated by the background developments; only a portion of trips are expected to pass through Project study area.

FIGURE 5

BASE YEAR 2022 LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

HAWAIIAN CEMENT
KAHULUI HARBOR
FACILITY RELOCATION



Austin Tsutsumi & Associates, Inc.
Engineers & Surveyors

TABLE 3: LOS SUMMARY TABLE
EXISTING CONDITIONS AND BASE YEAR 2022

Intersection	Existing 2018 Conditions						Base Year 2022					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Kane St/Kahului Beach Rd & Kaahumanu Ave												
NB LT	58.0	0.22	E	57.5	0.26	E	58.3	0.32	E	58.6	0.38	E
NB TH	68.3	0.77	E	91.5	0.86	F	67.7	0.77	E	103.6	0.91	F
NB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
EB LT	84.3	0.79	F	79.1	0.78	E	83.7	0.78	F	79.1	0.78	E
EB TH	28.8	0.51	C	40.5	0.78	D	33.8	0.62	C	53.0	0.92	D
EB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
WB LT	124.5	0.84	F	76.7	0.78	E	115.3	0.84	F	76.1	0.78	E
WB TH	48.2	0.61	D	48.9	0.56	D	52.6	0.70	D	54.0	0.69	D
WB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
SB LT/TH	50.7	0.92	D	58.8	0.94	E	52.7	0.94	D	60.2	0.96	E
SB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
OVERALL	45.7	-	D	52.6	-	D	48.9	-	D	58.9	-	E
2: Maui Mall Dwy/Wharf St & Kaahumanu Ave												
NB LT	63.5	0.39	E	62.4	0.62	E	63.3	0.40	E	62.3	0.62	E
NB TH/RT	60.9	0.12	E	54.6	0.02	D	61.1	0.17	E	54.8	0.05	D
EB LT	74.5	0.48	E	68.9	0.44	E	73.9	0.49	E	68.9	0.44	E
EB TH	0.2	0.33	A	0.1	0.50	A	0.3	0.40	A	0.1	0.58	A
EB RT	0.0	0.03	A	0.0	0.08	A	0.0	0.03	A	0.0	0.09	A
WB LT	82.2	0.77	F	76.3	0.79	E	82.2	0.77	F	76.1	0.79	E
WB TH	2.4	0.28	A	4.3	0.30	A	2.6	0.31	A	4.6	0.36	A
WB TH/RT	2.6	0.28	A	4.5	0.30	A	2.9	0.31	A	4.9	0.36	A
SB LT/TH	61.6	0.13	E	55.2	0.08	E	61.8	0.15	E	55.3	0.10	E
SB RT	60.0	0.02	E	54.5	0.01	D	59.7	0.02	E	54.5	0.02	D
OVERALL	5.1	-	A	7.1	-	A	4.9	-	A	6.8	-	A
3: Kaahumanu Ave & Hana Hwy												
EB LT	15.5	0.32	C	12.9	0.23	B	17.6	0.37	C	15.6	0.29	C
OVERALL	1.1	-	-	0.7	-	-	1.1	-	-	0.7	-	-
4: Kamehameha Ave/Hobron Ave & Hana Hwy												
NB LT/TH	63.5	0.82	E	63.9	0.84	E	63.3	0.82	E	63.4	0.84	E
NB RT	55.0	0.03	E	55.5	0.09	E	54.8	0.05	D	56.4	0.29	E
EB TH/RT	1.2	0.41	A	3.6	0.66	A	1.7	0.50	A	6.0	0.77	A
WB LT	61.1	0.78	E	62.2	0.84	E	61.0	0.79	E	62.7	0.84	E
WB TH	8.3	0.46	A	11.0	0.47	B	9.0	0.52	A	12.8	0.57	B
WB RT	5.9	0.13	A	7.9	0.11	A	6.1	0.14	A	8.2	0.12	A
SB TH	58.9	0.28	E	60.9	0.67	E	59.1	0.31	E	61.1	0.69	E
SB LT/TH	63.4	0.72	E	62.8	0.78	E	63.4	0.72	E	62.8	0.78	E
SB RT	57.5	0.01	E	55.5	0.01	E	57.4	0.01	E	55.5	0.01	E
OVERALL	14.2	-	B	18.9	-	B	13.9	-	B	19.7	-	B
5: Hobron Ave & Kaahumanu Ave/VIP Foods Dwy												
NB LT/TH/RT	7.4	0.01	A	7.9	0.04	A	7.5	0.02	A	7.9	0.04	A
EB LT/TH	12.2	0.20	B	14.9	0.23	B	12.7	0.22	B	15.1	0.23	C
WB LT/TH/RT	11.5	0.03	B	12.8	0.01	B	11.7	0.05	B	12.9	0.02	B
SB LT/TH	8.1	0.00	A	0.0	0.00	A	8.1	0.01	A	0.0	0.00	A
OVERALL	3.9	-	-	3.0	-	-	4.3	-	-	3.2	-	-
6: Hobron Ave & Gate 9 Access Rd												
NB LT/TH	8.8	0.03	A	8.3	0.01	A	8.8	0.03	A	8.3	0.02	A
OVERALL	0.5	-	-	0.2	-	-	0.6	-	-	0.2	-	-

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Munekiyo Hiraga

September 24, 2020

Future Year 2022 Conditions

Project Construction Impacts

The Project proposes all staging to be done on site with crew sizes less than 20 workers at a time. Concrete deliveries are projected to occur once every 10 minutes with the footing and once every 30 minutes for vertical work. There are no lane closures anticipated for utility work. It's estimated that about 10 trucks per day will be generated for the demolition work. All staging and loading will occur away from public roadways.

Project Build-out Impacts

Hawaiian Cement plans to remain in the Kahului Harbor industrial area, but relocate its facility approximately 600 feet northeast of its current site, to the A&B parcel identified as TMK: (2) 3-7-010:009. Existing tenants of this A&B parcel will continue to operate and include Par Petroleum, A&B roundhouse tenants, KT&S, a trucking and towing tenant and Matson. No changes to these users or trips generated by existing tenants are anticipated. At this new A&B parcel, Hawaiian Cement will increase the size of the cement holding tanks, but this is not anticipated to generate additional daily average traffic beyond existing conditions. However, cement demand and Project vehicle trips will be dependent on the level of construction occurring on Maui. See Figure 1 for current and proposed circulation plans.

Access to the Project will occur at two (2) existing accesses via Hobron Avenue. The Project proposes to enter only at the existing southeast end of the A&B parcel, across the Hobron Avenue/Amala Place intersection and just north of its current Gate 9 entrance and exit only at the northeast end of the A&B parcel. Circulation within the A&B site is subject to change and will depend on the future redevelopment of the A&B parcel, but Project access points on Hobron Avenue will not change regardless of internal circulation. A gate at the northwest corner of the site permits access to the adjacent parcel, but since this gate is rarely used, the two Project accesses will primarily service parcel traffic only. No intersection improvements are planned at either of the two existing Project accesses.

As noted above, additional trips are not anticipated to be generated as a result of the Project as Project trips are directly related to cement demand in the region. To account for a worst-case scenario with high cement demand, additional trips were generated and added to the studied roadway network. Based on historical records provided by Hawaiian Cement, cement demand has ranged from approximately 28,000 tons per year to upwards of 84,000 tons per year, which correlates to approximately 13 to 21 roundtrip truck trips per day. Truck trips include flatbed trucks used for transporting materials and cement mixer trucks used to deliver cement. As a conservative measure, half of the daily trips were assumed to occur during the AM peak hour and half were assumed to occur during the PM peak hour; however, the majority of trips are anticipated to occur outside of the peak hours of traffic based on historical data. See Table 4 below for the anticipated Project trips.

Ms. Tessa Munekiyo Ng, Vice President
Munekiyo Hiraga

September 24, 2020

Table 4: Project-Generated Trips

Land Use	AM Peak Hour			PM Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
Hawaiian Cement Facility	11	11	21	11	11	21

The Institute of Transportation Engineers (ITE) Transportation Impact Analyses for Site Developments, dated 2010, recommends that:

> *"… in lieu of other locally established thresholds, a traffic access/impact study should be conducted whenever a proposed development will generate 100 or more added (new) peak direction trips to or from the site during the adjacent roadway's peak hours or the development's peak hours."*

Because the projected AM and PM peak hours resulted in Project-generated traffic below the minimum 100 new trip threshold, a Traffic Impact Analysis Report (TIAR) is not required for the Project. Although not required, the following traffic analysis for Future Year 2022 with the Project is provided to determine the full impact of the Project on the nearby roadways.

Project-generated trips were distributed through the roadway network based on existing travel patterns. The new entrance is currently proposed at the southeast end of the A&B parcel, across the Hobron Avenue/Amala Place intersection and just north of its current Gate 9 entrance. The new exit is proposed at either the northeast side of the A&B parcel or at the entrance across from Amala Place. Circulation within the A&B site is subject to change and will depend on the future redevelopment of the A&B parcel, but Project access points on Hobron Avenue will not change regardless of internal circulation.

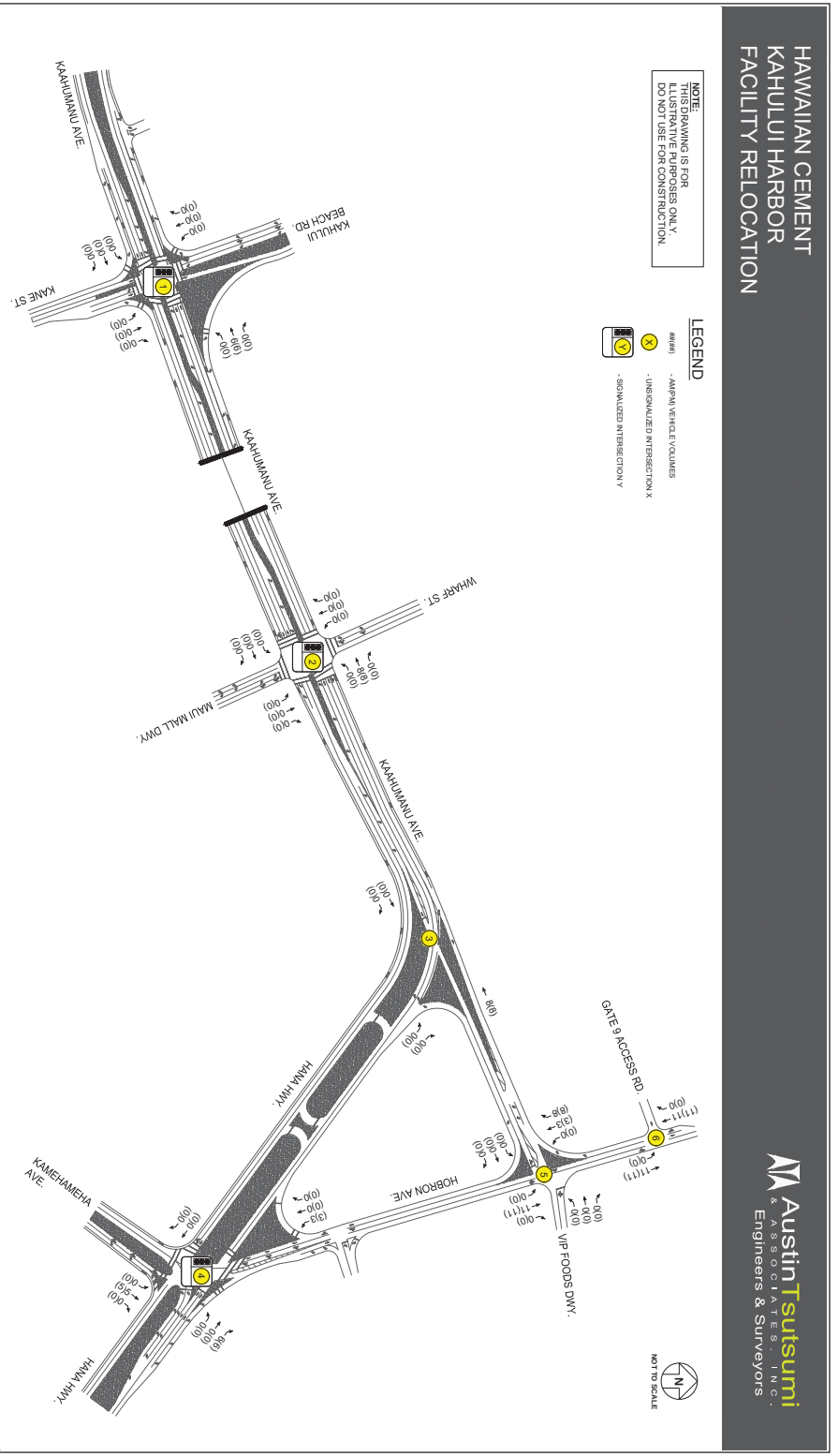
Although existing traffic counts likely include some traffic from the existing Hawaiian Cement facility, no reductions were applied to the existing trips as the current access points to the facility are shared with other sites, and Hawaiian Cement facility trips were not differentiated from other vehicles during data collection. This is assumed to provide a conservative projection for the Project. Figure 6 illustrates the Project-generated trip distribution.

By Future Year 2022 with the Project, all study intersections are forecast to operate similar to Base Year 2022 conditions with no significant change to overall traffic volumes, delay or LOS due to low Project traffic increases. Primary access to the site occurs via the Hana Highway/Kamehameha Avenue/Hobron Avenue intersection, which is a signalized intersection that is part of the coordinated Kaahumanu Avenue-Hana Highway corridor. This coordinated corridor favors the flow of the mainline through traffic to the mainline left-turn and side street Kamehameha Avenue and Hobron Avenue approaches. Since Project traffic does not increase mainline through movements, no improvements are recommended.

Figure 7 illustrates the Future Year 2022 lane configurations, volumes and LOS for the study intersection movements. Table 5 summarizes the Future Year 2022 LOS compared to Base Year 2022 LOS at the study intersections. LOS worksheets are provided in Enclosure 3.

FIGURE 6

PROJECT-GENERATED TRAFFIC



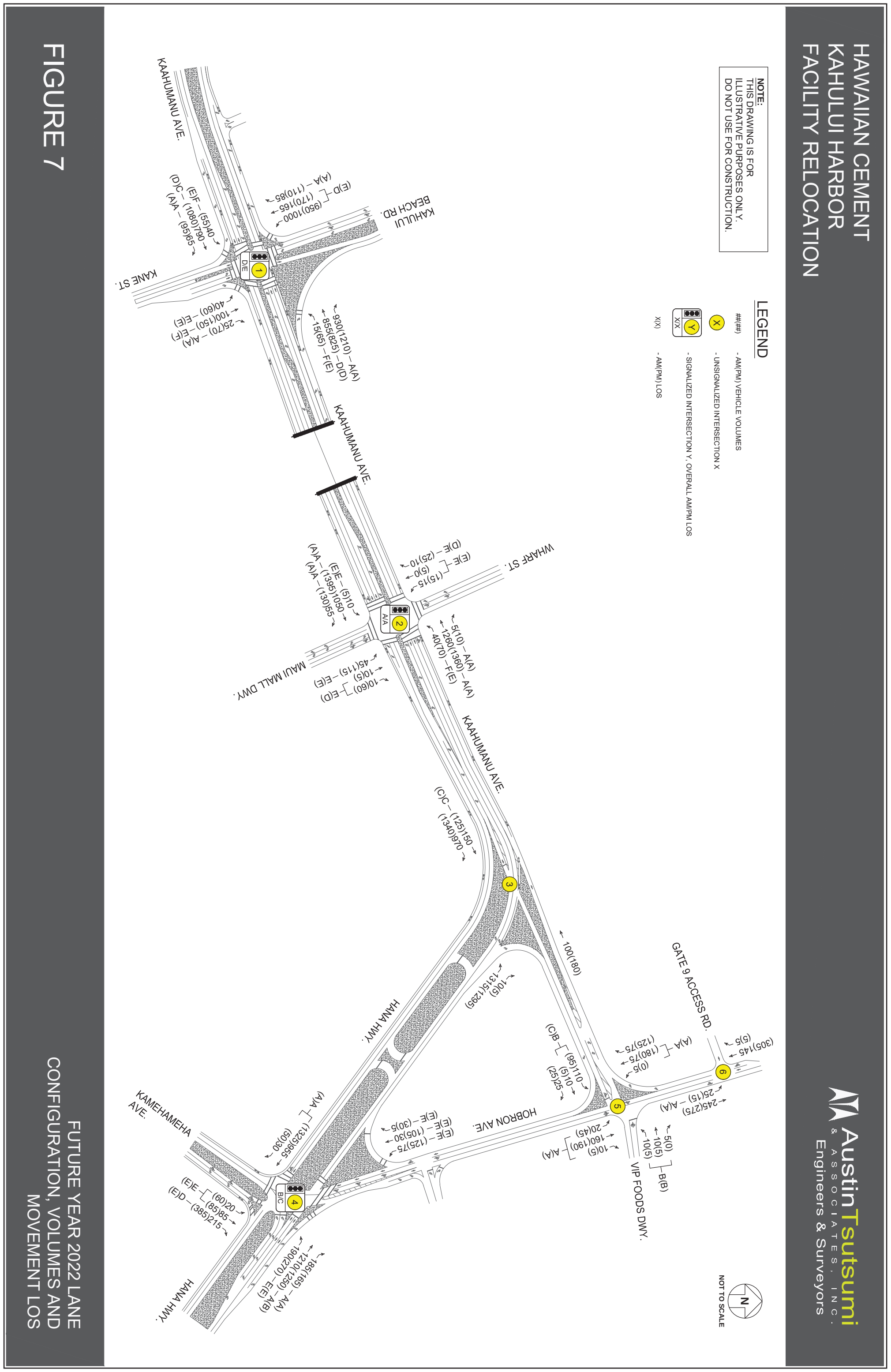


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TABLE 5: LOS SUMMARY TABLE
BASE YEAR 2022 AND FUTURE YEAR 2022

Intersection	Base Year 2022						Future Year 2022					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Kane St/Kahului Beach Rd & Kaahumanu Ave												
NB LT	58.3	0.32	E	58.6	0.38	E	58.3	0.32	E	58.6	0.38	E
NB TH	67.7	0.77	E	103.6	0.91	F	67.7	0.77	E	103.6	0.91	F
NB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
EB LT	83.7	0.78	F	79.1	0.78	E	83.7	0.78	F	79.1	0.78	E
EB TH	33.8	0.62	C	53.0	0.92	D	33.8	0.62	C	53.0	0.92	D
EB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
WB LT	115.3	0.84	F	76.1	0.78	E	115.3	0.84	F	76.1	0.78	E
WB TH	52.6	0.70	D	54.0	0.69	D	52.8	0.70	D	54.2	0.69	D
WB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
SB LT/TH	52.7	0.94	D	60.2	0.96	E	52.7	0.94	D	60.2	0.96	E
SB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
OVERALL	48.9	-	D	58.9	-	E	49.0	-	D	58.9	-	E
2: Maui Mall Dwy/Wharf St & Kaahumanu Ave												
NB LT	63.3	0.40	E	62.3	0.62	E	63.3	0.40	E	62.3	0.62	E
NB TH/RT	61.1	0.17	E	54.8	0.05	D	61.1	0.17	E	54.8	0.05	D
EB LT	73.9	0.49	E	68.9	0.44	E	73.9	0.49	E	68.9	0.44	E
EB TH	0.3	0.40	A	0.1	0.58	A	0.3	0.40	A	0.1	0.58	A
EB RT	0.0	0.03	A	0.0	0.09	A	0.0	0.03	A	0.0	0.09	A
WB LT	82.2	0.77	F	76.1	0.79	E	82.2	0.77	F	76.1	0.79	E
WB TH	2.6	0.31	A	4.6	0.36	A	2.6	0.31	A	4.6	0.36	A
WB TH/RT	2.9	0.31	A	4.9	0.36	A	2.9	0.31	A	5.0	0.36	A
SB LT/TH	61.8	0.15	E	55.3	0.10	E	61.8	0.15	E	55.3	0.10	E
SB RT	59.7	0.02	E	54.5	0.02	D	59.7	0.02	E	54.5	0.02	D
OVERALL	4.9	-	A	6.8	-	A	4.9	-	A	6.9	-	A
3: Kaahumanu Ave & Hana Hwy												
EB LT	17.6	0.37	C	15.6	0.29	C	17.6	0.37	C	15.6	0.29	C
OVERALL	1.1	-	-	0.7	-	-	1.1	-	-	0.7	-	-
4: Kamehameha Ave/Hobron Ave & Hana Hwy												
NB LT/TH	63.3	0.82	E	63.4	0.84	E	63.0	0.82	E	63.2	0.84	E
NB RT	54.8	0.05	D	56.4	0.29	E	54.4	0.04	D	56.3	0.32	E
EB TH/RT	1.7	0.50	A	6.0	0.77	A	1.7	0.50	A	6.4	0.78	A
WB LT	61.0	0.79	E	62.7	0.84	E	61.0	0.79	E	62.7	0.84	E
WB TH	9.0	0.52	A	12.8	0.57	B	9.4	0.52	A	13.3	0.58	B
WB RT	6.1	0.14	A	8.2	0.12	A	6.3	0.15	A	8.5	0.13	A
SB TH	59.1	0.31	E	61.1	0.69	E	58.7	0.30	E	60.5	0.66	E
SB LT/TH	63.4	0.72	E	62.8	0.78	E	63.6	0.74	E	62.7	0.79	E
SB RT	57.4	0.01	E	55.5	0.01	E	57.1	0.01	E	55.1	0.01	E
OVERALL	13.9	-	B	19.7	-	B	14.2	-	B	20.2	-	C
5: Hobron Ave & Kaahumanu Ave/VIP Foods Dwy												
NB LT/TH/RT	7.5	0.02	A	7.9	0.04	A	7.5	0.02	A	7.9	0.04	A
EB LT/TH	12.7	0.22	B	15.1	0.23	C	12.9	0.22	B	15.5	0.24	C
WB LT/TH/RT	11.7	0.05	B	12.9	0.02	B	11.8	0.05	B	13.2	0.02	B
SB LT/TH	8.1	0.01	A	0.0	0.00	A	8.2	0.01	A	0.0	0.00	A
OVERALL	4.3	-	-	3.2	-	-	4.2	-	-	3.1	-	-
6: Hobron Ave & Gate 9 Access Rd												
NB LT/TH	8.8	0.03	A	8.3	0.02	A	8.9	0.03	A	8.4	0.02	A
OVERALL	0.6	-	-	0.2	-	-	0.5	-	-	0.2	-	-

Ms. Tessa Munekiyo Ng, Vice President
Munekiyo Hiraga

September 24, 2020

Conclusions

The following are the conclusions of the Traffic Assessment study:

- The study intersections operate adequately under existing conditions with some minor street and turning movements operating at LOS E/F at the signalized intersections during both peak hours of traffic.
- By Base Year 2022, traffic in the region is anticipated to increase as a result of background developments. The majority of movements are expected to continue operating similar to existing conditions, with some movements at the Kaahumanu Avenue/Kahului Beach Road/Kane Street intersection expected to experience longer delays.
- The Project is not anticipated to increase trips over existing conditions. However, Project trips will ultimately depend on cement demand and the construction industry and may be higher than in existing conditions
    - A worst-case scenario based on the maximum historical cement demand was used to evaluate the impacts of the Project. A total of 21(21) new Project trips were conservatively added to the studied roadway network during the AM(PM) peak hours of traffic to represent the worst-case scenario, reflective of high cement-demand.
    - Although existing traffic count data includes trips to/from the current Hawaiian Cement facility, as a conservative measure, no reductions were applied to the existing trips.
- By Future Year 2022, traffic is anticipated to operate similar to Base Year 2022 due to the limited impacts expected from the Project.
- Primary regional access to the site occurs via the Hana Highway/Kamehameha Avenue/Hobron Avenue intersection, which is a signalized intersection that is part of the coordinated Kaahumanu Avenue-Hana Highway corridor. This coordinated corridor favors the flow of the mainline through traffic to the mainline left-turn and side street Kamehameha Avenue and Hobron Avenue approaches.
- Local access will occur via two (2) existing Hobron Avenue; Project access restricted to enter only at the southeast access and exit only at the northeast access.
- Since the Project only minimally increases traffic, no improvements are recommended.

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

Ms. Tessa Munekiyo Ng, Vice President
Munekiyo Hiraga

September 24, 2020

We appreciate the opportunity to prepare this Traffic Assessment for the Hawaiian Cement Kahului Harbor Facility Relocation. Should you require clarification, please contact me at (808) 244-8044.

Sincerely,

AUSTIN, TSUTSUMI & ASSOCIATES, INC.

By

TYLER K. FUJIWARA, P.E.
Chief Transportation Manager – Maui

Enclosures: 1. Turning Movement Count Data
2. LOS Criteria
3. LOS Worksheets

Y:\2016\16-529\Report\Submitted\200916 TA FINAL sent to MH

Enclosure 1: Traffic Count Data

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Kahului Beach Rd_Kane St - Kaahumanu Ave
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KAHULUI BEACH RD SOUTHBOUND				KAAHUMANU AVE WESTBOUND				KANE ST NORTHBOUND				KAAHUMANU AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	156	32	3	1	3	129	110	0	3	11	9	2	3	108	5	2	577
06:45	214	31	0	0	6	113	136	0	6	15	2	0	4	140	20	1	688
Total	370	63	3	1	9	242	246	0	9	26	11	2	7	248	25	3	1265
07:00	209	34	21	0	4	159	156	1	11	27	7	2	8	178	13	3	833
07:15	220	41	17	0	4	203	202	0	15	21	10	0	11	155	12	1	912
07:30	224	45	24	0	2	221	242	0	6	22	5	3	11	209	11	1	1026
07:45	226	39	24	0	1	192	234	0	2	26	2	0	12	220	16	1	995
Total	879	159	86	0	11	775	834	1	34	96	24	5	42	762	52	6	3766
08:00	239	29	19	1	5	179	194	0	3	24	4	0	5	122	11	2	837
08:15	245	28	14	0	4	197	187	1	5	16	3	2	5	106	6	1	820
Grand Total	1733	279	122	2	29	1393	1461	2	51	162	42	9	59	1238	94	12	6688
Apprch %	81.1	13.1	5.7	0.1	1	48.3	50.6	0.1	19.3	61.4	15.9	3.4	4.2	88.2	6.7	0.9	
Total %	25.9	4.2	1.8	0	0.4	20.8	21.8	0	0.8	2.4	0.6	0.1	0.9	18.5	1.4	0.2	
Motorcycles	2	2	0	0	0	1	0	0	0	0	0	0	0	1	0	0	6
% Motorcycles	0.1	0.7	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0.1
Cars & Light Goods	1674	269	116	0	29	1367	1426	0	48	156	38	0	55	1198	91	0	6467
% Cars & Light Goods	96.6	96.4	95.1	0	100	98.1	97.6	0	94.1	96.3	90.5	0	93.2	96.8	96.8	0	96.7
Buses	9	4	3	0	0	9	12	0	2	2	1	0	2	20	2	0	66
% Buses	0.5	1.4	2.5	0	0	0.6	0.8	0	3.9	1.2	2.4	0	3.4	1.6	2.1	0	1
Single-Unit Trucks	42	4	3	0	0	15	18	0	1	4	3	0	2	17	1	0	110
% Single-Unit Trucks	2.4	1.4	2.5	0	0	1.1	1.2	0	2	2.5	7.1	0	3.4	1.4	1.1	0	1.6
Articulated Trucks	6	0	0	0	0	1	5	0	0	0	0	0	0	2	0	0	14
% Articulated Trucks	0.3	0	0	0	0	0.1	0.3	0	0	0	0	0	0	0.2	0	0	0.2
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16.7	0
Pedestrians	0	0	0	2	0	0	0	2	0	0	0	9	0	0	0	10	23
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	100	0	0	0	83.3	0.3

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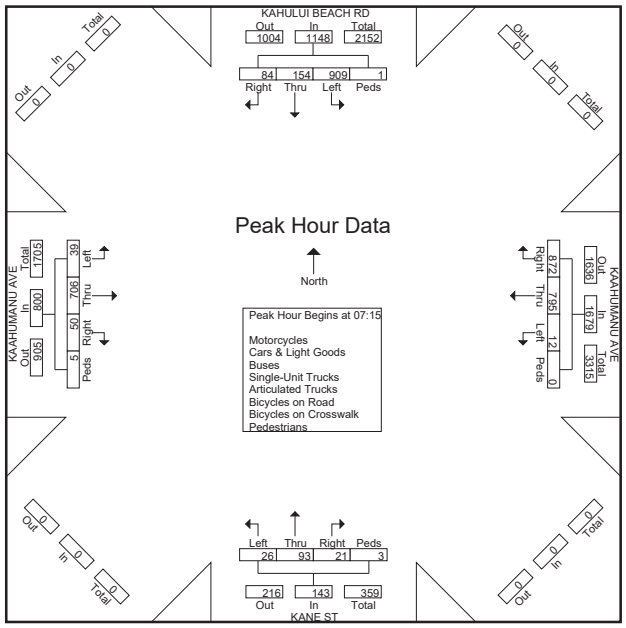
Phone: 533-3646 Fax: 526-1267

File Name : Kahului Beach Rd_Kane St - Kaahumanu Ave
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 2

	KAHULUI BEACH RD SOUTHBOUND					KAAHUMANU AVE WESTBOUND					KANE ST NORTHBOUND					KAAHUMANU AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 08:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	220	41	17	0	278	4	203	202	0	409	**15**	21	**10**	0	**46**	11	155	12	1	179	912
07:30	224	**45**	**24**	0	**293**	2	**221**	**242**	0	**465**	6	22	5	**3**	36	11	209	11	1	232	**1026**
07:45	226	39	24	0	289	1	192	234	0	427	2	**26**	2	0	30	**12**	**220**	**16**	1	**249**	995
08:00	**239**	29	19	**1**	288	**5**	179	194	0	378	3	24	4	0	31	5	122	11	**2**	140	837
Total Volume	909	154	84	1	1148	12	795	872	0	1679	26	93	21	3	143	39	706	50	5	800	3770
% App. Total	79.2	13.4	7.3	0.1		0.7	47.3	51.9	0		18.2	65	14.7	2.1		4.9	88.2	6.2	0.6		
PHF	.951	.856	.875	.250	.980	.600	.899	.901	.000	.903	.433	.894	.525	.250	.777	.813	.802	.781	.625	.803	.919



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Phone: 533-3646 Fax: 526-1267

File Name : Wharf Dwy_Maui Mall Access - Kaahumanu Ave
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	WHARF ST SOUTHBOUND				KAAHUMANU AVE WESTBOUND				MAUI MALL ACCESS NORTHBOUND				KAAHUMANU AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	0	0	1	0	7	182	3	0	1	0	4	0	6	172	5	0	381
06:45	1	0	1	0	6	208	4	0	7	0	3	0	8	236	6	0	480
Total	1	0	2	0	13	390	7	0	8	0	7	0	14	408	11	0	861
07:00	1	0	1	0	5	264	2	0	9	0	1	0	3	211	9	0	506
07:15	1	0	1	0	4	305	2	0	9	2	0	0	3	201	12	0	540
07:30	4	0	1	1	10	286	0	0	10	3	4	0	4	224	13	0	560
07:45	3	0	5	0	10	278	2	0	15	0	1	0	0	226	13	0	553
Total	9	0	8	1	29	1133	6	0	43	5	6	0	10	862	47	0	2159
08:00	5	0	3	0	16	265	0	0	8	1	3	0	2	225	14	0	542
08:15	2	0	4	0	10	308	1	0	16	0	3	0	3	180	18	0	545
Grand Total	17	0	17	1	68	2096	14	0	75	6	19	0	29	1675	90	0	4107
Apprch %	48.6	0	48.6	2.9	3.1	96.2	0.6	0	75	6	19	0	1.6	93.4	5	0	
Total %	0.4	0	0.4	0	1.7	51	0.3	0	1.8	0.1	0.5	0	0.7	40.8	2.2	0	
Motorcycles	0	0	0	0	1	2	0	0	0	0	1	0	0	1	0	0	5
% Motorcycles	0	0	0	0	1.5	0.1	0	0	0	0	5.3	0	0	0.1	0	0	0.1
Cars & Light Goods	7	0	12	0	67	2056	14	0	75	5	18	0	28	1620	90	0	3992
% Cars & Light Goods	41.2	0	70.6	0	98.5	98.1	100	0	100	83.3	94.7	0	96.6	96.7	100	0	97.2
Buses	0	0	0	0	0	13	0	0	0	0	0	0	0	18	0	0	31
% Buses	0	0	0	0	0	0.6	0	0	0	0	0	0	0	1.1	0	0	0.8
Single-Unit Trucks	5	0	4	0	0	19	0	0	0	1	0	0	1	32	0	0	62
% Single-Unit Trucks	29.4	0	23.5	0	0	0.9	0	0	0	16.7	0	0	3.4	1.9	0	0	1.5
Articulated Trucks	5	0	1	0	0	6	0	0	0	0	0	0	0	4	0	0	16
% Articulated Trucks	29.4	0	5.9	0	0	0.3	0	0	0	0	0	0	0	0.2	0	0	0.4
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0

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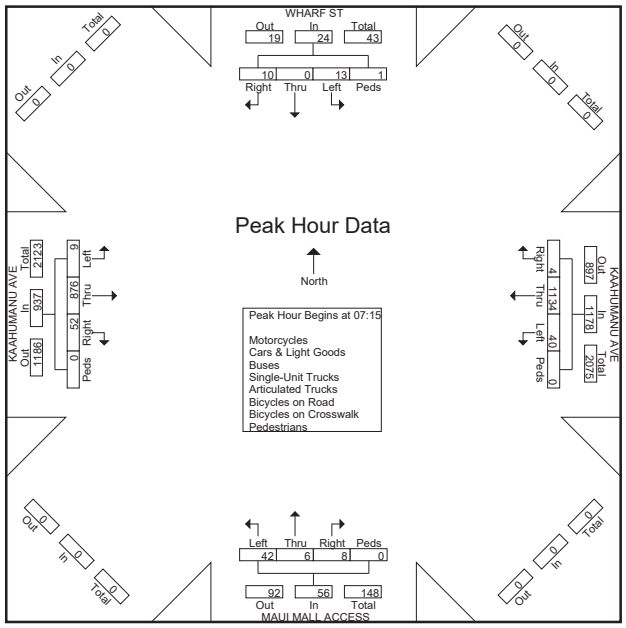
File Name : Wharf Dwy_Maui Mall Access - Kaahumanu Ave
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 2

	WHARF ST SOUTHBOUND					KAAHUMANU AVE WESTBOUND					MAUI MALL ACCESS NORTHBOUND					KAAHUMANU AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 to 08:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	1	0	1	0	2	4	**305**	**2**	0	**311**	9	2	0	0	11	3	201	12	0	216	540
07:30	4	0	1	**1**	6	10	286	0	0	296	10	**3**	**4**	0	**17**	**4**	224	13	0	**241**	**560**
07:45	3	0	**5**	0	**8**	10	278	2	0	290	**15**	0	1	0	16	0	**226**	13	0	239	553
08:00	**5**	0	3	0	8	**16**	265	0	0	281	8	1	3	0	12	2	225	**14**	0	241	542
Total Volume	13	0	10	1	24	40	1134	4	0	1178	42	6	8	0	56	9	876	52	0	937	2195
% App. Total	54.2	0	41.7	4.2		3.4	96.3	0.3	0		75	10.7	14.3	0		1	93.5	5.5	0		
PHF	.650	.000	.500	.250	.750	.625	.930	.500	.000	.947	.700	.500	.500	.000	.824	.563	.969	.929	.000	.972	.980



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File Name : AM_Hana Hwy - Kaahumanu Ave
Site Code : 00000000
Start Date : 5/12/2016
Page No : 1

Groups Printed- Unshifted

	KAAHUMANU AVE Eastbound				Westbound				HANA HWY Northbound				HANA HWY Southbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	0	22	104	0	0	12	0	0	103	0	1	0	0	0	0	0	242
06:15 AM	0	22	109	0	0	11	0	0	154	0	2	0	0	0	0	0	298
06:30 AM	0	24	145	0	0	11	0	0	179	0	1	0	0	0	0	0	360
06:45 AM	0	34	202	0	0	16	0	0	261	0	0	0	0	0	0	0	513
Total	0	102	560	0	0	50	0	0	697	0	4	0	0	0	0	0	1413
07:00 AM	0	27	210	0	0	13	0	0	257	0	0	0	0	0	0	0	507
07:15 AM	0	26	198	0	0	21	0	0	358	0	1	0	0	0	0	0	604
07:30 AM	0	39	206	0	0	20	0	0	323	0	4	0	0	0	0	0	592
07:45 AM	0	44	202	0	0	20	0	1	264	0	2	0	0	0	0	0	533
Total	0	136	816	0	0	74	0	1	1202	0	7	0	0	0	0	0	2236
08:00 AM	0	40	189	0	0	31	0	0	252	0	0	0	0	0	0	0	512
08:15 AM	0	49	168	0	0	36	0	0	255	0	3	0	0	0	0	0	511
Grand Total	0	327	1733	0	0	191	0	1	2406	0	14	0	0	0	0	0	4672
Apprch %	0	15.9	84.1	0	0	99.5	0	0.5	99.4	0	0.6	0	0	0	0	0	
Total %	0	7	37.1	0	0	4.1	0	0	51.5	0	0.3	0	0	0	0	0	

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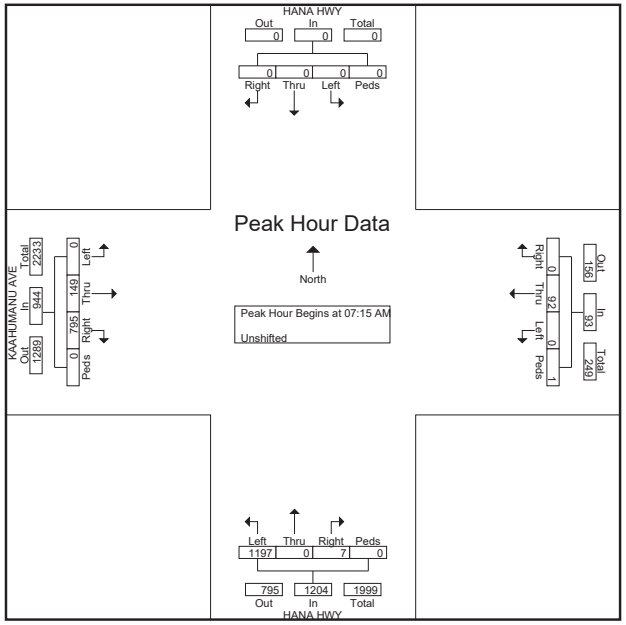
File Name : AM_Hana Hwy - Kaahumanu Ave
Site Code : 00000000
Start Date : 5/12/2016
Page No : 2

	KAAHUMANU AVE Eastbound					Westbound					HANA HWY Northbound					HANA HWY Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	26	198	0	224	0	21	0	0	21	358	0	1	0	359	0	0	0	0	0	604
07:30 AM	0	39	206	0	245	0	20	0	0	20	323	0	4	0	327	0	0	0	0	0	592
07:45 AM	0	44	202	0	246	0	20	0	1	21	264	0	2	0	266	0	0	0	0	0	533
08:00 AM	0	40	189	0	229	0	31	0	0	31	252	0	0	0	252	0	0	0	0	0	512
Total Volume	0	149	795	0	944	0	92	0	1	93	1197	0	7	0	1204	0	0	0	0	0	2241
% App. Total																					
PHF	.000	.847	.965	.000	.959	.000	.742	.000	.250	.750	.836	.000	.438	.000	.838	.000	.000	.000	.000	.000	.928



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File Name : Hana Hwy - Hobron Ave_Kamehameha Ave
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HANA HWY SOUTHBOUND				HOBRON AVE WESTBOUND				HANA HWY NORTHBOUND				KAMEHAMEHA HWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	0	142	3	0	8	4	11	0	29	189	33	0	9	4	30	0	462
06:45	0	193	5	0	8	8	13	0	40	230	40	0	18	14	26	0	595
Total	0	335	8	0	16	12	24	0	69	419	73	0	27	18	56	0	1057
07:00	0	185	14	0	7	5	9	0	42	266	24	0	16	9	34	0	611
07:15	0	190	8	0	13	6	16	0	39	261	37	0	16	15	51	0	652
07:30	0	200	8	0	18	6	17	0	44	287	51	0	20	16	45	0	712
07:45	0	191	2	0	15	11	21	0	52	282	40	0	29	26	48	0	717
Total	0	766	32	0	53	28	63	0	177	1096	152	0	81	66	178	0	2692
08:00	0	209	8	0	24	4	22	0	48	257	49	0	19	21	42	0	703
08:15	0	147	10	0	19	14	27	0	34	291	50	0	23	15	53	0	683
Grand Total	0	1457	58	0	112	58	136	0	328	2063	324	0	150	120	329	0	5135
Apprch %	0	96.2	3.8	0	36.6	19	44.4	0	12.1	76	11.9	0	25	20	54.9	0	
Total %	0	28.4	1.1	0	2.2	1.1	2.6	0	6.4	40.2	6.3	0	2.9	2.3	6.4	0	
Motorcycles	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
% Motorcycles	0	0.1	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	0	1406	55	0	75	53	136	0	315	2063	265	0	136	91	307	0	4902
% Cars & Light Goods	0	96.5	94.8	0	67	91.4	100	0	96	100	81.8	0	90.7	75.8	93.3	0	95.5
Buses	0	17	0	0	1	1	0	0	7	0	0	0	0	1	4	0	31
% Buses	0	1.2	0	0	0.9	1.7	0	0	2.1	0	0	0	0	0.8	1.2	0	0.6
Single-Unit Trucks	0	24	3	0	19	3	0	0	6	0	22	0	0	10	17	0	104
% Single-Unit Trucks	0	1.6	5.2	0	17	5.2	0	0	1.8	0	6.8	0	0	8.3	5.2	0	2
Articulated Trucks	0	8	0	0	15	1	0	0	0	0	37	0	14	18	1	0	94
% Articulated Trucks	0	0.5	0	0	13.4	1.7	0	0	0	0	11.4	0	9.3	15	0.3	0	1.8
Bicycles on Road	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
% Bicycles on Road	0	0.1	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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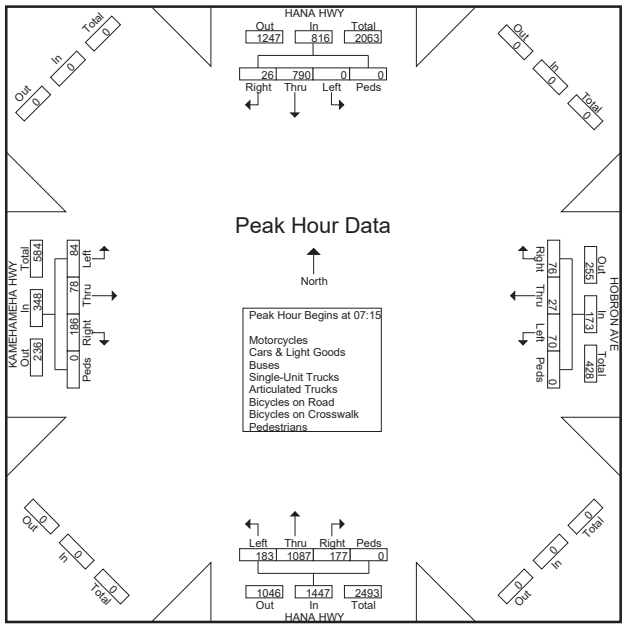
File Name : Hana Hwy - Hobron Ave_Kamehameha Ave
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 2

	HANA HWY SOUTHBOUND					HOBRON AVE WESTBOUND					HANA HWY NORTHBOUND					KAMEHAMEHA HWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 to 08:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	0	190	**8**	0	198	13	6	16	0	35	39	261	37	0	337	16	15	**51**	0	82	652
07:30	0	200	8	0	208	18	6	17	0	41	44	**287**	**51**	0	**382**	20	16	45	0	81	712
07:45	0	191	2	0	193	15	**11**	21	0	47	**52**	282	40	0	374	**29**	**26**	48	0	**103**	**717**
08:00	0	**209**	8	0	**217**	**24**	4	**22**	0	**50**	48	257	49	0	354	19	21	42	0	82	703
Total Volume	0	790	26	0	816	70	27	76	0	173	183	1087	177	0	1447	84	78	186	0	348	2784
% App. Total	0	96.8	3.2	0		40.5	15.6	43.9	0		12.6	75.1	12.2	0		24.1	22.4	53.4	0		
PHF	.000	.945	.813	.000	.940	.729	.614	.864	.000	.865	.880	.947	.868	.000	.947	.724	.750	.912	.000	.845	.971



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File Name : AM_Hobron Ave - Kaahumanu Ave
Site Code : 00000000
Start Date : 5/12/2016
Page No : 1

Groups Printed- Unshifted

	KAAHUMANU AVE Eastbound				KAAHUMANU AVE Westbound				HOBRON AVE Northbound				HOBRON AVE Southbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	8	5	2	0	1	2	0	0	0	13	2	0	0	4	9	0	46
06:15 AM	15	5	3	0	5	0	0	0	4	23	4	0	0	9	3	0	71
06:30 AM	19	2	1	0	0	0	0	0	3	36	4	0	0	10	10	0	85
06:45 AM	30	5	1	0	1	1	1	0	2	40	5	0	0	5	10	0	101
Total	72	17	7	0	7	3	1	0	9	112	15	0	0	28	32	0	303
07:00 AM	21	0	5	2	0	0	1	0	1	28	4	0	0	17	11	0	90
07:15 AM	22	2	4	0	2	1	0	0	2	37	4	0	0	14	16	0	104
07:30 AM	28	2	5	0	0	2	1	0	4	30	2	0	0	22	15	0	111
07:45 AM	29	1	7	0	1	1	0	0	5	34	1	0	1	14	16	0	110
Total	100	5	21	2	3	4	2	0	12	129	11	0	1	67	58	0	415
08:00 AM	29	1	6	0	4	3	0	0	7	36	3	0	1	22	18	0	130
08:15 AM	30	0	4	0	1	0	2	0	4	34	6	0	1	22	29	0	133
Grand Total	231	23	38	2	15	10	5	0	32	311	35	0	3	139	137	0	981
Apprch %	78.6	7.8	12.9	0.7	50	33.3	16.7	0	8.5	82.3	9.3	0	1.1	49.8	49.1	0	
Total %	23.5	2.3	3.9	0.2	1.5	1	0.5	0	3.3	31.7	3.6	0	0.3	14.2	14	0	

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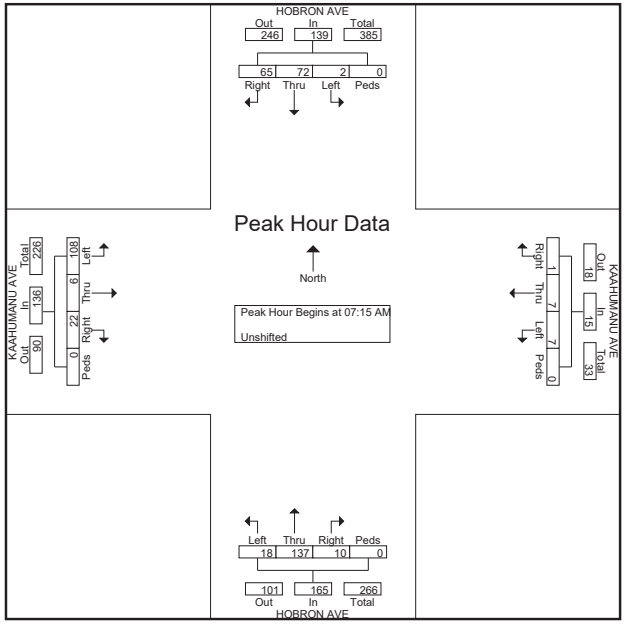
Site Code : 00000000
Start Date : 5/12/2016
Page No : 2

	KAAHUMANU AVE Eastbound					KAAHUMANU AVE Westbound					HOBRON AVE Northbound					HOBRON AVE Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 08:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	22	2	4	0	28	2	1	0	0	3	2	37	4	0	43	0	14	16	0	30	104
07:30 AM	28	2	5	0	35	0	2	1	0	3	4	30	2	0	36	0	22	15	0	37	111
07:45 AM	29	1	7	0	37	1	1	0	0	2	5	34	1	0	40	1	14	16	0	31	110
08:00 AM	29	1	6	0	36	4	3	0	0	7	7	36	3	0	46	1	22	18	0	41	130
Total Volume	108	6	22	0	136	7	7	1	0	15	18	137	10	0	165	2	72	65	0	139	455
% App. Total	79.4	4.4	16.2	0		46.7	46.7	6.7	0		10.9	83	6.1	0		1.4	51.8	46.8	0		
PHF	.931	.750	.786	.000	.919	.438	.583	.250	.000	.536	.643	.926	.625	.000	.897	.500	.818	.903	.000	.848	.875



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File Name : AM_Hobron Ave - Gate 9 Access Rd
Site Code : 00000000
Start Date : 5/12/2016
Page No : 1

Groups Printed- Unshifted

	GATE 9 ACCESS RD Eastbound				Westbound				HOBRON AVE Northbound				HOBRON AVE Southbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	0	0	0	0	0	0	0	0	0	27	0	0	0	11	0	0	38
06:15 AM	0	0	0	0	0	0	0	0	0	38	0	0	0	10	0	0	48
06:30 AM	0	0	0	0	0	0	0	0	0	55	0	0	0	18	0	0	73
06:45 AM	0	0	0	0	0	0	0	0	0	72	0	0	0	15	0	0	87
Total	0	0	0	0	0	0	0	0	0	192	0	0	0	54	0	0	246
07:00 AM	0	0	0	2	0	0	0	0	0	52	0	0	0	30	0	0	84
07:15 AM	0	0	0	2	0	0	0	0	0	58	0	0	0	27	0	0	87
07:30 AM	0	0	0	2	0	0	0	0	12	49	0	0	0	37	0	0	100
07:45 AM	0	0	0	0	0	0	0	0	2	64	0	0	0	29	1	0	96
Total	0	0	0	6	0	0	0	0	14	223	0	0	0	123	1	0	367
08:00 AM	0	0	0	0	0	0	0	0	9	52	0	0	0	40	0	0	101
08:15 AM	1	0	0	0	0	0	0	0	8	55	0	0	0	51	0	0	115
Grand Total	1	0	0	6	0	0	0	0	31	522	0	0	0	268	1	0	829
Apprch %	14.3	0	0	85.7	0	0	0	0	5.6	94.4	0	0	0	99.6	0.4	0	
Total %	0.1	0	0	0.7	0	0	0	0	3.7	63	0	0	0	32.3	0.1	0	

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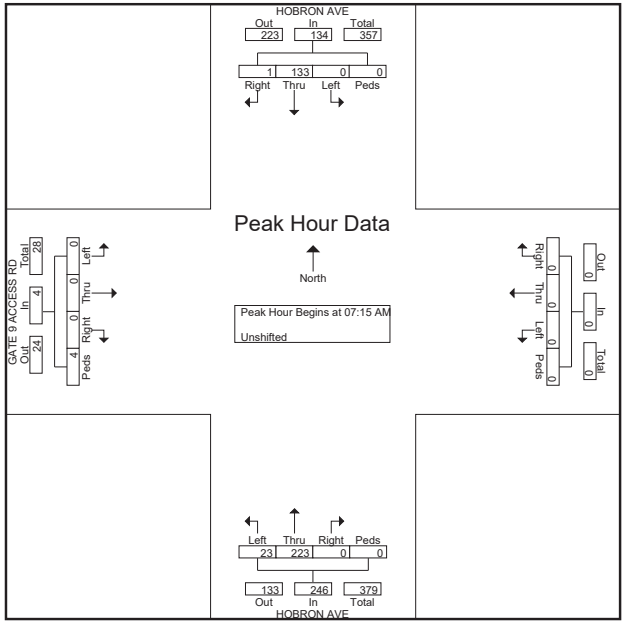
File Name : AM_Hobron Ave - Gate 9 Access Rd
Site Code : 00000000
Start Date : 5/12/2016
Page No : 2

	GATE 9 ACCESS RD Eastbound					Westbound					HOBRON AVE Northbound					HOBRON AVE Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 08:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	0	0	2	2	0	0	0	0	0	0	58	0	0	58	0	27	0	0	27	87
07:30 AM	0	0	0	2	2	0	0	0	0	0	12	49	0	0	61	0	37	0	0	37	100
07:45 AM	0	0	0	0	0	0	0	0	0	0	2	64	0	0	66	0	29	1	0	30	96
08:00 AM	0	0	0	0	0	0	0	0	0	0	9	52	0	0	61	0	40	0	0	40	101
Total Volume	0	0	0	4	4	0	0	0	0	0	23	223	0	0	246	0	133	1	0	134	384
% App. Total	0	0	0	100		0	0	0	0		9.3	90.7	0	0		0	99.3	0.7	0		
PHF	.000	.000	.000	.500	.500	.000	.000	.000	.000	.000	.479	.871	.000	.000	.932	.000	.831	.250	.000	.838	.950



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File Name : Kahului Beach Rd_Kane St - Kaahumanu Ave
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KAHULUI BEACH RD SOUTHBOUND				KAAHUMANU AVE WESTBOUND				KANE ST NORTHBOUND				KAAHUMANU AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	235	45	24	0	18	181	231	0	7	32	18	2	14	235	15	2	1059
15:30	203	37	28	4	11	187	309	0	7	26	13	6	14	252	25	7	1129
15:45	204	38	30	0	16	192	272	0	11	41	15	1	16	262	16	1	1115
Total	642	120	82	4	45	560	812	0	25	99	46	9	44	749	56	10	3303
16:00	219	40	24	3	16	154	280	1	16	41	22	0	11	242	25	5	1099
16:15	251	30	18	0	8	193	295	0	12	32	16	2	10	252	27	1	1147
16:30	203	28	39	0	9	204	273	0	11	41	23	3	18	282	21	6	1161
16:45	246	35	37	0	8	160	254	1	9	36	15	4	17	254	31	4	1111
Total	919	133	118	3	41	711	1102	2	48	150	76	9	56	1030	104	16	4518
17:00	245	31	33	0	15	173	305	0	12	35	22	0	16	262	32	1	1182
Grand Total	1806	284	233	7	101	1444	2219	2	85	284	144	18	116	2041	192	27	9003
Apprch %	77.5	12.2	10	0.3	2.7	38.3	58.9	0.1	16	53.5	27.1	3.4	4.9	85.9	8.1	1.1	
Total %	20.1	3.2	2.6	0.1	1.1	16	24.6	0	0.9	3.2	1.6	0.2	1.3	22.7	2.1	0.3	
Motorcycles	5	3	0	0	0	1	3	0	0	0	1	0	0	1	1	0	15
% Motorcycles	0.3	1.1	0	0	0	0.1	0.1	0	0	0	0.7	0	0	0	0.5	0	0.2
Cars & Light Goods	1769	279	228	0	99	1419	2183	0	84	277	141	0	114	2018	188	0	8799
% Cars & Light Goods	98	98.2	97.9	0	98	98.3	98.4	0	98.8	97.5	97.9	0	98.3	98.9	97.9	0	97.7
Buses	8	0	2	0	0	13	4	0	0	2	0	0	2	13	1	0	45
% Buses	0.4	0	0.9	0	0	0.9	0.2	0	0	0.7	0	0	1.7	0.6	0.5	0	0.5
Single-Unit Trucks	19	2	1	0	1	7	20	0	1	3	0	0	0	8	2	0	64
% Single-Unit Trucks	1.1	0.7	0.4	0	1	0.5	0.9	0	1.2	1.1	0	0	0	0.4	1	0	0.7
Articulated Trucks	4	0	1	0	1	4	9	0	0	2	1	0	0	1	0	0	23
% Articulated Trucks	0.2	0	0.4	0	1	0.3	0.4	0	0	0.7	0.7	0	0	0	0	0	0.3
Bicycles on Road	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	3
% Bicycles on Road	0.1	0	0.4	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	6	7
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	5.6	0	0	0	22.2	0.1
Pedestrians	0	0	0	7	0	0	0	2	0	0	0	17	0	0	0	21	47
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	94.4	0	0	0	77.8	0.5

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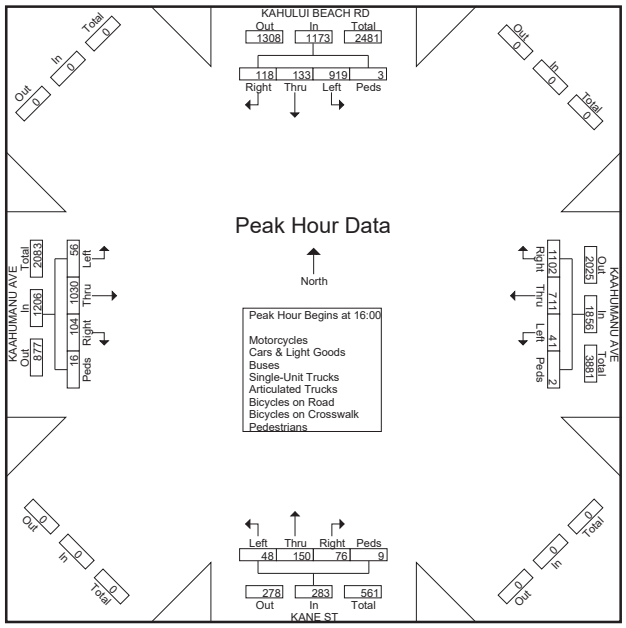
File Name : Kahului Beach Rd_Kane St - Kaahumanu Ave
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 2

	KAHULUI BEACH RD SOUTHBOUND					KAAHUMANU AVE WESTBOUND					KANE ST NORTHBOUND					KAAHUMANU AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 16:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:00																					
16:00	219	**40**	24	**3**	286	**16**	154	280	**1**	451	**16**	**41**	22	0	**79**	11	242	25	5	283	1099
16:15	**251**	30	18	0	299	8	193	**295**	0	**496**	12	32	16	2	62	10	252	27	1	290	1147
16:30	203	28	**39**	0	270	9	**204**	273	0	486	11	41	**23**	3	78	**18**	**282**	21	**6**	**327**	**1161**
16:45	246	35	37	0	**318**	8	160	254	1	423	9	36	15	**4**	64	17	254	**31**	4	306	1111
Total Volume	919	133	118	3	1173	41	711	1102	2	1856	48	150	76	9	283	56	1030	104	16	1206	4518
% App. Total	78.3	11.3	10.1	0.3		2.2	38.3	59.4	0.1		17	53	26.9	3.2		4.6	85.4	8.6	1.3		
PHF	.915	.831	.756	.250	.922	.641	.871	.934	.500	.935	.750	.915	.826	.563	.896	.778	.913	.839	.667	.922	.973



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File Name : Wharf Dwy_Maui Mall Access - Kaahumanu Ave
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	WHARF ST SOUTHBOUND				KAAHUMANU AVE WESTBOUND				MAUI MALL ACCESS NORTHBOUND				KAAHUMANU AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	4	1	1	0	9	243	1	1	20	1	17	0	3	332	37	0	670
15:30	7	0	14	1	20	330	2	0	30	0	16	0	2	282	35	1	740
15:45	2	0	4	1	28	292	2	1	37	0	16	0	0	287	22	0	692
Total	13	1	19	2	57	865	5	2	87	1	49	0	5	901	94	1	2102
16:00	0	0	3	0	12	263	1	1	28	0	7	1	0	317	33	0	666
16:15	0	1	1	0	10	216	0	0	38	0	9	0	1	301	28	0	605
16:30	1	0	3	0	19	222	0	0	30	0	20	0	0	308	33	0	636
16:45	0	0	0	0	11	218	1	0	28	0	16	0	0	310	30	0	614
Total	1	1	7	0	52	919	2	1	124	0	52	1	1	1236	124	0	2521
17:00	0	0	1	0	17	254	1	0	49	0	13	0	1	294	25	0	655
Grand Total	14	2	27	2	126	2038	8	3	260	1	114	1	7	2431	243	1	5278
Apprch %	31.1	4.4	60	4.4	5.8	93.7	0.4	0.1	69.1	0.3	30.3	0.3	0.3	90.6	9.1	0	
Total %	0.3	0	0.5	0	2.4	38.6	0.2	0.1	4.9	0	2.2	0	0.1	46.1	4.6	0	
Motorcycles	0	0	0	0	0	5	0	0	0	0	0	0	0	3	0	0	8
% Motorcycles	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.1	0	0	0.2
Cars & Light Goods	4	2	17	0	125	1996	8	0	260	1	114	0	7	2402	243	0	5179
% Cars & Light Goods	28.6	100	63	0	99.2	97.9	100	0	100	100	100	0	100	98.8	100	0	98.1
Buses	0	0	0	0	0	13	0	0	0	0	0	0	0	9	0	0	22
% Buses	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0.4	0	0	0.4
Single-Unit Trucks	4	0	1	0	1	16	0	0	0	0	0	0	0	14	0	0	36
% Single-Unit Trucks	28.6	0	3.7	0	0.8	0.8	0	0	0	0	0	0	0	0.6	0	0	0.7
Articulated Trucks	6	0	9	0	0	7	0	0	0	0	0	0	0	3	0	0	25
% Articulated Trucks	42.9	0	33.3	0	0	0.3	0	0	0	0	0	0	0	0.1	0	0	0.5
Bicycles on Road	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	0	0	0	0	33.3	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	6
% Pedestrians	0	0	0	100	0	0	0	66.7	0	0	0	100	0	0	0	100	0.1

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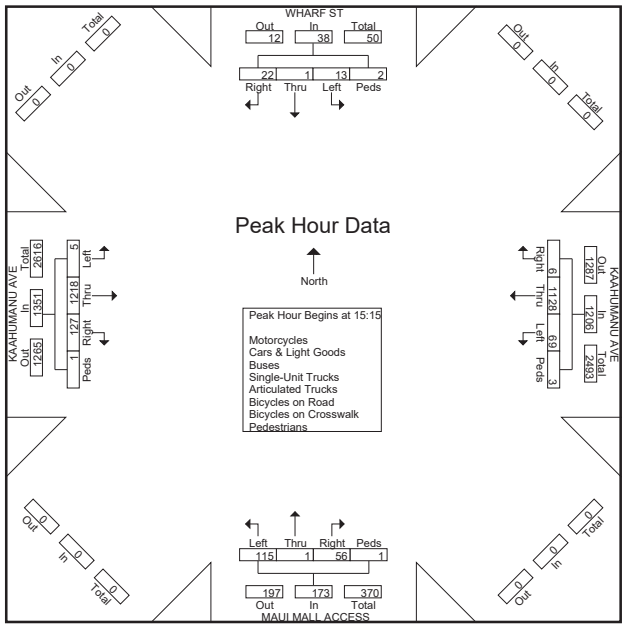
File Name : Wharf Dwy_Maui Mall Access - Kaahumanu Ave
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 2

	WHARF ST SOUTHBOUND					KAAHUMANU AVE WESTBOUND					MAUI MALL ACCESS NORTHBOUND					KAAHUMANU AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:15 to 17:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:15																					
15:15	4	**1**	1	0	6	9	243	1	**1**	254	20	**1**	**17**	0	38	**3**	**332**	**37**	0	**372**	670
15:30	**7**	0	**14**	**1**	**22**	20	**330**	**2**	0	**352**	30	0	16	0	46	2	282	35	**1**	320	**740**
15:45	2	0	4	1	7	**28**	292	2	1	323	**37**	0	16	0	**53**	0	287	22	0	309	692
16:00	0	0	3	0	3	12	263	1	1	277	28	0	7	**1**	36	0	317	33	0	350	666
Total Volume	13	1	22	2	38	69	1128	6	3	1206	115	1	56	1	173	5	1218	127	1	1351	2768
% App. Total	34.2	2.6	57.9	5.3		5.7	93.5	0.5	0.2		66.5	0.6	32.4	0.6		0.4	90.2	9.4	0.1		
PHF	.464	.250	.393	.500	.432	.616	.855	.750	.750	.857	.777	.250	.824	.250	.816	.417	.917	.858	.250	.908	.935



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File Name : PM_Hana Hwy - Kaahumanu Ave
Site Code : 00000000
Start Date : 5/12/2016
Page No : 1

Groups Printed- Unshifted

	KAAHUMANU AVE Eastbound				Westbound				HANA HWY Northbound				HANA HWY Southbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	0	36	221	0	0	42	0	0	261	0	5	0	0	0	0	0	565
03:15 PM	0	29	281	0	0	36	0	0	248	0	0	0	0	0	0	0	594
03:30 PM	0	28	268	0	0	51	0	0	301	0	0	0	0	0	0	0	648
03:45 PM	0	32	244	0	0	33	1	0	261	0	1	0	0	0	0	0	572
Total	0	125	1014	0	0	162	1	0	1071	0	6	0	0	0	0	0	2379
04:00 PM	0	28	286	0	0	28	0	0	239	0	2	0	0	0	0	0	583
04:15 PM	0	31	294	0	0	28	0	0	225	0	0	0	0	0	0	0	578
04:30 PM	0	30	265	0	0	32	0	0	234	0	2	0	0	0	0	0	563
04:45 PM	0	29	299	0	0	37	0	0	236	0	1	0	0	0	0	0	602
Total	0	118	1144	0	0	125	0	0	934	0	5	0	0	0	0	0	2326
Grand Total	0	243	2158	0	0	287	1	0	2005	0	11	0	0	0	0	0	4705
Apprch %	0	10.1	89.9	0	0	99.7	0.3	0	99.5	0	0.5	0	0	0	0	0	
Total %	0	5.2	45.9	0	0	6.1	0	0	42.6	0	0.2	0	0	0	0	0	

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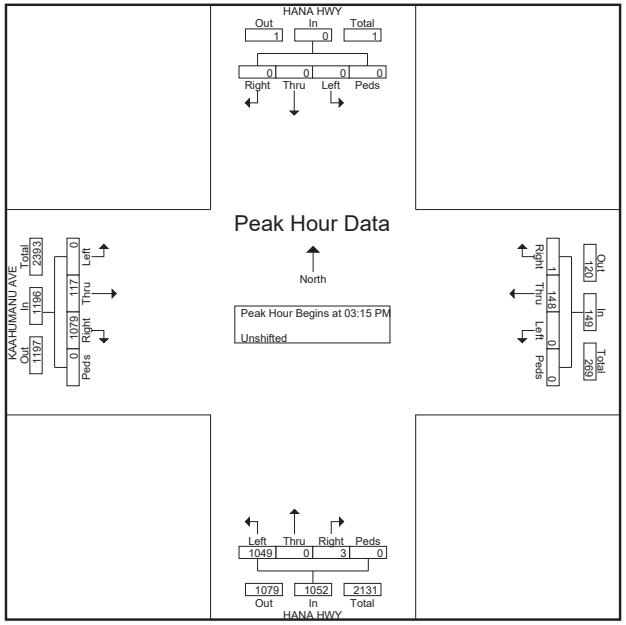
File Name : PM_Hana Hwy - Kaahumanu Ave
Site Code : 00000000
Start Date : 5/12/2016
Page No : 2

	KAAHUMANU AVE Eastbound					Westbound					HANA HWY Northbound					HANA HWY Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	0	29	281	0	310	0	36	0	0	36	248	0	0	0	248	0	0	0	0	0	594
03:30 PM	0	28	268	0	296	0	51	0	0	51	301	0	0	0	301	0	0	0	0	0	648
03:45 PM	0	32	244	0	276	0	33	1	0	34	261	0	1	0	262	0	0	0	0	0	572
04:00 PM	0	28	286	0	314	0	28	0	0	28	239	0	2	0	241	0	0	0	0	0	583
Total Volume	0	117	1079	0	1196	0	148	1	0	149	1049	0	3	0	1052	0	0	0	0	0	2397
% App. Total																					
PHF	.000	.914	.943	.000	.952	.000	.725	.250	.000	.730	.871	.000	.375	.000	.874	.000	.000	.000	.000	.000	.925



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File Name : Hana Hwy - Hobron Ave_Kamehameha Ave1
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HANA HWY SOUTHBOUND				HOBRON AVE WESTBOUND				HANA HWY NORTHBOUND				KAMEHAMEHA HWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	0	278	9	0	21	18	35	0	61	239	37	0	30	22	79	0	829
15:30	0	315	14	2	39	24	63	0	66	299	42	0	32	20	89	0	1005
15:45	0	260	10	1	36	32	65	0	80	267	45	0	35	15	81	0	927
Total	0	853	33	3	96	74	163	0	207	805	124	0	97	57	249	0	2761
16:00	0	294	14	0	24	28	60	0	56	226	34	0	36	20	83	0	875
16:15	0	302	1	0	24	15	39	0	73	226	43	0	29	16	96	0	864
16:30	0	318	2	0	34	18	47	0	66	240	55	0	26	12	94	0	912
16:45	0	290	4	0	43	31	74	0	62	201	58	0	28	18	100	0	909
Total	0	1204	21	0	125	92	220	0	257	893	190	0	119	66	373	0	3560
17:00	0	323	4	0	28	36	68	0	58	254	29	0	36	12	98	0	946
Grand Total	0	2380	58	3	249	202	451	0	522	1952	343	0	252	135	720	0	7267
Apprch %	0	97.5	2.4	0.1	27.6	22.4	50	0	18.5	69.3	12.2	0	22.8	12.2	65	0	
Total %	0	32.8	0.8	0	3.4	2.8	6.2	0	7.2	26.9	4.7	0	3.5	1.9	9.9	0	
Motorcycles	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
% Motorcycles	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	0	2351	54	0	240	198	451	0	514	1952	320	0	249	125	711	0	7165
% Cars & Light Goods	0	98.8	93.1	0	96.4	98	100	0	98.5	100	93.3	0	98.8	92.6	98.8	0	98.6
Buses	0	8	0	0	0	2	0	0	7	0	0	0	0	1	6	0	24
% Buses	0	0.3	0	0	0	1	0	0	1.3	0	0	0	0	0.7	0.8	0	0.3
Single-Unit Trucks	0	15	0	0	5	0	0	0	1	0	18	0	0	4	3	0	46
% Single-Unit Trucks	0	0.6	0	0	2	0	0	0	0.2	0	5.2	0	0	3	0.4	0	0.6
Articulated Trucks	0	3	4	0	4	2	0	0	0	0	5	0	3	5	0	0	26
% Articulated Trucks	0	0.1	6.9	0	1.6	1	0	0	0	0	1.5	0	1.2	3.7	0	0	0.4
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
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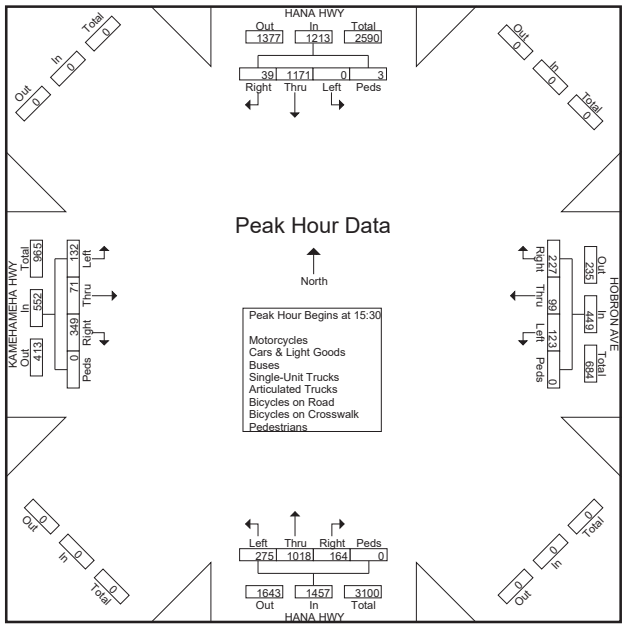
File Name : Hana Hwy - Hobron Ave_Kamehameha Ave1
Site Code : 16-014.07 Maui DOT Signal Optimization
Start Date : 5/8/2018
Page No : 2

	HANA HWY SOUTHBOUND					HOBRON AVE WESTBOUND					HANA HWY NORTHBOUND					KAMEHAMEHA HWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:15 to 17:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	**315**	**14**	**2**	**331**	**39**	24	63	0	126	66	**299**	42	0	**407**	32	**20**	89	0	**141**	**1005**
15:45	0	260	10	1	271	36	**32**	**65**	0	**133**	**80**	267	**45**	0	392	35	15	81	0	131	927
16:00	0	294	14	0	308	24	28	60	0	112	56	226	34	0	316	**36**	20	83	0	139	875
16:15	0	302	1	0	303	24	15	39	0	78	73	226	43	0	342	29	16	**96**	0	141	864
Total Volume	0	1171	39	3	1213	123	99	227	0	449	275	1018	164	0	1457	132	71	349	0	552	3671
% App. Total	0	96.5	3.2	0.2		27.4	22	50.6	0		18.9	69.9	11.3	0		23.9	12.9	63.2	0		
PHF	.000	.929	.696	.375	.916	.788	.773	.873	.000	.844	.859	.851	.911	.000	.895	.917	.888	.909	.000	.979	.913



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File Name : PM_Hobron Ave - Kaahumanu Ave
Site Code : 00000000
Start Date : 5/12/2016
Page No : 1

Groups Printed- Unshifted

	KAAHUMANU AVE Eastbound				KAAHUMANU AVE Westbound				HOBRON AVE Northbound				HOBRON AVE Southbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	30	1	4	0	1	2	1	0	7	55	1	0	1	21	28	0	152
03:15 PM	27	0	7	0	0	2	0	0	8	46	2	0	0	39	26	0	157
03:30 PM	15	1	6	0	1	1	0	0	16	25	1	0	0	49	27	0	142
03:45 PM	25	2	4	0	1	0	0	0	7	39	1	0	0	44	22	0	145
Total	97	4	21	0	3	5	1	0	38	165	5	0	1	153	103	0	596
04:00 PM	20	1	5	0	0	1	0	0	12	36	1	0	0	42	19	0	137
04:15 PM	15	1	9	0	0	3	0	0	4	28	0	0	0	22	24	0	106
04:30 PM	25	2	5	1	1	2	0	0	1	24	3	0	0	30	27	0	121
04:45 PM	24	0	9	0	2	5	1	0	6	14	2	0	1	16	28	0	108
Total	84	4	28	1	3	11	1	0	23	102	6	0	1	110	98	0	472
Grand Total	181	8	49	1	6	16	2	0	61	267	11	0	2	263	201	0	1068
Apprch %	75.7	3.3	20.5	0.4	25	66.7	8.3	0	18	78.8	3.2	0	0.4	56.4	43.1	0	
Total %	16.9	0.7	4.6	0.1	0.6	1.5	0.2	0	5.7	25	1	0	0.2	24.6	18.8	0	

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File Name : PM_Hobron Ave - Kaahumanu Ave
Site Code : 00000000
Start Date : 5/12/2016
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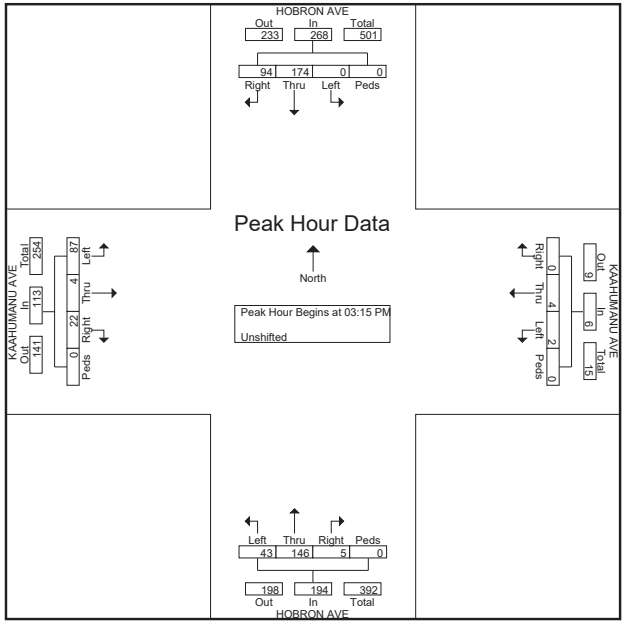
	KAAHUMANU AVE Eastbound					KAAHUMANU AVE Westbound					HOBRON AVE Northbound					HOBRON AVE Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:15 PM to 04:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	27	0	7	0	34	0	2	0	0	2	8	46	2	0	56	0	39	26	0	65	157
03:30 PM	15	1	6	0	22	1	1	0	0	2	16	25	1	0	42	0	49	27	0	76	142
03:45 PM	25	2	4	0	31	1	0	0	0	1	7	39	1	0	47	0	44	22	0	66	145
04:00 PM	20	1	5	0	26	0	1	0	0	1	12	36	1	0	49	0	42	19	0	61	137
Total Volume	87	4	22	0	113	2	4	0	0	6	43	146	5	0	194	0	174	94	0	268	581
% App. Total	77	3.5	19.5	0		33.3	66.7	0	0		22.2	75.3	2.6	0		0	64.9	35.1	0		
PHF	.806	.500	.786	.000	.831	.500	.500	.000	.000	.750	.672	.793	.625	.000	.866	.000	.888	.870	.000	.882	.925



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File Name : PM_Hobron Ave - Gate 9 Access Rd
Site Code : 00000000
Start Date : 5/12/2016
Page No : 1

Groups Printed- Unshifted

	GATE 9 ACCESS RD Eastbound				Westbound				HOBRON AVE Northbound				HOBRON AVE Southbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	0	0	2	0	0	0	0	0	23	60	0	0	0	51	1	0	137
03:15 PM	1	0	0	0	0	0	0	0	12	58	0	0	0	67	1	0	139
03:30 PM	0	0	0	0	0	0	0	0	0	43	0	0	0	79	0	0	122
03:45 PM	0	0	0	0	0	0	0	0	0	63	0	0	0	68	0	0	131
Total	1	0	2	0	0	0	0	0	35	224	0	0	0	265	2	0	529
04:00 PM	0	0	0	0	0	0	0	0	0	58	0	0	0	58	0	0	116
04:15 PM	0	0	0	0	0	0	0	0	0	42	0	0	0	45	0	0	87
04:30 PM	0	0	0	1	0	0	0	0	0	47	0	0	0	60	0	0	108
04:45 PM	0	0	0	1	0	0	0	0	0	38	0	0	0	44	0	0	83
Total	0	0	0	2	0	0	0	0	0	185	0	0	0	207	0	0	394
Grand Total	1	0	2	2	0	0	0	0	35	409	0	0	0	472	2	0	923
Apprch %	20	0	40	40	0	0	0	0	7.9	92.1	0	0	0	99.6	0.4	0	
Total %	0.1	0	0.2	0.2	0	0	0	0	3.8	44.3	0	0	0	51.1	0.2	0	

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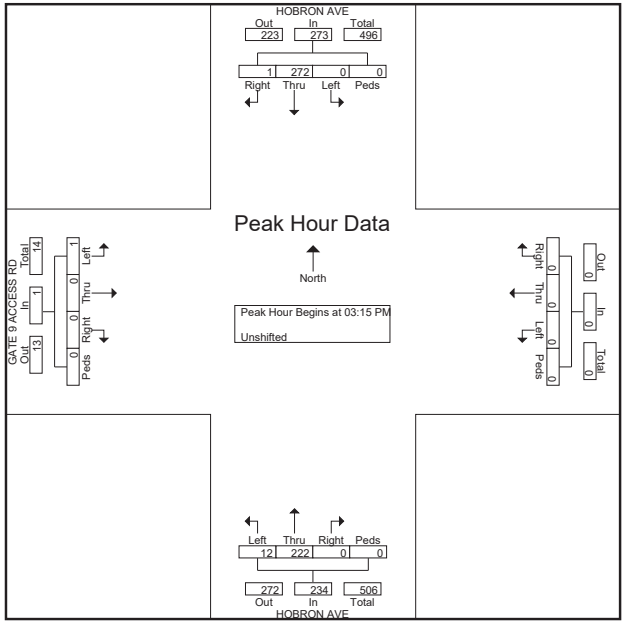
Site Code : 00000000
Start Date : 5/12/2016
Page No : 2

	GATE 9 ACCESS RD Eastbound					Westbound					HOBRON AVE Northbound					HOBRON AVE Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:15 PM to 04:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	1	0	0	0	1	0	0	0	0	0	12	58	0	0	70	0	67	1	0	68	139
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	43	0	0	43	0	79	0	0	79	122
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	63	0	0	63	0	68	0	0	68	131
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	58	0	0	58	0	58	0	0	58	116
Total Volume	1	0	0	0	1	0	0	0	0	0	12	222	0	0	234	0	272	1	0	273	508
% App. Total	100	0	0	0		0	0	0	0		5.1	94.9	0	0		0	99.6	0.4	0		
PHF	.250	.000	.000	.000	.250	.000	.000	.000	.000	.000	.250	.881	.000	.000	.836	.000	.861	.250	.000	.864	.914



Enclosure 2: LOS Criteria

ENCLOSURE 2 – LEVEL OF SERVICE (LOS) CRITERIA

VEHICULAR LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 6th Edition)

Level of service for vehicles at signalized intersections is directly related to delay values and is assigned on that basis. Level of Service is a measure of the acceptability of delay values to motorists at a given intersection. The criteria are given in the table below.

Level-of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec./veh.)
A	< 10.0
B	>10.0 and ≤ 20.0
C	>20.0 and ≤ 35.0
D	>35.0 and ≤ 55.0
E	>55.0 and ≤ 80.0
F	> 80.0

Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group or approach in question.

VEHICULAR LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS (HCM 6th Edition)

The level of service criteria for vehicles at unsignalized intersections is defined as the average control delay, in seconds per vehicle.

LOS delay threshold values are lower for two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections than those of signalized intersections. This is because more vehicles pass through signalized intersections, and therefore, drivers expect and tolerate greater delays. While the criteria for level of service for TWSC and AWSC intersections are the same, procedures to calculate the average total delay may differ.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50

Enclosure 3: LOS Worksheets

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
1: Kane St/Kahului Beach Rd & Kaahumanu Ave — 08/27/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	706	50	12	795	872	26	93	21	909	154	84
Future Volume (veh/h)	39	706	50	12	795	872	26	93	21	909	154	84
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1856	1841	1870	1870	1856	1870	1870	1678	1841	1811	1811
Adj Flow Rate, veh/h	42	767	0	13	864	0	28	101	0	1107	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	3	4	2	2	3	2	2	15	4	6	6
Cap, veh/h	53	1495		15	1427		125	132		1203	0	
Arrive On Green	0.03	0.42	0.00	0.00	0.13	0.00	0.07	0.07	0.00	0.34	0.00	0.00
Sat Flow, veh/h	1725	3526	1560	1781	3554	1572	1781	1870	1422	3506	0	1535
Grp Volume(v), veh/h	42	767	0	13	864	0	28	101	0	1107	0	0
Grp Sat Flow(s),veh/h/ln	1725	1763	1560	1781	1777	1572	1781	1870	1422	1753	0	1535
Q Serve(g_s), s	3.1	20.8	0.0	0.9	29.8	0.0	1.9	6.9	0.0	39.4	0.0	0.0
Cycle Q Clear(g_c), s	3.1	20.8	0.0	0.9	29.8	0.0	1.9	6.9	0.0	39.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	53	1495		15	1427		125	132		1203	0	
V/C Ratio(X)	0.79	0.51		0.84	0.61		0.22	0.77		0.92	0.00	
Avail Cap(c_a), veh/h	133	1495		137	1427		260	273		1349	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.81	0.81	0.00	1.00	1.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	62.6	27.6	0.0	64.7	46.7	0.0	57.1	59.4	0.0	41.0	0.0	0.0
Incr Delay (d2), s/veh	21.7	1.3	0.0	59.8	1.6	0.0	0.9	8.9	0.0	9.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	8.9	0.0	0.7	14.5	0.0	0.9	3.6	0.0	18.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	84.3	28.8	0.0	124.5	48.2	0.0	58.0	68.3	0.0	50.7	0.0	0.0
LnGrp LOS	F	C		F	D		E	E		D	A	
Approach Vol, veh/h		809	A		877	A		129	A		1107	A
Approach Delay, s/veh		31.7			49.4			66.1			50.7	
Approach LOS		C			D			E			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	58.2		49.6	5.1	61.1		14.2				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	10.0	31.0		50.0	10.0	31.0		19.0				
Max Q Clear Time (g_c+I1), s	5.1	31.8		41.4	2.9	22.8		8.9				
Green Ext Time (p_c), s	0.0	0.0		3.2	0.0	3.2		0.3				

Intersection Summary	
HCM 6th Ctrl Delay	45.7
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
2: Maui Mall Dwy/Wharf St & Kaahumanu Ave — 08/27/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	876	52	40	1134	4	42	6	8	13	0	10
Future Volume (veh/h)	9	876	52	40	1134	4	42	6	8	13	0	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1856	1870	1870	1870	1870	1870	1648	1648	1870	1870	1455
Adj Flow Rate, veh/h	10	952	43	43	1233	4	46	7	1	14	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	3	2	2	2	2	2	17	17	2	2	30
Cap, veh/h	21	2891	1300	56	4412	14	119	58	8	106	0	50
Arrive On Green	0.02	1.00	1.00	0.03	0.84	0.84	0.04	0.04	0.04	0.04	0.00	0.04
Sat Flow, veh/h	1781	3526	1585	1781	5254	17	1418	1410	201	1243	0	1233
Grp Volume(v), veh/h	10	952	43	43	799	438	46	0	8	14	0	1
Grp Sat Flow(s),veh/h/ln	1781	1763	1585	1781	1702	1867	1418	0	1612	1243	0	1233
Q Serve(g_s), s	0.7	0.0	0.0	3.1	6.4	6.4	1.8	0.0	0.6	1.3	0.0	0.1
Cycle Q Clear(g_c), s	0.7	0.0	0.0	3.1	6.4	6.4	3.7	0.0	0.6	1.9	0.0	0.1
Prop In Lane	1.00		1.00	1.00		0.01	1.00		0.13	1.00		1.00
Lane Grp Cap(c), veh/h	21	2891	1300	56	2859	1568	119	0	66	106	0	50
V/C Ratio(X)	0.48	0.33	0.03	0.77	0.28	0.28	0.39	0.00	0.12	0.13	0.00	0.02
Avail Cap(c_a), veh/h	123	2891	1300	247	2859	1568	366	0	347	352	0	266
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.69	0.69	0.69	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	63.1	0.0	0.0	62.5	2.2	2.2	61.5	0.0	60.1	61.0	0.0	59.8
Incr Delay (d2), s/veh	11.4	0.2	0.0	19.7	0.2	0.4	2.1	0.0	0.8	0.6	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.1	0.0	1.7	1.5	1.7	1.6	0.0	0.3	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.5	0.2	0.0	82.2	2.4	2.6	63.5	0.0	60.9	61.6	0.0	60.0
LnGrp LOS	E	A	A	F	A	A	E	A	E	E	A	E
Approach Vol, veh/h		1005			1280			54			15	
Approach Delay, s/veh		0.9			5.2			63.1			61.5	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.5	114.2		10.3	8.1	111.6		10.3				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	9.0	79.0		28.0	18.0	70.0		28.0				
Max Q Clear Time (g_c+I1), s	2.7	8.4		3.9	5.1	2.0		5.7				
Green Ext Time (p_c), s	0.0	25.6		0.0	0.0	19.1		0.1				

Intersection Summary	
HCM 6th Ctrl Delay	5.1
HCM 6th LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	149	795	1197	7	0	92
Future Vol, veh/h	149	795	1197	7	0	92
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	Free	-	Free
Storage Length	400	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	4	2	29	2	9
Mvmt Flow	162	864	1301	8	0	100

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1301	0	-	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.24	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.27	-	-	-	-	-
Pot Cap-1 Maneuver	502	-	-	0	0	0
Stage 1	-	-	-	0	0	0
Stage 2	-	-	-	0	0	0
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	502	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	2.5	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	502	-	-	-
HCM Lane V/C Ratio	0.323	-	-	-
HCM Control Delay (s)	15.5	-	-	0
HCM Lane LOS	C	-	-	A
HCM 95th %tile Q(veh)	1.4	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	790	26	183	1087	177	19	78	186	70	27	4
Future Volume (veh/h)	0	790	26	183	1087	177	19	78	186	70	27	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1841	1841	1841	1870	1663	1604	1604	1811	1841	1841	1870
Adj Flow Rate, veh/h	0	859	27	199	1182	135	21	85	4	76	29	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	4	4	4	2	16	20	20	6	4	4	2
Cap, veh/h	0	2099	66	254	2558	1014	26	104	125	106	105	95
Arrive On Green	0.00	1.00	1.00	0.07	0.72	0.72	0.08	0.08	0.08	0.06	0.06	0.06
Sat Flow, veh/h	0	3553	109	3401	3554	1409	315	1273	1535	1753	1749	1585
Grp Volume(v), veh/h	0	434	452	199	1182	135	106	0	4	76	29	1
Grp Sat Flow(s),veh/h/ln	0	1749	1821	1700	1777	1409	1588	0	1535	1753	1749	1585
Q Serve(g_s), s	0.0	0.0	0.0	7.5	18.2	3.9	8.5	0.0	0.3	5.5	2.1	0.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	7.5	18.2	3.9	8.5	0.0	0.3	5.5	2.1	0.1
Prop In Lane	0.00		0.06	1.00		1.00	0.20		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	1061	1105	254	2558	1014	130	0	125	106	105	95
V/C Ratio(X)	0.00	0.41	0.41	0.78	0.46	0.13	0.82	0.00	0.03	0.72	0.28	0.01
Avail Cap(c_a), veh/h	0	1061	1105	523	2558	1014	293	0	283	324	323	293
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	59.1	7.7	5.6	58.7	0.0	55.0	60.0	58.4	57.4
Incr Delay (d2), s/veh	0.0	1.2	1.1	2.0	0.6	0.3	4.7	0.0	0.0	3.4	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.3	0.3	3.3	6.4	1.1	3.6	0.0	0.1	2.6	0.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	1.2	1.1	61.1	8.3	5.9	63.5	0.0	55.0	63.4	58.9	57.5
LnGrp LOS	A	A	A	E	A	A	E	A	E	E	E	E
Approach Vol, veh/h		886			1516			110			106	
Approach Delay, s/veh		1.1			15.0			63.2			62.1	
Approach LOS		A			B			E			E	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		99.6		13.8	14.7	84.8		16.6				
Change Period (Y+Rc), s		6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s		64.0		24.0	20.0	39.0		24.0				
Max Q Clear Time (g_c+I1), s		20.2		7.5	9.5	2.0		10.5				
Green Ext Time (p_c), s		23.6		0.3	0.3	13.1		0.3				

Intersection Summary		
HCM 6th Ctrl Delay	14.2	
HCM 6th LOS	B	

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	108	6	22	7	7	1	18	147	10	2	72	65
Future Vol, veh/h	108	6	22	7	7	1	18	147	10	2	72	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	0	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	13	2	5	58	29	100	6	25	50	50	37	7
Mvmt Flow	117	7	24	8	8	1	20	160	11	2	78	71

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	292	293	-	292	288	166	78	0	0	171	0	0
Stage 1	82	82	-	206	206	-	-	-	-	-	-	-
Stage 2	210	211	-	86	82	-	-	-	-	-	-	-
Critical Hdwy	7.23	6.52	-	7.68	6.79	7.2	4.16	-	-	4.6	-	-
Critical Hdwy Stg 1	6.23	5.52	-	6.68	5.79	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.23	5.52	-	6.68	5.79	-	-	-	-	-	-	-
Follow-up Hdwy	3.617	4.018	-	4.022	4.261	4.2	2.254	-	-	2.65	-	-
Pot Cap-1 Maneuver	639	618	0	563	579	676	1495	-	-	1162	-	-
Stage 1	900	827	0	684	684	-	-	-	-	-	-	-
Stage 2	768	728	0	800	777	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	623	607	-	551	569	676	1495	-	-	1162	-	-
Mov Cap-2 Maneuver	623	607	-	551	569	-	-	-	-	-	-	-
Stage 1	887	825	-	674	674	-	-	-	-	-	-	-
Stage 2	747	717	-	792	775	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.2	11.5	0.8	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1495	-	-	622	-	566	1162	-	-
HCM Lane V/C Ratio	0.013	-	-	0.199	-	0.029	0.002	-	-
HCM Control Delay (s)	7.4	0	-	12.2	0	11.5	8.1	0	-
HCM Lane LOS	A	A	-	B	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.7	-	0.1	0	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	23	233	133	1
Future Vol, veh/h	0	0	23	233	133	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	35
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	100	10	20	100
Mvmt Flow	0	0	25	253	145	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	449	73	146	0	-	0
Stage 1	146	-	-	-	-	-
Stage 2	303	-	-	-	-	-
Critical Hdwy	6.63	6.93	5.6	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	3.15	-	-	-
Pot Cap-1 Maneuver	553	975	970	-	-	-
Stage 1	867	-	-	-	-	-
Stage 2	748	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	536	975	970	-	-	-
Mov Cap-2 Maneuver	536	-	-	-	-	-
Stage 1	841	-	-	-	-	-
Stage 2	748	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	970	-	-	-	-
HCM Lane V/C Ratio	0.026	-	-	-	-
HCM Control Delay (s)	8.8	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-	-

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
1: Kane Street/Kahului Beach Road & Kaahumanu Ave — 08/28/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	991	81	61	714	1092	41	140	68	861	160	106
Future Volume (veh/h)	55	991	81	61	714	1092	41	140	68	861	160	106
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1841	1856	1856	1870	1856	1870	1856	1870	1870
Adj Flow Rate, veh/h	60	1077	0	66	776	0	45	152	0	1060	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	3	4	3	3	2	3	2	3	2	2
Cap, veh/h	77	1383		85	1389		170	177		1127	0	
Arrive On Green	0.04	0.39	0.00	0.02	0.13	0.00	0.10	0.10	0.00	0.32	0.00	0.00
Sat Flow, veh/h	1781	3554	1572	1753	3526	1572	1781	1856	1585	3534	0	1585
Grp Volume(v), veh/h	60	1077	0	66	776	0	45	152	0	1060	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1572	1753	1763	1572	1781	1856	1585	1767	0	1585
Q Serve(g_s), s	4.5	35.9	0.0	5.1	27.9	0.0	3.2	10.9	0.0	39.4	0.0	0.0
Cycle Q Clear(g_c), s	4.5	35.9	0.0	5.1	27.9	0.0	3.2	10.9	0.0	39.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	77	1383		85	1389		170	177		1127	0	
V/C Ratio(X)	0.78	0.78		0.78	0.56		0.26	0.86		0.94	0.00	
Avail Cap(c_a), veh/h	172	1383		169	1389		172	179		1178	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.75	0.75	0.00	1.00	1.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	63.9	36.1	0.0	65.7	47.7	0.0	56.6	60.1	0.0	44.7	0.0	0.0
Incr Delay (d2), s/veh	15.2	4.4	0.0	11.0	1.2	0.0	0.8	31.4	0.0	14.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	16.1	0.0	2.6	13.5	0.0	1.5	6.7	0.0	19.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.1	40.5	0.0	76.7	48.9	0.0	57.5	91.5	0.0	58.8	0.0	0.0
LnGrp LOS	E	D		E	D		E	F		E	A	
Approach Vol, veh/h		1137	A		842	A		197	A		1060	A
Approach Delay, s/veh		42.6			51.1			83.7			58.8	
Approach LOS		D			D			F			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.9	59.2		48.0	10.5	58.5		17.9				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	13.0	44.0		45.0	13.0	44.0		13.0				
Max Q Clear Time (g_c+I1), s	6.5	29.9		41.4	7.1	37.9		12.9				
Green Ext Time (p_c), s	0.0	4.5		1.6	0.1	3.5		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	52.6
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
2: Maui Mall Dwy/Wharf Street & Kaahumanu Ave — 08/28/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1218	127	69	1128	6	115	1	56	13	1	22
Future Volume (veh/h)	5	1218	127	69	1128	6	115	1	56	13	1	22
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1856	1856	1870	1870	1870	1870	1870	1292
Adj Flow Rate, veh/h	5	1324	92	75	1226	7	125	1	3	14	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	3	3	2	2	2	2	2	41
Cap, veh/h	11	2631	1173	95	4094	23	202	42	126	185	12	112
Arrive On Green	0.01	1.00	1.00	0.05	0.79	0.79	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	1781	3554	1584	1781	5198	30	1416	411	1233	1308	113	1095
Grp Volume(v), veh/h	5	1324	92	75	797	436	125	0	4	15	0	1
Grp Sat Flow(s),veh/h/ln	1781	1777	1584	1781	1689	1850	1416	0	1644	1421	0	1095
Q Serve(g_s), s	0.4	0.0	0.0	5.6	8.8	8.9	9.9	0.0	0.3	1.1	0.0	0.1
Cycle Q Clear(g_c), s	0.4	0.0	0.0	5.6	8.8	8.9	11.3	0.0	0.3	1.4	0.0	0.1
Prop In Lane	1.00		1.00	1.00		0.02	1.00		0.75	0.93		1.00
Lane Grp Cap(c), veh/h	11	2631	1173	95	2660	1457	202	0	168	197	0	112
V/C Ratio(X)	0.44	0.50	0.08	0.79	0.30	0.30	0.62	0.00	0.02	0.08	0.00	0.01
Avail Cap(c_a), veh/h	211	2631	1173	211	2660	1457	351	0	341	347	0	227
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.09	0.09	0.09	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	66.4	0.0	0.0	63.1	4.0	4.0	59.3	0.0	54.5	55.1	0.0	54.4
Incr Delay (d2), s/veh	2.4	0.1	0.0	13.1	0.3	0.5	3.1	0.0	0.1	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	2.9	2.6	3.0	4.4	0.0	0.1	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.9	0.1	0.0	76.3	4.3	4.5	62.4	0.0	54.6	55.2	0.0	54.5
LnGrp LOS	E	A	A	E	A	A	E	A	D	E	A	D
Approach Vol, veh/h		1421			1308			129			16	
Approach Delay, s/veh		0.3			8.5			62.2			55.2	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	111.3		18.8	11.2	105.0		18.8				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	16.0	77.0		28.0	16.0	77.0		28.0				
Max Q Clear Time (g_c+I1), s	2.4	10.9		3.4	7.6	2.0		13.3				
Green Ext Time (p_c), s	0.0	25.0		0.0	0.1	34.7		0.3				

Intersection Summary	
HCM 6th Ctrl Delay	7.1
HCM 6th LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	125	1162	1070	3	0	169
Future Vol, veh/h	125	1162	1070	3	0	169
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	Free	-	Free
Storage Length	400	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	2	2	11
Mvmt Flow	136	1263	1163	3	0	184

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1163	0	-	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.16	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.23	-	-	-	-	-
Pot Cap-1 Maneuver	591	-	-	0	0	0
Stage 1	-	-	-	0	0	0
Stage 2	-	-	-	0	0	0
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	591	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	591	-	-	-
HCM Lane V/C Ratio	0.23	-	-	-
HCM Control Delay (s)	12.9	-	-	0
HCM Lane LOS	B	-	-	A
HCM 95th %tile Q(veh)	0.9	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1147	47	263	1031	158	56	77	332	120	102	28
Future Volume (veh/h)	0	1147	47	263	1031	158	56	77	332	120	102	28
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	1767	1811	1811	1870	1870	1870	1781
Adj Flow Rate, veh/h	0	1247	49	286	1121	111	61	84	14	130	111	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	9	6	6	2	2	2	8
Cap, veh/h	0	1881	74	342	2401	1011	73	100	155	166	166	140
Arrive On Green	0.00	1.00	1.00	0.10	0.68	0.68	0.10	0.10	0.10	0.09	0.09	0.09
Sat Flow, veh/h	0	3579	137	3456	3554	1497	746	1028	1585	1781	1777	1495
Grp Volume(v), veh/h	0	635	661	286	1121	111	145	0	14	130	111	1
Grp Sat Flow(s),veh/h/ln	0	1777	1846	1728	1777	1497	1774	0	1585	1781	1777	1495
Q Serve(g_s), s	0.0	0.0	0.0	11.0	20.2	3.5	10.8	0.0	1.1	9.6	8.2	0.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	11.0	20.2	3.5	10.8	0.0	1.1	9.6	8.2	0.1
Prop In Lane	0.00		0.07	1.00		1.00	0.42		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	959	996	342	2401	1011	173	0	155	166	166	140
V/C Ratio(X)	0.00	0.66	0.66	0.84	0.47	0.11	0.84	0.00	0.09	0.78	0.67	0.01
Avail Cap(c_a), veh/h	0	959	996	563	2401	1011	315	0	282	317	316	266
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	59.8	10.4	7.7	59.8	0.0	55.4	59.8	59.2	55.5
Incr Delay (d2), s/veh	0.0	3.6	3.5	2.5	0.7	0.2	4.0	0.0	0.1	3.0	1.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.0	1.0	4.9	7.6	1.2	5.1	0.0	0.4	4.5	3.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	3.6	3.5	62.2	11.0	7.9	63.9	0.0	55.5	62.8	60.9	55.5
LnGrp LOS	A	A	A	E	B	A	E	A	E	E	E	E
Approach Vol, veh/h		1296			1518			159			242	
Approach Delay, s/veh		3.5			20.5			63.1			61.9	
Approach LOS		A			C			E			E	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		97.2		18.6	18.3	78.8		19.2				
Change Period (Y+Rc), s		6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s		69.0		24.0	22.0	42.0		24.0				
Max Q Clear Time (g_c+I1), s		22.2		11.6	13.0	2.0		12.8				
Green Ext Time (p_c), s		22.5		0.7	0.4	22.6		0.4				

Intersection Summary	
HCM 6th Ctrl Delay	18.9
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	95	4	22	2	4	0	43	179	5	0	174	115
Future Vol, veh/h	95	4	22	2	4	0	43	179	5	0	174	115
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	0	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	4	25	2	2	2	2	21	7	2	2	3	5
Mvmt Flow	103	4	24	2	4	0	47	195	5	0	189	125

Major/Minor	Minor2			Minor1				Major1			Major2	
Conflicting Flow All	483	483	-	483	481	198	189	0	0	200	0	0
Stage 1	189	189	-	292	292	-	-	-	-	-	-	-
Stage 2	294	294	-	191	189	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.75	-	7.12	6.52	6.22	4.31	-	-	4.12	-	-
Critical Hdwy Stg 1	6.14	5.75	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.75	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.225	-	3.518	4.018	3.318	2.389	-	-	2.218	-	-
Pot Cap-1 Maneuver	491	451	0	494	485	843	1279	-	-	1372	-	-
Stage 1	808	703	0	716	671	-	-	-	-	-	-	-
Stage 2	710	630	0	811	744	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	472	433	-	475	465	843	1279	-	-	1372	-	-
Mov Cap-2 Maneuver	472	433	-	475	465	-	-	-	-	-	-	-
Stage 1	775	703	-	687	643	-	-	-	-	-	-	-
Stage 2	676	604	-	806	744	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.9	12.8	1.5	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1279	-	-	470	-	468	1372	-	-
HCM Lane V/C Ratio	0.037	-	-	0.229	-	0.014	-	-	-
HCM Control Delay (s)	7.9	0	-	14.9	0	12.8	0	-	-
HCM Lane LOS	A	A	-	B	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.9	-	0	0	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	12	263	293	1
Future Vol, veh/h	0	0	12	263	293	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	35
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	25	5	4	2
Mvmt Flow	0	0	13	286	318	1

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	631	160	319	0	-	0
Stage 1	319	-	-	-	-	-
Stage 2	312	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.475	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.4375	-	-	-
Pot Cap-1 Maneuver	429	857	1105	-	-	-
Stage 1	710	-	-	-	-	-
Stage 2	741	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	423	857	1105	-	-	-
Mov Cap-2 Maneuver	423	-	-	-	-	-
Stage 1	700	-	-	-	-	-
Stage 2	741	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1105	-	-	-	-
HCM Lane V/C Ratio	0.012	-	-	-	-
HCM Control Delay (s)	8.3	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
1: Kane St/Kahului Beach Rd & Kaahumanu Ave — 09/17/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	790	65	15	850	930	40	100	25	1000	165	85
Future Volume (veh/h)	40	790	65	15	850	930	40	100	25	1000	165	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1856	1841	1870	1870	1856	1870	1870	1678	1841	1811	1811
Adj Flow Rate, veh/h	43	859	0	16	924	0	43	109	0	1215	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	3	4	2	2	3	2	2	15	4	6	6
Cap, veh/h	55	1383		19	1319		134	141		1289	0	
Arrive On Green	0.03	0.39	0.00	0.00	0.12	0.00	0.08	0.08	0.00	0.37	0.00	0.00
Sat Flow, veh/h	1725	3526	1560	1781	3554	1572	1781	1870	1422	3506	0	1535
Grp Volume(v), veh/h	43	859	0	16	924	0	43	109	0	1215	0	0
Grp Sat Flow(s),veh/h/ln	1725	1763	1560	1781	1777	1572	1781	1870	1422	1753	0	1535
Q Serve(g_s), s	3.2	25.4	0.0	1.2	32.4	0.0	3.0	7.4	0.0	43.6	0.0	0.0
Cycle Q Clear(g_c), s	3.2	25.4	0.0	1.2	32.4	0.0	3.0	7.4	0.0	43.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	55	1383		19	1319		134	141		1289	0	
V/C Ratio(X)	0.78	0.62		0.84	0.70		0.32	0.77		0.94	0.00	
Avail Cap(c_a), veh/h	133	1383		137	1319		260	273		1349	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.81	0.81	0.00	1.00	1.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	62.5	31.7	0.0	64.7	50.1	0.0	56.9	59.0	0.0	39.8	0.0	0.0
Incr Delay (d2), s/veh	21.2	2.1	0.0	50.6	2.5	0.0	1.4	8.7	0.0	12.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	11.1	0.0	0.8	16.0	0.0	1.4	3.9	0.0	20.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	83.7	33.8	0.0	115.3	52.6	0.0	58.3	67.7	0.0	52.7	0.0	0.0
LnGrp LOS	F	C		F	D		E	E		D	A	
Approach Vol, veh/h		902	A		940	A		152	A		1215	A
Approach Delay, s/veh		36.2			53.7			65.0			52.7	
Approach LOS		D			D			E			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	54.3		52.8	5.4	57.0		14.8				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	10.0	31.0		50.0	10.0	31.0		19.0				
Max Q Clear Time (g_c+I1), s	5.2	34.4		45.6	3.2	27.4		9.4				
Green Ext Time (p_c), s	0.0	0.0		2.2	0.0	1.8		0.4				

Intersection Summary	
HCM 6th Ctrl Delay	48.9
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
2: Maui Mall Dwy/Wharf St & Kaahumanu Ave — 09/17/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	1050	55	40	1255	5	45	10	10	15	0	10
Future Volume (veh/h)	10	1050	55	40	1255	5	45	10	10	15	0	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1856	1870	1870	1870	1870	1870	1648	1648	1870	1870	1455
Adj Flow Rate, veh/h	11	1141	45	43	1364	5	49	11	1	16	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	3	2	2	2	2	2	17	17	2	2	30
Cap, veh/h	22	2884	1296	56	4394	16	123	64	6	106	0	53
Arrive On Green	0.03	1.00	1.00	0.03	0.84	0.84	0.04	0.04	0.04	0.04	0.00	0.04
Sat Flow, veh/h	1781	3526	1585	1781	5252	19	1418	1488	135	1170	0	1233
Grp Volume(v), veh/h	11	1141	45	43	884	485	49	0	12	16	0	1
Grp Sat Flow(s),veh/h/ln	1781	1763	1585	1781	1702	1867	1418	0	1624	1170	0	1233
Q Serve(g_s), s	0.8	0.0	0.0	3.1	7.5	7.5	1.5	0.0	0.9	1.4	0.0	0.1
Cycle Q Clear(g_c), s	0.8	0.0	0.0	3.1	7.5	7.5	3.8	0.0	0.9	2.4	0.0	0.1
Prop In Lane	1.00		1.00	1.00		0.01	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	22	2884	1296	56	2848	1562	123	0	70	106	0	53
V/C Ratio(X)	0.49	0.40	0.03	0.77	0.31	0.31	0.40	0.00	0.17	0.15	0.00	0.02
Avail Cap(c_a), veh/h	123	2884	1296	247	2848	1562	367	0	350	347	0	266
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.69	0.69	0.69	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	62.9	0.0	0.0	62.5	2.3	2.3	61.2	0.0	60.0	61.1	0.0	59.6
Incr Delay (d2), s/veh	10.9	0.3	0.0	19.7	0.3	0.5	2.1	0.0	1.1	0.7	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.1	0.0	1.7	1.8	2.1	1.7	0.0	0.4	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.9	0.3	0.0	82.2	2.6	2.9	63.3	0.0	61.1	61.8	0.0	59.7
LnGrp LOS	E	A	A	F	A	A	E	A	E	E	A	E
Approach Vol, veh/h		1197			1412			61			17	
Approach Delay, s/veh		0.9			5.1			62.9			61.6	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	113.8		10.6	8.1	111.3		10.6				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	9.6	79.0		28.0	18.0	70.0		28.0				
Max Q Clear Time (g_c+I1), s	2.8	9.5		4.4	5.1	2.0		5.8				
Green Ext Time (p_c), s	0.0	30.1		0.0	0.0	25.5		0.1				

Intersection Summary	
HCM 6th Ctrl Delay	4.9
HCM 6th LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	150	970	1315	10	0	95
Future Vol, veh/h	150	970	1315	10	0	95
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	Free	-	Free
Storage Length	400	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	4	2	29	2	9
Mvmt Flow	163	1054	1429	11	0	103

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1429	0	-	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.24	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.27	-	-	-	-	-
Pot Cap-1 Maneuver	447	-	-	0	0	0
Stage 1	-	-	-	0	0	0
Stage 2	-	-	-	0	0	0
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	447	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	2.4	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	447	-	-	-
HCM Lane V/C Ratio	0.365	-	-	-
HCM Control Delay (s)	17.6	-	-	0
HCM Lane LOS	C	-	-	A
HCM 95th %tile Q(veh)	1.6	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	955	30	190	1210	180	20	80	215	70	30	5
Future Volume (veh/h)	0	955	30	190	1210	180	20	80	215	70	30	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1841	1841	1841	1870	1663	1604	1604	1811	1841	1841	1870
Adj Flow Rate, veh/h	0	1038	32	207	1315	143	22	87	6	76	33	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	4	4	4	2	16	20	20	6	4	4	2
Cap, veh/h	0	2084	64	262	2549	1011	27	106	129	106	106	96
Arrive On Green	0.00	1.00	1.00	0.08	0.72	0.72	0.08	0.08	0.08	0.06	0.06	0.06
Sat Flow, veh/h	0	3555	107	3401	3554	1409	320	1267	1535	1753	1749	1585
Grp Volume(v), veh/h	0	524	546	207	1315	143	109	0	6	76	33	1
Grp Sat Flow(s),veh/h/ln	0	1749	1822	1700	1777	1409	1588	0	1535	1753	1749	1585
Q Serve(g_s), s	0.0	0.0	0.0	7.8	21.6	4.1	8.8	0.0	0.5	5.5	2.3	0.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	7.8	21.6	4.1	8.8	0.0	0.5	5.5	2.3	0.1
Prop In Lane	0.00		0.06	1.00		1.00	0.20		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	1052	1096	262	2549	1011	133	0	129	106	106	96
V/C Ratio(X)	0.00	0.50	0.50	0.79	0.52	0.14	0.82	0.00	0.05	0.72	0.31	0.01
Avail Cap(c_a), veh/h	0	1052	1096	523	2549	1011	293	0	283	324	323	293
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	58.9	8.2	5.8	58.6	0.0	54.8	60.0	58.5	57.4
Incr Delay (d2), s/veh	0.0	1.7	1.6	2.0	0.7	0.3	4.7	0.0	0.1	3.4	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.5	0.5	3.4	7.7	1.2	3.7	0.0	0.2	2.6	1.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	1.7	1.6	61.0	9.0	6.1	63.3	0.0	54.8	63.4	59.1	57.4
LnGrp LOS	A	A	A	E	A	A	E	A	D	E	E	E
Approach Vol, veh/h		1070			1665			115			110	
Approach Delay, s/veh		1.7			15.2			62.8			62.0	
Approach LOS		A			B			E			E	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		99.3		13.8	15.0	84.2		16.9				
Change Period (Y+Rc), s		6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s		64.0		24.0	20.0	39.0		24.0				
Max Q Clear Time (g_c+I1), s		23.6		7.5	9.8	2.0		10.8				
Green Ext Time (p_c), s		25.5		0.3	0.3	16.8		0.3				

Intersection Summary	
HCM 6th Ctrl Delay	13.9
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	110	10	25	10	10	5	20	150	10	5	75	65
Future Vol, veh/h	110	10	25	10	10	5	20	150	10	5	75	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	0	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	13	2	5	58	29	100	6	25	50	50	37	7
Mvmt Flow	120	11	27	11	11	5	22	163	11	5	82	71

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	313	310	-	311	305	169	82	0	0	174	0	0
Stage 1	92	92	-	213	213	-	-	-	-	-	-	-
Stage 2	221	218	-	98	92	-	-	-	-	-	-	-
Critical Hdwy	7.23	6.52	-	7.68	6.79	7.2	4.16	-	-	4.6	-	-
Critical Hdwy Stg 1	6.23	5.52	-	6.68	5.79	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.23	5.52	-	6.68	5.79	-	-	-	-	-	-	-
Follow-up Hdwy	3.617	4.018	-	4.022	4.261	4.2	2.254	-	-	2.65	-	-
Pot Cap-1 Maneuver	619	605	0	546	566	674	1490	-	-	1159	-	-
Stage 1	889	819	0	677	679	-	-	-	-	-	-	-
Stage 2	757	723	0	788	769	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	595	592	-	530	554	674	1490	-	-	1159	-	-
Mov Cap-2 Maneuver	595	592	-	530	554	-	-	-	-	-	-	-
Stage 1	875	815	-	666	668	-	-	-	-	-	-	-
Stage 2	727	711	-	774	765	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.7	11.7	0.8	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1490	-	-	595	-	564	1159	-	-
HCM Lane V/C Ratio	0.015	-	-	0.219	-	0.048	0.005	-	-
HCM Control Delay (s)	7.5	0	-	12.7	0	11.7	8.1	0	-
HCM Lane LOS	A	A	-	B	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.8	-	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	25	235	135	5
Future Vol, veh/h	0	0	25	235	135	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	35
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	100	10	20	100
Mvmt Flow	0	0	27	255	147	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	459	76	152	0	-	0
Stage 1	150	-	-	-	-	-
Stage 2	309	-	-	-	-	-
Critical Hdwy	6.63	6.93	5.6	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	3.15	-	-	-
Pot Cap-1 Maneuver	545	970	964	-	-	-
Stage 1	863	-	-	-	-	-
Stage 2	744	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	527	970	964	-	-	-
Mov Cap-2 Maneuver	527	-	-	-	-	-
Stage 1	835	-	-	-	-	-
Stage 2	744	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0.9	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	964	-	-	-	-
HCM Lane V/C Ratio	0.028	-	-	-	-
HCM Control Delay (s)	8.8	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-	-

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
1: Kane Street/Kahului Beach Road & Kaahumanu Ave — 09/17/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	1080	95	65	820	1210	60	150	70	950	170	110
Future Volume (veh/h)	55	1080	95	65	820	1210	60	150	70	950	170	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1841	1856	1856	1870	1856	1870	1856	1870	1870
Adj Flow Rate, veh/h	60	1174	0	71	891	0	65	163	0	1165	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	3	4	3	3	2	3	2	3	2	2
Cap, veh/h	77	1281		91	1300		172	179		1214	0	
Arrive On Green	0.04	0.36	0.00	0.02	0.12	0.00	0.10	0.10	0.00	0.34	0.00	0.00
Sat Flow, veh/h	1781	3554	1572	1753	3526	1572	1781	1856	1585	3534	0	1585
Grp Volume(v), veh/h	60	1174	0	71	891	0	65	163	0	1165	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1572	1753	1763	1572	1781	1856	1585	1767	0	1585
Q Serve(g_s), s	4.5	42.6	0.0	5.4	32.7	0.0	4.6	11.7	0.0	43.6	0.0	0.0
Cycle Q Clear(g_c), s	4.5	42.6	0.0	5.4	32.7	0.0	4.6	11.7	0.0	43.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	77	1281		91	1300		172	179		1214	0	
V/C Ratio(X)	0.78	0.92		0.78	0.69		0.38	0.91		0.96	0.00	
Avail Cap(c_a), veh/h	172	1281		169	1300		172	179		1230	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.75	0.75	0.00	1.00	1.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	63.9	41.2	0.0	65.6	51.8	0.0	57.2	60.4	0.0	43.4	0.0	0.0
Incr Delay (d2), s/veh	15.2	11.8	0.0	10.5	2.2	0.0	1.4	43.2	0.0	16.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	20.4	0.0	2.8	15.9	0.0	2.2	7.7	0.0	21.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.1	53.0	0.0	76.1	54.0	0.0	58.6	103.6	0.0	60.2	0.0	0.0
LnGrp LOS	E	D		E	D		E	F		E	A	
Approach Vol, veh/h		1234	A		962	A		228	A		1165	A
Approach Delay, s/veh		54.3			55.6			90.8			60.2	
Approach LOS		D			E			F			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.9	55.8		51.4	11.0	54.6		18.0				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	13.0	42.0		47.0	13.0	42.0		13.0				
Max Q Clear Time (g_c+I1), s	6.5	34.7		45.6	7.4	44.6		13.7				
Green Ext Time (p_c), s	0.0	3.4		0.8	0.1	0.0		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	58.9
HCM 6th LOS	E

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
2: Maui Mall Dwy/Wharf Street & Kaahumanu Ave — 09/17/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1395	130	70	1350	10	115	5	60	15	5	25
Future Volume (veh/h)	5	1395	130	70	1350	10	115	5	60	15	5	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1856	1856	1870	1870	1870	1870	1870	1292
Adj Flow Rate, veh/h	5	1516	100	76	1467	11	125	5	4	16	5	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	3	3	2	2	2	2	2	41
Cap, veh/h	11	2628	1171	97	4084	31	202	99	79	158	43	112
Arrive On Green	0.01	1.00	1.00	0.05	0.79	0.79	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	1781	3554	1584	1781	5187	39	1411	961	769	1084	423	1095
Grp Volume(v), veh/h	5	1516	100	76	955	523	125	0	9	21	0	2
Grp Sat Flow(s),veh/h/ln	1781	1777	1584	1781	1689	1849	1411	0	1729	1507	0	1095
Q Serve(g_s), s	0.4	0.0	0.0	5.7	11.3	11.3	9.7	0.0	0.6	0.9	0.0	0.2
Cycle Q Clear(g_c), s	0.4	0.0	0.0	5.7	11.3	11.3	11.3	0.0	0.6	1.6	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.02	1.00		0.44	0.76		1.00
Lane Grp Cap(c), veh/h	11	2628	1171	97	2659	1456	202	0	177	202	0	112
V/C Ratio(X)	0.44	0.58	0.09	0.79	0.36	0.36	0.62	0.00	0.05	0.10	0.00	0.02
Avail Cap(c_a), veh/h	211	2628	1171	211	2659	1456	350	0	359	358	0	227
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.09	0.09	0.09	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	66.4	0.0	0.0	63.1	4.3	4.3	59.3	0.0	54.7	55.0	0.0	54.5
Incr Delay (d2), s/veh	2.4	0.1	0.0	13.1	0.4	0.7	3.1	0.0	0.1	0.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	2.9	3.4	3.8	4.4	0.0	0.3	0.7	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.9	0.1	0.0	76.1	4.6	4.9	62.3	0.0	54.8	55.3	0.0	54.5
LnGrp LOS	E	A	A	E	A	A	E	A	D	E	A	D
Approach Vol, veh/h		1621			1554			134			23	
Approach Delay, s/veh		0.3			8.2			61.8			55.2	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	111.3		18.8	11.3	104.8		18.8				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	16.0	77.0		28.0	16.0	77.0		28.0				
Max Q Clear Time (g_c+I1), s	2.4	13.3		3.6	7.7	2.0		13.3				
Green Ext Time (p_c), s	0.0	32.7		0.1	0.1	43.2		0.3				

Intersection Summary	
HCM 6th Ctrl Delay	6.8
HCM 6th LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	125	1340	1295	5	0	170
Future Vol, veh/h	125	1340	1295	5	0	170
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	Free	-	Free
Storage Length	400	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	2	2	11
Mvmt Flow	136	1457	1408	5	0	185

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1408	0	-	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.16	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.23	-	-	-	-	-
Pot Cap-1 Maneuver	475	-	-	0	0	0
Stage 1	-	-	-	0	0	0
Stage 2	-	-	-	0	0	0
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	475	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	475	-	-	-
HCM Lane V/C Ratio	0.286	-	-	-
HCM Control Delay (s)	15.6	-	-	0
HCM Lane LOS	C	-	-	A
HCM 95th %tile Q(veh)	1.2	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1325	50	270	1250	160	60	80	385	120	105	30
Future Volume (veh/h)	0	1325	50	270	1250	160	60	80	385	120	105	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	1767	1811	1811	1870	1870	1870	1781
Adj Flow Rate, veh/h	0	1440	52	293	1359	122	65	87	47	130	114	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	9	6	6	2	2	2	8
Cap, veh/h	0	1864	67	349	2384	1004	78	104	162	167	166	140
Arrive On Green	0.00	1.00	1.00	0.10	0.67	0.67	0.10	0.10	0.10	0.09	0.09	0.09
Sat Flow, veh/h	0	3592	126	3456	3554	1497	758	1015	1585	1781	1777	1495
Grp Volume(v), veh/h	0	730	762	293	1359	122	152	0	47	130	114	1
Grp Sat Flow(s),veh/h/ln	0	1777	1848	1728	1777	1497	1773	0	1585	1781	1777	1495
Q Serve(g_s), s	0.0	0.0	0.0	11.2	27.5	3.9	11.4	0.0	3.7	9.6	8.4	0.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	11.2	27.5	3.9	11.4	0.0	3.7	9.6	8.4	0.1
Prop In Lane	0.00		0.07	1.00		1.00	0.43		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	947	985	349	2384	1004	181	0	162	167	166	140
V/C Ratio(X)	0.00	0.77	0.77	0.84	0.57	0.12	0.84	0.00	0.29	0.78	0.69	0.01
Avail Cap(c_a), veh/h	0	947	985	563	2384	1004	315	0	282	317	316	266
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	59.6	11.8	8.0	59.5	0.0	56.1	59.8	59.3	55.5
Incr Delay (d2), s/veh	0.0	6.0	5.9	3.1	1.0	0.2	3.9	0.0	0.4	3.0	1.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.6	1.6	5.0	10.5	1.3	5.3	0.0	1.5	4.5	3.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	6.0	5.9	62.7	12.8	8.2	63.4	0.0	56.4	62.8	61.1	55.5
LnGrp LOS	A	A	A	E	B	A	E	A	E	E	E	E
Approach Vol, veh/h		1492			1774			199			245	
Approach Delay, s/veh		6.0			20.8			61.8			62.0	
Approach LOS		A			C			E			E	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		96.6		18.6	18.6	77.9		19.8				
Change Period (Y+Rc), s		6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s		69.0		24.0	22.0	42.0		24.0				
Max Q Clear Time (g_c+I1), s		29.5		11.6	13.2	2.0		13.4				
Green Ext Time (p_c), s		25.8		0.7	0.4	27.0		0.5				

Intersection Summary		
HCM 6th Ctrl Delay		19.7
HCM 6th LOS		B

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	95	5	25	5	5	0	45	180	5	0	175	115
Future Vol, veh/h	95	5	25	5	5	0	45	180	5	0	175	115
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	0	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	4	25	2	2	2	2	21	7	2	2	3	5
Mvmt Flow	103	5	27	5	5	0	49	196	5	0	190	125

Major/Minor	Minor2			Minor1				Major1			Major2	
Conflicting Flow All	489	489	-	490	487	199	190	0	0	201	0	0
Stage 1	190	190	-	297	297	-	-	-	-	-	-	-
Stage 2	299	299	-	193	190	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.75	-	7.12	6.52	6.22	4.31	-	-	4.12	-	-
Critical Hdwy Stg 1	6.14	5.75	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.75	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.225	-	3.518	4.018	3.318	2.389	-	-	2.218	-	-
Pot Cap-1 Maneuver	486	448	0	489	481	842	1278	-	-	1371	-	-
Stage 1	807	702	0	712	668	-	-	-	-	-	-	-
Stage 2	706	627	0	809	743	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	466	429	-	468	460	842	1278	-	-	1371	-	-
Mov Cap-2 Maneuver	466	429	-	468	460	-	-	-	-	-	-	-
Stage 1	772	702	-	681	639	-	-	-	-	-	-	-
Stage 2	670	600	-	803	743	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.1	12.9	1.6	0
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1278	-	-	464	-	464	1371	-	-
HCM Lane V/C Ratio	0.038	-	-	0.234	-	0.023	-	-	-
HCM Control Delay (s)	7.9	0	-	15.1	0	12.9	0	-	-
HCM Lane LOS	A	A	-	C	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.9	-	0.1	0	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	15	265	295	5
Future Vol, veh/h	0	0	15	265	295	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	35
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	25	5	4	2
Mvmt Flow	0	0	16	288	321	5

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	644	163	326	0	-	0
Stage 1	324	-	-	-	-	-
Stage 2	320	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.475	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.4375	-	-	-
Pot Cap-1 Maneuver	421	854	1098	-	-	-
Stage 1	706	-	-	-	-	-
Stage 2	735	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	414	854	1098	-	-	-
Mov Cap-2 Maneuver	414	-	-	-	-	-
Stage 1	694	-	-	-	-	-
Stage 2	735	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1098	-	-	-	-
HCM Lane V/C Ratio	0.015	-	-	-	-
HCM Control Delay (s)	8.3	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
1: Kane St/Kahului Beach Rd & Kaahumanu Ave — 09/17/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	790	65	15	855	930	40	100	25	1000	165	85
Future Volume (veh/h)	40	790	65	15	855	930	40	100	25	1000	165	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1856	1841	1870	1870	1856	1870	1870	1678	1841	1811	1811
Adj Flow Rate, veh/h	43	859	0	16	929	0	43	109	0	1215	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	3	4	2	2	3	2	2	15	4	6	6
Cap, veh/h	55	1383		19	1319		134	141		1289	0	
Arrive On Green	0.03	0.39	0.00	0.00	0.12	0.00	0.08	0.08	0.00	0.37	0.00	0.00
Sat Flow, veh/h	1725	3526	1560	1781	3554	1572	1781	1870	1422	3506	0	1535
Grp Volume(v), veh/h	43	859	0	16	929	0	43	109	0	1215	0	0
Grp Sat Flow(s),veh/h/ln	1725	1763	1560	1781	1777	1572	1781	1870	1422	1753	0	1535
Q Serve(g_s), s	3.2	25.4	0.0	1.2	32.6	0.0	3.0	7.4	0.0	43.6	0.0	0.0
Cycle Q Clear(g_c), s	3.2	25.4	0.0	1.2	32.6	0.0	3.0	7.4	0.0	43.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	55	1383		19	1319		134	141		1289	0	
V/C Ratio(X)	0.78	0.62		0.84	0.70		0.32	0.77		0.94	0.00	
Avail Cap(c_a), veh/h	133	1383		137	1319		260	273		1349	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.81	0.81	0.00	1.00	1.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	62.5	31.7	0.0	64.7	50.2	0.0	56.9	59.0	0.0	39.8	0.0	0.0
Incr Delay (d2), s/veh	21.2	2.1	0.0	50.6	2.6	0.0	1.4	8.7	0.0	12.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	11.1	0.0	0.8	16.1	0.0	1.4	3.9	0.0	20.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	83.7	33.8	0.0	115.3	52.8	0.0	58.3	67.7	0.0	52.7	0.0	0.0
LnGrp LOS	F	C		F	D		E	E		D	A	
Approach Vol, veh/h		902	A		945	A		152	A		1215	A
Approach Delay, s/veh		36.2			53.8			65.0			52.7	
Approach LOS		D			D			E			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	54.3		52.8	5.4	57.0		14.8				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	10.0	31.0		50.0	10.0	31.0		19.0				
Max Q Clear Time (g_c+I1), s	5.2	34.6		45.6	3.2	27.4		9.4				
Green Ext Time (p_c), s	0.0	0.0		2.2	0.0	1.8		0.4				

Intersection Summary	
HCM 6th Ctrl Delay	49.0
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
2: Maui Mall Dwy/Wharf St & Kaahumanu Ave — 09/17/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	1050	55	40	1260	5	45	10	10	15	0	10
Future Volume (veh/h)	10	1050	55	40	1260	5	45	10	10	15	0	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1856	1870	1870	1870	1870	1870	1648	1648	1870	1870	1455
Adj Flow Rate, veh/h	11	1141	45	43	1370	5	49	11	1	16	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	3	2	2	2	2	2	17	17	2	2	30
Cap, veh/h	22	2884	1296	56	4394	16	123	64	6	106	0	53
Arrive On Green	0.03	1.00	1.00	0.03	0.84	0.84	0.04	0.04	0.04	0.04	0.00	0.04
Sat Flow, veh/h	1781	3526	1585	1781	5252	19	1418	1488	135	1170	0	1233
Grp Volume(v), veh/h	11	1141	45	43	888	487	49	0	12	16	0	1
Grp Sat Flow(s),veh/h/ln	1781	1763	1585	1781	1702	1867	1418	0	1624	1170	0	1233
Q Serve(g_s), s	0.8	0.0	0.0	3.1	7.5	7.5	1.5	0.0	0.9	1.4	0.0	0.1
Cycle Q Clear(g_c), s	0.8	0.0	0.0	3.1	7.5	7.5	3.8	0.0	0.9	2.4	0.0	0.1
Prop In Lane	1.00		1.00	1.00		0.01	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	22	2884	1296	56	2848	1562	123	0	70	106	0	53
V/C Ratio(X)	0.49	0.40	0.03	0.77	0.31	0.31	0.40	0.00	0.17	0.15	0.00	0.02
Avail Cap(c_a), veh/h	123	2884	1296	247	2848	1562	367	0	350	347	0	266
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.69	0.69	0.69	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	62.9	0.0	0.0	62.5	2.3	2.3	61.2	0.0	60.0	61.1	0.0	59.6
Incr Delay (d2), s/veh	10.9	0.3	0.0	19.7	0.3	0.5	2.1	0.0	1.1	0.7	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.1	0.0	1.7	1.8	2.1	1.7	0.0	0.4	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.9	0.3	0.0	82.2	2.6	2.9	63.3	0.0	61.1	61.8	0.0	59.7
LnGrp LOS	E	A	A	F	A	A	E	A	E	E	A	E
Approach Vol, veh/h		1197			1418			61			17	
Approach Delay, s/veh		0.9			5.1			62.9			61.6	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	113.8		10.6	8.1	111.3		10.6				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	9.6	79.0		28.0	18.0	70.0		28.0				
Max Q Clear Time (g_c+I1), s	2.8	9.5		4.4	5.1	2.0		5.8				
Green Ext Time (p_c), s	0.0	30.3		0.0	0.0	25.5		0.1				

Intersection Summary	
HCM 6th Ctrl Delay	4.9
HCM 6th LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	150	970	1315	10	0	100
Future Vol, veh/h	150	970	1315	10	0	100
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	Free	-	Free
Storage Length	400	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	4	2	29	2	9
Mvmt Flow	163	1054	1429	11	0	109

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1429	0	-	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.24	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.27	-	-	-	-	-
Pot Cap-1 Maneuver	447	-	-	0	0	0
Stage 1	-	-	-	0	0	0
Stage 2	-	-	-	0	0	0
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	447	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	2.4	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	447	-	-	-
HCM Lane V/C Ratio	0.365	-	-	-
HCM Control Delay (s)	17.6	-	-	0
HCM Lane LOS	C	-	-	A
HCM 95th %tile Q(veh)	1.6	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	955	30	190	1210	185	20	85	215	75	30	5
Future Volume (veh/h)	0	955	30	190	1210	185	20	85	215	75	30	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1841	1841	1841	1870	1663	1604	1604	1811	1841	1841	1870
Adj Flow Rate, veh/h	0	1038	32	207	1315	146	22	92	6	82	33	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	4	4	4	2	16	20	20	6	4	4	2
Cap, veh/h	0	2064	64	262	2529	1003	27	112	134	110	110	100
Arrive On Green	0.00	1.00	1.00	0.08	0.71	0.71	0.09	0.09	0.09	0.06	0.06	0.06
Sat Flow, veh/h	0	3555	107	3401	3554	1409	307	1282	1535	1753	1749	1585
Grp Volume(v), veh/h	0	524	546	207	1315	146	114	0	6	82	33	1
Grp Sat Flow(s),veh/h/ln	0	1749	1822	1700	1777	1409	1588	0	1535	1753	1749	1585
Q Serve(g_s), s	0.0	0.0	0.0	7.8	22.0	4.3	9.2	0.0	0.5	6.0	2.3	0.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	7.8	22.0	4.3	9.2	0.0	0.5	6.0	2.3	0.1
Prop In Lane	0.00		0.06	1.00		1.00	0.19		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	1042	1085	262	2529	1003	138	0	134	110	110	100
V/C Ratio(X)	0.00	0.50	0.50	0.79	0.52	0.15	0.82	0.00	0.04	0.74	0.30	0.01
Avail Cap(c_a), veh/h	0	1042	1085	523	2529	1003	293	0	283	324	323	293
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	58.9	8.6	6.0	58.4	0.0	54.4	59.9	58.2	57.1
Incr Delay (d2), s/veh	0.0	1.7	1.7	2.0	0.8	0.3	4.6	0.0	0.1	3.7	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.5	0.5	3.4	7.9	1.3	3.9	0.0	0.2	2.8	1.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	1.7	1.7	61.0	9.4	6.3	63.0	0.0	54.4	63.6	58.7	57.1
LnGrp LOS	A	A	A	E	A	A	E	A	D	E	E	E
Approach Vol, veh/h		1070			1668			120			116	
Approach Delay, s/veh		1.7			15.5			62.6			62.1	
Approach LOS		A			B			E			E	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		98.5		14.2	15.0	83.5		17.3				
Change Period (Y+Rc), s		6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s		64.0		24.0	20.0	39.0		24.0				
Max Q Clear Time (g_c+I1), s		24.0		8.0	9.8	2.0		11.2				
Green Ext Time (p_c), s		25.4		0.3	0.3	16.8		0.3				

Intersection Summary	
HCM 6th Ctrl Delay	14.2
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	110	10	25	10	10	5	20	160	10	5	75	75
Future Vol, veh/h	110	10	25	10	10	5	20	160	10	5	75	75
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	0	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	13	2	5	58	29	100	6	25	50	50	37	7
Mvmt Flow	120	11	27	11	11	5	22	174	11	5	82	82

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	324	321	-	322	316	180	82	0	0	185	0	0
Stage 1	92	92	-	224	224	-	-	-	-	-	-	-
Stage 2	232	229	-	98	92	-	-	-	-	-	-	-
Critical Hdwy	7.23	6.52	-	7.68	6.79	7.2	4.16	-	-	4.6	-	-
Critical Hdwy Stg 1	6.23	5.52	-	6.68	5.79	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.23	5.52	-	6.68	5.79	-	-	-	-	-	-	-
Follow-up Hdwy	3.617	4.018	-	4.022	4.261	4.2	2.254	-	-	2.65	-	-
Pot Cap-1 Maneuver	608	596	0	536	558	663	1490	-	-	1147	-	-
Stage 1	889	819	0	668	671	-	-	-	-	-	-	-
Stage 2	747	715	0	788	769	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	584	583	-	520	546	663	1490	-	-	1147	-	-
Mov Cap-2 Maneuver	584	583	-	520	546	-	-	-	-	-	-	-
Stage 1	875	815	-	657	660	-	-	-	-	-	-	-
Stage 2	717	704	-	774	765	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.9	11.8	0.8	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1490	-	-	584	-	554	1147	-	-
HCM Lane V/C Ratio	0.015	-	-	0.223	-	0.049	0.005	-	-
HCM Control Delay (s)	7.5	0	-	12.9	0	11.8	8.2	0	-
HCM Lane LOS	A	A	-	B	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.8	-	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	25	245	145	5
Future Vol, veh/h	0	0	25	245	145	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	35
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	100	10	20	100
Mvmt Flow	0	0	27	266	158	5

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	481	82	163	0	-	0
Stage 1	161	-	-	-	-	-
Stage 2	320	-	-	-	-	-
Critical Hdwy	6.63	6.93	5.6	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	3.15	-	-	-
Pot Cap-1 Maneuver	529	962	952	-	-	-
Stage 1	852	-	-	-	-	-
Stage 2	735	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	512	962	952	-	-	-
Mov Cap-2 Maneuver	512	-	-	-	-	-
Stage 1	824	-	-	-	-	-
Stage 2	735	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	952	-	-	-	-
HCM Lane V/C Ratio	0.029	-	-	-	-
HCM Control Delay (s)	8.9	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-	-

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
1: Kane Street/Kahului Beach Road & Kaahumanu Ave — 09/17/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	1080	95	65	825	1210	60	150	70	950	170	110
Future Volume (veh/h)	55	1080	95	65	825	1210	60	150	70	950	170	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1841	1856	1856	1870	1856	1870	1856	1870	1870
Adj Flow Rate, veh/h	60	1174	0	71	897	0	65	163	0	1165	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	3	4	3	3	2	3	2	3	2	2
Cap, veh/h	77	1281		91	1300		172	179		1214	0	
Arrive On Green	0.04	0.36	0.00	0.02	0.12	0.00	0.10	0.10	0.00	0.34	0.00	0.00
Sat Flow, veh/h	1781	3554	1572	1753	3526	1572	1781	1856	1585	3534	0	1585
Grp Volume(v), veh/h	60	1174	0	71	897	0	65	163	0	1165	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1572	1753	1763	1572	1781	1856	1585	1767	0	1585
Q Serve(g_s), s	4.5	42.6	0.0	5.4	32.9	0.0	4.6	11.7	0.0	43.6	0.0	0.0
Cycle Q Clear(g_c), s	4.5	42.6	0.0	5.4	32.9	0.0	4.6	11.7	0.0	43.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	77	1281		91	1300		172	179		1214	0	
V/C Ratio(X)	0.78	0.92		0.78	0.69		0.38	0.91		0.96	0.00	
Avail Cap(c_a), veh/h	172	1281		169	1300		172	179		1230	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.75	0.75	0.00	1.00	1.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	63.9	41.2	0.0	65.6	51.9	0.0	57.2	60.4	0.0	43.4	0.0	0.0
Incr Delay (d2), s/veh	15.2	11.8	0.0	10.5	2.3	0.0	1.4	43.2	0.0	16.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	20.4	0.0	2.8	16.0	0.0	2.2	7.7	0.0	21.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.1	53.0	0.0	76.1	54.2	0.0	58.6	103.6	0.0	60.2	0.0	0.0
LnGrp LOS	E	D		E	D		E	F		E	A	
Approach Vol, veh/h		1234	A		968	A		228	A		1165	A
Approach Delay, s/veh		54.3			55.8			90.8			60.2	
Approach LOS		D			E			F			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.9	55.8		51.4	11.0	54.6		18.0				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	13.0	42.0		47.0	13.0	42.0		13.0				
Max Q Clear Time (g_c+I1), s	6.5	34.9		45.6	7.4	44.6		13.7				
Green Ext Time (p_c), s	0.0	3.3		0.8	0.1	0.0		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	58.9
HCM 6th LOS	E

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary — Hawaiian Cement Kahului Harbor
2: Maui Mall Dwy/Wharf Street & Kaahumanu Ave — 09/17/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1395	130	70	1360	10	115	5	60	15	5	25
Future Volume (veh/h)	5	1395	130	70	1360	10	115	5	60	15	5	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1856	1856	1870	1870	1870	1870	1870	1292
Adj Flow Rate, veh/h	5	1516	100	76	1478	11	125	5	4	16	5	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	3	3	2	2	2	2	2	41
Cap, veh/h	11	2628	1171	97	4084	30	202	99	79	158	43	112
Arrive On Green	0.01	1.00	1.00	0.05	0.79	0.79	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	1781	3554	1584	1781	5187	39	1411	961	769	1084	423	1095
Grp Volume(v), veh/h	5	1516	100	76	962	527	125	0	9	21	0	2
Grp Sat Flow(s),veh/h/ln	1781	1777	1584	1781	1689	1849	1411	0	1729	1507	0	1095
Q Serve(g_s), s	0.4	0.0	0.0	5.7	11.4	11.4	9.7	0.0	0.6	0.9	0.0	0.2
Cycle Q Clear(g_c), s	0.4	0.0	0.0	5.7	11.4	11.4	11.3	0.0	0.6	1.6	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.02	1.00		0.44	0.76		1.00
Lane Grp Cap(c), veh/h	11	2628	1171	97	2659	1456	202	0	177	202	0	112
V/C Ratio(X)	0.44	0.58	0.09	0.79	0.36	0.36	0.62	0.00	0.05	0.10	0.00	0.02
Avail Cap(c_a), veh/h	211	2628	1171	211	2659	1456	350	0	359	358	0	227
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.09	0.09	0.09	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	66.4	0.0	0.0	63.1	4.3	4.3	59.3	0.0	54.7	55.0	0.0	54.5
Incr Delay (d2), s/veh	2.4	0.1	0.0	13.1	0.4	0.7	3.1	0.0	0.1	0.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	2.9	3.4	3.9	4.4	0.0	0.3	0.7	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.9	0.1	0.0	76.1	4.6	5.0	62.3	0.0	54.8	55.3	0.0	54.5
LnGrp LOS	E	A	A	E	A	A	E	A	D	E	A	D
Approach Vol, veh/h		1621			1565			134			23	
Approach Delay, s/veh		0.3			8.2			61.8			55.2	
Approach LOS		A			A			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	111.3		18.8	11.3	104.8		18.8				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	16.0	77.0		28.0	16.0	77.0		28.0				
Max Q Clear Time (g_c+I1), s	2.4	13.4		3.6	7.7	2.0		13.3				
Green Ext Time (p_c), s	0.0	33.1		0.1	0.1	43.2		0.3				

Intersection Summary	
HCM 6th Ctrl Delay	6.9
HCM 6th LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	125	1340	1295	5	0	180
Future Vol, veh/h	125	1340	1295	5	0	180
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	Free	-	Free
Storage Length	400	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	2	2	11
Mvmt Flow	136	1457	1408	5	0	196

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1408	0	-	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.16	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.23	-	-	-	-	-
Pot Cap-1 Maneuver	475	-	-	0	0	0
Stage 1	-	-	-	0	0	0
Stage 2	-	-	-	0	0	0
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	475	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	475	-	-	-
HCM Lane V/C Ratio	0.286	-	-	-
HCM Control Delay (s)	15.6	-	-	0
HCM Lane LOS	C	-	-	A
HCM 95th %tile Q(veh)	1.2	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1325	50	270	1250	165	60	85	385	125	105	30
Future Volume (veh/h)	0	1325	50	270	1250	165	60	85	385	125	105	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	1767	1811	1811	1870	1870	1870	1781
Adj Flow Rate, veh/h	0	1440	52	293	1359	125	65	92	53	136	114	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	9	6	6	2	2	2	8
Cap, veh/h	0	1843	66	349	2363	995	77	109	167	172	172	145
Arrive On Green	0.00	1.00	1.00	0.10	0.66	0.66	0.11	0.11	0.11	0.10	0.10	0.10
Sat Flow, veh/h	0	3592	126	3456	3554	1497	735	1040	1585	1781	1777	1496
Grp Volume(v), veh/h	0	730	762	293	1359	125	157	0	53	136	114	1
Grp Sat Flow(s),veh/h/ln	0	1777	1848	1728	1777	1497	1774	0	1585	1781	1777	1496
Q Serve(g_s), s	0.0	0.0	0.0	11.2	28.0	4.1	11.7	0.0	4.2	10.1	8.4	0.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	11.2	28.0	4.1	11.7	0.0	4.2	10.1	8.4	0.1
Prop In Lane	0.00		0.07	1.00		1.00	0.41		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	936	974	349	2363	995	187	0	167	172	172	145
V/C Ratio(X)	0.00	0.78	0.78	0.84	0.58	0.13	0.84	0.00	0.32	0.79	0.66	0.01
Avail Cap(c_a), veh/h	0	936	974	563	2363	995	315	0	282	317	316	266
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	59.6	12.3	8.3	59.3	0.0	55.9	59.6	58.9	55.1
Incr Delay (d2), s/veh	0.0	6.4	6.3	3.1	1.0	0.3	3.9	0.0	0.4	3.0	1.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.7	1.7	5.0	10.8	1.4	5.5	0.0	1.7	4.7	3.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	6.4	6.3	62.7	13.3	8.5	63.2	0.0	56.3	62.7	60.5	55.1
LnGrp LOS	A	A	A	E	B	A	E	A	E	E	E	E
Approach Vol, veh/h		1492			1777			210			251	
Approach Delay, s/veh		6.3			21.1			61.5			61.7	
Approach LOS		A			C			E			E	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		95.8		19.1	18.6	77.1		20.2				
Change Period (Y+Rc), s		6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s		69.0		24.0	22.0	42.0		24.0				
Max Q Clear Time (g_c+I1), s		30.0		12.1	13.2	2.0		13.7				
Green Ext Time (p_c), s		25.6		0.7	0.4	27.0		0.5				

Intersection Summary		
HCM 6th Ctrl Delay	20.2	
HCM 6th LOS	C	

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	95	5	25	5	5	0	45	190	5	0	180	125
Future Vol, veh/h	95	5	25	5	5	0	45	190	5	0	180	125
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	0	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	4	25	2	2	2	2	21	7	2	2	3	5
Mvmt Flow	103	5	27	5	5	0	49	207	5	0	196	136

Major/Minor	Minor2			Minor1				Major1			Major2	
Conflicting Flow All	506	506	-	507	504	210	196	0	0	212	0	0
Stage 1	196	196	-	308	308	-	-	-	-	-	-	-
Stage 2	310	310	-	199	196	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.75	-	7.12	6.52	6.22	4.31	-	-	4.12	-	-
Critical Hdwy Stg 1	6.14	5.75	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.75	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.225	-	3.518	4.018	3.318	2.389	-	-	2.218	-	-
Pot Cap-1 Maneuver	474	438	0	476	470	830	1271	-	-	1358	-	-
Stage 1	801	697	0	702	660	-	-	-	-	-	-	-
Stage 2	696	620	0	803	739	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	454	419	-	456	449	830	1271	-	-	1358	-	-
Mov Cap-2 Maneuver	454	419	-	456	449	-	-	-	-	-	-	-
Stage 1	766	697	-	671	631	-	-	-	-	-	-	-
Stage 2	660	593	-	797	739	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.5	13.2	1.5	0
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1271	-	-	452	-	452	1358	-	-
HCM Lane V/C Ratio	0.038	-	-	0.24	-	0.024	-	-	-
HCM Control Delay (s)	7.9	0	-	15.5	0	13.2	0	-	-
HCM Lane LOS	A	A	-	C	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.9	-	0.1	0	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	15	275	305	5
Future Vol, veh/h	0	0	15	275	305	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	35
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	25	5	4	2
Mvmt Flow	0	0	16	299	332	5

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	666	169	337	0	-	0
Stage 1	335	-	-	-	-	-
Stage 2	331	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.475	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.4375	-	-	-
Pot Cap-1 Maneuver	408	846	1087	-	-	-
Stage 1	697	-	-	-	-	-
Stage 2	727	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	401	846	1087	-	-	-
Mov Cap-2 Maneuver	401	-	-	-	-	-
Stage 1	684	-	-	-	-	-
Stage 2	727	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1087	-	-	-	-
HCM Lane V/C Ratio	0.015	-	-	-	-
HCM Control Delay (s)	8.4	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

APPENDIX

F

PRELIMINARY ENGINEERING REPORT AND DRAINAGE REPORT

PRELIMINARY ENGINEERING REPORT

for

KAHULUI HARBOR
HAWAIIAN CEMENT FACILITY RELOCATION

KAHULUI, MAUI, HAWAII
TMK: (2) 3-7-010:009 (POR)

Prepared for

Hawaiian Cement

Prepared by

SATO & ASSOCIATES, INC.
Consulting Engineers
2046 South King Street
Honolulu, Hawaii 96826

OCTOBER 2020

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A. Projected Domestic Water Demand Calculations
B. Projected Wastewater Flow Calculations
C. Runoff Calculation Summary
D. Drainage Plan

I. INTRODUCTION

This report provides a preliminary evaluation of the proposed relocation of the Hawaiian Cement facility at Kahului Harbor. Information on the existing conditions for drainage, water, sewer, and roadway conditions will be summarized. An overview of probable improvements needed to support the facility's new location will also be discussed.

II. PROPOSED PROJECT

Location

Hawaiian Cement currently operates out of Kahului Harbor at Pier 2. Due to the State of Hawaii, Department of Transportation, Harbors Division's Kahului Harbor Development Plan, the existing facility needs to relocate from its current location as soon as possible.

The new cement facility being planned will be situated on an adjacent parcel identified by TMK (2) 3-7-010:009 herein after referred to as the lot, currently owned by A&B Properties Hawaii. The facility would occupy approximately 25,000 square feet of the 10.5-acre lot near its northern property line. Bordering the proposed site to the North and West is Kahului Harbor. To the East lies the PAR Hawaii Tank farm and directly South of the project are abandoned warehouses used during HC&S sugar operations. See Exhibits 1 and 2.

Project Description

As envisioned, the new facility will include two 56-foot diameter by 90-foot high, bulk cement storage silos and a 1,750 square foot warehouse. Site improvements include 5 paved parking stalls, underground utilities (sewer, water, and fire protection), and landscaping. Access to the site will be off an existing entrance to the lot from Hobron Avenue.

III. EXISTING CONDITIONS

Topography and Site Conditions

The area where the new cement facility is proposed to be built is relatively flat with a gradual slope toward the west. Elevations range from a high of approximately 7.1 feet MSL near the eastern side of the site close to the PAR tank farm to approximately 6.5 feet toward the western end. The average elevation throughout the site is approximated to be 6.8 feet.

The proposed project site was originally used for loading of raw sugar and other sugar products. Once sugar production on the Island ended, activity at the site ceased. Many of the existing structures have deteriorated due to exposure to the environment and lack of maintenance and have already been demolished. Structures that remain are three abandoned warehouse buildings to the south, an old "roundhouse" building that has been converted into offices to the east close to Hobron Avenue, and an old Scale house room with an elevated covered conveyor belt that transverse a portion of the site to the north and west. Both the abandoned warehouses and the "roundhouse" building will not be impacted by the project. The Scale house and elevated conveyor belt is slated for demotion by others.

Because of the previous type of operations (industrial), the remaining areas of the site consists of deteriorated AC pavement. Where structures once existed, a compacted gravel layer with patches of grass/weeds exists. See Exhibit 5.

Flood Zone

According to the Federal Emergency Management Agency Flood Insurance Rate Map, the site is located in Coastal High Hazard Flood Zone VE with a base Flood Elevation (BFE) of 15.5 feet. As part of the project's entitlements, the applicant is in the process of obtaining a Flood Variance from the County of Maui. See Exhibit 6.

Roadways and Site Access

Vehicle access to the site will be via an existing paved access off of Hobron Avenue. The access which is located along the lot's southern boundary.

Drainage

As mentioned earlier in this report, the site consists of deteriorated pavement and graveled areas with patches of grass/weeds. Remnants of old buildings once used in support of the sugar loading operations are also located though out the property. Typical of older industrial areas, no improvements for capture of storm runoff were built on the site or in the immediate surrounding area.

Under the existing conditions described previously, the Hawaiian Cement site produces storm runoff at a rate of 2.0 cubic feet per second (cfs). Since the area is relatively flat, the runoff tends to pond around the site. During longer or heavy storm events, the runoff will sheet flow in a westerly direction into the harbor property eventually flowing into the ocean.

Water

According to the County of Maui, Department of Water Supply's "Fire Protection Water Distribution Map", there is an existing 6-inch ductile iron waterline that runs within the site near its western boundary with Kahului Harbor. The line is connected to a 12-inch waterline that originates at Wharf Street to the west and a 4-inch waterline that runs along Hobron Avenue to the east. See Exhibit 7. An existing fire hydrant (hydrant 582) is located on the eastern side of the lot, directly across Amala Street. Another hydrant (hydrant 757) is located to the east of the lot in the harbor property on Ala Luina Street.

Maui Department of Water Supply indicates a 1-inch water meter and a 2-inch water meter located along the southern boundary services the property.

Sewer

Based on research of available "As-built" drawings and discussions with the County of Maui's Wastewater Reclamation Division, it was determined that there is no available sewer connection to the lot. A County gravity sewer line exists on Wharf Street, but this line is too far from the site to be a viable connection point. The only other County lines near the site are force mains located to the south of the property and on Hobron Avenue. A private (State owned) sewer force main runs along Ala Luina Street in the harbor property to the east of the site. See Exhibit 8.

Electrical, Telephone, and Cable

The Maui Electric Company (MECO), Hawaiian Telcom, and Spectrum are the electrical, telephone and cable service providers for the Island of Maui. Existing overhead lines run though the site but will need to be relocated to make room for the propose site improvements.

IV. PROBABLE IMPROVEMENTS

Roadway

Access to the site will be via an existing paved access way off of Hobron Avenue. The access is located between the existing warehouse buildings.

Hobron Avenue which comes under the jurisdiction of the State is one of the major ingress/egress points into the harbor. The Hobron Avenue access to the harbor is mainly used for hauling of freight coming in or being shipped out of the Island. Since the road and surrounding highway already accommodates large trailers entering and exiting the harbor facility, no improvements are anticipated to be needed.

Domestic Water

The project's water demand, based on County of Maui, Department of Water Supply Guidelines, is estimated to be 3,500 gallons per day (see Appendix A). This estimate is based on lease land area. Water demand based on actual fixture count and landscape area will be submitted when applying for a building permit. The actual water demand is not expected to exceed 3,000 gallons per day. The required meter size is anticipated to be no larger than a 3/4-inch meter which has a flow of 30 gallons per minute.

Sewer

As previously stated, there is no sewer service connection point for the lot. The closest County gravity system is located on Wharf Street. Due to the distance from this existing sewer line to the proposed site, connection to this line is impractical. Other options would be to construct a private treatment system for the project or connecting to the private sewer system located in Ala Luina Street in the harbor property. Discussions with Engineers from the Harbor's Division have indicated that they would allow connection from the site into the force main via the existing lateral that serviced the old Harbor Division office.

Wastewater flow calculations estimate the project will generate an average flow of 150 gallons per day. See Appendix B - Projected Wastewater Flow.

Drainage

The new cement facility will consist of two storage silos and a warehouse that will be used for bagging and storage of the bagged concrete. Other improvements that will be built include parking areas, a paved truck access to the silos, and landscaping. The 25,000 sf site will include landscape areas totaling 10,000 sf.

Runoff generated from the developed site is estimated to be 1.61 cfs, a decrease of 0.39 cfs when compared to existing conditions. The site will be graded to direct most of the runoff into depressed landscape areas. When the amount of runoff exceeds the volume within the

landscaped areas, the runoff will sheet flow in a westerly direction off the site and into the ocean. A summary of existing and post development runoff calculations is shown in Appendix C. Existing and post development drainage patterns are shown in Appendix D.

Electrical, Telephone, and Cable

In order to construct the proposed improvements, existing power poles within the site will need to be relocated. The project's electrical engineer will need to work with Maui Electric Company to determine the best option for relocating the poles and for providing new electrical service to the site.

VI. REFERENCES

Federal Emergency Management Agency, Federal Insurance Administration. "Flood Insurance Rate Map", Maui County, Hawaii, effective October 12, 2018.

Title MC-15, Department of Public Works and Waste Management, County of Maui, Subtitle 01, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui.

Department of Water Supply, County of Maui. Fire Protection Water Distribution Map, "Kahului Town, Wailuku District."

EXHIBITS

1. *Vicinity Map*
2. *Location Map*
3. *Overall Site Plan*
4. *Site Plan*
5. *Existing Site Conditions*
6. *Flood Hazard Map*
7. *Fire Protection and Water Distribution Map*
8. *Sewer System Map*

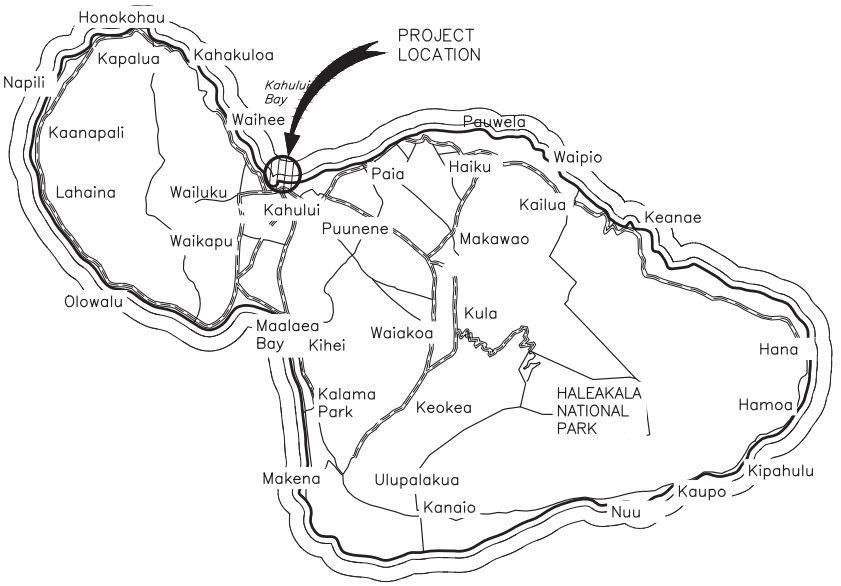
APPENDICES

A. *Projected Domestic Water Demand Calculations*

B. *Projected Wastewater Flow Calculations*

C. *Runoff Calculation Summary*

D. *Drainage Plan*



NORTH

□ICINITY MAP

SCALE: NONE

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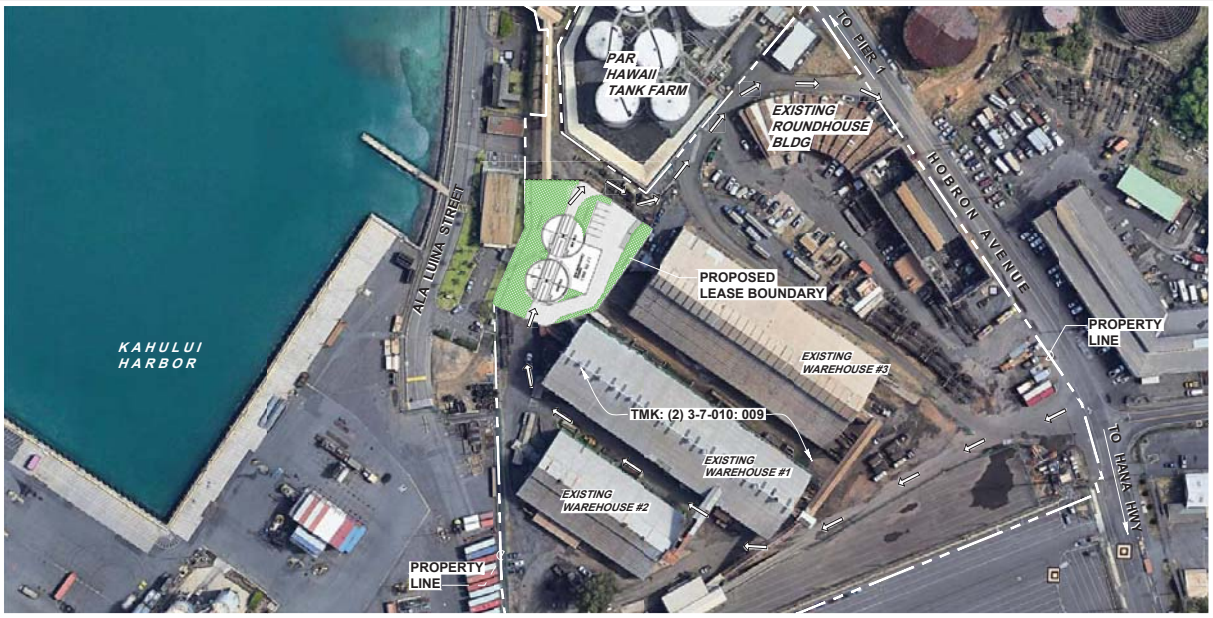
SATO AND ASSOCIATES, INC.
CONSULTING ENGINEERS CIVIL & STRUCTURAL
WAILUKU, MAUI • HONOLULU, OAHU

TM□ □2□3□□010: 00□ AND 003
□AHULUI, MAUI, HAWAII

EXHIBIT 1



OVERALL SITE PLAN

SCALE: 1" = 100'-0"

GRAPHIC SCALE: 1"=100'

100' 50' 0 100' 200' 300'

NORTH

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TMK (2) 3-7-010: 009 AND 003
KAHULUI, MAUI, HAWAII

EXHIBIT 3

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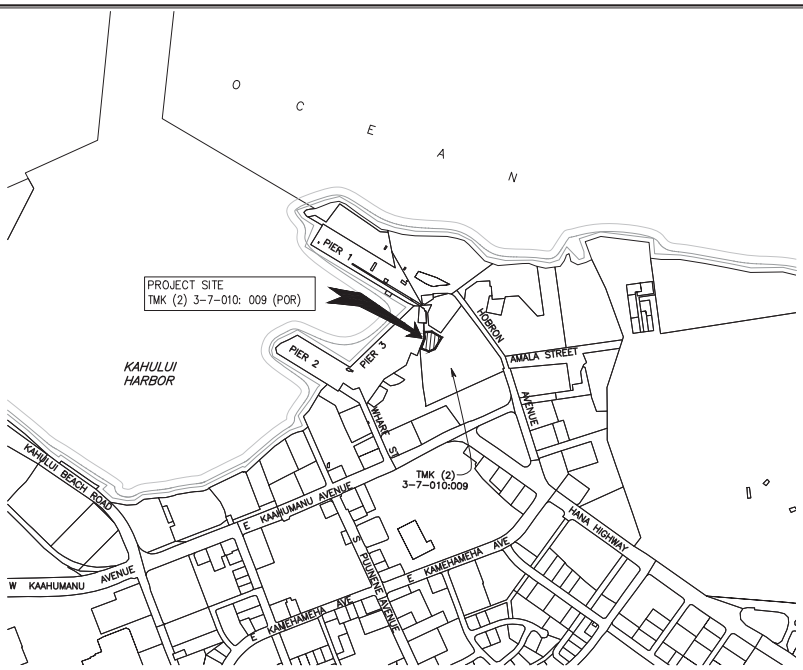

LOCATION MAP

SCALE: NONE

NORTH

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TM□ 2□3□010: 00□ AND 003
□AHULUI, MAUI, HAWAII

EXHIBIT 2

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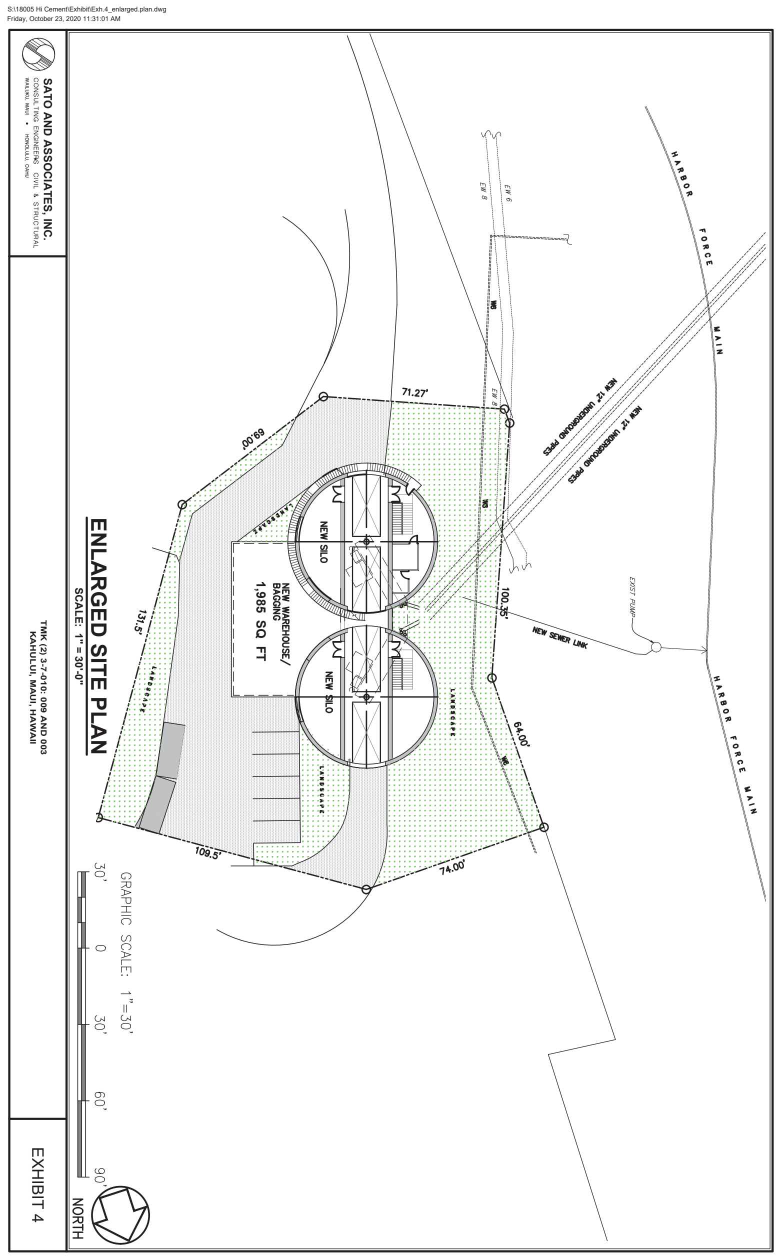
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ENLARGED SITE PLAN
SCALE: 1" = 30'-0"
TMK (2) 3-7-010: 009 AND 003
KAHULUI, MAUI, HAWAII
EXHIBIT 4
NEW WAREHOUSE/
BAGGING
1,985 SQ FT
NEW SILO
NEW SILO
HARBOR FORCE MAIN
HARBOR FORCE MAIN
NEW 12" UNDERGROUND PIPES
NEW 12" UNDERGROUND PIPES
NEW SEWER LINK
EXIST PUMP
71.27'
69.00'
131.5'
109.5'
74.00'
64.00'
100.35'
GRAPHIC SCALE: 1"=30'
30'
0
30'
60'
90'
NORTH

EXHIBIT 5

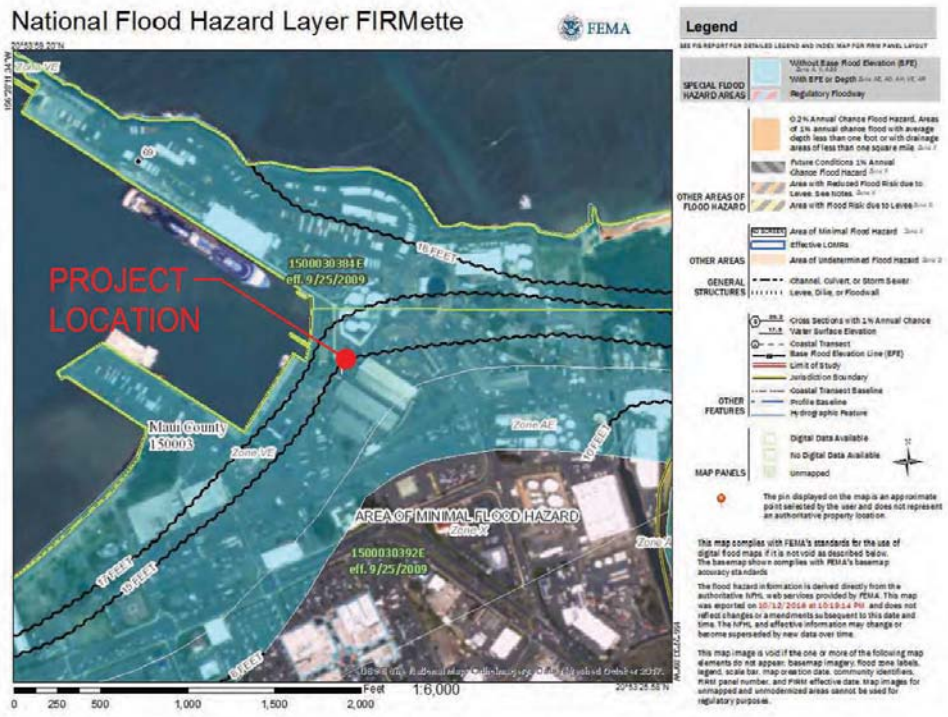


EXHIBIT 6

FLOOD HAZARD MAP

EXHIBIT 7

Fire Protection Water Distribution Map

Vicinity of Kahului Harbor

Red – County Gravity S.L.
Blue – County Force Main
Orange – Private

EXHIBIT 8

APPENDIX A

PROJECTED DOMESTIC WATER DEMAND
FOR
KAHULUI HARBOR HAWAIIAN CEMENT FACILITY RELOCATION
TMK: (2) 3-7-010:009 (POR)

OCTOBER 2020

Reference: Table 100-18 Domestic Consumption Guidelines
County of Maui, Department of Water Supply, Water System Standards, 2002

Conceptual Site Plan

Description: The project involves the construction of two new 56' diameter storage silos for storage of bulk cement that is barged in from Oahu and a 1,958 square foot warehouse for bagging and storage of bagged cement.

Estimated Domestic Water Demand

Use	Lot Area (SF)	Rate (GALS/SF/DAY)	Water Demand (GPD)
Industrial	25,216	140 GAL/1,000 SF/DAY	3,500
Total	25,216		**3,500**

APPENDIX B

PROJECTED WASTEWATER FLOW
FOR
KAHULUI HARBOR HAWAIIAN CEMENT FACILITY RELOCATION
TMK: (2) 3-7-010:009 (POR)

OCTOBER 2020

Reference: County of Maui, Department of Environmental Management, Wastewater Reclamation Division, Wastewater Flow Standards, February 2, 2006

Conceptual Site Plan

Description: The project involves the construction of two new 56' diameter storage silos for storage of bulk cement that is barged in from Oahu and a 1,958 square foot warehouse for bagging and storage of bagged cement.

Estimated Wastewater Flow

Use	Area (SF)	Persons/SF	Contribution gal/person/day	Wastewater Flow (GPD)
Warehouse	1,985	1 per 350	30	170
Total	1,985			**170**

APPENDIX - C

HYDROLOGIC RUNOFF CALCULATIONS

Hydrologic calculations for both existing and developed conditions were done using the Rational Method. Factors used in the calculations were taken from the County of Maui's Drainage Standards as outlines in "Title MC-15, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui."

Rational Method: Q = CiA

Q	=	Peak flow rate (cfs)
C	=	Runoff coefficient
i	=	Intensity (in/hr)
A	=	Area (acre)

The following factors were used:

A. Recurrence Intervals:

10 year, 1-hour storm
I = 2" (From Plate 4)

B. Time of Concentration:

Overland flow time was determined from Plate 1, using hydraulic length, slope, and ground characteristics to the intake point.

C. Rainfall Intensity:

Rainfall intensity (i) was determined by using Plate 2, comparing the time of concentration with 1 hour rainfall.

D. Runoff Coefficient:

Runoff coefficient (C) was determined from Tables 1 and 2, as follows:

Runoff Coefficients for Built-Up Areas (Table 1)		
Infiltration	0.20	negligible
Relief	0.00	flat
Vegetal Cover	0.07	none
Develoment Type	0.55	industrial & business
	0.82	C value for existing condition

For areas with multiple surfaces, a weighted "c" value was calculated

Pavement and Buildings	C= 0.95	A = 0.34
Grass and Landscaped Areas	C= 0.35	A = 0.23
		0.58

0.71 C value (weighted) for developed condition

SUMMARY STORM RUNOFF CALCULATIONS (EXISTING CONDITIONS)

PROJECT: Hawaiian Cement Kahului Harbor
LOCATION Kahului, Maui, Hawaii

Tm = 10 YEARS 1-HR. RAINFALL = 2 INCHES CALCULATIONS BY: LC
CHECKED BY: LC

AREA	OVERLAND FLOW TIME			i (IN./HR.)	A (ACRES)	Q (CFS)	C VALUE	INLET	GOES TO
	LENGTH (FEET)	SLOPE (FT/FT)	Tc (MIN.)						
1	220	0.30%	9.5	4.2	0.58	2.00	0.82	-	Puddles within site than sheet flows offsite
				TOTAL	0.58	**2.00**			

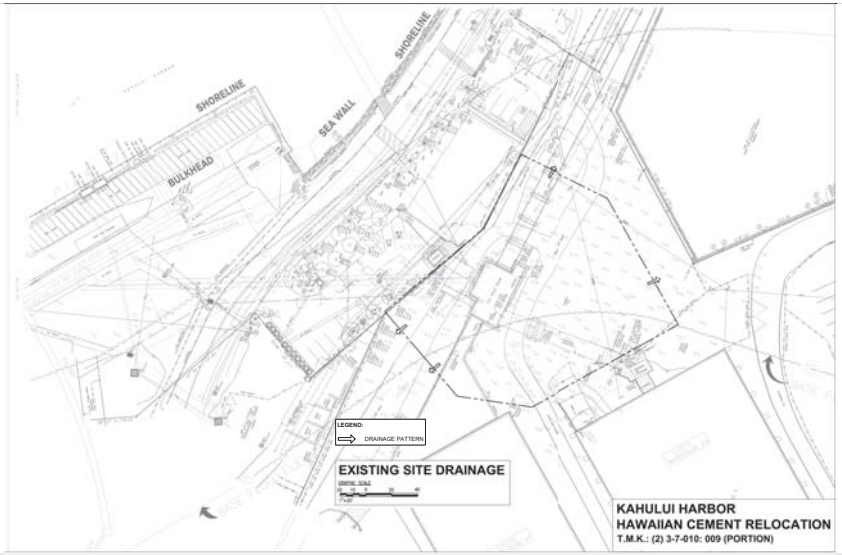
SUMMARY STORM RUNOFF CALCULATIONS (POST DEVELOPMENT)

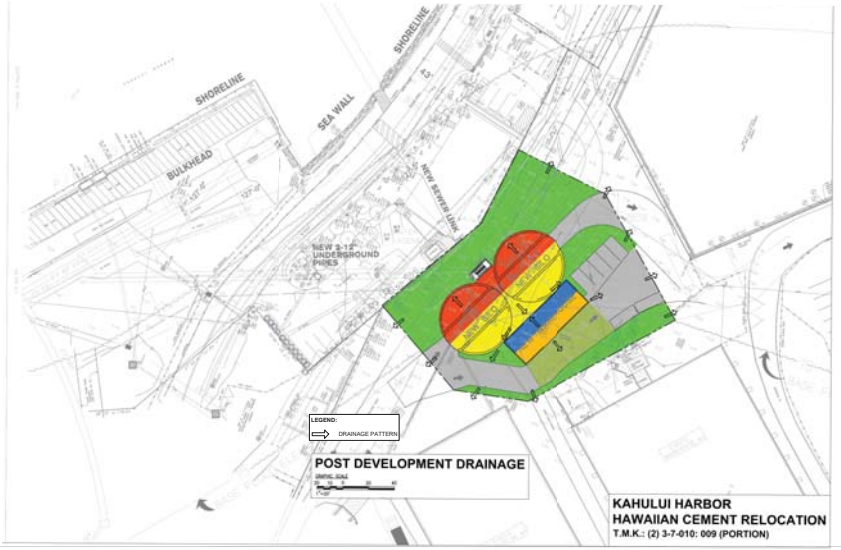
PROJECT: Hawaiian Cement Kahului Harbor
LOCATION Kahului, Maui, Hawaii

Tm = 10 YEARS 1-HR. RAINFALL = 2 INCHES CALCULATIONS BY: LC
CHECKED BY: LC

AREA	OVERLAND FLOW TIME			i (IN./HR.)	A (ACRES)	Q (CFS)	C VALUE	INLET	GOES TO
	LENGTH (FEET)	SLOPE (FT/FT)	Tc (MIN.)						
1	220	0.3%	11.4	3.9	0.58	1.61	0.71	-	detain in landscaped areas
				TOTAL	0.58	**1.61**			

APPENDIX D
DRAINAGE PLAN





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MUNEKIYO HIRAGA

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