DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

JOSH GREEN
LT. GOVERNOR
STATE OF HAWAII

FILE COPY
JUL - 8 2020

WILLIAM J. AILA, JR
CHAIRMAN
HAWAIIAN HOMES COMMISSION

TYLER I. GOMES
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAII 96805

June 16, 2020 Ref:#PO-20-162

Mr. Keith Kawaoka, Acting Director
Office of Environmental Quality Control
Department of Health, State of Hawai'i
235 South Beretania Street, Room #702
Honolulu, Hawaii 96813

SUBJECT: Draft Environmental Assessment
DHHL Hanapēpē Homestead Community
Tax Map Keys (TMKs): (4) 1-8-007:003; (4) 1-8-008:035, 081, 086, and 087

Dear Mr. Kawaoka:

With this letter, the Department of Hawaiian Home Lands (DHHL) hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Hanapēpē Homestead Community Project in the Hanapēpē Ahupua'a, Waimea Moku, on the Island of Kauai for publication in the next available edition of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice.*

An Adobe PDF file of the DEA-AFONSI is enclosed with this letter.

If you have any questions on this matter or the proposed project, please feel free to contact Jared Chang of SSFM International, Inc. at (808) 356-1242 or Nancy McPherson of DHHL at (808) 620-9519.

Mahalo,

William J. Ailā, Jr., Chairman
Hawaiian Homes Commission

c: Jared Chang, SSFM International, Inc.

20-303

From: webmaster@hawaii.gov
To: HI Office of Environmental Quality Control
Subject: New online submission for The Environmental Notice
Date: Tuesday, June 30, 2020 1:35:51 PM

Action Name

DHHL Hanapepe Homestead Community

Type of Document/Determination

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

HRS §343-5(a) Trigger(s)

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

Judicial district

Waimea, Kaua‘i

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

(4) 1-8-007:003; and
(4) 1-8-008:035, 081, 086, and 087

Action type

Agency

Other required permits and approvals

HRS §6E, Historic Preservation Review Clearance, HRS Chapter 343, National Pollutant Discharge Elimination System (NPDES) General Permit, Individual Wastewater System Approval, Grading and Grubbing Permit, Building Permit

Proposing/determining agency

Department of Hawaiian Home Lands

Agency contact name

Nancy McPherson

Agency contact email (for info about the action)

nancy.m.mcpherson@hawaii.gov

Email address or URL for receiving comments

nancy.m.mcpherson@hawaii.gov

Agency contact phone

(808) 620-9819

Agency address

91-5420 Kapolei Parkway
Kapolei, Hawaii 96707
United States
Map It

Was this submittal prepared by a consultant?

Yes

Consultant

SSFM International, Inc.

Consultant contact name

Jared Chang

Consultant contact email

jchang@ssfm.com

Consultant contact phone

(808) 356-1242

Consultant address

501 Sumner Street, Suite 620
Honolulu, Hawaii 96817
United States
Map It

Action summary

The Hanapēpē Homestead Community Project seeks to provide Department of Hawaiian Home Lands (DHHL) waitlist beneficiaries with residential and subsistence agriculture homesteading opportunities in Hanapepe, Kauai. This Project was identified in DHHL's Kaua'i Island Plan as one of three priority areas for new residential and agricultural homestead development on Kauai. The majority of DHHL's Hanapēpē lands are designated for subsistence agriculture and residential homesteading. Other complementary land uses are designated for commercial and community use. This homestead community is envisioned as DHHL's largest residential and agricultural community on the west side of Kaua'i. It is situated adjacent to the Hanapēpē town center and within commuting distance of local employment centers.

Reasons supporting determination

See Draft EA Section 5.0.

Attached documents (signed agency letter & EA/EIS)

- 200630-DHHL-Hanapepe-Draft-EA-FINAL.pdf
- PO-20-162_OEQC-DEA-Response-re-Hanapepe-Hmstd-Comm-Project.PDF

Action location map

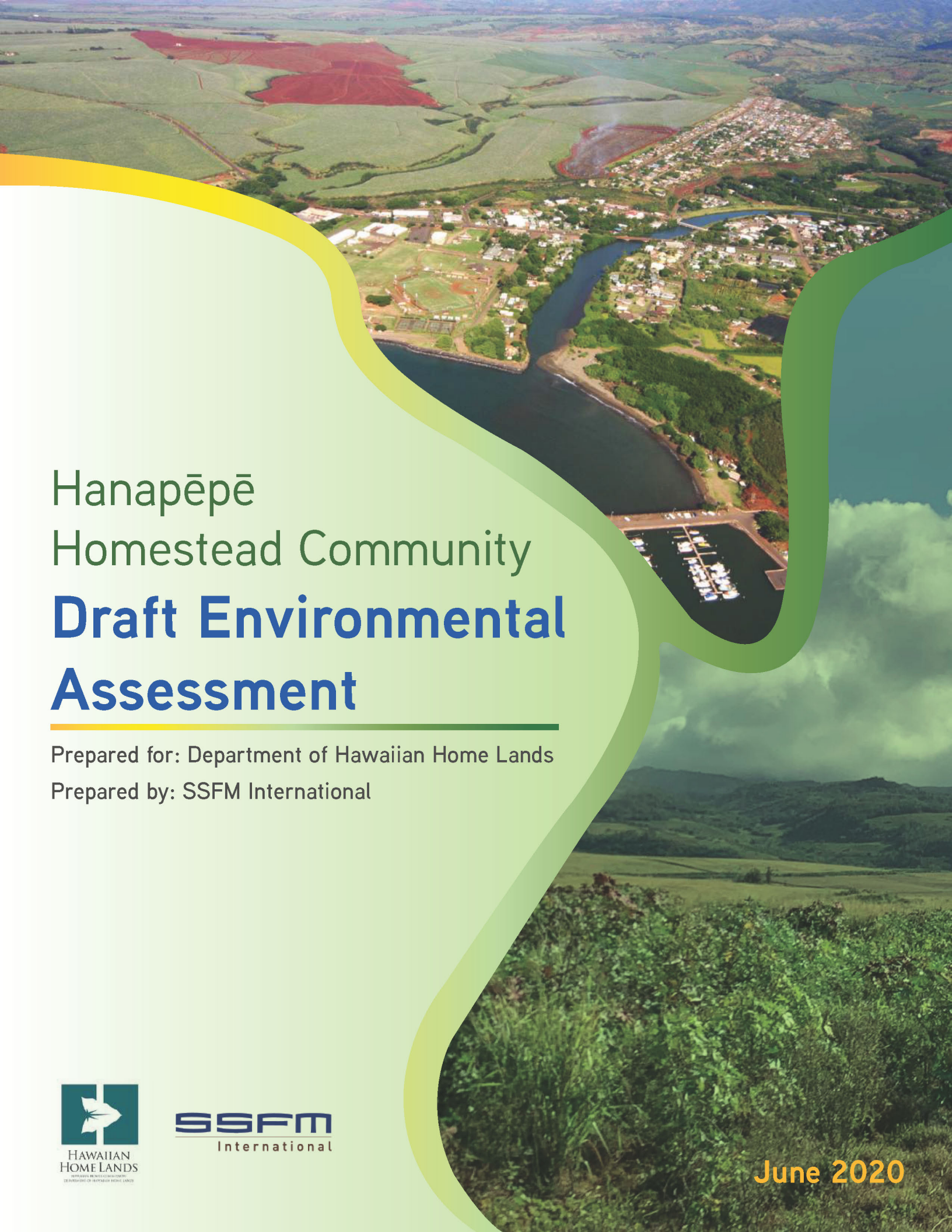
- Hanapepe.zip

Authorized individual

Jared Chang

Authorization

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



Hanapēpē Homestead Community

Draft Environmental Assessment

Prepared for: Department of Hawaiian Home Lands

Prepared by: SSFM International

HAWAIIAN HOME LANDS

SSFM International

June 2020

This page intentionally left blank

Draft Environmental Assessment for the

Hanapēpē Homestead Community

Hanapēpē Ahupuaʻa, Waimea Moku, Island of Kauaʻi

Prepared For:

HAWAIIAN HOME LANDS

HAWAIIAN HOMES COMMISSION · DEPARTMENT OF HAWAIIAN HOME LANDS

Prepared by:

SSFM International

June 2020

This page intentionally left blank

PROJECT SUMMARY TABLE

This Draft Environmental Assessment (EA) has been prepared in accordance with the requirements of Chapter 343, Hawai‘i Revised Statutes (HRS) and Hawai‘i Administrative Rules (HAR) Title 11-200 *Environmental Impact Statement Rules.*

Project Name:	Hanapēpē Homestead Community
Proposing Agency:	Department of Hawaiian Home Lands (DHHL) Hale Kalaniana‘ole 91-5420 Kapolei Parkway Kapolei, HI 96707 Contact: Nancy McPherson nancy.m.mcpherson@hawaii.gov
Accepting Authority:	Hawaiian Homes Commission (HHC) Department of Hawaiian Home Lands Hale Kalaniana‘ole 91-5420 Kapolei Parkway Kapolei, HI 96707
EA Preparer:	SSFM International, Inc. 501 Sumner Street, Suite 620 Honolulu, Hawai‘i 96817 Contact: Jared Chang, AICP jchang@ssfm.com
Project Location:	Hanapēpē Ahupua‘a, Waimea Moku, Island of Kaua‘i
Project Size:	363 acres
Tax Map Keys:	(4) 1-8-007:003 (4) 1-8-008:035, 081, 086, and 087
Landowner:	State of Hawai‘i, Department of Hawaiian Home Lands
Project Site Existing Uses:	Agriculture and Commercial
State Land Use:	Agricultural and Urban
Kaua‘i County Zoning:	Agriculture (A) and Open (O)
Chapter 343, HRS Trigger:	Use of State lands and funds
Special Management Area:	Outside SMA
Flood Zone:	Flood Zone X and AE
Anticipated Determination:	Finding of No Significant Impact (FONSI)
Project Site Permits/ Approvals Required:	HRS §6E, Historic Preservation Review Clearance HRS Chapter 343 National Pollutant Discharge Elimination System (NPDES) General Permit Individual Wastewater System Approval Grading and Grubbing Permit Building Permit
Agencies and Parties Consulted:	See Chapter 6: Agencies and Organizations Consulted

TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION 1
1.1 Background 1
1.2 Project Need and Objectives 1
1.2 Project Location 2
1.3 Description of the Proposed Project 5
1.3.1 Residential Homesteads 8
1.3.2 Subsistence Agriculture Homesteads 8
1.3.3 Commercial and Community Use Areas 10
1.3.4 Special District 10
1.3.5 Conservation 10
1.3.6 Roads and Access 10
1.3.7 Grading and Runoff, Drainage, and Erosion Control 11
1.3.8 Water System 11
1.3.9 Wastewater System 12
1.3.10 Electrical Power and Communications 13
1.4 Estimated Project Costs 13
1.5 Approvals and Permits 14

2.0 AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES 15
2.1 Climate 15
2.2 Geology, Topography and Soils 15
2.3 Hydrology 21
2.4 Air Quality and Noise 22
2.5 Flora and Fauna 24
2.6 Natural Hazards 26
2.7 Historic and Archaeological Resources 29
2.8 Cultural Resources 31
2.9 Viewplanes 32
2.10 Roads and Traffic 36
2.10.1 Existing Roads and Facilities 38
2.10.2 Existing Traffic Conditions 39
2.10.3 Future Traffic Conditions 40
2.11 Public and Private Utilities 45
2.11.1 Sewer Services 45
2.11.2 Water Services 46
2.11.3 Power and Communications 48
2.12 Public Services 48
2.12.1 Police Protection 48
2.12.2 Fire Protection 48
2.12.3 Medical Services 48
2.13 Socio-Economic Conditions 49
2.14 Potential Cumulative and Secondary Impacts 49

3.0 RELATIONSHIP TO PLANS AND POLICIES 51

3.1 Federal Plans and Policies 51
3.1.1 Archaeological and Historic Preservation Act (16 U.S.C. § 470(F) and National Historic Preservation Act (16 U.S.C. § 470(F) 51
3.1.2 Coastal Zone Management Act (16 U.S.C. § 1456(C)(1) 51
3.1.3 Endangered Species Act 16 U.S.C. §1536(A)(2) and (4) 51
3.2 State of Hawai‘i Plans and Policies 52
3.2.1 State Land Use Law, Chapter 205, HRS 52
3.2.2 State of Hawai‘i Coastal Zone Management Program, Chapter 205A, HRS 52
3.2.3 Hawai‘i State Plan, Chapter 226, HRS 58
3.2.4 Hawai‘i Revised Statutes Chapter 343 71
3.2.5 DHHL Kaua‘i Island Plan 71
3.3 County of Kaua‘i Plans and Policies 71
3.3.1 County General Plan 71
3.3.2 County of Kaua‘i Comprehensive Zoning Ordinance 72
3.3.3 West Kaua‘i Community Plan 73

4.0 PROJECT ALTERNATIVES 75
4.1 No Action Alternative 75
4.2 Alternative 1: Maintain Existing DHHL Land Use Plan 75
4.3 Alternative 2: Modified Land Use Plan (Preferred) 76

5.0 FINDINGS AND ANTICIPATED DETERMINATION 80
5.1 Anticipated Determination 80
5.2 Significance Criteria Findings 80

6.0 AGENCIES AND ORGANIZATIONS CONSULTED 85
6.1 Existing Lessees Meeting 85
6.2 Beneficiary Consultation Meetings 86
6.3 Stakeholder Consultation Meetings 87
6.4 Community Meetings 87
6.5 Pre-Assessment Consultation 87

7.0 REFERENCES 91

LIST OF FIGURES

Figure 1: Hanapēpē Homestead Project Location 3
Figure 2: Tax Map Key Boundaries 4
Figure 3: Preferred Land Use Plan 6
Figure 4: Phase 2 Residential Subdivision 9
Figure 5: Slope Analysis Map and Table 17
Figure 6: Agricultural Lands of Importance to the State of Hawaii Map 18
Figure 7: Natural Resources Conservation Service Hanapēpē Soils Map 19
Figure 8: FEMA Flood Zone and SLR-XA Map 28
Figure 9: Location of Viewplane Photos 34
Figure 10: Views from the Project Site 35
Figure 11: TIAR Study Intersections 37
Figure 12: Proposed Roadway Network 44
Figure 13: Alt 1: Maintain Existing DHHL Land Use Plan 78
Figure 14: Alt 2: Modified Land Use Plan (Preferred) 79

LIST OF TABLES

Table 1: Proposed Land Uses and Acres 7
Table 2: Main Vegetation Types Observed in Hanapēpē 25
Table 3: Main Faunal Types Observed in Hanapēpē 25
Table 4: Roadway Annual Average Daily Traffic (2016) 39
Table 5: Level of Service Descriptions 39
Table 6: Pre-Assessment Consultation 88

APPENDICES

Appendix A – Pre-Assessment Consultation Comments
Appendix B – Biological Survey Report
Appendix C – Archaeological Assessment
Appendix D – Cultural Impact Assessment
Appendix E - Traffic Impact Analysis Report
Appendix F - Community Outreach Meeting Summaries

LIST OF ACRONYMS

AIS Archaeological Inventory Survey
ASYA Aquifer System Area
BMP Best Management Practice
CFS Cubic Feet per Second
CIA Cultural Impact Assessment
CTAHR College of Tropical Agriculture and Human Resources, University of Hawai‘i
CZM Coastal Zone Management
DHHL Department of Hawaiian Home Lands, State of Hawai‘i
DLNR Department of Land and Natural Resources, State of Hawai‘i
DOH Department of Health, State of Hawai‘i
DPW Department of Public Works, County of Kaua‘i
DOW Department of Water, County of Kaua‘i
EA Environmental Assessment
GPD Gallons Per Day
GPM Gallons Per Minute
HAR Hawai‘i Administrative Rules
HDOT Department of Transportation, State of Hawaii
HHCA Hawaiian Homes Commission Act
HHL Hawaiian Home Lands
HDOT State of Hawai‘i Department of Transportation
HHCA Hawaiian Homes Commission Act
HRS Hawai‘i Revised Statutes
IAL Important Agricultural Lands
IWS Individual Wastewater System
KIUC Kaua‘i Island Utility Cooperative
LiDAR Light Detection and Ranging
LCA Land Commission Award
LOS Level of Service
LUPAG Land Use Pattern Allocation Guide
MG Million Gallons
MGD Million Gallons per Day
MSL Mean Sea Level
NPDES National Pollutant Discharge Elimination System
REC Recognized Environmental Concern
SHPD State Historic Preservation Division
SLH Session Laws of Hawai‘i
SOS Save our Shearwaters
TIAR Traffic Impact Analysis Report
TMK Tax Map Key
USGS United States Geological Survey
USFWS United States Fish and Wildlife Service
v/c volume-to-capacity ratio
VPH Vehicles Per Hour
WWTP Wastewater Treatment Plant

This page intentionally left blank

1.0 PROJECT DESCRIPTION

The purpose of the Hawaiian Homes Commission Act (HHCA) of 1920 is "to enable native Hawaiians to return to their lands in order to fully support self-sufficiency for native Hawaiians and the self-determination of native Hawaiians in the administration of this Act, and the preservation of the values, traditions, and culture of native Hawaiians." The Hanapēpē Homestead Community Project seeks to provide Department of Hawaiian Home Lands (DHHL) waitlist beneficiaries with residential and subsistence agriculture homesteading opportunities. This is in support of DHHL's mission to manage the Hawaiian Home Lands trust effectively and to develop and deliver lands to native Hawaiians.

1.1 BACKGROUND

The Hanapēpē Homestead Community ("Project") was identified in DHHL's Kaua'i Island Plan ("Island Plan") (DHHL, 2004) as one of three priority areas for new residential and agricultural homestead development, based on waitlist preference and estimated development cost. The majority of DHHL's Hanapēpē lands are designated for subsistence agriculture and residential homesteading. Other complementary land uses are designated for commercial and community use. This homestead community is envisioned as DHHL's largest residential and agricultural community on the west side of Kaua'i. It is situated adjacent to the Hanapēpē town center and within commuting distance of local employment centers.

In February 2017, the Hawaiian Homes Commission approved amendments to the Hawai'i Administrative Rules, Title 10, to allow small-lot agricultural homestead leases that are being administered programmatically as "Subsistence Agricultural" homestead leases. The 2018 State Legislature, with support from Senate President Ron Kouchi, allocated funding to DHHL specifically for planning of the Hanapēpē homestead community & engineering design work for what is identified as the next phase of development ("Phase 2") for DHHL's Hanapēpē lands, which will consist of up to 75 Residential homestead lots.

The Project is proposed on DHHL lands and involves the use of state funds, which triggers the preparation of an Environmental Assessment (EA) as prescribed by Hawai'i Revised Statutes, Chapter 343.

1.2 PROJECT NEED AND OBJECTIVES

The purpose of the Project is to award residential and subsistence agriculture lots to beneficiaries on the DHHL waitlist, update the land use plan and infrastructure needs identified in the Island Plan, confirm waitlist beneficiary preferences, and designate the location for the next phase of residential homestead development (Phase 2). It also identifies desired elements and uses for Community Use and Commercial areas, and desired density of future subsistence agriculture homestead lots.

There are approximately 1,625 beneficiaries on the Kaua'i Island Residential waitlist and 2,225 on the Agricultural waitlist. Based on 2019 survey responses from 333 waitlist beneficiaries, 37% of respondents are on both Residential and Agricultural Waitlists with 59% of all respondents indicating they would be "very likely" to accept an award in Hanapēpē.

1.2 PROJECT LOCATION

DHHL's Hanapēpē Lands consist of the existing 47-lot Phase 1 Residential homestead area; adjacent undeveloped lands including Tax Map Keys (TMKs) (4) 1-8-007:003, 021, 018, collectively hereinafter described as the "Mauka Site"; and TMKs (4) 1-8-008:035, 081, 086, and 087, collectively hereinafter described as the "Makai Site." These areas are located just west of historic Hanapēpē town and the Hanapēpē River and along both sides of Kaumualiʻi Highway. The Mauka Site is 357 acres, exclusive of the existing Phase 1 residential subdivision; and the Makai Site is 6 acres. See Figure 1, Location Map, and Figure 2, Tax Map Keys.

The 357-acre Mauka Site includes some of the most fertile agricultural lands within DHHL's holdings, and its location near Hanapēpē town and within commuting distance of regional job centers make it an attractive location for homestead development. The entire Mauka Site was formerly used for the commercial cultivation of sugarcane for more than 70 years and reportedly pineapple prior to the 1950's. The site was leased and managed by Olokele Sugar (C. Brewer) until 1994. In 1994, Gay and Robinson Sugar Plantation bought out C. Brewer and farmed sugarcane on the site until 2009. There are no building permits or other improvements listed for the Mauka Site. The site is currently vacant, undeveloped and overgrown with wild cane and brush.

The 6-acre Makai Site is bounded by the Kaumualiʻi highway on the north, Lele Road on the west and a drainage channel on the east. The Makai Site has been in warehouse industrial use for at least 60 years and houses multiple existing business operations. The Makai Site consists of four TMK parcels, all owned by DHHL. Each of the four parcels has business operations/tenants as follows:

- Parcel 035 – Habitat for Humanity carpentry shop and secondhand store. Parcel 035 also contains a parking and equipment storage yard in use by another business.
- Parcel 081 – Parking/storage area for Wally Rita Trucking.
- Parcel 086 – School bus parking lot operated by Akita Enterprises.
- Parcel 087 – Truck repair service shop, operated by R. W. Palama and Sons Trucking.

The County of Kauaʻi website listed no building permits on file for the Makai Site. Aerial photos indicate that warehouse-type buildings have existed on the site since the early 1950's. Prior to that, the site appears to have been undeveloped.

Figure 1: **HANAPĒPĒ HOMESTEAD PROJECT LOCATION**

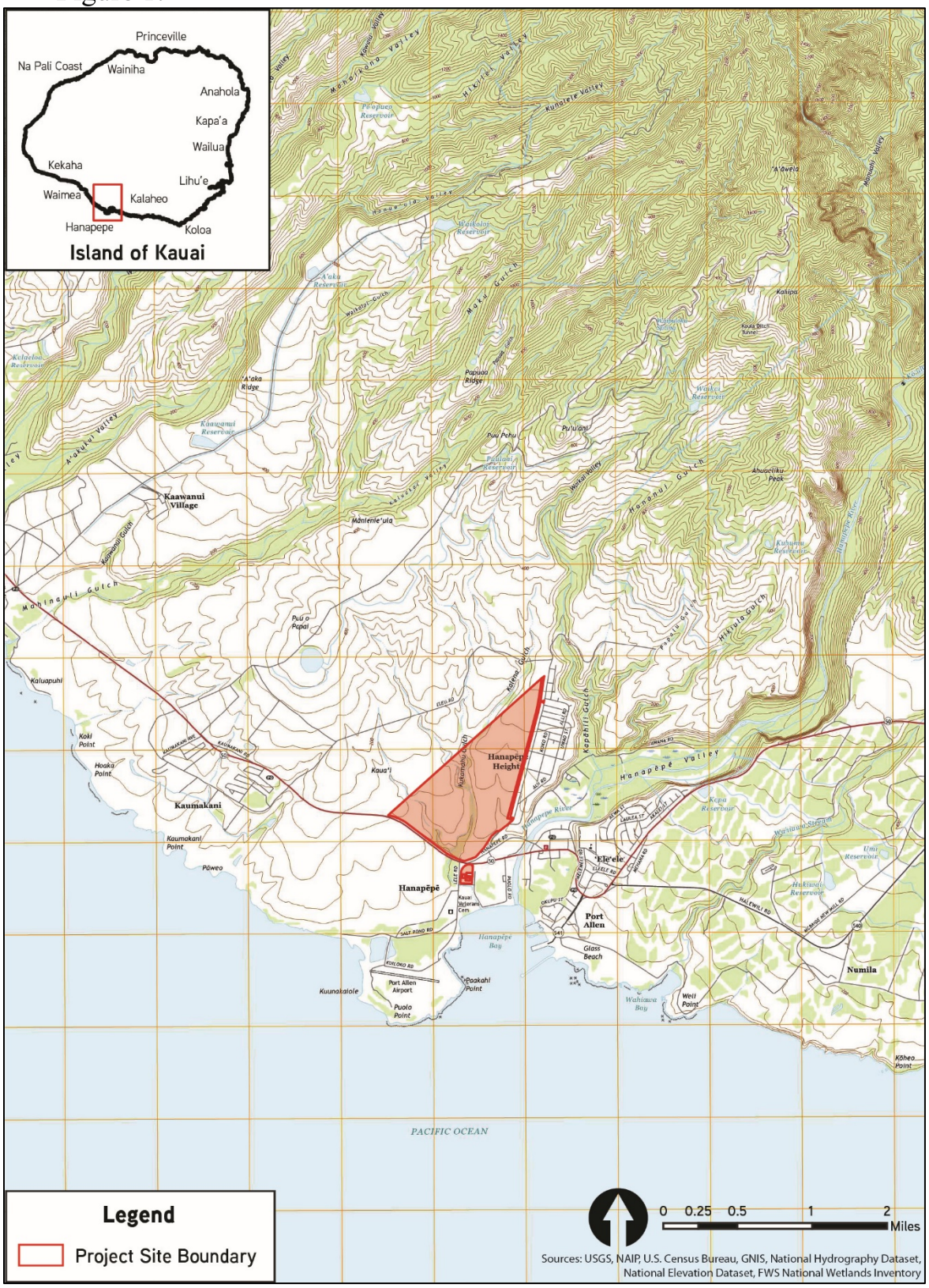
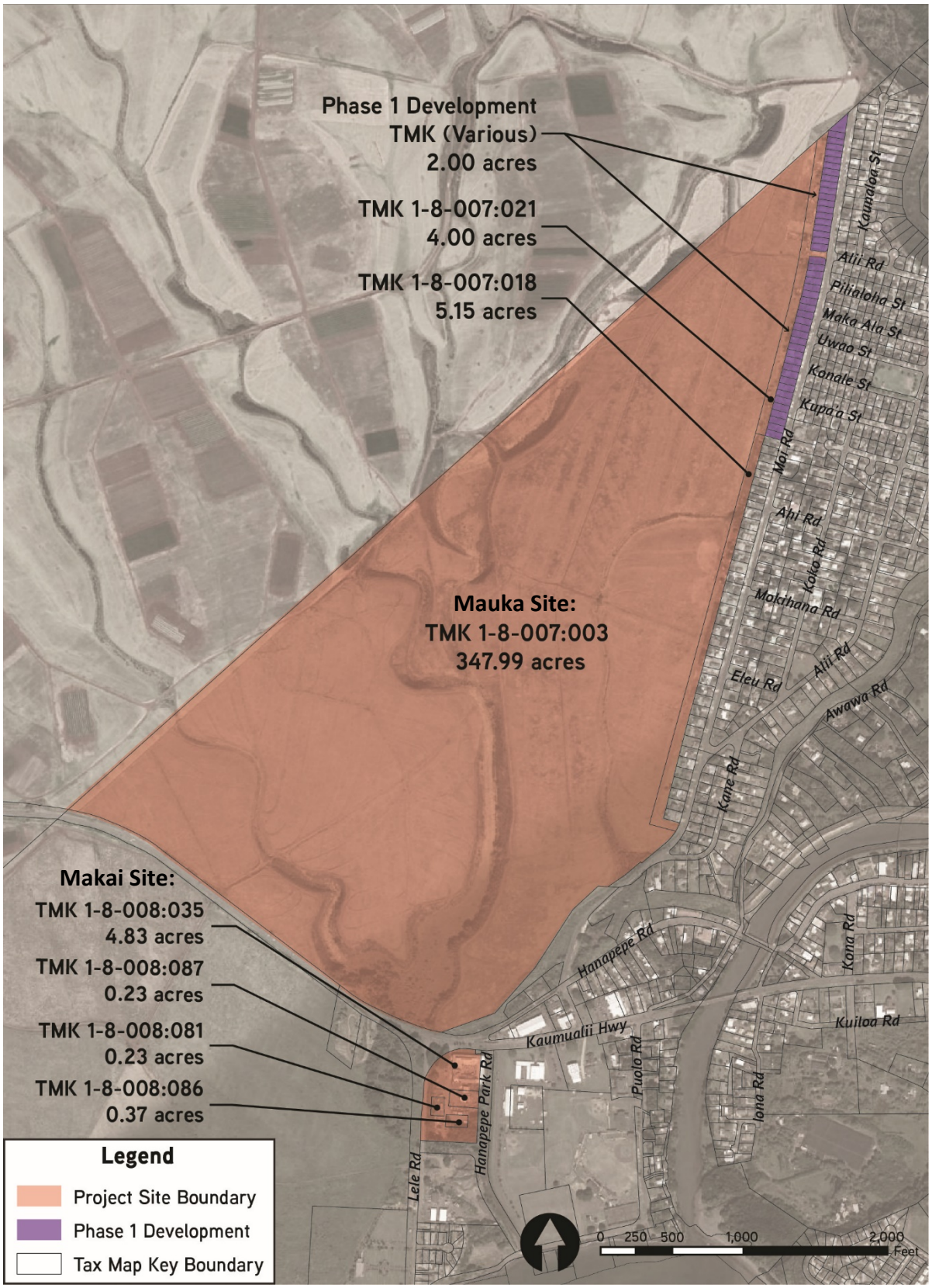


Figure 2: **TAX MAP KEY BOUNDARIES**



1.3 DESCRIPTION OF THE PROPOSED PROJECT

Hanapēpē is envisioned to be DHHL's largest residential and agricultural community on the west side of Kaua'i. The DHHL is proposing the Hanapēpē Homestead Community ("Project") to offer up to 449 new Residential homestead lots on 126 acres and up to 111 new Subsistence Agricultural homestead lots on 157 acres, based on waitlist preference and estimated development cost. Other complementary land uses are proposed to include 13 acres for Commercial use; 26 acres for Community Use; 33 acres for Special District; and 8 acres of Conservation. The preferred land use plan depicting the spatial layout of proposed land uses is provided as Figure 3. Table 1 provides a summary of proposed land uses and acreages.

Full build-out of the Project is anticipated to be developed over multiple phases and years. The next phase under the proposed Project (Phase 2) includes up to 75 new Residential homestead lots near existing homes along Moi Road. Full build-out (Phase 3) is anticipated to include additional residential homesteads, development of Subsistence Agriculture homestead lots ranging in size from less than 1 acre up to 3 acres, development of Commercial and Community Use areas, and infrastructure improvements to serve the homestead community. Infrastructure for this Project will be designed to provide for the health and safety of residents but be appropriate for a rural area.

The preferred land use plan (identified as Alternative 2 in this EA) concentrates Residential land use areas east of Kukamahu Gulch, adjacent to existing residential development and infrastructure. Concentrating Residential homesteads to the east of the gulch is consistent with the County's West Kaua'i Community Plan update, which calls for focusing development in and adjacent to existing neighborhoods and town centers in accordance with smart growth principles. It also enables the subdivision to be more easily and cost-effectively serviced by existing water and sewer infrastructure along Moi Road.

Subsistence Agriculture areas are concentrated to the west of the gulch to provide a more gradual transition between the residential areas and open space and agricultural lands to the west of the site. This will also help to preserve viewplanes across the southwest of the site.

Commercial and Community Use Areas are provided in the southwest corner of the Makai Site with the intent of providing a destination for the west side community that may include a park, ball fields, and community center, as well as agriculture-supportive uses such as a farmers market, community garden, and shared equipment/ facilities. A future mauka extension of Lele Road as a gateway to the community and a second access to Hanapēpē Heights is included, as is a new small Commercial area at this location to allow for small commercial uses to serve the existing Hanapēpē Heights community as well as the new homesteads. The gulch areas will be designated as Conservation and Special District to indicate their intended uses as open space or limited use areas.

Figure 3: **PREFERRED LAND USE PLAN**

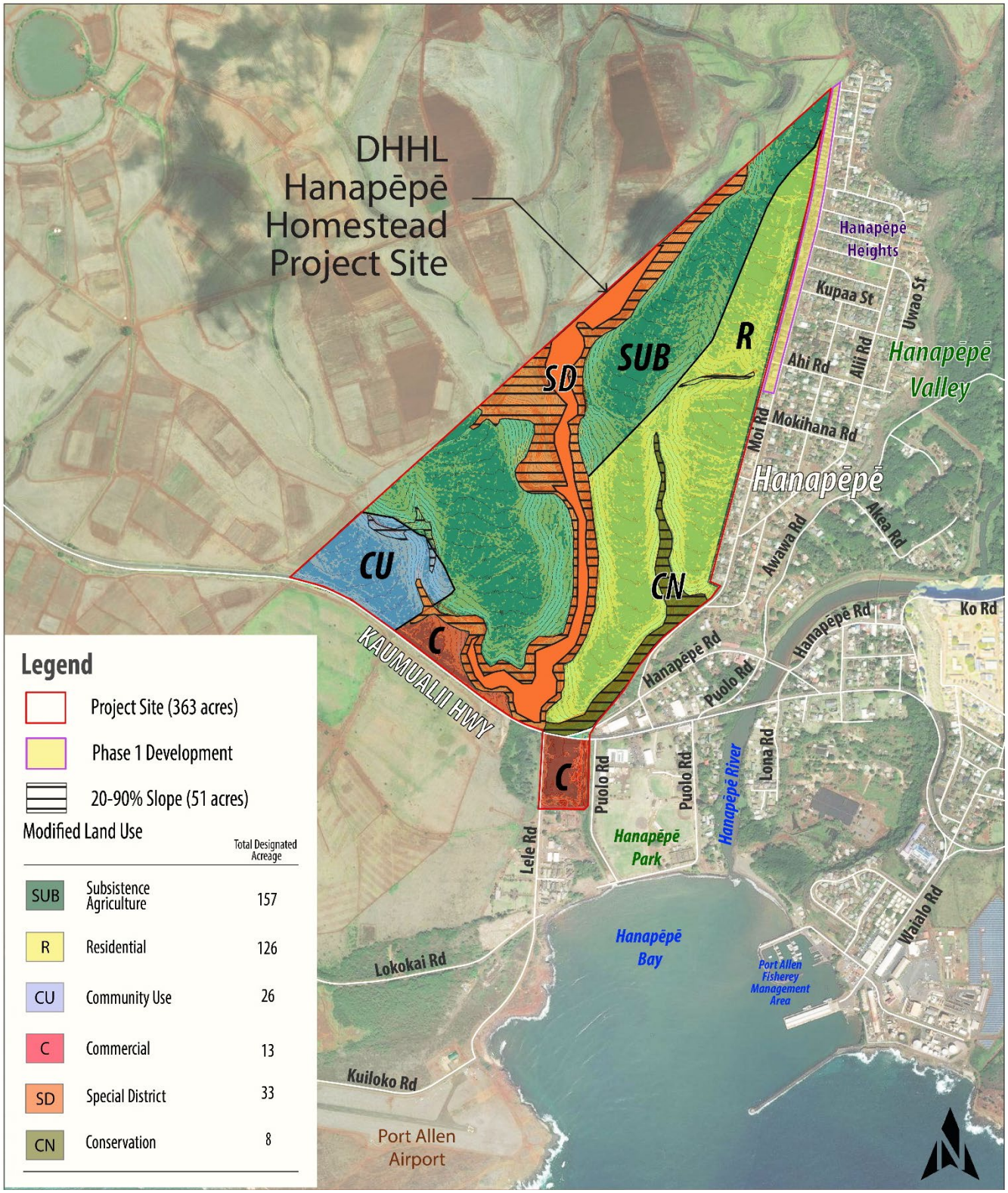


TABLE 1: PROPOSED LAND USES AND ACRES

Subsistence Agriculture • Small lot agriculture. Lots no larger than three (3) acres in size. • Up to 111 new Subsistence Agricultural homestead development lots. • Lessees are required to actively cultivate subsistence agriculture OR reside and cultivate subsistence agriculture on their lots. • Crops are expected to provide food for home consumption or small-scale commercial production.	**157 acres (43%)**
Residential • Lots approximately 7,500 sf or less in size. • Up to 449 new Residential homestead lots. • Residential subdivisions are built to County standards in areas close to existing infrastructure and in conjunction with community use areas.	**126 acres (35%)**
Commercial • Commercial areas that could include retail, office, public space, public services and health care services.	**13 acres (4%)**
Community Use • Common areas for community use. • Possible uses include parks and recreation, cultural activities, community-based economic development, utilities, other facilities and amenities.	**26 acres (7%)**
Special District • Areas requiring special attention because of unusual opportunities and/or constraints, e.g. natural hazard areas. Possible uses include cultural uses, agricultural uses, open space or stormwater management.	**33 acres (9%)**
Conservation • Areas that include steep slopes (>20% slopes) • Possible uses include preservation and open space.	**8 acres (2%)**
TOTAL	**363 acres**

1.3.1 RESIDENTIAL HOMESTEADS

The development of Residential homesteads is a priority for DHHL waitlist beneficiaries. The next phase of development (Phase 2) will consist of up to 75 Residential homestead lots and will be located behind existing residences along Moi Road near the north end of the Mauka Site. This will allow the development to take advantage of existing infrastructure connections and roadway stub-outs along Moi Road.

At full build-out, the homestead community will include up to 449 Residential homestead lots. Residential homestead lots are sized at approximately 7,500 square feet (sf). A site plan showing the next phase of Residential homestead lots is provided in Figure 4.

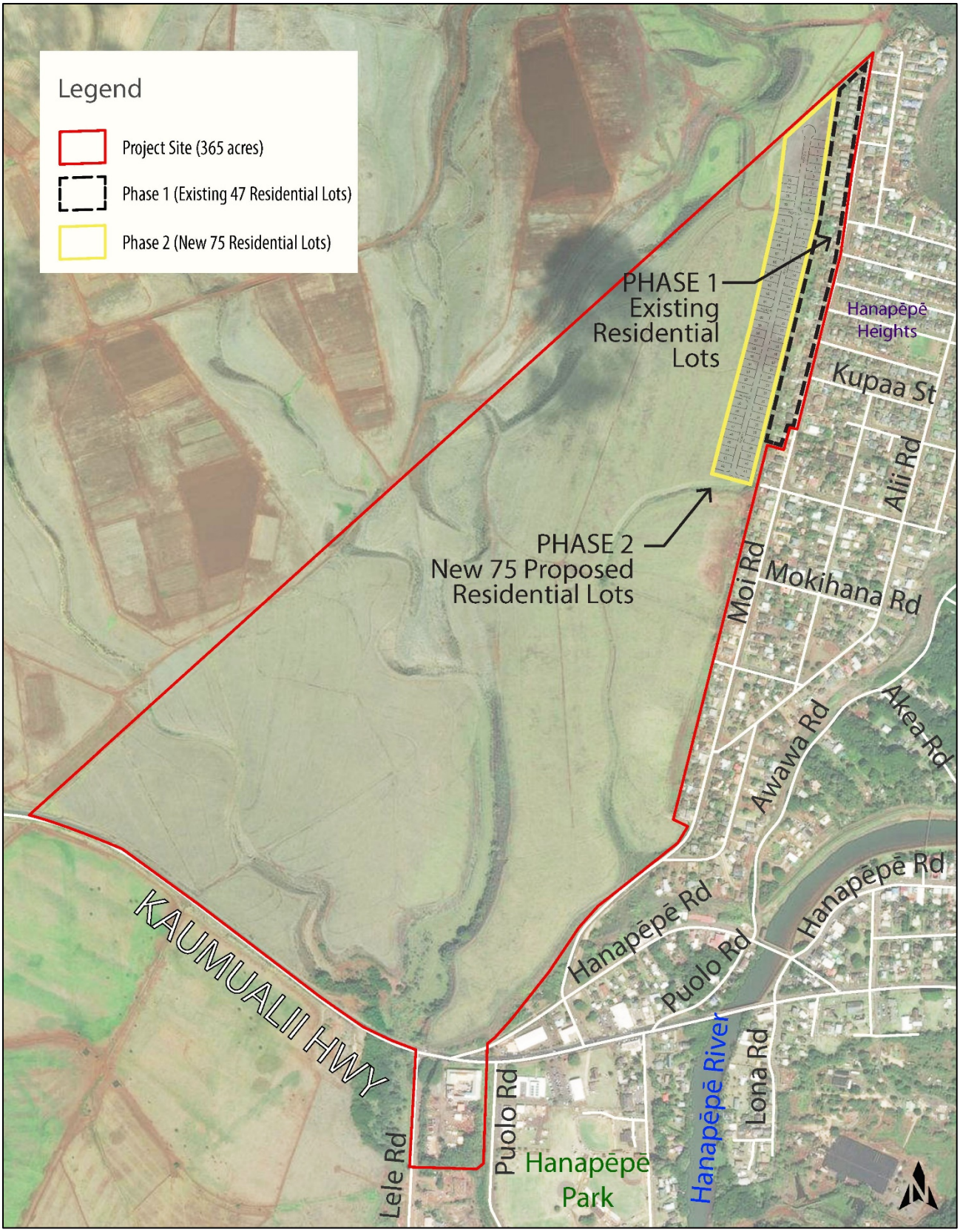
1.3.2 SUBSISTENCE AGRICULTURE HOMESTEADS

The proposed Subsistence Agriculture homestead lots are sized to range from less than one (1) acre to no more than three (3) acres that would enable growing crops, a garden, or raising animals for subsistence living. The DHHL Subsistence Agricultural homestead designation was created to provide agricultural lands that are more manageable than the larger agricultural homestead lots that were previously offered by DHHL. In a lot of instances, the larger agricultural lots were underutilized by some lessees. Smaller sized Subsistence Agricultural lots also allow DHHL to provide more homesteading opportunities to those on the waitlist.

The Subsistence Agriculture lots allow for, but do not require, a residence. The crops grown on Subsistence Agricultural lots are expected to provided food for home consumption or to allow for small-scale commercial production. Subsistence Agriculture lessees are required to either actively cultivate their land or reside and actively cultivate their land within three years of receiving their leases. Infrastructure in the Subsistence Agriculture areas will be rural in nature in order to maintain the character of the Project area.

As part of the beneficiary consultation process for this Project, DHHL Kaua‘i waitlist applicants were surveyed in 2019. Of the surveyed beneficiaries on the agricultural waiting list, the majority of applicants (80%) intend to both farm and/or raise livestock and build a house on their Subsistence Agricultural lot if awarded. Based on other DHHL agricultural homesteads, an average of 50% of lessees tend to reside on the lots, which would result in about 55 homes expected in the Subsistence Agriculture land use areas. Ninety-two percent of waitlist beneficiaries specifically interested in the Hanapēpē agricultural award said they would be willing to accept lots of one-half to one acre in size.

Figure 4: **PHASE 2 RESIDENTIAL SUBDIVISION**



1.3.3 COMMERCIAL AND COMMUNITY USE AREAS

DHHL designates Commercial lands as those that are suitable for business, retail, and commercial activities. Specific commercial uses will be determined as opportunities arise but will be complementary to the uses in the area. The existing commercial industrial area on the Makai Site is being leased by several businesses that for the purposes of this environmental assessment are assumed to remain in place.

Community Use areas are common areas for shared homestead uses and facilities. They may include space for parks, recreation, cultural activities, community-based economic development, utilities and other facilities and amenities. The specific community uses will be determined by the homestead community, which may choose to form a Homestead Association. Based on the 2019 survey of waitlist beneficiaries, the Community Uses most important to have in a homestead community were: playground (51%), government services (49%), medical/dental clinic (47%), farmers market (46%), and community center (46%). Outreach to existing lessees and waitlist beneficiaries on Kaua‘i confirmed support for these uses, as well as interest in sports fields, preschools/childcare, kupuna housing and services, and cultural activities.

The development of Commercial and Community Use areas is anticipated to occur in Phase 3 of this plan, with anticipated completion by 2040 as availability of funding permits.

1.3.4 SPECIAL DISTRICT

Areas within the Project site requiring special attention because of topographical constraints or other factors are designated as Special District. The Special District within the Project area primarily consists of Kukamahu Gulch, drainageway buffers, and unbuildable areas. Possible uses for these areas include cultural uses, agricultural uses, open space or stormwater management.

1.3.5 CONSERVATION

Approximately 2 percent of the Project site will be designated as Conservation in order to protect natural drainageways and environmentally sensitive areas. The possible uses for the Conservation areas include preservation and open space.

1.3.6 ROADS AND ACCESS

A traffic impact study was prepared to identify access needs for Phase 2 and Phase 3 of the Project. For Phase 2, Moi Road would continue to serve as the sole ingress/egress to the Project site. For Phase 3 (full build-out), two additional access points are proposed, including a roundabout intersection at Kaumuali‘i Highway and Lele Road and new access off Kaumuali‘i Highway near the southwest corner of the Mauka Site.

Residential subdivision roads for Phase 2 will connect to Moi Road via existing stub-outs that were constructed when the Phase 1 homesteads were developed. New roads within the subdivision will follow the standards outlined in the County of Kaua‘i Street Design Manual for residential uses. Roads would have a right-of-way of 48 feet with 20-foot to 26-foot travelways, and dedication to the County of Kaua‘i will be pursued. DHHL will coordinate with HDOT to

provide access to the Project off of Kaumualiʻi Highway, and with Kauaʻi County Department of Public Works (DPW) for access from Moi Road.

Street lighting will be designed to meet Kaua'i County street light standards, and underground lighting circuits will be provided for new roadways within the development. Pole mounted luminaires and underground lighting circuits can be provided along bike and pedestrian paths within the development.

It is likely that at least one roadway crossing of Kukamahu Gulch will be included in full build-out of the Mauka Site. This will require further study to determine the best and most feasible location.

1.3.7 GRADING AND RUNOFF, DRAINAGE, AND EROSION CONTROL

A Drainage Master Plan was prepared by SSFM International, Inc. to model stormwater flows from the proposed development and determine the preliminary locations and sizes of the various stormwater management facilities needed to ensure minimal impacts on the downstream receiving waters.

An analysis of the existing drainage patterns and flow rates was carried out to determine the existing flow rates for the 10-year and 50-year recurrence intervals. The Mauka Site includes approximately 357 acres, and the upstream watershed consists of approximately 1,600 acres of agricultural lands and 84 acres of single-family residential lands. There are two major discharge points in which runoff exits the site, including Kukamahu Gulch, which discharges through an existing culvert beneath Kaumualiʻi Highway, and also a drainage inlet on Moi Road near Kane Road.

The runoff rates for the Project were modeled based on the proposed single-family Residential, Subsistence Agriculture and Commercial/Community Use land uses. Eleven (11) stormwater detention basins are proposed at various locations of the development site, including ten (10) within the Mauka Site and one (1) on the Makai Site.

With the proposed stormwater detention basins and controlled release rates to the downstream systems, the post-development peak flow rate at Kukamahu Gulch (Outlet 1) is estimated to be 45 cubic feet per second (cfs), which is an increase of approximately 28% compared to existing conditions, but is within the hydraulic capacity of the existing culvert.

Similarly, with the proposed stormwater detention basins and controlled release rates to the downstream systems, the post-development peak flow rate at Moi Road (Outlet 2) is estimated to be 185 cfs, which represents an increase of only 15% compared to existing conditions.

The various detention basins can also be incorporated into a Low Impact Development strategy to further reduce the environmental impact and provide additional water quality improvement opportunities.

1.3.8 WATER SYSTEM

A Water Master Plan was prepared by SSFM International, Inc. to assess the existing water supply capacity, identify the ultimate demands for the Project, and determine how the existing water system may be affected by the addition of Project. The existing Hanapēpē-ʻEleʻele water

supply network was analyzed to assess the performance of the existing water supply system with the increased demands resulting from the Project.

The increased water demands for the Project's initial phase of development (Phase 2) will increase the maximum day demand by 56,250 gallons with a peak flow of approximately 90 gpm and under full build-out conditions will increase the maximum day demand by 644,270 gallons with a peak demand rate in the range of 1,000 gpm.

The water master plan prepared for the Project shows that the existing water supply system is able to meet the increased demands associated with Phase 2 of the Project plus demands from Phase 1 of the Lima Ola Development. With the facility improvements planned for the 'Ele'ele system to support the Lima Ola build-out conditions (expansion of the 'Ele'ele storage tanks), the existing supply and distribution network are able to meet the increased demands to support the Project full build-out (Phase 3). No additional source wells are anticipated to be required and no additional storage is anticipated to be required.

The proposed distribution system will include a connection to the existing 12-inch water main on Moi Road, plus a network of new onsite water mains ranging in size from 12-inch to 6-inch pipelines. On-site pressure reducing valves will be required to control system pressure and maintain compatibility with the existing DOW pressure zones. The water system will provide domestic water and fire protection for the entire homestead community, all in accordance with DOW Standards. The DOW system could also supply irrigation water for the Subsistence Agriculture lots if DHHL is unable to locate alternative sources of non-potable water.

1.3.9 WASTEWATER SYSTEM

A Wastewater Master Plan was prepared by SSFM International, Inc. to identify wastewater generation and infrastructure requirements for the project. This plan consisted of two phased scenarios; Phase 2 (75 residential lots) and Phase 3 (full build-out).

For Phase 2, an 8-inch gravity sewer would be installed running along a new residential road, parallel to Moi Road, at roughly 3 percent grade and will connect downstream to existing sewer manholes at the upper Moi Road / Ahi Road intersection and further downslope at the lower Moi Road / Ahi Road intersection. Preliminary discussion with the County of Kaua'i Department of Public Works, Division of Wastewater Management (DWWM) indicated that the 'Ele'ele Wastewater Treatment Plant (WWTP) has enough capacity to accommodate the additional 75 houses proposed in Phase 2, however capacity is based on a first-come, first-served basis. Phase 2 would have an average daily flow of 0.030 MGD and peak flow of 0.166 MGD.

Phase 3 (full build-out) of the homestead community is proposed to be served by a combination of municipal sewer systems for the Residential homesteads, and individual wastewater systems (IWS) for the Subsistence Agricultural lots. The potential additional future flows to the 'Ele'ele WWTP from the Project's full build-out of Residential, Commercial and Community Uses would have an average daily flow of 0.199 MGD and peak flows of 1.030 MGD. The Subsistence Agricultural lots are proposed to be serviced by IWS consisting of septic tanks and leach fields that accommodate up to 1,000 gallons per day (GPD) of domestic wastewater.

The ability of Phase 3 to connect to the County sewer system will be dependent upon timing, refinement of sewer generation flows and availability of capacity. The West Kaua'i Community Plan (Departmental Draft, 2020) estimates that the 'Ele'ele WWTP has adequate wastewater

capacity through 2040. However, it is not currently known if the ‘Ele‘ele WWTP has enough capacity to include full build-out of the Hanapēpē Homestead Community as it remains subject to the first-come, first-served policy. DHHL plans to work with DWWM to identify possible upgrades to the wastewater collection and treatment works, as needed in the future.

Solid waste disposal will be provided through the County DPW, Division of Solid Waste automated refuse collection system for residential lots. Solid waste disposal for subsistence agricultural lots and commercial lots will be the responsibility of the lessee.

1.3.10 ELECTRICAL POWER AND COMMUNICATIONS

Electrical utility planning for the development includes primary electrical (power) and telecommunication (telephone, internet and CATV) utility infrastructure and street lighting systems along existing and new roadways. The utility companies are typically responsible for the construction of overhead utility pole lines (pole, overhead conductors, pole-mounted transformers, etc.), underground distribution cables and pad-mounted primary transformers.

There are existing Kaua‘i Island Utility Cooperative (KIUC) owned electrical distribution systems in the area. These consist of overhead lines on wooden utility poles along Kaumuali‘i Highway and Moi Road, as well as underground distribution systems along portions of Moi Road. These 12kV overhead power lines are stepped down via three-phase and single-phase transformers to service the customers in the area. Electrical power will be provided by KIUC via the existing overhead electrical distribution system running along Moi Road. Preliminary discussions with KIUC indicate there is existing capacity to support the Project. New KIUC underground infrastructure is anticipated and will likely follow the alignment of the new roadways within road right-of-way.

There are existing telecommunication and CATV distribution systems in the area. These run overhead along Kaumuali‘i Highway and Moi Road, as well as underground distribution systems along Moi Road. Telecom services for DHHL properties are currently provided to customers in the area by Sandwich Isles Communications (SIC). CATV services for DHHL properties are provided to customers in the area by Hawaiian Telcom.

According to preliminary discussions with the utility companies, the existing electrical, telecommunication, and CATV distribution systems in the area are sufficient to support the proposed development. These distribution systems can be extended and provide new services into the Mauka Site via underground distribution systems. Further coordination and discussion with the utility companies will be necessary to confirm and identify any necessary improvements, upgrades, or modifications to the respective utility distribution systems.

1.4 ESTIMATED PROJECT COSTS

The next phase under the proposed Project (Phase 2) including up to 75 new Residential homestead lots near existing homes along Moi Road is estimated to cost approximately $13 million inclusive of a 15% construction contingency. Projected costs include site earthwork, roads, water, sewer, drainage, electrical and telecommunications.

Full build-out (Phase 3) of the Project is anticipated to be developed over multiple phases and years and is estimated to cost approximately $120 million inclusive of a 15% construction

contingency. Full build-out is anticipated to include infrastructure to support additional residential homesteads, development of Subsistence Agriculture homestead lots, and development of Commercial and Community Use areas. All estimated costs were developed in April 2020.

1.5 APPROVALS AND PERMITS

The following approvals and permits are anticipated to be needed for the completion of the Project:

State Historic Preservation Division

- HRS §6E, Historic Preservation Review Clearance

Office of Environmental Quality Control

- HRS Chapter 343 Compliance

State Department of Health

- National Pollutant Discharge Elimination System (NPDES) General Permit
- Individual Wastewater System Approval

State Department of Transportation

- Permit to Perform Work Within a State Highway Right-of-Way

Kaua‘i County of Public Works

- Grading and Grubbing Permit
- Building Permit

Kaua‘i County Department of Water Supply

- Water

Kaua‘i County Wastewater Management Division

- Sewer Connection Permit

2.0 AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This chapter describes the natural, man-made, and social environment; the potential impacts that may result from implementation of the Project; and measures proposed to mitigate those impacts.

2.1 CLIMATE

Hanapēpē has a tropical savannah climate with light rainfall most months of the year. The mean annual temperature is 74 degrees Fahrenheit with mean annual precipitation averaging 27 inches (UHM 2014). The dominant winds are northeast trade winds like much of Hawai‘i.

Potential Impacts and Mitigation Measures

The Project is not anticipated to have any effect on the region’s climate.

2.2 GEOLOGY, TOPOGRAPHY AND SOILS

A slope analysis of the Project site was conducted using topographic LiDAR (light detection and ranging) data to determine slopes and calculate acreages of the developable areas of the site. The Hanapēpē Homestead area is generally moderately sloped, however there are areas of steeper slopes in and around the gulches.

Moderate slopes are good for aesthetics and site drainage, but steeply sloped areas can substantially raise development costs. Moderate slopes with grades of less than 10% are the easiest to build on. Between 15% and 20%, more complex grading and foundation work is required. Steep slopes above 20% require more extensive earth moving and soil stabilization to create workable grades and to prevent erosion. Figure 5 shows the amount of acreage for the various levels of slope in the Project area. Slopes over 20% are the main constraint to development of the proposed homesteads.

Mauka Site: The 2013 USGS Topographic Map of the area show the site located on the northwestern side of the Hanapēpē River drainage basin and to the west-northwest of Hanapēpē town. The southeastern side of the site is approximately 250 yards from the western bank of the Hanapēpē River and about 0.3 miles north of Hanapēpē Bay where the Hanapēpē River meets the Pacific Ocean. The site sits approximately 30 feet above msl at the lowest, southern end and slopes gently up to approximately 250 feet msl at the extreme northeastern corner of the site (KSK, 2019).

The Mauka site includes Agricultural Lands of Importance to the State of Hawaii (ALISH) that are classified as “Prime,” “Unique.” and “Other.” See Figure 6, ALISH Map. The portions of the Project area designated as prime generally have the flattest land with the least amount of slope. “Other” designated lands are found mostly along the gulches.

Prime agricultural land is best suited for the production of food, feed, forage and fiber crops. The land has the soil quality, growing season, and moisture needed to produce sustained high yields of crops. Other important agricultural land is land other than Prime, or Unique, Agricultural land. The lands in this classification are important to agriculture, yet exhibit

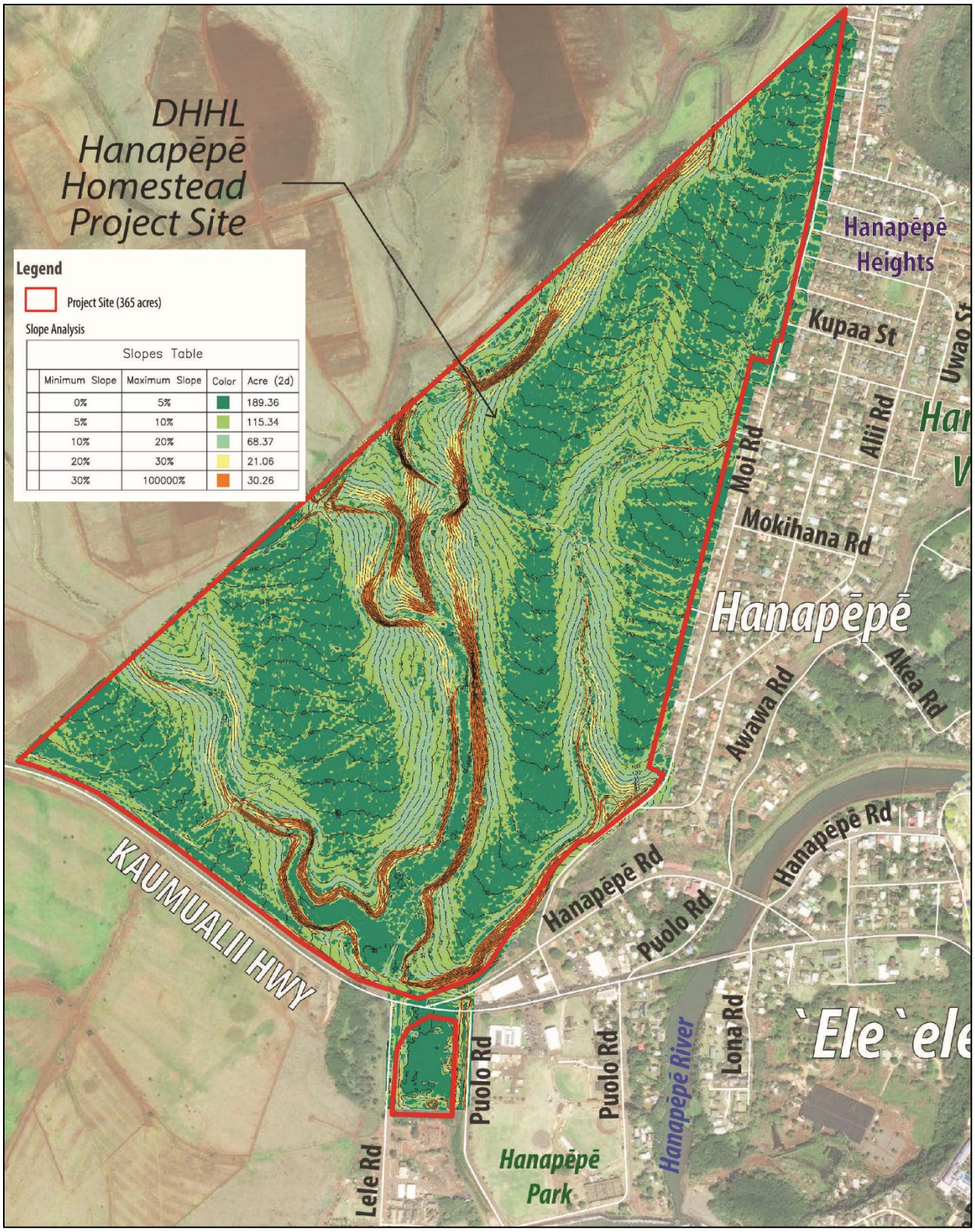
properties like slopes, flooding, or seasonal wetness that exclude them from the Prime ALISH classification.

The predominant soil type present at the Mauka Site is Makaweli silty clay loam at close to 80% coverage. Other soil types have been identified on the site in lower percentages. See Figure 7, Soils Map.

Makai Site: The 2013 USGS Topographic Map of the area and the Google Earth satellite images show the site located on the western side of the Hanapēpē River drainage basin and at the base of the western slope of the volcano. The site is approximately 30 feet above mean sea level (msl), and about ¼ mile from the mouth of Hanapēpē River where it enters Hanapēpē Bay. The surrounding area to the south slopes gently down to sea level and the topography to the north of the site rises gently up the slopes of the volcano.

The Makai Site is comprised of one type of soil identified as "Pakala" soil, which is classified as a Class B "clay loam." This soil is "deep and moderately deep, moderately well and well-drained soil with moderately coarse textures." Soil layers for this type of soil are generally segregated at the Site as follows: 0 – 16 inches - Clay Loam. Silt-clay materials, clayey soils; and 16 – 59 inches – Silty Clay Loam. Silt-clay materials, clayey soil.

Figure 5: **SLOPE ANALYSIS MAP AND TABLE**



Slopes Table

Minimum Slope	Maximum Slope	Color	Acre (2d)
0%	5%		189.36
5%	10%		115.34
10%	20%		68.37
20%	30%		21.06
30%	100000%		30.26

Figure 6: **AGRICULTURAL LANDS OF IMPORTANCE TO THE STATE OF HAWAII MAP**

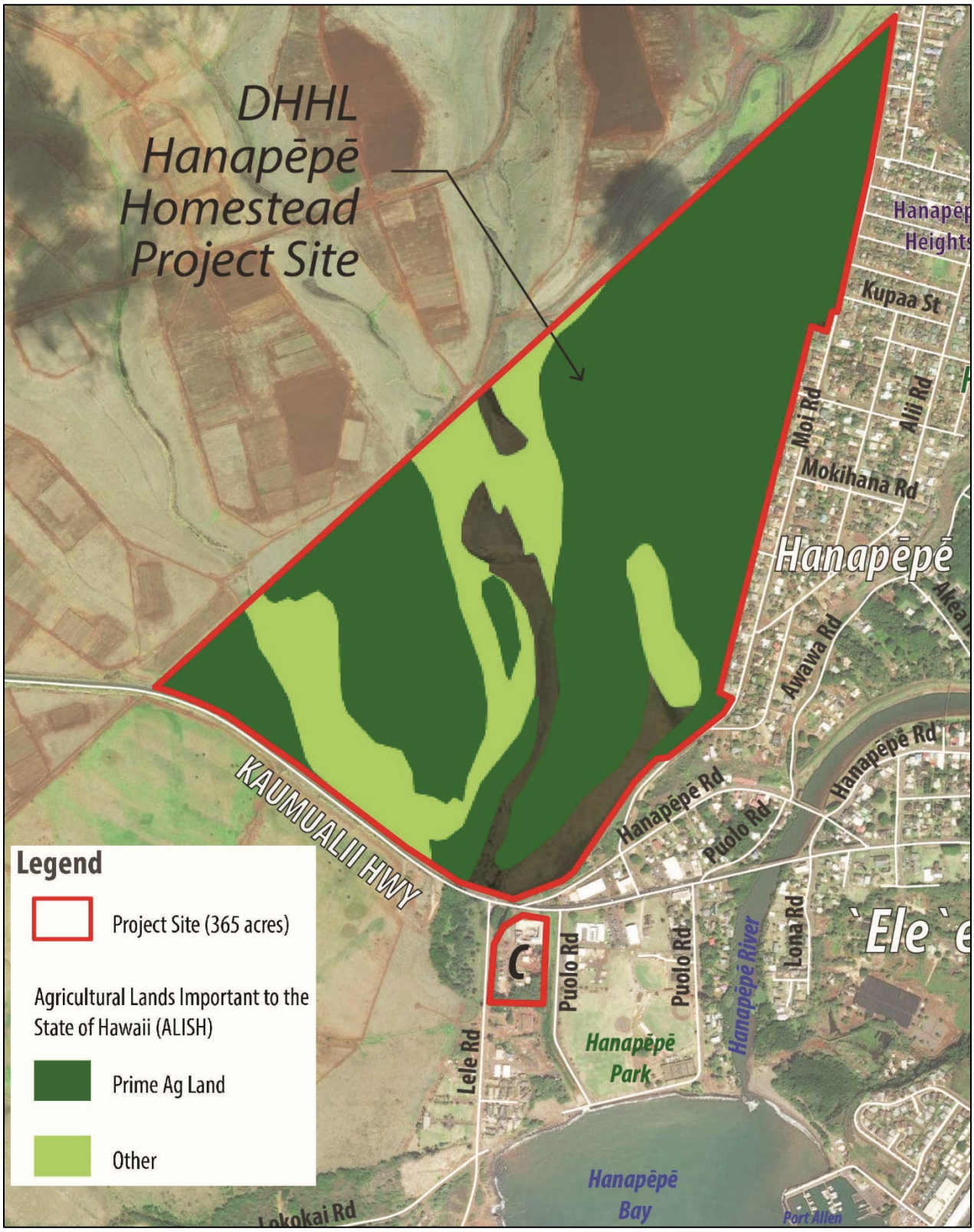
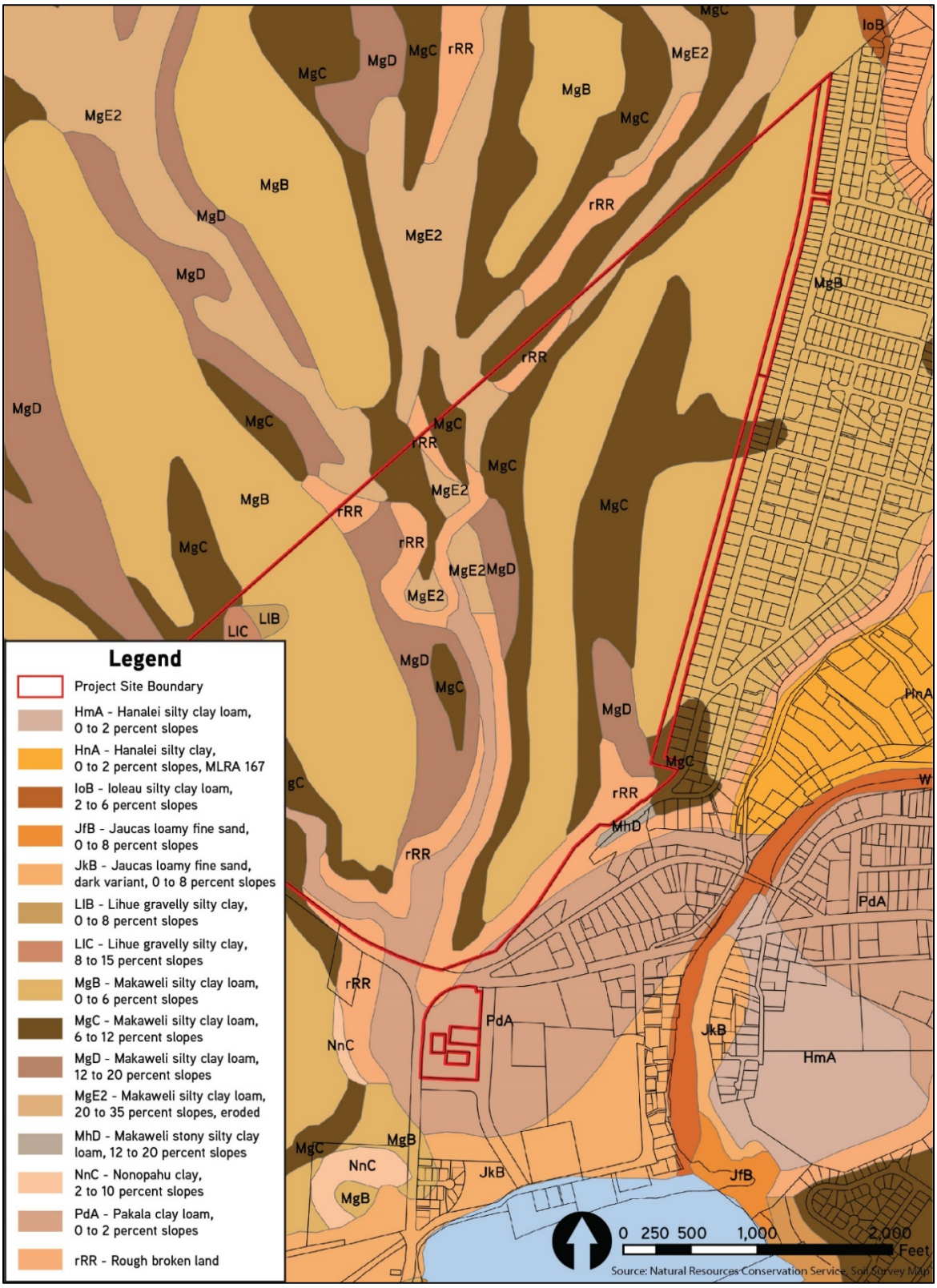


Figure 7: **NATURAL RESOURCES CONSERVATION SERVICE HANAPĒPĒ SOILS MAP**



Potential Impacts and Mitigation Measures

The primary constraints to development for the Mauka Site are related to the topography of several gulches of varying widths and steepness crossing the site. In general, the slopes and soils in these areas are less suited to development and are more likely to include sensitive resources such as flora, fauna, and cultural resources. Accordingly, the preferred land use plan designates the majority of the gulch areas and portions of the site with greater than 20% slope as Conservation or Special District. The proposed Project will have mitigable impacts upon the environment. The impact on the soil is anticipated to be less intensive than the commercial agricultural operations that previously dominated the area.

The site shall be graded for accessibility in accordance with the Americans with Disabilities Act. Requirements include, in part, providing at least one accessible route from public transportation stops.

No significant impact to topographic landforms or soils at the subject property is anticipated. It is anticipated that the new underground water, sewer, and drainage systems will not be impacted by sea level rise, due to the elevated topography and the inland location of the site. All grading operations will be conducted in full compliance with dust, erosion control, and other requirements of the County of Kaua‘i and HAR, Section 11-60, 1-33 applicable to fugitive dust. A construction grading permit will be required. Best management practices will be included in construction plans to mitigate dust and/or silt emissions.

A Phase 1 Environmental Site Assessment Report was prepared for the Project by Kevin S. Kennedy LLC in 2019 (KSK 2019). The Mauka Site revealed no evidence of Recognized Environmental Concerns (RECs). However, the entire site was formerly used for commercial cultivation of sugarcane and pineapple. The normal application of pesticides and herbicides does not constitute an environmental “release” or “spill” under Hawaii environmental laws. Any future residential or commercial development of former agricultural lands will require environmental sampling and analysis of the soil to assess the presence and concentrations of various agrichemicals, their constituents and byproducts. The Makai Site is comprised of four adjoining tax parcels that contain 1) a Habitat for Humanity carpentry shop 2) two trucking companies with diesel truck repair operations and 3) a school bus parking lot with bus maintenance and repair operations. The Environmental Site Assessment has revealed evidence of REC’s at the site. These REC’s include the truck repair and maintenance operations, storage of bulk fuel and oil in the unsecured containers, stockpiled soil/asphalts, abandoned vehicles and truck parts, old battery storage and oil stained soil. Any future change in use or tenants should involve further study and remediation efforts as are determined necessary.

2.3 HYDROLOGY

Surface Water

There are no perennial streams located within or near the Project area. Both sites fall within the Waimea Aquifer Sector of Kaua'i, which encompasses nearly the entire western side of the island, with the exception of the Nāpali Coast area. The Waimea Aquifer Sector is comprised of four aquifer systems: Kekaha, Waimea, Makaweli and Hanapēpē.

Groundwater

Mauka Site: According to Mink and Lau (1992), the Mauka Site overlies portions of two separate Aquifer Systems: the Makaweli Aquifer System, which generally underlies the western half of the Mauka Site and the Hanapēpē Aquifer System, which underlies the eastern half.

Six separate aquifers underlie various areas of the Mauka Site, three upper and three lower aquifers. For the eastern half of the Site, Mink and Lau assigned aquifer code 20304111 (21111) to the upper aquifer. The first part of the upper aquifer code number, 20304111, indicates that it is part of the Hanapēpē Aquifer System and contains a basal-type unconfined aquifer present in horizontally extensive lavas. The aquifer contains fresh water in contact with seawater and is unconfined (the water table is the upper surface of the saturated aquifer). The second part of the aquifer code number, 21111, is the aquifer Status Code, which in this case indicates that the aquifer has potential use as a drinking water aquifer. The aquifer contains fresh water with no salinity (chloride concentration < 250 mg/l), is irreplaceable and has a high vulnerability to contamination (Mink and Lau, 1992). The Mauka Site also falls within the Commission on Water Resource Management's (CWRM) Makaweli Aquifer, assigned aquifer code 20303. The CWRM Water Resource Protection Plan's aquifer system boundary area places the Project site within the Makaweli Aquifer. The Makaweli aquifer system is identified as having a sustainable yield of 26 MGD.

Makai Site: The Makai Site overlies portions of the Makaweli Aquifer System. Two aquifers underlie the site, an upper and lower aquifer. Mink and Lau assigned aquifer code 20303111(21111) to the upper aquifer. The first part of the upper aquifer code number, 20303111, indicates that it is a basal-type unconfined aquifer present in horizontally extensive lavas. The aquifer contains fresh water in contact with seawater and is unconfined (the water table is the upper surface of the saturated aquifer). The second part of the aquifer code number, 21111, indicates that the aquifer has potential use as a drinking water aquifer. The aquifer contains water with a "low" salinity (chloride concentration 250 – 1,000 mg/l), is irreplaceable and has a high vulnerability to contamination (Mink and Lau, 1992).

The lower aquifer, aquifer code 20303122(21113), is a basal-type, confined aquifer contained in dike compartments. The aquifer status code for this lower aquifer (21113) indicates that the aquifer has potential use as a drinking water aquifer, containing fresh water (chloride content < 250 mg/l). The aquifer is considered irreplaceable and has a "low" vulnerability to contamination.

Potential Impacts and Mitigation Measures

There are no perennial streams located within or immediately adjacent to the Project area, however there is a high probability that portions of the land being used would have waters of the

U.S. present on the site and a delineation of waters of the U.S. may be necessary as future phases are developed. Consultation with the U.S. Army Corps' of Engineers Regulatory Program will be necessary to determine if a Department of Army permit is required (file number POH-2019-00231).

The Project will meet or exceed County drainage requirements by preparing a drainage master plan in accordance with Federal, State and County regulations. Eleven (11) stormwater detention basins have been proposed at various locations on the development site, including ten (10) within the Mauka Site and one (1) on the Makai Site. In addition, Low Impact Development strategies can be incorporated to further reduce the environmental impact and provide additional water quality improvement opportunities.

No long-term impacts to groundwater aquifers or surface waters are expected to result from the property's development. Best management practices will be implemented during construction to minimize risk of siltation and pollution due to construction related stormwater runoff. The Project will comply with HAR, Sections 11-54-1.1, and 4 through 8. A National Pollutant Discharge Elimination System (NPDES) permit coverage for discharges of wastewater, including stormwater runoff, into State surface waters (HAR, Chapter 11-55) will be secured. The initial Phase 2 (75 new residential lots) is not anticipated to involve work in, over, or under waters of the U.S. All discharges related to the Project construction and operation activities will comply with the State of Hawai‘i's Water Quality Standards.

Any subsequent unforeseen negative impacts may be mitigated through management protocols developed with the lessees, continued coordination with the State Historic Preservation Division (SHPD), and designation of streams, gulches, and biologically promising areas as Conservation or Special District.

2.4 AIR QUALITY AND NOISE

Air quality in the Hanapēpē area is not rated on the Air Quality Index provided by the Hawai‘i Department of Health, Environmental Health Division. However, the air quality in Hanapēpē is considered satisfactory and air pollution poses little to no risk. The Project area is surrounded by non-active agricultural areas and residential uses. Air quality in the vicinity of the Project is mostly affected by emissions from vehicular sources which emit carbon monoxide, nitrogen oxides, hydrocarbons and other air pollutants.

There are two potential types of air pollution emissions that could directly result in short-term air quality impacts during Project construction phases: (1) fugitive dust from soil excavation, aggregate processing and vehicle movement, and (2) exhaust emissions from on-site construction equipment. Indirectly, there also could be short-term air quality impacts from addition of construction vehicular traffic on Moi Road, from slow-moving construction equipment traveling to and from the Project site, and from a temporary increase in local traffic caused by commuting construction workers.

Fugitive dust emissions from construction activities are difficult to estimate accurately because of their elusive nature of emission and because the potential for dust generation varies greatly depending upon the type of soil at the construction site, the amount and type of dirt-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed.

On-site mobile and stationary construction equipment also will emit air pollutants from engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxide emissions from diesel engines can be relatively high compared to gasoline powered equipment, but the standards for nitrogen dioxide are set on an annual basis and are not likely to be violated by short-term construction equipment emissions. Indirectly, slow-moving construction vehicles on roadways leading to and from the Project site could obstruct the normal flow of traffic to such an extent that overall vehicular emissions increase.

Noise levels in the area are fairly low and are primarily associated with vehicles traveling along the highway and Moi Road.

Potential Impacts and Mitigation Measures

The proposed Project will have short-term construction related impacts on noise and air quality, but impacts will be mitigated through best management practices.

Mitigating construction noise at the source is the most effective form of noise control and most construction equipment will follow appropriate noise control. Construction will be mitigated by best management practices in accordance with State Department of Health and County of Kaua‘i construction permit conditions. During Project construction, the dominant noise sources will likely be earth moving equipment, such as bulldozers and diesel-powered trucks.

Short-term impacts on air quality are anticipated to result from fugitive dust during Project construction phases. Because of this, an effective dust control plan for the period of construction should be prepared and implemented. After construction, any long-term impacts on air quality from motor vehicle traffic related to this Project will likely be negligible.

Adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-dirt surfaces in active construction areas from becoming significant sources of dust. Control regulations will further stipulate that open-bodied trucks be covered at all times when in motion if they are transporting materials likely to give rise to airborne dust. Haul trucks tracking dirt onto paved streets from unpaved areas are oftentimes a significant source of dust in construction areas. Some means to alleviate this problem, such as tire washing or road cleaning, may be appropriate. Dust monitoring will be considered as a means to quantitatively evaluate the effectiveness of dust control measures.

On-site mobile and stationary construction equipment air pollutant impacts will be mitigated by moving heavy construction equipment during periods of lower traffic volume. Likewise, the schedules of commuting construction workers may be adjusted as needed to avoid peak hours in the Project vicinity.

After the period of construction, long-term impacts on air quality from motor vehicle exhausts can potentially occur at or near any location that attracts large volumes of motor vehicle traffic. Carbon monoxide emissions are usually the primary issue, and public areas near traffic-congested intersections are the main concern. The Project’s traffic impact analysis indicates that the existing traffic level of service at these intersections is reasonably good, and in the future condition, it was found that with construction of the Project this would continue to be the case. Considering the small Project-related traffic volumes that are expected and the reasonably good

traffic level of service that is forecast, traffic from the proposed Project should have no measurable long-term impacts on air pollution levels in the Project area.

2.5 FLORA AND FAUNA

A team of biologists from H.T. Harvey and Associates conducted a flora and fauna survey of the Project area on March 4, 2019. A copy of the biological survey report is provided in Appendix .

Most of the inaccessible interior of the Project area can be described as grassland habitat. Because this area has a long history of intensive cultivation, there are almost no traces of original vegetation at the site today. It is covered with dense, monotypic stands of dead guinea grass (*Megathyrsus maximus*) with scattered haole koa trees (*Leucaena leucocephala*). Unlike in the aerial photographs of the Project area, the Kukamahu Gulch habitat could not be distinguished when scanning the interior of the Project area from the eastern and southern borders. However, limited access to the southernmost portion of the gulch which runs parallel to the Highway revealed that the gulch was dry. The gulch constitutes a sharp drop of about 30 ft. from the edge of the Highway right-of-way. The western end of the gulch is comprised of large ʻopiuma trees (*Pithecellobium dulce*) with hardly any understory vegetation.

A total of 53 plant species were observed in the surveyed parts of the Project area. Fifty-one (96%) of these are either cultivated or naturalized and two species (4%): hoary abutilon (*Abutilon incanum*) and ʻuhaloa (*Waltheria indica*) are believed to be indigenous to the Hawaiian Islands (Wagner et al., 1999). No plant species state- or federally-listed as threatened or endangered, or candidates for listing, and no rare native Hawaiian plant species were observed in the accessible parts of the Project area. The Project area does not contain proposed or designated critical habitat for threatened or endangered plant species. The main vegetation types observed are provided in Table 2.

Fourteen (14) bird species, all nonnative introduced species were seen during the survey of the Project area. Seven (7) of these species are designated as injurious species on the state list of injurious wildlife (DLNR, 2015) and are known to be harmful to agriculture, aquaculture, or indigenous wildlife or plants or to constitute a nuisance or health hazard: cattle egret (*Bubulcus ibis*), zebra dove (*Geopelia striata*), spotted dove (*Streptopelia chinensis*), Japanese white-eye (*Zosterops japonicus*), chestnut munia (*Lonchura atricapilla*), white-rumped shama (*Copsychus malabaricus*), and rose-ringed parakeet (*Psittacula krameri*). The first four of these species were either abundant or commonly found on the Project site, while the latter three were uncommon and rare, respectively, on the site. The other common and abundant urban bird species observed during the course of the survey were all nonnative introduced species typically seen in lowland areas. These included the common myna (*Acridotheres tristis*), northern cardinal (*Cardinalis cardinalis*), house finch (*Carpodacus mexicanus*), domestic pigeon or rock dove (*Paroaria coronata*), red-crested cardinal (*Paroaria coronata*), and domestic chicken (*Gallus domesticus*). Hawaii's only native land mammal is the ʻŌpeʻapeʻa, the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), which can be found throughout Kauaʻi, Maui, Oahu, and Hawaiʻi islands. They roost in native and non-native trees alike, and often forage in area like the borders between forest and pasture lands, forest road corridors, streams, bays and inlets.

Although no Hawaiian seabirds were observed, there was evidence of the presence of seabirds in the area. The electrical transmission lines along Kaumualiʻi Highway near the southwest corner

of the property have bird diverters attached, which function to visually warn seabirds transiting the area of the presence of power lines. A check of the Kaua‘i Humane Society’s Save Our Shearwaters (SOS) Program seabird fallout records indicate that Hanapēpē and ‘Ele‘ele areas experience fallout of the threatened Newell’s shearwater (*Puffinus newelli*), Hawaiian petrel (*Pterodroma sandwichensis*), and wedge-tailed shearwater (*Puffinus pacificus*) on an annual basis. The fallout records in close proximity to the Project site indicate that these species fly near or over the Project site on an annual basis. The main faunal types observed are provided in Table 3.

TABLE 2: MAIN VEGETATION TYPES OBSERVED IN HANAPĒPĒ

AREA	DOMINANT VEGETATION
6-acre industrial parcel	Mixed-scrub vegetation, ornamental plants, variety of trees and shrubs (haole koa, monkeypod, ‘opiuma), ‘uhaloa
Hanapēpē Road	Haole koa shrubland, guinea grass, buffel grass, creeping indigo
Project Area interior	Grassland habits, dead guinea grass, scattered haole koa trees
Kukamahu Gulch	‘Opiuma trees, castor bean shrubs, haole koa, guinea grass

TABLE 3: MAIN FAUNAL TYPES OBSERVED IN HANAPĒPĒ

TYPE OF FAUNA	OBSERVATION/DESCRIPTION
Non-native birds	Cattle egret, zebra dove, spotted dove, Japanese white eye, chestnut Munia, rose-ringed parakeet, common myna, domestic pigeon, domestic chicken
Native birds/ mammals	None
Non-native mammals	domestic and feral cats, domestic horses

Potential impacts and mitigation measures

It is unlikely that the proposed Project will have a significant adverse impact on any plant species state or federally listed as threatened or endangered, candidate species for listing as endangered, species of concern, or rare native Hawaiian plant species. The Project area is highly disturbed, comprising of abandoned agricultural land now dominated by guinea grass grassland, residences, and an industrial lot, and with 96% of the flora being nonnative. The two indigenous plant species found in the Project area commonly occur on Kaua‘i and the other Main Hawaiian Islands. However, it should be noted that the vast majority of the Mauka Site could not be surveyed on foot and was only able to be scanned using binoculars. It is possible that since

agricultural practices were abandoned, some native plant species recruited and found refuge in suitable pockets of the Project area not invaded by the surrounding weedy vegetation (e.g. near the gulch habitat). Therefore, it is recommended that, before any major vegetation clearing is conducted, the interior of the 357-acre parcel should be surveyed on foot to confirm the presence or absence of any native plant species.

No native wildlife species were observed in the Project area at the time of the survey. However, the vast open grasslands of the Mauka Site appear to provide suitable habitat for Hawaiian short-eared owl (*Asio flammeus sandwichensis*) or pueo. This area also likely provides habitat for non-native barn owl (*Tyto alba*) and introduced game birds such as ring-necked pheasant (*Phasianus colchicus*), gray francolin (*Francolinus pondicerianus*); black francolin (*Francolinus francolinus*); and Erckel's francolin (*Francolinus erckelii*) (DLNR, 2019). These species are relatively common and distributed throughout the State and have open grassland habitat available in adjacent fallow agricultural land and pasture areas. On-foot surveys for seabirds were not conducted. However, the endangered Hawaiian petrel, threatened Newell's shearwater, and wedge-tailed shearwater are seabird species known to occur on Kaua‘i and transit through the Project area (SOS 2018, USFWS 2019). Furthermore, seabird diverters were observed on the utility wires along Kaumuali‘i Highway near the southwestern end of the Project area suggests that seabirds frequent the Project area during the February-December seabird breeding season and tall overhead powerlines present a collision hazard to these birds in this area. Similarly, recent Save Our Shearwaters fallout records (SOS 2018) also indicate that fledgling seabirds are attracted to external lights in adjacent urban areas and external lights pose a light attraction hazard during the seabird fallout season from September 15 to December 15 in this area.

The further development of powerlines and external lighting present an additional risk to the birds, if not minimized or avoided (KIUC 2011). It is recommended that the Project incorporate measures to avoid or minimize potential impacts, such as limiting the quantity of, and shielding street lights, community park lighting, and external lights on buildings.

Hawaiian hoary bats are known to occur on Kaua‘i (Tomich 1986) and their presence in the Project area cannot be ruled out. No trees greater than 15 feet tall should be trimmed or removed during the bat pupping season from June 1 to September 15.

2.6 NATURAL HAZARDS

Kaua‘i island is subject to various natural hazards. Flooding, wildfires, and tsunami are the main risks. The vulnerability of the Project side to these hazards is described below.

Flood Hazard Risk

The Project area is designated as an area of minimal flood hazard, Flood Zone X, on the Federal Emergency Management Agency Flood Insurance Rate Maps. Zone X is determined to be outside the 500-year flood zone, with minimal risk of flooding.

Wildfire Hazard Risk

The State Department of Land and Natural Resources Division of Forestry and Wildlife identified the Mauka Site as in the “N/A” zone for risk to wildfire hazards. However, due to drier weather, hotter temperatures and stoppage of agricultural uses on the Project site, the risk of wildfire is high, and development of the site would help to mitigate the risk of wildfire

substantially, with appropriate firebreaks provided between developed and open areas. Based on community concerns, DHHL Land Management Division recently (in 2019) cleared the area behind the existing residential homestead lots to create a fire break as a safety measure in the event of wild fire.

Tsunami Risk

The Pacific Disaster Center has identified the Makai Site as being within the Tsunami Evacuation Zone. The larger Mauka Site is determined to be outside the Tsunami Evacuation Zone.

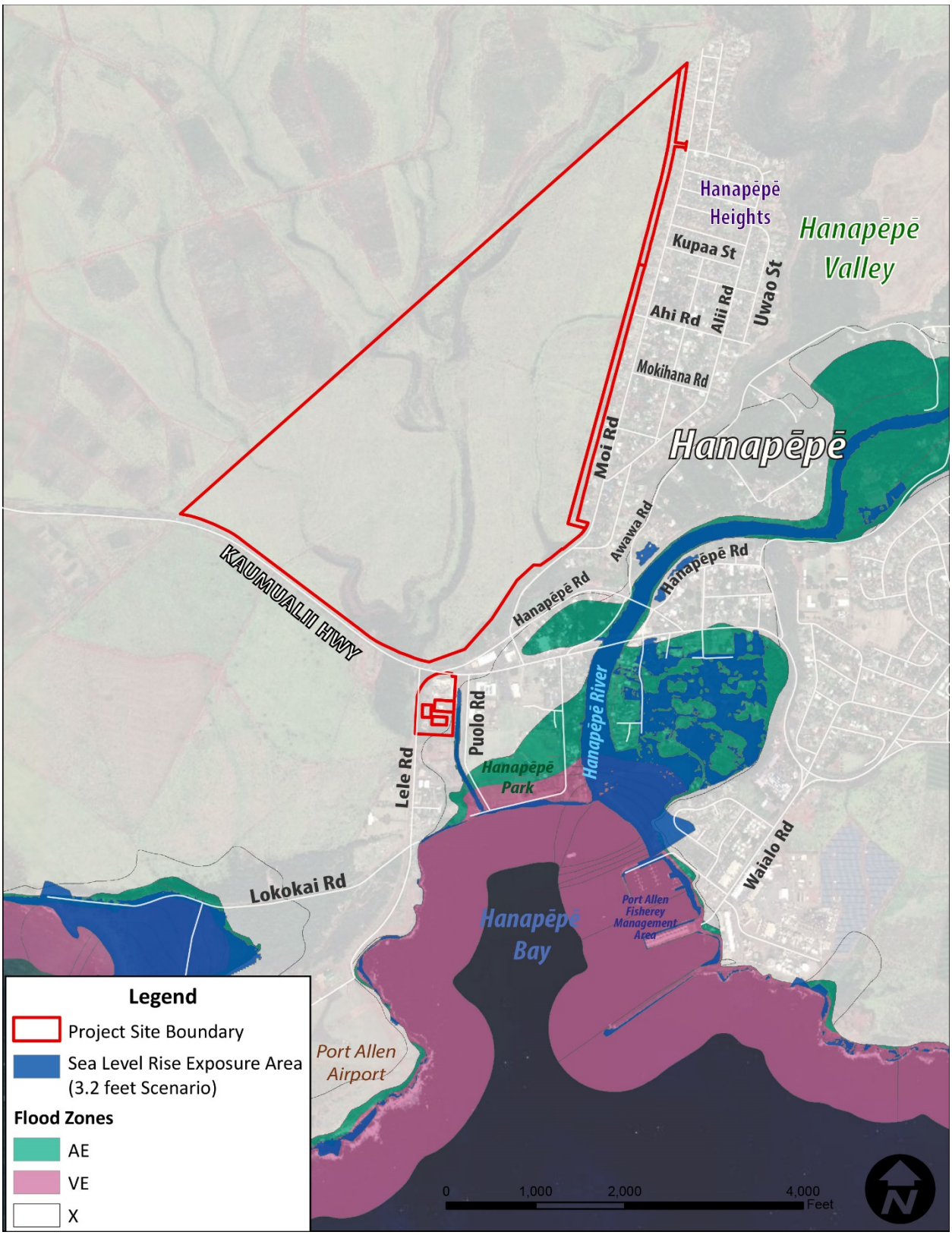
Flooding & Sea Level Rise

Both the Makai and Mauka Sites are designated as Flood Zone X on the Federal Emergency Management Agency Flood Insurance Rate Maps. Flood Zone X is determined to be outside the 500-year flood zone, with minimal risk of flooding. Both sites are located outside of the 3.2-foot Sea Level Rise Exposure Area (SLR-XA) from the Hawai‘i Sea Level Rise Vulnerability and Adaptation Report. The Makai Site is located adjacent to but outside of the 3.2-foot Sea Level Rise Exposure Area SLR-XA. See Figure 8.

Potential Impacts and Mitigation Measures

The chance of flooding is minimal. The National Flood Insurance Program (NFIP) does not regulate developments within Zone X of the Flood Insurance Rate Maps and the entirety of the Project is located within Zone X. In the event of an extreme tsunami, residents, employees and visitors will be able to take shelter in portions of Hanapēpē or community use facilities in the future. Wildfires were noted as a concern in consultation with current lessees and neighboring landowners. It was noted that firebreaks should be maintained between residential areas and open areas including gulches and grasslands to minimize wildfire risk. The Project area is located outside the 3.2-foot Sea Level Rise Exposure Area (SLR-XA) identified in the Hawai‘i Sea Level Rise Vulnerability and Adaptation Report (2017).

Figure 8: **FEMA FLOOD ZONE AND SLR-XA MAP**



2.7 HISTORIC AND ARCHAEOLOGICAL RESOURCES

An archaeological assessment was conducted by DUDEK dated April 2019 to assess potential impacts of the proposed land use plan in accordance with the requirements set forth in HRS Chapter 343. A copy of this report is provided in Appendix .

No known archaeological features or deposits within the Project areas were noted during background research of the Mauka Site. No archaeological features or deposits were observed during the preliminary site visit, however the dense and tall vegetation obscures the majority of the larger land parcel. Ranching and extensive mechanized agricultural activities have taken place on the Mauka Site for over 150 years, and the Makai Site has undergone at least one century of development.

Early Historic Period

Kaua‘i Kuapapa (ancient Kaua‘i) and Hanapēpē Ahupua‘a (traditional land division) were likely settled sometime after the 11th century C.E. by waves of Polynesia seafarers from the Marquesas and Tahiti. Hanapēpē Ahupua‘a hosted initial human settlement and uses unique throughout the Hawaiian Islands. Hanapēpē is translated as “crushed bay” and may be derived from Hanapepehi “killing bay”. Traditional land divisions and boundaries have changed throughout time; Hanapēpē Ahupua‘a was initially part of Kona Moku, then Waimea.

It encompasses the Hanapēpē River system that winds through numerous canyons and valleys before terminating at Hanapēpē Bay. Freshwater flowed through an array of terrains and elevations and ensured that Hanapēpē’s resources were plentiful and varied. Salt was harvested from ancient salt pans situated along the coast.

Handy and Handy (1972) suggest that Hanapēpē, as well as canyonlands throughout Kaua‘i hosted rare inland populations and settlements. They argue people within them subsisted primarily on kalo yields from dryland lo‘i flanking rivers and streams, and interacted rarely with the sea.

In 1778, Captain James Cook and the crew of *The Discovery* arrived at the mouth of the Waimea River, roughly 6 miles northwest of the Project areas. James Ellis, the surgeon’s mate on board, sketched Kaua‘i island’s south shore. Cooks arrival opened Kaua‘i and the islands to successive eras of foreign incursion, invited settlement and colonization.

Mid to Late 1800s

Mid-19th century accounts describe the fertile kalo fields, inland settlements and population of Hanapēpē. In 1847, Reverend Bingham recorded an inland settlement of 140 cottages and seven hundred inhabitants farming kalo in Hanapēpē Valley. An 1853 map of Kaua‘i population estimates counts roughly 1,400 people in the Hanapēpē Ahupua‘a. A description of Hanapēpē Valley from the same year describes its plantations, dwellings and coconut and taro patches. In an 1864 letter, Norwegian settler and ally of King Kamehameha III Valdemar Knudsen describes Hanapēpē as replete with fallow kalo and rice fields, and states that hula is still being practiced despite missionary bans.

Whaling, trade and commerce flourished between 1830-1861 in cities and settlements along Kaua‘i’s southwest coast (Joesting, 1984). Rice farming became established on Kaua‘i between the 1850’s and 1860’s.

The expansive growth of the sugar cane and pineapple industries throughout the archipelago transformed settlement and land use in Hanapēpē. The sugar industry in the Hawaiian Islands began on Kaua‘i and lasted from 1835 through 2009, drastically altering the landscape, economy and settlement patterns across the island and in the Project area.

In 1865, Elizabeth McHutcheson Sinclair, a wealthy Scottish emigrant who arrived via numerous booming economic frontiers around the Pacific rim, purchased the land between the Hanapēpē and Waimea rivers. Sinclair’s purchase is referenced as the Makaweli Ahupua‘a, but by description and in maps through the early 20th century, appears to have included the Project area in adjacent Hanapēpē Ahupua‘a. Sinclair partnered with her sons-in-law Francis Gay and Aubrey Robinson to form the Gay and Robinson partnership, purchased the lands adjoining theirs in Hanapēpē, and owned the entirety of the Kona District by 1873. Gay and Robinson and the Hawaiian Sugar Company plantations, as well as a ranch, resulted on Makaweli and Hanapēpē lands.

1900’s

A 1901 map of Kaua‘i classifies Hanapēpē and the Project areas as former Crown Lands initially reserved exclusively for use by Kamehameha III that transitioned into public domain before being classed as “Public Lands.” A 1903 map of Kaua‘i depicts Hanapēpē and the Project areas as “public lands”. The Project area also appears as part of the Gay and Robinson Makaweli Plantation. In the 1930’s, Hanapēpē Valley was under heavy agricultural cultivation. In 1941, C. Brewer Co. leased land from Gay and Robinson and established the Olokele Sugar Company, which operated until 1994 before being reabsorbed into the Gay and Robinson family holdings. Gay and Robinson is the last of three sugar plantations in the Hawaiian Islands and the last family-owned plantation.

Contemporary Land Use

The Mauka Site was formerly in sugar cane cultivation by Olokele Sugar Company, Ltd. The Project site is currently vacant and lays fallow, with no agricultural activity or production. DHHL previously established approximately 47 Residential homestead lots along Moi Road, on the eastern edge of the Project area.

Potential Impacts and Mitigation Measures

No archaeological features or deposits within the Project areas were noted during background research of the subject parcel. Neither were archaeological features or deposits observed during the preliminary site visit, although extremely dense, tall vegetation obscures the majority of the Mauka Site. Ranching and extensive mechanized agricultural activities have taken place on the Mauka Site for over 150 years, and the Makai Site has undergone at least one century of development.

Based on the fact that one archaeological study has partially, definitively occurred in the Project areas, an Archaeological Inventory Survey (AIS) of the subject properties is likely necessary for future development. The AIS should be developed in coordination with the SHPD and undertaken in full compliance with HAR 13-275, 13-276 and all additional applicable heritage legislation. Special attention should be given to any sinkholes and caves present on the larger subject property that may contain cultural materials/heritage destroyed or cleared from the rest of the landscape by extensive, sustained, ranching and sugar cane cultivation activities. The Project

designates the gulches as Conservation areas not to be developed, which constitutes a preliminary effort to preserve possible features that may exist in the gulch areas. DHHL will continue to consult with the SHPD to determine what additional historic preservation work might be required, if any, including additional documentation of specific known features.

2.8 CULTURAL RESOURCES

A Cultural Impact Assessment (CIA) was conducted by Nohopapa Hawaiʻi, dated December 2019 to identify cultural resources within the Project area, potential impacts to those resources as a result of the proposed Project, and recommended measures to mitigate impacts. A draft of the CIA is provided in Appendix .

Background on the Hanapēpē Area

The Project area is located in the Ahupuaʻa of Hanapēpē (crushed bay) in the Kona Moku. The study area consists of two discontiguous ʻApana (portions or segments), made up of five TMK parcels. Hanapēpē Ahupuaʻa is replete with wahi pana (legendary places) and oral history. In a rare occurrence, makaʻāinana (common people) purportedly disposed of an unreasonable, obsessive high chief by throwing him off Holoiwi (traveling bones) Cliff. Hanapēpē Ahupuaʻa hosts several leina ʻo ka ʻuhane - leaping places associated with the transit of the dead into Pō, the "place of the dead", or afterlife.

Early accounts depict Hanapēpē Ahupuaʻa as hosting a rich trajectory of initial human settlement and uses unique throughout the Hawaiian Islands. Legends and oral histories state Kauaʻi experienced famine and drought less frequently than the other islands. During the Māhele, Crown lands in the Ahupuaʻa of Hanapēpē, once inalienable and in trust for the people, were sold off to large land owners.

During the Hawaiian Kingdom Era (pre- Jan.17, 1893) portions of Hanapēpē were already in sugar. The 1865 land purchase of Elizabeth McHutcheson Sinclair established two sugar plantations and a cattle ranch between Hanapēpē River and Waimea River. In the 1950's, the Hanapēpē Heights neighborhood was established adjacent to the Project area.

No archaeological features or deposits within the Project area were noted during background research or found during the fieldwork.

Community Consultations

Nohopapa Hawaiʻi consulted with individuals knowledgeable with the Project area who participated in community ethnographic interviews for contributions to the cultural impact assessment. Ethnographic research involves gathering oral histories and conducting interviews with living communities to record historical connections to a place. Six individuals were contacted for the study. Three individuals participated in ethnographic interviews, one provided discussions off the record, and the fifth declined to participate. All community members interviewed commented on the lack of archival history about Hanapēpē, in both Hawaiian and English, citing that little remains of the moʻolelo, ʻoli, mele, hula, and place names of Hanapēpē from historic times.

Hanapēpē, even at the time of the Mahele (1850s) had a large population, supported by agriculture extending deep into the valley. At this time, paʻakai was being actively harvested at ʻUkulā to support mauka and makai food preparation and preservation.

Hanapēpē was a place renowned for hula. The hālau Palaihiwa o Kaipuwai, established in 1945 by the late Kumu Hula Helen Kaipuwai Kekua Waiau taught hālau in Hanapēpē for a time. Her granddaughter and current Kumu Hula Kēhaulani Kekua spent time learning moʻolelo from area kūpuna in her grandmother's tradition.

Today there are twenty-two Hanapēpē ʻohana who make salt. Their families have roots in the area and have been passing down moʻolelo of the area as well as the traditional cultural practice of cultivating loʻi paʻakai. It is these families, grounded by practice, that are most likely to have kept the old stories of the area alive. One well known kūpuna and salt maker, the late Aunty Wilma Holi, shared share several moʻolelo of the area, passed down to her through her family, with ʻohana and friends of her time. The interviewees' main concerns about the Project were that the process, design, and build-out be thoughtful, and that Hawaiian cultural resources be protected and even restored as a result of the development of a new Hawaiian homestead area.

Access throughout Hanapēpē lands remains an important cultural issue. Interviewees also expressed concerns over safety and worries were expressed over the speed at which vehicles travel on Kaumualiʻi Highway along the stretch bordering Hanapēpē Hawaiian Home Lands and the intersection of Kaumualiʻi Highway with Lele Road and Hanapēpē Road. A general concern involves limiting access to dunes and the education needed to reduce the negative effects of compacting the clay substrate beneath the sand due to vehicle access. This can result in impacts to the well used for salt making, and prevents native plant species that grow on the dunes from flourishing. The increasing dune erosion, dust and debris along the windy shoreline are detrimental to the local ecosystem and salt production.

The salt makers would like to see new homesteaders informed about ways to take care of the makai area and encourage community and visitor support in adhering to protective measures. Creating cultural connections with new homesteaders coming to Hanapēpē is an important step towards growing a healthier Hawaiian community. Through active engagement and restoration, new Hawaiian Homesteads in Hanapēpē could positively impact cultural resources and grow traditional cultural practices.

2.9 VIEWPLANES

The Project is located on agricultural open space land on the mauka side of Kaumualiʻi Highway. The Mauka Site is located on a gentle slope within two miles of the coast. The Makai Site is located within approximately a half mile of the coast. Much of the region was previously under sugar cultivation and remains in agricultural open space from Hanapēpē town to Waimea town.

Views from the Project's Mauka Site are generally of agricultural open space when looking west, open space and coastline when looking south, Residential areas and Hanapēpē town when looking east, open space and mountainous areas when looking north. Figure 9 provides a map key for viewplane vantage points of photos provided in Figure 10.

Public views of the property are generally from Kaumualiʻi Highway, which runs east to west along the Project area. Views are mainly of pasture lands, tall grasses, shrubs, and some trees. Figure 8 provides views of the Project site from Kaumualiʻi Highway.

Potential Impacts and Mitigation Measures

The proposed Project will have mitigable impacts upon the environment. The Project will alter the existing views of agricultural lands as they are converted to homesteads, but the Subsistence Agriculture land use will be consistent with previous and current agricultural land uses. Single-family homes may be built by lessees and no mid- or high-rise buildings will be allowed. The Subsistence Agricultural lots will be larger than the Residential lots, maintaining open space views from Kaumualiʻi Highway.

Future Commercial and Community Use development will occur adjacent to Kaumualiʻi Highway at the lowest elevations in the Mauka Site, thereby resulting in less impacts to mauka to makai viewplanes in the area. Where appropriate for design, adequate setbacks and screening landscaping will be considered to mitigate possible visual impacts along Kaumuali'i Highway.

Figure 9: **LOCATION OF VIEWPLANE PHOTOS**

Figure 10: **VIEWS FROM THE PROJECT SITE**

Photo Location 1 – Looking North (Mauka)

Photo Location 2 – Looking South (Makai)

Photo Location 3 – Looking South (Makai)

Photo Location 4 – Looking Southwest (over gulch)

Photo Location 5 -- Looking North from Kaumuali'i Hwy

Photo Location 6 – Looking North (Mauka)

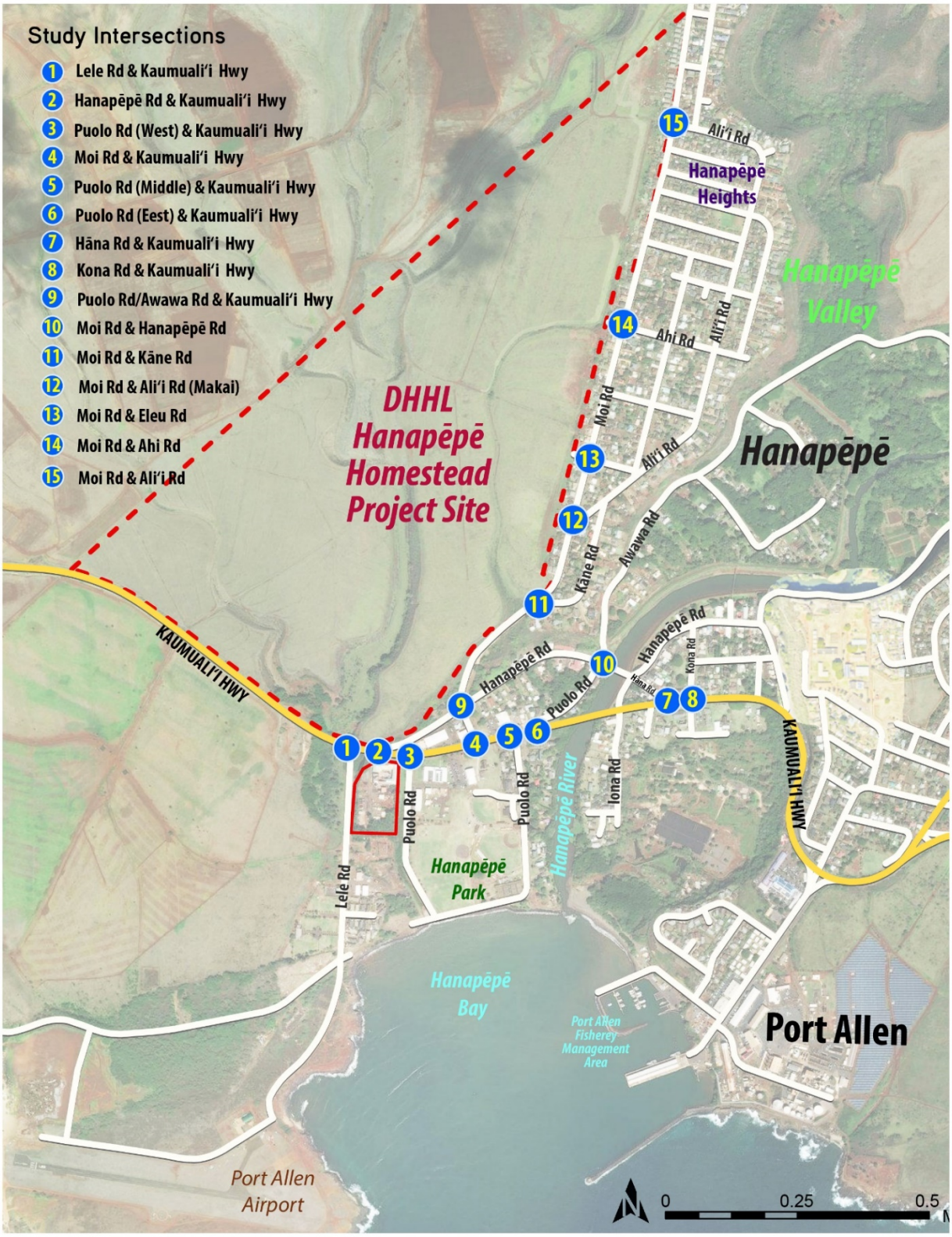
2.10 ROADS AND TRAFFIC

SSFM International prepared a Traffic Impact Analysis Report (TIAR) for the Project dated March 25, 2020. A copy of this TIAR is provided in Appendix . The TIAR was prepared to assess traffic impacts as a result of the Project. Multimodal turning movement traffic counts were taken at 15 study intersections in the vicinity of Project area and analyzed for Existing (2019), Future (2025, 2040) Without Project, and Future (2025, 2040) With Project conditions. The Project location and study intersections are shown in Figure 11.

The TIAR assessed the impacts of the two Project phases:

- Phase 2 is assumed to include 75 new residential lots with an expected build-out and occupancy by 2025.
- Phase 3 full build-out includes 449 Residential lots, 111 Subsistence Agricultural lots, and development of new Commercial/Community Use areas. It also assumes the ongoing commercial /industrial use of the Makai Site. Full build-out is assumed to occur by 2040. The southwest corner portion of the Mauka Site is assumed to have Community Use areas for shared homestead uses and facilities that may include spaces for parks, recreation, cultural activities utilities and other amenities.

Figure 11: **TIAR STUDY INTERSECTIONS**



2.10.1 EXISTING ROADS AND FACILITIES

Surrounding Roadways

Kaumualiʻi Highway (State Route 50) is an undivided, two lane, two-way thoroughfare, classified as minor arterial. It traverses in the east-west direction in the Project area. It connects Hanapēpē to Kaumakani Village in the west and ʻEleʻele town in the east. The posted speed limit is 35-mph in the study area. Six-foot-wide shoulders are present on both sides of the road. No sidewalks, bikeways, or bike facilities exist along Kaumualiʻi Highway in the study area.

Moi Road starts from the signalized intersection with Kaumualiʻi Highway and ends mauka of its intersection with Aliʻi Road. It is a two-lane, two-way mauka-makai thoroughfare with a 25-mph posted speed limit. It connects Kaumualiʻi Highway to the existing DHHL and Hanapēpē Heights residential neighborhoods. Dedicated left turn lanes are present for both east and westbound movements at the intersection of Moi Road and Kaumualiʻi Highway. No shoulders, sidewalks, bikeways, or bike facilities exist along Moi Road. There are four (4) existing access roads to the Mauka Site that are oriented in east-west direction along Moi Road, at its intersections with Aliʻi Road, Ahi Road, Eleu Road and 300' north of the intersection with Kane Road.

Hanapēpē Road starts from the stop-controlled intersection with Kaumualiʻi Highway, east of Puna road and ends at another stop-controlled with Kaumualiʻi Highway west of Puolo Road. It is a two-lane, two-way, east-west thoroughfare with a 25-mph posted speed limit. No shoulders, sidewalks, bikeways, or bike facilities exist along Hanapēpē Road.

Lele Road starts from the stop-controlled intersection with Kaumualiʻi Highway, west of Puolo Road, and ends makai of its intersection with Salt Pond Road. It is a two-lane, two-way, mauka-makai thoroughfare with a 25-mph posted speed limit. It connects Kaumualiʻi Highway to the Salt Pond Park and Port Allen Airport. No shoulders, sidewalks, bikeways, or bike facilities exist along Lele Road.

Pedestrian and Bicycle Facilities

Minimal dedicated pedestrian or bicycle facilities exist in the Project area. Six-foot-wide shoulders are present on both sides of Kaumualiʻi Highway, however no other roads in the Project area have dedicated space for pedestrians or bicycles, limiting the ability for people to get around the community by means other than passenger vehicle.

Bus Transit System

Kauaʻi Bus provides service to the island of Kauaʻi from Kekaha to Hānalei. Route 100, Kekaha-Līhuʻe mainline passes through Hanapēpē once per hour from 5:40am to 8:40pm. Bus stops are located at Hanapēpē Multipurpose Building on Puolo Road, Hanapēpē Armory and Hanapēpē First United Church on Kaumualiʻi Highway. Route 200, Līhuʻe-Kekaha mainline passes through Hanapēpē once per hour from 6:30am to 10:30pm. Bus stops are located at Westside Pharmacy, Mariko Store on Kaumualiʻi Highway and Hanapēpē Multipurpose Building on Puolo Road.

2.10.2 EXISTING TRAFFIC CONDITIONS

Moi Road and Kaumualiʻi Highway are two major roads which provide access to the existing and proposed developments. Considering existing traffic movements in the Project area and the anticipated impact of the Project, 15 intersections were selected for study. Out of these, 15 intersections 6 are along Moi Road and 8 are along Kaumualiʻi Highway. Both Moi Road and Kaumualiʻi Highway intersect each other at signalized intersections, and all other study intersections are stop-controlled.

The most recent historical average daily traffic (ADT) along the roadways in the Project area in the year 2016 is shown in Table 4. The data comes from annual traffic counts completed by the HDOT and provided in *Historical Traffic Station Maps*.

TABLE 4: ROADWAY ANNUAL AVERAGE DAILY TRAFFIC (2016)

Roadway	Station	Location	ADT
Kaumualiʻi Hwy	B730 050 01702	Between Lele Road and Kaumakani Village Road	11,200
Moi Road	B730 543 00006	Between Hanapēpē Road and Kāne Road	4,600

Intersection peak period turning movement traffic counts for 14 study intersections were taken on Tuesday, May 14, 2019 and Wednesday, May 22, 2019 during the peak periods of traffic from 6:00am to 9:00am in the morning and 3:00pm to 6:00pm in the afternoon. Peak hours in the study area are identified as 7:00am to 8:00am in the morning and 3:30pm to 4:30pm in the evening. The traffic count data may be found in Appendix E.

During the existing AM and PM peak hours, the signalized intersection of Kaumualiʻi Highway and Moi Road resulted in acceptable level of service (LOS) C or better for the intersection and movements. All the stop-controlled intersections along Moi Road resulted in LOS D or better. The side street approaches of the stop-controlled intersections along Kaumualiʻi Highway, east of Moi Road resulted in LOS E or F due to the lack of gaps in heavy traffic volumes highway. (See Table 5 for description of LOS). No significant pedestrian activity was observed in the study area. During the morning peak hour, a total of eight pedestrians were observed crossing the intersection of Kaumualiʻi Highway and Kona Road. During the afternoon peak hour, a total of 13 pedestrians were observed crossing the intersection of Moi Road and Aliʻi Road.

TABLE 5: LEVEL OF SERVICE DESCRIPTIONS

LOS	Description	Acceptability
A	Control delay is minimal	Satisfactory
B	Control delay is not significant	Satisfactory
C	Stable operation. Queuing begins to occur.	Satisfactory
D	Less stable condition. Increase in delays, decrease in travel speeds.	Acceptable*
E	Unstable operation, significant delays	Worse than acceptable
F	High delays, extensive queuing.	Worse than acceptable

2.10.3 FUTURE TRAFFIC CONDITIONS

DHHL is planning on building out the Project in multiple phases, with projected buildout years of 2025 (Phase 2) and 2040 (Phase 3).

Future (2025) Traffic Conditions Without Project (Phase 2)

The Kaua‘i County General Plan forecasts a growth rate of 1.10% for population, 1.06% for jobs, and 1.07% for housing per annum between 2010 and 2035 for the County of Kaua‘i. Out of the Projected growth, 47 % of the future population growth is allocated to the Līhu‘e District, 26% to South Kaua‘i, 13% to East Kaua‘i and 14 % to the remaining three districts – North Shore, Waimea-Kekaha, and Hanapēpē- Ele‘ele.

Traffic forecasting for the study area for Future Without Project conditions were based on known surrounding developments as well as background growth anticipated in the area. Therefore, a 0.25% growth rate per annum was applied to all intersection movements in the study area. The resulting LOS for the Future Without Project (Phase 2) conditions are similar to existing conditions LOS.

Future (2025) Without Project intersection/movement LOS and average delay (in seconds per vehicle) were determined for the AM and PM weekday peak hours. At the signalized intersection of Kaumuali‘i Highway and Moi Road all intersection movements resulted in acceptable LOS C or better. All stop-controlled intersection turning movements resulted in acceptable LOS D or better except for following turning movements:

- Puolo Road (Middle) and Kaumuali‘i Highway (Intersection #5): southbound movements resulted in LOS E for both AM and PM peak hours.
- Puolo Road (East) and Kaumuali‘i Highway (Intersection #6): northbound movements resulted in LOS E for AM peak hour.
- Hāna Road and Kaumuali‘i Highway (Intersection #7): southbound movements resulted in LOS E for both AM and PM peak hours.
- Kona Road (East) and Kaumuali‘i Highway (Intersection #8): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for PM peak hour.

All poorly operating approaches are for the side streets and are due to the lack of gaps in heavy traffic volumes on Kaumuali‘i Highway during the peak hours.

Future (2025) Traffic Conditions With Project (Phase 2)

The trip generated volumes from the Project are distributed along the new access roads and the existing transportation network. These volumes are further added to the Future Without Project volumes for Future With Project volumes. The signalized intersection of Kaumuali‘i Highway and Moi Road resulted in acceptable LOS C or better for the intersection and movements. All the two-way stop- controlled intersection turning movements resulted in acceptable LOS of D or better except for following turning movements:

- Puolo Road (Middle) and Kaumuali‘i Highway (Intersection #5): southbound movements resulted in LOS E for both AM and PM peak hours.

- Puolo Road (East) and Kaumualiʻi Highway (Intersection #6): northbound movements resulted in LOS E for AM peak hour.
- Hāna Road and Kaumualiʻi Highway (Intersection #7): southbound movements resulted in LOS E for both AM and PM peak hours.
- Kona Road (East) and Kaumualiʻi Highway (Intersection #8): southbound movements resulted in LOS F with v/c ratio less than 1 for PM peak hour.

All poorly operating approaches are for the side streets and are due to the lack of gaps in heavy traffic volumes on Kaumualiʻi Highway during the peak hours.

Future (2040) Traffic Conditions Without Project

Project related trips for subsequent phases were added to the Future (2040) Without Project volumes to estimate Future (2040). Future (2040) without Project intersection/movement LOS and average delay (in seconds per vehicle) were determined for the AM and PM weekday peak hours. The signalized intersection of Kaumualiʻi Highway and Moi Road resulted in acceptable LOS C or better for the intersection and movements. All the two-way stop-controlled intersection turning movements resulted in acceptable LOS D or better except for following turning movements:

- Puolo Road (Middle) and Kaumualiʻi Highway (Intersection #5): southbound movements resulted in LOS F with v/c ratio less than 1 for AM and LOS E for PM peak hours.
- Puolo Road (East) and Kaumualiʻi Highway (Intersection #6): northbound movements resulted in LOS E for AM peak hour and southbound movements resulted in LOS E for PM peak hour.
- Hāna Road and Kaumualiʻi Highway (Intersection #7): southbound movements resulted in LOS F with v/c ratio less than 1 for AM and LOS E for PM peak hours.
- Kona Road (East) and Kaumualiʻi Highway (Intersection #8): southbound movements resulted in LOS F with v/c ratio less than 1 for PM peak hour.

All poorly operating approaches are for the side streets and are due to the lack of gaps in heavy traffic volumes on Kaumualiʻi Highway during the peak hours.

Future (2040) Traffic Conditions with the Project (Phase 3)

Future (2040) with Project intersection/movement LOS and average delay (in seconds per vehicle) were determined for the AM and PM weekday peak hours. The signalized intersection of Kaumualiʻi Highway and Moi Road resulted in acceptable LOS C or better for the intersection and movements. All the two-way stop-controlled intersection turning movements resulted in acceptable LOS D or better except for following turning movements:

- Lele Road and Kaumualiʻi Highway (Intersection #1): northbound movements resulted in LOS E for AM peak hour and LOS F with v/c ratio greater than 1 for PM peak hours; southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio greater than 1 for both AM and PM peak hours.

- Hanapēpē Road and Kaumualiʻi Highway (Intersection #2): northbound movements resulted in LOS F with v/c ratio less than 1 for the PM peak hour.
- Puolo Road (West) and Kaumualiʻi Highway (Intersection #3): northbound movements resulted in LOS E for the PM peak hour.
- Puolo Road (Middle) and Kaumualiʻi Highway (Intersection #5): northbound movements resulted in LOS E for the PM peak hour; southbound movements resulted in LOS F with v/c ratio less than 1 for both AM and PM peak hours.
- Puolo Road (East) and Kaumualiʻi Highway (Intersection #6): northbound movements resulted in LOS F with v/c ratio less than 1 for the AM peak hour; southbound movements resulted in LOS F with v/c ratio less than 1 for the PM peak hour.
- Hāna Road and Kaumualiʻi Highway (Intersection #7): southbound movements resulted in LOS F with v/c ratio less than 1 for both AM and PM peak hours.
- Kona Road (East) and Kaumualiʻi Highway (Intersection #8): northbound movements resulted in LOS E for PM peak hour; southbound movements resulted in LOS E for the AM peak hour and LOS F with v/c ratio greater than 1 for PM peak hour.
- Sixth Access Road and Kaumualiʻi Highway(New Road on Figure 12): southbound movements resulted in LOS F with v/c ratio less than 1 for both AM and PM peak hours.

Potential Impacts and Mitigation Measures

Phase 2 of the Project (75 new residential lots) is anticipated to result in minimal impact on the transportation network with existing intersections operating at the same LOS levels.

Mitigation measures were analyzed to alleviate the congestion at the intersections which resulted in higher delays for Future (2040) With Project (Phase 3) conditions. The following changes in geometric configurations or change in control-type at the intersection were applied as mitigation measures.

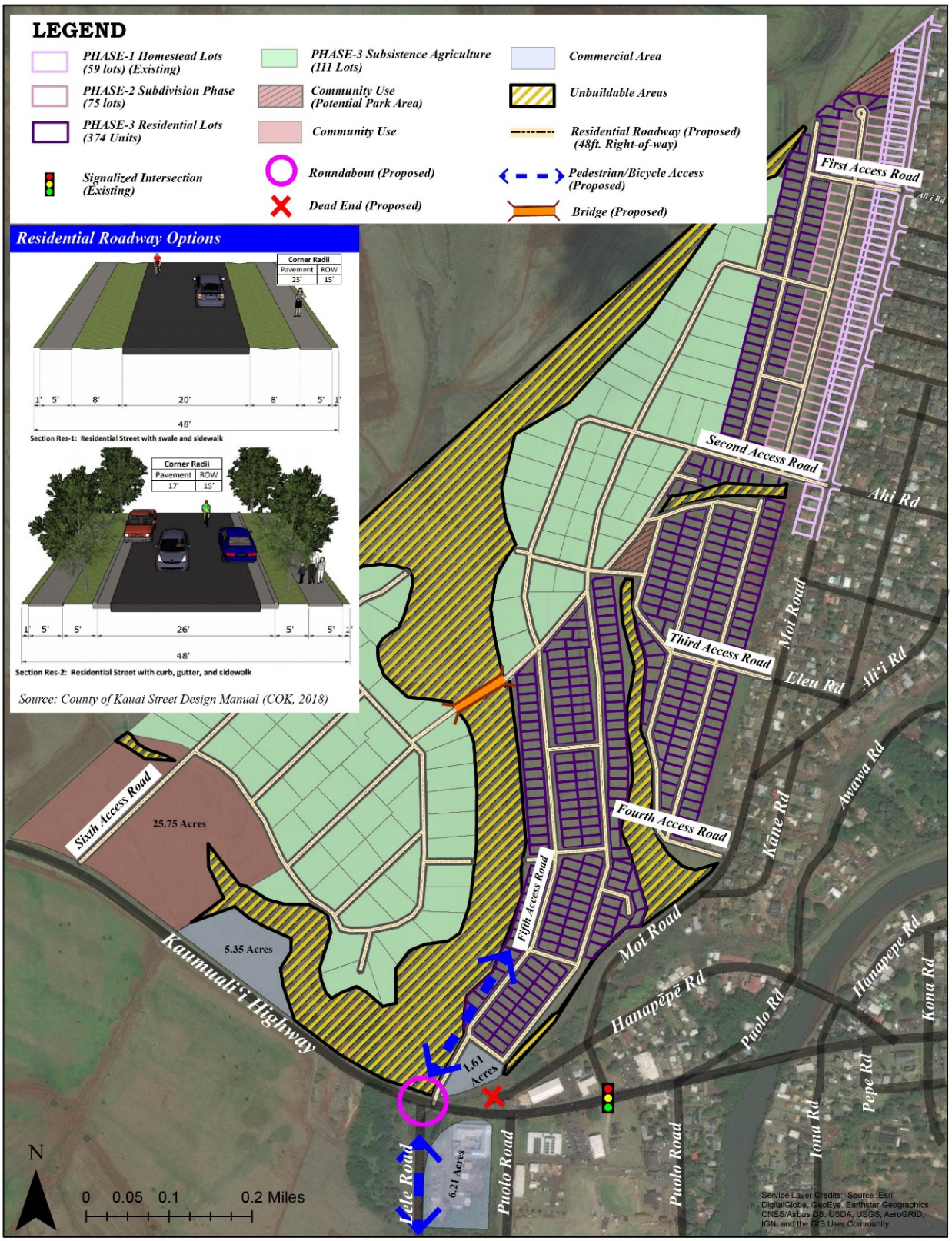
- Roundabout at Lele Road and Kaumualiʻi Highway (Intersection #1): The intersection resulted in LOS F with volume-to-capacity (v/c) ratio 1.18 (> 1) and 1.79 (> 1) for the AM and PM peak hours respectively.
- Signal Warrants from the Manual on Uniform Traffic Control Devices (MUTCD) were analyzed with 70% factor as Hanapēpē is an isolated community with population less than 10,000. County of Kauaʻi General Plan forecasts the population Hanapēpē-ʻEleʻele district will grow to 7,094 by 2035 (Table 1-1 Kauaʻi County Population, Island-Wide and By District (1990-2035). Four Hour Signal Warrants passed using the existing volumes and Peak Hour Signal Warrants passed for Future (2040) With Project Conditions. Warrants are included in the TIAR. Per the County of Kauaʻi's Street Design Manual, "a roundabout shall be used at any location where MUTCD signal warrants or all-way stop control warrants are met". The resulting roundabout achieves appropriate LOS C or better for all approaches.
- Alteration of Hanapēpē Road and Kaumualiʻi Highway (Intersection #2): The Project proposes the removal of the misaligned (< 90-degrees) north leg at the intersection of Hanapēpē Road and Kaumualiʻi Road. As a result, Hanapēpē Road is turned into a dead-

end street north of the intersection. The right turning vehicles from Hanapēpē Road to Kaumualiʻi Highway are redistributed to make a right turn at the signalized intersection of Moi Road and Kaumualiʻi Highway (Intersection #4). The resulting intersection has an appropriate LOS D or better.

- Consolidation of intersections: Puolo Road (West) and Kaumualiʻi Highway (Intersection #3): northbound movements resulted in LOS E for both AM and PM peak hours, southbound movements resulted in LOS E for the AM peak hour.
- Puolo Road (Middle) and Kaumualiʻi Highway (Intersection #5) and Puolo Road (East) and Kaumualiʻi Highway (Intersection #6): The closely spaced intersections are proposed for consolidation so as to form a single intersection, reducing the number of access points along Kaumualiʻi Highway which should reduce delay. The resulting intersection results in LOS F for the AM peak Northbound approach and PM peak Southbound approach. However, each had acceptable v/c ratios.
- Dedicated turn lane at Kona Road and Kaumualiʻi Highway (Intersection #8): Delay can be reduced for southbound vehicles turning right from Kona Street onto Kaumualiʻi Highway by providing a dedicated right-turn lane. However, the southbound shared left/thru movement results in LOS F with v/c < 1.0 for both AM and PM peak hours.
- Stop signage at Hanapēpē Road and Moi Road (Intersection #9): With the reconfiguration of the west end of Hanapēpē Road to a dead-end, and the volumes redistributed, the intersection of Hanapēpē Road and Moi Road was reconfigured with STOP signs for the Hanapēpē Road approaches only. The resulting intersection has an appropriate LOS C or better for all approaches.
- Dedicated turn lane for Sixth Access Road and Kaumualiʻi Highway (New Intersection on Figure 12): Delay can be reduced for southbound vehicles turning right from Sixth Access Road onto Kaumualiʻi Highway by providing a dedicated right-turn lane. However, the southbound shared left movement resulted in LOS F with v/c < 1.0 for both AM and PM peak hours.

With the development of the Residential lots, it is recommended to include dedicated space for bicycles and pedestrians as a part of new roadway build-out. This may look like one of the Residential Street cross-sections provided in the County of Kauaʻi Street Design Manual, with minimum five-foot-wide sidewalks included on either side and travel speeds low enough for people on bicycles to share the road. A continuous off-street path may be an appropriate solution to connect the residential neighborhood mauka of the highway to the commercial center and beach makai of the highway. Enhanced crosswalks should be included where appropriate. The proposed transportation network improvements are shown in Figure 12.

Figure 12: **PROPOSED ROADWAY NETWORK**



2.11 PUBLIC AND PRIVATE UTILITIES

2.11.1 SEWER SERVICES

The segment of existing sewer collection system serving DHHL's existing 47 residential lots is located under Moi Road and was included as part of the DHHL Hanapēpē Residence Lots, Phase 1. The Phase 1 sewer pipe is an existing 8-inch diameter vitrified clay pipe, sloping at about 1 to 9 percent. The existing design flow of this facility is about 0.055 million gallons per day (MGD) and at a 3 percent pipe slope, the available capacity is about 1.18 MGD. The downstream sewer connection occurs makai of the Moi Road and Kupa'a Street intersection to an 8-inch sewer collection system. According to County DWWM, the gravity sewer discharges raw sewage into Sewer Pump Station (SPS) #1 located west of Hanapēpē River which is then conveyed about 1,100 ft downstream to a larger SPS #2, nestled between Hanapēpē Road and Kona Road, east of Hanapēpē River. Wastewater from SPS #2 is then conveyed to the 'Ele'ele WWTP, located further east and going makai along Waialo Road, approximately 2,700 ft away measured in radial distance.

Potential Impacts and Mitigation Measures

An analysis of wastewater requirements was conducted for two scenarios; Phase 2 (75 residential lots) and Phase 3 (full build-out).

For Phase 2, an 8-inch gravity sewer would be installed running along a new residential road, parallel to Moi Road, at roughly 3 percent grade and will connect downstream to existing sewer manholes at the upper Moi Road / Ahi Road intersection and further downslope at the lower Moi Road / Ahi Road intersection. Preliminary discussion with the County of Kaua'i Department of Public Works, Division of Wastewater Management (DWWM) indicated that the 'Ele'ele Wastewater Treatment Plant (WWTP) has enough capacity to accommodate the additional 75 houses proposed in Phase 2, however capacity is based on a first-come, first-served basis. Phase 2 would have an average daily flow of 0.030 MGD and peak flow of 0.166 MGD.

Phase 3 (full build-out) of the homestead community is proposed to be served by a combination of municipal sewer systems for the Residential homesteads, and individual wastewater systems (IWS) for the Subsistence Agricultural lots. The potential additional future flows to the 'Ele'ele WWTP from the Project's full build-out of Residential, Commercial and Community se areas would have an average daily flow of 0.199 MGD and peak flows of 1.030 MGD. The Subsistence Agricultural lots are proposed to be serviced by IWS consisting of septic tanks and leach fields that accommodate up to 1,000 gallons per day (GPD) of domestic wastewater.

The ability of the Phase 3 to connect to the County sewer system will be dependent upon timing, refinement of sewer generation flows and availability of capacity. The West Kaua'i Community Plan (Departmental Draft, 2020) estimates that the 'Ele'ele WWTP has adequate wastewater capacity through 2040. However, it is not currently known if the 'Ele'ele WWTP has enough capacity to include the full build-out of the Hanapēpē Homestead Community as it remains subject to the first-come, first-served policy. In addition, is unknown currently if the downstream existing sewer pump stations have adequate pumping capacity to accommodate Phase 3 of this Project. DHHL's design team has provided Phase 2 and Phase 3 design flows to the County DWWM for hydraulic capacity analysis and to determine if the pump station will require

improvements to increase flow capacity. If needed, DHHL plans to work with DWWM to identify possible upgrades to the wastewater collection and treatment works.

Since the proposed Project area is generally in a down slope direction, any new lift stations and pump stations would be located at the low spots along the proposed roadway network. The assumed gravity sewer pipe size is 8-inch diameter with more than adequate flow capacity along the main sewers following the roadway profiles (generally at 3 percent). The sewer collection system hydraulics will be refined and optimized in subsequent design phases. If a segment of the force main needs to be located along the State highway, then sewer easements will be required.

For lots which slope away from Moi Road, depending upon the severity of the falling slope, it is possible to sewer split level lots either by gravity and/or by sewage sump pumps. For lots with steeper topography where it is not feasible to raise building pads to sufficient height, a septic tank effluent pump (STEP) setup is proposed. These STEP sewers feature a septic holding tank installed with a low-profile sump pump, typically two pumps, one of which is on standby.

Depending upon the type of commercial uses within the Project area, wastewater pretreatment may be required by the County and State. This may apply to uses such as restaurants requiring grease traps, grease interceptor tanks, and oil-water separator chambers.

According to the State Department of Health Wastewater Branch, domestic wastewater must be collected from lots less than one acre in size. The Subsistence Agriculture lots, which are equal or greater to one acre, will be served by individual wastewater systems (IWS) for up to 1,000 GPD of domestic wastewater as per allowed. Septic tanks and leach fields are recommended. No sewer connection and treatment by WWTP is required when the IWS are properly maintained.

2.11.2 WATER SERVICES

The water system will provide domestic water, irrigation supply, and fire protection for the homestead community, in accordance with County DOW Standards.

Existing Hanapēpē-‘Ele‘ele Water System

The Kauai County Department of Water (DOW) has four (4) well sources in the Hanapēpē-‘Ele‘ele water system. Two (Hanapēpē A and Hanapēpē B) of the four wells are situated in the Hanapēpē Valley. Hanapēpē A was drilled in 1974 and has a pumping capacity of 500 gpm. The existing ground elevation at Hanapēpē A is 98 feet above mean sea level (MSL). Hanapēpē B was drilled in 1980 and has a pumping capacity of 900 gpm. The existing ground elevation at Hanapēpē B is 99 feet MSL.

The two other wells (Hanapēpē 25-1 and Hanapēpē 4) that are part of the Hanapēpē-‘Ele‘ele system are located on the west side of the Hanapēpē Valley. Hanapēpē 25-1 was drilled in 1966 and has a pumping capacity of 150 gpm. Hanapēpē 25-1 has been abandoned in place and is no longer being used by the DOW due to a pump/motor problem. The existing ground elevation at Hanapēpē 25-1 is 78 feet MSL. Hanapēpē 4 was drilled in 1993 and has a pumping capacity of 700 gpm. The existing ground elevation at Hanapēpē 4 is 463 feet MSL.

The DOW has three (3) water storage tanks located along Kaumuali‘i Highway, two (2) 0.4 MG steel tanks with 340-foot spillway elevations and one (1) 0.2-MG concrete tank with a 402-foot spillway elevation. Delivery of water from any of the wells into the storage tanks is accomplished by two 750 gpm ‘Ele‘ele booster pumps in Hanapēpē Valley and a 27-inch pipe up

the valley wall to the steel tanks at the 340-foot elevation. A smaller 120 gpm booster pump delivers water from the 340-foot tanks to the 402-foot tanks.

Hanapēpē-‘Ele‘ele Water System Analysis

The existing Hanapēpē-‘Ele‘ele water supply network was analyzed to assess the performance of the existing water supply system with the increased demands resulting from the Project. The water supply system was modelled using the Innovyze *InfoWater* model, based on the available DOW mapping information. The *InfoWater* model uses the EPANET engine to perform the hydraulic analysis and is also capable of completing extended period simulation modeling. The various junction elevations, pipe sizes and demands were based on the available contour mapping and aerial photos to estimate the water demands throughout the system.

Three separate modeling scenarios were conducted as part of the system analysis. The initial analysis included the existing conditions in order to establish the baseline of the water system performance. The second scenario included the Project Phase 2 including the 75 single family homes plus Phase 1 of the Lima Ola Development, which is understood to include 38 single family homes, 111 multi-family homes plus 3 acres for the community center and 2.5 acres of irrigation. The third scenario included the Project full build-out (Phase 3) including all residential areas, commercial sites and the subsistence agricultural areas plus full buildout of the Lima Ola Development, including Phase 2, Phase 3 and Phase 4. Facility improvements associated with the Lima Ola build out include a proposed storage tank at the 402 feet elevation plus upgrades to the ‘Ele‘ele Nani pump station to a capacity of 350 gpm.

The increased water demands for the Project’s initial phase of development (Phase 2) will increase the maximum day demand by 56,250 gallons with a peak flow of approximately 90 gpm and under full build-out conditions will increase the maximum day demand by 644,270 gallons with a peak demand rate in the range of 1,000 gpm.

An analysis of the existing storage reservoirs was also carried out based on the consumption data provided by DOW and the Projected demand from full build-out. The analysis finds that current storage capacity is adequate to meet the requirements for the existing system plus the increased demands from the proposed Project. The existing Hanapēpē-‘Ele‘ele water system has 2.0 million gallons (MG) of available storage.

Potential Impacts and Mitigation Measures

The water master plan prepared for the Project shows that the existing water supply system is able to meet the increased demands associated with Phase 2 of the Project plus demands from Phase 1 of the Lima Ola Development. With the facility improvements planned for the ‘Ele‘ele system to support the Lima Ola build-out conditions (expansion of the ‘Ele‘ele storage tanks), the existing supply and distribution network are able to meet the increased demands to support the Project full build-out (Phase 3). No additional source wells are anticipated to be required and no additional storage is anticipated to be required.

The proposed distribution system will include a connection to the existing 12-inch water main on Moi Road, plus a network of new onsite water mains ranging in size from 12-inch to 6-inch pipelines. On-site pressure reducing valves will be required to control system pressure and maintain compatibility with the existing DOW pressure zones. The water system will provide domestic water and fire protection for the entire homestead community, all in accordance with

DOW Standards. The DOW system could also supply irrigation water for the Subsistence Agriculture lots if DHHL is unable to locate alternative sources of non-potable water.

The water master plan will be submitted to DOW at the time of development to provide a determination of availability. If DOW's water system is determined to be unable to serve part or all of the proposed homesteads, a private water system will be designed to provide domestic water, irrigation supply for the subsistence lots and fire protection for the entire community, in accordance with DOW Standards.

DHHL is also considering the possibility of connecting to the existing Gay and Robinson (G&R) irrigation water system on the neighboring parcel as an alternative source of irrigation water to serve the homestead community. This would involve extending irrigation water lines from the G&R owned parcel to the west of the site, and constructing a storage and distribution system on the DHHL Mauka Site to provide irrigation water to lessees. Further discussion and coordination with G&R will be required to determine the feasibility of this option.

2.11.3 POWER AND COMMUNICATIONS

Electrical power will be provided by Kaua'i Island Utility Cooperative (KIUC) via the existing overhead electrical distribution system running along Moi Road. Preliminary discussions with KIUC indicate there is existing capacity to support the Project. New KIUC underground infrastructure is anticipated and will likely follow the alignment of the new roadways within road right-of-way.

2.12 PUBLIC SERVICES

2.12.1 POLICE PROTECTION

Police service in the Hanapēpē area is provided by the Waimea Sub-station. The Waimea Sub-station is located at 4590 Ola Road, approximately 7 miles from the proposed Project site.

2.12.2 FIRE PROTECTION

Fire protection service for the Hanapēpē area is currently provided by the Hanapēpē Fire Station. The Hanapēpē Fire Station is located at 1-3787 Kaumuali'i Hwy. Response time to the proposed development from the station, a distance of about 1.5 miles, is estimated at 2-3 minutes.

2.12.3 MEDICAL SERVICES

The closest health care facility nearest the Project site is the Kaua'i Veterans Memorial Hospital, located at 4643 Waimea Canyon Dr, Waimea, Hawai'i. The facility is located about 7 miles west of the Project site.

Project Impacts and Mitigation Measures

The Project is not expected to have significant adverse impacts on public services and community facilities.

2.13 SOCIO-ECONOMIC CONDITIONS

The County of Kaua'i resident population was estimated to be 71,377 in the 2018 American Community Survey. The Hanapēpē Census Designated Place (CDP) population estimate from the 2018 American Community Survey was 2,870 people and 948 total housing units.

The Project will increase the population of Hanapēpē through new permanent residences in the short term of up to 75 residential lots and in the long term with the addition of up to 449 Residential lots and 111 Subsistence Agriculture lots. Based on the experience of previous DHHL agricultural homesteads, only 50% of the Subsistence Agricultural lots are expected to result in residences. However, all of the lessees, regardless of whether or not they ultimately reside in Hanapēpē, will be required to pay property taxes on their lot, which will contribute toward public facilities and services.

Project Impacts and Mitigation Measures

Development of the Project will provide additional construction jobs over the phased construction period. In addition to construction expenditures, construction activity will generate indirect sales associated with supplying goods and services to construction companies and to the families of construction workers. In turn, the companies supplying goods and services, and the families of their employees will purchase goods and services from other companies, and so on. These indirect sales will include sales by companies that supply building materials (cement, steel, lumber, roofing materials, plumbing equipment, electrical equipment, hard-ware supplies, lighting, flooring, etc.); rent out construction equipment; repair equipment; provide warehousing services; provide shipping and trucking services; etc. Indirect sales also include sales by grocery stores, drugstores, restaurants, service stations, beauty salons, medical providers, accountants, attorneys, insurance agents, etc.

Most of the tax revenues generated by the Project will be paid to the State, not the County. In total, the State will receive money from excise taxes, corporate income taxes, and personal income taxes. The County will receive money from the excise tax surcharge. Due to the exemption for qualifying low-income rental Projects, this amount does not include any excise tax or surcharge on the construction costs of the residential portion of the Project.

2.14 POTENTIAL CUMULATIVE AND SECONDARY IMPACTS

Cumulative impacts are impacts which result from the incremental effects of an activity when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertake such other actions. The proposed Project is not anticipated to generate substantial cumulative impacts. Short-term impacts to adjacent homes and roads rights of way may occur during construction. These will be mitigated to the extent possible, as previously described. In the long-term, there will be no adverse cumulative impacts on traffic, noise, air quality, flora or fauna with implementation of recommended mitigation measures. Wastewater capacity for Phase 2 has been confirmed by the County, however full build-out has the potential to require a new WWTP which will occupy buildable land and require additional funding and environmental protection considerations. Depending upon the category of commercial activities within the Project, wastewater pre-treatment could be required by the County and State.

This page intentionally left blank

3.0 RELATIONSHIP TO PLANS AND POLICIES

3.1 FEDERAL PLANS AND POLICIES

3.1.1 ARCHAEOLOGICAL AND HISTORIC PRESERVATION ACT (16 U.S.C. § 470(F) AND NATIONAL HISTORIC PRESERVATION ACT (16 U.S.C. § 470(F)

The Archaeological and Historic Preservation Act is a federal policy that is meant to provide for the preservation of significant historic American sites, buildings, and objects. The National Historic Preservation Act is a federal policy that is meant to preserve historic federal sites, and established the National Register of Historic Places, National Historic Landmarks list, and the State Historic Preservation Offices.

Discussion: The Project area was used extensively for agricultural operations and there are currently no known archaeological or cultural features within the Project area today. DHHL will continue to consult with the SHPD through HRS Chapter 6E consultation to determine if any additional historic preservation work might be required, including additional documentation of specific known features.

3.1.2 COASTAL ZONE MANAGEMENT ACT (16 U.S.C. § 1456(C)(1)

The Coastal Zone Management Act is a federal policy meant to preserve, protect, develop and restore and enhance the resources of America's coastal zone. This act encourages coastal states to create a Coastal Zone Management Program to protect and preserve their coastal resources.

Discussion: The Project will adhere to the regulations established by the Federal Coastal Zone Management Act and the State Coastal Zone Management Program for the protection of coastal resources.

3.1.3 ENDANGERED SPECIES ACT 16 U.S.C. §1536(A)(2) AND (4)

The Endangered Species Act is a national policy that is designed to protect critically imperiled species from extinction as a consequence of economic growth and development. The Act is administered by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

Discussion: The Project will adhere to the regulations established by the Federal Endangered Species Act, and State and County regulations for the protection of endangered species. It is unlikely that the proposed Project will have a significant adverse impact on any plant species state or federally listed as threatened or endangered, candidate species for listing as endangered, species of concern, or rare native Hawaiian plant species. The Project area is highly disturbed, comprising of abandoned agricultural land now dominated by guinea grass grassland, residences, and an industrial lot, and with 96% of the flora being nonnative. It is recommended that, before any major vegetation clearing is conducted, the interior of the 357-acre parcel should be surveyed on foot during to confirm the presence or absence of any native plant species.

No native wildlife species were observed in the Project area at the time of the survey. However, the vast open grasslands in Mauka Site appear to provide suitable habitat for various species. The endangered Hawaiian petrel, threatened Newell's shearwater, and wedge-tailed shearwater are

seabird species known to occur on Kaua‘i and transit through the Project area (SOS 2018, USFWS 2019). Furthermore, seabird diverters were observed on the utility wires along Kaumuali‘i Highway near the southwestern end of the Project area suggests that seabirds frequent the Project area during the February-December seabird breeding season and tall overhead powerlines present a collision hazard to these birds in this area. Similarly, recent Save Our Shearwaters fallout records (SOS 2018) also indicate that fledgling seabirds are attracted to external lights in adjacent urban areas and external lights pose a light attraction hazard during the seabird fallout season from September 15 to December 15 in this area.

The Project will incorporate measures to avoid or minimize potential impacts, such as limiting the quantity, and shielding street lights, community park lighting, and external lights on buildings. Hawaiian hoary bats are known to occur on Kaua‘i (Tomich 1986) and their presence in the Project area cannot be ruled out. Consequently, no trees greater than 15 feet tall should be trimmed or removed during the bat pupping season from June 1 to September 15.

3.2 STATE OF HAWAI‘I PLANS AND POLICIES

3.2.1 STATE LAND USE LAW, CHAPTER 205, HRS

The State Land Use Law, Chapter 205 HRS, established the State Land Use Commission, which classifies all lands in Hawai‘i into four land use districts: Rural, Agricultural, Conservation, and Urban. The 359-acre Mauka Site is in the State Land Use Agricultural District. The 6-acre Makai Site is designated as Urban. According to Chapter 205 Land Use Commission, Article 5 Zoning, the minimum lot size for Agricultural district lands is no less than one acre. However, it should be noted that under the Hawaiian Homes Commission Act, which has been incorporated into Article XII Sections 1 and 3 of the State Constitution, laws such as HRS Chapter 205, that would significantly affect DHHL’s use of its lands do not apply to Hawaiian Home Lands. The Hawaiian Homes Commission has exclusive land use authority over Hawaiian Home Lands.

3.2.2 STATE OF HAWAI‘I COASTAL ZONE MANAGEMENT PROGRAM, CHAPTER 205A, HRS

The Hawai‘i Coastal Zone Management (CZM) Program was created in 1977 through the enactment of Chapter 205A, HRS to coordinate Federal, State, and County agency efforts in the comprehensive management of Hawai‘i’s coastal resources. The Hawai‘i CZM Program is administered by the State Office of Planning, but each of the four counties are responsible for administering the program locally through Special Management Area permits and shoreline setback provisions in their respective counties. The coastal zone encompasses the entire state, as there is no point of land more than 30 miles from the ocean.

The Coastal Zone Management Act (CZMA) of 1972 (16 USC 1451 et seq.) encourages coastal states to protect coastal resources consistent with the state’s coastal zone management program. The objectives of the Coastal Zone Management (CZM) Program are to provide the public with recreational opportunities, protect historic resources, protect scenic and open space resources, protect coastal ecosystems, provide facilities for economic development, reduce hazards and manage development. As discussed throughout this document, the proposed project is not anticipated to have adverse impacts on the area’s recreational opportunities, historic resources,

scenic and open space resources, or coastal ecosystems. A discussion of the Project's consistency with the CZM objectives and policies are provide in this section.

1) Recreational Resources

Objective:

Provide coastal recreational opportunities accessible to the public.

Policies:

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

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

i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

ii) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites, fishponds and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the state for recreation when replacement is not feasible or desirable;

iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

v) Ensuring public recreational use of county, state and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect and where feasible, restore the recreational value of coastal waters;

vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches and artificial reefs for surfing and fishing; and

viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, county planning commissions; and crediting such dedication against the requirements of Section 46-6, HRS.

Discussion: The Project does not conflict with this objective or these policies. Since no coastal development or improvements are associated with this Project, there are no anticipated impacts to coastal recreational opportunities and accessibility to the coastline.

2) Historic Resources

Objective:

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

Policies:

A) Identify and analyze significant archaeological resources;

B) Maximize information retention through preservation of remains and artifacts or salvage operations; and

C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Discussion: The proposed project will be constructed in keeping with the guidelines and objectives of the aforementioned objective and policies. No archaeological features or deposits within the Project areas were noted during background research of the subject parcel. Neither were archaeological features or deposits observed during the preliminary site visit, although extremely dense, tall vegetation obscures the majority of the Mauka Site. Ranching and extensive mechanized agricultural activities have taken place on the Mauka Site for over 150 years, and the Makai Site has undergone at least one century of development. The Project designates the gulches as Conservation areas not to be developed, which constitutes a preliminary effort to preserve possible features that may exist in the gulch areas. DHHL will continue to consult with the SHPD to determine what additional historic preservation work might be required, if any, including additional documentation of specific known features.

3) Scenic and Open Space Resources

Objective:

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

Policies:

A) Identify valued scenic resources in the coastal zone management area;

B) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

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

Discussion: The project is not anticipated to have a significant negative impact on scenic viewplanes or scenic resources. The Project will alter the existing views of agricultural lands as they are converted to homesteads, but the Subsistence Agriculture land use will be consistent with previous and current agricultural land uses. Single-family homes may be built by lessees and no mid- or high-rise buildings will be allowed. The Subsistence Agricultural lots will be larger than the Residential lots, maintaining open space views from Kaumualiʻi Highway.

4) Coastal Ecosystems

Objective:

Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources

B) Improve the technical basis for natural resource management;

C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance

D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

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

Discussion: The Project will be consistent with these policies. To minimize degradation to the water quality of near-shore waters, best management practices will be implemented during the construction phases of the Project. Such measures would be developed during the design of this project, and would comply with the County's Erosion and Sedimentation Control regulations. Drainage will be designed to maintain acceptable drainage patterns.

5) Economic Uses

Objective:

Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

A) Concentrate in appropriate areas the location of coastal dependent development necessary to the State's economy;

B) Insure that coastal dependent development such as harbors and ports, visitor industry facilities, and energy generating facilities are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such development and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

i) Utilization of presently designated locations is not feasible;

ii) Adverse environmental effects are minimized; and

iii) Important to the State's economy.

Discussion: The Project does not conflict with this objective or these policies. The Project does not involve coastal development or improvements along the coastline.

6) Coastal Hazards

Objective:

Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, and subsidence.

Policies:

A) Develop and communicate adequate information on storm wave, tsunami, flood erosion, and subsidence hazard;

B) Control development in areas subject to storm wave, tsunami, flood, erosion, and subsidence hazard;

C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

D) Prevent coastal flooding from inland projects.

Discussion: The design of the Project will conform to all regulatory requirements to ensure adequate and proper storm drainage and erosion control to the surrounding properties.

According to the Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency, the entirety of the Project is located in Zone X which is an area that has been determined to be outside the 0.2% annual chance floodplain and outside of the 500-year floodplain. The chance of flooding is minimal, and the Project area is located outside the 3.2-foot Sea Level Rise Exposure Area (SLR-XA) identified in the Hawai‘i Sea Level Rise Vulnerability and Adaptation Report (2017). As a future benefit, in the event of an extreme tsunami, residents, employees and visitors will be able to take shelter in portions of Hanapēpē or community use facilities in the future.

7) Managing Development

Objective:

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

Policies:

A) Effectively utilize and implement existing law to the maximum extent possible in managing present and future coastal zone development;

B) Facilitate timely processing of application for development permits and resolve overlapping or conflicting permit requirements; and

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

Discussion: The Project does not conflict with this objective or these policies. The Environmental Assessment process requires public notification and allowance for public and agency comment and a comprehensive outreach program was followed for this Project (see Section 6.0).

8) Public Participation

Objective:

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

Policies:

A) Promote public involvement in coastal zone management processes;

B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal-related issues, developments, and government activities; and

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

Discussion: The Project is consistent with this objective and policies. A comprehensive stakeholder engagement plan was developed for the Project and is being implemented to gather input from existing DHHL lessees and beneficiaries, as well as the greater Hanapēpē community and relevant agencies. See Section 6.0 of this document.

9) Beach Protection

Objective:

Protect beaches for public use and recreation.

Policies:

A) Locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements due to erosion;

B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities;

C) Minimize the construction of public erosion-protection structures seaward of the shoreline;

D) Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor; and

E) Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor;

Discussion: The Project does not conflict with the beach protection objective or policies. Beaches will not be impacted by this proposed project. The project is inland from the shoreline setback and does not involve any construction seaward of the shoreline.

10) Marine Resources

Objective:

Implement the State's ocean resources management plan.

Policies:

A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

B) Coordinate the management of marine and coastal resources and activities management to improve effectiveness and efficiency;

C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

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

Discussion: The Project does not conflict with the marine resources objective or policies. The Project will include appropriate design and permit compliance aimed to avoid any negative effects to marine and coastal resources, and will incorporate appropriate low-impact development measures where appropriate, to minimize impacts to affected streams and near-shore waters. A drainage master plan will be prepared in design phase and will be in accordance with Federal, State and County regulations. A National Pollutant Discharge Elimination System (NPDES) permit coverage for discharges of wastewater, including stormwater runoff, into State surface waters (HAR, Chapter 11-55) will be secured.

3.2.3 HAWAI'I STATE PLAN, CHAPTER 226, HRS

The Hawai'i State Plan, codified as HRS Chapter 226, serves as a guide for the future long-range development of the State; identifies goals, objectives, policies and priorities for the State; provides a basis for determining priorities and allocating resources; improves coordination of federal, state and county activities, and establishes a system to integrate major state and county activities.

The use of the subject property would be consistent with Chapter 226, Hawai'i Revised Statutes.

§226-5 Objective and policies for population.

(a) It shall be the objective in planning for the State's population to guide population growth to be consistent with the achievement of physical, economic, and social objectives contained in this chapter.

(b) To achieve the population objective, it shall be the policy of this State to:

(1) Manage population growth statewide in a manner that provides increased opportunities for Hawaii's people to pursue their physical, social, and economic aspirations while recognizing the unique needs of each county.

(2) Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs and desires.

(3) Promote increased opportunities for Hawaii's people to pursue their socio-economic aspirations throughout the islands.

(4) Encourage research activities and public awareness programs to foster an understanding of Hawaii's limited capacity to accommodate population needs and to address concerns resulting from an increase in Hawaii's population.

(5) Encourage federal actions and coordination among major governmental agencies to promote a more balanced distribution of immigrants among the states, provided that such actions do not prevent the reunion of immediate family members.

(6) Pursue an increase in federal assistance for states with a greater proportion of foreign immigrants relative to their state's population.

(7) Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(1), (2), (3), and (7) through the master planning efforts provided by DHHL and new residential and commercial opportunities for native Hawaiian beneficiaries. The southeast portion of the Mauka Site is located within walking distance of Hanapēpē Town and is designated as Neighborhood General in the Kaua‘i General Plan. This designation is considered appropriate for medium-density mixed-use commercial and residential development. Adding a new Commercial area at this location where a new road and gateway is envisioned is consistent with the County’s policy of encouraging mixed use in the core of Hanapēpē town.

The land use plan provides Commercial and Community Use areas along the highway on the southwestern side of the Makai Site with the intent of providing a destination for the west side community that may include a park, ball fields, and community center, as well as agriculture-supportive uses such as a farmers market, community garden, and shared equipment/facilities.

§226-6 Objectives and policies for the economy--in general.

(a) Planning for the State's economy in general shall be directed toward achievement of the following objectives:

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

(2) A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.

(b) To achieve the general economic objectives, it shall be the policy of this State to:

(1) Promote and encourage entrepreneurship within Hawaii by residents and non-residents of the State.

(2) Expand Hawaii's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.

(3) Promote Hawaii as an attractive market for environmentally and socially sound investment activities that benefit Hawaii's people.

(4) Transform and maintain Hawaii as a place that welcomes and facilitates innovative activity that may lead to commercial opportunities.

(5) Promote innovative activity that may pose initial risks, but ultimately contribute to the economy of Hawaii.

(6) Seek broader outlets for new or expanded Hawaii business investments.

(7) Expand existing markets and penetrate new markets for Hawaii's products and services.

(8) Assure that the basic economic needs of Hawaii's people are maintained in the event of disruptions in overseas transportation.

(9) Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives.

(10) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawaii's small-scale producers, manufacturers, and distributors.

(11) Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.

(12) Encourage innovative activities that may not be labor-intensive, but may otherwise contribute to the economy of Hawaii.

(13) Foster greater cooperation and coordination between the government and private sectors in developing Hawaii's employment and economic growth opportunities.

(14) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.

(15) Maintain acceptable working conditions and standards for Hawaii's workers.

(16) Provide equal employment opportunities for all segments of Hawaii's population through affirmative action and nondiscrimination measures.

(17) Stimulate the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.

(18) Encourage businesses that have favorable financial multiplier effects within Hawaii's economy, particularly with respect to emerging industries in science and technology.

(19) Promote and protect intangible resources in Hawaii, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.

(20) Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new or innovative potential growth industries in particular.

(21) Foster a business climate in Hawaii--including attitudes, tax and regulatory policies, and financial and technical assistance programs--that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(1), (8), (9), (10) and (14) through new agricultural and commercial opportunities for native Hawaiian beneficiaries.

§226-7 Objectives and policies for the economy--agriculture.

(a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:

(1) Viability of Hawaii's sugar and pineapple industries.

(2) Growth and development of diversified agriculture throughout the State.

(3) An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being.

(b) To achieve the agriculture objectives, it shall be the policy of this State to:

(1) Establish a clear direction for Hawaii's agriculture through stakeholder commitment and advocacy.

(2) Encourage agriculture by making the best use of natural resources.

(3) Provide the governor and the legislature with information and options needed for prudent decision-making for the development of agriculture.

(4) Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits.

(5) Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawaii's economy.

(6) Seek the enactment and retention of federal and state legislation that benefits Hawaii's agricultural industries.

(7) Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawaii's food producers and consumers in the State, nation, and world.

(8) Support research and development activities that strengthen economic productivity in agriculture, stimulate greater efficiency, and enhance the development of new products and agricultural by-products.

(9) Enhance agricultural growth by providing public incentives and encouraging private initiatives.

(10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.

(11) Increase the attractiveness and opportunities for an agricultural education and livelihood.

(12) In addition to the State's priority on food, expand Hawaii's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises.

(13) Promote economically competitive activities that increase Hawaii's agricultural self-sufficiency, including the increased purchase and use of Hawaii-grown food and food products by residents, businesses, and governmental bodies as defined under section 103D-104.

(14) Promote and assist in the establishment of sound financial programs for diversified agriculture.

(15) Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment.

(16) Facilitate the transition of agricultural lands in economically nonfeasible agricultural production to economically viable agricultural uses.

(17) Perpetuate, promote, and increase use of traditional Hawaiian farming systems, such as the use of loko iʻa, māla, and irrigated loʻi, and growth of traditional Hawaiian crops, such as kalo, ʻuala, and ʻulu.

(18) Increase and develop small-scale farms.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(2), (10),(11), (14), (16), (17) and (18) through new agricultural and commercial opportunities for native Hawaiian beneficiaries.

§226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources.

(a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:

(1) Prudent use of Hawaii's land-based, shoreline, and marine resources.

(2) Effective protection of Hawaii's unique and fragile environmental resources.

(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:

(1) Exercise an overall conservation ethic in the use of Hawaii's natural resources.

(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.

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

(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.

(5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.

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

(7) Provide public incentives that encourage private actions to protect significant natural resources from degradation or unnecessary depletion.

(8) Pursue compatible relationships among activities, facilities, and natural resources.

(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(1), (2), (3), (4), (5), (6), and (8) through new agricultural and commercial opportunities for native Hawaiian beneficiaries.

§226-12 Objective and policies for the physical environment--scenic, natural beauty, and historic resources.

(a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.

(b) To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:

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

(2) Provide incentives to maintain and enhance historic, cultural, and scenic amenities.

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

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

(5) Encourage the design of developments and activities that complement the natural beauty of the islands.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(1), (3) and (5) through the preferred land use plan's spatial layout of the proposed land uses. The gulch areas would transition into Conservation and Special District which is consistent with preservation of natural and historic resources. In addition, maintaining the western side of the parcel in Subsistence Agriculture will help to preserve view planes and green space to the southwest, which is consistent with desires expressed by existing homestead lessees.

§226-13 Objectives and policies for the physical environment--land, air, and water quality.

(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:

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

(2) Greater public awareness and appreciation of Hawaii's environmental resources.

(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:

(1) Foster educational activities that promote a better understanding of Hawaii's limited environmental resources.

(2) Promote the proper management of Hawaii's land and water resources.

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

(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.

(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.

(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.

(7) Encourage urban developments in close proximity to existing services and facilities.

(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaii's people, their cultures and visitors.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(2), (3), (5), (7) and (8). The land use plan concentrates residential land use areas east of Kukamahu Gulch is consistent with smart growth principles, which calls for focusing development in and adjacent to existing neighborhoods and town centers. From an infrastructure standpoint, concentrating residential development on the east side of the gulch is advantageous, as sewer and water lines can be extended from existing facilities. Best management practices will

be implemented to protect land and water resources. The physical environment will be improved with complete streets design to accommodate people walking, biking, and taking transit in addition to vehicles.

The Project has identified opportunities to for homesteaders to be informed about ways to take care of the surrounding lands and encourage community and visitor support in adhering to protective measures. Creating cultural connections with new homesteaders to Hanapēpē is an important step towards growing a healthier Hawaiian community. Through active engagement and restoration, new Hawaiian Homesteads in Hanapēpē could positively impact cultural resources and grow traditional cultural practice.

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

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

(b) To achieve the general facility systems objective, it shall be the policy of this State to:

> *(1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.*
>
> *(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.*
>
> *(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.*
>
> *(4) Pursue alternative methods of financing programs and Projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.*

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(1), (2), and (3). Consultations with public utility service providers are occurring as part of this EA and in preliminary design actions.

§226-15 Objectives and policies for facility systems--solid and liquid wastes.

(a) Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:

> *(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.*
>
> *(2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.*

(b) To achieve solid and liquid waste objectives, it shall be the policy of this State to:

> *(1) Encourage the adequate development of sewerage facilities that complement planned growth.*

(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.

(3) Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(1), (2), and (3). Consultations with public utility service providers are occurring as part of this EA and in preliminary design actions.

§226-16 Objective and policies for facility systems--water.

(a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.

(b) To achieve the facility systems water objective, it shall be the policy of this State to:

(1) Coordinate development of land use activities with existing and potential water supply.

(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.

(3) Reclaim and encourage the productive use of runoff water and wastewater discharges.

(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.

(5) Support water supply services to areas experiencing critical water problems.

(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(1), (2), (3) and (4). Consultations with public utility service providers are occurring as part of this EA and in preliminary design actions. DHHL is also considering the possibility of connecting to the existing Gay and Robinson irrigation water system on the neighboring parcel as an alternative source of irrigation water to serve the homestead community.

§226-17 Objectives and policies for facility systems--transportation.

(a) Planning for the State's facility systems with regard to transportation shall be directed towards the achievement of the following objectives:

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

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

(b) To achieve the transportation objectives, it shall be the policy of this State to:

(1) Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter;

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

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

(4) Provide for improved accessibility to shipping, docking, and storage facilities;

(5) Promote a reasonable level and variety of mass transportation services that adequately meet statewide and community needs;

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

(7) Encourage a variety of carriers to offer increased opportunities and advantages to interisland movement of people and goods;

(8) Increase the capacities of airport and harbor systems and support facilities to effectively accommodate transshipment and storage needs;

(9) Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification;

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

(11) Encourage safe and convenient use of low-cost, energy-efficient, non-polluting means of transportation;

(12) Coordinate intergovernmental land use and transportation planning activities to ensure the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives; and

(13) Encourage diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(1), (2), (6), (9), (10), and (12). The Project will provide residents with multi-modal opportunities through complete streets design and expanded transportation networks. Consultations with the State Department of Transportation and County Department of Public Works are occurring as part of this EA and in preliminary design actions.

§226-19 Objectives and policies for socio-cultural advancement--housing.

(a) Planning for the State's socio-cultural advancement with regard to housing shall be directed toward the achievement of the following objectives:

(1) Greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure

that more affordable housing is made available to very low-, low- and moderate-income segments of Hawaii's population.

(2) The orderly development of residential areas sensitive to community needs and other land uses.

(3) The development and provision of affordable rental housing by the State to meet the housing needs of Hawaii's people.

(b) To achieve the housing objectives, it shall be the policy of this State to:

(1) Effectively accommodate the housing needs of Hawaii's people.

(2) Stimulate and promote feasible approaches that increase housing choices for low-income, moderate-income, and gap-group households.

(3) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.

(4) Promote appropriate improvement, rehabilitation, and maintenance of existing housing units and residential areas.

(5) Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.

(6) Facilitate the use of available vacant, developable, and underutilized urban lands for housing.

(7) Foster a variety of lifestyles traditional to Hawaii through the design and maintenance of neighborhoods that reflect the culture and values of the community.

(8) Promote research and development of methods to reduce the cost of housing construction in Hawaii.

Discussion: The proposed Project is consistent with all of these objectives and policies by providing much needed housing opportunities to DHHL's native Hawaiian beneficiaries, some of whom have been on the waiting list for decades.

§226-20 Objectives and policies for socio-cultural advancement--health.

(a) Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives:

(1) Fulfillment of basic individual health needs of the general public.

(2) Maintenance of sanitary and environmentally healthful conditions in Hawaii's communities.

(3) Elimination of health disparities by identifying and addressing social determinants of health.

(b) To achieve the health objectives, it shall be the policy of this State to:

(1) Provide adequate and accessible services and facilities for prevention and treatment of physical and mental health problems, including substance abuse.

(2) Encourage improved cooperation among public and private sectors in the provision of health care to accommodate the total health needs of individuals throughout the State.

(3) Encourage public and private efforts to develop and promote statewide and local strategies to reduce health care and related insurance costs.

(4) Foster an awareness of the need for personal health maintenance and preventive health care through education and other measures.

(5) Provide programs, services, and activities that ensure environmentally healthful and sanitary conditions.

(6) Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring, and enforcement.

(7) Prioritize programs, services, interventions, and activities that address identified social determinants of health to improve native Hawaiian health and well-being consistent with the United States Congress' declaration of policy as codified in title 42 United States Code section 11702, and to reduce health disparities of disproportionately affected demographics, including native Hawaiians, other Pacific Islanders, and Filipinos. The prioritization of affected demographic groups other than native Hawaiians may be reviewed every ten years and revised based on the best available epidemiological and public health data.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (b)(1), and (7). The Project will provide the Hanapēpē community with opportunities for expanded health services and community spaces to encourage personal health, particularly for those uses best suited to help native Hawaiians.

§226-22 Objective and policies for socio-cultural advancement--social services.

(a) Planning for the State's socio-cultural advancement with regard to social services shall be directed towards the achievement of the objective of improved public and private social services and activities that enable individuals, families, and groups to become more self-reliant and confident to improve their well-being.

(b) To achieve the social service objective, it shall be the policy of the State to:

(1) Assist individuals, especially those in need of attaining a minimally adequate standard of living and those confronted by social and economic hardship conditions, through social services and activities within the State's fiscal capacities.

(2) Promote coordination and integrative approaches among public and private agencies and programs to jointly address social problems that will enable individuals, families, and groups to deal effectively with social problems and to enhance their participation in society.

(3) Facilitate the adjustment of new residents, especially recently arrived immigrants, into Hawaii's communities.

(4) Promote alternatives to institutional care in the provision of long-term care for elder and disabled populations.

(5) Support public and private efforts to prevent domestic abuse and child molestation, and assist victims of abuse and neglect.

(6) Promote programs which assist people in need of family planning services to enable them to meet their needs.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (a) and (b)(1). The preferred land use plan will provide a common area for community-building which includes possible uses such as parks, cultural activities, and community-based economic development, other facilities and amenities.

§226-23 Objective and policies for socio-cultural advancement--leisure.

(a) Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations.

(b) To achieve the leisure objective, it shall be the policy of this State to:

(1) Foster and preserve Hawaii's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities.

(2) Provide a wide range of activities and facilities to fulfill the cultural, artistic, and recreational needs of all diverse and special groups effectively and efficiently.

(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.

(4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.

(5) Ensure opportunities for everyone to use and enjoy Hawaii's recreational resources.

(6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs.

(7) Provide adequate and accessible physical fitness programs to promote the physical and mental well-being of Hawaii's people.

(8) Increase opportunities for appreciation and participation in the creative arts, including the literary, theatrical, visual, musical, folk, and traditional art forms.

(9) Encourage the development of creative expression in the artistic disciplines to enable all segments of Hawaii's population to participate in the creative arts.

(10) Assure adequate access to significant natural and cultural resources in public ownership.

Discussion: The proposed Project is consistent with these policies. It advances, in particular, items (a) and (b)(1), (4) and (10). The preferred land use plan will provide a common area for community-building which includes possible uses such as parks, cultural activities, and community-based economic development, other facilities and amenities.

3.2.4 HAWAIʻI REVISED STATUTES CHAPTER 343

The proposed action involves the use of State lands. Therefore, the Draft EA was prepared in accordance with Chapter 343 HRS, and HAR Title 11, Chapter 200.

3.2.5 DHHL KAUAʻI ISLAND PLAN

The Kauaʻi Island Plan provides recommendations for the future use of the Department of Hawaiian Home Lands' 20,565 acres on Kauaʻi. The plan designates appropriate land uses which ensure DHHL land will be developed to its highest potential. The plan is intended to guide overall land use patterns and development on Kauaʻi for the next 20 years. The plan identifies land designations for all DHHL land and as prioritizes areas for new residential development. The plan also identifies areas for agricultural lease and limited but adequate areas for income-generating commercial and industrial uses.

Discussion: The Project will support the Kauaʻi Island Plan goal of 840 residential homesteads by providing Residential and Subsistence Agriculture homesteading opportunities for beneficiaries.

3.3 COUNTY OF KAUAʻI PLANS AND POLICIES

3.3.1 COUNTY GENERAL PLAN

The Kauaʻi County General Plan establishes priorities for managing growth and community development over a 20-year planning timeframe. In addition to being required by State law, the County Charter instructs that the General Plan guide future action concerning land use and development regulations, urban renewal programs, and expenditures for capital improvements. The current General Plan was adopted in 2018.

The Kauaʻi County Future Land Use Maps describe the desired types of land use in broad terms. The boundaries are generalized and do not carry the legal weight of metes and bounds. The General Plan states that the County of Kauaʻi's objective regarding the Department of Hawaiian Home Lands is to support the DHHL in its mission to provide housing to beneficiaries. The General Plan recognizes Hanapēpē as an appropriate location for incremental change. The Mauka Site is designated as Agriculture (196 acres), Residential Community (152 acres), and Neighborhood General (11 acres) on the Future Land Use Map. The 6-acre Makai Site is designated Neighborhood General (Figure 4). The General Plan designations partially correspond with those in DHHL's Kauaʻi Island Plan. DHHL is not required to match General Plan Land Use Designations, and meetings with the County Planning Department indicated that they are flexible as to how land use designations are applied.

The following actions in the General Plan relate to DHHL lands:

- Integrate the recommendations of DHHL plans into community planning.

- Partner with DHHL on infrastructure Projects that will support development of both County and DHHL priority growth areas.
- Respect and support the mission of DHHL to prioritize planning for their beneficiaries.

The Project is supportive and aligned with the envisioned land uses and policies outlined in the General Plan. General Plan policies supported by the Project include:

Policy #2: Provide Affordable Housing While Facilitating a Diversity of Privately Developed Housing for Local Families

Discussion: The Project will establish a Residential and Subsistence Agricultural homestead community in the Hanapēpē area. The lands will be available for the native Hawaiian population they are designated to be used for the fulfillment of the Hawaiian Homes Commission Act.

Policy #8: Design Healthy and Complete Neighborhoods

Discussion: The proposed Project will establish a neighborhood where it is safe and convenient to walk and bike to allow residents to increase physical activity on a daily basis.

Sector: II. Housing

> **Objective: To increase housing opportunities for low- and moderate-income households**
>
> **Objective: To develop compact, walkable communities consistent with the Future Land Use Map**
>
> **Objective: To support the Department of Hawaiian Home Lands in their mission to provide housing to their beneficiaries.**

Discussion: The proposed Project is consistent with the Kaua‘i County General Plan objectives of providing housing opportunities, developing compact, walkable communities, and supporting the DHHL in its mission to provide housing for beneficiaries.

3.3.2 COUNTY OF KAUA‘I COMPREHENSIVE ZONING ORDINANCE

Chapter 8 of the Kaua‘i County Code is known as the Comprehensive Zoning Ordinance (CZO). The Project site is zoned Agriculture (A) and Open (O). The DHHL is not subject to the requirements of the CZO. Attorney General opinion 72-21 states “Hawaiian home lands needed for purposes of the Hawaiian Homes Commission Act (HHCA) are to be used and disposed of in accordance with the act and are not subject to County zoning requirements.” Since the lands are to be used to fulfill the purposes of the HHCA, DHHL is not subject to County zoning. DHHL will declare the zoning designations for the Project site when it proceeds with subdivision of the next phase of homesteads.

Project team members and the County of Kaua‘i Planning Department met with the Planning Director and long-range planning staff on December 14, 2018 and April 5, 2019. The purpose of the meetings were to brief County staff on the project, discuss County standards for rural development, compare DHHL land uses with COK zoning designations, and discuss relevant input from the West Kaua‘i Community Plan (CP) process.

The COK planning department acknowledged that DHHL is not required to meet COK planning and zoning standards and the County does not have a "Rural" zoning designation standard. Agricultural zoning has only one designation. The CZO allows one house on one acre in an Agriculture zone, then one house every two acres thereafter, up to a maximum of five houses. Currently, Accessory Dwelling Units(ADU's) are not allowed on Ag land. Cluster Agriculture Development is encouraged in the Kaua'i General Plan, but is currently not required.

3.3.3 WEST KAUA'I COMMUNITY PLAN

The County of Kaua'i is currently developing a West Kaua'i Community Plan to manage future growth and change in the Hanapēpē-'Ele'ele and Waimea-Kekaha planning districts, while also coordinating land use and transportation planning. The purpose is to implement a general land use map, zoning maps, and design criteria to guide and regulate future development and protect valued physical and social characteristics. A shared vision will be developed along with guidance for the improvement of Hanapēpē-'Ele'ele. The plan will amend and update the Waimea-Kekaha Development Plan (1977) and the Hanapēpē-'Ele'ele Development Plan (1974). The public process for the West Kaua'i Community Plan launched in August 2018. The Plan has been approved by the Kaua'i Planning Commission and is being transmitted to the County Council for adoption later this year. The new plan will supplement the Kaua'i General Plan and the Comprehensive Zoning Ordinance by regulating use and development practices (COK, 2020).

DHHL has consulted with the COK Planning Department throughout the development of the EA to ensure coordination between the West Kaua'i Community Plan and the Project. Community input from the Community Plan process has been factored into the development of the preferred land use plan, including the provision of an additional access road for the Hanapēpē Heights community and allowance for Community Use area that can provide additional park capacity to serve the west side community. Further, the preferred land use plan is consistent with the CP policies of promoting smart growth and form-based zoning.

This page intentionally left blank

4.0 PROJECT ALTERNATIVES

The No Action alternative, existing land use plan and a modified land use plan alternative were considered as Project alternatives. The alternatives identified are:

- No Action Alternative;
- Alternative 1 maintains the existing DHHL Land Use Plan as presented in the Kaua‘i Island Plan, and refines it to reflect developable and undevelopable areas; and
- Alternative 2 presents a modified land use configuration that the Project team believes is preferred from a land suitability and environmental standpoint and is compatible with planning best practices. The acreages of land designated for homesteads, Community Uses, and Commercial areas are roughly the same proportions as in Alternative 1.

Based on the findings of a land suitability analysis, the following criteria was used for the land use plan alternatives:

- Avoid development in areas with steep slopes (20% or greater).
- Avoid development in the bottom of gulches, except as needed for road/infrastructure crossings and drainage/flood control.
- Maintain similar ratio of DHHL land uses/acreages as presented in the Kaua‘i Island Plan.
- Minimize the need for gulch crossings.
- Provide buffers between residential and agricultural areas.
- Provide alternate roadway access from Kaumuali‘i Highway to Hanapēpē Heights.
- Where possible, align land uses, roadways, and infrastructure with County of Kaua‘i policies, plans, and standards.

Alternatives were refined through an infrastructure assessment, beneficiary survey, and community engagement activities described in Chapter 6.0.

4.1 NO ACTION ALTERNATIVE

Under the “No Action” alternative, there will not be a change from the current situation where the land is sitting vacant as agricultural open space. There will continue to be over 1,600 applications on the waitlist for residential homesteads and over 2,225 applications for the agricultural waitlist. DHHL beneficiaries will continue to wait on agricultural and residential homestead wait lists, and the land will have to be actively managed to reduce fire hazard and prevent dumping.

4.2 ALTERNATIVE 1: MAINTAIN EXISTING DHHL LAND USE PLAN

Alternative 1 retains the existing land use designations in the DHHL Kaua‘i Island Plan for the Hanapēpē Homestead site (Figure 13) Based on identified constraints for topography and soil types, the Project team calculated the acreages of developable versus non-developable areas. Based on the criteria, the developable area is reduced by approximately 84 acres. This includes 51 acres with 20% slope or greater, and 33 acres within the gulch.

Based on the results of the land suitability analysis, the existing land use plan is feasible from a land suitability standpoint. As stated in the Kaua‘i Island Plan, the terrain and soils on the Mauka Site are well suited for dwellings. The flat conditions and scenic views make the land designated as Residential a good choice for residential development. The Commercial and Community Use areas along the highway are large enough to accommodate uses such as a community center, park, and farmers market. With the appropriate mix of community serving uses, these areas could provide a significant benefit to the west side beneficiary community and the greater community of Hanapēpē.

Drawbacks to the Existing Land Use Plan alternative are that it spreads residential and commercial development across Kukamahu Gulch, with those uses reaching to the western border of the site. This may require longer extensions of roads and utilities, as well as additional gulch crossings, with associated environmental and cost impacts. From a planning best practices standpoint, it is preferable to encourage compact development patterns that concentrate residential and commercial development within walking and biking distance of existing town centers.

In addition, placing residential and commercial uses adjacent to agricultural lands, which exist to the west of the site, can result in unwanted impacts from agricultural activities (noise, dust, pesticides, etc.) and in complaints from residents and businesses. In general, it is preferable to provide a buffer and allow for a gradual transition of decreasing density between residential and agricultural areas.

Finally, the residential areas to the west of the gulch are directly mauka of the area leading down to Salt Pond Park. This may add to existing concerns about runoff impacting the salt ponds.

4.3 ALTERNATIVE 2: MODIFIED LAND USE PLAN (PREFERRED)

Alternative 2 concentrates Residential land uses to the east of Kukamahu Gulch, adjacent to existing residential development (Figure 14). Subsistence agriculture areas are concentrated to the west of the gulch. The Commercial and Community Use areas in the southwest corner of the Makai Site are adjusted to reflect beneficiary preferences, and a new small area of Commercial is proposed just mauka of the Makai Site, in anticipation of a future mauka extension of Lele Road as a gateway to the community. Based on identified constraints for topography and soil types, the total developable area is 281 acres.

Concentrating residential development to the east of the gulch is consistent with smart growth principles, which calls for focusing development in and adjacent to existing neighborhoods and town centers. It is also compatible with form-based code, which the County plans to adopt via the West Kaua‘i Community Plan. Form-based code replaces conventional use-based zoning with standards based on development form and type rather than use. The desired effect is a gradient, or transect, of uses transitioning from high density mixed use in town centers to lower density types. The gulch crossing the Mauka Site provides a natural division to separate denser Residential lots from larger lot Subsistence Agriculture homesteads, which would then transition into open space and adjacent agricultural lands. In addition, maintaining the western side of the parcel in agricultural use will help to preserve view planes and green space to the southwest, which is consistent with desires expressed by existing lessees.

The southeast portion of the Mauka Site is located within walking distance of Hanapēpē Town and is designated as Neighborhood General in the Kaua‘i General Plan. This designation is considered appropriate for medium-density mixed-use commercial and residential development. Adding a new Commercial area at this location where a new road and gateway is envisioned is consistent with the County’s policy of encouraging mixed use in the core of Hanapēpē town.

Alternative 2 adjusts the Commercial and Community Use areas along the highway on the southwestern side of the Makai Site to reflect beneficiary input indicating the desire for a larger Community Use area and smaller Commercial area closer to Hanapēpē Town. The acreage for Community Use is increased with the intent of providing a destination for the west side community that may include a park, ball fields, and community center, as well as agriculture-supportive uses such as a farmer’s market, community garden, and shared equipment/facilities. The Commercial area is decreased and moved closer to Hanapēpē Town.

Concentrating residential development on the east side of the gulch is advantageous from an infrastructure standpoint, as sewer and water lines can be extended from the existing subdivision without crossing the gulch.

Figure 13: **ALT 1: MAINTAIN EXISTING DHHL LAND USE PLAN**

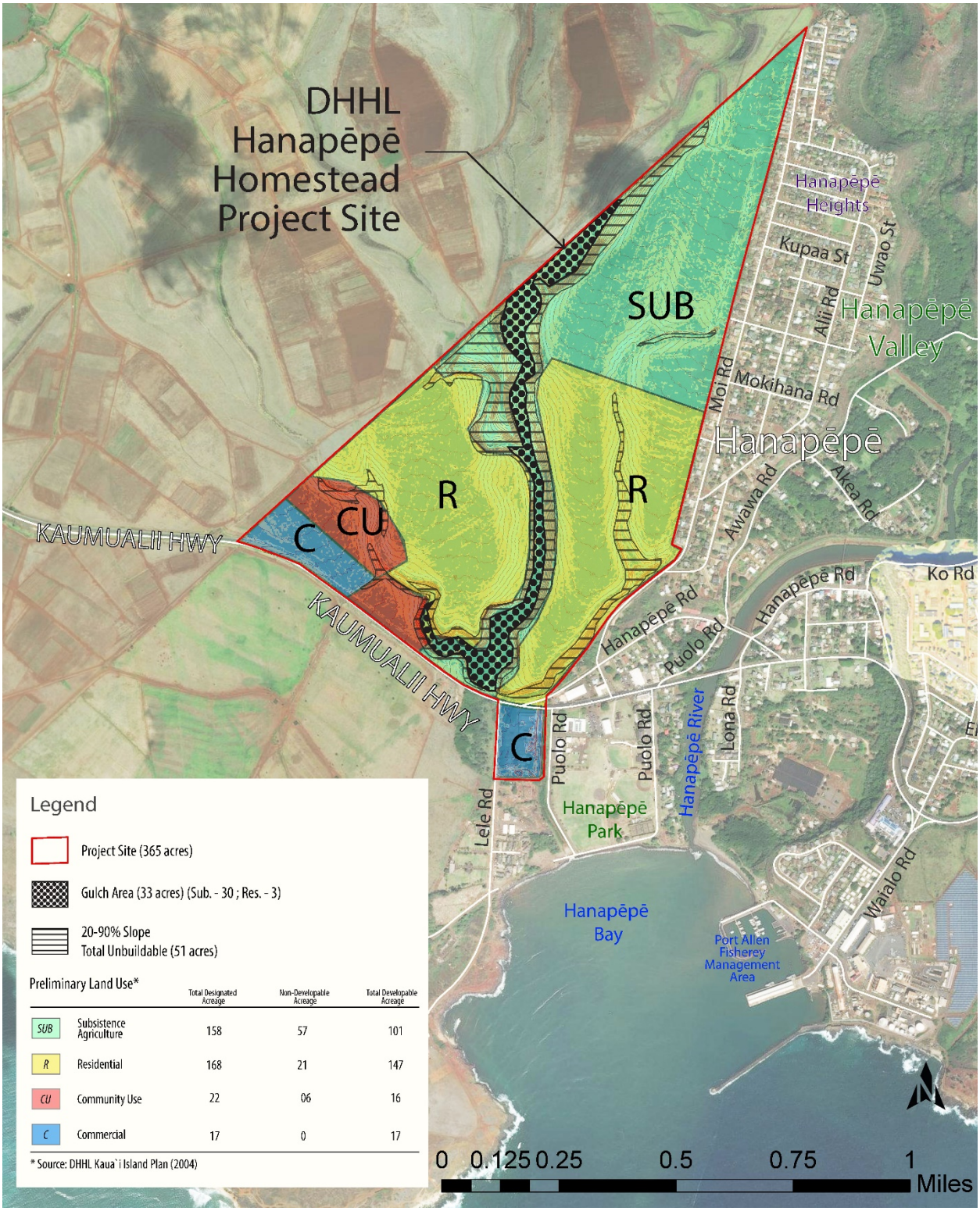
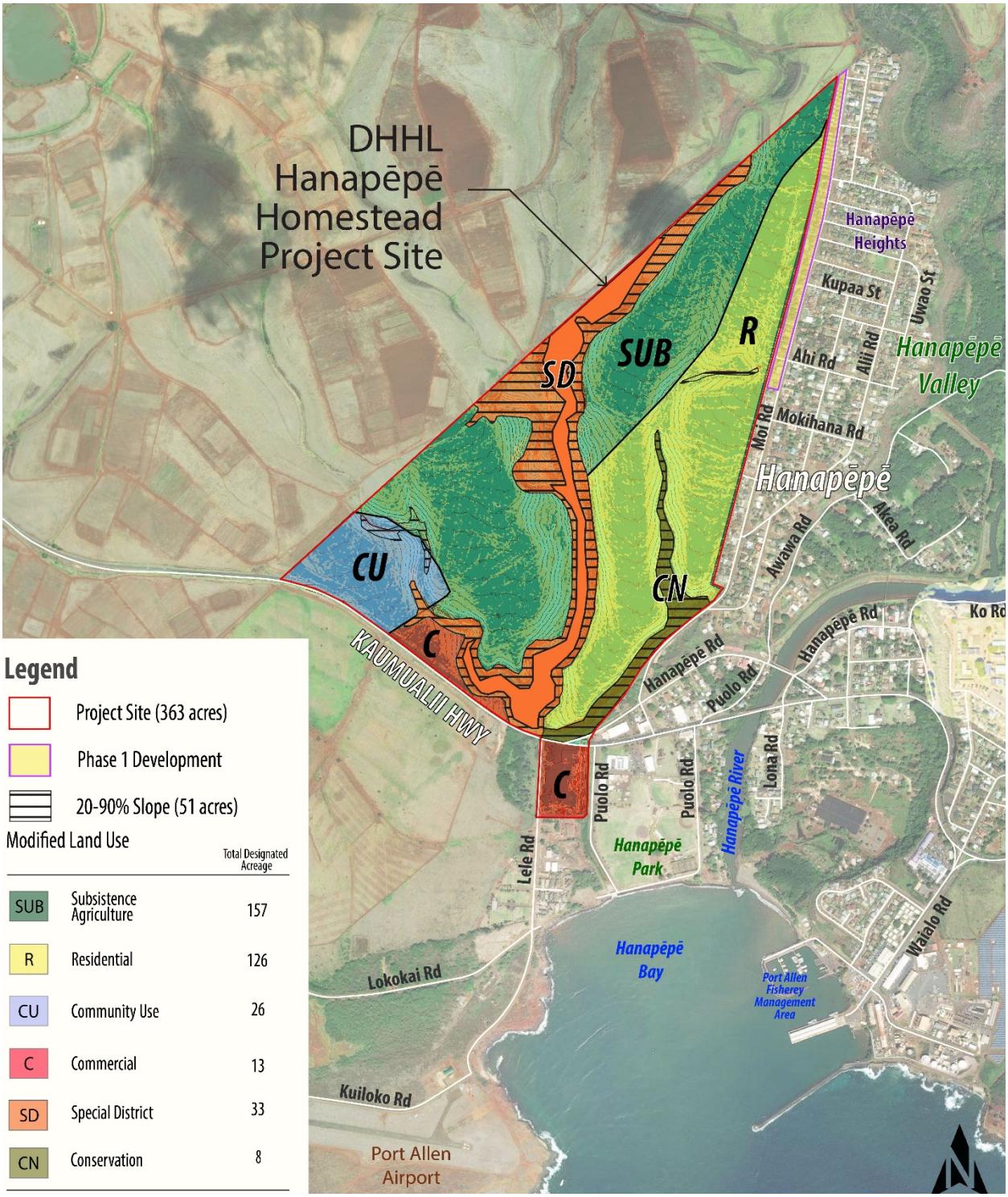


Figure 14: **ALT 2: MODIFIED LAND USE PLAN (PREFERRED)**



5.0 FINDINGS AND ANTICIPATED DETERMINATION

5.1 ANTICIPATED DETERMINATION

The proposed Hanapēpē Homestead Community Project is not anticipated to have a significant impact based on the criteria set forth in HAR, Chapter 200, Title 11, Section 12. The objective of this Draft EA is to identify and consider the "significance" of potential environmental effects which includes the sum of effects on the quality of the environment along with cumulative long-term effects.

As set forth in HAR, Chapter 200, Title 11, a prescribed set of 13 Significance Criteria is used to determine the Project's impact on the environment. The Project's relationship to each criterion is discussed in this chapter.

5.2 SIGNIFICANCE CRITERIA FINDINGS

To determine whether a proposed action may have a significant effect on the environment under HAR Title 11, Chapter 200.1 (2019), the Proposing Agency needs to consider every phase of the action, the expected primary and secondary consequences, cumulative effect, and the short- and long-term effects. The Proposing Agency's review and evaluation of the proposed action's effect on the environment would result in a determination whether: 1) the action would have a significant effect on the environment, and an Environmental Impact Statement Preparation Notice should be issued, or 2) the action would not have a significant effect warranting a Finding of No Significant Impact (FONSI).

1. Irrevocably commits a natural, cultural, or historic resource.

The Project is not expected to adversely impact natural or cultural resources in Hanapēpē. Technical studies have been conducted to assess the potential impact of the Project on fauna and flora, as well as cultural and archaeological resources on DHHL's Hanapēpē lands and downstream lands.

Studies have found that the prime agricultural portions of the Mauka Site property were previously under long-term, intensive sugar cultivation and have since been used for farming and pasture, limiting the expectation of finding pre-contact archaeological or cultural features, or significant native habitats. The primary constraints to development of the Mauka Site are related to the topography of several gulches of varying widths and steepness cross the site. In general, the slopes and soils in these areas are less suited to development, and are more likely to include sensitive resources such as flora, fauna, and cultural resources. Accordingly, the Land Use Plan designates the majority of the gulch areas and portions of the site with greater than 20% slope as Conservation land or Special District.

Minimizing any potential impacts to the Hanapēpē salt ponds is critically important for protection of cultural practices in Hanapēpē. While the Project site is not believed to drain into the salt ponds area presently, reports of periodic flooding through the gulches and across the

highway require careful attention to drainage system design and runoff retention. The Project will meet or exceed County drainage requirements by providing stormwater detention basins and applying Low Impact Development strategies to reduce the environmental impact of runoff and improve water quality.

Any subsequent unforeseen negative impacts may be mitigated through management protocols developed with the lessees; continued coordination with SHPD; and designation of streams, gulches, and biologically promising areas as Conservation or Special District.

2. Curtails the range of beneficial uses of the environment.

The proposed Project is not expected to curtail the range of beneficial use of the environment by placing native Hawaiians on the land and by designating streams, gulches, and areas with the potential for native habitat restoration as Conservation or Special District.

Given the presence of high-quality agricultural lands on the Mauka Site, the site is well suited for agricultural use, and the preferred location of Subsistence Agriculture lots will provides a buffer between Residential and agricultural uses to the west of the gulch. Proposed Residential uses are located to take advantage of natural buffers and trade winds, as well as proximity to existing infrastructure facilities along Moi Road.

Results of environmental studies and research suggest that the Makai Site should remain in industrial and/or commercial use. Of concern is the existence of soils that are prone to ponding and flooding, as well as the presence of Recognized Environmental Concerns on the site as identified in the Phase 1 Environmental Site Assessment. These warrant further study and will likely require additional drainage mitigation measures with any changes in use.

3. Conflicts with the State's environmental policies or long-term environmental goals and guidelines established by law.

This Project does not conflict with the State's long-term environmental policies or goals and guidelines. Potential adverse impacts are associated with short-term construction activities that will be mitigated through compliance with regulatory guidelines and use of best management practices. In the short-term, the Project provides up to 75 additional Residential lots for beneficiary lessees. In the long term, the Project provides up to 374 additional Residential lots, 111 Subsistence Agricultural and community and economic opportunities for native Hawaiians to improve their quality of life.

4. Has a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State.

The Project will be beneficial to the economy and social welfare of the State by providing opportunities for native Hawaiian beneficiaries to obtain homestead leases at $1.00/year for 99 years, and to receive other programmatic supports that increase crop production and build capacity for homesteaders to engage in subsistence agricultural activities and to possibly reside on the lot. The lessees provide an additional customer base for the existing commercial businesses within Hanapēpē Town.

Current lessees and beneficiaries have identified a number of potential commercial uses that would contribute positively to the economic and social welfare of the surrounding community. These new commercial uses on the Project site would likely result in additional jobs and services offered to the Hanapēpē community.

Nohopapa Hawai‘i consulted with individuals knowledgeable with the Project area who participated in community ethnographic interviews for contributions to the cultural impact assessment. Ethnographic research involves gathering oral histories and conducting interviews with living communities to record historical connections to a place. Six individuals were contacted for the study. No significant adverse impacts from the project were identified.

5. Has a substantial adverse effect on public health.

The Project will have short-term construction- related impacts on noise and air quality, but they will be mitigated by compliance with Department of Health regulations. Potential long-term impacts on public health will be mitigated through wastewater disposal accommodated by connection to the ‘Ele‘ele WWTP or thru individual wastewater disposal systems that are approved by the DOH; surface water runoff managed by a Drainage Master Plan, and streams and gulches protected as Conservation or Special District-designated areas. Walking and biking paths as well as community use areas in the new homestead community will provide opportunities for active transportation and recreation to promote health.

6. Involves adverse secondary impacts, such as population changes or effects on public facilities.

The Project will increase the population of Hanapēpē through new permanent residences in the short term of up to 75 Residential lots and in the long term with the addition of up to 449 Residential lots and 111 Subsistence Agriculture lots. Based on the experience of previous DHHL agricultural homesteads, only 50% of the Subsistence Agricultural lots are expected to result in residences. However, all of the lessees, regardless of whether or not they ultimately reside in Hanapēpē, will be required to pay property taxes on their lot, which will contribute toward public facilities and services.

In the short term, public utility services are anticipated to be able to accommodate the Phase 2 residential subdivision for potable water and irrigation, wastewater connection, solid waste pick up, electricity and communications.

In the long-term, should public utilities not be available due to capacity issues, additional options will be necessary to provide water and wastewater services. The water master plan that was prepared to assess the existing water supply capacity and propose infrastructure improvements includes the possibility of a new well, storage tank and distribution system should the existing County system prove unable to accommodate the development. DHHL will mitigate the potential impacts to public utilities and services by working with the County DOW and DWWM to ensure the Project can be accommodated appropriately through County-owned systems.

There is only one public road to enter and exit the Project site and Hanapēpē Heights community at this time, which is Moi Road. Access road stub-outs exist along Moi Road across from Ali‘i Road, Ahi Road, and Eleu Road to provide future connection in DHHL’s Hanapēpē lands. Moi

Road is the collector for entire residential community. Lessees and residents have expressed a desire for alternate access, and the traffic analysis for the Project indicates a second access will be needed to mitigate traffic. The land use plan identifies a proposed location for the second access road, which is anticipated to be developed as part of the long-term site build-out.

7. Involves a substantial degradation of environmental quality.

Construction activities will cause some impacts to air quality, noise, and traffic in the area of the Project, but these are temporary in nature and will be mitigated by best management practices in accordance with State and County permit regulations. Potential impacts to surface water and drainage will be mitigated by a drainage master plan that is being developed to minimize erosion and manage runoff. Furthermore, roughly 10 percent of the Project site will be dedicated to Conservation and Special District uses in order to protect natural drainageways.

8. Is individually limited but cumulatively has substantial adverse effect upon the environment or involves a commitment for larger actions.

The proposed Project is not expected to have a significant negative cumulative effect upon the environment. DHHL does not have any other Projects in the vicinity and this Project does not commit DHHL or others to additional actions.

9. Has a substantial adverse effect on a rare, threatened or endangered species, or its habitat.

There are no known threatened or endangered species or associated habitats on or near the property. The areas most likely to contain any sensitive habitat, such as the gulches and steep slopes, are proposed for Conservation or Special District. Additionally, best practices will be carried out to protect against potential impacts to the Hawaiian hoary bat, Hawaiian hawk, and seabirds that may fly over the property.

10. Has a substantial adverse effect on air or water quality or ambient noise levels.

Construction activities will cause some impacts to air quality, noise, and surface water in the area of the Project, but these are temporary in nature, will follow appropriate regulations, and will be mitigated by best management practices in accordance with State Department of Health and County of Kaua‘i construction permit conditions.

Potential long-term impacts to surface water quality will be mitigated by a drainage master plan that is being developed to minimize erosion and manage runoff. After construction, the Project is not expected to have a detrimental impact on air quality or noise levels. There may be a slight increase in impervious surfaces due to the construction of roads, houses, and community facilities, but any additional runoff will be contained on-site through drainage features identified during the development of a master drainage plan. The drainage master plan will identify features and practices to minimize erosion.

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

The Mauka Site is not located in an environmentally sensitive area. It is located outside of the flood plain, tsunami zone, beach area, geologically hazardous land, estuary, and 3.2-foot Sea Level Rise Exposure Area (SLR-XA) from the Hawai‘i Sea Level Rise Vulnerability and Adaptation Report. It should be noted that for the islands of Lāna‘i, Moloka‘i, and Hawai‘i, the SLR-XA represents only the passive flooding hazard due to the lack of historical data needed to model the other two hazards.

The Makai Site is designated as an area of minimal flood hazard, Flood Zone X, on the Federal Emergency Management Agency Flood Insurance Rate Maps. Zone X is determined to be outside the 500-year flood zone, with minimal risk of flooding. The Pacific Disaster Center has identified the Makai Site as being within the Tsunami Evacuation Zone. The Makai Site is located adjacent to but outside of the 3.2-foot Sea Level Rise Exposure Area SLR-XA.

The State Department of Land and Natural Resources Division of Forestry and Wildlife identified the Mauka Site as in the “N/A” zone for risk to wildfire hazards. However, due to drier weather, hotter temperatures and stoppage of agricultural uses on the Project site, the risk of wildfire is high, and development of the site would help to mitigate the risk of wildfire substantially, with appropriate firebreaks provided between developed and open areas.

12. Has a substantial adverse effect on scenic vistas and view-planes, during day or night, identified in county or state plans or studies.

The Project site is not located in an area that has been identified as a scenic view plane or area of natural beauty by the County or State and it contains no significant geographical points, such as pu‘u. The proposed Project will not result in significant impacts to scenic vistas and view planes during day or night. The Project will alter the existing views of agricultural lands as they are converted to homesteads, but the Subsistence Agriculture land use will be generally consistent with previous and current agricultural land uses. The new Residential lots will be located adjacent to the existing homes and subdivision.

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

The new agricultural activities, commercial and community use areas, and homes will increase energy consumption but are not anticipated to require substantial energy requirements or emit substantial greenhouse gases when compared with other similar Projects.

6.0 AGENCIES AND ORGANIZATIONS CONSULTED

A comprehensive stakeholder engagement plan was developed for the Project and is being implemented to gather input from existing DHHL lessees and beneficiaries, as well as the greater Hanapēpē community and relevant agencies. Activities to date have included:

- A meeting with existing Hanapēpē lessees and applicants to provide insights into current conditions on and around the Project site, and to identify important elements of culture, identity, and place.
- Two beneficiary consultation meetings to inform beneficiaries about the Project and invite their participation in envisioning the future homestead community.
- One community meeting open to the public and beneficiaries, to introduce the Project, gather input for consideration in the EA, and envision the relationship of the lessees, homesteads, and Project site to the greater Hanapēpē community.
- A beneficiary survey to obtain current information on demand for homestead types in the Hanapēpē area, and to identify desired types of development, including communal use areas and facilities.
- A Cultural Impact Assessment and Phase I Environmental Site Assessment involving interviews and consultation with Hanapēpē residents, kupuna, landowners, and businesses.
- Consultations with adjacent landowner and former lessee of the site Gay and Robinson to gather information on the site history and discuss the relationship of the homestead community to adjacent agricultural lands and facilities.
- Consultations with relevant State and County agencies to address the relationship of the homestead community to existing plans, policies, and infrastructure.
- EA Pre-Consultation letters sent to relevant agencies and organizations requesting initial input on the Project and topics to address in the Draft EA.
- Presentation to the Hawaiian Homes Commission.

6.1 EXISTING LESSEES MEETING

A meeting with existing Hanapēpē Lessees was held on December 13, 2018 at the Hanapēpē Library. The purpose of the meeting was to introduce the Project team and meet the existing lessees, share information regarding the process and timeline for the Project, hear and collect lessee manaʻo on existing homesteads, the Project site, and the relationship of the homesteads to the greater community and island. A copy of the meeting summary is provided in Appendix F.

Twenty-two people attended, approximately half of whom were existing lessees, and the other half were applicants on the DHHL waiting list. The Project team shared a presentation and distributed fact sheets with the plans and timeline for the Project. Valuable information about the Project site was gleaned from the meeting, as summarized below:

- Vehicular Access: There is only one road to enter and exit the community. Traffic backs up during emergencies, as people go up Moi Road for evacuation.
- Fire Management: The community is concerned with fire because the parcel behind their homes is overgrown and dry, and there are no firebreaks to prevent a fire from spreading.
- Natural Disasters & Hazards: Heavy rains cause flooding across homestead lots and the highway below the site. Drainage should be a priority to address.
- Housing Product Types: Applicants expressed a preference for turnkey homes over self-help or rent to own. There was interest in how land uses/product types would be selected. Lessees expressed a desire for a community center with playground, emergency shelter, and other uses.
- Homestead Lot Size: The existing homesteads are close together, and many lessees have extended their backyards to provide more space. Lessees would like areas behind homesteads lots extended to allow the lessees more space. Future homesteads should be built with bigger lots.
- Timing of Project: Applicants are hopeful that the development process can be completed in less than 10 years.
- Uses behind Existing Homestead Lots: The land behind the existing Homestead lots were previously used as gardens to grow food. Lessees would also like a firebreak behind existing lots.
- Water Supply: Lessees noted that there is only one well and one pump for Hanapēpē . The Homestead development may need a new well.

6.2 BENEFICIARY CONSULTATION MEETINGS

Two (2) beneficiary consultation meetings were held on July 24, 2019 and December 5, 2019. Both meetings we held at the ‘Ele‘ele Elementary School. Copies of meeting summaries are included in Appendix F. Presentations were provided in English, and it was also translated into ‘Ōlelo Ni‘ihau by an interpreter. Attendees received copies of the agenda in English and ‘Ōlelo Ni‘ihau, as well as copies of the presentation and Project distributed fact sheets with the plans and timeline for the Project.

The purpose of the July 24, 2019 meeting was to introduce the Project team and meet DHHL beneficiaries and applicants, share information regarding the findings from work done to date, share preliminary findings from the beneficiary survey, gather input on preliminary land use plan alternatives, and gather input on desired qualities and land uses for a Hanapēpē Homestead community.

The purpose of the December 5, 2019 meeting was to present and gather input on two proposed land use plan scenarios for full buildout, as well as preferred uses within Community Use and Commercial areas. Additionally, input was gathered on what should be addressed in the EA. The Project team provided a brief overview of the Project and a recap of beneficiary input and findings from early consultations, technical studies, and the beneficiary survey and meetings. The Project team also presented preliminary land use plan alternatives for the Environmental Assessment. Map stations were set up to allow attendees to review and mark up the proposed site

layout, as well as provide input on preferred uses within Community Use and Commercial Areas. Informational and interactive boards were on display in an open house format.

A third beneficiary consultation meeting is planned to occur during the EA review process.

6.3 STAKEHOLDER CONSULTATION MEETINGS

Initial stakeholder consultation meetings were held between December 2018 and April 2019. The SSFM Project team and DHHL staff met with and/or initiated e-mail correspondence with the following agencies and organizations:

- COK Planning Department
- COK Department of Public Works
- COK DPW Division of Wastewater Management
- COK Department of Water
- State of Hawai‘i Department of Transportation
- Gay and Robinson

6.4 COMMUNITY MEETINGS

One (1) community meeting was held on October 26, 2019 at the ‘Ele‘ele Elementary School. A copy of the meeting summary is included in Appendix F. The purpose of the meeting was to introduce the Project, share findings from work done to date, share preliminary findings from the beneficiary survey, present land us plan alternatives for EA, gather input on what’s important to residents of Hanapēpē and how they view their community, and gather input on what should be addressed in the EA.

The Project team shared a presentation and developed informative and interactive boards on display in an open house format. Attendees received copies of the agenda, as well as copies of the presentation and Project fact sheet.

A second community meeting is planned to occur during the EA review process.

6.5 PRE-ASSESSMENT CONSULTATION

The following agencies and organizations were consulted during the preparation of the Draft EA. All written comments received during the early consultation period of the Draft EA are included in Appendix A.

TABLE 6: PRE-ASSESSMENT CONSULTATION

Distribution	Pre-Assessment Consultation Recipient	Comments Received
FEDERAL AGENCIES		
U.S. Fish and Wildlife Service	**X**	
U.S. Army Corps of Engineers, Honolulu District Regulatory Office	**X**	**X**
STATE OF HAWAI'I AGENCY		
State of Hawai'i Department of Agriculture	**X**	
State of Hawai'i Department of Business, Economic Development & Tourism	**X**	
State of Hawai'i Department of Accounting and General Services	**X**	X
State of Hawai'i Department of Land and Natural Resources, Division of Aquatic Resources	**X**	
State of Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife	**X**	
State of Hawai'i Department of Land and Natural Resources, Division of State Parks	**X**	
State of Hawai'i Department of Land and Natural Resources, Engineering Division	**X**	
State of Hawai'i Department of Land and Natural Resources, Office of Coastal and Conservation Lands	**X**	
State of Hawai'i Department of Transportation, Highways Division	**X**	X
State of Hawai'i Department of Health, Clean Air Branch	**X**	
State of Hawai'i Department of Health, Clean Water Branch	**X**	
Office of Hawaiian Affairs	**X**	
COUNTY OF KAUA'I		
County of Kaua'i Housing Agency	**X**	
County of Kaua'i Planning Department	**X**	
County of Kaua'i Water Department	**X**	
County of Kaua'i Department of Public Works	**X**	

County of Kaua‘i Department of Public Works, Engineering Division	**X**	X
County of Kaua‘i Department of Public Works, Roads Division	**X**	
County of Kaua‘i Department of Public Works, Waste Water Management Division	**X**	
County of Kaua‘i Department of Public Works, Solid Waste Division	**X**	
County of Kaua‘i Emergency Management Agency	**X**	
County of Kaua‘i Fire Department	**X**	
ELECTED OFFICIALS		
State Representative, House District 16	**X**	
State Senator, Senate District 8	**X**	
Kaua‘i County Council Chair	**X**	

This page intentionally left blank

7.0 REFERENCES

2018. *Kaua'i Kakou County General Plan.* County of Kaua'i Department of Planning. Prepared by SSFM International. Adopted February 7, 2018. Available online at: http://plankauai.com/

2012. *Lima Ola Workforce Housing Development Master Plan*. County of Kaua'i Housing Agency. Prepared by Kimura International. March 2012.

2004. *Kaua'i Island Plan*. Prepared by G70. June 2004. Available online at: https://dhhl.hawaii.gov/wp-content/uploads/2012/05/Island_Plan_Kaua'i_2004.pdf

2018. *Draft Environmental Assessment for the Honomū Subsistence Agricultural Homestead Community.* Prepared by Townscape. September 2018

2015. *Hawai'i Administrative Rules, Chapter 124, Indigenous Wildlife, Endangered and Threatened Wildlife, Injurious Wildlife, Introduced Wild Birds, and Introduced Wildlife*. http://dlnr.hawaii.gov/dofaw/files/2013/09/Chap124a.pdf Accessed Nov 3, 2016.

2019. *Division of Forestry and Wildlife Game Bird Hunting. Information on hunting in Hawaii*. http://dlnr.hawaii.gov/recreation/hunting/bird. Accessed May 22, 2019.

DUDEK. 2019. *Hanapēpē Archaeological Assessment.* Report Prepared for SSFM International. April 2019.

H.T. Harvey & Associates. 2019. *Biological Surveys in Support of Planning For Department of Hawaiian Homeland Hanapēpē Kaua'i Homesteads Project*. Report Prepared for SSFM International. May 2019.

Kevin Kennedy Consulting. 2019. *Phase 1 Environmental Site Assessment Report.* Report Prepared for SSFM International. March 2019.

Mink, J. F. and Lau, L. S. 1992. *Aquifer Identification and Classification for Kaua'i : Groundwater Protection Strategy for Hawaii*. Water Resources Research Center Technical Report No. 186. September 1992.

Nohopapa Hawai'i. 2019. *A Cultural Impact Assessment for the Department of Hawaiian Homelands.* Report Prepared for SSFM International. December 2019.

Federal Emergency Management Agency. Flood Insurance Rate Map, Map Number1500020286F Date: 11/26/2010.

Federal Emergency Management Agency (FEMA). 2014a. Definitions of FEMA Flood Zone Designations. Available online at: http://snmapmod.snco.us/fmm/document/fema-flood-zone-definitions.pdf.

Flood Hazard Areas – State of Hawai'i. Prepared by Hawai'i Statewide GIS Program. October 19, 2016. Available online at: http://planning.hawaii.gov/gis/download-gis-data/.

2014. *Hawai'i Soil Atlas*. Accessed on March 8, 2019 from http://gis.ctahr.hawaii.edu/SoilAtlas.

2001. *Web Soil Survey database. U.S. Department of Agriculture, Natural Resources Conservation Service*. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx (accessed April 2019)

2019. Critical Habitat Portal, Critical Habitat Mapper. Washington, D.C. <http://ecos.fws.gov/crithab/>. Accessed March 15, 2019.

2011. *Short-Term Seabird Habitat Conservation Plan.* Prepared by Planning Solutions, Inc. Rana Biological Consulting, Inc., and Ebbin Moser + Skaggs, LLP. Lihue, Kauai, Hawaii.

2018. *Results of electronic records search for fallout records of seabirds for sector 21-Port Allen, Kauai, during 2017*. Kauai Humane Society, Save our Shearwaters Program. Lihue, Hawaii.

Tomich, P. Q. 1986. *Mammals in Hawaii.* Second edition. Bishop Museum Special Publication 76. Bishop Museum Press, Honolulu, Hawaii.

Wagner, W. L., and D. R. Herbst. 1999. S*upplement to the manual of the flowering plants of Hawaii.* Pages 1855–1918 in W. L. Wagner, D. R. Herbst, and S. H. Sohmer, editors, Manual of the Flowering Plants of Hawaii. University of Hawaii Press and Bishop Museum Press, Honolulu.

Wagner, W. L., D. R. Herbst, N. Khan, and T. Flynn. 2012. *Hawaiian Vascular Plant Updates: A Supplement to the Manual of the Flowering Plants of Hawaii and Hawaii's Ferns and Fern Allies. Version 1.3.*

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. *Manual of the Flowering Plants of Hawaii.* Two volumes. Revised edition. University of Hawaii Press and Bishop Museum Press, Honolulu.

Appendix A – Pre-Assessment Consultation Comments

DAVID Y. IGE
GOVERNOR

CURT T.
COMP

AUDRE
DEPUTY C

SSFM
INTERNATIONAL, INC.
RECEIVED
DEC 11 2019
JKC
FILE

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

DEC 9 2019

Mr. Jared Chang, AICP
SSFM International
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

Subject: DHHL Hanapepe Kauai Homestead
Pre- Assessment Consultation for Environmental Assessment
Hanapepe, Kauai, Hawaii
Tax Map Key (TMK): (4) 1-8-007:003; (4) 1-8-008: 035, 081, 087, 087

Thank you for the opportunity to provide comments on the subject project. The project does not impact any of the Department of Accounting and General Services' projects or existing facilities, and we have no comments to offer at this time.

If you have any questions, your staff may call Mr. Dennis Chen of the Public Works Division at 586-0491.

Sincerely,

CURT T. OTAGURO
Comptroller

DYKC:jl

SSFM International
Innovate | Adapt | Sustain

June 30, 2020 SSFM 2018_021.000

Mr. Curt T. Otaguro
Comptroller
State of Hawaii
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawai'i 96810

SUBJECT: **DHHL Hanapēpē Kaua'i Homestead**
Response to Comments on Pre-Assessment Consultation for Environmental Assessment
Hanapēpē, Kaua'i, Hawai'i
Tax Map Key (TMK): (4)1-8-007:003; (4) 1-8-008: 035, 081, 087, 087

Dear Mr. Moule:

Thank you for your letter dated December 9, 2019 regarding the subject project.

We note that the project does no impact any of the Department of Accounting and General Services' projects or existing facilities.

Your December 9th letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

If you have any questions on this matter or the proposed project, please feel free to contact me at (808) 356-1242 or by email at Jchang@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jared Chang, AICP
Manager, Strategic Services Group

DAVID Y. IGE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

November 26, 2019

SSFM INTERNATIONAL, INC.
RECEIVED
NOV 2 2019

JADE T. BUTAY
DIRECTOR
Deputy Director
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

IN REPLY REFER TO:
HWY-PS 2.1676

FILE

FILE COPY

Mr. Jared Chang
Manager, Strategic Services Group
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

Subject: Pre-Assessment Consultation
Hanapepe Kauai Homestead
State Department of Hawaiian Home Lands
Hanapepe, Kauai, Hawaii
Tax Map Key: (4) 1-8-007:003; (4) 1-8-008:035, 081, 086, and 087

The State Department of Hawaiian Home Lands (DHHL) proposes to develop Hanapepe Kauai Homestead on approximately 365 acres in Hanapepe to provide residential and subsistence agriculture homesteading opportunities for DHHL beneficiaries.

The majority (359 acres) of the project site is north of Kaumualii Highway (State Route 50) on Tax Map Key (TMK) parcel (4) 1-8-007: 003. The remaining 6 acres of the project site are located adjacent and south of Kaumualii Highway on TMK parcels (4) 1-8-008:035, 081, 086, and 087.

Based on the Pre-Assessment Consultation materials provided, the Hawaii Department of Transportation (HDOT) has the following comments relevant to State roads:

1. A Traffic Impact Analysis Report (TIAR) should be prepared by a licensed professional engineer and included in the Draft Environmental Assessment (EA). The TIAR should identify potential direct, indirect and cumulative effects to Kaumualii Highway traffic conditions and intersections (e.g., Moi Road, Lele Road, Hanapepe Road) in the study area.

2. Describe the phasing of the project and anticipated trip generation associated with each phase leading to full build-out.

3. Include mitigation measures for potential significant adverse impacts to traffic conditions.

4. HDOT prefers no new access roads to Kaumualii Highway and recommends alternatives be considered in the EA for the proposed Lele Road extension across Kaumualii Highway.

5. Describe any ancillary uses (special events) such as a farmer's market or agricultural programs open to the public. Theses should be reflected in the TIAR's trip generation.

6. A permit to perform work upon State highways shall be required for any work within the highway right-of-way (ROW). Construction plans prepared by a Hawaii licensed engineer shall be submitted for review and approval prior to applying for a permit to perform work.

7. Describe the existing and proposed storm water drainage at the project site. No additional stormwater runoff will be permitted in the State highway ROW, including culverts. All additional stormwater runoff from the project site shall be managed and mitigated onsite.

If you have any questions, please contact Jeyan Thirugnanam, Systems Planning Engineer, Highways Division, Planning Branch at (808) 587-6336 or by email at jeyan.thirugnanam@hawaii.gov. Please reference file review number PS 2019-149.

Sincerely,

JADE T. BUTAY
Director of Transportation

SSFM International
Innovate | Adapt | Sustain

June 30, 2020 SSFM 2018_021.000

Mr. Jade T. Butay
Director
State of Hawai'i
Department of Transportation
Highways Division, Planning Branch
869 Punchbowl Street
Honolulu, Hawai'i 96813

SUBJECT: **DHHL Hanapēpē Kaua'i Homestead**
Response to Comments on Pre-Assessment Consultation for Environmental Assessment
Hanapēpē, Kaua'i, Hawai'i
Tax Map Key (TMK): (4)1-8-007:003; (4) 1-8-008: 035, 081, 087, 087

Dear Mr. Butay:

Thank you for your letter dated November 26, 2019 (HWY-PS 2.1676) regarding the subject project. We offer the following response to your comments.

A Traffic Impact Analysis Report (TIAR) has been prepared for the project and included in the Draft EA. The TIAR includes discussion on the comments provided in your letter for the subject project.

Your November 26th letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

If you have any questions on this matter or the proposed project, please feel free to contact me at (808) 356-1242 or by email at Jchang@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jared Chang, AICP
Manager, Strategic Services Group

ENGINEERING DIVISION
DEPARTMENT OF PUBLIC WORKS
THE COUNTY OF KAUA'I

DEREK S. K. KAWAKAMI, MAYOR
MICHAEL A. DAHILIG, MANAGING DIRECTOR

LYLE M.
DEPUTY COUN

SSFM INTERNATIONAL, INC.
RECEIVED
DEC 0 5 2019
FILE
FILE COPY

December 3, 2019

SSFM International
501 Sumner Suite 620
Honolulu, HI 96817
Attention: Mr. Jared Chang, AICP

SUBJECT: DHHL Hanapēpē Kaua'i Homestead
Pre Assessment Consultation for Environmental Assessment
Hanapēpē, Kauai, Hawai'i
TMK (4) 1-8-007: 003; (4)1-8-008: 035, 081, & 087

PW 11.19.021

Dear Mr. Chang,

Your letter dated November 4, 2019 requested that the Engineering Division of the Department of Public Works (DPW) provide any comments, concerns, or regulatory requirements that the Division may have on the subject project. DHHL is proposing to develop a homestead community on about 365 acres of land in Hanapēpē.

We recommend that the following items be included for discussion in the Environmental Assessment (EA):

1. Short term (construction) impacts of the project on air quality and water quality.
2. Identification of downstream drainage areas and the impact of drainage from the project on these properties.
3. Evaluation and discussion on the use of Moi Road between the project site and Kaumuali'i Highway.
4. Traffic Impacts both in the Hanapēpē Heights area and on Kaumualii Highway.

Thank you for providing this opportunity for consultation on this pending project. We look forward to receipt of the EA. If you have any questions or need additional information, please contact Stanford Iwamoto, Engineering Division at (808) 241-4896 or siwamoto@kauai.gov .

Sincerely,

Michael Moule, P.E.
Chief, Engineering Division

Concur,

Lyle Tabata
Deputy County Engineer

MM/SI
cc: Design and Permitting Section

SSFM International
Innovate | Adapt | Sustain

June 30, 2020 SSFM 2018_021.000

Mr. Michael Moule
Chief, Engineering Division
Department of Public Works
County of Kauai
444 Rice Street, Suite 175
Līhu‘e, Hawai‘i 96766

SUBJECT: **DHHL Hanapēpē Kaua‘i Homestead**
Response to Comments on Pre-Assessment Consultation for Environmental Assessment
Hanapēpē, Kaua‘i, Hawai‘i
Tax Map Key (TMK): (4)1-8-007:003; (4) 1-8-008: 035, 081, 087, 087

Dear Mr. Moule:

Thank you for your letter dated December 3, 2019 (PW 11.19.021) regarding the subject project. We offer the following response to your comments.

The Draft Environmental Assessment includes discussion on:

- Short term construction impacts of the project on air quality and water quality
- Identification of downstream drainage areas and the impact of drainage on these project areas
- Evaluation and discussion on the use of Moi Road between the project site and Kaumuali‘i highway
- Traffic Impacts

Your December 3rd letter, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

If you have any questions on this matter or the proposed project, please feel free to contact me at (808) 356-1242 or by email at Jchang@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jared Chang, AICP
Manager, Strategic Services Group

Carlos Kelton

From: Speerstra, Linda CIV USARMY CEPOH (US) <Linda.Speerstra@usace.army.mil>
Sent: Tuesday, November 26, 2019 12:36 PM
To: Jared Chang
Cc: Speerstra, Linda CIV USARMY CEPOH (US)
Subject: POH-2019-0231 Hawaiian Home Lands - Kaua'i Hanapepe

Aloha Mr. Chang, thank you for reaching out to the Corps in regards to the Hanapepe Kaua'i Homestead EA . The Honolulu District, U.S. Army Corps of Engineers (Corps), Regulatory Branch has received your request for comments on November 22, 2019 for a Department of the Army (DA) scoping comments. Your request has been assigned DA file number POH-2019-00231. Please reference this number in all future correspondence with our office relating to this action.

To determine if a DA permit is required for a proposed action, the Corps must first determine whether the proposed project is located within the Corps' geographic jurisdiction (i.e., whether the activity is located within a water of the U.S.). If the activity is within a water of the U.S., the Corps must then determine whether the proposed project is a regulated activity under Section 10 and/or Section 404 or if the activity is exempt. The determination provided in this letter pertains only to the question of geographic jurisdiction.

Based on our review of the information you provided we are not able to determine is the project area contains waters of the U.S., and/or wetlands, under the Corps' regulatory jurisdiction. The information submitted indicates that technical reports will be available in the forthcoming DEA. I'm providing the following information in regards to the Regulatory program.

DA authorization is required if you propose to place dredged and/or fill material into waters of the U.S., including wetlands and/or perform work in navigable waters of the U.S.

Section 404 of the Clean Water Act requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including jurisdictional wetlands (33 U.S.C. 1344). The Corps defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Section 10 of the Rivers and Harbors Act of 1899 requires that a DA permit be obtained for structures or work in or affecting navigable waters of the U.S. (33 U.S.C. 403). Section 10 waters are those waters subject to the ebb and flow of the tide shoreward to the mean high water mark, and/or other waters identified by the Honolulu District.

Based on the information provided, it would appear that there is a high probability that portions of the land being used would have waters of the US present on the site. As you are preparing the EA, it would be prudent to include a delineation of waters of the US for the Corps review. If you have any questions or would like to discuss further please contact me via email at linda.speerstra@usace.army.mil, by mail at the address above, by phone at (808) 835-4300 if you have questions. I appreciate your cooperation with the Corps' Regulatory Program.

Linda Speerstra
Chief, Regulatory Branch
U.S. Army Corps of Engineers
Honolulu District
808-835-4300

Linda Speerstra
Chief, Regulatory Branch
U.S. Army Corps of Engineers
Honolulu District
808-835-4300

This email has been scanned for spam and viruses by Proofpoint Essentials. Visit the following link to report this email as spam:
https://us3.proofpointessentials.com/index01.php?mod_id*&mod_option=gitem&mail_id*74807774-WFA4Z7BRMTP4&r_address=hang%40ssfm.com&report=

SSFM International
Innovate | Adapt | Sustain

June 30, 2020 SSFM 2018_021.000

Ms. Linda Speerstra
Chief, Regulatory Branch
U.S. Army Corps of Engineers-Honolulu District
Building 252
Fort Shafter, HI 96858-5440
Linda.Speerstra@usace.army.mil

SUBJECT: **DHHL Hanapēpē Kaua'i Homestead**
Response to Comments on Pre-Assessment Consultation for Environmental Assessment
Hanapēpē, Kaua'i, Hawai'i
Tax Map Key (TMK): (4)1-8-007:003; (4) 1-8-008: 035, 081, 087, 087

Dear Ms. Speerstra:

Thank you for your email received on November 26, 2019 (POH-2019-00231) regarding the subject project. We offer the following response to your comments.

We will work with USACE in the future to determine the Department of Army permit applicability.

Your November 26th email, along with this response, will be included in the Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process.

If you have any questions on this matter or the proposed project, please feel free to contact me at (808) 356-1242 or by email at Jchang@ssfm.com.

Mahalo,

SSFM INTERNATIONAL, INC.

Jared Chang, AICP
Manager, Strategic Services Group

Appendix B – Biological Survey Report

H. T. HARVEY & ASSOCIATES

Ecological Consultants

Biological Surveys in Support of Planning For Department of Hawaiian Homelands Hanapēpē Kaua'i Homesteads Project

Project # 4244

Prepared for:

Melissa White
SSFM Internatinal
501 Sumner Street, Suite 620
Honolulu, HI 96817

Prepared by:

H. T. Harvey & Associates

May 23, 2019

745 Fort Street, Suite 2003 • Honolulu, HI 96813 • Ph: 808.441.2080 • F: 808.441.2090

Table of Contents

Section 1.0 Project Background 1
Section 2.0 Methods 3
Section 3.0 Results 5
3.1 Flora 5
3.2 Fauna 11
Section 4.0 Conclusions and Recommendations 13
Section 5.0 References 15

Figures

Figure 1. Location of Project Area 2
Figure 2. Habitat Types 4
Figure 3. Mixed Scrub Vegetation in the Southern 6-Acre Parcel of the Project Area. Monkey Pod (*Samanea Saman*) tree in the Foreground and Haole Koa (*Leucaena leucocephala*) Trees in the Background. 9
Figure 4. Eastern Border of the Project Area Along Hanapēpē Road with Haole Koa (*Leucaena leucocephala) Thickets*. 9
Figure 5. Roadside Weedy Vegetation Representative of the Majority of the Eastern and Southern Border of the Project Area 10
Figure 6. Grassland Habitat in the 359-Acre Northern Parcel of Project Area Comprised of Dead Guinea Grass (*Urochloa maxima*) and Scattered Haole Koa (*Leucaena leucocephala*). 10
Figure 7. Gulch Habitat it the Southeastern Corner of the Project Area with Castor Bean Shrubs *(Ricinus communis*) and 'Opiuma (*Pitheœllobium dulce*) trees. 11
Figure 8. Seabird Diverters on Utility Wires Along Kaumualii Highway Near the Southwestern Border of the Project Area 13

Tables

Table 1. Plant Species Observed at the DHHL Hanapēpē Project Area, *Kaua'i* 5
Table 2. Bird Species Observed in the Project Area 12

List of Preparers

Scott Terrill, Principal

Paul Conry, Senior Associate Wildlife Ecologist

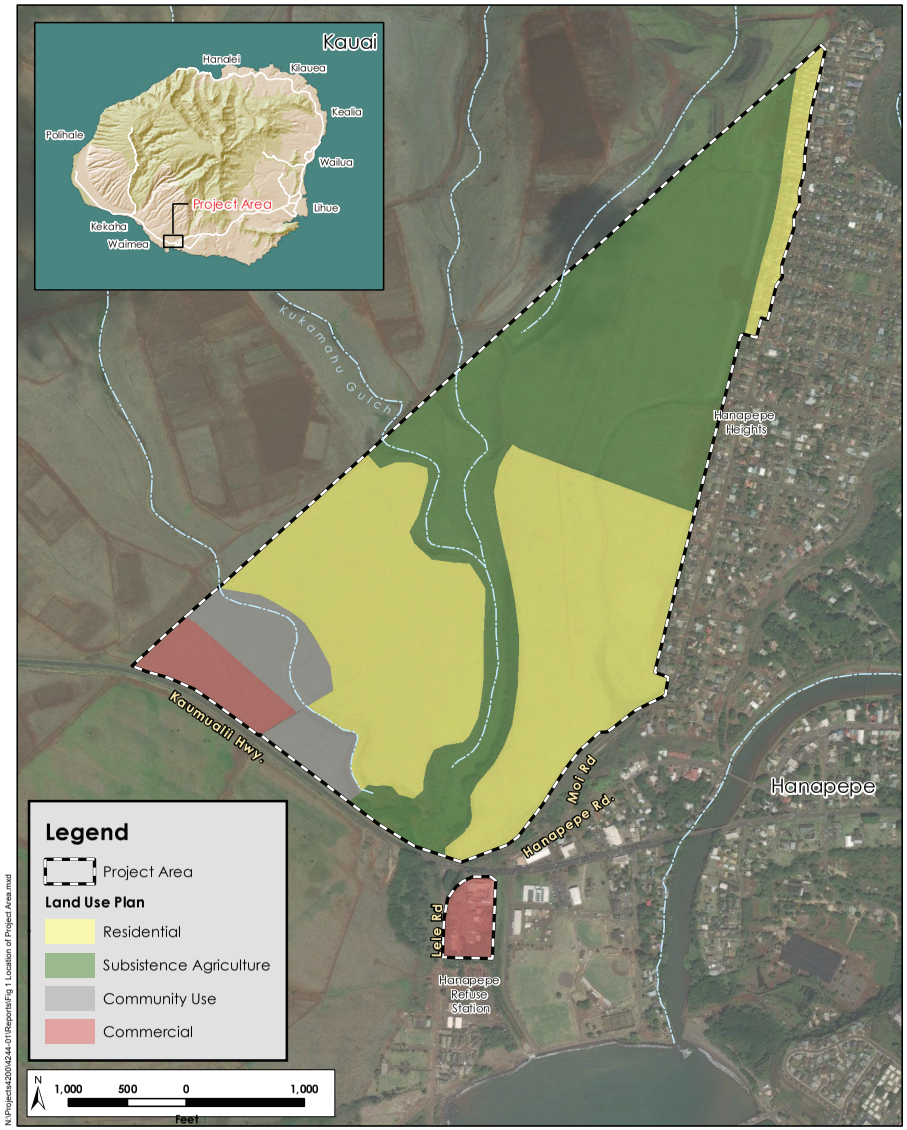
Shahin Ansari, Senior Plant Ecologist

Section 1.0 Project Background

The Department of Hawaiian Homelands (DHHL) owns approximately 365 acres of land in the western part of Kaua'i, just west of Hanapēpē town (Figure 1). The Kaumuali'i Highway divides this DHHL property into a larger 359-acre *mauka* parcel to the north and a smaller 6-acre *makai* parcel to the south. The norther parcel is bound by Moi Road and the Hanapēpē Heights residential neighborhood to the east, and agricultural lands to the west (Figure 1). It ranges from 20 to 200 ft. in elevation and is bisected by the Kulamanu Gulch (Group 70 2004). This *mauka* parcel is designated as Agriculture by the State Land Use System and the existing land use includes residential—36 homesteads and agriculture—fallow sugarcane land. The smaller southern parcel is bound by Lele Road to the west, a drainage channel to the east, and the Hanapēpē transfer refuse station to the south (Figure 1). It is designated Urban by the State Land Use System and the existing use is industrial—comprising of a warehouse and parking lot (Group 70 2004).

DHHL is planning to develop this 365-acre property in Hanapēpē to provide residential and agricultural homesteading opportunities to their beneficiaries. This 365-acre property (henceforth also referred to as the project area) is envisioned to be DHHL's largest community on the west side of Kaua'i with a mix of land uses including subsistence agriculture, residential, commercial, and community use (Figure 1). SFFM International (SSFM) is providing DHHL with planning and permitting services for this rural homestead community project. For this project, SSFM's work plan is to build on the conceptual land use plan and infrastructure requirements identified in DHHL's Kaua'i Island Plan (Group 70 2004) which includes, land suitability analysis, infrastructure assessment, environmental assessment, and a community engagement program. To support their initial land suitability analysis, SSFM contracted H. T. Harvey & Associates to conduct a flora and fauna survey of the project area. The objectives of the biological survey were to:

- Conduct a reconnaissance level wildlife survey to identify and document the presence of wildlife (birds and mammals) species.
- Conduct a reconnaissance level botanical survey to identify and document the vegetation communities and the plant species observed in the project area.
- Identify and document the presence of biological issues of concern including the presence of any taxa state or federally listed as threatened or endangered and candidate species for listing or sensitive habitats such as wetlands.
- Identify potential impacts and a range of potential conservation measures that may be considered for inclusion into the planning stage of the project if any taxa state or federally listed as threatened or endangered and candidate species for listing are found in the project area.



H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1. Location of Project Area
(4244-01)
May 2019

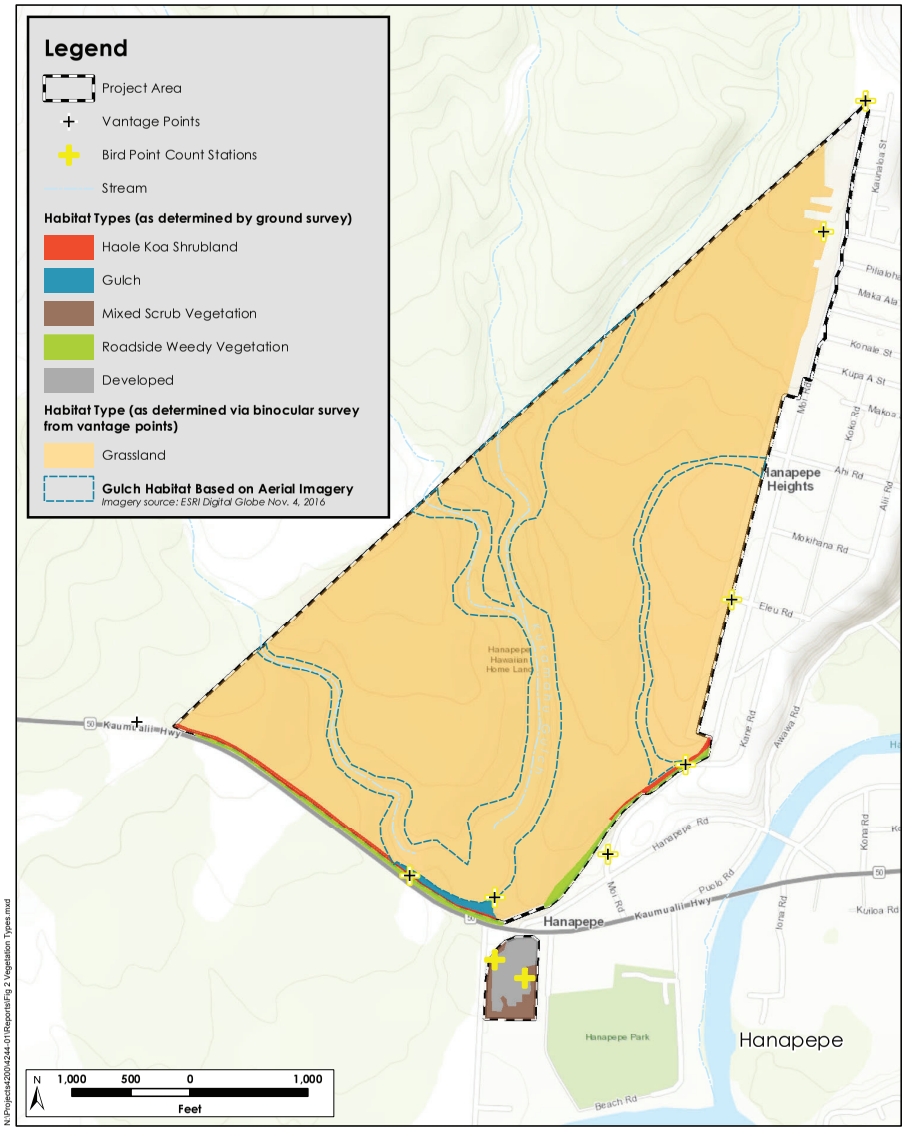
Section 2.0 Methods

A reconnaissance level biological survey of the project area was conducted on March 4, 2019 from 8:30 am to 5 pm. Sunny to partially cloudy skies and moderate trade winds prevailed during the survey period. One botanist and one wildlife biologist (together referred to as biologists) conducted the survey together. A handheld Global Positioning System (GPS) device loaded with spatial details was used to navigate during the survey and to record field observations. The biologists walked the accessible parts (see discussion below) of the project area documenting the vegetation type, plants, birds and mammals. In general, rocky outcrops, shaded areas, and depressions which are more likely to support native plant species were intensively surveyed. Visual and auditory detection together with observations of scats, tracks, nests, and other animal signs were used to record observations of birds and mammals. In addition to general observation, nine 10-minute point counts were also conducted, tallying all birds seen or heard by a single observer from a fixed point over a period of 10-minutes.

The biologists first surveyed the smaller 6-acre parcel to the south of the Highway on foot, recording vegetation and plant and animal species observed. The vast majority of the larger 359-acre parcel to the north of the Highway could not be surveyed by foot. The eastern border of the project area, from the Highway along Hanapepe Road and Moi Road, up until the first homestead was lined with a wall of thick impenetrable vegetation on a high berm that ran parallel to the road and prevented access to the interior of the project area. The remaining northern part of the eastern border along Moi Road was lined with residences of Hanapēpē Heights (Figure 2). Eleu Road and Ali‘i Road, which ran in the east-west direction, intersected this residential development and provided access at two points between the houses up to the eastern edge of the project area but, again access to the interior of the project area from here was blocked due to boundary fences, locked gates on previously used jeep trails, and impenetrable thickets of tall dead grass. The biologists drove Moi Road making several stops to document flora and fauna observations; particularly stopping at vantage points from where they could scan the habitat in the interior of the project area using binoculars (Figure 2).

The biologists also drove the southern border of the project area along Kaumuali‘i Highway stopping at several places to document the vegetation and plant and animal species observed. Surveying on foot was limited to a narrow strip of vegetation along the Highway as the dense vegetation, sometimes on high earthen berm, made it difficult to access the interior part of the project area. But, the biologists stopped at some vantage points to scan the interior habitat of the project area using binoculars.

At four locations the biologists encountered locked gates—at the end of Moi Road at the norther tip of the project area, Eleu Road and Ali‘i Road in the central part of the project area, and from the Highway at the southwestern tip of the project area. If additional surveys are needed later in the planning stages, it is possible that the jeep roads leading from these gates would provide access into the interior parts of the project interior.



N:\Projects\4200\4244-01\Reports\Fig 2 Vegetation Types.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 2. Habitat Types
(4244-01)
May 2019

Section 3.0 Results

3.1 Flora

No plant species state or federally listed as threatened, endangered, or candidates for listing, and no rare native Hawaiian plant species were observed in the accessible parts of the project area. The project area did not contain proposed or designated critical habitat for threatened or endangered plant species (USFWS 2019).

A total of 53 plant species were observed in the surveyed parts of the project area. Fifty-one (96%) of these are either cultivated or naturalized and two species (4%): hoary abutilon (*Abutilon incanum*) and ʻuhaloa (*Waltheria indica*) are believed to be indigenous to the Hawaiian Islands (Wagner et al. 1999). Table 1 below provides a list of the plant species observed in the accessible parts of the project area.

Table 1. Plant Species Observed at the DHHL Hanapēpē Project Area, *Kauaʻi*

Family	Scientific Name	Common name	Status[1]	Qualitative Relative Abundance in Project Area
Angiosperms – Monocots				
Agavaceae	*Cordyline fruticosa* (L.) A.Chev.	Ti, ki	pol	R
	Dracaena marginata Lam.	Dragon tree	cul	R
	Dracaena reflexa Lamarck	Song of India	cul	R
Liliaceae	*Crinum asiaticum* L.	Giant lily	cul	R
Musaceae	*Musa sp.*	Banana	cul	R
Poaceae	*Cenchrus ciliaris* L.	Buffel grass	nat	C
	Chloris barbata Sw.	Swollen finger grass	nat	C
	Cynodon dactylon (L.) Pers.	Bermuda grass	nat	C
	Eragrostis sp.	love grass	nat	C
	Eleusine indica (L.) Gaertn.	Wire grass	nat	C
	Urochloa maxima (Jacq.) R. Webster	Guinea grass	nat	A
Angiosperms – Dicots				
Acanthaceae	*Asystasia gangetica (L.) T.Anderson*	Chinese violet	nat	U
	Ruellia brittoniana Leonard	Purple ruellia	nat	U
	Thunbergia fragrans Roxb.	White thunbergia	nat	U
Amaranthaceae	*Alternanthera pungens* Kunth	Khaki weed	nat	U

Family	Scientific Name	Common name	Status[1]	Qualitative Relative Abundance in Project Area
	Amaranthus spinosus L.	Amaranthus	nat	U
Anacardiaceae	*Mangifera indica* L.	Mango	nat	R
Apocynaceae	*Catharanthus roseus* (L.) G.Don	Madagascar periwinkle	nat	R
Asteraceae	*Ageratum conyzoides* L.	Billy goat weed	nat	C
	Emilia fosbergii Nicolson	Pualele	nat	U
	Parthenium hysterophorus L.	False ragweed	nat	U
	Pluchea carolinensis (Jacq.) G.Don	Sourbush	nat	U
	Tridax procumbens L.	Coatbuttons	nat	C
	Verbesina encelioides (Cav.) Benth. & Hook.	Golden crown-beard	nat	C
Bignoneaceae	*Spathodea campanulata* P.Beauv.	African tulip tree	nat	R
Boraginaceae	*Heliotropium procumbens* Mill. var. depressum (Cham.) *Fosberg*	Fourspike heliotrope	nat	U
Brassicaceae	*Lepidium oblongum* Small	Peppergrass	nat	C
Cactaceae	*Opuntia ficus-indica* (L.) Mill.	Prickly pear cactus	nat	R
Capparaceae	*Cleome gynandra* L.	Wild spider flower	nat	C
Clusiaceae	*Clusia rosea* Jacq.	Autograph tree	nat	R
Convolvulaceae	*Ipomoea obscura* (L.) Ker Gawl.	Ipomoea	nat	C
Euphorbiaceae	*Euphorbia candelabrum* Tre maut & Kotschy	African candelabra	cul	R
	Euphorbia hirta L.	Hairy spurge	nat	C
	Euphorbia hypericifolia L.	Graceful spurge	nat	C
	Ricinus communis L.	Castor	nat	C
Fabaceae	*Chamaecrista nictitans* (L.) Moench ssp. *patellaria* (DC. ex Collad.) H.S.Irwin & Barneby var. glabrata (Vogel) *H.S.Irwin & Barneby*	Partridge pea	nat	U
	Desmodium incanum DC.	Spanish clover	nat	C
	Indigofera spicata Forssk.	Creeping indigo	nat	C
	Leucaena leucocephala (Lam.) de Wit	Haole koa	nat	A
	Macroptilium lathyroides (L.) Urb.	Cow pea	nat	C

Family	Scientific Name	Common name	Status[1]	Qualitative Relative Abundance in Project Area
	Pithecellobium dulce (Roxb.) Benth.	Manila tamarind, ʻOpiuma	nat	C
	Samanea saman (Jacq.) Merr.	Monkeypod	nat	U
Lamiaceae	*Leonotis nepetifolia* (L.) R.Br.	Lion's ear	nat	U
Malvaceae	*Abutilon incanum* (Link) Sweet	Hoary abutilon	ind?	R
	Sida ciliaris L.	Red ilima	nat	C
	Sida rhombifolia L.	Cuban jute	nat?	C
Moraceae	*Ficus sp.*	Ficus	nat	R
Myrtaceae	*Syzygium cumini* (L.) Skeels	Java plum	nat	R
Nyctaginaceae	*Bougainvillea* sp.	Bougainvillea	nat	R
Rubiaceae	*Spermacoce assurgens* Ruiz & Pav.	Buttonweed	nat	C
Sterculiaceae	*Waltheria indica* L.	ʻUhaloa	ind?	U
Verbenaceae	*Clerodendrum ×speciosum* D'Ombrain	Java glory vine	cul	R
Zingeberaceae	*Alpinia purpurata* (Vieill.) K.Schum.	Red ginger	nat	R

[1] **Status:** pol = Polynesian introduction. pol? = Questionably a Polynesian introduction. Species that may have been Polynesian introductions or that possibly were introduced in historical times (after 1778). nat = naturalized = introduced or alien (all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact [i.e., Cook's arrival in the islands in 1778]). ind = indigenous = species that occur naturally in the archipelago but that also have a wider distribution outside of Hawaii. ind? = questionably indigenous (species for which dates of introduction or other information do not make a clear argument for their dispersal here by natural or human-related mechanism but for which the weight of the evidence suggests that they are probably indigenous). end = endemic = species that occur naturally only in the Hawaiian Islands. cul = cultivated = species that are known to be cultivated but, not naturalized in the Hawaiian Islands.

Qualitative Relative Abundance of Observed Species on Site: A = abundant—forming a major part of the vegetation in the survey on the project site. C = common—widely scattered throughout the area or locally abundant in a portion of it. U = uncommon—scattered sparsely throughout the area or occurring in a few small patches. R = rare—only a few isolated individuals on the project site.

Additional Notes: This checklist is an inventory of plant species observed on March 4, 2019 in parts of the project area accessible on foot. The plant names are arranged alphabetically by family, then by species, into each of two groups: monocots and dicots within the subdivision of angiosperm (flowering plants). The taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999); recent name changes are those recorded in Wagner and Herbst (1999) and Wagner et al. (2012).

The vegetation in the smaller 6-acre industrial parcel can be described as mixed-scrub vegetation representative of a highly disturbed lowland habitat. The entrance to this parcel was landscaped with ornamental plants such as song of India (*Dracaena reflexa*), dragon tree (*Dracaena marginata*), Java glory vine (*Clerodendrum ×speciosum*), and

giant lily (*Crinum asiaticum*). Most of the center of this parcel was bare ground. Trees and shrubs along the western and southern portion of the parcel comprised of species such as ʻopiuma (*Pithecellobium dulce*), monkeypod (Samanea saman), and haole koa (*Leucaena leucocephala*) (Figure 3). The ground cover primarily comprised of weedy vegetation such as golden crown-beard (*Verbesina encelioides*), spiny amaranthus (*Amaranthus spinosus*), guinea grass (*Urochloa maxima*), and swollen finger grass (*Chloris barbata*) growing in between the existing buildings and structures. Scattered individuals of the indigenous species of ʻuhaloa were also found in this parcel.

Vegetation along the eastern border along Hanapēpē Road can be described as haole koa shrubland, mostly comprised of haole koa thickets mixed in with guinea grass (Figure 4). Vegetation along the remaining eastern and southern borders of the project area was that of haole koa shrubland and mixed roadside vegetation. Low growing weedy plants such as buffel grass (*Cenchrus ciliaris*), coatbuttons (*Tridax procumbens*), hairy spurge (*Euphorbia hirta*), and creeping indigo (*Indigofera spicata*) were characteristic of the roadside in the eastern and southern borders of the project area. A narrow band of haole koa shrubland generally occurred behind the strip of roadside vegetation toward the project area (Figure 5).

The vast majority of the inaccessible interior of the project area which was scanned using binoculars can be described as grassland habitat (Figure 6). It was covered with dense, monotypic stand of dead guinea grass with a scattered haole koa trees. Unlike in the aerial photographs of the project area, the Kulamanu Gulch habitat could not be distinguished when scanning the interior of the project area from the eastern and southern borders. However, limited access to the southernmost portion of the gulch which runs parallel to the Highway revealed that the gulch was dry. The gulch constituted a sharp drop of about 30 ft. from the edge of the Highway right-of-way. The western end of the gulch comprised of large ʻopiuma trees with hardly any understory vegetation. Castor bean shrubs, ʻopiuma trees, haole koa, and guinea grass were abundant in the eastern end of the gulch (Figure 7).

Figure 3. Mixed Scrub Vegetation in the Southern 6-Acre Parcel of the Project Area. Monkey Pod (*Samanea Saman*) tree in the Foreground and Haole Koa (*Leucaena leucocephala*) Trees in the Background.

Figure 4. Eastern Border of the Project Area Along Hanapēpē Road with Haole Koa (*Leucaena leucocephala) Thickets.*

Figure 5. Roadside Weedy Vegetation Representative of the Majority of the Eastern and Southern Border of the Project Area.

Figure 6. Grassland Habitat in the 359-Acre Northern Parcel of Project Area Comprised of Dead Guinea Grass (*Urochloa maxima*) and Scattered Haole Koa (*Leucaena leucocephala*).

Figure 7. Gulch Habitat it the Southeastern Corner of the Project Area with Castor Bean Shrubs (*Ricinus communis*) and 'Opiuma (*Pithecellobium dulce*) trees.

3.2 Fauna

Fourteen bird species—all nonnative introduced species were seen during the survey of the project area (Table 2). Seven of these species are designated as injurious species on the state list of injurious wildlife (DLNR 2015) and are known to be harmful to agriculture, aquaculture, or indigenous wildlife or plants or to constitute a nuisance or health hazard: cattle egret (*Bubulcus ibis*), zebra dove (*Geopelia striata*), spotted dove (*Streptopelia chinensis*), Japanese white-eye (*Zosterops japonicus*), chestnut munia (*Lonchura atricapilla*), white-rumped shama (*Copsychus malabaricus*), and rose-ringed parakeet (*Psittacula krameri*). The first four of these species were either abundant or commonly found on the project site, while the latter three were uncommon and rare, respectively, on the site. The other common and abundant urban bird species observed during the course of the survey were all nonnative introduced species typically seen in lowland areas. These included the common myna (*Acridotheres tristis*), northern cardinal (*Cardinalis cardinalis*), house finch (*Carpodacus mexicanus*), domestic pigeon or rock dove (*Paroaria coronata*), red-crested cardinal (*Paroaria coronata*), and domestic chicken (*Gallus domesticus*).

Although no Hawaiian seabirds were observed in our survey, there was evidence of the presence of seabirds in the area. The electrical transmission lines along Kaumuali'i Highway near the southwest corner of the property had bird diverters attached, which function to visually warn seabirds transiting the area of the power lines presence (Figure 8). A check of the Kaua'i Humane Society's Save our Shearwaters (SOS) Program seabird fallout records indicate that Hanapēpē and 'Ele'ele areas experience fallout of the threatened Newell's shearwater (*Puffins newelli*), Hawaiian petrel (Pterodroma sandwichensis), and wedge-tailed shearwater (*Puffinus*

pacificus) on an annual basis. The fallout records in close proximity to the project site indicate that these species fly near or over the project site on an annual basis.

The mammals observed during the survey were three domestic cats (*Felis catus*) and three domestic horses (*Equus ferus caballus*). The cats were observed in and around the vicinity of residential areas, and likely were pet cats or semi-wild feral cats cared for by residents. Although rats (*Rattus* spp.) were not observed during the survey, they also are expected to be present in the project area because of the proximity to residential units. The horses were observed adjacent to residential areas, and likely kept by residents.

No nonnative reptiles or amphibians were seen or heard during the survey. Hawai'i does not have any native terrestrial reptiles or amphibians.

Table 2. Bird Species Observed in the Project Area

Scientific Name	Common Name	Status	Number Observed on Point Count Stations (n=9)	Number of Stations Occupied	Qualitative Relative Abundance
Acridotheres tristis	Common myna	X	36	7	Abundant
Bubulcus ibis	Cattle egret	X, IW	6	5	Common
Cardinalis cardinalis	Northern cardinal	X	9	4	Common
Carpodacus mexicanus	House finch	X	20	7	Abundant
Columba livia	Rock dove (pigeon)	X	16	4	Common
Copsychus malabaricus	White-rumped shama	X, IW	2	2	Uncommon
Geopelia striata	Zebra dove	X, IW	11	5	Abundant
Lonchura atricapilla	Chestnut munia	X,IW	7	1	Uncommon
Lonchura punctulata	Nutmeg manakin	X	1	1	Uncommon
Paroaria coronata	Red-crested cardinal	X	5	2	Common
Psittacula krameri	Rose-ringed parakeet	X, IW	1	1	Rare
Streptopelia chinensis	Spotted dove	X, IW	13	6	Abundant
Zosterops japonicus	Japanese white-eye	X, IW	23	6	Abundant
Gallus domesticus	Domestic chicken	X	33	8	Abundant
		Totals	**183**		

Section 4.0 Conclusions and Recommendations

It is unlikely that the proposed development of a rural homestead community by DHHL on their 365-acre property in Hanapēpē will have a significant adverse impact on any plant species state or federally listed as threatened or endangered, candidate species for listing as endangered, species of concern, or rare native Hawaiian plant species. The project area is highly disturbed, comprising of abandoned agricultural land now dominated by guinea grass grassland, residences, and an industrial lot, and with 96% of the flora being nonnative. The two indigenous plant species found in the project area commonly occur on Kaua'i and the other main Hawaiian Islands. However, it should be noted that the vast majority of the larger 359-acre parcel could not be surveyed on foot and was only scanned using binoculars. It is possible that since agricultural practice was abandoned, some native plant species recruited and found refuge in suitable pockets (e.g. near the gulch habitat) of the project area not invaded by the surrounding weedy vegetation. While the results of this survey, conducted in support of a land suitability analysis, do not reveal any botanical resources of concern at the project site, H. T. Harvey & Associates recommends that, before any major vegetation clearing is conducted, the interior of the 359-acre parcel should be surveyed on foot to confirm the presence or absence of any native plant species. Also, at the time of the survey, dry conditions prevailed and the vast majority of the vegetation was either dead or dry. We recommend that this future follow-up survey be conducted during the wet season to capture possible native plant species that might die back during the dry season.

Figure 8. Seabird Diverters on Utility Wires Along Kaumualii Highway Near the Southwestern Border of the Project Area.

No native wildlife species were observed in the project area at the time of the survey. However the vast open grasslands in the larger 359-acre parcel appear to provide suitable habitat for Hawaiian short-eared owl (*Asio flammeus sandwichensis*) or pueo. This area also likely provides habitat for non-native barn owl (*Tyto alba*), and introduced game birds such as ring-necked pheasant (*Phasianus colchicus*), gray francolin (*Francolinus pondicerianus*); black francolin (*Francolinus francolinus*); and Erckel's francolin (*Francolinus erckelii*) (DLNR 2019). These species are relatively common, and distributed throughout the state, and have open grassland habitat available in adjacent fallow agricultural land and pasture areas.

Surveys for seabirds were not conducted however, the endangered Hawaiian petrel, threatened Newell's shearwater, and wedge-tailed shearwater are seabird species known to occur on Kaua'i and transit through the project area (SOS 2018, USFWS 2019). Furthermore, seabird diverters were observed on the utility wires along Kaumuali'i Highway near the southwestern end of the project area (Figure 8) suggests that seabirds frequent the project area during the February-December seabird breeding season and tall overhead powerlines present a collision hazard to these birds in this area. Similarly, recent Save Our Shearwaters fallout records (SOS 2018) also indicate that fledgling seabirds are attracted to external lights in adjacent urban areas and external lights pose a light attraction hazard during the seabird fallout season from September 15-December 15 in this area. The further development of powerlines and external lighting present an additional risk to the birds, if not minimized or avoided (KIUC 2011).

H. T. Harvey & Associates recommends that further planning for the homestead community project should include an assessment of the risk from these features and incorporate measures to avoid or minimize potential impacts. Seabird light attraction risk can be reduced by limiting the quantity, and shielding street lights, community park lighting, and external lights on buildings. Planners should also investigate and consider options to avoid or minimize seabird powerline collisions by undergrounding powerlines, using lower-risk horizontal line configurations, attaching bird diverters to lines, or planting fast growing shielding vegetation so that seabirds will fly over and avoid powerlines (KIUC 2011). We also recommend that the planners seek early advice from U.S. Fish and Wildlife Service and State Department of Land and Natural Resources' Division of Forestry and Wildlife on potential risks of project features to listed seabirds and appropriate measures that can be taken to avoid or minimize impacts.

Surveys to detect Hawaiian hoary bats were not conducted in support of the planning phase of this project. However, Hawaiian hoary bats are known to occur on Kaua'i (Tomich 1986) and their presence in the project area cannot be ruled out. If DHHL plans to remove any large trees from the project area then DHHL should follow the U. S. Fish and Wildlife guidelines which recommends that no trees greater than 15 feet tall be trimmed or removed during the bat pupping season from June 1 to September 15.

Section 5.0 References

[DLNR] Hawai'i Department of Land and Natural Resources. 2015. Hawai'i Administrative Rules, Chapter 124, Indigenous Wildlife, Endangered and Threatened Wildlife, Injurious Wildlife, Introduced Wild Birds, and Introduced Wildlife. http://dlnr.hawaii.gov/dofaw/files/2013/09/Chap124a.pdf Accessed Nov 3, 2016.

[DLNR] Hawai'i Department of Land and Natural Resources. 2019. Division of Forestry and Wildlife Game Bird Hunting. Information on hunting in Hawaii. http://dlnr.hawaii.gov/recreation/hunting/bird. Accessed May 22, 2019.

Group 70. 2004. Kaua'i Island Plan. Prepared for Department of Hawaiian Home Lands. <https://dhhl.hawaii.gov/wp-content/uploads/2012/05/Island_Plan_*Kaua'i*_2004.pdf> Accessed March 16, 2019.

[KIUC] Kauai Island Utility Cooperative. 2011. Short-Term Seabird Habitat Conservation Plan. Prepared by Planning Solutions, Inc. Rana Biological Consulting, Inc., and Ebbin Moser + Skaggs, LLP. Lihue, Kauai, Hawaii.

[SOS] Save our Shearwaters Program Database. 2018. Results of electronic records search for fallout records of seabirds for sector 21-Port Allen, Kauai, during 2017. Kauai Humane Society, Save our Shearwaters Program. Lihue, Hawaii.

Tomich, P. Q. 1986. Mammals in Hawaii. Second edition. Bishop Museum Special Publication 76. Bishop Museum Press, Honolulu, Hawaii.

[USFWS] U.S. Fish and Wildlife Service. 2019. Critical Habitat Portal, Critical Habitat Mapper. Washington, D.C. <http://ecos.fws.gov/crithab/>. Accessed March 15, 2019.

Wagner, W. L., and D. R. Herbst. 1999. Supplement to the manual of the flowering plants of Hawaii. Pages 1855–1918 *in* W. L. Wagner, D. R. Herbst, and S. H. Sohmer, editors, Manual of the Flowering Plants of Hawaii. University of Hawaii Press and Bishop Museum Press, Honolulu.

Wagner, W. L., D. R. Herbst, N. Khan, and T. Flynn. 2012. Hawaiian Vascular Plant Updates: A Supplement to the Manual of the Flowering Plants of Hawaii and Hawaii's Ferns and Fern Allies. Version 1.3.

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. Manual of the Flowering Plants of Hawaii. Two volumes. Revised edition. University of Hawaii Press and Bishop Museum Press, Honolulu.

Appendix C – Archaeological Assessment

HANAPĒPĒ ARCHAEOLOGICAL ASSESSMENT

Hanapēpē Ahupuaʻa, Waimea Moku, Island of Kauaʻi
359 Acres in TMK (4) 1-8-007:003 and 6 Acres in TMKs (4) 1-8-008:035, 081, 086, and 087

PREPARED FOR:

SSFM INTERNATIONAL
501 Sumner Street, Suite 620
Honolulu, Hawaiʻi, 96817
Contact: Jared Chang, AICP
Manager, Strategic Services Group

PREPARED BY:

Rachel Hoerman, Ph.D.
DUDEK
970 North Kalaheo Avenue, Suite C206
Kailua, Oʻahu, Hawaiʻi 96734

APRIL 2019

INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

SECTION PAGE

MANAGEMENT SUMMARY III

1 INTRODUCTION 1
- 1.1 Project Description and Location 1
- 1.2 Area of Potential Effects 3
- 1.3 Regulatory Setting 5

2 ENVIRONMENTAL SETTING 11

3 BACKGROUND RESEARCH 13
- 3.1 Traditional and Early Post-Contact Eras to the Late 18th Century 13
- 3.2 Early Historical Era: The Late 18th Century Through the 1830s 15
- 3.3 The Constitutional Monarchy of Hawai'i and the Great Māhele: 1840s–1850s 16
- 3.4 Hanapēpē from the Late 19th Century to the Present 21
- 3.5 Previous Archaeological Background Information 29

4 FIELDWORK 39

5 FINDINGS AND RECOMMENDATIONS 41

SOURCES CONSULTED 43

FIGURES

1. Island of Kaua'i with Project Site Locations 2
2. South Kaua'i with Project Site Locations 4
3. Hanapēpē Kaua'i – Soils of the Project Areas 12
4. Undated photograph of Traditional Salt Pans in Hanapēpē 13
5. James Ellis' 1778 sketch of Kaua'i Island's Shouth Shore 15
6. Map Depicting Kaua'i's Population, 1853 18
7. Hanapēpē Town, Mid- to Late 1880s. 20
8. Map of Kaua'i, 1901 21
9. Map of Kaua'i, 1903 22
10. Hanapēpē Valley, 1930s 23
11. Hanapēpē Town, 1940s 24
12. Hanapēpē Town, 1950s 27
13. Hanapēpē Town, 1960s 28

TABLE OF CONTENTS (CONTINUED)

PAGE

14. Previous Archaeological Studies Conducted Within the Direct and Indirect Project APEs 30
15. Hanapēpē Kaua'i – Project Area Boundaries and Half Mile Indirect APE Featuring State Inventory of Historic Places-Listed Archaeological Sites 31

TABLES

1. LCAs Granted in the Hanapēpē Heights Neighborhood During the 1950s 25
2. Archaeological Resource Investigations and Technical Reports within the Project Direct and Indirect APEs 32

MANAGEMENT SUMMARY

DUDEK PROJECT NAME: Hanapēpē Archaeological Assessment

COUNTY/BOROUGH: Hanapēpē, Kaua'i, Hawai'i, 96716

AHUPUA'A/MOKU: Hanapēpē Ahupua'a, Waimea Moku

TMKs: 359 acres in TMK (4) 1-8-007:003 and 6 acres in TMKs (4) 1-8-009:035, 081, 086, and 087

COORDINATES: 21°55´18.6"N, 159°35´54.7"W

USGS QUAD MAP: Hanapepe, HI, USGS 7.5-minute topographic quadrangle

DIRECT APE: 365 acres (Parcel Nos. 180070030000, 180080810000; 180080350000; 180080860000; 180080870000)

INDIRECT APE: One-half-(0.5)-mile radius around the subject properties

PURPOSE: Archaeological assessment

INVESTIGATION PERMIT NUMBER: Archaeological Permit Number 19-04, issued by the State of Hawai'i Department of Land and Natural Resources-State Historic Preservation Division

PROJECT DESCRIPTION: The purpose of this archaeological assessment is to assess impacts of SSFM's proposed land use plan in accordance with the requirements set forth in Hawai'i Revised Statutes (HRS) Chapter 343. SSFM International is coordinating Phase I planning and permitting for a rural homestead community development project on approximately 365 acres of lands owned by the Department of Hawaiian Homelands (DHHL) adjacent to the Hanapēpē town center. Proposed is a development that will provide residential and agricultural homesteading opportunities to DHHL's waitlist beneficiaries, and support DHHL's mission to manage the Hawaiian Home Lands trust effectively and to develop and deliver lands to native Hawaiians.

HISTORIC PROPERTIES: There are no historic properties within the direct APE. One historic property is located in the indirect APE: Hanapēpē Lot No. 18 (listed on the Hawai'i Register of Historic Places on 8/31/1991 and the National Register of Historic Places on 10/13/1993).

PROJECT ACREAGE: 365 acres (Parcel Nos. 180070030000, 180080810000; 180080350000; 180080860000; 180080870000)

DETERMINATIONS/RECOMMENDATIONS: It is not possible to determine whether significant historic properties are present on the subject properties that would be affected by the proposed work. An archaeological inventory survey scoped in coordination with the State Historic Preservation Division is recommended to determine whether significant historic properties are present on the subject properties, and if so, their location, extent and nature.

INTENTIONALLY LEFT BLANK

1 INTRODUCTION

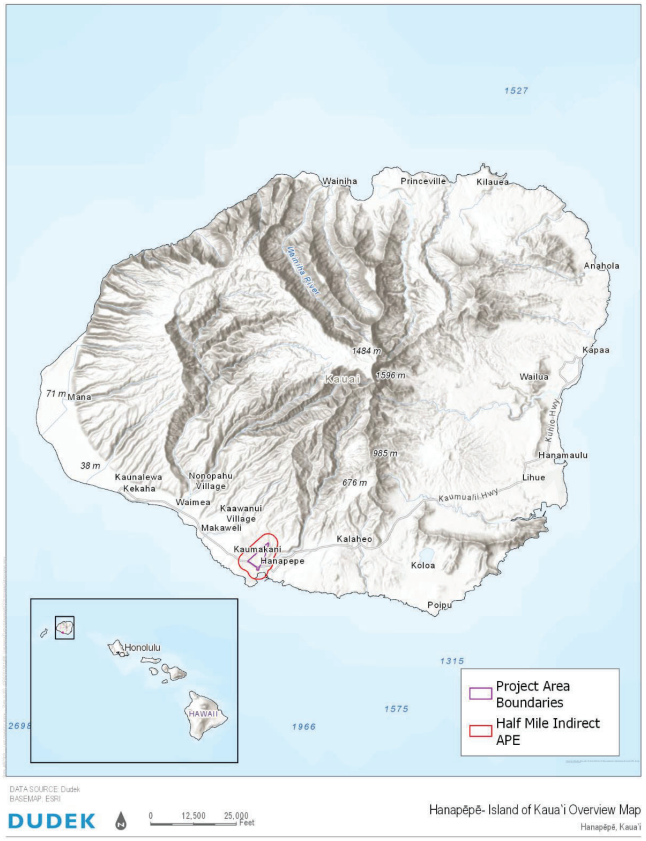
1.1 Project Description and Location

At the request of SSFM International, LLC, Dudek prepared this archaeological assessment for the 365-acre Hanapēpē Homestead Project located in Hanapēpē, Hawai'i, 96716, Hanapēpē Ahupua'a, Waimea Moku, Island of Kaua'i (Figure 1). SSFM International is coordinating Phase I planning and permitting for a rural homestead community development project on approximately 365 acres of lands owned by the Department of Hawaiian Homelands (DHHL) west of the Hanapēpē town center and Hanapēpē Heights neighborhood. Proposed is a development that will provide residential and agricultural homesteading opportunities to DHHL's waitlist beneficiaries, and support DHHL's mission to manage the Hawaiian Home Lands trust effectively and to develop and deliver lands to native Hawaiians.

The purpose of this archaeological assessment is to assess impacts of the proposed land use plan in accordance with the requirements set forth in Hawai'i Revised Statutes (HRS) Chapter 343 (DLNR-SHPD 2019). This assessment reviews the known heritage of Hanapēpē Ahupua'a, determines the likely presence or absence of additional heritage resources within the Project Area and recommends an Archaeological Inventory Survey, coordinated with the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD).

The proposed project will take place on two land parcels. One is a 359-acre sloped, triangular tract of undeveloped, presently fallow agricultural land directly west of a row of existing, north-south trending DHHL homesteads in the Hanapēpē Heights residential neighborhood. It is bordered to the south by the Kaumuali'i Highway and a narrow tract of forested land, and to the west and north by agricultural lands. The other land parcel is a six-acre tract of land bordered by Kaumuali'i Highway to the north, Puolo Road, to the east, mixed residential and commercial development to the south and Lele Road to the west. The Hanapēpē Valley lies 0.25 miles east of the larger parcel, and the Hanapēpē River flows within 0.25 miles east of both parcels. The County of Kaua'i Real Property Tax Office Website (County of Kaua'i) lists Hawaiian Homelands as the owner of the larger subject property and the State of Hawai'i as the owner of the smaller subject property.

Figure 1. Island of Kaua'i with Project Site Locations

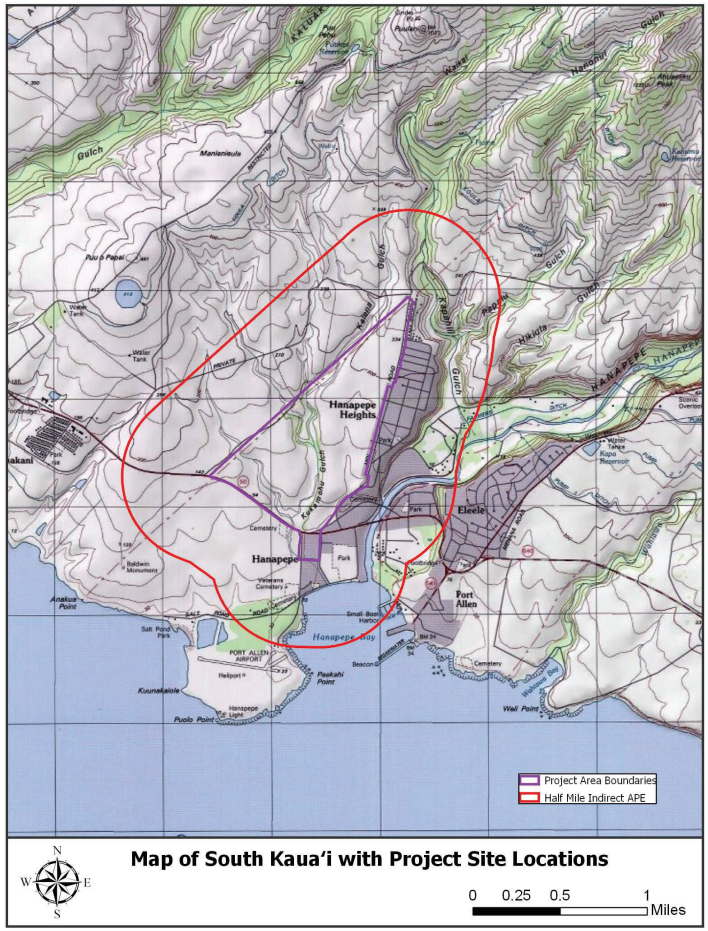


1.2 Area of Potential Effects

The Area of Potential Effects (APE) is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties. Determination of the APE is influenced by a project's setting, the scale and nature of the undertaking, and the different kinds of effects that may result from the undertaking (36 Code of Federal Regulations [CFR] 800.16(d)).

The direct APE for the proposed project is defined as the two subject properties totaling 365-acres upon which ground disturbance for development will occur. The indirect APE is defined as a one-half (0.5)-mile radius around each of the subject properties constituting the direct APE (Figure 2).

Figure 2. South Kaua'i with Project Site Locations



1.3 Regulatory Setting

Federal

The NHPA, as amended (54 USC 300101 et seq., formerly 16 USC 470 et seq.; National Historic Preservation Act), instituted historic preservation as a national policy. The NHPA established the National Register of Historic Places (NRHP) and National Historic Landmarks Program, and implemented historic preservation as a partnership among Federal, State, Tribal, and local governments, non-profit organizations, and private individuals. The NHPA directs the Secretary of the Interior, acting through the NPS, to issue regulations governing State Historic Preservation Programs and staff. NHPA statutory provisions define the SHPO's role as assisting Federal agencies with fulfilling their review and compliance responsibilities under Section 106 of the NHPA; mandate requirements every State or Territory historic preservation office must meet in order to retain federally approved status; and, require federal agencies to create historic preservation programs, designate historic preservation officers and create processes for nominating properties to the NRHP under Section 110.

NRHP guidelines for the evaluation of historic significance were developed to be flexible and to recognize those who have made significant contributions to the nation's history and heritage. NRHP criteria are intended to guide state and local governments, federal agencies, and others in their evaluations of historic properties' significance and NRHP eligibility.

A historic property is defined as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the NRHP criteria" (36 CFR Sections 800.16(i)(1)).

"Integrity" is defined in NRHP guidance, How to Apply the National Register Criteria, as "the ability of a property to convey its significance. To be listed in the NRHP, a property must not only be shown to be significant under the NRHP criteria, but it also must have integrity" (NPS 2002). NRHP guidance further states that properties be completed at least 50 years ago to be considered for eligibility. Properties completed fewer than 50 years before evaluation must be proven to be "exceptionally important" (criteria consideration G) to be considered for listing.

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location,

design, setting, materials, workmanship, feeling, and association. To be eligible for NRHP listing, a historic property must possess integrity and meet at least one of the criteria for significance:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of persons significant in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded, or may be likely to yield, information important in prehistory or history.

Effects on historic properties under Section 106 of the NHPA are defined in the assessment of adverse effects in 36 CFR Sections 800.5(a)(1) as follows:

> An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be further removed in distance or be cumulative.

Adverse effects on historic properties are clearly defined and include the following (36 CFR 800.5(2)):

(i) Physical destruction of or damage to all or part of the property;

(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR Part 68) and applicable guidelines;

(iii) Removal of the property from its historic location;

(iv) Change of the character of the property's use or of physical features within the property's setting that contributes to its historic significance;

(v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;

(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

To comply with Section 106 of the NHPA, the criteria of adverse effect are applied to historic properties that exist in the area of potential effects (APE), pursuant to 36 CFR Section 800.5(a)(1). If no historic properties are identified in the APE, a finding of "no historic properties affected" is made for a project. If there are historic properties in the APE, application of the criteria of adverse effect will result in project-related findings of either "no adverse effect" or "adverse effect," as described above. A finding of no adverse effect may be appropriate when the undertaking's effects do not meet the thresholds in criteria of adverse effect under 36 CFR Section 800.5(a)(1), in certain cases when the undertaking is modified to avoid or lessen effects, or if conditions were imposed to ensure review of rehabilitation plans for conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties (codified in 36 CFR Part 68).

If adverse effects findings were expected to result from a project, mitigation is required, as feasible, and resolution of those adverse effects by consultation may occur to avoid, minimize, or mitigate adverse effects on historic properties, pursuant to 36 CFR Section 800.6(a).

State

The Hawai'i Register of Historic Places (Hawai'i Register) is an official list of properties recognized for their significance to the history, architecture, archaeology, or culture of communities throughout Hawai'i. Buildings, structures, sites, districts, and objects over 50 years old are eligible for nomination to the Hawai'i Register. Private residential and commercial properties listed on the Hawai'i Register are eligible for county property tax benefits and access to grant funding. The Hawai'i Register is not comprehensive, but rather intended to represent the variety of significant historic properties throughout Hawai'i.

§6E-3 Historic preservation program

Hawai'i's Historic Preservation Division is ensconced within the Department of Land and Natural Resources and charged with administrating a comprehensive historic preservation program under the NHPA as amended, when applicable, and:

(1) Development of an on-going program of historical, architectural, and archaeological research and development, including surveys, excavations, scientific recording, interpretation, and publications on the State's historical and cultural resources.

(2) Acquisition of historic or cultural properties, real or personal, in fee or in any lesser interest, by gift, purchase, condemnation, devise, bequest, land exchange, or other means; preservation, restoration, administration, or transference of the property; and the charging of reasonable admissions to that property.

(3) Development of a statewide survey and inventory to identify and document historic properties, aviation artifacts, and burial sites, including all those owned by the State and the counties.

(4) Preparation of information for the Hawai'i Register of Historic Places and listing on the National Register of Historic Places.

(5) Preparation, review, and revisions of a state historic preservation plan, including budget requirements and land use recommendations.

(6) Application for and receipt of gifts, grants, technical assistance, and other funding from public and private sources for the purposes of this chapter.

(7) Provision of technical and financial assistance to the counties and public and private agencies involved in historic preservation activities.

(8) Coordination of activities of the counties in accordance with the state plan for historic preservation.

(9) Stimulation of public interest in historic preservation, including the development and implementation of interpretive programs for historic properties listed on or eligible for the Hawai'i Register of Historic Places.

(10) Coordination of the evaluation and management of burial sites as provided in section 6E–43.

(11) Acquisition of burial sites in fee or in any lesser interest, by gift, purchase, condemnation, devise, bequest, land exchange, or other means, to be held in trust.

(12) Submittal of an annual report to the governor and legislature detailing the accomplishments of the year and recommendations for changes in the state plan or future programs relating to historic preservation, and an accounting of all income, expenditures, and the fund balance of the Hawai'i historic preservation special fund.

(13) Regulation of archaeological activities throughout the State.

(14) Employment of sufficient professional and technical staff for the purposes of this chapter without regard to chapters 76 and 77.

(15) The charging of fees to at least partially defray the costs of administering sections 6E-3(13), 6E-8, and 6E-42 of this chapter.

(16) Adoption of rules in accordance with chapter 91, necessary to carry out the purposes of this chapter.

(17) Development and adoption, in consultation with the Office of Hawaiian Affairs native historic preservation council, of rules governing permits for access by native Hawaiians and Hawai'i and to cultural, historic, and pre-contact sites and monuments.

(L 1976, c 104, pt of §2; am L 1987, c 330, §1; am L 1989, c 324, §2; am L 1990, c 306, §5; am L 1991, c 108, §2; am L 1993, c 323, §2; am L 1996, c 97 §4; am L 1997, c 207, §1; am L 1998, c 311, §1.)

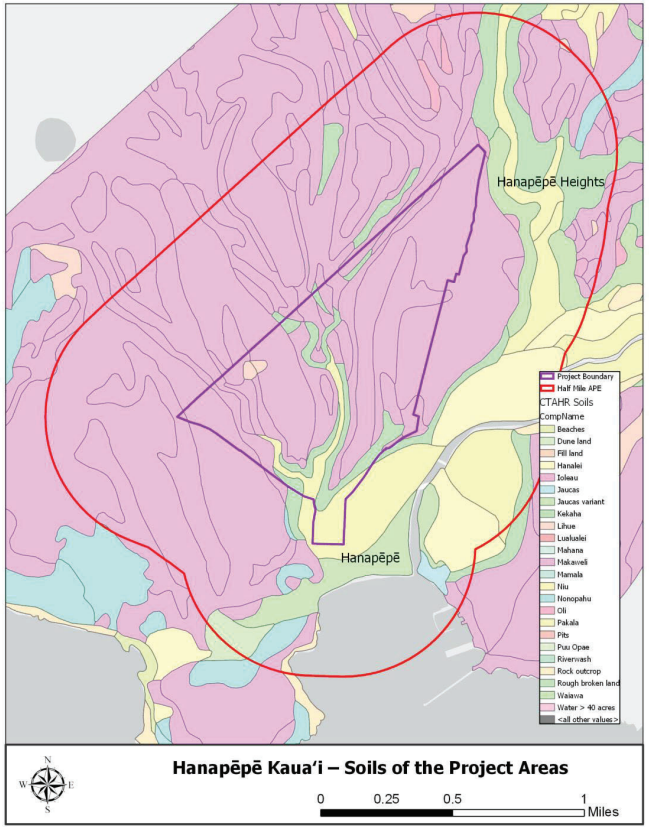
INTENTIONALLY LEFT BLANK

2 ENVIRONMENTAL SETTING

The proposed project will take place at Hanapēpē, Kaua'i, Hawai'i, 96716, Hanapēpē Ahupua'a, Waimea Moku, Island of Kaua'i. The Hawaiian archipelago consists of volcanic high mountain-islands formed by tectonic activity beginning roughly 11.3 ma to the present. The Island of Kaua'i was likely formed by the collapse of a single shield volcano roughly 5.5 million of years ago, that has since heavily eroded, sunk, and been partially inundated by the sea. Hanapēpē Bay is the mouth of a former valley. The project areas flank and perhaps are also on top of, fragments of the collapsed shield volcano, as well as younger tectonic geology (Blay and Siemens 2013:52, 53, 61). Kaua'i and Ni'ihau are the two leeward islands of the Hawaiian chain.

The two subject properties constituting the project areas are in leeward, semi-coastal, arid locations. Cane grass, as well as other unidentified trees, grasses and cacti, populate the 359-acre subject property that is also veined by ancient gorges. The remaining 6 acres are located on a flat, developed lot in a mixed residential-commercial neighborhood where vegetation consists primarily of ornamental landscaping on private and commercial property. Both project areas are predominated by the deep-red Makaweli soil series endemic to coastal Kaua'i from Waimea to Hanapēpē, and punctuated by pukas (depressions) of rough, broken land (Figure 3). The larger subject property slopes drastically towards the sea while the other lies roughly at sea level. The majority of the project areas sit between 10 and 33 feet above sea level on a 6–12% slope. The rest of the landscape sits at sea level or is characterized by a 40–70% slope. Hanapēpē has a tropical savannah climate with light rainfall most months of the year. The mean annual temperature is 74 degrees Fahrenheit with mean annual precipitation averaging 27 inches (UHM 2014).

Figure 3. Hanapēpē Kaua'i – Soils of the Project Areas



3 BACKGROUND RESEARCH

3.1 Traditional and Early Post-Contact Eras to the Late 18th Century

Kaua'i Kuapapa (ancient Kaua'i) and Hanapēpē Ahupua'a hosted a rich trajectory of initial human settlement and use unique throughout the Hawaiian Islands. Kaua'i Kuapapa was likely settled sometime after the 11th century C.E. by waves of Polynesian Seafarers from the Marquesas and Tahiti (Bayman and Dye 2013; Cozad 2008: 7). Legends and oral histories state Kaua'i experienced famine and drought less frequently than the other islands, and served as a refuge for those fleeing violence, war and violation of kapu (Joesting 1984: 111). Known as Kaua'i Malie (peaceful Kaua'i), the island and was never conquered in warfare during traditional times (Cozad 2008: 7-8; Joesting 1984:1).

Hanapēpē is translated as "crushed bay", and may be derived from Hanapēpēhi "killing bay" (Cozad 2008: 21; Pukui et al. 1974 : 41; Wichman 1998:30). Traditional land divisions and boundaries changed through time; Hanapēpē Ahupua'a was initially part of Kona Moku, then Waimea. It encompasses the Hanapēpē River system that winds through numerous canyons and valleys before terminating at Hanapēpē Bay. Plentiful freshwater flowing through an array of terrains and elevations ensured Hanapēpē's natural resources were plentiful and variegated. Hauli'i Valley was renowned for its kava. Bird catching was practiced throughout the valley (see summary of accounts in Winieski et al. 1996: 23-24). Salt was harvested from ancient salt pans (Figure 4) pockmarking the coast, and there were surf breaks off Hanapēpē's shores (Finney and Houston 1966).

Figure 4. Undated photograph of Traditional Salt Pans in Hanapēpē

On the basis of archaeological, linguistic and botanical evidence, as well as oral history, Handy and Handy suggest Hanapēpē, as well as canyonlands throughout Kaua'i hosted rare inland populations and settlements. They argue people within them subsisted primarily on kalo yields from dryland lo'i flanking rivers and streams and interacted rarely with the sea (Handy and Handy 1972: 266-268; 396, 397).

Eleven heiau are associated with Hanapēpē Ahupua'a. Francis Gay (1875) situates three temple complexes in the valley:

- Maloku – a small heiau on top of Kahalau land
- Kauakahiunu – a small heiau proximal to Kailiili
- Name unknown – located at West Paleilei, beneath Peapea Peak

Thrum (1907) recorded seven heiau complexes in Hanapēpē Ahupua'a:

- Nihoana – a small, low-walled heiau that was destroyed
- Makole – a small heiau with a platform and walls located on Makole Bluff that was destroyed in the 1860s, although walls might remain
- Pualu – a walled, paved pookanaka heiau dedicated to Kane in disrepair
- Name unknown – Dedicated to Kaumualii and destroyed in roughly 1865
- Kuwiliwili – a large, high walled pookanaka heiau in Hanapēpē
- Kauakahinunu – a coastal heiau at Puolo Point dedicated to Kane and Kanaloa, with walls still standing
- Moloku – an open platform heiau in decent condition near the intersection of Kuopoo and Kahalau ridges

Beckwith (1970: 53) mentions one heiau in the ahupua'a:

- Kuikahi – a heiau near Manawaiopuna Stream

Hanapēpē Ahupua'a is replete with wahi pana (legendary places) and oral history. In a rare occurrence, maka'āinana (common people) purportedly disposed of an unreasonable, obsessive high chief by throwing him off Holo iwi (traveling bones) Cliff. Hanapēpē Ahupua'a hosts several leina 'o ka 'uhane - leaping places associated with the transit of the dead into pō, the "place of the dead", or afterlife (Beckwith 1970:154, 155; Fornander 1999:5:575; Wichman 1998:29). In 1999, Hanapēpē resident Ms. Holi identified Pūolu Point as one such location.

3.2 Early Historical Era: The Late 18th Century Through the 1830s

In 1778, Captain James Cook and the crew of *The Discovery* arrived at the mouth of the Waimea River, roughly 6 miles northwest of the project areas. James Ellis, the surgeon's mate on board, sketched Kaua'i Island's south shore (Figure 5; Kaua'i Museum 2017; Ellis in Josting 1984:64). Cook's arrival opened Kaua'i and the islands to successive eras of foreign incursion, invited settlement and colonization.

Figure 5. James Ellis' 1778 sketch of Kaua'i Island's Shouth Shore

Kamehameha I unified the major Hawaiian Islands in 1795 and solidified his rule in 1810 with the political conquest of King Kaumuali'i, and therefore Kaua'i and Ni'ihau (Joesting 1984: 54, 70). After the death of Kamehameha I, changes unfolding throughout the Hawaiian Kingdom drastically altered Hanapēpē.

From the 1810s through the 1830s, the arrival of European and American missionaries, foreign diseases and establishment of the sandalwood and whaling trades shifted the population demographics, usage and economy of Hanapēpē, including the subject parcel (Cozad 2008:21, 29; I'i, 1959:87-89). Kaua'i Ali'i controlled the sandalwood trade and enlisted the maka'āinana to physically transport it from inland to the port at Waimea (Joesting 1984: 92). From 1815-1817, the Russian trader and emissary Georg Scheffer engaged in commerce and efforts to establish a Russian colony on Kaua'i. Through alliance with King Kaumuali'i, Scheffer was granted land holdings throughout the island, including the 'ili of Kuiloa in Hanapēpē, though he was ultimately driven from the islands by Americans allied to King Kamehameha (Kaua'i Museum 2017).

On April 4, 1820, George Prince Kaumuali'i, son of King Kaumuali'i, returned to Kaua'i with missionaries sent by the American Board of Commissioners for Foreign Missions, who then

established themselves in Koloa. A decade previously, George Prince Kaumuali'i's father entrusted a sea captain with funds to transport his 5 to 6 year-old son to the northeastern United States and secure him a Western education. After enrolling him in school briefly, the sea captain relinquished charge of the child to a schoolteacher named Cotton. King Kaumuali'i's attempts to locate his son and inquire after his welfare went unanswered. As a young man, George Kaumuali'i took numerous jobs and fought as a marine with the U.S. Navy in the war of 1812 before attending a mission school and returning to the islands (Kaua'i Museum 2017; Joesting 1984:82-83).

In 1824, a series of skirmishes and battles occurred throughout the Hanapēpē Ahupua'a and neighboring landscapes between factions of Kaua'i Ali'i and the forces of the O'ahu-based Liholiho (Kamehameha II) their family and retainers. In August 1824, a battle between forces loyal to Kaua'i Ali'i led by George Kaumualii and King Kamehameha occurred on the 'Ele'ele Plains of the Hanapēpē Ahupua'a, east of the project area. Armed with traditional weapons, the army of the Kaua'i Ali'i's were overwhelmed by the cannons and rifles of King Kamehameha II's forces. Slaughter of the local community ensued. First-hand accounts state the majority of victims were women and children whose bodies were left where they fell (Cozad 2008:21; Joesting 1984:107-109).

The 1824 conflicts resulted in the re-districting and redistribution of land throughout Kaua'i, including the project area. An influx of settlers from throughout the Hawaiian Islands were awarded land in Hanapēpē and surrounds (Joesting 1985: 1).

Located between the capital city of Waimea and busy port city of Koloa, Hanapēpē town and the lands adjacent, likely including the project areas, were home to Hawaiian kalo (taro) and Chinese rice farmers, sugar and pineapple plantation workers of a variety of nationalities from 1830 onwards.

3.3 The Constitutional Monarchy of Hawai'i and the Great Māhele: 1840s–1850s

Promulgated by Kauikeaouli (King Kamehameha III), two constitutions drafted in 1840 and 1852 transformed the Hawaiian Kingdom into a constitutional monarchy and established systems of governance, representation and law throughout the archipelago. From the maka'ainana to the Ali'i, many laws focused on distributing land and power to the Hawaiian people. Their intention was to provide a degree of landed security and autonomy against the threats of disease, increasing foreign incursion into the island, social, political and religious tumult and the conquest of island nations elsewhere in the Pacific by the Europeans and Americans (Van Dyke 2003:30,31).

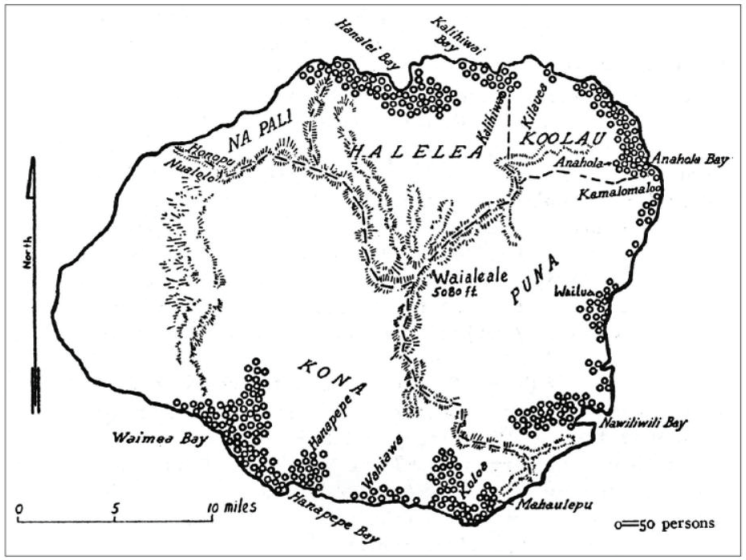
The Great Māhale (literally, "division") was a complex, sweeping series of land acts and reforms enacted between 1840 and 1856. It upended the traditional Native Hawaiian system of collective land utilization based on agricultural yield and complex social hierarchies and introduced concepts of land commodification and ownership to the Hawaiian Islands (Van Dyke 2003:1,11).

Three key actions and acts are pertinent to the background context of this archaeological assessment. In 1846, a Land Commission operational through 1855 was created to review and grant Native Hawaiian land claims (Van Dyke 2003: 33–34). On July 10, 1850, the Alien Land Ownership Act granted private land ownership rights to foreigners. The December 1850 Kuleana Act encouraged maka'ainana to file claim with the Land Commission for the 'Āina they were presently using plus 0.25 additional acres for a house lot. However, concepts of and paths to land ownership were unknown/unclear to maka'ainana, the majority of whom did not file claims (Van Dyke 2003:46).

During the Great Māhele, social and political upheaval heavily influenced formal land tenureship in Hanapēpē. Following his victory in the Kaua'i rebellion, King Kamehameha III incorporated the entire ahupua'a into his private land holdings. Numerous Land Commission Awards (LCAs) were also granted to *Ali'i* related to or associated with King Kamehameha III. Additionally, maka'āinana from throughout the islands were granted LCAs that enabled their settlement of Hanapēpē. Dudek conducted a review of LCAs for 359 acres in TMK (4) 1-8-007:003 and 6 acres in TMKs (4) 1-8-009:035, 081, 086 and 087 using Avakonohiki's online Land Commissions Awards Index and Search (Avakonohiki) and the Kipuka Database (Office of Hawaiian Affairs) to determine Victoria Kamamalu was granted a Land Commission Award (LCA) for the entire Makaweli Ahupua'a (LCA 7713:1) in 1861 that included the larger project area. Kamamalu's LCA contained 19 additional, unlocated kuleana (OHA). Notably, LCAS 3654 and 9059:1 were granted to Kamae and included Kukamahu Gulch, Kuwiliwili Heiau and a fishing shelter. No LCAs are associated with the smaller project area.

A plentitude of mid-19th century accounts describe the fertile kalo fields, inland settlements and population of Hanapēpē. In 1847, Reverand Bingham situated an inland settlement of 140 cottages and seven hundred inhabitants farming kalo in Hanapēpē Valley. An 1853 map of Kaua'i population estimates (Figure 6) counts roughly 1,400 people in the Hanapēpē Ahupua'a (Coultier 1971: 16). A description of Hanapēpē Valley from the same year describes its plantations, dwellings and coconut and taro patches (Coulter 1971: 15). In an 1864 letter, Norwegian settler and ally of King Kamehameha III Valdemer Knudson describes Hanapēpē as replete with fallow kalo and rice fields, and states hula is still being practiced despite missionary bans.

Figure 6. Map Depicting Kaua'i's Population, 1853



Whaling, trade and commerce flourished between 1830 and 1861 in cities and settlements along Kaua'i's southwest coast (Joesting 1984: 170). Rice farming became established on Kaua'i between the 1850s–1860s and persisted through the 1960s. Economic prosperity and proximity to the ports led to bars and opium dens and later pool halls proliferating in Hanapēpē town (Cozad 2008:29).

The expansive growth of the sugar cane and pineapple industries throughout the archipelago transformed settlement and land use in Hanapēpē. The sugar industry in the Hawaiian Islands

began on Kaua'i; from 1835 through 1985, drastically altering the landscape, economy and settlement patterns across the island and on the project areas (Cozad 2008: 29).

In 1865, Elizabeth McHutcheson Sinclair, a wealthy Scottish emigrant to the islands via numerous booming economic frontiers around the Pacific Rim, purchased the land between the Hanapēpē and Waimea Rivers. Sinclair's purchase is referenced as the Makaweli Ahupua'a, but by description and in maps through the early 20th century, appears to have included the project areas in adjacent Hanapēpē Ahupua'a (Joesting 1984: 193). Sinclair partnered with her sons-in-law Francis Gay and Aubrey Robinson to form the Gay and Robinson partnership, purchased the lands adjoining theirs in Hanapēpē, and owned the entirety of the Kona District by 1873 (Joesting 1984: 190-199). Gay and Robinson and the Hawaiian Sugar Company plantations, as well as a ranch, resulted on Makaweli and Hanapēpē lands.

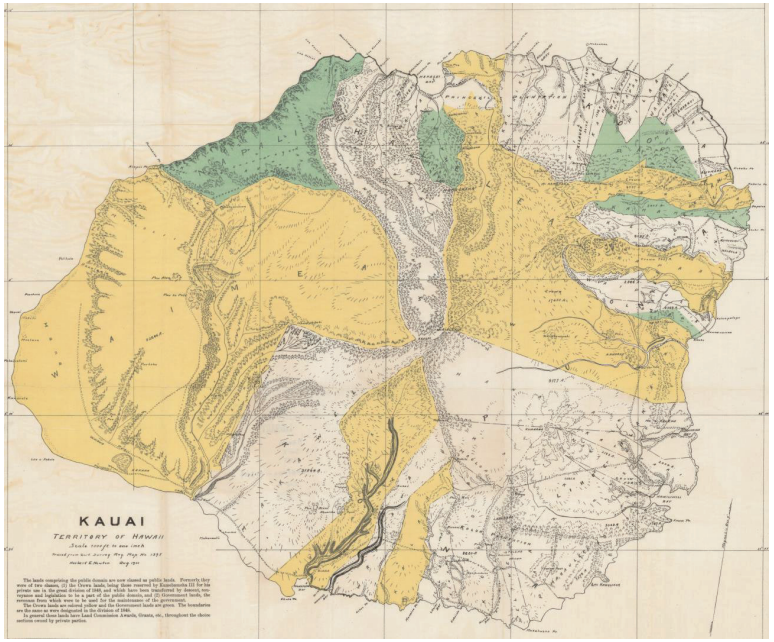
A photograph taken in Hanapēpē town in the mid-to-late 1880s (Figure 7) shows houseplots with structures and gardens flanking a muddy thoroughfare. Rice paddies are found throughout the lowland coastal zone. The smaller project area appears as a wooded tract of land, whereas the southerly portions of the larger project area appear vacant and vegetated.

Figure 7. Hanapēpē Town, Mid- to Late 1880s.

3.4 Hanapēpē from the Late 19th Century to the Present

A 1901 map of Kaua'i (Figure 8; Newton 1901) classifies Hanapēpē and the project areas as former Crown Lands initially reserved exclusively for use by Kamehameha III that transitioned into public domain before being classed as "Public Lands".

Figure 8. Map of Kaua'i, 1901



A 1903 map of Kaua'i (Figure 9; Newton and Wall 1903) prepared for the Governor's Annual Report shows depicts Hanapēpē and the project areas as "Public Lands". The project areas also appear as part of the Gay and Robinson Makaweli Plantation.

Figure 9. Map of Kaua'i, 1903

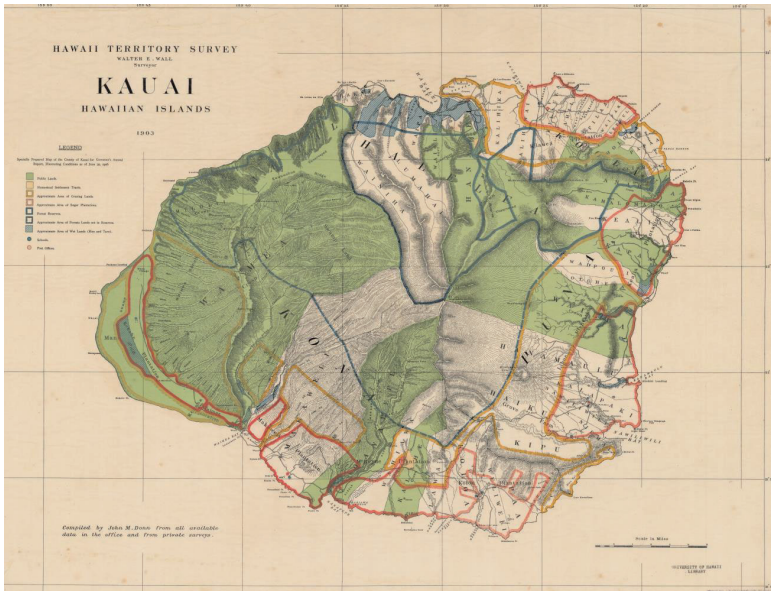


Figure 10. Hanapēpē Valley, 1930s

A photograph of Hanapēpē Valley taken in the 1930s from the bluff above shows a landscape under heavy agricultural cultivation (Cozad 2008: 24).

In 1941, C. Brewer Co. leased land from Gay and Robinson and established the Olokele Sugar Company, which operated until 1994 before being reabsorbed into the Gay and Robinson family holdings. Gay and Robinson is the last of three sugar plantations in the Hawaiian Islands and the last family-owned plantation (Joesting 1984: 219, 220). A photograph of Hanapēpē Town in the 1940s (Figure 11), looking towards the ocean, shows the bluff comprising the southern portion of the larger project area vegetated and devoid of development. The same photograph provides an overview of the already-developed smaller project area.

Figure 11. Hanapēpē Town, 1940s

During the 1950s and 1960s, numerous LCAs consisting of vacant land tracts located in the Hanapēpē Heights neighborhood directly adjacent to the larger project area were granted (Table 1). Photographs of Hanapēpē (Figures 12 and 13) feature vantages of the settlement east of the project areas, during the same timeframe.

Table 1. LCAs Granted in the Hanapēpē Heights Neighborhood During the 1950s

LCA #	Claimant	TMK
13192	Daniel Gonsalves Peters, Sr., and Fannie Kawaimakalehua Ellis Peters	418008999
8652	Edward K. Watase	418008999
8071	Kiyoshi Kimata	418008999
13263	Koichi Kujima Kanna	418008999
13165	Masaji Obuchi and Hatsuyo Suzurikakawa Obuchi	418008999
13202	Mitsuo Nozaki	418008999
13169	Shigeo Nakao	418008999
10481	Yasue Enoki	418008999
11313	Yasue Enoki	418008999
11804	Yasue Enoki	418008999
12283	Yasue Enoki	418008999
13430	Ayako Nishimura Nakatsuka	418007017
8672	John I. Silva	418007017
10984	Masayuki Shimonishi	418007017
11695	Masayuki Shimonishi	418007017
11995	Ayako Nishimura Nakatsuka	418009999
13430	Ayako Nishimura Nakatsuka	418009999
12458	Hifumi Kawahara and Hatsuko F. Kawahara	418009999
12189	Isidro Cabugon Buduan	418009999
12077	Kenzo Watase	418009999
11861	Louis Ganansa Silva	418009999
12771	Masaichi Saito and Shigeo Saito	418009999
13542	Norman Stanley Cabral and Satsuki Fujii Cabral	418009999

Table 1. LCAs Granted in the Hanapēpē Heights Neighborhood During the 1950s

LCA #	Claimant	TMK
12689	Sadao Tsuneta and Haruyo T. Tsuneta	418009999
12792	Stanley Luke Seto	418009999
12965	Thomas Cayetano Mortera and Gertrude Asignar Mortera	418009999
12094	Tsukasa Murakami and Yukie Kawakami Murakami	418009999
11799	Wah Git Dang and Amy Chuck Dang	418009999
13525	William Takashi Kanekiyo and Frances Fujie Fanamura Kanekiyo	418009999
12491	Yasuo Nishikawa and Ayame Onzuka Nishikawa	418009999
11937	Yoshiyuki Ogata	418009999
11995	Ayako Nishimura Nakatsuka	418009016
11995	Ayako Nishimura Nakatsuka	418009999
13430	Ayako Nishimura Nakatsuka	418009999
12458	Hifumi Kawahara and Hatsuko F. Kawahara	418009999
12189	Isidro Cabugon Buduan	418009999
12077	Kenzo Watase	418009999
11861	Louis Ganansa	418009999
12771	Masaichi Saito and Shigeo Saito	418009999
13542	Norman Stanley Cabral and Satsuki Fujii Cabral	418009999
12689	Sadao Tsuneta and Haruyo T. Tsuneta	418009999
12792	Stanley Luke Seto	418009999
12965	Thomas Cayetano Mortera and Gertrude Asignar Mortera	418009999
12094	Tsukasa Murakami and Yukie Kawakami Murakami	418009999
11799	Wah Git Dang and Amy Chuck Dang	418009999
13525	William Tasaki Kanekiyo and Frances Fujie Funamura Kanekiyo	418009999
12491	Yasuo Nishikawa and Ayame Onzuka Nishikawa	418009999
11937	Yoshiyuki Ogata	418009999
12925	Jaime Balauro Basquez and Apolonia Funtanilia Basquez	N/A
12925	Jaime Balauro Basquez and Apolonia Funtanilia Basquez	418009034

Table 1. LCAs Granted in the Hanapēpē Heights Neighborhood During the 1950s

LCA #	Claimant	TMK
12771	Masaichi Saito and Shigeo Saito	N/A
12925	Jaime Balauro Basquez and Apolonia Funtanilia Basquez	418009020
12771	Masaichi Saito and Shigeo Saito	418009020
13366	John Simao and Dorothy Kona Simao	418009020
12491	Yasuo Nishikawa and Ayame Onzuka Nishikawa	418009020
13366	John Simao and Dorothy Kona Simao	N/A
13366	John Simao and Dorothy Kona Simao	418009036
13366	John Simao and Dorothy Kona Simao	418009019
12771	Masaichi Saito and Shigeo Saito	418009019

Figure 12. Hanapēpē Town, 1950s

Figure 13. Hanapēpē Town, 1960s

In addition to the literature review described above, Dudek also reviewed pertinent online records from pertinent agencies and entities for additional information concerning historical development of the subject properties through the present:

- County of Kaua'i Property Record Search. On March 20, 2019, Dudek staff reviewed all available property information on the Kaua'i County Assessor's website. The review included details relating to owner and parcel information, commercial improvements, sales information, and of all available permit information. Dudek also reviewed the online parcel map to assess adjacent parcels within the indirect APE. The 359-acre subject property lists Hawaiian Home Lands as the Fee Owner of the subject property, currently tax-classified as agricultural land. The same website lists the State of Hawai'i as the owner of the subject property, also tax classified-as agricultural, with the County of Kaua'i as lessee. No additional permits were associated with either project area.
- Historic Properties Located Within the Project Direct and Indirect APE. Searching the NRHP and Historic Hawai'i Foundation's online databases located one NRHP and Hawai'i Register listed property within 0.5 miles of the direct APE: Hanapēpē Town Lot #18, a pool hall constructed in 1926 (National Register of Historic Places; Historic Hawai'i Foundation).

- Aerial Photograph and Historic Topographical Map Review. A review of historic and modern aerial photographs and topographical map from the National Environmental Title Research, LLC (NETR) was conducted as part of archival research for the project. Aerials from 1950 and 1981 were available for the subject properties, as were topographic maps from 1965, 1971, 1984, 1985, 1998, 2013 and 2017. The 1950 aerial depicts the 359-acre project area as subdivided into fields under heavy mechanized agricultural cultivation, and the 6-acre land tract as hosting multiple buildings. Topographic maps from 1965 and 1971 depict the 359-acre subject property as vacant land and the 6-acre subject property as the location of one building. In a 1981 aerial photo, the larger project area appears subdivided into fields and under heavy agricultural cultivation and the smaller project area as developed and hosting structures. The NETR topographic maps available between 1984 and 2017 show the 359-acre subject property remained undeveloped, and a suite of buildings and features difficult to distinguish for an exact count on the 6-acre land parcel.

3.5 Previous Archaeological Background Information

On November 29, 2018, with the assistance of Helen Wong Smith, Librarian/Archivist for the SHPD, Dudek Archaeological Technician Tiffany Brown conducted an in-person search for records pertaining to the subject property. The SHPD library is located in Kapolei, O'ahu, Hawai'i, and houses cultural resources records for the Hawaiian Islands. Ms. Brown's search revealed 16 resources on file related to the subject property. Previous archaeological studies conducted within the direct and indirect project APEs, as well as their results, are mapped in Figures 14 and 15, summarized in Table 2, and discussed below.

Figure 14. Previous Archaeological Studies Conducted Within the Direct and Indirect Project APEs

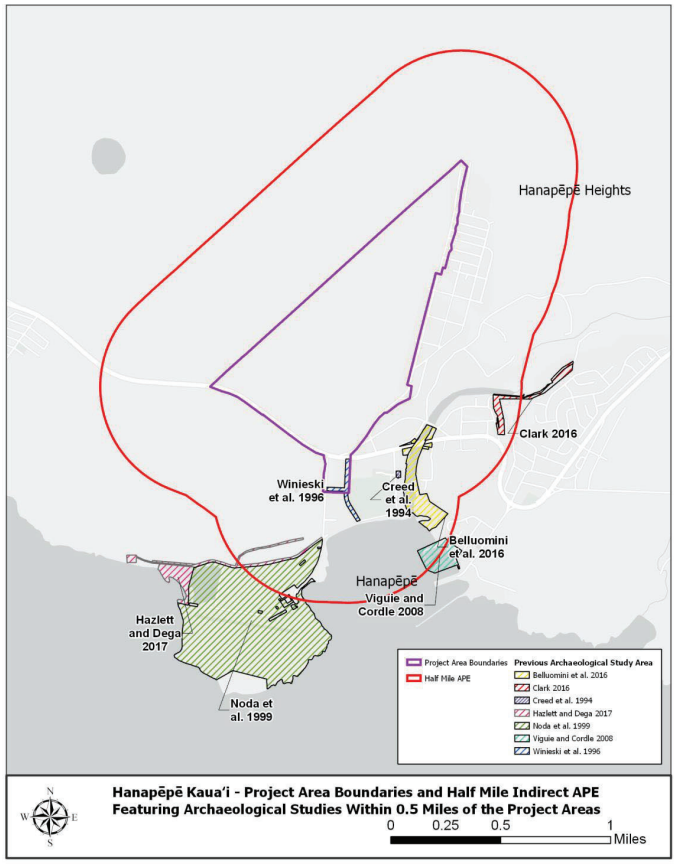


Figure 15. Hanapēpē Kaua'i – Project Area Boundaries and Half Mile Indirect APE Featuring State Inventory of Historic Places-Listed Archaeological Sites

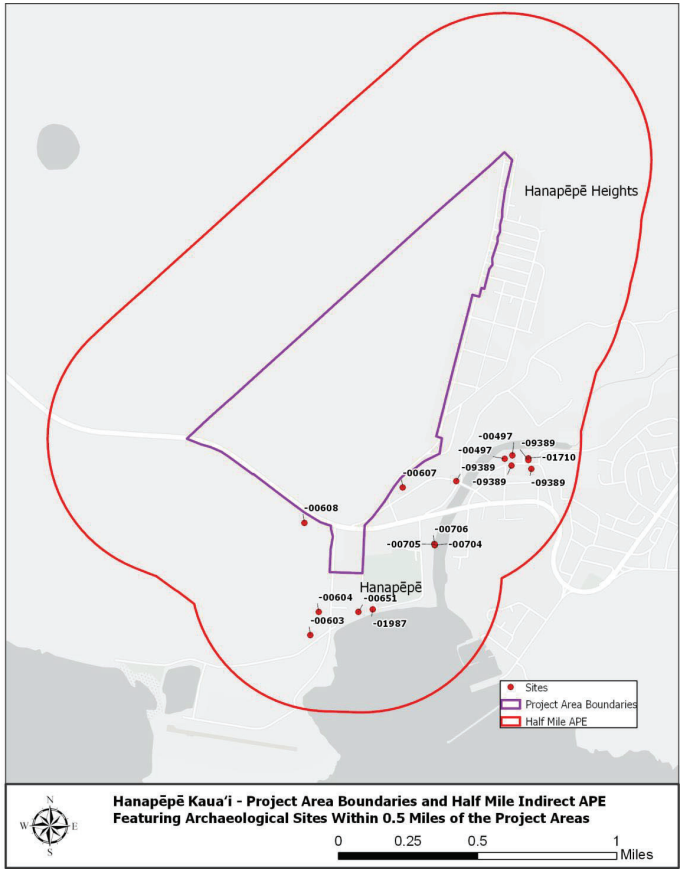


Table 2. Archaeological Resource Investigations and Technical Reports within the Project Direct and Indirect APEs

Reference	Study/Resource Type	Location	Results
Kikuchi 1963	Archaeological Inventory Survey and	Southern coast of Kaua'i from the bay of Hanapēpē to the southeastern shore of Maha'ulepu	Numerous archaeological sites and features reported: Historic burials noted throughout caves in Hanapēpē Valley; Akowai Heiau in Hanapēpē Valley; Salt Pan Beach Park; multiple heiaus; Salt Pan harvesting areas; House sites on Pu'olu Point; rock shelters, house sites, shrines, canoe shed walls, enclosures, rock formations, middens and multiple petroglyph sites along the coast
Creed et al. 1994	Archaeological Inventory Survey	TMK (4) 1-9-10:2 and 3	Two human burials, State Inventory of Historic Places (SIHP) Site #s 50-30-09-704 and 705, and a cultural deposit, State Site 50-30-09-706
Winieski et al. 1996	Archaeological Monitoring Report	TMK (4) 1-8-08:45	One primary coffin burial, SIHP Site # 50-30-09-1987, additional scattered/fragmented human burials
Noda et al. 1999	Environmental Assessment	TMK (4) 1-8-08:04, 33, 80, 83, 85	Reconfirmed existence of previously recorded archaeological sites. Noted no new sites.
Viguie and Cordle 2008	Archaeological Monitoring Report	TMK (4) 2-1-03:010	One historic railroad junction feature, SIHP Site #50-30-09-585
Donham 2010	Chapter 6E-8 Historic Preservation Review	TMK (4)-1-8-008:020 and :038	No historic properties affected

Table 2. Archaeological Resource Investigations and Technical Reports within the Project Direct and Indirect APEs

Reference	Study/Resource Type	Location	Results
Donham 2011a	NHPA Section 106 Consultation	(4) 1-7-006:004	Community consultation and visual impacts mitigation requested
Donham 2011b	National Historic Preservation Act (NHPA) Section 106 Consultation	TMK (3) 2-4-057:001	With proper mitigation, no adverse effect on historic properties
Donham 2014a	Chapter 6E-8 Historic Preservation Review	TMKs (4) 1-8-008:020 (portion)	Additional information requested
Donham 2014b	Chapter 6E-8 Historic Preservation Review and NHPA Section 106 Consultation	TMK (4) 1-4-004:003; 1-9-009:006-009; 1-9-010:003; 4-1-009:054; 4-1-011:016, 020 and 4-5-008:009, 012	No historic properties affected (TMKs (4) 1-6-005:003, (4) 4-1-009:054 and (4) 1-011:016 and 020) Archaeological Inventory Survey (TMKs (4) 1-9-009:006, 007,008 and 009) Burial Treatment Plan and Archaeological Monitoring Plan (TMK (4) 1-9-010:003) Archaeological Inventory Survey Report (TMKs (4) 4-5-008:009 and 012, 4-5-011:007)
Kamai and Hammatt 2014	Final Archaeological Monitoring Plan	TMK (4) Zone 1	Potential for significant sub-surface cultural deposits and pre-Contact human burials requires on-site archaeological monitoring near previously-identified historic properties

Table 2. Archaeological Resource Investigations and Technical Reports within the Project Direct and Indirect APEs

Reference	Study/Resource Type	Location	Results
Clark 2016	Emergency Archaeological Monitoring Plan	TMKs (4) 1-9-003:001, 002, 003 & 004	Archaeological monitoring plan for vegetation clearing rock scaling, post hole excavations, surface survey of cleared areas and documentation of existing historic properties
Belluomini et al. 2016	Final Archaeological Inventory Survey Report	TMK (4) 1-9-007:001 (por.), Hanapēpē River, 013 (por.), 020 (por.) and 034 (por.) and 1-9-010:014 (por.), 015 (por.), 046 (por.) and 050 (por.) Kaumuali'i Highway and Iona Road Rights-of-Way	SIHP Site #s 50-30-09-2280, the Hanapēpē River Bridge; 50-30-09-2281, a historic wall; 50-30-09-2282, a basalt retaining wall; 50-30-09-2283 a large earthen and piled basalt stone berm; Sites-2280 and -2283 NRHP eligible
Belluomini et al. 2017	Mitigation Plan	TMKs: [4] 1-9-007, [4] 1-9-010, [4] 2-7-001, [4]-4-6-014, [4]-4-7-003, and [4] 4-7-008	Precautionary archaeological monitoring for all ground disturbance related to the Hanapēpē River Bridge replacement project; Historic American Engineering Record documentation and interpretive signage developed and installed for the Hanapēpē River Bridge; Best management practices employed in order to preserve the historic integrity of the Hanapēpē River Bridge and earthen/basalt berm

Table 2. Archaeological Resource Investigations and Technical Reports within the Project Direct and Indirect APEs

Reference	Study/Resource Type	Location	Results
Hazlett and Dega 2017	Final Archaeological Assessment	TMK (4) 1-8-008: Portions of 016, 036, 043, 044	No cultural deposits or archaeology identified; monitoring requested by the SHPD

In 1963, Kikuchi (Kikuchi 1963) conducted an archaeological survey and test excavations focused on locating sites, determining the extent of vandalism, and assessing the archaeological potential of the Waimea District. The study was sponsored by the University of Hawaii Committee for the Preservation and Study of Hawaiian Language, Art, and Culture. It supplemented and corrected findings from a 1961 coastal survey from Hanapēpē Bay to the southeastern shore of Maha'ulepu filed with the Bishop Museum that could not be located. The 1963 fieldwork focused on Waimea District coastal zones, waterways, and valleys. Fieldwork extended inland to an indeterminate extent that may or may not have included part or all of the project area. Kikuchi noted no heritage in the project area, but confirmed seven sites and site clusters proximal to the coasts and waterways of Hanapēpē Ahupua'a. Those sites included 1) An unspecified number (possibly four, possibly more) of heavily vandalized burial caves and associated stone walls in Hanapēpē Valley; 2) Platforms, walls, a paved area, and house sites associated with Akowai Heiau, relocated from an old map belonging to Alexander and Baldwin; 3) A vandalized subsurface cultural deposit at Salt Pan Beach Park, actively being eroded by natural forces as well (Kikuchi and his team recovered bird, pig, and shell midden from the site and noted 20–30 fishhooks were previously recovered from the site); 4) A coastal fishing shelter and associated midden deposit; 5) A monument marker called "Ka-wiliwili" above "Ke-ana-kua" Point demarcating "Ku-wiliwili" Heiau, said to be a po'okanaka heiau; 6) A salt pan used by local families to procure salt in traditional through modern times; and 7) House sites and walls at Pu'ulo Point.

In 1994, Cultural Surveys Hawai'i conducted a subsurface archaeological subsurface inventory survey of a Hanapēpē house plot outside and southeast of the 359-acre project area and east of the 6-acre project area, on the west bank of the Hanapēpē River (Creed et al. 1994). During backhoe trenching, a discontinuous cultural deposit (State Site # 50-30-09-706) radiocarbon dated to the historic period and two human burials (State Site #s 50-30-09-704 and 50-30-09-705) were discovered. The human burials were left *in situ*, reburied and their locations denoted on the ground surface. Given the house plot owner's unknown future plans, archaeological

monitoring and additional protective measures in the event of ground surface disturbance were recommended.

In 1996, Cultural Surveys Hawai'i performed archaeological monitoring for the Hanapēpē Drainage Improvement Project – the only archaeological study that occurred within the direct APE (Winieski et al. 1996). Work occurred south of the 359-acre project area, on a linear strip of land above a subsurface drainage pipe extending from Kaumualii Highway to Hanapēpē Bay in a land tract that included the eastern boundary of the smaller project area. One historic-era coffin burial (State Site # 50-30-09-1987) as well as additional scattered/fragmented human burials. Archaeological monitoring for future ground disturbance was recommended given the history of human burial discoveries in the area.

In 1997, International Archaeological Research Institute Inc. (IARII) conducted an archaeological inventory survey included in Noda and Associates 1999 Environmental Assessment (Noda and Associates 1999). IARII's original report was not included in the documentation or available during Dudek's SHPD research trip. As stated by Noda and Associates, previously noted archaeological—House Sites (State Site #50-30-09-50), Kauakahiunu Heiau (State Site #50-30-09-51), the House or Fishing Site (State Site #50-30-09-52)—could not be relocated, perhaps due to recent hurricanes and storms; no new archaeological or historic sites were reported. Prohibiting development in sandy areas was recommended due to the high likelihood of encountering human burials. The Environmental Assessment Reviewee, the Director of Transportation, determined the project would have no significant environmental effect, including to cultural resources.

In 2008, an archaeological monitoring report produced by Scientific Consultant Services summarized results from "spot check" archaeological monitoring activities in support of septic system improvements roughly 0.5 miles southeast of the 359-acre project area and 0.5 miles east of the 6-acre project area, on the eastern shores of Hanapēpē Bay (Viguie and Cordle 2008). Excavations encountered State Site # 50-30-09-585, historic plantation-era railroad infrastructure. Archaeological monitoring was recommended for all future work due to prolific sand deposits in the area.

In 2010, Theresa Donham, Acting State Historic Preservation Archaeology Branch Chief, conducted a Chapter 6E-8 Historic Preservation Review for the County of Kaua'i Planning Department for subdivision followed by consolidation of the Kaua'i Veteran's Cemetery (Donham 2010. The cemetery sits south of both project areas, northwest and inland of Hanapēpē Bay. Citing high disturbance from grading visible from aerial photos and intensive,

well-documented sugar cane farming, Donham returned a determination of no historic properties affected.

In 2011, Theresa Donham, Acting State Historic Preservation Archaeology Branch Chief, conducted an NHPA Section 106 review of documentation from Earth Touch, Inc., for construction of new antenna support structures by/for the use of Federal Communications Commission (FCC; Donham 2011a; Donham 2011b). The supporting documentation was not included with the letters on file at the SHPD and available to Dudek. Proximity to the Olokele Sugar Company mill and plantation led Donham to initially requested community consultation and visual impacts mitigation (Donham 2011a), before ultimately determining the antenna collocation would have no adverse effects on historic properties and could proceed (2011b).

In 2016, Pacific Consulting Services, Inc., submitted an Emergency Archaeological Monitoring Plan in support of the Ko Road Rockfall Project roughly 0.5 miles east of the 359-acre project area and 1.5 northeast of the 6-acre project area (Clark 2016). Archaeological monitoring of vegetation clearing and redocumentation of historic sites including rock walls, an old survey marker and potential Native Hawaiian burial cave were proposed.

In 2016, Belluomini et al. submitted a final archaeological inventory survey report for the Hanapēpē River Bridge Replacement project southeast of the 359-acre project area and east-northeast of the 6-acre project area (Belluomini et al. 2016). The study identified four historic properties, SIHP Site #s 50-30-09-2280, the Hanapēpē River Bridge; 50-30-09-2281, a historic wall; 50-30-09-2282, a basalt retaining wall; 50-30-09-2283 a large earthen and piled basalt stone berm. Mitigation recommendations for NRHP-eligible Sites -2280 and -2283 included Historic American Building Survey/Historic American Engineering Record/Historic American Landscape NPS consultation and architectural recordation, interpretive signage developed in consultation with the SHPD, best management practices exercised when removing a portion of the NRHP-eligible berm as well as avoidance and proper protection of historic properties adjacent to the APE. Precautionary archaeological monitoring undertaken with community consultation was requested by the project proponent.

In 2017, Belluomini et al. authored a mitigation plan for the Hanapēpē Bridge replacement project, southeast and northeast of the project areas. Precautionary archaeological monitoring for all ground disturbance related to the Hanapēpē River Bridge replacement project, Historic American Engineering Record documentation and interpretive signage developed and installed for the Hanapēpē River Bridge, and best management practices employed in order to preserve the historic integrity of the Hanapēpē River Bridge and earthen/basalt berm were recommended.

In 2017, Scientific Consultant Services performed an archaeological assessment in support of utilities installation by the County of Kaua'i Department of Public Works at the Salt Pond Beach Park. The assessment occurred south-southwest of the project areas, following Salt Pond Road from Salt Pond Beach Park to Hanapēpē town (Hazlett and Dega 2017). No cultural deposits or new archaeology was noted. The SHPD recommended monitoring ground disturbance associated with the project due to the project area's proximity to Salt Pond Beach Park (State Site #50-30-09-03038) and proximal sandy, subsurface deposits likely to contain cultural materials.

4 FIELDWORK

Preliminary project fieldwork consisting of stakeholder outreach and a site visit were conducted in December 2018. On December 13, 2018, Dudek Principal Investigator and Archaeologist Rachel Hoerman, PhD, attended a stakeholder outreach meeting for the project at the Hanapēpē town library convened by SSFM International and the Department of Hawaiian Homelands. Other members of the project team were also present. The purpose of the stakeholder outreach meeting was to familiarize community members with the project, introduce the project team, and provide a forum for conversation, questions and feedback. During and after the meeting, community members informed Dr. Hoerman of sinkholes and burial caves purportedly located in the larger project area. They also provided the names and phone numbers of reputed elders with cultural/lineal ties to Hanapēpē who might be able to provide additional information regarding archaeology contained in the project areas; however, multiple attempts to connect with the individuals were unsuccessful.

Dr. Hoerman conducted a site visit to the project areas alongside other members of the project team on December 14, 2018. The larger project area is densely vegetated and fenced with limited access along the east side only, via access points and gates in the Hanapēpē Heights neighborhood. The smaller project area is a heavily paved and developed land parcel sitting at sea level near Hanapēpē Bay.

Although recommended (see next section), an archaeological inventory survey (AIS) was not part of the scope of work for this project.

INTENTIONALLY LEFT BLANK

5 FINDINGS AND RECOMMENDATIONS

No archaeological features or deposits within the project areas were noted during background research of the subject parcel. Nor were archaeological features or deposits observed during the preliminary site visit, though extremely dense, tall vegetation obscures the majority of the larger land parcel. Ranching and extensive mechanized agricultural activities have taken place on the larger project area for over 150 years, and the smaller project area has undergone at least one century of development.

Based on the fact that one archaeological study has partially, definitively occurred in the project areas (it is indeterminate whether Kikuchi's 1963 pedestrian inventory survey of coastal Kaua'i covered any, part or all of the project areas), Dudek determines an AIS of the subject properties is necessary. The AIS should be developed in coordination with the DLNR-SHPD and undertaken in full compliance with Hawai'i Administrative Rules 13-275, 13-276 and all additional applicable heritage legislation. AIS results should determine whether heritage is present in the project areas, and if so, verify its location and extent, evaluate its significance and plan for its avoidance/conservation/management in consideration of the proposed project. Special attention should be given to sinkholes and caves present on the larger subject property – they may contain cultural materials/heritage destroyed or cleared from the rest of the landscape by extensive, sustained, ranching and sugar cane farming activities.

INTENTIONALLY LEFT BLANK

SOURCES CONSULTED

Avakonohiki. 2019. "LCA Search". Retrieved from Avakonohiki on 03/10/19 from http://www.avakonohiki.org/lca-index--search.html.

Bayman, J. and Dye, T.S. 2013. *Hawai'i's Past in a World of Pacific Islands* (SAA Contemporary Perspectives). Washington D.C. Society for American Archaeology.

Beckwith, M. 1970. *Hawaiian Mythology*. University of Hawai'i Press, Honolulu.

Belluomini, S.A. and H. Hammatt, Ph.D. *Final Mitigation Plan for the Federal Highway Administration/Central Federal Lands Highway Division (FHWA/CFLHD) Contract DTFH68-13-R-00027 on Kaua'i, for the Bridge 7E, Hanapēpē River Bridge, and Kapa'a Stream Bridge Replacement Projects TMKs: [4] 1-9-007, [4] 1-9-010, [4] 2-7-001, [4]-4-6-014, [4]-4-7-003, and [4] 4-7-008 (various parcels).* Prepared for CH2M Hill on behalf of the Federal Highway Administration (FHWA) Central Federal Lands Highway Division (CFLHD) by Cultural Surveys Hawai'i.

Belluomini, S.A., T. Yucha and H. Hammatt, Ph.D. *Archaeological Inventory Survey Report for the Federal Highway Administration/Central Federal Lands Highway Division (FHWA/CFLHD) Contract DTFH68-13-R-00027 on Kaua'i, for the Bridge 7E, Hanapēpē River Bridge, and Kapa'a Stream Bridge Replacement Projects TMKs: [4] 1-9-007, [4] 1-9-010, [4] 2-7-001, [4]-4-6-014, [4]-4-7-003, and [4] 4-7-008 (various parcels).* Prepared for CH2M Hill on behalf of the Federal Highway Administration (FHWA) Central Federal Lands Highway Division (CFLHD) by Cultural Surveys Hawai'i.

Blay, C. and R. Siemers. 2013. *Kauai's Geologic History: A Simplified Overview*. Hagadone, Honolulu.

Bushnell, O.A. 1993 *The Gifts of Civilization: Germs and Genocide in Hawai'i*. Honolulu: University of Hawai'i Press.

Clark, S. 2016. *Final Emergency Archaeological Monitoring Plan in Support of the Ko Road Rockfall Project, Hanapēpē Ahupua'a, Kona District, Kaua'i Island TMKs (4) 1-9-003:001, 002, 003 & 004.* Prepared for Hi-Tech Rockfall Construction, Inc., by Pacific Consulting Services, Inc.

Cozad, S. 2008. *Kauai*. Arcadia Publishing, Charleston. - -
2011. *Kauai: 100 Years in Postcards.* Arcadia Publishing, Charleston.

Coulter, J.W. 1971. *Population and Utilization of Land and Sea in Hawaii*, 1853. Bishop Museum Bulletin 88, Bernice Pauahi Bishop Museum, Honolulu.

County of Kaua'i. 2019. "Real Property Tax Search." Accessed on 4/8/2019 from http://www.qpublic.net/hi/kauai/.

Creed, V., PhD, W. Folk and H. Hammatt, PhD. 1994. *Archaeological Inventory Survey of a Houseplot at Hanapēpē, Kauai.* Prepared for State of Hawaii Department of Land and Natural Resources by Cultural Surveys Hawaii.

Department of Land and Natural Resources State Historic Preservation Division (DLNR-SHPD). 2019. "Administrative Rules, Department of Land and Natural Resources, Hawai'i Administrative Rules, Title 13." Retrieved on 03/08/2019 from http://dlnr.hawaii.gov/rules/.

Donn, J.M. and W. E. Wall. 1903. "Kauai, Hawaiian Islands. Compiled, from all available data in the office and also from private surveys by John M. Donn." Retrieved on 03/01/19 from http://evols.library.manoa.hawaii.edu/handle/10524/49269 on 03/01/19.

Finney, B. and J. Houston. 1966. *Surfing: The Sport of Hawaiian Kings*. Charles E. Tuttle Company, Rutlidge, Vermont.

Fornander, A. 1916–1919. *Collection of Hawaiian Antiquities and Folk-Lore*. Bishop Museum Press, Honolulu.

Gay, F. 1873. Kaua'i Place Names in Laauokala, Mahininauli, and Ukula Plus Old Kamaainas in Hanapepe Plus Punalau and Kaawanui (Place names copied from old books). Copies by Mary Pukui from 1873 Francis Gay Papers, Makaweli Place Names, Bishop Museum Library, Honolulu.

Handy, E.S. Craighill and E.G. Handy. 1972. *Native planters in old Hawaii: their life, lore, and environment*. Bishop Museum Press, Honolulu.

Hazlett, A. PhD, and M. Dega, PhD. 2017. *Archaeological Assessment for the Salt Pond Beach Park Effluent Disposal System, Hanapepe Ahupua'a, Kona District, Island of Kaua'i [TMK: (4) 1-8-008: Portions of 016, 036, 043, 044]*. Prepared for: Mr. Andrew Keane, OCEANIT on behalf of the County of Kaua'i Department of Public Works (CoKDPW) by Scientific Consultant Services, Inc.

Historic Hawai'i Foundation. 2019. "Kauai Historic Places". Retrevied on 3/8/2019 from https://historichawaii.org/historic-properties/kauai-historic-properties/.

Joesting, E. 1984. *Kauai: The Separate Kingdom*. University of Hawaii Press and Kauai Museum Associated, Limited.

Ī'ī, John Papa 1959 *Fragments of Hawaiian History, as Recorded by John Papa Ī'ī*. Bishop Museum Press, Honolulu.

Kaua'i Museum. 2017. *The Life and Legacy of Kaumuali'i, The Last Ali'i Ai Moku of Kaua'i and Ni'ihau and his son Humehume*. Kaua'i Museum Publication.

Kennedy, J. 1995. *Monitoring Plan for Puolo Road, TMK: 1-08-08:03. Hanapepe, Waimea, Kauai.* Prepared for Mr. Steve Oliver, County Engineer, by Archaeological Consultants of the Pacific, Inc.

Kikuchi, W. 1963. *Archaeological Survey and Excavations on the Island of Kauai, Kona District, Hawaiian Islands*. Sponsored by University of Hawaii Committee for the Preservation and Study of Hawaiian Language, Art, and Culture.

National Park Service (NPS). 2002. How to Apply the National Register Criteria. Retrieved on 3/01/19 from https://www.nps.gov/nr/publications/bulletins/nrb15/.

National Historic Preservation Act of 1966, as amended through December 26, 2016 and Codified in Title 54 of the United States Code. S. Bill 3035, 89th Cong. (1966). Retrieved on 03/01/19 from the Advisory Council on Historic Properties from https://www.achp.gov/sites/default/files/2018-06/nhpa.pdf.

National Environmental Title Research, LLC (NETR). 2019. Historic Aerials. Retrieved on 3/8/2019 from https://www.historicaerials.com/.

Newton, H. 1901. "Map of Kauai, Territory of Hawaii. Traced from Gov't Survey Reg. Map No. 1395. Herbert E. Newton. Aug. 1901." Retrieved on 3/01/19 from http://evols.library.manoa.hawaii.edu/handle/10524/49273.

Noda and Associates. 1999. *Final Environmental Assessment Port Allen Airport TMK 1-8-08:4, 33, 80, 83, 85 State Project No. AK2010-01*. Prepared for State of Hawaii Department of Transportation Airports Division by Edward K. Noda and Associates.

Office of Hawaiian Affairs (OHA). "Land Awards". Retrieved on 3/12/19 from http://kipukadatabase.com/kipuka/#view5.

Pukui, M., S. Elbert and E. Mookini. 1974. *Place Names of Hawaii.* University of Hawaii Press. Honolulu.

Thrum, T. 1907. Heiaus and Heiau Sites Throughout the Hawaiian Islands, Kaua'i. *Hawaiian Almanac and Annual for 1907*. Thos. G. Thrum, Honolulu.

University of Hawai'i at Mānoa (UHM) 2014 "Hawai'i Soil Atlas." Accessed on March 8, 2019 from http://gis.ctahr.hawaii.edu/SoilAtlas.

Van Dyke, J. 2008. *Who Owns the Crown Lands of Hawai'i?* University of Hawaii Press, Honolulu.

Viguie, J.D., Ph.D., and S. Cordle. 2008. *An Archaeological Monitoring Report for Sewage Improvements at Port Allen Small Boat Harbor Ele'ele and Hanapēpē Ahupua'a, East Kona District, Kaua'i Island, Hawai'i [TMK 2-1-03:010]*. Prepared for Engineering Solutions, Inc., by Scientific Consultant Services, Inc.

Wichman, F. 1998. *Kaua'i: Ancient Place-Names and Their Stories.* University of Hawaii Press. Honolulu.

Winieski, J., V. Creed, PhD, and H. Hammatt, PhD. 1996. *Archaeological Monitoring of the Hanapēpē Drainage Improvement Project, Hanapēpē, Waimea, Kaua'i (TMK 1-8-08:45).* Prepared for State of Hawaii Finance, Housing, and Development Corporation by Cultural Surveys Hawaii.

Appendix D – Cultural Impact Assessment

A Cultural Impact Assessment for the Department of Hawaiian Home Lands, Hanapēpē

(Re-Dacted Draft for review)

Hanapēpē Ahupuaʻa
Kona Moku, Kauaʻi Mokupuni

TMKs (4) 1-8-007:003, 1-8-008:035, 081, 086 & 087

Dominique Leu Cordy, MA
Devin Kamealoha Forrest, MA
Lilia Merrin, MA
Leimomi Wheeler, BS

Prepared for: SSFM
Prepared by: Nohopapa Hawaiʻi December 2019

Table of Contents

Table of Contents ii
List of Figures v
List of Tables vi
Introduction & Methods 7
Scope of Work 7
Methods 11
Ethnohistorical Research and Review 11
Community Ethnographic Interviews 12
Data Gathering 13
Scoping and Interviewee Selection Criteria: 13
Data Integration 14
Ethics 14
Study Area 15
Geology & Soils 18
Historic Era 21
Māhele of 1848 22
Kō (Sugar) and the mauka DHHL ʻĀpana 25
Timeline of Sugar in Hanapēpē 25
Hawaii Sugar Company's Makaweli Plantation (1889-1941) 26
Plantation Ditches 26
The Hanapēpē Massacre 27
Hanapēpē Plantation Dump Site 27
Military and the Air Field 29
Education –Schools in Hanapēpē 29
Cultural Traditions 31
ʻŌlelo Noʻeau 31
Nā Oli a me nā Mele 31
E Ola Mau ʻO Pūʻolo 32
[Insert Mele] 33
Nūpepa Hawaiʻi 33
Palapala ʻĀina 34
Community Voices 48
Acknowledgements 50
Kuʻulei Santos 50

Chad Shimmelfennig 50
Summary 51
Nā Inoa ʻĀina o Hanapēpē - Place Names of Hanapēpē 53
Cultural Beliefs, Practices, & Resources Identified 56
Wai 56
Mai uka i kai 56
Water flow 57
Emerging wai 58
Religious places and practices tied to wai ..... **Error! Bookmark not defined.**
Paʻakai 58
The origins of paʻakai: Wai Maka o Kia 59
ʻŌlelo Noʻeau on paʻakai: 60
Makani 61
Mauka - Makai Connections 62
Continuing Hawaiian Cultural Education 63
Cultural Resources – Kamaʻāina and ʻOhana 64
Natural Resources and Practices 65
Marine Resources and Practices ..... **Error! Bookmark not defined.**
Study Recommendations 66
Other notes of interest: ..... **Error! Bookmark not defined.**
References Cited 70
Appendix A: Nūpepa Sources 75
Appendix B: Certificate of Boundaries, No. 17, Hanapēpē 78
Appendix C: Guidelines For Assessing Cultural Impacts 81
Introduction 81
Background 81
Cultural Impact Assessment Methodology 82
Cultural Impact Assessment Contents 84
Appendix D: Community Contact Letter 85
APPENDIX E: Interview Questions 86
Background Information: 86
Mo ʻolelo, Place Names, Mele: 86
Cultural and historic sites: 86
Historical Information: 86
Resources: 86
Cultural Practices (gathering, hula, protocol, hoʻokupu): 87

Hunting & Fishing Practices: 87
Knowledge Sources: 87
Community / Individual Concerns: 87
Community / Individual Recommendations: 87
References: 87
Appendix F: Informed Consent Form 88
Appendix G: Bill for Environmental Impact Statements 89
Appendix H: Act 50 91
Appendix I: Interview Transcripts and/or Summaries 92

List of Figures

Figure 1. Introduction to Project Area, Kaua;i Island, Moku of Kona, Ahupuaʻa of Hanapēpē, Department of Hawaiian Homeland parcels. 8

Figure 2. Kauaʻi TMK Plat 1-8-07A showing the study area. 9

Figure 3. Kauaʻi TMK Plat 1-8-08A showing southern, makai, parcel of study area. 10

Figure 4. USGS map showing Hanapēpē Ahupuaʻa and the study area. 16

Figure 5. Aerial Imagery (Microsoft Bing Maps) showing Hanapēpē Ahupuaʻa and the study area. 17

Figure 6. From USGS Bulletin 13 (1960, p18), Geology by Stearns, MacDonald, Davis & Cox, 1934-54. Study are location added in blue. 18

Figure 7. Map showing the soil types and distribution in and around the project area..... 20

Figure 8. Map showing Mahele Land Commission Awards and Crown lands in and around the study area. 24

Figure 9. Portion of Hawaiʻi State Register Map 2144, 'The Makaweli Plantation of the Hawaiian Sugar Company'. This map dates to circa1901. Ditches, kahawai and plantation railways are highlighted. 28

Figure 10. Portion of RM2246, the 1891 map by H. E. Newton showing the study area, including place names 37

Figure 11. Portion of RM2144, the 1901 map by Arthur C. Alexander showing the study area. .. 38

Figure 12. Portion of RM2615, the map by F. W. Thrum, traced in 1918 by P. E. Arioli, showing a portion of the study area. 39

Figure 13. Portion of RM2657, the map compiled from Government Survey Records by J. Iao in 1919, showing a portion of the study area. 40

Figure 14. . Portion of RM2701, the map by A. S. Chaney, in 1923, showing the study area. 41

Figure 15. Is taken from p.98 of Bishop Museum Bulletin 80 (Bennett 1931) 46

Figure 16. Map showing the stream gulches of the Hanapēpē DHHL parcels, their muli (feeders), and their traditional names. 54

Figure 17. Map of traditional Hawaiian wahi, in and around project area, compiled from historic maps and archival sources. 55

List of Tables

Table 1. Hi State 2018 TMK parcels making up the study area. 15

Table 2. Soil Symbols Key and descriptions (see Figures 5 & 6). Table data taken from Foote et al, 1972. 19

Table 3. Some population data specific to Hanapēpē 21

Table 4. Table of maps depictiong Study Area. 35

Table 5. Wahi inoa, place names, within the Study Area 42

Table 6. Wahi inoa, place names, in immediate vicinity of the Study Area 42

Table 7. Wahi inoa, place names, in the vicinity of project area – wahi that are connected by gulch, plateau, direct watershed, etc. 43

Table 8. Table of wahi kūpuna, by archaeological site number. As documented in Bishop Museum Bulletin 8, Bennett 1931, p112-14 47

Table 9. Community Participants 49

Introduction & Methods

Scope of Work

At the request of SSFM, Nohopapa Hawai‘i, LLC conducted a Cultural Impact Assessment (CIA) for the Hanapēpē Department of Hawaiian Home Lands (DHHL) parcels located in Hanapēpē ahupua‘a, Kona moku, Kaua‘i mokupuni. Nohopapa Hawai‘i, LLC has been tasked to:

2.4.Conduct a Cutlural Impact Assessment of the project area. The Cultural Impact Assessment will include: Research focusing on traditions and legends; limited historic research; resaerch of oral histories conducted within and around project area; interviews with persons/organizations knowledgable with the project area; assessment of the potential impacts of the Conceptual Plan alternatives, identification of mitigation measures for the selected alternative, if needed, and preparation of text documenting the methodology, results, and findings.[1]

The CIA includes an English and Hawaiian review of literature, historical maps, photographs, and various ethnographic interviews related to traditional cultural practices and land use. Contents of the study include:

The structure and content of this Cultural Impact Assessment is in compliance with the primary guiding documents including: *The Hawai‘i Environmental Council's Guidelines for Assessing Cultural Impacts* (Appendix A), *A Bill for Environmental Impact Statements* (Appendix B), and *Act 50* (Appendix C). This Cultural Impact Assessment meets the standards for all of these documents, and therefore is in accordance with Chapter 343, HRS.

[1] Taken from the Scope of Services > Scope of Work > 2 > 2.4

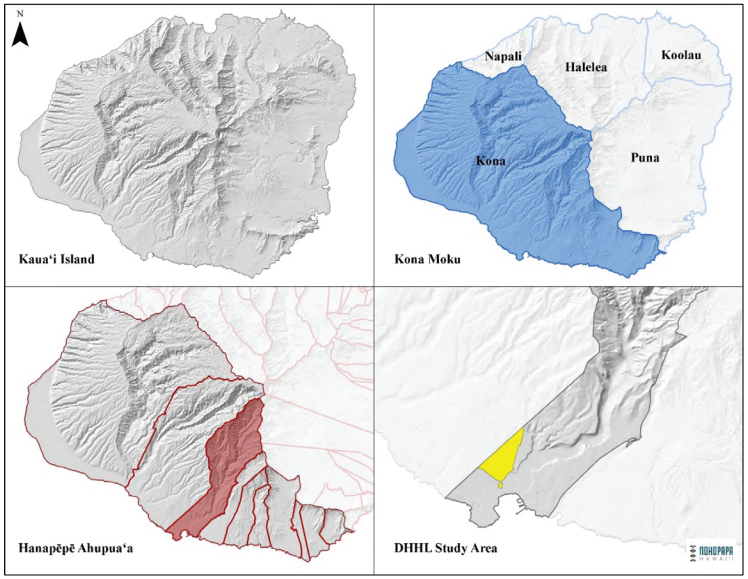


Figure 1. Introduction to Project Area, Kaua;i Island, Moku of Kona, Ahupua'a of Hanapēpē, Department of Hawaiian Homeland parcels.

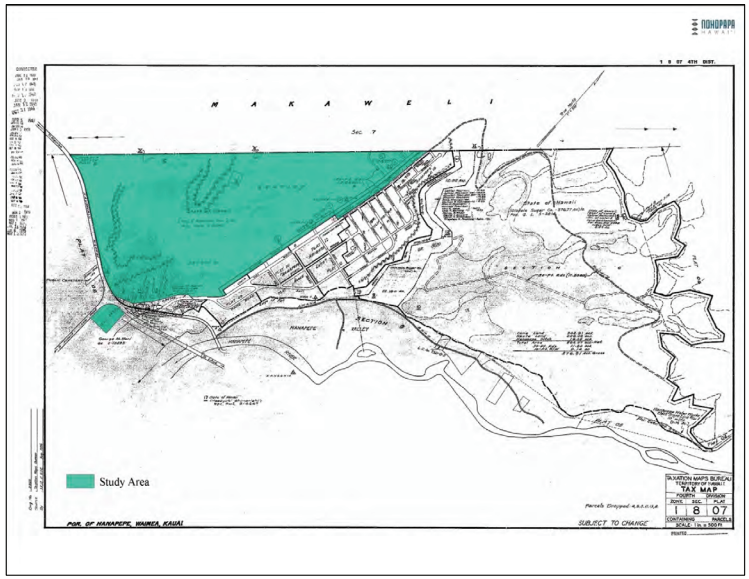


Figure 2. Kaua'i TMK Plat 1-8-07A showing the study area.

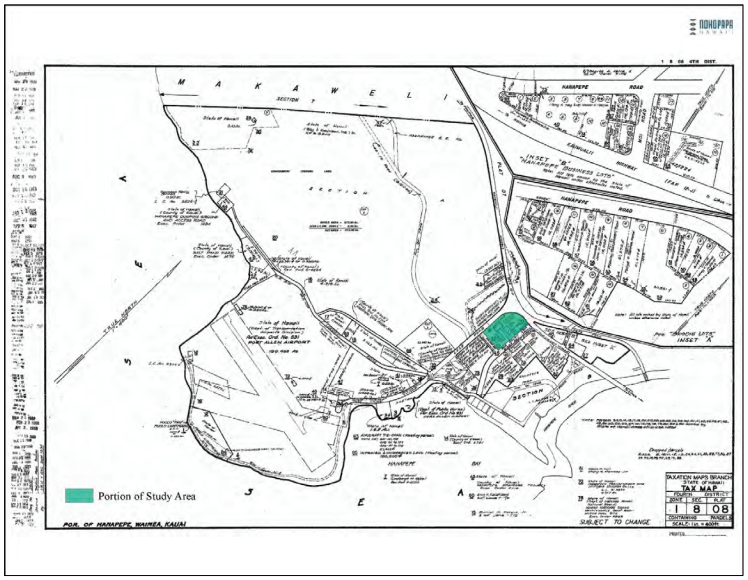


Figure 3. Kaua'i TMK Plat 1-8-08A showing southern, makai, parcel of study area.

E ʻonipaʻa i ka imi naʻauao.
Be steadfastin the seeking of knowledge.

Methods

A cultural impact assessment is not just an area specific, but a project specific, assessment of impacts to cultural resources, practices, and even beliefs within a study area. This CIA, therefore focuses specifically on the study area, casting the ʻupena wider as our research or the community guides us. This report is not nor is it intended to be a history of Hanapēpē. To the best of our ability we have kept this report relevant to the study area; incorporating larger Hanapēpē ahupuaʻa, Kona Moku, Kauaʻi Island, or even pae ʻāina mea when we found connections and relevance to the project and the study area.

This CIA consisted of two phase. Phase I) ethnohistorical research and review with initial community outreach, and Phase II) community ethnographic interviews, summaries, and recommendations; with the final report being synthesized after the completion of Phase I & II.

Project personnel included: Kelley L. Uyeoka, MA and S. Kekuewa Kikiloi, PhD, principals; and subcontractors Devin Kamealoha Forrest, MA, Dominique Leu Cordy, MA, and Lilia Merrin, MA. While conducting this study, Nohopapa Hawaiʻi's research team incorporated a set of values and beliefs to help guide our research, analysis, behavior, perspective, and overall frame of reference. The core values directing our hui included:

- **Aloha ʻāina**- to have a deep and cherished love for the land which created and sustains us
- **Haʻahaʻa**- to be humble, modest, unassuming, unobtrusive, and maintain humility
- **Hoʻomau**- to recognize, appreciate, and encourage the preservation, perpetuation, and continuity of our wahi pana and lāhui (nation)
- **ʻIke pono**- to recognize, feel, and understand righteousness, properness and goodness in all we do
- **ʻImi Naʻauao**- to seek knowledge or education; be ambitious to learn
- **Kuleana**- to view our work as both a privilege and responsibility
- **Pule**- to open the connection and communication lines to a higher source of power so that this work is intentionally guided

These values represent the underlying foundation, spirit, and structure for this study. It was our hope that by providing a frame of reference and guiding values, the teams' efforts would be better understood in the context of our being indigenous and kamaʻāina researchers genuinely believing in and practicing aloha ʻāina and aloha lāhui.

The *collection* of information was divided into two parts – ethnohistorical and ethnographic.

Ethnohistorical Research and Review

According to the State of Hawaiʻi Environmental Council's, *Guidelines for Assessing Cultural Impacts (*adopted 1997), "The legislature finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture."

It is with this in mind that the ethnohistorical research was conducted. To the best of our ability we have surveyed primary source material related to Hanapepe and the study area. Extensive Hawaiian language sources were surveyed.

It is our scholarly experience that second, third, and further-hand recounting of events, people, and stories, often lead back to a single English translation of a Hawaiian language source. Like the childrens' game telephone, this method of recounting history often changes in the telling. Unlike oral histories within a culture, the scholarly 'telephone' game comes with external agendas and perspectives, coupled with heavy missionary influences and translations from Hawaiian to English by that same missionary body, these secondary sources are often a mistelling vs a retelling or continuation of mo'olelo.

A variety of repositories and resources were examined to develop a general description of the natural, cultural, historical, and archaeological background of the study area and Hanapepe ahupuaʻa.

Information on the natural landscape of the Makaweli/Hanapepe borderlands was gathered primarily through reviewing County, State and Federal GIS data, atlases, maps, scientific reports, and reference books.

Inoa ʻāina, nūpepa, moʻolelo, mele, oli, and ʻōlelo noʻeau were compiled from Hawaiian language and English sources in books, newspapers, online databases, and archives.

Historical accounts were collected from primary and secondary documents including records, journals, newspapers, and previous reports. Historic maps and Māhele data were gathered from various, state and private collections. Including the Bernice Pauahi Bishop Museum (BPBM) Archives in Kapālama, Oʻahu and Kauaʻi Hsitoric Society (KHS) in Līhuʻe, Kauaʻi.

Archaeological information was compiled from previous archaeological reports and studies available at the State Historic Preservation Department.

Digital Archvial repositories visited include Ulu Kau, Nupepa, AVA Konohiki, Hawaii Office of Planning GIS repository, Papakilo Database, Kīpuka Database, AVA Konohiki, Punawaiola, and others.

Community Ethnographic Interviews

Ethnographic research involves gathering oral histories and conducting interviews with living communities to record and acknowledge peoples' historical connections to place as well as document the visions communities have for their wahi pana. Ethnographic work provides a "voice" for a community's history, traditions, and concerns and is used to capture and understand the indigenous viewpoint (past and present) associated with cultural places. Hawaiians have always maintained intimate relationships with their environments and by generating detailed stories about places; knowledge is passed on to future generations. In South Kohala, many kūpuna and kamaʻāina have maintained close connections to their ʻāina and have kept the stories of the landscape alive. Through our ethnographic efforts, we attempted to capture and present some of these personal histories and moʻolelo.

Ethnographic research involves an intimate connection between the ethnographer and the participant, a trusting relationship must be developed. Nohopapa ethnographers, possess a special understanding and appreciation of Hawaiʻi's history, environment, and culture that allows them to collaborate and work closely with communities in a sensitive and culturally appropriate fashion. In retrospect, the professionalism and cultural sensitivity and awareness of Nohopapa staff encourages the forging of an understanding, trusting, and genuine relationship with the community.

Data Gathering

Ethnographi work is a multi-phase study, the process consisted of identifying appropriate and knowledgeable individuals, conducting oral history interviews, summarizing the digitally recorded interviews, analyzing the oral history data, and preparing the report. The data gathering methodology utilized for this study included scoping via word of mouth sampling, semi-structured interviews, site visits, and personal observations.

Scoping and Interviewee Selection Criteria:

Scoping for this project began with contacting interested and knowledgeable individuals, organizations, and groups recognized as having genealogical, cultural, historical, or managerial connections to the project ahupuaʻa. Initial scoping methods included utilizing emails and prepared mail out letters to inform individuals of the project, contacting and following up with individuals by telephone, and/or meeting with individuals in person to discuss the project (Appendix D).

Knowledgeable consultants were selected if they met one or more of the following criteria: 1) possessed genealogical ties to the project area or vicinity; and/or 2) were considered Hawaiian cultural practitioners. Participants were selected because of their familiarity with or knowledge of the project area and its surrounding resources. A few participants explained that a number of kūpuna who were familiar with the project area had unfortunately passed away. Consequently, project staff had to rely heavily upon those resource persons who were interviewed as well as on secondary information sources such as reports, newspapers, and other written documents and materials. A number of organizations and individuals were eventually contacted, and (at this time) four community members have participated in more formal interviews.

Knowledge Sources:

During the study, project staff learned that interview participants obtained their knowledge about the project ahupuaʻa from four primary sources:

1. ʻOhana knowledge or knowledge and information passed on within the ʻohana from one generation to the next.
2. Knowledge obtained from individuals outside their ʻohana such as teachers, cultural practitioners, and kūpuna.
3. Knowledge obtained through written sources such as books, documents, newspapers, reports, and studies.
4. Knowledge gathered through personal observations and practices (such as knowledge acquired through cultural practices within the project area).

Most individuals interviewed acquired their knowledge of Hanapēpē through personal experience or from older family and community members who passed on personal, historical, and/or genealogical information about Hanapēpē. Some individuals acquired their knowledge from written sources or from other individuals outside their family. A handful of cultural practitioners obtained their knowledge about the project ahupuaʻa by spending time in the area and through first hand observation.

Ethnographic Interviews:

The study utilized semi-structured interviews because they are open ended yet follow a general

script covering a pre-determined list of topics. The interviews were conducted in a "talk story" format to allow for a more informal dialogue and free-flowing sharing. This style of interview is typically more comfortable for interview participants as it flows more naturally and does not follow a rigid structure. The interview questions were open ended which allowed for more freedom to answer but still kept the interview focused on the desired research outcomes. Information gathered during the initial phases of archival research and scoping for this project was utilized to construct the open-ended questions for the semi-structured interviews. The interview questions were derived from those primary themes identified as being crucial for obtaining a comprehensive understanding of the historical and contemporary knowledge of Hanapēpē The primary themes guiding the interviews included:

* ʻOhana and individual connections and relationships to the area
* Moʻolelo, place names, mele, oli, hula
* Past and present cultural practices and protocols
* Knowledge of natural and cultural resources
* Traditional and historic land use and ownership
* Knowledge of fishing or mauka gathering from Puolo to Puu Lani
* Concerns and suggestions regarding the DHHL phased Homestead plan
* Referrals of kūpuna and kamaʻāina who might be willing to share their cultural knowledge of the area

Data Integration

Two interview were audio recorded, and portions were then transcribed and summarized; one interview was recorded by a note taker and then transcribed and summarized. The summaries were then sent to the interviewee for review, an accuracy check, and to confirm they were comfortable with the thoughts, information, and comments being shared. A great amount of scrutiny and care was used to ensure that all of the collected data, information, and transcriptions were presented as accurately as possible. Throughout the study, project staff remained keenly aware of the critical importance of ensuring that the voices of the community were honored and respected, correctly heard, and properly conveyed.

Ethics

Throughout the study, and particularly before any type of meeting or interview, it was explicitly and carefully explained to all participants that their involvement in the study was strictly voluntary. A comprehensive and detailed informed consent process was initiated and completed, including providing ample project background information, before participation in the study was allowed. The informed consent forms (Appendix F) included all of the specific participant rights including notification that participants could choose to remain anonymous. Project background information included explaining the study focus and the purpose, significance, and importance of the study. After proper notification and discussion, some interview participants voluntarily provided verbal consent for the researchers to use their manaʻo for the study. Throughout the project period, all participants had open and regular access to the researchers. All of the interviews were scheduled and arranged for the participant's convenience, and none of the interviews or meetings was initiated until participants felt completely satisfied with the process.

Study Area

The project area for this CIA includes TMKs TMKs (4) 1-8-007:003, (4) 1-8-008:035, 081, 086 and 087, the parcels that make up the un-developed portion of the Hanapēpē Hawaiian Homelands; ahupuaʻa of Hanapēpē, moku of Kona, mokupuni of Kauaʻi. While the primary study area consists of these two ʻāpana, divided into five (5) TMK, we took a broader look uka and makai from the study area. This widening of our lens acknowledges the interconnectedness of natural and cultural landscapes on Kauaʻi; through geography, moʻolelo, oral histories, events, wahi pana the movement of people, wai, laʻau, fauna, and the overlapping of cultural practices mauka to makai and across wao.

Table 1. Hi State 2018 TMK parcels making up the study area.

HI State 2018 TMK	Mauka or Makai parcel	Acreage (TMK)
4-1-8-007:003	Mauka	346.36
4-1-8-008:035	Makai	4.92
4-1-8-008:081	Makai	0.32
4-1-8-008:086	Makai	0.34
4-1-8-008:087	Makai	0.63

The study is comprised of two discontiguous ʻāpana, made up of five TMK parcels, totaling 355-365 acres (depending on the source, GIS or HI TMKs). The mauka, and larger, parcel is located along the northern side of the Kaumualiʻi Highway on the western plateau of Hanapēpē, west of Moi Road, along its border with Makaweli. The larger parcel has been in grass for years. Some existing homesteaders along Moi road have been using the fringe area to grow gardens, fruit trees and native plants, or maintaining it for a firebreak. The makai, and smaller, ʻāpana is at the southeast (makai-Eleʻele) corner of Kaumualiʻi Highway and Lele Road, where Habitat for Humanity has its warehouse at present. (See Figures 2 and 3, previous).

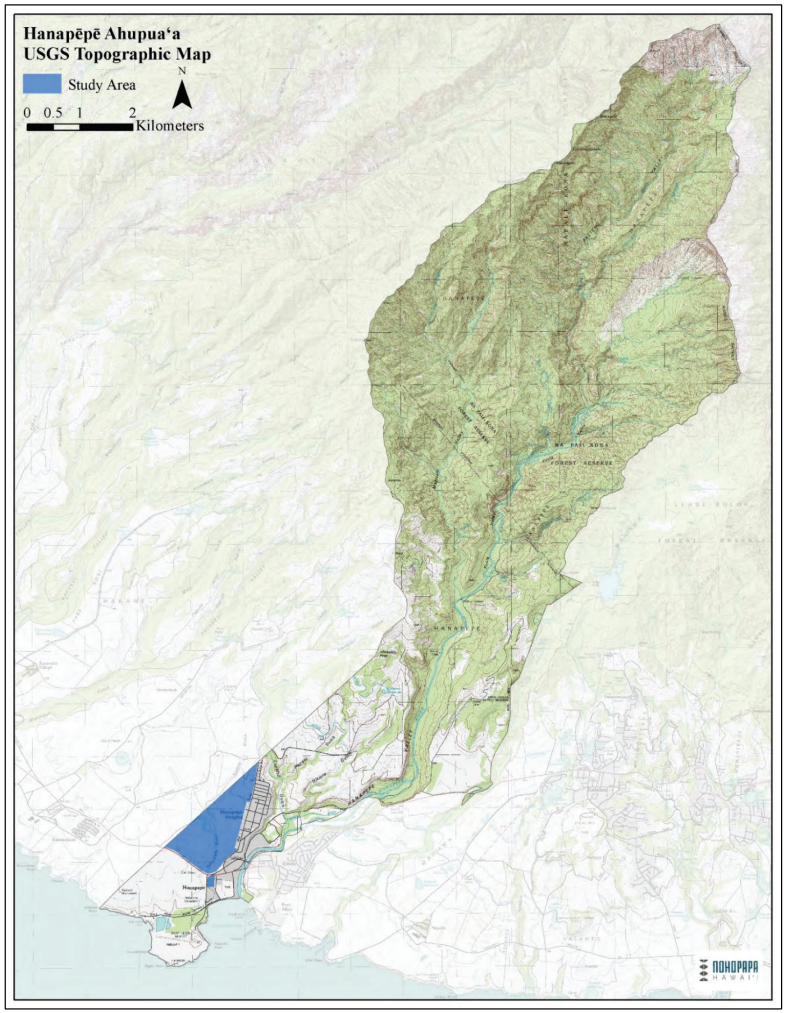


Figure 4. USGS map showing Hanapēpē Ahupuaʻa and the study area.

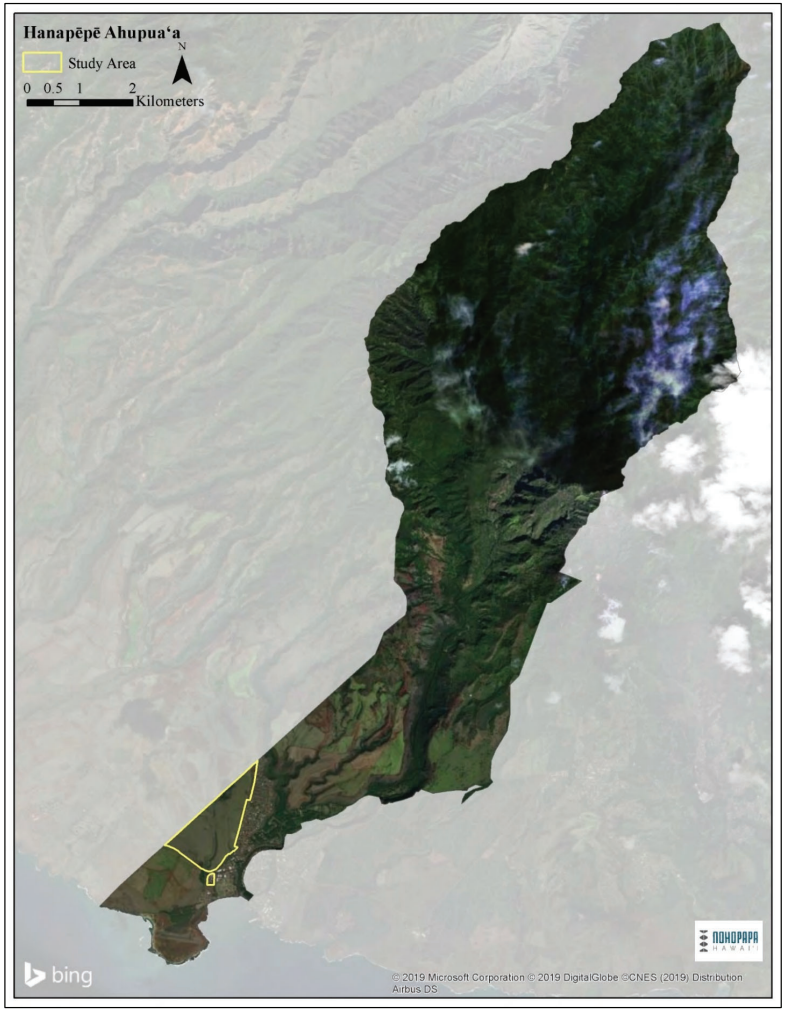


Figure 5. Aerial Imagery (Microsoft Bing Maps) showing Hanapēpē Ahupua'a and the study area.

Geology & Soils

The project area is part of the Waimea Canyon volcanic series, which formed off of the "great Kauai shield volcano" (USGS Bulletin 13, MacDonald et al 1960). The study area sits upon the western flank of Hanapēpē valley, deposited in the Pleistocene as part of the Koloa volcanic series.

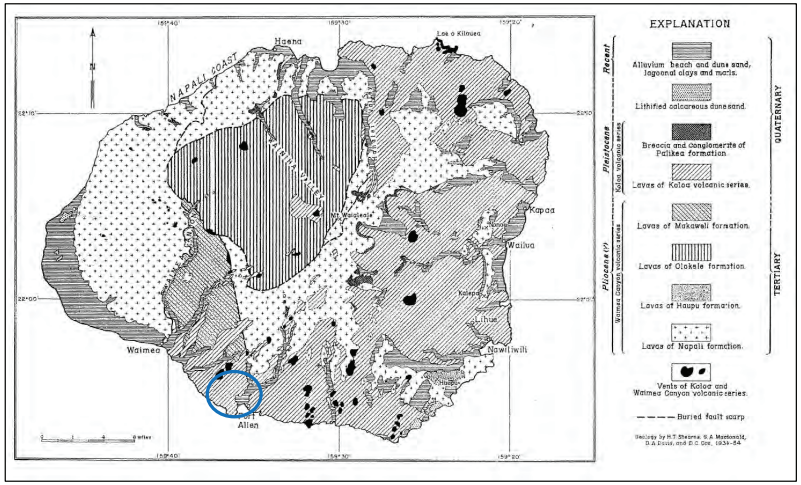


Figure 6. From USGS Bulletin 13 (1960, p18), Geology by Stearns, MacDonald, Davis & Cox, 1934-54. Study are location added in blue.

> At places where the pre-Koloa slopes were gentler, lavas of the Waimea Canyon volcanic series...are weathered to depths of a few feet or a few tens of feet, and commonly are covered with several feet of soil....in the area between Makaweli and Hanapepe Valleys, where lavas of the Koloa rest on a surface of older rocks that slopes southwestward at an average ancle of about 5°, the underlying lavas of the Waimea Canyon volcanic series are partly decomposed to a depth of 25 to 50 feet and capped by 2 to 5 feet of brownish-red soil (MacDonald et al 1960, p.54).

Three soil series (Līhu'e, Makweli and Pakala) are represented in the study area as well as areas of "rough broken land."

The Līh'ue soil series are typically upland and well-draining soils that have eroded from igneous rock (Foote et al 1972, p82). These study area soils have slow runoff with a slight erosion hazard.

The Makaweli soil series have eroded from igneous rock; these are well drained soils on the uplands (Ibid p90-91).

Elevations range from nearly sea level to 500 feet. The annual rainfall amounts to 20 35 inches. Three-fourths of it occurs from October through March. The mean annual soil termperature is 74°.

Table 2. Soil Symbols Key and descriptions (see Figures 5 & 6). Table data taken from Foote et al, 1972.[2]

MU SYM	Munsell Soil Key	description	Use
LIB	Lihue gravelly silty clay	0 to 8 percent slopes. This soil contains inronstone-gibbsite pebbles and has brighter colors in the B horizon.	sugarcane, pasture, and homesites
LIC		8 to 15 percent slopes.	sugarcane, pasture, wildlife habitat, and homesites
MgB	Makaweli silty clay loam	Permeability is moderate. Runoff is slow, and the erosion hazard is slight. In places roots penetrate to a depth of 5 feet or more.	for irrigated sugarcane and pasture
MgC		Runoff is medium and the erosion hazard is moderate. Included in mapping were small severely eroded areas.	sugarcane, pasture and homesites
MgD		Rapid runoff with severe erosion hazard.	Sugarcane and pasture
MdE2		Rapid runoff with severe erosion hazard.	pasture
PdA	Pakala clay loam	Runoff is very slow, and the erosion hazard is no more than slight; subject to infrequent nondamaging overflow.	Sugarcane and pasture, smal acreage for truck crops.
rRR	Rough Broken Land	Runoff is rapid, and geologic erosion is active	Watershed and wildlife habitat. Some places pasture and woodland.

The Pakala soil series are geographically associated with Makaweli soils. This series consists of Alluvial fans & bottom lands. These are layered soils from sea level to 400 ft amsl (Ibid p107-8). Top, or surface layers are often dark reddish brown, with a fine sandy loam layer below, "that is massive."

Rough Broken lands, in the study area, will include the steeper slopes (40-70%) of intermittently flowing stream gulches and drainage channels; generally not stony.

Soil information is included here to highlight the connectedness of the project area geology from uka to kai. The deeper soils and hardpan connect the slopes of Puʻu Lani to the ocean, as does the flow of basal ground water. This geologic and hydrologic slope/flow crosses our Study area boundaries, as well as modern district and traditional ahupuaʻa, i.e. the ahupuaʻa of Makaweli and Hanapēpē. We often describe barriers, boundary, and palena across the land and forget how soil, shallow and deep, connects places regardless of lines on a map.

[2] It is important to note that soil designations for 'Prime Agriculture' were developed in the mid-1900s and are based, in large part, on the sugar and pineapple industries. Soils that are prime for traditional agriculture, such as wetland kalo cultivation are often categorized as 'sub-prime'.

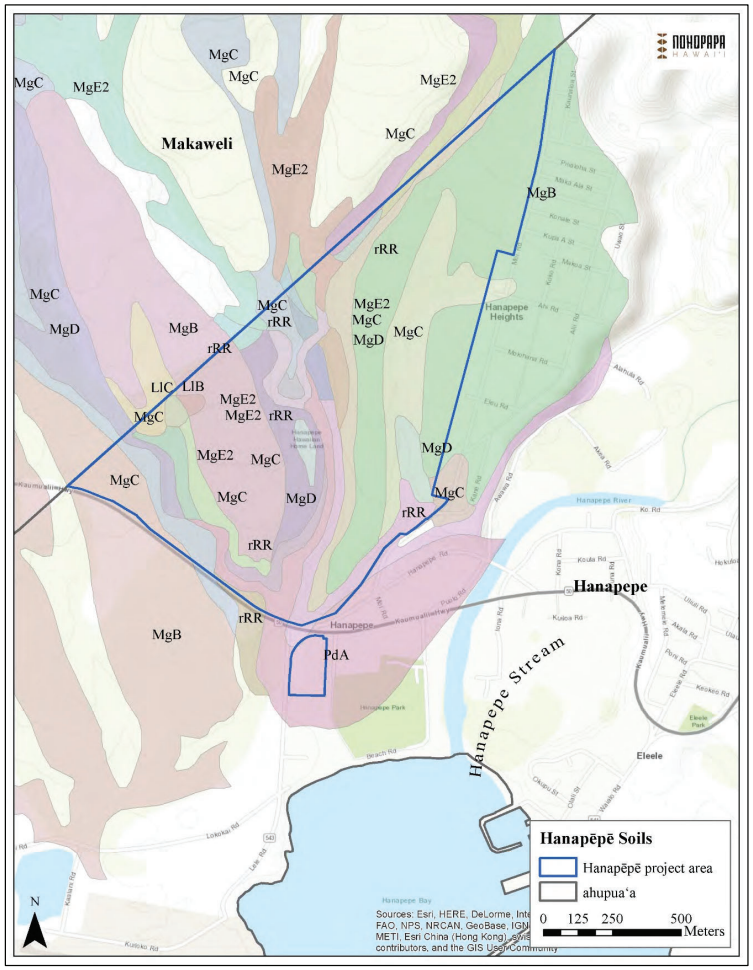


Figure 7. Map showing the soil types and distribution in and around the project area.

Historic Era

Earliest accounts of Kona Moku are from the journals of Captain Cook during his visit to Waimea. Many of the details expressed by such early visitors reveal how the economic and social changes of the following century were heavily influenced by the introduction of western religion, diseases, and commodities.

By 1822, at the time of the Hanapēpē aliʻi Kupihea and Kiaimoku, there was an American Protestant Mission station in Hanapēpē (Bingham 1855, p221); Established by Nancy & Samuel Ruggles, who traveled to Waimea, Kauaʻi with Humehume (George) Kaumualiʻi on his return from the Americas (Ibid).

Over this next century, the lands and people of Kona Moku, and Hanapēpē Ahupuaʻa experienced significant and lasting change. The traditional ʻohana and ahupuaʻa systems began to weaken and diminish soon after the advent of strong foreign influence from explorers, missionaries, and capitalists. The population of rural Kaua'i was not only decimated by disease, but affected by the migration of people to more populace areas on and off island. Additionally, foreign traders and businessmen pushed new industries such as the sandalwood, sugar, and cattle ranching. By the mid-1800s, the economy shifted from a self-sustainable one to a cash and purchase-only economy found locals dependent on currency, stores, and material goods.

Table 3. Some population data specific to Hanapēpē.

Year	Population	Source
1820s	"a few hundred"	Bingham
1930	1,088	Territorial Planning Board
1950	1,250	US Census Bureau[3]
1980	1,417	US Census Bureau

The 1848 Māhele also drastically changed life across Hawaiʻi and the surrounding areas. During that period, the traditional system of land use was transformed to a western model of property privatization. While the aliʻi divided up the land and granted kuleana awards to makaʻāinana in hopes of keeping them on the ʻāina, individual land sales enabled foreigners to purchase large tracts of land for economic purposes. Cattle ranching and sugar plantations leased lands before the Māhele and bought them outright afterwards. After the overthrow in 1893, Crown lands in Hanapēpē, that include the project area were no longer inalienable and often the plantation who was leasing the land purchased it.

Cattle ranching companies and to a greater extent sugar plantation significantly impacted the regions natural environment. Cattle, clearing for fields, and the introduction of non-native plants and animals caused the deforestation of entire native ecosystems. Sugar plantations set up camps and brought in hundreds and over time thousands of workers: Pilipino, Portugese, Japanese, Chinese, and others.

All of these cultural, social, economic, environmental, and even demographic changes

[3] 1950 (population of Hanapepe was ~1,250, a little more than 4% of the Island wide population of 29,683 (US Census Bureau).

significantly impacted the rural Hawaiian lifestyle. Rather than maintaining traditional practices of interdependence and reciprocity, post-contact life became increasingly Westernized, with ʻohana and households becoming more distant and isolated. Many residents left Hanapēpē for the larger towns and even other islands; resulting in individuals separating themselves from ʻohana and disconnecting themselves from their ancestral lands. However, through all of this turmoil, many traditional practices and values were kept alive and continue to be cherished and practiced in contemporary times. And most importantly, the love that kamaʻāina maintained for the ʻāina has not waivered.

Māhele of 1848

The 2nd half of the 19th century was a time of extreme upheaval of land in Hawaiʻi and just as importantly, Hawaiians relationship with ʻāina. In the 1850s the Māhele fundamentally changed the relationship of the makaʻāinana with the ʻāina. Privatization of land was a slow process that began in 1848 as a transition to ownership through land claims and Government purchases. This slow transtion was rocketed forward 45-years later by the overthrow of the Hawaiian monarchy in 1893.

The Hawaiian Kingdom was overthrown and Crown lands in the Ahupuaʻa of Hanapēpē, once inalienable and in trust for the people, were sold off to large land owners just as neighboring ahupuaʻa and ʻili were sold by the aliʻi who had claimed them as konohiki LCA. American understandings of private property, once a foreign idea, became part of peoples' daily relationship with land.

As with cattle, fences came with private property. Access to places and resources were changed. Of course Hawaiians were ʻakamai, and to the best of their abilities they continued to access places, practice culture, and maintain a relationship with ʻāina that is, even today, not completely American. Yet even Hawaiian's unique pilina to place could not prevent the erection of fences and restriction of movment that comes with the privitization of land. These movements of people and land, as it changed hands, began to limit access to places and resources that were, for generations, manged by common understanding and kapu, but open to those with kuleana. These places were now opened to those who owned lands or had business with these land owners.

At least 79 LCA were awarded in the ahupuaʻa of Hanapēpē. None are within or bounding the study area, as much of the ahupuaʻa was Crown lands, including the western upland slopes and Pūolo point and the coastline abutting Makaweli. Most LCA in Hanapēpē are concentrated where Hanapēpē Town is today, extending far upriver into the valley. However, there were two kuleana, in three seperate ʻāpana, that were awarded outside of Hanapēpē town, to the west. These kuleana are along the coast directly downslope and makai of the project area.

Prior to the overthrow, the approximately 8,000 acres making up the Hanapepe Crown lands was estimated at $50,000, and were under lease 53, with an annual rent of $1,000; "Good grazing with valuable water rights," (sic, Table E p71).

> Hanapepe. – A valuable tract in the Kona District adjoining the Hawaiian Sugar Company's lands at Makaweli. The land at Hanapepe comprises about 600 acres of cane land and also a large area of good rice land. All of the upper portion of the land is suitable for grazing, there being no woodland. The water used for irrigating the Sugar Company's extensive cane field on Makaweli is obtained from a branch of the Hanapepe River. The

Ahupuaa of Hanapepe contains approximately 8000 acres, nearly all of which being rich and very fertile (Iaukea 1894, p40).

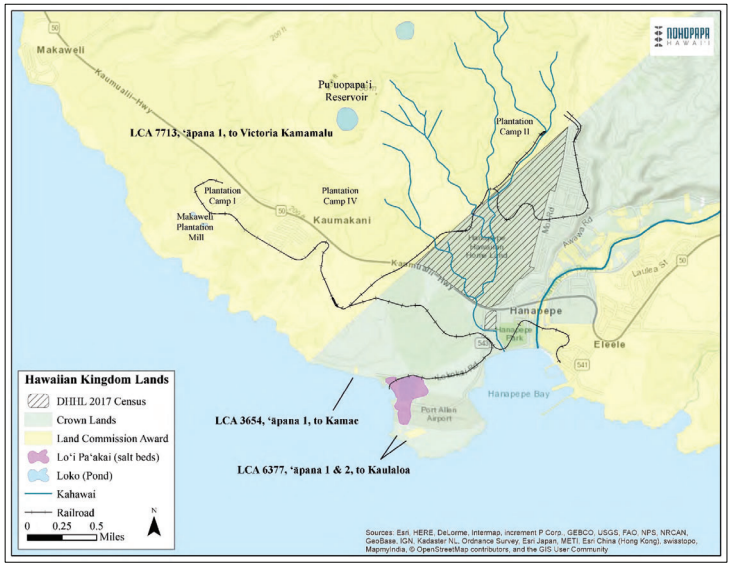


Figure 8. Map showing Mahele Land Commission Awards and Crown lands in and around the study area.

Kō (Sugar) and the mauka DHHL ʻĀpana[4]

During Hawaiian Kingdom era (pre- Jan. 17, 1893) portions of Hanapēpē were already in sugar.

In the 1850sThe lands of Makaweli ahupuaʻa, the ʻili of ʻEleʻele and neighboring ahupuaʻa of Wahiawa were acquired by McBryde Sugar Company (MSC), after an 1899 merger of McBryde Estate and Koloa Agricultrual Company; these lands were originally the konohiki LCAs 7714 B ʻāpana 6 to Moses Kekuaiwa and LCA7712 ʻāpana 5 to Mataio Kekuanaoa. Elizabeth McHutcheson Sinclair (later Gary & Robinson) purchased Makaweli from Victoria Kamamalu, including the western uplands abutting Makaweli: the current study area. These were the lands in and around the project area purchased by Westerners, from the aliʻi, for their sugar ventures.

Although in motion prior to the over throw of the Hawaiian monarchy, the sugar industry's impacts were most widely felt as they expanded their fee-simple land base and governmental influence after the overthrow of the Queen Liliʻuokalani in January of 1893.

Post overthrow, sugar rapidly changed the face of the both the land and population of Hanapēpē. Makaweli Plantation, as part of the Hawaiian Sugar Company (HSC) was the dominant plantion and mill in the area. The following pages provide a timeline and discussion of the historic industry of sugar and its impacts on the study area.

Timeline of Sugar in Hanapēpē

1865 land purchase Elizabeth McHutcheson Sinclair from (land btwn Hanapepe & Waimea rvr) this would consist of Victoria Kamamalu's Makaweli claim[5]

- Two sugar plantations & a cattle ranch
- **1886** 1st hospital built outside of Honolulu, in Makaweli

1889 Gay & Robinson - Partnership btwn: McHutcheson Sinclair, her daughters & grandsons (Aubrey Robinson & Francis Gay)

1887, December 27th, Gay & Robinson lease Hanapēpē Crown lands under lease No.53, for 30-years, $1,000/year;

This lease was originally to expire in 1917, with *all* cane lands reverting to the Crown, ~1,000 acres. (Ibid, Table F.Rent Roll, p75). All or some of these were purchased in **1921**

1889 Sir William Renny Watson leased 7,000 ac Makaweli lands from G&R & would form the Hawaiian Sugar Company (HSCo)

- G&R kept 4,000 ac for sugar & processed at HSCo plant in Makaweli
- 1st HSCo sugar crop (no including G&R) ~11,500 tons of sugar

1921 the Hawaiian Sugar Company acquires 24-acres of former Crown lands for $1,800. Territory of Hawaiʻi Land Patent Grant No.7857

1928 annual sugar yield ~27,057 tons of raw sugar

---

[4] Time line (from Gay & robinson Sugar Plantation promo)
[5] LCA 7713 ʻāpana

1941 C.Brewer Co. bought out HSCo. & got lease with G&R would form Olokele Sugar Co.

1994 G&R purchase assets of Olokele Sugar Co. This was the first time G&R planted its own sugar on all of its own lands

1999 G&R sugar average yield 14.13 tons/acre

Hawaii Sugar Company's Makaweli Plantation (1889-1941)

The Makaweli Plantation extended across Makaweli ahupuaʻa and a portion of Hanapēpē ahupuaʻa; from the south bank of Kekupua stream gulch in the west to to the west bank of Hanapēpē River, in the east. In fact the plantation railroad crossed Hanapēpē River and ended at ʻEleʻele Landing (today what is Port Allen). Makaweli Plantation included portions of Western Hanapēpē, including the uplands and the study area, as well as the entire ʻUkulā salt making area and the Penninsula that borders Kapalawai Bay (Shark Bay).

Portugese camp was at the base of Moi Road just below and to the west of the cemetery (see Figure 9 on the following page). Field X is the sand flats where the DHHL industrial parcel sits. Field IX was where Port Allen Airport is today, Field II and XVI were north and west of Salt Pond and the Ukula salt pans. The mauka DHHL parcel covers portions of Fields XI, XIV and II. Camp II, Philipino camp was just outside and west of the northern apex of DHHL lands at the 'Y' Where Kalena and Kukamahu stream gulches meet. The entire area was criss-crossed with plantation railroads.

The center of the Makaweli Plantation was at Camp 1, ~1.5 miles, west, down the road from the DHHL Hanapēpē lands, connected by railways.

Fields II and XI

The majority of the study are is within Field II and partially in Field XI (237.6 ac field) of the Makaweli Plantation of the Hawaiian Sugar Company (RM2144).

The Makai, industrial parcel is within Field X (67.6 acre field)

Camp OO os just north and west of the Project area (near mauka apex) across Kalena gulch. Here there was also a paddock, stable and Overseers houses.

Plantation Ditches

In addition to its rail lines, the Hawaiian Sugar Company (HSC) maintained, dug, and utilized an extensive ditch system to water and drain its fields.

The Koula ditch system taps the very source of Hanapēpē's water at Manawaiopuna; it is the site of a wailele (falls) and the heiau Kuikahi, where Kāne went to pule. Water is still diverted today from Manawaiopuna, along Koula ditch across Hanapēpē and into Makaweli.

A waste water ditch ran from the Makaweli plantation all the way to Hanapēpē Bay. Based on Historic maps, its exit into the ocean today is in the same lcoation as during plantation times. The stream gulches in mauka and makai DHHL study parcels feed into this ditch. There are a Hawaiian and a Japanese cemetery immediately to the west of where this ditch meets the

ocean.[6] It would come as no surprise, that in 1995-6, when, "for the purpose of widening a previously existing earthen drainage channel", that a coffin burial and fragments of ʻiwi (human remains) were encountered by heavy machinery. The waste water ditch was expanded by the Hawaii Housing Finance and Development Corporation (HFDC).[7]

The Hanapēpē Massacre

The September 1924 a confrontation between striking Philipinoe plantation workers and law enforcement resulted in what has been called the "Hanapepe Massacre." Sixteen (16) Ilocano plantation workers, four (4) Hawaiian special deputies were killed, and twenty-five (25) others were wounded. [8]

Accounts have the conflict arising outside of the old school building, which was located near the road to Salt Pond. Once the shooting began, some people took cover in Brodie's banana patch (Alcantra 1988).

Hugh H. Brodie was the principal of Hanapēpē School beginning in 1897. In 1911, the Commissioners of Public Education built ʻEleʻele school (at current location) and Hanapēpē School closed in 1912. After Hanapēpē school closed Brodie took over the lease of that lot (from 1922-1953). The DHHL industrial parcel, where the Habitat for Humanity warehouse is located, is within the original Government Lease of the Hanapepe School Lot and its surroundings that H. Brodie held (CSF 3957, see Appendix J).[9]

It is, therefore, likely that the Hanapēpē masacre took place in and/or immediately around the current DHHL Hanapēpē Industrial lot. While this is not part of the *traditional* Hawaiian history of Hanapēpē, it is an important historical event. Many Hawaiians in Hanapēpē today are multi-ethnic and have ties back to the labor disputes that lead to the masacre, as well as those who were involved, on both sides.

Hanapēpē Plantation Dump Site

Located within the larger, mauka, DHHL study area is a sugar era plantation "dumping site." It is within Kukamahu gulch at the terminus of a small railroad spur and inside DHHL holdings.

The Copy Survey Furnished 9977 shows General Lease 3070 to Gay & Robinson. The accompanying CSF 9977 map shows the dumping ground at the terminus of a road or railroad spur, dead-ending within, or just of the edge of Kukamahu gulch. Register Map (RM)2701 shows sketched in square "1.12 ac"; while not labelled on RM2701, this area is consistent with the "dumping site" on CSF9977.[10]

---

[6] Register Maps 2615 (c.1918) and 2657 (c1919).
[7] Winieski, Creed & Hammat, 1996
[8] Advertiser, September 10, 11, 1924. Accounts from Fern who recieved information from the Plantation (Fern interview ESOHP, pp529, 534-35). Also, Alcantara, Ruben, Filipino History in Hawaii before 1946: The Sakada Years of Filipinos in Hawaii. Lorton, VA, 1988. Accessed 12/5/2019 from UH Mānoa Scholar Space https://scholarspace.manoa.hawaii.edu/handle/10125/17651
[9] GL to H.H. Brodie and H.W. Brodie from 1922- through a series of Government General Leases. See CSF 3957 – GL1466, 4176 – GL1466 (addition to Lot 67), 8419 – GL2593.
[10] CSFs can be downloaded and accessed by number at the HI State DAGS site, here.

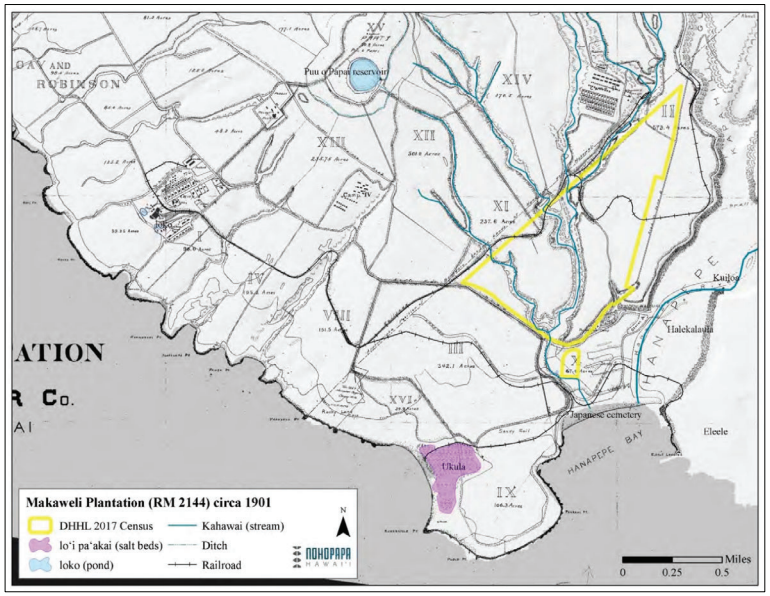


Figure 9. Portion of Hawai'i State Register Map 2144, 'The Makaweli Plantation of the Hawaiian Sugar Company'. *This map dates to circa1901. Ditches, kahawai and plantation railways are highlighted.*

Military and the Air Field

1920s US Signal Corps & US Army Air Corps established a communication station, a "Signal Corps reservation" in a field at Puolo Point. The field was used as a landing strip; Burns Field. Burns field was ~67-acres and was acquired by the Army at some point prior to WW II.

1928 the Territory of Hawaii purchased 29.35 acres for $15,000 next to Burns Field.[11]

After the bombing of Pearl Harbor Dec. 7th, **1941** the Territory of Hawaii was put under Martial Law by Lt. General Walter C. Short. Hawai'I became a military district under a military governor who reported to the Hawaiian Department Commander.

Burns Field (Port Allen Airstrip) was closed to civilians during WWII; Mana airstrip was used for civilian air traffic; and the Burns airfield was expanded by the US military.

Instead of retiring the airfield it rolled into civilian use, and today instead of ferrying commuters it has become a base for helicopter tours and sky diving planes for tourists.

Education –Schools in Hanapēpē

Early on, the tradition of formal education was well established in Hanapēpē with hula hālau, the prevelance of which was mentioned earlier in Nūpepa records. The first western school in Hanapēpē was established within two years of the first mission. Schools being a way of spreading European religion and customs as well as literacy. The Hawaiian Kingdom, in the 1850s, established common free school and took up part of the financial and shared managerial responsibility for schools, along with Protestant and later Catholic and Mormon Missions. Students were still instructed in Hawaiian, by this time often by Hawaiian teachers.

Below is a timeline of schools in Hanapēpē:

1822-4 Ruggles, Nancy and Samuel established first school as part of their American Protestant Mission (Bingham 1855).

In **1824**, the Ruggles school was abandoned.

1837, Samuel Whitney re-established a school, this time on western side of Hanapēpē Bay, near the road leading to Ukula.

King Kamehameha III, in **1840**, forms the Ministry of Public Education and founds the Public School System in Hawai'i.

Prior to this time schools were exclusively the province of foreign Missions, predominantly American Protestants, but also Catholics and Mormons. However, the school system and the western missions remained intimately tied together, at least until the end of the reign of Kamehameha III. (Kuykendahl 1838, p3.35-367).

By January 1, **1841**, it was "required that a school should be maintained in every community where there were fifteen or more children of suitable age" (Ibid, p347-348). Additionally, there were guidelines laid out for teacher credentials, tax exemptions, local and General school agents who reported back to the Legislature.

In **1841**, Papohaku, a Protestant, was appointed the first Kau'i Island General School Agent.

By **1850**, an Act established that 1/20th part of all Government Lands would be reserved for education (Ibid, p.352).

In **1847**, The school teachers at Hanapēpē School(s) were Kapihenui, Iese, and Kaiwi.

By **1860** there were three schools in Hanapēpē, but only two schools remained by **1865**.

The Kingdom of Hawai'i was illegally overthrown in **1893**, and by **1896** the Hawaiian language was banned and ceased to be taught or spoken in schools.

In **1897**, Hanapēpē School had 122 students and Hugh Brodie was the principal.

After 90-years Hanapēpē School closed and a new school in 'Ele'ele was established in **1912**.

2020, 'Ele'ele School continues the tradition of educating Hanapēpē children, more than 175-years after the first formal school was established.

[11] Executive Order No. 338

Cultural Traditions

Oral and written moʻolelo, ʻōlelo noʻeau, mele, tell of the akua, kupua, ʻaumākua, aliʻi, and ka poʻe kānaka whose cultural traditions are the foundations of Hawaiian culture, which continues to add new mele, ʻoli, moʻolelo, and even ʻōlelo noʻeau to its cannon.

ʻŌlelo Noʻeau

ʻŌlelo noʻeau are Hawaiian proverbs. Many ʻōlelo noʻeau were and still are common knowledge among Hawaiian communities across the pae ʻāina, just as others are island or even moku specific. These proverbs can provide us with links to common knowledge of moʻolelo, history and place. ʻŌlelo noʻeau, in one short phrase, provide a layered window into Hawaiian humor, observational knowledge, and cultural values; often they incorporate kaona (hidden meaning) used generously in Hawaiian language traditions.

After a long hiatus, the Hawaiian community has again begun to add to the body of ʻōlelo noʻeau, perpatuating this traditional practice and adding to the body of Hawaiian knowledge.

The following ʻōlelo noʻeau were gathered by Mary Kawena Pukui and published in, *ʻŌlelo Noʻeau Hawaiian Proverbs and Poetical Sayings* (1983).

ʻOlelo Noʻeau of Kona Moku

No. 1775, p190:

Ke one kapu o Kahamaluʻihi
The sacred sand of Kahamaluʻihi.

A city of refuge for those of Waimea, Mānā and the Kona side of Kauaʻi.

No. 1905:

Kukui-lau-nui-o-Kona.
Thickly leafed kukui of Kona.

A thick cloud that shuts out the light of the sun, like a heavily leafed kukui tree. The expression was used in the Kona district of Kauaʻi.

No. 1097, p117:

Hoʻolele ka uila o Makaweli.
Sending the lightning of Makaweli flying.

[of Makaweli Ahupuaʻa] A play on maka-weli (terrifying eyes), this saying refers to the sending of a god on an errand of destruction.

Nā Oli a me nā Mele

"Ua aneane nalowale paha na mele o ka wa kahiko, kawalawala loa na kanaka i ike. He mea minamina ia, no ka mea, ma ua mau mele la, ua maopopo ke ano o ka noho ana o kanaka i ka wa mamua loa aku nei, a o ka mooolelo o ka aina kekahi. O ka mea e mau aku ai a

nalowale ole na mele, oia ke pai ana ma ka buke a ma ka nupepa paha, alaila, he hiki no i na hanauna hou aku ke heluhelu a e kawiliwili iloko o ka manao..."

-*Ka Hae Hawaiʻi.* March 21, 1860

"Traditional Hawaiian songs may soon be forgotten; they are not seen enough by people. This is very unfortunate, because it is within these compositions that that the lives of those who lived before us are understood, as well as the stories of the land. What will ensure the continuance of these traditional Hawaiian songs so that they are not lost, is publishing them in books and perhaps newspapers, then, future generations will be able to read them and become entwined in their meaning..."

-English Translation, *Ka Hae Hawaiʻi.* March 21, 1860.

Oli (chants) and mele (songs) have long been a means of perpetuating traditional knowledge through artistic expression. Pukui (1949) refers to oli and mele composition and writes, "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 may arise." The word oli refers to a chant that is not danced to and the word mele refers to a song, poem, or chant of any kind (Elbert & Pukui 1959). Oli and mele are often given as hoʻokupu (a gift or offering) to honor akua and aliʻi, to commemorate place visits and events, to celebrate life and death, and to share stories.

In the translation of oli and mele, there are often *kaona*, layers of meaning, beyond literal translation; levels of inner meaning. Pukui explains that the kaona can sometimes be obvious, so that anyone familiar with the figurative use of the Hawaiian language can understand it. Other times, it may be so veiled that it is only understood by those to whom the composition belongs (Pukui 1949).

Presented below are mele that make reference to the renowned places of Kona, with a focus on the ahupuaʻa of Hanapēpē, and specifically areas in and around the study area.

E Ola Mau ʻO Pūʻolo

The following mele was written by Malia Nobrega Olivera of Hanapēpē and makes reference to ʻUkulā and Pūʻolo at the kai, as well as the connection these places have to the uplands. The lands directly uplsope of ʻUkulā and Pūʻolo include the DHHL Hanapēpē study area. (Aikau et al, 2019).

E Ola Mau ʻO Pūʻolo	**Pūʻolo Continues to Live**
Aloha Kauaʻi Moku ʻo Kona ʻĀina Kupuna Kaulana ʻo Hanapēpē mai uka a i kai	Beloved Kauaʻi, Kona District Ancestral Land Famous is Hanapēpē, from the uplands to the ocean
Aloha ʻĀina Ola ka lae ʻo Pūʻolo, pūʻolo paʻakai ʻĀina Kupuna Paʻakahi, Kuunakaʻiole, ʻUkulā, Kunakaiawe	Love for the land Pūʻolo Point lives, salt bundles Ancestral Land Paʻakahi, Kuunakaʻiole, ʻUkulā, Kunakaiawe

Aloha ʻĀina	Love for the land
E ola mau ʻo Pūʻolo, e ola nō ē	Pūʻolo continues to live, lives on indeed
E ola!	Life!

[Insert 2nd Mele]

[pending consent]

Nūpepa Hawaiʻi

Hawaiian language newspapers ("Nūpepa Hawaiʻi") of the nineteenth and early twentieth century present a rich source of kanaka maoli history and culture to a growing audience of Hawaiian language students and readers. These Nūpepa Hawaiʻi were used by makaʻāinana and aliʻi alike to spread general news of the day, government business, religious teachings, as well as moʻolelo, and previously unwritten traditional oral histories.

The contributing authors of the Nūpepa Hawaiʻi articles were from many different localities around the Hawaiian Kingdom. They recorded the happenings of their communities, sometimes relating what they were witnessing, and sometimes passing on events moving and affecting the larger lāhui and metropolitan areas.

Many articles portray the Hanapēpē area as being a place of debauchery. A place where even the police were afraid to enforce the laws.[12] These accounts do not however come from a place of objectivity. These accounts instead come from authors who are from within or heavily involved in the Missions[13] of the era – their writings clearly promote the prevalent Christian ideals of that era. At the time of these accounts 1850s-1860s, Hawaiian language newspapers in Hawaiʻi were educational vehicles of western religion. (Hori 2001).

In 1861 Hawaiian language newspapers in opposition to the religious press of the missionaries appeared. To some extent this nūpepa period maintained an essence of the Christian propriety and idealism taught in the earlier press. However, when this shell of Christian idealism is stripped away, we see Hanapēpē as a place where native Hawaiian culture thrives. Throngs of people go to the "hōʻike" or hula shows of the kumu hula in the area named Wahineaea and Kaulaloa.[14] It is no wonder that many of the Kauaʻi contributors to Helen Roberts 1924 chant and hula collection once resided in the Hanapēpē and Makaweli area.[15]

Despite Hanapēpē's record of being a bastion of sin, according to early missionary opinion, it was a very productive river valley producing large amounts of rice, so much so that taro and poi production was nearly phased out (Ka Nupepa Kuokoa 26 May 1866; Ka Nupepa Kuokoa 10 November 1866) Hanapēpē from 1860 on would continue its rice production until it eventually becomes the second largest rice producer in the 1870s according to David Keaweamahi on his tour around Kauaʻi (Ka Lahui Hawaii 7 September 1876).

[12] Nupepa Article 2. No ka Hula ma Hanapepe, Kauai, Ka Hae Hawaii, 5 Aug 1857. Nupepa Article 3. Ka Puni Lealea ma Hanapepe, Ka Nupepa Kuokoa, 27 August 1864.
[13] Protestant mostly & to a lesser degree Catholic and Mormon.
[14] Ibid, Nupepa Article 3
[15] The Honolulu Advertiser 14 October 192

During this tour Keaweamahi is taken around the Hanapēpē area and shown where people are living, fishing and farming. He is also taken to catch wī (hīhīwai/water mollusks) which are very plentiful in the river. He then journeys to far inland Hanapēpē, to storied places of the area, one being where Māui the demigod captured the sun according to his "hoa kamaʻāina" native guide.

After the overthrow of the Hawaiian Kingdom in 1893, and the rise of a Territorial Government, land tenure and use shifted. In the 1900s, there was a request by Judge Silas Chandler and the people of Hanapēpē to open up Government lands there for homesteading which, according to the article was requested of the governor previous (Ka Nupepa Kuokoa 28 June 1918).

Some of these lands were eventually turned into homestead and others were auctioned off for various uses such as dairy farming (Ka Nupepa Kuokoa 26 October 1922).

Along with farming and land use, the articles in the Nūpepa Hawaiʻi as well ʻŌlelo Hawaiʻi historical interviews collected in the early 1930s to 1980s, include records on water in the Hanapēpē area.

The earliest article "He Wai Hou" or "A New Water Source," is printed in Ka Hae Hawaii 16 April 1856. This article explains the amazing appearance of a new spring in southern Hanapēpē on Puʻuopapaʻi, now present day Makaweli; at an elevation and due west of the current study area.

There is not much talk of water until the Territorial Government brings suit against Gay & Robinson for the 5,900 acres of Hanapēpē valley lands along with their water rights. The article further explains that the land and the water that goes through it is around 40,000,000-60,000,000 gallons per day. The suit was unsuccessful (Ka Nupepa Kuokoa 4 November 1921).

Five years after this lawsuit, the Territory sends out an attorney to check on reports of people altering the flow of the Hanapēpē river (Ka Nupepa Kuokoa 19 August 1926). The article does not go into specifics and there is no follow up in the newspapers on whether there was any tampering with river flow.

As deduced from the earliest Nūpepa Hawaiʻi articles of the Hanapēpē area, new springs and underground tunnels have existed in the area and could affect the flow of water or runoff from the current study site. Furthermore, it would also be valuable through the development process to be aware of actions that could adversely affect the subterranean landscape.

Palapala ʻĀina

Early maps of the study area and the surrounding areas of Makaweli and Hanapēpē provide information describing the study area landscape prior to modern times. Historic maps physically document changes to the land occurring over a period of years.

The Hawaiʻi State Register Maps (RM), Copy Survey Furnished (CSF) maps can be accessed online at the Department of Agriculture and General Services (DAGS) website here. The TMK Plat maps, current and historic, can be obtained through the County of Kauaʻi Real Property Tax offices in Līhuʻe. The Kauaʻi Historic Society (KHS) has an extensivve map collection that can be obtained by membership and archival appointment with the wonderful staff at the Historic Society, also in Līhuʻe. Two other sources that have some maps are the Grove Farm Museum, the Kauaʻi Count Planning Office and Real Property Tax Assessment Office, Līhuʻe.

Table 4. Table of historic maps accessed fo rthis project that depict the Study Area.

Map	Notes
RM158	Plan of Hanapepe, Kauai. Scale 20 chains = 1 inch, J.W. Gay, Oct. 1872.
RM163 & trace	Plan of Kuiloa, the Property of Mrs. Kapiolani Kalakaua. Scale 1 inch = 4 chains, J.W. Gay, Dec. 23, 1870. Cetified HTS copy, W.E. Wall, Feb. 13, 1919.
RM1374	Plan of Manuahi, Kauai. James Gay, 1875. (mauka puu)
RM1379	Plan of Kuiloa, the Property of Mrs. Kapiolani Kalakaua. Scale 1 inch = 4 chains, J.W. Gay, Dec. 23, 187a Nov 1875 trace of RM163 by M.D. Monsarrat
RM2144	Map of the Makaweli Plantation of the Hawaiian Sugar Co., Makaweli, Kaua‘i. Scale 500 ft = 1 inch, Arthur C. Alexander, December, 1901.
RM2246	Map of Kauai Compiled from Government Surveys and Private Surveys of Lands Belonging to Gay and Robinson, 1891. Scale 1 inch = 3,000 ft, Map by L.E. Implay, traced by H.E> Newton April-1903.
RM2438	Hanapēpē Forest Reserve low line
RM2615 & trace	HI Territory Survey Hanapepe Valley, Kona-Kauai. Scale 1 inch = 100 ft, Survey & map by F.W. Thrum, June 1918. Traced by P.E. Arioli October 1918, Sheet 1.
RM2657 & trace	HI Territory Survey, Hanapepe Valley, Hanapepe, Kona, Kauai, Showing Rice and Kula Lots. Scale 1 inch = 300 ft, Compiled from Govt Survey records [see RM2615 thru RM2620] by J. Iao, Dec. 1919.
RM2701	HI Territory Survey Hanapepe Cane Lands, Hanapepe, Kona, Kauai. Scale 1 inch =500 ft, survey and map by A.S. Chaney, April 1923.
RM2979	Hanapēpē Luna
RM4013	Hanapepe Heights House Lots, Hanapepe, Kona (Waimea), Kauai. Scale 1 inch = 100 ft, Joseph A. Aiu, July 1948
RM4017	HI Territory Survey, Hanapepe Kona (Waimea), Kauai, Hawaii. Scale 1 inch = 100 ft, Joseph A. Aiu, October 1948.
RM4065	HI Territory Survey Hanapepe Town Lots, First Series, Hanapepe, Waimea (Kona), Kauai, T.H. scale 1 inch = 50 ft, survey by Lum Hing – August, 1954. Map by Akira Fujita – March, 1955. Tracing by Osamu Fukuya – March, 1955.
CSF4093	Lease Rokuichi Gotunda Application, Hanapepe Salt Pond, Hanapepe, Kona,Kauai, Scale 1 inch = 500 ft.
CSF 9977	HI Territory Survey, Lease Sections A, B, C, and D, Hanapepe Gov't Lands, Hanapepe, Kona (Waimea), Kauai. Scale 1 inch = 1,000 ft, Joseph A. Aiu, 1944. CSF 9976-9979, see GL 3070 to Gay & Robinson.
CSF9415	HI Territory, Survey Department, Lease C.B. Hofgaard co., LTC. – Applicant, Hanapepe, Kona (Waimea), Kauai. TMK Map 1-8-08. Scale 1 inch= 100 ft, Joseph A. Aiu, Jan. 31, 1941.

Map	Notes
Plat 3054	Island of Kauai, Waimea [sic]
Plat 3075-B	HI Territory Survey, Hanapepe Heights House Lots, Hanapepe, Kona (Waimea), Kauai. Scale 1 inch = 100 ft, survey and map by Joseph A. Siu, July 1948.
KHS-W-4	USGS Topo, Hanapepe Quadrangle, 75-min series, 1963.
KHS-W-13	McBryde Sugar Co. LTD. Scale 1 inch = 24,000 ft, Oct. 1973. Heavy water damage

The following pages, Figures 10-12, include portions of historic maps of the Kona Moku focusing on the ahupua‘a of Hanapēpē and Makaweli and situating the current study are within a historic context.

Tables 5-7, reflects the collection of place names that collected from historic maps and archives.

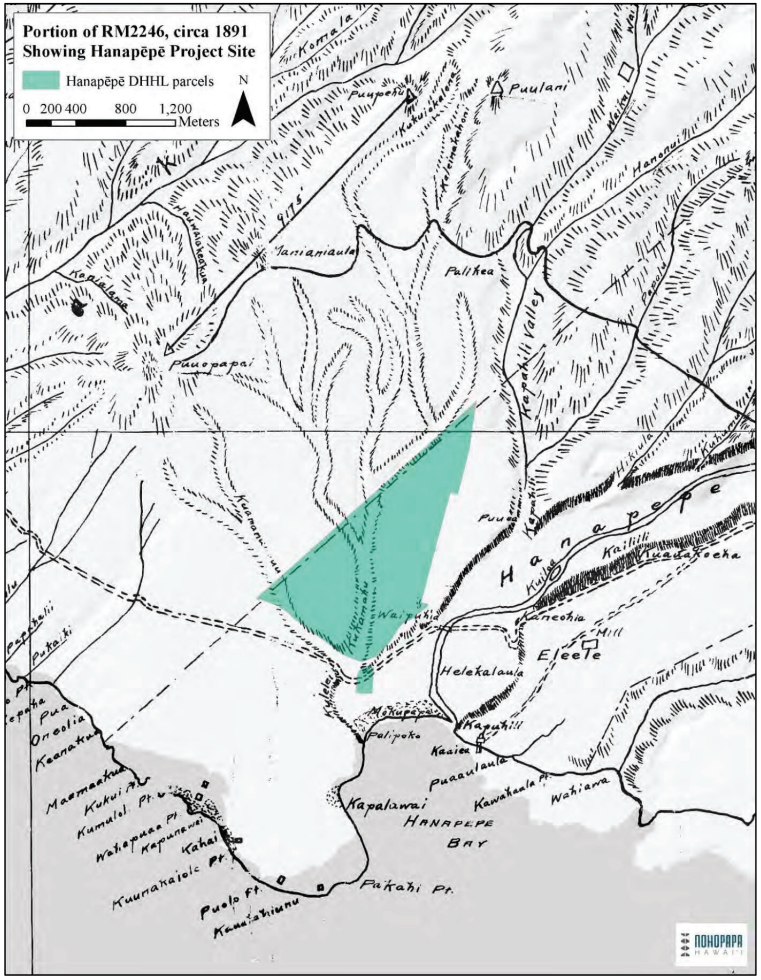

Portion of RM2246, circa 1891
Showing Hanapēpē Project Site
Hanapēpē DHHL parcels
0 200 400 800 1,200
Meters
N
Puulani
Puupoku
Kuhuiokalani
Kanianiaula
Puuopapai
Kapalaoa
Pulikea
Kapakili Valley
Hanapepe
Kailili
Kaeaokeoka
Waipuhia
Kaneohia Mill
Eleele
Helekalauia
Mahupu
Kapuhili
Paliporo
Kaaiea
Puaaulauia
Kawakaula Pt.
Wahiawa
Kapalawai
HANAPEPE BAY
Pakaki Pt.
Puolo Pt.
Kawakiunu
Kuumakaioio Pt.
Kahai
Kapunewai
Wahapuaa Pt.
Kumalei Pt.
Kukui Pt.
Maomaokuu
Kaanaku
Oneolia
Pua
Pakaki
Pepeiao
Kaunamano
Kaeaokeoka
Kaiili
Kuiha
Kaneohia
Helekalauia
Kapuhili
Puaaulauia
Wahiawa
Kawakaula Pt.
Kapalawai

Figure 12. Portion of RM2615, the map by F. W. Thrum, traced in 1918 by P. E. Arioli, showing a portion of the study area.

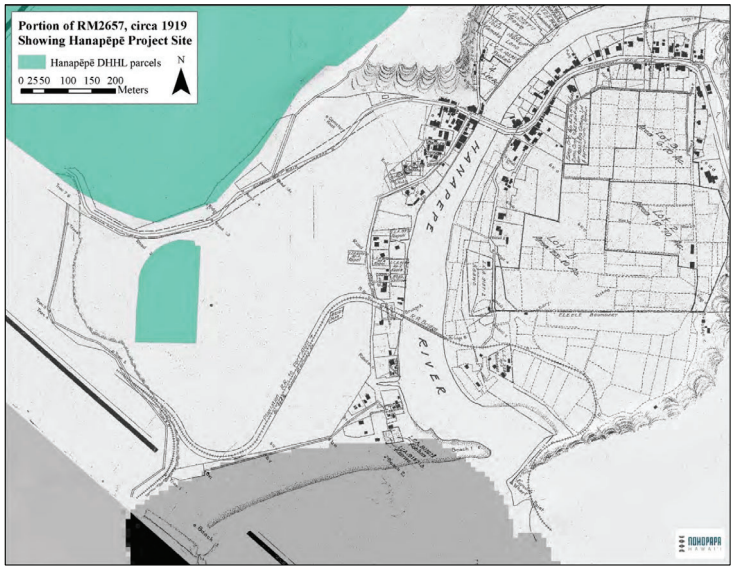


Figure 13. Portion of RM2657, the map compiled from Government Survey Records by J. Iao in 1919, showing a portion of the study area.

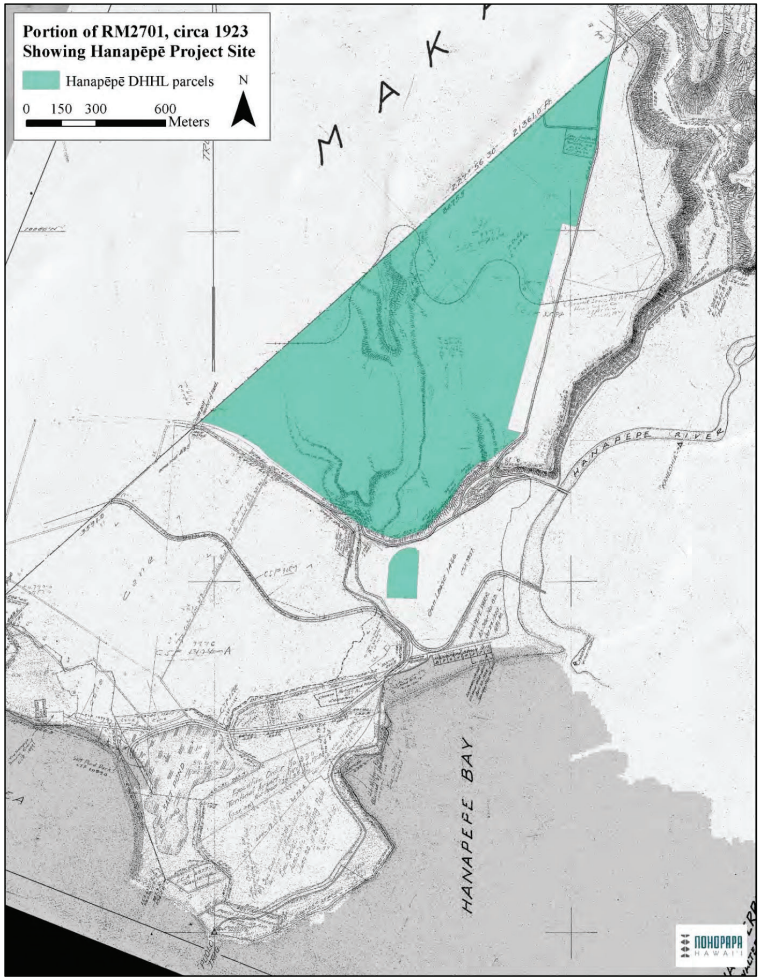


Figure 14. . Portion of RM2701, the map by A. S. Chaney, in 1923, showing the study area.

Table 5. Wahi inoa, place names, within *the Study Area*

Wahi Name	Type	Notes	Source
Hanapepe Dumping ground	dump (plantation)	Plantation Dumping ground. Directly off Railroad, within Kukamahu gulch.	RM2701 (c.1923). General Lease 3070, see CSF 9977 map and description, and CSF13507
Kalena	kahawai, gulch, streamgulch	<Null>	RM2144 (c.1901). Name from "tigerhyd_n83" shapefile, US Census Bureau. Line derived from "darstreams" shapefile, USGS line graphs 1983, CWRM HI Sream database 1993, DLNR Div of Aquatic Rsrcs 2004 & 2008.
Kukamahu	kahawai, gulch, streamgulch	<Null>	
Kuamanuunuu	kahawai, gulch, streamgulch	<Null>	

Table 6. Wahi inoa, place names, in immediate vicinity *of the Study Area*

Wahi Name	Type	Notes	Source
cemetery knoll	cemetery	Puu at base of DHHL Hanapepe apana and its current access point on Moi road, next to former "Portugese Camp." Within a 4.4 ac parcel, labelled simply "cemtery knoll" on RM2615 (c.1918).	RM2615 (c.1918). USGS Topo. RM2144 (c.1901).
Waipuhia	kualapa, ridge	Alternate name on sugar maps is Ridge B. "Waipuhia" from RM2246 (c.1891); alternate spellings, "Waipiihia" on RM158 (c.1872) and "Waipuhi" on CSF 9977 maps.	RM158 (c.1872). RM2246 (c.1891). CSF 9977 map for General Lease 3070 to Gay & Robinson (c.1944).
Kuulei	kualapa, ridge	<Null>	RM2246 (c.1891). & Bing aerial Imagery.

Table 7. Wahi inoa, place names, in the vicinity *of project area – wahi that are connected by gulch, plateau, direct watershed, etc.*

Wahi Name	Type	Notes	Source
Kalaeopaoo	awa, cove	Saddle or point between Keanakua and Maamaakua. At kai boundary between Makaweli & Hanapēpē (Kaumakani fishing coastline)	Gay Francis (1873, p7). RM2246 (c.1893)
Kapunawai	awa, cove	the cove of sand beach, per Francis Gay. What is today Salt Pond Park	Francis Gay (1873, p7)
Kailiili	kahaone, sandy beach	On the middle part of the Ukula Penninsula, close to Kauakahiunu	Franci Gay (1873, p7).
Mokupapa	kahaone, sandy beach	Sand at Hanapepe is Mokupapa (Francis Gay, 1873). Since channelization of Hanapepe River, beach has receded and is rocky coastline now.	Francis Gay (1873, p7). RM2246 (c.1893)
Maamaakua	rocky beach, kahapohaku	Rocky beach west of salt pond, towards border with Makaweli.	RM2246 (c.1891). Francis Gay (1873, p7).
Kaleinakahoni	kahawai, gulch	<Null>	RM2144 (c.1901). Name from "tigerhyd_n83" shapefile, US Census Bureau. Line derived from "darstreams" shapefile, USGS line graphs 1983, CWRM HI Sream database 1993, DLNR Div of Aquatic Rsrcs 2004 & 2008.
Kukuiokalena	kahawai, gulch	<Null>	Name from RM2246 (c.1891). RM2144 (c.1901). "tigerhyd_n83" shapefile, US Census Bureau. Line derived from "darstreams" shapefile, USGS line graphs 1983, CWRM HI Sream database 1993, DLNR Div of Aquatic Rsrcs 2004 & 2008.
Kauakahiunu	koʻa, ahu	A unu or altar close to Kailiili, probably a koʻa.	RM2246 (c.1891). Francis Gay (1873, p7).
Puuea	kualapa, ridge	Puu (or pali?) east of the project area near the pali overlooking Hanapēpē stream main tributary ʻYʻ	RM2246 (c.1891).
Kapalawai	kuono, cove & beach	Called "shark bay" by local fisherman. beach on east side on east side of point Pakahi	RM2246 (c.1891). Francis Gay (1873, p7)

Wahi Name	Type	Notes	Source
Kaaiea	lae, point	Kaaiea, opposite of Pakahi, marking east side of Hanapepe Bay (francis Gay, p7), now location of Port Allen.	RM2246 (c.1891) and Francis Gay (1873, p7).
Kawiliwili	lae, point	<Null>	Fracis Gay Journal (1873, p7).
Kukui point	lae, point	Location is best guess baed on RM2246 & coastline (map does not georeference well).	RM2246 (c.1891).
Kumuloli point	lae, point	Location is best guess baed on RM2246 & coastline (map does not georeference well).	RM2246 (c.1891).
Kuunakaiole	lae, point	Along coast south of salt pond. "Kunakaiole" on RM2144 (c.1901) and "Kuunakaiole" on RM2246 (c.1891) & USGS Topo.	RM2246 (c.1891). RM2144 (c.1901). USGS Topo
Pakahi Point	lae, point	A point on the opposite end of Kaaiapoint, on West side of Hanapepe Bay, Francis Gay Journal (1873, p7). At mouth of Hanapepe Bay (west-side). Spelled "Pakahi" on RM2246 (c.1891) and Francis Gay (1873, p7). "Paakahi" on RM2144 (c.1901).	RM2246 (c.1891). RM2144 (c.1901). USGS Topo
Puolo Point	lae, point	What many refer to as Ukulaʻs entire rocky coastline. Also have heard Puolo Penninsula in place of Ukula Penninsula (unsure if traditional or colloquial).	RM2144 (c.1901). USGS Topo
Wahapuaa point	lae, point	Location is best guess baed on RM2246 & coastline (map does not georeference well).	RM2246 (c.1891).
Kupuhili	lae, point, & a keana (cave)	Kupuhili is at the mouth of Hanapepe river. Francis Gay shows it as both a lae and a cave.	Francis Gay journal (1873, p7). RM2615 (c.1918). RM2657 (c.1919).
Ukula	loi paakai, salt bed	Ukula, flat land, now commonly known as Salt Pond.	Name from Francis Gay (1873, p7) and Nupepa RM2144 (c.1901). RM2701 (c.1923). Map from cancelled CSF 4093 (a cancelled lease of the entire salt pond area to Rokuichi Gotunda).
Manianiaula reservoir	loko, pond, reservoir	No longer has wai, not in use. Manienieula on RM2144 and "Manianiula" on RM2246. Reservoir in a natural crater. No longer appears on hydrological layers.	RM2246 (c.1901). RM2144 (c.1901).

Wahi Name	Type	Notes	Source
Puu o Papai	loko, pond, reservoir, puu & luapele (crater)	Still in use. Reservoir along SW (makai-lower) end of Koula Ditch system. Camp V & steam pump tapping Kukamahu streamgulch is just to the north. If not syphoned this highpoint would run off into Kukamahu (lowest trib) that flows directly into DHHL Hanapepe apana. Also Puuopapai and Pu'u o Papa'i	RM2144 (c.1901). HI State Office of Planning (Joan Delos Santos) shapefile "HI_Kauai_surf_waterbody_area_pond". USGS Topo
Kuahanui	paena, landing	Landing at Ukula (salt ponds)	RM2246 (c.1891). Francis Gay (1873, p7).
Palikea	pali, cliff	Palikea is a pali at the head of Kuapoo peak. RM2246 shows Palikea is in the plateau area to the west of this point; wahi is possibly an ili & a pali.	RM2246 (c.1891). RM2144 (c.1904). USGS Topo
Palipoko	pali, cliff	<Null>	RM2246 (c.1891).
Kahai	wahi pana, storied place	Unsure what kind of wahi this is. It is a kai or coastal name. Location is best guess based on RM2246 & coastline (map does not georeference well).	RM2246 (c.1891).

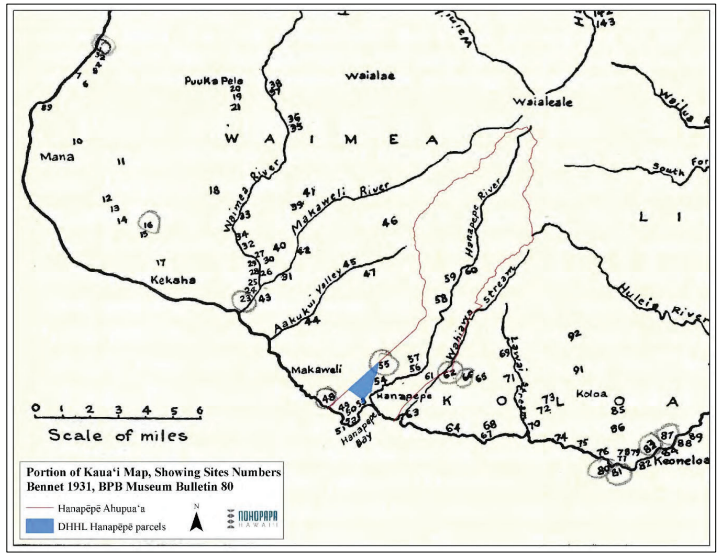


Figure 15. Is taken from p.98 of Bishop Museum Bulletin 80 (Bennett 1931)

Table 8. Table of wahi kūpuna, by archaeological site number. As documented in Bishop Museum Bulletin 8, Bennett 1931, p112-14.

Wahi kūpuna	Description	Site No.	locale
Kuwiliwili Heiau	Said to be located just below Makaweli Camp 3, which site is now in the cane fields. Thrum describes this heiau as, "A large, high walled enclosure of *pookanaka* class now destroyed." At the location mentioned there is nothing to indicate a structure but a pile of rocks gathered from a cane field.	48	Makaweli
Salt Pan, near Puolo Point	The extent of this salt pan is shown on the government map. It is notable among the salt pans of Kauai in having no artificial divisions. It is merely a natural flat area on which the sea water could be let in and evaporate.	49	Salt pond
House Sites, at Pouolo Point	The remains of many house sites appear on the great flat lands near the salt pan. Most of the house sites are surrounded by walls 2 to 3 feet high, many of which have been built up recently. Walls run everywhere. East of here the field has been cleared for an airport. Along the shore the tumbled remains of wind shelters used by fisherman can be seen.	50	Ukula
Kauakahiunu heiau, at Puolo point	Thrum described as "A walled heiau of medium size at the shore, part of walls still standing. Kane and Kanaloa its deities." The site is now but slightly marked by crumbled stones. It measures at the outside about 80 by 40 feet. The walls were said to have been about 4 feet high.	51	Puolo
House site or Ko'a, at Puolo Point	The front part of this structure rests on the beach stones above which it has been built up 5 to 8 feet. In rough weather the sea spray must have washed over it. The exact measurements and plan are given on figure 29 [p113 Bennet 1931]. It is composed of three sections with steps leading up to one. The paving on two of the sections is with very small beach pebbles. The other section is more tore down, and is paved with larger stones. A wall one foot high runs around the south side and across the front (sea side).	52	Puolo
Sand burials	In the sand on the northwest side of Hanapepe bay, burials are found.	53	NW Hanapepe Bay sands
Makole heiau	Makole bluff is said to be the one on the inland side of the government road west of the river, halfway between the road and Kapahili valley. Thrum describes it as, "A small heiau platform character on side of bluff destroyed in the [eighteen] sixties; portions of the walls said to be still seen." None of the walls could be found.	54	Makole Bluff
Pualu heiau	On the east side of Kapahili gulch, about one quarter mile from the road, and at the base of the second pali. This structure consists of a single platform 142 by 50 feet built up in front 6 feet, and backed by a wall 3 to 4 feet high and 3 feet wide. The whole structure seems tohav ebeen paved with 3 to 4 inch stones, but it is very much disturbed, and much of the rock has been hauled away...	55	Hanapēpē
Akowai heiau	At a place called Akowai on the steeply sloping side of a bluff. The structure is described by Thrum as, "A small paved heiau of about 50 feet square, in bad condition..."	56	

Community Voices

Ethnographic research involves gathering oral histories and conducting interviews with living communities to record and acknowledge people's historical connections to place as well as document continued practices and pilina communities have for their wahi pana. It is clear from the naming of virtually all things on the landscape that Hawaiians maintained an intimate relationships with their environments.

In Hanapēpē, it is the kamaʻāina, rather than historical archives, that have kept the stories of the landscape alive. Through our ethnographic efforts, we have tried to capture and present some of these moʻolelo. The manaʻo of these long-time residents who graciously shared their ʻike and memories should be respected and acknowledged.

Ethnographic work for this study was conducted from September through December 2019. As a multi-phase study, the ethnographic process consisted of identifying appropriate and knowledgeable individuals, conducting oral history interviews, summarizing the digitally recorded interviews, analyzing the oral history data, getting consent from interviewees to use their manaʻo, and preparing the report. Six individuals were contacted for this study. Three individuals participated in ethnographic interviews, one gave us manaʻo off the record, and a fifth declined to participate. The table below lists the names and some background information of individuals that chose to participate in this CIA, formally and informally.

Another Method we utilized during the CIA process were surveys. The Nohopapa team put together several small menti-meter surveys which we released at Public Meeting no.1, to the paʻakai hui, and others. Unfortunately this approach didnt yield any new information. Rather the best additions were informal talk stories iwth beneficiaries during DHHL community meetings. This manaʻo has been incorporated into this report in "Community Concerns and Recommendations" section.

Table 9. Community Participants

Community Participant	Background	Notes
Waiting permission	•	
Chad Shimmelfennig	• Kamaʻāina • Generational ties to Hanapēpē • Teacher at ʻEleʻele that incorporates traditional Hawaiian values & practices into curriculum	Interviewed.
Kuulei Santos	• Kamaʻāina • Generational ties to Hanapēpē • Cultural Practitioner • Of a Salt making ʻohana	Interviewed. Also referred to interview by two other interviewees.
Waiting permission	•	
Alan Murakami	• Lawyer with Native Hawaiian Legal Corporation (NHLC)	Asked for a written comment since he is representing paʻakai hui in current litigation.
Leanora Kaiaokamalie	• County of Kauaʻi Planner • Kamaʻāina • Generational ties to Hanapēpē • Cultural Practitioner • Of a Salt making ʻohana	Not formally interviewed, but consulted in her role within Kauaʻi County Planning; regarding County Westside Master Plan update status.

It is interesting to note that all of our interviewees recommened at least one of our other interviewees for this CIA. The only other person reccomended by our interviewees that we were unable to interview for this study was Janet Kahalekomo, a kūpuna and long time resident of Hanapēpē. We recommend any future or additional ethnography to approach her first.

Acknowledgements

Nohopapa Hawaiʻi would like to mahalo the individuals who shared their precious time, memories, and stories with us. Without their willingness to share personal recollections and manaʻo with us, this important study would not have been possible. The contributors below are arranged alphabetically by community participant.

[**Insert Name & Bio when consent is recieved**]

Kuʻulei Santos

Born and raised on the West side of Kauaʻi, Kuʻulei Santos shares her family connection to the Hanapēpē area, "My father was born and raised in Hanapēpē,. He lived right by Port Allen and he started making Hawaiian salt when he was a little kid, probably 10 or 11, I think. My grandmother lived on Niʻihau for a really long time. My dad's brothers were raised on Niʻihau so my family has pretty much been from that side of the Island."

Chad Shimmelfennig

Chad was born in Waimea, raised in Hanamāʻulu with ancestral and personal connections to Hanapēpē. He is currently a 5th grade teacher at ʻEleʻele Elementary. He incorporates a good deal of mea Hawaiʻi into his curriculum—using hale building, and loʻi and waterflow to teach math and culture, requiring his haumāna to kāhea (entrance oli) into their classroom, and talking geography through wahi pana. Chad has introduced school wide initiatives to normalize Hawaiian culture and protocols within everyday school routine. He was approached to share his manaʻo on the impacts of the proposed Hanapēpē full build out of up to 428 homes and how the increase in Hawaiian families, and students, would impact his and the schoolʻs ability to continue to reinforce Hawaiian values and incorporate culture into teaching for future DHHL beneficiaries and the larger Hanapēpē community.

Chad was recommended to us by DHHL beneficiaries who are parents of his (current and or former students).

Summary

At first glance, when the Nohopapa team took on this project and saw how mauka the study area we thought perhaps we would not need to focus to hard on salt or impacts in the Pūolo Penninsula. But the more research we did, we realized that there were direct connections between the project area and the mauka slopes to the Salt Pond area. Not only are they on the same geographical slope, tied together by surface and groudn water, but there were moʻolelo that traversed mauka-makai throught the study area. Most importantly perhaps, it was the commnity that pointed out how important ʻUkulā, Salt Pond, Shark Bay and Pūolo were to them, no matter where in Hanapēpē they lived. So, guided by research and the community, we cast our ʻupena a little wider

For this project we visited the BPBM archives, the Hawaiian Mission Houses Archives, the Kauaʻi Historical Society Archives and Nūpepa Hawaiʻi. Little was found in the Nūpepa Hawaiʻi on Hanapēpē. Community memebers [insert when consent recieved], Chad Shimmelfennig and [waiting for consent to add name] all commented on the lack of archival history about Hanapēpē, Hawaiian or English.

For whatever reason, little remains of the moʻolelo, ʻoli, mele, hula, and place names of Hanapēpē from historic times. We have found from talking with the community, and affirmed it through our own research, that even Hawaiian language repositories provide a void when it comes to researching Hanapēpē.

What we have found is that Hanapēpē, even at the time of the Mahele (1850s) had a large population, supported by agriculture extending deep into the valley. At theis time, paʻakai was being actively harvested at ʻUkulā to support mauka and makai food preparation and preservation. And there were active hula halau with kumu hula that were kaulana, *famous*, enough to have been named in 1857 nūpepa articles:

- Wahineaea
- Kaulaloa

Kumu hula in both past and present were often repositories of history through mele. As was written about in the Nūpepa section, as long ago as the early-mid 1800s Hanapēpē was place renowned for hula. The hālau Palaihiwa o Kaipuwai, established in 1945 by the late Kumu Hula Helen Kaipuwai Kekua Waiau taught hālau in Hanapēpē for a time. Her granddaughter and current Kumu Hula Kēhaulani Kekua spent time learning moʻolelo from area kūpuna in her grandmothers tradition.

Today there are twenty-two Hanapēpē ʻohana who make salt. Their families have roots to the area and have been passing down moʻolelo of the area as well as the traditional cultural practice of cultivating loʻi paʻakai. It is these families, grounded by practice, who that are most likely to have kept the old stories of the area alive. One well known kūpuna, and salt maker, the late Aunty Wilma Holi, shared share several moʻolelo of the area, passed down to her through her family, with ʻohana and friends in her time.

While much of the place specific moʻolelo of Hanapēpē are unwritten, and what is written is scattered in a variety of places, Hanapēpē has a rich Hawaiian cultural past and present. We were able to pull some place names out of historic maps and were likewise shared some by community members to create new maps compiling old places. Through the CIA process we were able to identify some Hanapēpē moʻolelo passed down orally, about places within and

around the study area; often emphasizing the connection from mauka to makai.

Additionally, interview mea has been incorporated into the following report section "Na Wahi o Hanapēpē" rather than segregating community voices we attemp to themetize the main discussions of our interviews with study research to provide a more wholistic discussion of the places and stories connected to the project.

Maika‘i Kaua‘i, hemolele i ka mālie.
Beautiful Kaua‘i, peaceful in the calm.[16]

Nā Inoa ‘Āina o Hanapēpē - Place Names of Hanapēpē

When people manage their resources and live in a place they develop an intimate relationship with that wahi. For Hawaiians that means the histories and stories of place, mo‘olelo, and the names, the inoa, that went along with them. Wahi were named or revealed their names, which were passed on by the kua ‘āina and the names and stories of these places endured for generations as common knowledge.

This section is an introduction to the portions of Makweli and Hanapēpē immediately surrounding and connected to the study area, wether geological or mythological.

Even though many of the wahi of Hanapēpē have new names, the old names and their stories endure. They are sometimes held in the memories of our kūpuna, pages of books, or rolled up in old maps. The word *wahi*, comes up frequently. According to Pukui and Elbert (1986, 2003) wahi is most simply: place.

> 1. n. Place, location, position, site, setting. (Ka wahi contracts to common kahi). Ma kekahi wahi, somewhere. Kēlā wahi kēia wahi, everywhere. Ma ia mau wahi, hereabouts, thereabouts. Ma nā wahi āpau, everywhere, wherever, universal.

The learning and remembering wahi inoa and wahi pana lead to the understanding of the stories behind naming, and provide insight into a place itself, its people, its roll in history, in everyday life, the depths of its resources and ways to better care for and protect it.

> Once spoken, an inoa took on an existence, invisible, intangible, but real. An inoa could be a causative agent, capable of marshaling mystic elements to help or hurt the bearer of the name. And, so went the belief, the more an inoa was spoken, the stronger became this name-force and its potential to benefit or harm.
>
> -Pukui, Haertig, & Lee 1972:94

Nohopapa Hawai‘i engages in a process of re-mapping that compiles wahi inoa, place names, from different sources – most pointedly historic maps—to re-map traditional landscapes with often “mis-placed” wahi inoa. We often too quickly jump to say we have lost place names, it is more hopeful to say we have lost them and it is only a matter of re-discovery and finding.

This re-mapping is an important tool for community interviews but its real value, we hope, will be as a resource for the Hanapēpē community. Figures 16 and 17, on the following pages, are maps compiling the wahi inoa of Hanapēpē in and around the Hanapēpē Hawaiian Home Lands.

The maps on the following pages are the compilation of both the archival research and ethnographic interviews conducted during this study.

[16] Pukui 1893, p224, ‘Ōlelo No‘eau no.2060, “Line from a chant.”

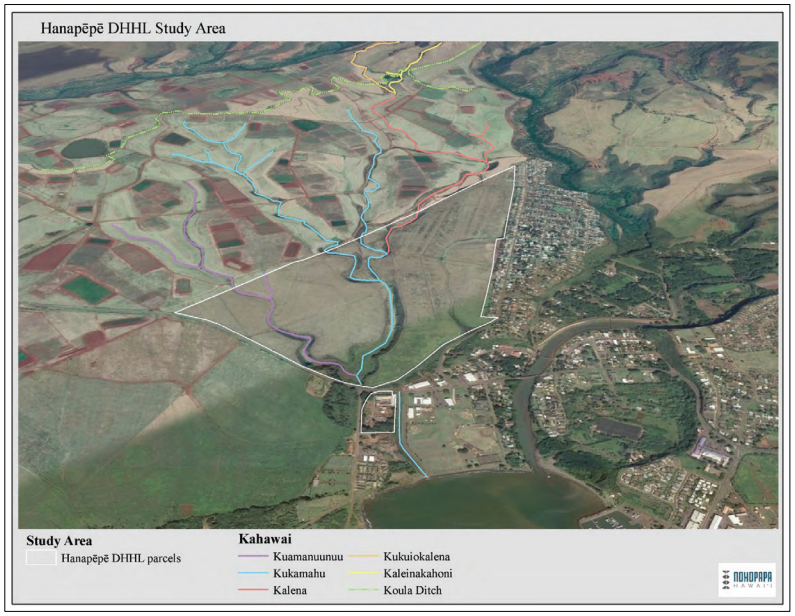


Figure 16. Map showing the stream gulches of the Hanapēpē DHHL parcels, their muli (feeders), and their traditional names.

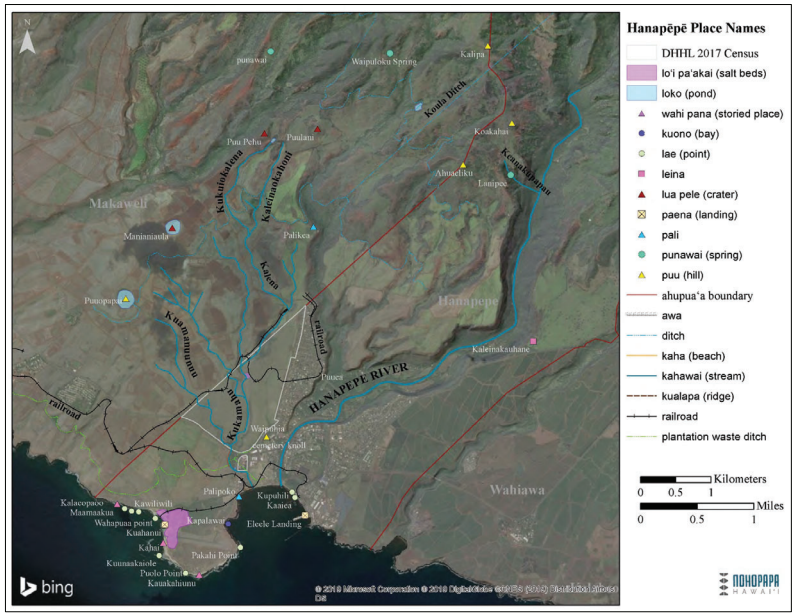


Figure 17. Map of traditional Hawaiian wahi, in and around project area, compiled from historic maps and archival sources.

Cultural Beliefs, Practices, & Resources Identified

Discussions of specific aspects of traditional Hawaiian culture as they relate to the study area are presented below. These discussions are based on information from ethnohistorical resources, archaeological investigations, and ethnographic information gathered for this cultural impact assessment. This information was assessed to identify cultural beliefs, practices, and resources associated with the project area as well as the areas and communities it has connections to (ie impacts) "to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in the assessment" (OEQC 1997).

Cultural landscapes encompass the unity between kānaka and the ʻāina. They are an integration of both natural and cultural resources as well as the cultures that value these resources. The concepts of mālama ʻāina and aloha ʻāina reflect the Hawaiian worldview of preserving and protecting both the natural and cultural resources found on the land. Nā kūpuna (the ancestors) depended on their cultural beliefs, practices, and resources for survival. Many of these cultural beliefs and practices have been passed down through the generations and today are still prevalent in different places, including Hanapēpē. Today, the right to perform Hawaiian traditional and customary practices is protected under Article XII, Section 7 of the Hawaiʻi State Constitution. Additionally, the *Guidelines for Assessing Cultural Impacts* state, "... although traditional practices may have been interrupted for many years, these customary practices cannot be denied in the future" (OEQC 1997).

The mindset of nā kūpuna evolved and developed over centuries; responsive to the natural environment. Today, our communities must be sensitive to and better understand nature and the environment to obtain a glimpse of how their kūpuna understood and lived within their universe. Every place, feature, resource, and atmospheric element in the Hawaiian universe was either utilized or recognized by nā kūpuna and often named, described, or recorded within moʻolelo, mele, and oli. These cultural traditions of the past help shed light on how our Hawaiian ancestors lived, what they thought about, and what they believed in.

The topic discussions on the following pages are the compilation of both the archival research and ethnographic interviews conducted during this study. These compiled reflections and discussions on the Traditional adn Cultural Resources in, around, and connected to the study area establish the cultural interconnectedness of these wahi.

Wai

Wai, water, is both the wealth of a land and its people and a signal of the health of the land and its people. Water, both fresh and brackish, underground and surface, has been a repeating theme of conversation during DHHL study area meetings, interviews, and off-record community conversations. It is certainly the one potential impact people are the *most* concerned about.

Mai uka i kai

Puʻulani, the puʻu above the study area and the wai hālau for the stream gulches that run through the Hanapēpē Hawaiian Homelands are connected to the kai at Salt Pond, ʻUkulā through moʻolelo involving some of the Pele clan.

> Puulani, 2.5 miles north of Hanapepe, is a cinder cone partly veneered by a thin flow of lava, It lies on the projection of the Makaweli Graben fault, and the rise of magma may have been localized by the fault (MacDonald et al 1960, p.69).

Puʻulani and its surrounding slopes are part of the same "localized" flow, this includes the slopes above the study area, the study area, and the slopes continuing down to Pūolo point and the Salt Pond area on the west side of Hanapēpē Valley.

According to Kumu Kēhaulani Kekua, Puʻulani is not merely a wahi inoa, but a wahi pana (a storied place). "It [Puulani] is one of the last places on Kauaʻi where Pele attempted to create a volcanic home for herself and her siblings" (Hālau Newsletter). [insert when consent recieved] Both Kuʻulei Santos and Kēhau Kekua shared Pele moʻolelo connecting Kamohoaliʻi to the study area, from his travels from Kapalawai (Shark Bay) mauka, along watery paths through underground tunnels and lava tubes to Puʻulani. This path takes Kamohoaliʻi directly through, albeit beneath, the study area.

Kumu Hula Kēhaulani Kekua was shared this story by respected Hanapēpē kūpuna and salt maker, the deceased, Aunty Wilma Holi.

> In the bay of Hanapēpē (referred to more commonly as Port Allen) are numerous hale manō or shark houses. It is said that a sequence of underground ocean lava tubes enables sharks and other ocean creatures to find their way up to fresh water pool of Manowaiopuna far up in Hanapēpē valley. Pele's older brother, Kamohoaliʻi is a shark god and the navigator of her canoe. He was known to frequent this upland retreat as a favorite place of residency whenever he visited Kauaʻi (Kekua, Hālau News Letter).

Geology in the area does not lend itself to large lava tubes that we find on Hawaiʻi island (MacDonald et al 1960). However, there are geological connections of the undrelying substrate mauka to makai. Perhaps these lava tubes are more metaphoric than physical, who can say? This moʻolelo does however layout the path of water flow, surface and subsurface, through the study area; establishing this connection from legendary times.

Kumu Kēhau reminds us, "As with other important natural resources in Hawaiʻi that were known to our ancestors, they were viewed as gifts from the gods themselves. The loʻi paʻakai at ʻUkulā in Hanapēpē are no different. And for this amazing resource, we are reminded of the kindness and generosity of Pelehonuamea, the goddess of fire and the volcano" (Ibid).

Water flow

Just as Kamohoaliʻi travelled upslope from Kapalawai (Shark Bay), in Port Allen, to Puulani in the uplands. Water flows from the stream gulches below Puʻulani, through the project area, and into the waters of Kapalawai. This understanding of movement, the direction of the flow of water in the area is reflected in this moʻolelo.

During storm events, the occurence of stream gulch and surface water run-off from the study area is easily visible for those who are inclined to kilo, observe. During heavy rain events, storm water run-off into Kapalawai, Shark Bay, and how the ocean is turned brown. It should be noted that Kapalawai is on the western curve of Hanapēpē Bay. It is clear when storm runoff is coming out of the plantation waste ditch. Widened at its mouth, in 1996, the old plantaion waste ditch funnels surface flow from the study area gulches, the highway and adjoining lands into the ocean alongside the Hanapēpē Ball Park. Currents pull that water along the western coast—

Palipoko, Kapalawai, Paakahi Point—and out to sea. This is different and separate than the flow entering the Bay on its Northeast end, from Hanapēpē River.

[Insert when consent recieved discussion of TPL & OSC acquisition].

Emerging wai

The earliest *historic* account we found of wai near the study area is in a nūpepa article. "He Wai Hou" or "A New Water Source." Printed in Ka Hae Hawaii 16 April 1856, this article explains the amazing appearance of a new spring in southern Hanapēpē on Puʻuopapaʻi, now present day Makaweli; at an elevation with and due west of the current study area.

Puʻuopapaʻi is a lua pele, or crater, it sits on the same slope as the project area, descending from Puʻulani and Puʻupehu. Puʻuopapaʻi was was utilized as a reservoir during plantation times. Like its neighbor to the north, the lua pele & reservoir of Manianiaula, Puʻuopapaʻi is connected to the Koula ditch system. Unlike Manianiaula, Puʻuopapaʻi is still an active reservoir. If it had not been modified as a plantation reservoir, the drainage for Puʻuopapaʻi would naturally have flowed into the gulches of uamanuunuu and Kukamahu, which intersect within the study area (See Title page and Figure X).

Paʻakai

It probably does not need to be said, but paʻakai and its making is deeply tied to Hanapēpē. In many ways paʻakai defines Hanapēpē in the modern psyche of Hawaiʻi. If someone mentions Hanapēpē to someone, lets say not from Kauaʻi, they very likely will think "salt."

ʻUkulā is the name most consistently found for the area where loʻi paʻakai are traditionally cultivated in Hanapēpē. Although ʻUkulā was identified on maps, one place name that we could not locate was pointed out to us by Malia Nobrega. The wahi "Kuunakaiawe," the name given by Christina Kali for the loʻi paʻakai in the ʻUkulā salt making area, in the KHS KCC film clip (c1974).

Salty wells

Kuʻulei Santos points out that where Hawaiian salt is cultivated is the lowest portion of the Salt Pond area. ʻUkulā sits is in a subtle depressed bowl. This low lying area is more sensitive to flooding and ponding during storms and high surf events, both of which can ruin the salt harvest. But this low lying area is an important place, where clay deposists are found and where a shallow hole can reveal clean salty springs, or wells, which are critical to salt making. Kuʻulei Santos explains,

> if you look at the kind of water that is in the salt making area, it's not 100% saltwater. It's a little bit of fresh water. And so the combination of it helps. It can't just be all salt water. So that's not just coming from the ocean. We don't really know what exactly happens underneath to give it all those elements to help us make Hawaiian salt.

The presence of a heiau and the moʻolelo that goes with it might help to explain the phenomenon. "There was a heiau at Pūʻolo point very close to the loko paʻakai at ʻUkulā, it was called **Kauakahiunu**" (Kekua, Hālau Newsletter). This heaiau was also recorded by Bennet (1931). The health of the salty springs at ʻUkulā are tied to this heiau and its akua (see no.51 in Figure 15 and Table 8).

> It [Kauakahiunu] was specifically dedicated to the primordial gods, Kāne and Kanaloa, who are revered for the opening of springs and water sources througout Hawai‘i. In most cases, they gifted people with fresh, sweet drinking water. However, at ‘Ukulā, they provided a system of brackish water (Kekua).

[Insert when consent recieved discussion of wells & depth sensitive pūnā at ‘Ukulā].

Ku‘ulei Santos gives a first hand account of her experience with the wells at ‘Ukulā, which support the Kāne Kanaloa mo‘olelo. Emphasizing a fine balance of salt and fresh water, a rare ankyalline habitat where the native ‘opae can be found.

> ..all the entities matter to us. The way the water flows underground into our tunnels. The way the clay appears in certain areas, that helps us build the clay pods. The way the brine shrimp kind of just shows up in our wells, it's all due to how everything flows together.

[Insert once conset obtained]

The origins of pa‘akai: Wai Maka o Kia

In the past, there were many centers for pa‘akai cultivation across the pae ‘āina – Honouliuli, Kalaemanō, Kawaihae. Perhaps Hanapēpē's renown is not merely for the endurance of the practice, but also because of its origins.

The following mo‘olelo was compiled by Kumu Hula Kēhaulani Kekua in a hālau newsletter, it was shared with her by Aunty Wilma Holi of Hanapēpē. It talks of the origin of salt making at ‘Ukulā in Hanapēpē, as well as the origin of food preservation – the salting and drying of fish.

> The mo‘olelo is centered around Kia – a woman from Hanapēpē who often traveled to the shores of ‘Ukulā to fish and gather food from the sea. One day, she experienced an unusual streak of luck and in her excitement, caught an overabundance of fish. Even after giving away portions of her catch to family, friends and strangers, Kia was left with a great excess of fish. She began to cry helplessly, knowing that she had taken far more than she had needed. The rest of the fish would rot and go to waste, poho.
>
> From beyond the sand dune where she sat crying, an elderly woman appeared to console her. When told of her dilemma, the woman gently took Kia's hand assuring her that she would help to resolve her problem.
>
> "Come with me," she said as she led the fisherwoman to an area just beyond the beach. She began to dig a pit in the ground until it filled up with water that came up from within the earth. "Put your fish in here for a little while, then dry it out in the sun," the woman told her, as she explained how the salt from the ocean spring would help to preserve the rest of her catch. Kia's crying subsided to a quiet stream of tears, grateful for the kind stranger who had appeared to help her. Assuring Kia that everything would be fine, the woman gently wiped the salty tears from her face and placed it in a basin of ‘alaea. The first salt is said to have come from Kia's tears.

> This marked the beginning of the famous lo‘i pa‘akai of ‘Ukulā at Hanapēpē. From that day on, the knowledge of cultivating Hawaiian salt was spread amongst the people, along with its significance for preservation, purification and cleansing.

Ku‘ulei Santos had a similar salt making story, although she did not name the crying woman. Ku‘ulei's account expands on the identity of the elderly woman.

> They said the lady who appeared from the bushes was Pele. They say Pele was hanging out over there because she liked the shark god who liked to visit her so he would swim underground in the tunnels. The way Hawaiian salt is made, water flows underground into our wells. So they say that's why, she [Kia] wasn't allowed to go to the ocean. They also call that bay right there before Salt Pond or Puolo Point, Sharks Bay.

‘Ōlelo No‘eau on pa‘akai:

Continuously...since before written history, ‘ohana in Hanapēpē have been making salt. Salt was important to survival in subsistence (pre-refrigeration) times, and it is still important today. It is what we eat in every meal. We use it to dry fish, dry meat, tenderize, preserve and flavor our mea ‘ai. It is no wonder there were specific ‘ōlelo no‘eau dedicated to pa‘akai.

No.1082, pg115:

> Ho‘okāhi no ‘ōpae, ‘ula ka pa‘akai.
> One shrimp can redden the salt.

Said of a poor fare of food due to a bad crop. A single shrimp and some salt will do for the time being, as long as the shrimp flavors and colors the salt.

No.1216, pg.132:

> I komo ka ‘ai i ka pa‘akai.
> It is the salt that makes the poi go in.

Poi tastes much better with salted meats, If there is no meat, one can make a meal of *poi* and salt.

No,375, p46.

> E pū pa‘akai aku a pa‘a ka houpo.
> Take a bit of salt till the diaphragm is solid.

Said by one whose fare is humble, consisting mostly of *poi* with salt or *kukui* relish. "Eat till you are satisfied of this humble fare."

No.252, p31:

> E ‘ai i kēkakhi, e kāpī kekāhi.
> Eat some, salt some.

Said to young people: Eat some now and save some for another time.

No.972, p104:

> He wahi paʻakai.
> Just a package of salt.

Something good; a gift of anything one has grown or made.

Like most wai, paʻakai, salt is one of the most universally appropriate hoʻokupu one can offer as makana. It is both sacred and noa. As Kumu Kēhau Kekua writes, "Our kupuna knew that the establishment and continued existence of the salt beds involved a greater relationship with the sites that surrounded it. They also acknowledge the powers of nature for such profound gifts and resources that supported their well-being" (Hālau Newsletter *Na Loʻi Paʻakai Kahiko*).

Salt under threat

One of the best things about Hanapēpē salt is that is isn't a commodity, or at least it cannot be bought. It is something that is gifted. A cultural tradition that tourists cannot buy. There's something sacred in that. Yet, when we get salt nowadays its in gallon bags instead of 5-gallon buckets. Kuʻulei Santos openly acknowledge the change,

> Back in the day, we used to give away five-gallon buckets. If you asked me for Hawaiian salt, I would give you a five-gallon bucket. Now, we can't give. Someone asked me yesterday for 25-pounds of Hawaiian salt. I'm like, 'We haven't made Hawaiian salt last year. I can't give you that as much as I would like to.'

Salt in Hanapēpē is under threat. The salt making season hasnt been consistent. There have been wet seasons, wet years (2018), and storm surge in the winters inundating the beds. The wells are affected by each other and other subsurface impacts. Clay deposits are becoming more scarce.

> It's a lot harder to find some of the things that were so abundant in the past. Like the clay that we use to make the actual salt beds used to be so easy. Now it's like, you know, you ever watch that movie *Holes* and then you see all the like piles of dirt? There is that movie where it's holes and they're digging for treasure. And so you look on the desert and then there's all of these like mounds of dirt. That's what salt makers look like now. We're trying to dig for clay. During the summer, you'll see like all these hills of clay but you can't find it anymore. So it's harder and harder to find the clay to make Hawaiian salt."

Kuʻulei and other salt makers are worried about the future of Hanapēpē paʻakai. They are the practitioners but all ofKauaʻi, in fact all of the pae ʻāina benefits from paʻakai. In her Newsletter Kumu Hula Kēhau Kekua writes,

This paʻakai [from ʻUkulā] is very special. For those of us who do not have regular access to paʻakai harvested from Hanapēpē, it is downright sacred. Although its intitial and more common use was for the preservation of food, I only use this paʻakai for ceremonies, healing and to offer as special makana and hoʻokupu.

As the Hawaiian comunity expands in Hanapēpē so to does the kuleana to protect its cultural resources and traditions.

Makani

[additional makani to add when consent recʻd]

A more mauka wind near the project area is the **Unulau** (Stone et al, 2013).

A mauka wind, from the source of the waters in mauka Hanapēpē is the **Makaupili** (Ibid).

Mauka - Makai Connections

At the apex of the Hanapēpē watershed is its wai hālau, the source of the fresh water in the ahupuaʻa.

These moʻolelo establish places around the study area as legendary, storied places, wahi pana. Moʻolelo specifically connect the craters and cinder cones immediately around the study area to Pele and the waters at ʻUkulā and of mauka Hanapēpē to Kāne. Most importantly these moʻolelo layout the interconnectedness of the landscape through waters above and below ground.

There are two Lua Pele (and reservoirs), Puʻu o Papaʻi and Manienieula, and one cinder cone, Puʻulani, in the lands around the Hanapēpē Hawaiian Homelands that are attributed to Pele and her time in the Hanapēpē area.

> In the bay of Hanapēpē (referred to more commonly as Port Allen) are numerous hale manō or shark houses. It is said that a squence of underground ocean lava tubes enable sharks and other ocean creatures to find their way up to fresh water pool of Manowaiopuna far up in Hanapēpē valley. Pele's older brother, Kamohoaliʻi is a shark god and the navigator of her canoe. He was known to frequent this upland retreat as a favorite place of residency whenever he visited kauaʻi.
>
> Puʻulani is the name of a cinder hill at Hanapēpē Heights. It is one of the last places on Kauaʻi where Pele attempted to create a volcanic home for herself and her siblings.
>
> Our kupuna knew that the establishment and continued existence of the salt beds involved a greater relationship with the sites that surrounded it. They also acknowledge the powers of nature for such proground gifts and resources that supported their well being.
>
> There is a moʻolelo or story that has been passed down through the years. It tells of the very beginnings of how these salt beds came to be. As with other important natural resources in Hawaiʻi that were known to our ancestors, they were viewed as gifts from the gods themselves. The loʻi paʻakai at ʻUkulā in Hanapēpē are no different. And for this amazing resource, we are reminded of the kindness and generosity of Pelehonuamea, the goddess of fire and the volcano.

One 1850s Hawaiian nūpepa article cites Hanapēpē as a "leina" or dwelling place for spirits.[17]

[17] Nupepa Article 1. Moolelo Hawaii Helu 13, Ka Hae Hawaii, 12 July 1858.

The article is unspecific as to a place, Kumu hula Kēhaulani Kekua (Ibid) identified one of the few leina ka ʻuhane on Kauaʻi as being,

> ma kai of the airport is Lae Pūʻolo or Pūʻolo Point – a promontory that has long been known to us as a leina ka ʻuhane. This is one of three known leina or jumping off points from which the spirits of deceased ancestors are believed to leap into the nether land of the Pō. The others are Kaʻena and Polihale.

There is a stream gulch, Kaleinakahoni, whose source is Puʻu Lani. Kaleinakahoni flows into Kalena gulch which flows across a portion of the project area before feeding into Kukamahu gulch, the main gulch dividing the project area.

Traditional subsistence, and modern Hawaiian subsistence, for many Kauaʻi families, draw from both mauka and makai. Mauka resources include pig hunting, laʻau gathering, which includes wood for hana noʻeau as well as wood for smoke houses. Laʻau for lei and hula as well as laʻau lapaʻau. Accessing important springs, natural reservoirs, and streams for both daily uses and ceremonial use reinforce pilina and maintain the histories and stories of place for future generations.

Continuing Hawaiian Cultural Education

Chad Shimmelfennig did express concern that with a full build out of 428 new households for the DHHL Hanapēpē project, coupled with the several hundered in the Limaloa affordable housing development that is happening concurrently,

> ...I don't think there's enough infrastructure there [ʻEleʻele school]. The campus is large enough and I know firsthand that our administration has requested more buildings and larger infrastructures. And right now, we're going the opposite direction because another private charter school has opened. So it's kind of taken away a lot of resources from us. At the same time, we're going to have an influx of more resources, which increases the amount of teachers we're going to need. Coupled with the shortage of teachers in Hawaiʻi. Its going to be a double-edged sword. Because we have 500 homes here being built, we have another 400 there. We're almost near maximum capacity here."

Although it will be a challenge for the DOE to increase its capacity to provide for >600-800 future Hanapēpē households, DHHL beneficiaries and others, Chad sees an upside. If at least half of those additional Hawaiian households Hanapēpē are Hawaiian he believes the influx of Native Hawaiian students, kānaka, could have a positive impact, increasing the in school need and demand for integrate Hawaiian cultural education.

> But I don't think it's going to affect the way classes are being taught because the way we're trying to focus things is it doesn't matter who you are, where you're from. This is our culture (Hawaiian). You come to Hawaiʻi, you're going to learn about Hawaiʻi. It's just that simple. Now with the increase of the Hawaiian kids, it's going to make it even more powerful because I see a lot of the parents haven't gone through things like this. So they're seeing this for the first time. It will only increase the amount of awareness in our community with our kids having a school with those kinds of foundational concept of Nā Hopena Aʻo. To increase the awareness in the home, they're seeing things in ʻōlelo Hawaiʻi and the parents say, 'What are you talking about?' So I've seen where parents have even taken a next step and they go out and learn now (ʻōlelo Hawaiʻi). Or they're doing Duolingo with their kids in the car. They're having these conversations. It's not just you come here, you learn.

Chad cautions that such a large growth of even Hawaiians in the 'Ele'ele student body doesn't necessarily mean they will be Hawaiians from Hanapēpē. Or that new teachers will be Hawaiian or from Hanapēpē. He says that as long as teachers place an importance and priority on Hawaiian culture, haumāna, Hawaiian and otherwise are drawn to that.

> A lot of times it's us as teachers, we're just not comfortable being uncomfortable. We're supposed to be the wealth of knowledge or the source of knowledge. Whereas, we got to teach for the kids in our culture, our wahi pana, and their kuleana for living in this area, and what to expect when they move out from this area. And with the kids being invested in this, it should increase the amount that they would like to learn or want to learn. Luckily, we have such a great community and the ability to do these things.

To help accomplish this Chad recommends teacher take advantage of a DOE program that offers free ʻōlelo Hawaiʻi (Hawaiian language) classes to its employees.

> When you come into our class, a lot of what you learn, you will learn in both languages. I look at and live by the quote 'To be the teacher you wish you had when you were younger' every day.

[insert mele mea when consent obtained]

Cultural Resources – Kamaʻāina and ʻOhana

Several participants lamented the loss of knowledge about Hanapēpē during the missionary and plantation era. We as researchers for this project also turned up with little from Hawaiian archival and even Hawaiian language sources. However, there are pockets

Chad also specifically named "a legacy kūpuna" Aunty Janet Kahelekomo. Books, *What is Hanapēpē?* and *Why they call it 'Ele'ele?*

- » "We're lucky to have a few legacy kūpuna like aunty Janet Kahalekomo whose seen a lot of changes in Hanapēpē. There's books such as *What is Hanapēpē?* which has three versions and *Why they call it 'Ele'ele?*, regarding the battles that happened here. We're still discovering heiau way up in the mountains right now. We know Hanapēpē through the nūpepa which was predominantly a kalo farming area which had a good irrigation system. A lot of kalo was grown all up and down this valley. And then from there, we had houses, we had a lot of wars. From the stories I've been told from my dad and from his grandfather, the theater was like one of the main hubs from West side, South side, even Līhuʻe. You came here to watch movies, have drinks. This was the place to be. We call it the little big town now. Stories from my dad taught me, we'd be driving down here, he'd be like, 'Oh, there was that, there was this over here. Your grandfather said that was over there.' The massacre (the Hanapēpē massacre) that happened, my grandfather was a witness. So stuff like that, you make connections. It's really cool to hear these things."

- Chad also sees the Hanapēpē Community itself as a valuable resource for cultural connections and education for students and new communities.
- As far as resources, we have an abundance of resources. We have people that have been living here for generations that have this ʻike about this area. If you want to go talk paʻakai, you can go see the source... If you want to go talk about hunting, we have such a

bright and vibrant community. You say something and someone will say, 'Oh, go talk to this person. Go talk to uncle so and so.'

Natural Resources and Practices

Makai of the project are at the coast there are still native lowland indigenous and endemic plants. One interviewee mentioned that there are no more native plants. Another said that she has observed several species and that they are coming back. [insert native plants observed at Pūolo when consent received]

The project area and much of the surrounding lands to the north and west were under sugar or in cattle from 1865-1941. Whatever native forest and plants had once been within the study area have been gone fore over 100-years.

Hanapēpē is famous for having had the kahuli (Carelia knudseni), native arboreal snail, in abundance in its upland forests (Cooke 1931). The kahuli are now extinct in Kaua‘i’s forest, the only wild populations are on O‘ahu and they are under threat. Although lacking kahuli, there are still forested uplands above the former sugar lands; including native forests.

Access

At the apex of moi road, a dirt road continues mauka where one *would* go to access the wao kele and its resoures; la‘au, pua‘a, etc. During both the DHHL Benficiary Meeting for existing leasees and the County of Kaua‘i West Kaua;i Plan Update meeting on Historic Resources, all those asked about mauka access above DHHL lands referred to the locked gate at the top of Moi road. That area had always been “G&R” or Gay and Robinson lands.

A northshore resident, who wished to remain anonymous, mentioned that he had gone hunting up above Moi Road on G & R lands, but that was because he was friends with the land owner; “...not just anybody can go holo over there.”

At DHHL Public meeting No.1, two wahine, who did not give us permission to use their names, shared that, as children, they remember going swimming in a moss lined ‘auwai above Moi road. This was possibly part of the Koula Ditch.[18]

[18] Looking at the map together we agreed it was very likely a portion of the Koula Ditch.

Study Recommendations

Based on interviews, consultations and comments we received at community meetings, this final section is a summary of community recommendations. We encouraged people to offer solutions whenever they had concerns and included those when they were given.

1. Mauka Access in design. Even if there is no access now, plan for the possibility of future access, who knows in two+ decades?

Gay & Robinson, are the current large surrounding landowners mauka of the study area, and access is restricted through their lands by fences and gates; specifically, a gate at the apex of Moi Road. At present there is no access to the upland forests and their resources for DHHL beneficiaries *at this time*. Although it is not common knowledge, there has been access in the not too distant past, where some community members would acces the waterways and wao kele (the forested) areas mauka of the study area.

It is possible, and hopeful that community access will one day be restored. The value of these resurces to the continued practice of Hawaiian culture and to the ability of any future DHHL community for subsistence hunting and gathering is clear.

The suggestion was made two us by (anonymous) beneficiaries at a DHHL Hanapēpē public meeting, that the possibility of future access be taken into account during development.

- Include road acces up to currently locked gates and/ or fencelines so that if upland gathering, hunting, etc access is available in the future the infrastructure will be in place.

2. Makai Access, ensure safety. Worries were expressed to us over the speed at which vehicles travel on Kaumuali‘i Highway along the stretch bordering Hanapēpē Hawaiian Home Lands and the intersection of Kaumuali‘i Hwy with Lele Road and Hanapēpē Road.

Keeping that in mind, addressing the high rate of speed in that down hill area is important. Three community members seperately mentioned a round-a-bout. Unsure if that is a current DOT or county initiative or if that is a community idea? It could ensure a safer merge and crossing for DHHL homesteaders from Hanapēpē Heights, Moi Road, onto Kaumuali‘i Highway or accesing makai resources.

When thinking about additional driveway onto main highway, consider that access for DHHL beneficiaris will not just be to get onto, but *accross* Kaumuali‘i Highway to access kai cultural resources.

As DHHL continues to work with DOT for additional access from its lands to Kaumuali‘i Highway for full build out, it seems important not to overlook safe access for its beneficiaries across the highway. Fishing, salt making, gathering, surfing, divining and paddling are all important cultural practices accessed through the busy intersection of Lele Road and Kaumuali‘i Highway.

3. Makai access, limiting of access to dunes and education.

Continued driving on the dunes has the effect of compacting the clay substrate beneath the sand – affecting the well used for salt making, it prevents native plant species that grow on the dunes from flourishing - increasing dune erosion and kicking up dust and debris along a very windy

shoreline—all of which are detrimental to the local ecosystem and salt production.

Pōhaku barricades were recently installed on the east (ʻEleʻele end) of Hanapēpē Salt pond to prevent driving and parking on the dunes. Access & use adversely affects community cultural resources. The County installed barricades, but have done nothing to educate the community about why they are there. Uninformed access & use adversely affects community cultural resources.

The salt makers would like to see new homesteaders informed about ways to take care of the makai area. So that protection of the area has more community buy in. The idea is that informed access and use can help preserve and even restore the resources in the area.

4. Signage – one interviewee indicated that the salt making families might be willing to work with local land managers to provide educational signage about the area.

Providing visitors with some history and guidance on being respectful. Note that in the past the salt making community was reluctant to take this step.

5. Education – Coordination with Hui Paʻakai for homesteader and larger community education about history, protocol and ways to mālama makai ecosystem and resources.

Signage was suggested by Kuʻulei Santos and Malia Nobrega as one way to educate visitors and new community memebers alike. Another suggestion was a cultural space or center when DHHL develops its makai parcel. Education about salt, fishing, native plants, and other makai resources that homesteaders might engage with as traditional cultural practices are important to prevent negative impacts to the surrounding area.

It is recommended that DHHL reach out to the Hui Paʻakai to establish signage, huakaʻi, workdays, or even handouts for new homesteaders. This sharing of ʻike would help knit together a growing community, help Hanapēpē mālama its precious makai cultural resources, share stewardship of an important ecosystem and a threatened cutlural practice. If DHHL does not try to mitigate the influx of a potential 400+ households on the immediate makai cultural resources, there is clear potential for negative impacts to the area.

Creating cultural connections with new homesteaders to Hanapēpē is an important step towards growing a healthier Hawaiian community. Through active engagement and restoration, new Hawaiian Homesteads in Hanapēpē could positively impact cultural resourcs and grow traditional cultural practice. Wether there are opportunities to learn about salt making, clean up mālama kahakai days, native outplanting and restoration workshops, place name and hsitorical sharing, or makai resources education; these are all pathways for homesteaders to grow their pilina with Hanapēpē. The relationship of people to place is the foundation of a Hawaiian community.

Include a new homesteader welcome packet to include educational material particularly about makai access and existing protections and potential future protections for cultural practices. Including reduced driving access on east end of Hanapēpē salt pond.

Those who were informed about reasons behind actions had more positive reactions.

6. In school education – A growing Hawaiian population, especially after max build out of the study area, will increase the needs and awareness_of Hawaiian cultural traditions in the

area, not only for Hawaiian, but all students.

Chad Shimmelfennig, in his role as a teachers at ʻEleʻele School, implements a great deal of traditional Hawaiian cultural practices and education into his curriculum and school activities. He said that an increased Hawaiian school age population, that we could see after full project build out, would be a *positive* impact.

DHHL, developer, and or Homestead association coordination and communication with ʻEleʻele school and even Waimea High to ensure there are positive impacts to Hawaiian education and cultural intergration into schools commensurate with increased Hawaiian haumāna with full build out. Perhaps DHHL or future planning can poll incoming awardees about their needs and hopes for Hawaiian cultural education at ʻEleʻele school.

7. Cultural space.

When a more detailed development design is made for the DHHL Industrial lot it should be noted that several people expressed the need for Hawaiian cultural community space. The level of request varied from "space" to a "cultural center" to things more general, educational opportunities, resources, library.

8. Ground water – There were worries expressed over the potential for contamination.

Depending on what septic, drainage, and water sources are used for houseing and irrigation. (salt beds use wells to fill the salt pans). Request that proper studies (current and future), monitoring, design, and best practices will be used.

In addition, if wells are drilled for other phases, the Hui Paʻakai would like to be re-consulted about their impacts since it was not a component of this study. It was pointed out that most regulations protect fresh, drinking, ground water. The wells for loʻi paʻakai are a special salty ground water and might not be taken into account.

9. Storm water – Run off from Kukamahu, which crosses the study area, meets the sea at the base of Palipoko near Kapalawai bay (Shark bay) across from Port Allen.

Concerns over surface paving, concreting and increased surface run-off were expressed; the effects and potential impacts on the fishery and tidepools along the east and southern tip of the ʻUkulā Penninsula.

Salt makers believe that any water run-off from the areas mauka of ʻUkulā has the potential to adversley affect the salt beds and affect the tidepools arond Pūolo Point, the nursing grounds for the mature fish people catch and eat. Pūolo is probably the closest and best resource for traditional cultural kai (ocean) access for current Hanapēpē residents. It will be the same for future Hanapēpē Hawaiian homesteaders.

Gulch – Management. It was noticed that the gulch area will be open.

One community member asked who will manage gulches? For flooding, invasive species? One consultee suggested using it as a resource for gathering. Instead of mowing, plant native plants that will help with soil retention and provide cultural resources for the community: lei, laau lapaau, mea ai, etc.

Itnerviewees suggested active gulch management with native plants as a resource and invasive

control. Monitoring of debris and material entering the gulches. Any restoration and montioring efforts could serve and a way to educate and connect homesteaders about wai, place names, native plants and their uses, as well as the value of things through the active mālama of their place.

*It was noted that the Curator of Living Collections at NTBG South Shore Gardens, is a current Hanapēpē Homesteader. He would be a valuable resource and contact to consult on any initiatives like those recommended.

10. Additional Research

While extensive research into the Nūpepa Hawaiʻi has been done for this project, a more extensive record of those living in the Hanapēpē area –than this CIA covers—would be valuable in order to record what the present populace has maintained or lost, in terms of area history.

Wewere no able to interview one respected area kūpuna in the course of this study, Janet Kahelekomo. Based on our interviewees comments, we recommend future research to include her voice.

In Sum

All those we talked to were not opposed to the proposed project. Their main concerns were that the process, design, and build out be thoughtful. And that Hawaiian Cultural Resources be protected and even restored as a result of the development of a new Hawaiian homestead area.

To close, this report we will leave you with one of Kuʻulei Santos's recomendations for future residents of Hanapēpē to culturally interact and connect with place.

> For me, I like to tell everyone that my house is bigger than the home that I live in and everybody has to remember that. If everybody would take the time to understand the area that they call home and what makes that part important and how can we help protect or how can we be mindful.
>
> People just need to remember that when you're calling a place home for all these 400 [new homesteaders], it would be nice if there was a little packet to say, 'These are the important things in Hanapēpē. These are the historical sites in Hanapēpē. This is what makes it unique or important and this is what you should do to help perpetuate or protect or at least learn about your town." Please understand why you're choosing Hanapēpē to be the place that you want to call home…"

References Cited

Aikau, Hokulani K. And and Vernadette Vicuna Gonzalez, editors

2019 *Detours: A Decolonial Guide to Hawaiʻi*. Duke University Press.

Alcantra, Ruben

1988 *Filipino History in Hawaii Before 1946: The Sakada Years of Filipinos in Hawaii*. UH Mānoa, Hawaiian & Pacific Collections. Accessed on Scholar Space December 17, 2018.

Bennet, Wendell Clark

1931 *Archaeology of Kauai*. Bernice P. Bishop Museum, Bulletin 80, p.170-195.

Bingham, Hiram A. M.

1855 A *Residence of Twenty-One Years in the Sandwich Islands or the Civil, Religious, and Political History of Those Islands*. Canandaigua, NY. Publisher, Goodwin, H. D. Goodwin, Auctioneer.

Chapin, Helen Garcimos

1989 *From Makaweli to Kohala: The Plantation Newspapers of Hawaiʻi*. The Hawaiian Journal of History, vol. 23, p.170-195.

Cooke, Gr. C. Montague

1931 *The Land Snail, Genus Carelia*. Bishop Museum Bulletin 85, Honolulu.

Commission of Boundaries for the Island of Kauai

1873 Boundary Commission Book: Hawaii, Kauai, Maui, Oahu, p81-83, Certificate 17, Boundary of the Ahupuaa of Hanapepe. Hawaiʻi State Archives, Honolulu.

Curtis J. Lyons to C. P. Iaukea

1893 December 6th. Interior Department Land Letters (IDLL). Honolulu, Hawaiʻi State Archives.

Elbert, Samuel H and Noelani Mahoe

1970 *Nā Mele O Hawaii Nei: 101 Hawaiian Songs*. University of Hawaii Press. Honolulu, HI.

Environmental Council, State of Hawaii

1997 *Guidelines for Assessing Cultural Impacts*. Adopted by the Environmental Council, State of Hawaii, November 19, 1997. OEQC-CIA Guidelines.

Foote, Donald E., Elmer L. Hill, Sakuichi Nakamura, and Floyd Stephens

1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai*. State of Hawaii. U.S. Dept. of Agriculture, Washington, D.C.

Fornander, Abraham

1878-1885
An Account of the Polynesian Race, Its Origin and Migrations and the Ancient History of the Hawaiian People to the Time of Kamehameha I. 3 vols. Trubner and Company, London.

Fornander, Abraham, and Thomas G. Thrum

1916-1917
Fornander Collection of Hawaiian Antiquities and Folk-lore: The Hawaiian Account of the Formation of Their Islands and Origin of Their Race, With The Traditions of Their Migrations, etc., As Gathered From Original Sources. Vol.4-Part I,II. Honolulu: Bishop Museum Press.

1918-1919
Fornander Collection of Hawaiian Antiquities and Folk-lore: The Hawaiian Account of the Formation of Their Islands and Origin of Their Race, with the Traditions of Their Migrations, Etc. Bishop Museum, Honolulu, HI.

Gay, Francis

1873 Journal of Francis Gay 1852-1928. Bernice Pauahi Bishop Museum.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte

2013 Online Rainfall Atlas of Hawai'i. Bulletin of the American Meteorological Society volume 94, pp. 313-316, doi: 10.1175/BAMS-D-11-00228.1. Electronic document, http://rainfall.geography.hawaii.edu (accessed 10 April 2014).

Haleole, S.N., and Martha Beckwith [translator]

1918 *The Hawaiian Romance of Laieikawai.* Washington: Govt. Printing Office.

Handy, E.S. Craighill and Elizabeth Green Craighill

1940 *The Hawaiian Planter Volume 1.* Bishop Museum Bulletin 161. Bishop Museum, Honolulu.

1991 *Native Planters in Old Hawaii: Their Life, Lore, and Environment;* Revised Edition. Bishop Museum Press: Honolulu, Hawaii.

Hawaiian Sugar Planters' Association

1969 (revised) HSPA Sugar Manual. Hawaiian Sugar Planters Association, Honolulu and Washington D.C. Native Planters in Old Hawaii: Their Life, Lore, and Environment; Revised Edition. Bishop Museum Press: Honolulu, Hawaii.

Hawai'i Tax Map Key (TMK)

2015 Tax Map Keys: [4] 1-8-007:003, 1-8-008: 035, 081, 086, and 087. Paper and digital copies on file at Kaua'i County Real Property Tax Assessment Division, 4444 Rice Street, Suite A-454 Lihue, Hawai'i 96766.

2018 GIS shapefile, County of Kaua'i, April 2018 update. By the County of Kauai GIS and the Real Property Assessment Division, Department of Finance.

Hori, Joan

2001 *Digitization for Preservation of an Important Hawaiian Language Newspaper: Background and Historical Significance of* Ka Nupepa Kuokoa. Hamilton Library, University of Hawai'i at Mānoa online resource at http://libweb.hawaii.edu/digicoll/nupepa_kuokoa/kuokoa_htm/kuokoa.html . Accessed 3-November-2019.

'Ī'ī, John Papa

1959 *Fragments of Hawaiian History.* Bishop Museum Press: Honolulu, HI.

Kekua, Kēhaulani (Kumu Hula)

unknown *Na Lo'i Pa'akai Kahiko: The Ancient Salt Befs of 'Ukula at Hanapepe.* Newsletter from Hālau Palaihiwa O Kaipuwai, public copy in State of Hawai'i DLNR: Testimony of the Chairperson of the Board of Land and Natural Resources, House Concurrent Resolution 117. March 24, 2008.

Kuykedall, Ralph S.

1938 *The Hawaiian Kingdom Volume I: 1778-1854 Foundation and Tranformation.* University of Hawaii Press, Honolulu.

Land Commission. Kingdom of Hawaii (ms in HawaiiState State Archives.)

n.d. Awards Book
n.d. Native Testimony
n.d. Native Register

MacDonald, G. A., D. A. Davis, and D. C. Cox

1960 *Geology and Ground-Water Resources of the Island of Kauai.* USGS Bulletin 13, Hawaii Division of Hydrography. Honolulu, Hawaii, Prepared in cooperation with the Geological Society, US Department of the Interior.

Buke Mahele

1848 Buke Kakau Paa no ka mahele aina i hooholoia iwaena o Kamehameha 3 a me Na Lii a me Na Konohiki ana. Hale Alii Honolulu. Ianuari 1848. [He kope 1868.] ms in Hawaii State Archives.

Nakuina, Moses K.

1992 *The Wind Gourd of La'amaomao.* Second edition. Esther T. Mookini and Sarah Nākoa, translators. Kalamakū Press, Honolulu.

Nūpepa, Ka Hae Hawaii

1856 He Wai Hou [Honolulu]. 16 April 1848. www.nupepa.org
1857, August 5. No ka Hula ma Hanapepe, Kauai [Honolulu]. www.nupepa.org.
1858, July 21. Moolelo Hawaii Helu 13 [Honolulu]. www.nupepa.org.
1858, November 10. Hoolaha[Honolulu]. www.nupepa.org.

Nūpepa, Ka Nupepa Kuokoa

1864, August 27. *Ka Puni Lealea ma Hanapepe*. www.nupepa.org.
1866, February 10. *Inu Awa ma Hanapepe Kauai*. www.nupepa.org.
1866, November 10. *Ko Hanapepe Mau Mea Hou*. www.nupepa.org.
1921, May 27. *Ka Hoopii a ke Teritore no na Aina ma Hanapepe*. www.nupepa.org.
1922, October 26. *Hoolaha Kuai o ka Aina Aupuni ma Hanapepe Kauai*. www.nupepa.org.

Pukui, Mary Kawena

1983 *ʻŌlelo Noʻeau: Hawaiian Proverbs & Poetical Sayings*. Honolulu: Bishop Museum Press.

Pukui, Mary Kawena, Samuel H. Elbert

1986, 2003
Hawaiian-English Dictionary. Honolulu: University of Hawaii Press.

Pukui, Mary Kawena, Samuel H. Elbert, and Esther T. Mookini

1974 *Place Names of Hawaii*. Honolulu: University of Hawaii Press.

Rice, William Hyde

1977 *Hawaiian Legends*. Originally published 1923. Bernice Pauahi Bishop Museum, Honolulu.

Sato, H. H., W. Ikeda, R. Paeth, R. Smythe, and M. Takehiro, Jr.

1973 *Soil Survey of the Island of Hawaii*, State of Hawaii. United States Department of Agriculture, Soil Conservation Service.

Spencer Mason Architects

1989 *Historic Bridge Inventory: Island of Kauaʻi*. Department of Transportation, Highways Division, Honolulu.

Stone, Kapōmaikaʻi, Lindsey Spencer, and Iāsona Ellinwood

2013 *Nā Makani o Kauaʻi-a-Mano: Wind Names of Kauaʻi from Moses Kuaea Nakuina's The Wind Gourd of Laʻamaomao*. Map for Kahua Aʻo: A Learning Foundation. Hawaiʻi State GIS & UH Mānoa SOEST: SEER.

The Garden Island

2011 *Island History for Friday*, August 12, 2011. Hank Sobeleski.

United States Geological Survey.

n.d. Board on Geographic Names, Geographic Names Information System. various dates Topographic maps of the Islands of Niihau, Kauai, Oahu, Molokai, Lanai, Maui, Hawaii. 1:24,000, 7.5-minute series.
1998 Honolulu USGS Survey 7.5-Minute Series Topographic Quadrangle.
Available at USGS Information Services, Box 25286, Denver, Colorado.

Winieski, John, Victoria S. Creed, and Hallett H. Hammatt

1996 *Archaeological Monitoring of the Hanapēpē Drainage Improvement Project*. Finance, Housing, and Development Corporation (FHDC), State of Hawaii.

Appendix A: Nūpepa Sources

Moolelo Hawaii Helu 13, Ka Hae Hawaii, 12 July 1858

"UA MAU KE EA O KA AINA I KA PONO."

BUKE 3. HONOLULU, OAHU, IULAI 21, 1858. ANO HOU.—HELU 16.

MOOLELO HAWAII.—Helu 13.

No ka uhane mahope iho o ka make ana o ke kino.

Aunee kulike ole ka manao o na kanaka kahiko o Hawaii nei no ke Uhane mahope iho o ka make ana o ke kino. He eholu wahi e noho ai ka Uhane, wahi a Iakua. Oia hoi, o ka lua o Pele, o Kilauea no ia, oleko o na wai, a me ka aina maloo.

Ina i make ke kino o na alii, a o kona mau kanaka ponoi paha, a me na kahu Pele, alaila, e hai ko lakou Uhane i ka lua o Pele, a e lawelawe mai na kahu Pele, a me k-na pu kanaka, e like me ka noho ana ma kela ao. A o na kahu Pele, o lakou keia pu paaka, a he mau luna hoi maluna o na kanaka ai pupupu, a iole ia, o keia pu kahu ponoi no. I ka noho ana o keia mau Uhane mai ia, ina makemake lakou, e hele ana ia ka ulu wale no, aala, kalo, maia, apu, hapuu, a ma keia manao o lakou la, a i maloko keia, e kana pu ia ia ai, ia, wau, paka, kila ahi, o-o, ihe, koi, pahi, mamo laiiee e hana ka Uhane me keia mau mea ma ia wahi.

Eia no hoi keiahi: Ina make ke kanaka, he hele wale no na Uhane, a hoi, a noho iho o ke kanaka e ola ana, malunu o ka elemakule o ke kanaka, malunu o ke kanaka e o ke wahine paha. Ua kapa ia kela Uhane, "He Makani, a he Uaihipili." Oia na manao o kanaka kahiko no ka Uhane mahope iho o ke make ana o ke kino.

* O ia Helu 12 no keia, aa pai hewa ia keia ma ka Iuai Helu 15. O ka mea keia a mahope iho.

J. P.

HE MOOLELO HEIHIANA.—Helu 34.

Ke ola o Goki III, M. H. 1759.

Na aoopuna o Keoki III na Keoki II. Make iho kona makuahine o Peridooka i ka wa e ola ana o Keoki II, a ili mai ke aupuni i kona keiki. Hanau mai o Keoki I ke makahiki 1738, a he 22 na makahiki i koun ola i iho ia ia mea. Na noho pu no kona makuahine, a me oia mahalo i na mea a pau, a komo iloko o lona mau makuaiu, a no kon, noho ana iluna ona, a ai mai keia Uhane i ko ai maoli o mauna, alaila, hele aku, a pela nawa ka hana ana. A o keia poe makuaiu, ua he pilikia ko lakou na ka aina, no ke kuan ia mai, na ka Pioro e akiaki ia lakou i kahi kapono pae ai. A ina na ka Malihwi, na ke Moo ; me na mea ano like e malama ia lakou. A ina na ka mouna ke pilikia, na ka Manoa malama, a ino na mea ano like. No keia mau mea ko na kanaka hookapu ana i keiki ki mau mea ai he nui wale.

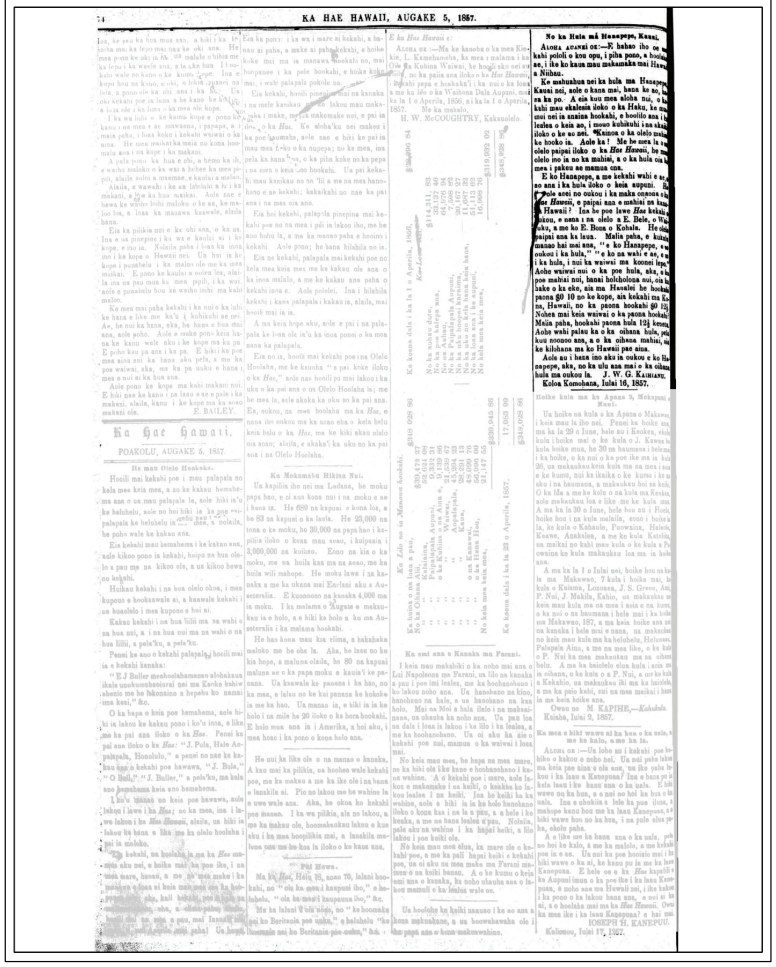
Eia kekahi: Ai ina ke aina malao, kahi i noho ai ka Uhane mahope iho o ka make ana o ke kino, a a ua hapaia mai keia mau wahi e Kaleiwa ka Uhane. Ua lawa keia mea "*Aina a ka Uhane,*" ma kein Mokupuni, kein Mokupuni o Hawaii nei i noho ia e ke kanaka. O kahi e noho ai ka Uhane o ke Niihau poe, ain ma Kapapakikiki, a a Mawiioka ma Lehua kahi, ei- hoi kihi i kapuia ka leina a ka Uhane o ke Niihau poe. Pela no hoi ko Kauai, ain ma Hanapepe. Kahi i noho ai ko laila poe Uhane, a o ke Ola-a poe, ain ma Kaimaloio, a ma Waimea keiehi. A o ke Mokuai poe, ain ma ke palena o Koolau a me Kona, mawena ohula o ke leina a ke Uhane, o Waimea ka nina nui. A o ke Lanai, ain ma Hoikawi, wahi a kekahi; aka, i ke manao o kekahi ain ma Kapuaiki, a. A he ohia wahi e noho ai ka Uhane o ke Maui, ain ma ke Ka-kehahi, una kula o ka Maunao kekahi. A o ke Hawaii, he ehoia wahi e noho ai na Uhane o Hilo, a o Waipio a me ke Palolo. O ia ka mea wahi a pau, na kapaia o ka leina a ka Uhane. Ina i kiki ka Uhane ma kekahi o keia mau wahi, aole e hiki ke hoi hou mai.

Eia no kekahi: Ina make ke kino, hele no ka Uhane me ke ano o ke kaina, pela no ka Uhane o keie ai. Ina ano kapa o ke kino i ka make ana, aole no hoi kapu, aole lani, aka, he ao po hahina ia ke no, ane like me ka ohu e uhi ana i ke aina, pela ke ano o kahi e noho ai na Uhane ma ia hope iho o ka make ana o ke kino; aole no hoi ia po ke ao ole no. Oiaa no ko na alii wahi, oiaa ko na kua. Malaili na hana a pau o iike me ka ao o ola ana, Oaiho, Pulwaehaiwe, Hoohiku Heenalu, moio, lua, nui ka, ai ka ulu wale no, uala, kalo, maia, apu, hapuu, a no keia manao o lakou la, a i maloko keia, e kana pu ia ia ai, ia, wau, paka, kila ahi, o-o, ihe, koi, pahi, mamo laiiee e hana ka Uhane me keia mau mea ma ia wahi.

Eia no hoi keiahi: Mamua ana kekahi poe, he hale wale no na Uhane, a hoi, a noho iho o ke kanaka e ola ana, malunu o ka elemakule o ke kanaka, malunu o ke kanaka e o ke wahine paha. Ua kapa ia kela Uhane, "He Makani, a he Uaihipili." Oia na manao o kanaka kahiko no ka Uhane mahope iho o ke make ana o ke kino.

J. P.

No ka Hula ma Hanapepe, Kauai, Ka Hae Hawaii, 5 August 1857



KA HAE HAWAII, AUGAKE 5, 1857.

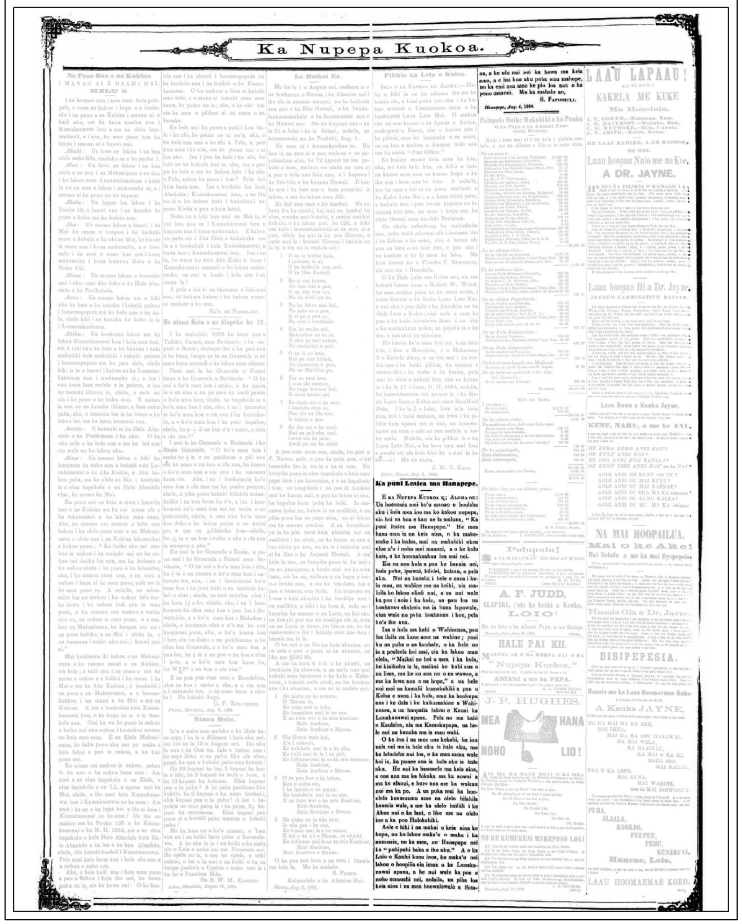
Ka Hae Hawaii.

POAKOLU, AUGAKE 5, 1857.

He mau Olelo Hookaka.

Hoolimaiwa ka Mr. Wilcokes, a ua hoouna aku i ia ia ma ka Kaua Hanapepe, Kauai

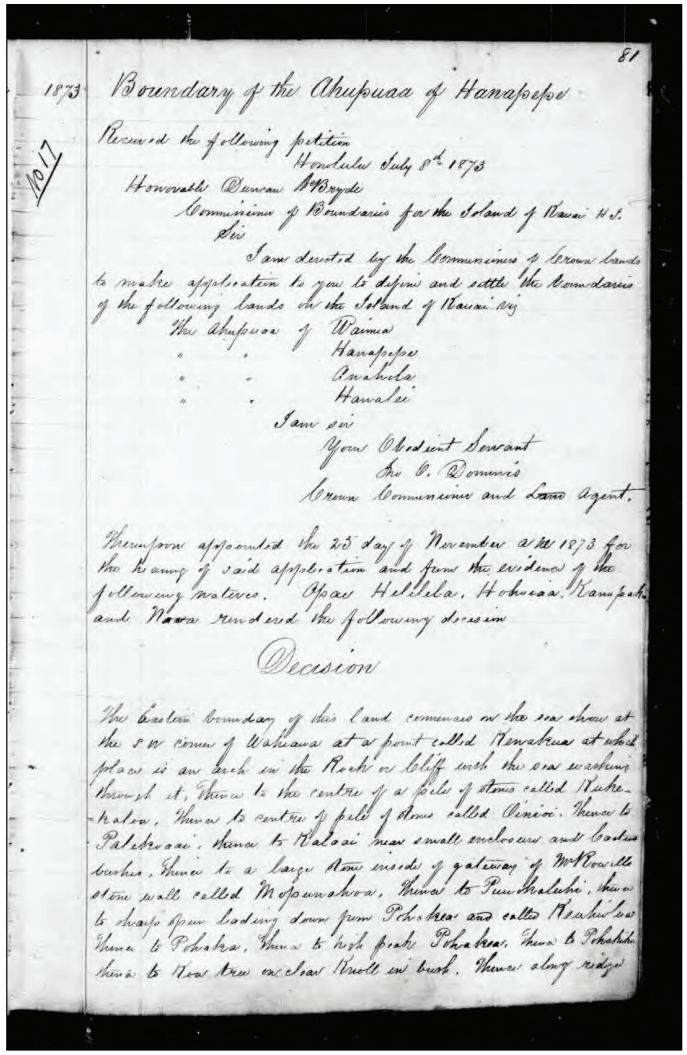
Ka Puni Lealea ma Hanapepe, Ka Nupepa Kuokoa, 27 August 1864



Ka Nupepa Kuokoa.

Nupepa Article 3. Ka Puni Lealea ma Hanapepe, Ka Nupepa Kuokoa, 27 August 1864.

Appendix B: Certificate of Boundaries, No. 17, Hanapēpē



1873 Boundary of the Ahupuaa of Hanapepe

No 17

81

Received the following petition

Honolulu July 8th 1873

Honorable Duncan McBryde

Commissioner of Boundaries for the Island of Kauai H.I.

Sir

I am directed by the Commissioner of Crown lands to make application to you to define and settle the boundaries of the following lands on the Island of Kauai viz

The Ahupuaa of Waimea

" " Hanapepe

" " Awahula

" " Hanalei

I am sir

Your Obedient Servant

Jno. S. Dominis

Crown Commissioner and Land Agent.

Thereupon appointed the 25 day of November A.D. 1873 for the hearing of said application and from the evidence of the following waters. Opaa Hellela, Hohoiea, Kaupaka and Naea rendered the following decision

Decision

The Eastern boundary of this land commences on the sea shore at the S.W. corner of Wahiawa at a point called Kewaikua at which place is an arch in the Rock or bluff with the sea washing through it, thence to the centre of a pile of stone called Kukekalow, thence to centre of pile of stone called Oniioi, thence to Palekoaai, thence to Kaloai near small enclosure and Cordyline bushes, thence to a large stone inside of gateway of Mr Rowells stone wall called Mopunaohoa, thence to Puuhakuhi, thence to sharp spur leading down from Pohakea and called Keaiki, thence to Pohaka, thence to high peak Pohakea, thence to Pohakiki, thence to New tree on clear knoll in bush, thence along ridge

1873 Boundary of the Ahupuaa of Hanapepe

to the top of Puuauiki thence continuing along ridge to Kiei Peak Kapolaoa the north West boundary of Wahiawa thence in a N.W. direction along the ridge until joining open loading from Kahili peak to Waialeale, thence along said ridge until joining open loading up the Western boundary of this land and Eastern boundary of Makawele, thence down the boundary of Makawele in a southerly direction to the ocean

Notes of Survey
Hanapepe

The eastern boundary of this land commences on the sea shore at the S W corner of Waiakua at a point called Kewakua at which place is an arch in the rock or cliff with the sea washing through it. at 95 links from top of Pali on the boundary line the following objects bear Ahualehu Peak N 4.45 E Puukapele N 32.25 W Puukhani Peak N 16.12 W Pohakea Peak on the boundary line N 27.52 E. Thence from 95 links on this line N 27.45 E 2280 links to the centre of a large pile of stones called Kukukalau Thence N 16.39 E 1847 links to centre of pile of stones called Ciniia Thence N 30.36 E 1410 links to centre 150 links of Pali to place called Palikaoai Thence N 36.55 E 9035 links to place called Kalaoai to west of corner cactus hedge and in a stone inclosure of about ¼ of an acre. Thence N 47.25 E 5753 links (crossing at 5570 links and 60 links to the west of a gateway or stone wall enclosing a land owned by Mr Rowell) to a large stone called Mopuna

Thence the following objects bear Ahualehu Peak N 40.15 W Pohakea N 13.52 E Thence from Mopunahoa N 28.16 3900 links to Koiahi. Thence N 14.49 E 2800 links to place called Puukalaoa (at 1700 links on this line passes the N W corner of house lot now occupied by the Kouhiki of this land). Thence from Puukalaoa N 5.10 E 3935 links to sharp open loading leading down from Pohakea, and called Kukiolea. Thence N 2.37 E 2100 links to Pohakea thence a hole has been cut in the rock the boundary runs along the ridge to the eastward of the Keanuy grove (see plan)

Thence the following objects bear Ahualehu Peak S 86.56 W

1873 Boundary of the Ahupuaa of Hanapepe

a sharp peak on the Makawele boundary towards Waialeale N 1.57 W Puukapele N 44.45 W, Thence from Pohakea following along the ridge to a peak bearing N 9.10 E 6300 links and called Pohakiki thence following along the ridge to a bare knoll in the bush to a large koa tree standing alone N 33.17 E 3700 links, thence along the ridge to the top of Puuauiki N 17.45 E 3200 links from thence continuing along the ridge until joining open loading from Kahili Peak to Makawele Thence in a N.W. direction along the ridge until joining the open loading up the western boundary of this land and Eastern boundary of Makawele

Surveys on Waipuhia road Pali E

The Western boundary of this land is described as follows as starting from Ahualehu Peak a place will know and easily found. The Boundary from Ahualehu Peak runs N 12.10 E 2200 links along ridge. Thence N 41.49 E 2500 links along the ridge Thence N 5.23 W 1710 links along ridge Thence N 42.23 W 2059 links along the ridge. Thence N 15.32 W 1400 links along the ridge. Thence N 66.30 W 750 links along the ridge. Thence N 3.40 E 3600 links along the ridge to the edge of the bush. Thence continuing along the ridge until joining the open loading from Kahili peak

Returning again to Ahualehu peak the boundary runs S 39.27 W 325.00 links to two flat stones at old roadway. Thence S 36.31 W 2740 links to the sea shore, thence following along the shore in an easterly direction to place of commencement on plan

Within this land are situated the lands of Eleele Kuiloa, Manuahi Koula and a land owned by Mr Rowell therefore the area is not given in survey

James W Gay Surveyor
1873

Appendix C: Guidelines For Assessing Cultural Impacts

Adopted by the Environmental Council, State of Hawai'i November 19, 1997

Introduction

It is the policy of the State of Hawai'i under Chapter 343, HRS, to alert decision makers, through the environmental assessment process, about significant environmental effects which may result from the implementation of certain actions. An environmental assessment of cultural impacts gathers information about cultural practices and cultural features that may be affected by actions subject to Chapter 343, and promotes responsible decision making.

Articles IX and XII of the State Constitution, other state laws, and the courts of the state require government agencies to promote and preserve cultural beliefs, practices, and resources of native Hawaiians and other ethnic groups. Chapter 343 also requires environmental assessment of cultural resources, in determining the significance of a proposed project.

The Environmental Council encourages preparers of environmental assessments and environmental impact statements to analyze the impact of a proposed action on cultural practices and features associated with the project area. The Council provides the following methodology and content protocol as guidance for any assessment of a project that may significantly affect cultural resources.

Background

Prior to the arrival of westerners and the ideas of private land ownership, Hawaiians freely accessed and gathered resources of the land and seas to fulfill their community responsibilities. During the Mahele of 1848, large tracts of land were divided and control was given to private individuals. When King Kamehameha the III was forced to set up this new system of land ownership, he reserved the right of access to privately owned lands for Native Hawaiian ahupua'a tenants. However, with the later emergence of the western concept of land ownership, many Hawaiians were denied access to previously available traditional resources.

In 1978, the Hawaii constitution was amended to protect and preserve traditional and customary rights of Native Hawaiians. Then in 1995 the Hawaii Supreme Court confirmed that Native Hawaiians have rights to access undeveloped and under- developed private lands. Recently, state lawmakers clarified that government agencies and private developers must assess the impacts of their development on the traditional practices of Native Hawaiians as well as the cultural resources of all people of Hawaii. These Hawaii laws, and the National Historic Preservation Act, clearly mandate federal agencies in Hawaii, including the military, to evaluate the impacts of their actions on traditional practices and cultural resources.

If you own or control undeveloped or under-developed lands in Hawaii, here are some hints as to whether traditional practices are occurring or may have occurred on your lands. If there is a trail on your property, that may be an indication of traditional practices or customary usage. Other clues include streams, caves and native plants. Another important point to remember is that, although traditional practices may have been interrupted for many

years, these customary practices cannot be denied in the future.

These traditional practices of Native Hawaiians were primarily for subsistence, medicinal, religious, and cultural purposes. Examples of traditional subsistence practices include fishing, picking opihi and collecting limu or seaweed. The collection of herbs to cure the sick is an example of a traditional medicinal practice. The underlying purpose for conducting these traditional practices is to fulfill one's community responsibilities, such as feeding people or healing the sick.

As it is the responsibility of Native Hawaiians to conduct these traditional practices, government agencies and private developers also have a responsibility to follow the law and assess the impacts of their actions on traditional and cultural resources.

The State Environmental Council has prepared guidelines for assessing cultural resources and has compiled a directory of cultural consultants who can conduct such studies. The State Historic Preservation Division has drafted guidelines on how to conduct ethnographic inventory surveys. And the Office of Planning has recently completed a case study on traditional gathering rights on Kaua'i.

The most important element of preparing Cultural Impact Assessments is consulting with community groups, especially with expert and responsible cultural practioners within the ahupua'a of the project site. Conducting the appropriate documentary research should then follow the interviews with the experts. Documentary research should include analysis of mahele and land records and review of transcripts of previous ethnographic interviews. Once all the information has been collected, and verified by the community experts, the assessment can then be used to protect and preserve these valuable traditional practices.

Native Hawaiians performed these traditional and customary practices out of a sense of responsibility: to feed their families, cure the sick, nurture the land, and honor their ancestors. As stewards of this sacred land, we too have a responsibility to preserve, protect and restore these cultural resources for future generations.

Cultural Impact Assessment Methodology

Cultural impacts differ from other types of impacts assessed in environmental assessments or environmental impact statements. A cultural impact assessment includes information relating to the practices and beliefs of a particular cultural or ethnic group or groups.

Such information may be obtained through scoping, community meetings, ethnographic interviews and oral histories. Information provided by knowledgeable informants, including traditional cultural practitioners, can be applied to the analysis of cultural impacts in conjunction with information concerning cultural practices and features obtained through consultation and from documentary research.

In scoping the cultural portion of an environmental assessment, the geographical extent of the inquiry should, in most instances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in the assessment. Thus, for example, a proposed action that may not physically alter gathering practices, but may affect access to gathering areas would be included in the assessment. An ahupua'a is usually the appropriate geographical unit to begin an assessment of cultural

impacts of a proposed action, particularly if it includes all of the types of cultural practices associated with the project area. In some cases, cultural practices are likely to extend beyond the ahupuaʻa and the geographical extent of the study area should take into account those cultural practices.

The historical period studied in a cultural impact assessment should commence with the initial presence in the area of the particular group whose cultural practices and features are being assessed. The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs.

The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man made and natural, including submerged cultural resources, which support such cultural practices and beliefs.

The Environmental Council recommends that preparers of assessments analyzing cultural impacts adopt the following protocol:

1. Identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupuaʻa;
2. Identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;
3. Receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;
4. Conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;
5. Identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and
6. Assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

Interviews and oral histories with knowledgeable individuals may be recorded, if consent is given, and field visits by preparers accompanied by informants are encouraged. Persons interviewed should be afforded an opportunity to review the record of the interview, and consent to publish the record should be obtained whenever possible. For example, the precise location of human burials are likely to be withheld from a cultural impact assessment, but it is important that the document identify the impact a project would have on the burials. At times an informant may provide information only on the condition that it remain in confidence. The wishes of the informant should be respected.

Primary source materials reviewed and analyzed may include, as appropriate: Mahele, land court, census and tax records, including testimonies; vital statistics records; family histories and genealogies; previously published or recorded ethnographic interviews and oral histories; community studies, old maps and photographs; and other archival documents, including correspondence, newspaper or almanac articles, and visitor journals. Secondary source materials such as historical, sociological, and anthropological texts, manuscripts, and similar materials, published and unpublished, should also be consulted. Other materials which should be examined include prior land use proposals, decisions, and rulings which pertain to the study area.

Cultural Impact Assessment Contents

In addition to the content requirements for environmental assessments and environmental impact statements, which are set out in HAR §§ 11-200-10 and 16 through 18, the portion of the assessment concerning cultural impacts should address, but not necessarily be limited to, the following matters:

7. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.
8. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.
9. Ethnographic and oral history interview procedures, including the circumstances, under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.
10. Biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.
11. A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.
12. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.
13. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project.
14. An explanation of confidential information that has been withheld from public disclosure in the assessment.
15. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.
16. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.
17. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

The inclusion of this information will help make environmental assessments and environmental impact statements complete and meet the requirements of Chapter 343, HRS.

Appendix D: Community Contact Letter

Aloha e [Contact Inoa]

My name is [Contact Inoa], I work with Nohopapa Hawai‘i, a Native Hawaiian owned and operated cutlrual resource management company whose mission is to preserve and perpetuate out cultural sites, stories and practices. We are underaking the Cultural Impact Assessment (CIA) component of a larger Environmental Assessment (EA). The EA is being done on behalf of Department of Hawaiian Homelands, for the Hanapēpē Homestead Plan; specifically for the planning process being done for a proposed build out of Residential and Subsistence Agriculture Lots.

We hope to collaborate with individuals knowledgeable to the study area and its surrounding traditional resources. Our kuleana in these interviews is to better understand the traditional cutlural history and resources of the area and identify potential impacts from the proposed project plan. If impacts are identified, we welcome input on solutions and altenatives that would benefit DHHL and the Hanapēpē community, present and future. I have attached some maps and fact sheets for your reference.

- Some topics and questions we were hoping you could share about regard:
- Native Hawaiian traditions and accounts (mo‘olelo, inna ‘āina, mele, oli, ‘ōlelo no‘eau, wahi pana, etc.).
- Past and present cultural practices and protocols.
- Knowledge of natural and cultural resources in the area.
- Concerns and suggestions for future management of this area.
- Solutions you think might be helpful towards these concerns.
- Additions that could be made to help benefit Hanapēpē or help build a better relationship with and its cultural resources.
- Referrals of kūpuna and kama‘āina who might be willing to share their cultural knowledge of the area.

If you have any questions ‘ike or mana‘o you would like to share please contact Lilia Merrin at liliamerrin@hotmail.com, or Dominique Cordy at liveinthenaau@gmail.com .We look forward to collaborating with you to document some of the cultural history of the Hanapēpē Hawaiian Homelands and its surrounding community for this important study.

Look forward to hearing from you soon.

Mahalo,

Lilia Merrin

liliamerrin@hotmail.com

APPENDIX E: Interview Questions

Please note that not all questions were asked of each interviewee. List was customized based on the background, theme, or expertise and experience of the individual.

Background Information:
- Name:
- When and where were you born:
- Where did you grow up:
- Where you reside
- Occupation /Affiliation:
- Personal/Family connection to the Hanapēpē area:

Mo ‘olelo, Place Names, Mele:
- Hula
- Legends or mo‘olelo –
- Akua & ‘aumakua -
- Place names -
- Mele and Oli -

Cultural and historic sites:
- Cultural or archaeological sites -
- Historical sites (plantation days, railroad, ditches) -
- Lava tubes, burials –
- Trails –
- Makai, Salt pans, Ukula –
- Mauka, Puu Lani and forest -

Historical Information:
- Past or present land ownership and use -
  - Kuleana lands
- Historic uses of the area:
  - Sandalwood, sugar, railway, pipi (ranching)
  - Plantation camps
- Historic events
- Historic persons

Resources:
- Native plants and trees -
  - Uses of these resources -
- Water resources, springs, streams -
- Winds & rains -
- Mountains,pu‘u,pali-
- Fishing & marine resources -
- Native birds or animals -

Cultural Practices (gathering, hula, protocol, ho'okupu):
- Current cultural practices -
- How did you learn the activities and how long have you been doing them -
- Past cultural practices -
- Past or present cultural protocols observed

Hunting & Fishing Practices:
- What do you hunt/fish?
- General area you hunt/fish?
- What kinds of changes to the natural/marine landscape have you noticed since hunting/fishing in those areas?

Knowledge Sources:
- Where does your knowledge come from:
- Your own direct knowledge
- Knowledge reported to you by 'ohana
- Knowledge reported to you by others
- Knowledge from sources such as written sources, archival sources, digital

Community / Individual Concerns:
- What changes in the landscape, practices and uses of natural and cultural resources have you observed in your lifetime:
- Do you have any, or know of any concerns the community might have related to cultural practices in the vicinity:
- Should all the cultural information you are sharing with us be included in the study? Is there any information that you do not want to be public?

Community / Individual Recommendations:
- Concerns about potential impacts to the Cultural resources in the area?
- What solutions you think might be helpful towards these concerns?
- Additions that could be made to help benefit Hanapēpē or help build a better relationship with and its cultural resources

References:
- Can you refer us to any other individuals or organizations we should talk to?

Appendix F: Informed Consent Form

NOHOPAPA

INFORMED CONSENT FORM

Aloha mai, Nohopapa Hawai'i appreciates your generosity and willingness to share your knowledge of the wahi pana of Hanapēpē and its surrounding areas. This mea will be used to guide and inform Nohopapa Hawai'i's Cultural Impact Assessment (CIA) for the DHHL Hanapēpē Homestead Project. The CIA is one component of the Environmental Assessment (EA) that is being prepared by SSFM International, for the Department of Hawaiian Home Lands (DHHL). The EA document will serve as the compliance document for the full build out of the Hanapēpē DHHL Hawaiian Homelands.

Nohopapa Hawai'i understands our responsibility in respecting the wishes and concerns of the interviewees participating in this study. Here are the procedures we promise to follow:

1. The interview will not be recorded without your knowledge and explicit permission.
2. You will have the opportunity to review the written transcript and summary of your interview. At that time, you may make any additions, deletions or corrections you wish.
3. You will be given a copy of the interview transcript and/or summary for your records.
4. You will be given a copy of this release form for your records.
5. You will be given a copy of any photographs taken of you during the interview.

For your protection, we need your written confirmation that (*circle* yes or no below):

1. You consent to the use of the complete transcript and/or interview quotes for the purposes of this study. Yes No
2. If a photograph is taken during the interview, you consent to the photograph being included in this study. Yes No

I, _____, agree to the procedures outlined above and,
(Please print your name here)
by my signature, give my consent and release of this interview and/or photograph to be used as specified.

_____ _____
(Signature) (Date)

Nohopapa Hawai'i, LLC nohopapa.hawai@gmail.com

Appendix G: Bill for Environmental Impact Statements

A BILL FOR AN ACT RELATING TO ENVIRONMENTAL IMPACT STATEMENTS [UNOFFICIAL VERSION] HOUSE OF REPRESENTATIVES H.B. NO, 2895 H.D.1 TWENTIETH LEGISLATURE, 2000, STATE OF HAWAI'I

A BILL FOR AN ACT RELATING TO ENVIRONMENTAL IMPACT STATEMENTS. BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAI'I:

SECTION 1. The legislature finds that there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawai'i's culture, and traditional and customary rights.

The legislature also finds that native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the "aloha spirit' in Hawai'i. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups.

Moreover, the past failure to require native Hawaiian cultural impact assessments has resulted in the loss and destruction of many important cultural resources and has interfered with the exercise of native Hawaiian culture. The legislature further finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture.

The purpose of this Act is to: (1) Require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and (2) Amend the definition of "significant effect" to include adverse effects on cultural practices.

SECTION 2. Section 343-2, Hawai'i Revised Statutes, is amended by amending the definitions of "environmental impact statement' or "statement" and "significant effect", to read as follows:

"Environmental impact statement" or "statement" means an informational document prepared in compliance with the rules adopted under section 343-6 and which discloses the environmental effects of a proposed action, effects of a proposed action on the economic [and] welfare, social welfare, and cultural practices of the community and State, effects of the economic activities arising out of the proposed action, measures proposed to minimize adverse effects, and alternatives to the action and their environmental effects.

The initial statement filed for public review shall be referred to as the draft statement and shall be distinguished from the final statement which is the document that has incorporated the public's comments and the responses to those comments. The final statement is the document that shall be evaluated for acceptability by the respective accepting authority.

"Significant effect" means the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of

the environment, are contrary to the State's environmental policies or long-term environmental goals as established by law, or adversely affect the economic [or] welfare, social welfare[.], or cultural practices of the community and State."

SECTION 3. Statutory material to be repealed is bracketed. New statutory material is underscored.

SECTION 4. This Act shall take effect upon its approval. Approved by the Governor as Act 50 on April 26, 2000.

Appendix H: Act 50

Act 50 [State of Hawai'i 2000]. H.B. NO. 2895 H.D.1 was passed by the 20th Legislature and approved by the Governor on April 26, 2000 as Act 50. The following excerpts illustrate the intent and mandates of this Act:

The legislature also finds that native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the "aloha spirit" in Hawai'i. Articles IX and XII of the State constitution, other State laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups.

Moreover, the past failure to require native Hawaiian cultural impact assessments has resulted in the loss and destruction of many important cultural resources and has interfered with the exercise of native Hawaiian culture. The legislature further finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture.

The purpose of this Act is to: (1) Require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and (2) Amend the definition of "significant effect" to include adverse effects on cultural practices.

SECTION 2. Section 343-2, Hawai'i Revised Statutes, is amended by amending the definitions of "environmental impact statement" or "statement" and "significant effect", to read as follows:

"Environmental impact statement" or "statement" means an informational document prepared in compliance with the rules adopted under section 343-6 and which discloses the environmental effects of a proposed action, effects of a proposed action on the economic [and] welfare, social welfare, and cultural practices of the community and State, effects of the economic activities arising out of the proposed action, measures proposed to minimize adverse effects, and alternatives to the action and their environmental effects....

Appendix I: Interview Transcripts and/or Summaries

HANAPĒPĒ CIA INTERVIEW QUESTIONS

Chad Shimmelfennig

Background Information:

- Name: Chad Shimmelfennig
- When and where were you born?
  - 1980 and Waimea, Kaua'i
- Where did you grow up?
  - Chad grew up mostly in Hanamā'ulu with his mother, "but my family (?) is from the West side and predominantly from Poipu, Koloa area"
- Do you have personal or family connection to Hanapēpē area?
  - Chad shares, "Yes, basically from Koloa or Māhāulepū to Waimea Valley. I have a lot of connections ancestrally and personally."
- How long have you been a teacher at 'Ele'ele Elementary?
  - Four years
- What grade to you teach?
  - Fifth grade
- What do you currently do to incooperate 'ike Hawai'i or 'ōlelo Hawai'i into your cirriculum? What kinds of activies do you do? And are these activities in the Hanapēpē area?
  - Chad shares, "The first month, when the kids come to my class, particularly, they learn a set of oli and mele. So before you can even walk through the door, we have it to where our entire fifth grade will kāhea. We'll ask permission to come into the classroom. The first few months the teachers will komo or we'll let them know when there's proper time to come in. Now we have it to the point where the students themselves are able to do their own komo to allow the rest of the classes to come in. Once they come in, we have the pledge of allegiance, Hawai'i Pono'ī. We have our oli Kaua'i. For my class, we particularly do a lot of the protocols and that are associated with our culture. So they need to learn all the protocols or the names. They learn oli Kaua'i. Right now because of the current situations going on, the kids really took favor to 'Kūha'aheo' (mele) so they've already mastered the whole song. We sing that every single day. Once that is done, then we start our work. And then once we do our curricular morning work, we have another set of oli and mele that we do. I think about 10 total after that, just to kind of start the day. And right now, because Makahiki season, we have Lono Makua. In the morning we leave (the classroom), kani ka pū. The whole entire school gets to hear us. We walk out with Lono Makua as a class. We bring him around the school and then we set him up in front of our lo'i, and we do all our protocols in front of Lono Makua."

- Chad shares he's the only kumu that is doing this, "I'm trying to get to the point where people see this as a normal thing, creating a norm. At Kamehameha School and Ānuenue, it's not a big deal (protocols). But trying to incorporate that into a DOE Public School, it's kind of taboo. So luckily it's been growing. Every year we just try continually stack more information for the kids to do. Such as building hale which is all our math. They (haumāna) wanted to do something big and wanted a loʻi. That was all math, again. This year we're doing a lot of science so construction of ahu which promotes a lot of engineering and problem solving. We get to go into the community and learn from community members, learn wahi pana, and they learn all these different protocols at the school. Our school particularly is really in favor of all this."
- Chad continues, "Kekaha School is doing a lot of big things so we communicate amongst the Kona Moku side and strengthen our kids in that sense. During Makahiki, we have a heʻe hōlua so we slide on the hill. The kids learn this on ʻUlu Day. They learn the significance of ʻulu, moʻolelo, and the cultural significance behind the plants. Along with several other teachers at ʻEleʻele School, we're trying to connect the place with our sciences versus trying teach the kids how to perform on a test. If we tell them about George Washington and the cherry tree, they have no connection to that and will ask, 'What's a cherry tree?' But if we tell them about Queen Liliʻuokalani and ʻIolani Palace, they make the connections, 'Oh, I went there.' Or Kaumualiʻi, 'This is where he lived and the places he went.' When we talk about paʻakai, they can see the paʻakai and the impacts happening today in their backyard. So we tie the kids into more where they're from to create what essentially we're calling Nā Hopena Aʻo (HĀ) for the DOE. Which is a policy that gives us (teachers) end result through our breath or hā. This is kind of what we're trying to really push as far as strengthening our kids so they know where they're from. When you're walking by, you pick up rubbish just because this is your place."
- Chad shares about DOE HĀ policy, "I think HĀ is in its fourth year. It's a policy that has been adopted through DOE. It's not a curriculum. It's not a 'thing'; it's a way of life. I mean we all come from different backgrounds. We all have been raised differently. But yet similarly we're kind of the same because when you walk into a house, you take off your slippers. It's the little things like that which creates a more intentional purpose in the classroom. So, I have the poster (HĀ), these are the values that we would like our students to see. When they leave, they have this strong sense of belonging, the sense of Hawaiʻi. Making them proud of where you're from."

Impacts to cultural education

- In 20 years DDHL will have 482 new residencies in Hanapēpē (as the max build out). Therefore, there will probably be more students enrolling in this school.
  - Is there enough infrastructure and resources (i.e. classrooms and teachers) to sustain the future in-coming student body?
    - Chad shares, "With this amount of count on top of habitat, I don't think there's enough infrastructure there. The campus is large enough and I know firsthand that our administration has requested more buildings and larger infrastructures. And right now, we're going the opposite direction because another private charter school has opened. So it's kind of taken away a lot of resources from us. At the same time, we're going to have an influx of more resources, which increases the amount of

teachers we're going to need. Coupled with the shortage of teachers in Hawaiʻi. Its going to be a double-edged sword. Because we have 500 homes here being built, we have another 400 there. We're almost near maximum capacity here."

    - Chad comments about how the teachers support one another, "The best thing about this environment here is we can go to each other and be like, 'Hey, you're doing this, how you do that? You know what, I'll send my students to come and teach you.' So it's a really good environment here where the teachers, if I'm strong at something, I'm going to ask somebody and they're stronger than we just kind of play off of each other, which in turn is only benefits our students. When they see us outside doing protocols, 'Oh, can we come? Shoots, come?'"
  - How will this effect your curriculum? Do you think there will be more of a need for cultural education?
    - Chad believes there will be more Native Hawaiian students or kānaka come to their school which will make it more powerful, "But I don't think it's going to affect the way classes are being taught because the way we're trying to focus things is it doesn't matter who you are, where you're from. This is our culture (Hawaiian). You come to Hawaiʻi, you're going to learn about Hawaiʻi. It's just that simple. Now with the increase of the Hawaiian kids, it's going to make it even more powerful because I see a lot of the parents haven't gone through things like this. So they're seeing this for the first time. It will only increase the amount of awareness in our community with our kids having a school with those kinds of foundational concept of Nā Hopena Aʻo. To increase the awareness in the home, they're seeing things in ʻōlelo Hawaiʻi and the parents say, 'What are you talking about?' So I've seen where parents have even taken a next step and they go out and learn now (ʻōlelo Hawaiʻi). Or they're doing Duolingo with their kids in the car. They're having these conversations. It's not just you come here, you learn."
    - Chad continues, "There will be a lot of positives. First, you're growing a community. You're going to have a lot of people because of how it works for Hawaiian Homelands. It's not necessarily you're from this area. You get to come in this area so you may have people not from this area and not knowing Hanapēpē culture. Coming from someplace else and saying that this is how we do it. That's a tricky slippery slope right there because you don't know who you'll get, weʻre they from, what they bring, what's the history is. Whereas everyone here, if you come here and they're like, 'Oh, we know who that is.' If you see someone they don't know, everybody's already talking. As far as teaching, you would hope, knowing that the kids have an invested concern into anything we talk about, they're invested into it. I mean a lot of kids they come out, when you teach them something about their culture or even if it's not their culture, but you set such an important precedent on learning this culture. It's not the kids and it's not the parents at all and it's not the community. A lot of times it's us as teachers, we're just not comfortable being uncomfortable. We're supposed to be the wealth of knowledge or the source of knowledge. Whereas, we got to teach for the kids in our culture, our wahi pana, and their kuleana for living in this area, and what to expect when they move out from this area. That kind of thing is the biggest concerns. And with the kids being invested in this, it should increase the amount that they would like to learn or want to learn. Luckily, we have such a great community and the ability to do these things. And now that the DOE is even allowed ʻōlelo

classes for free now. So I mean that's a huge thing that we've just celebrated. When you come into our class, a lot of what you learn, you will learn in both languages. I look at and live by the quote 'To be the teacher you wish you had when you were younger' every day."

- What resources do you think you or other kumu will need in the future?
  - Chad comments, "A lot of it really comes down to just how much they're going to want to put in. You're getting what you put in. As far as resources, we have an abundance of resources. We have people that have been living here for generations that have this ʻike about this area. If you want to go talk paʻakai, you can go see the source. You know who they are. If you want to see about mauka, you know who to talk to. If you want to go talk about hunting, we have such a bright and vibrant community. You say something and someone will say, 'Oh, go talk to this person. Go talk to uncle so and so.' You'll get the answers so quickly here. And not only that, if you're going to ask, you're going to have to do also. So it's just kind of like, if you don't ask, you're not going to do nothing. But once you ask, you're thrown into it. The community in that sense is purely a beneficial thing around here."
- I heard the office that you take your students on huakaʻi. If you could have an ask, or wish list, to teach ʻike Hawaiʻi, what would those asks be? What would you like to see?
  - Chad would like to see more funding, "The kids want to get out, they want to see Hanapēpē Valley. More intentional funds for field trips. They connect culturally and academically for us. We go as far as Waimea to learn about that area because they will eventually go there. The fourth grade does a great job of learning about the Hanapēpē ahupuaʻa. We try to expand over."
  - Chad shares about the different huakaʻi with haumāna, "A range from just going down to the swinging bridge to Salt Ponds to learn about the reef ecosystem there and planting limu or learning about the different limu. Paʻakai is a big one but the seasons are different from when we're in school. But a lot of the kids are luckily to be able to go with family or friends to help. As far as being from Hanapēpē, the kids all know fishing, where not to go swim because it's more sharks. These are just the kinds of things you grow up with. They know what to do."

Moʻolelo, Place Names, Mele, Hula:

- Do you know any moʻolelo for the Hanapēpē area?
  - Regarding moʻolelo, Chad mentioned a lot of it had been lost due to the Plantation Era, "We're lucky to have a few legacy kūpuna like aunty Janet Kahalekomo whose seen a lot of changes in Hanapēpē. There's books such as *What is Hanapēpē?* which has three versions and *Why they call it ʻEleʻele?*, regarding the battles that happened here. We're still discovering heiau way up in the mountains right now. We know Hanapēpē through the nūpepa which was predominantly a kalo farming area which had a good irrigation system. A lot of kalo was grown all up and down this valley. And then from there, we had houses, we had a lot of wars. From the stories I've been told from my dad and from his grandfather, the theater was like one of the main hubs from West side, South side, even Līhuʻe. You came here to watch movies, have drinks. This was the place to be. We call it the little big town now. Stories from my dad taught me, we'd be driving down here, he'd be like, 'Oh, there was that,

there was this over here. Your grandfather said that was over there.' The massacre (the Hanapēpē massacre) that happened, my grandfather was a witness. So stuff like that, you make connections. It's really cool to hear these things."

  - Chad continues to share about ʻEleʻele, "When you drive by it's all black because all the other street names are colors. But actually ʻeleʻele was because of the war that happened to the last revolt of Kamehameha and the last loyalists to Kaumualiʻi. And they said that the blood shed made the ground black because when the blood dried, it was black. That was one version. Or the smoke that could be seen from outside of Hanapēpē, they called it ʻeleʻele because of the smoke against Kaumualiʻi troops, which had still spears the traditional way versus Kamehameha troops which had muskets. So the black would have either been the smoke or the blood that dried in the ground that covered this whole area. And then they start naming the streets color names so then it just got lost."

Natural Landscapes, Resources, Uses:

- Can you share anything about the following in the area:
  - Water resources, springs, streams
    - Chad shares, "There's water resources but the only unfortunate part in this area because it's been badly damaged through the Plantation Era. Were there historical sites? Probably. Are they still there? Probably not because we all know in 1870s to 1950s they just moved whatever was in their way to gain more access to sugarcane. I don't know if there's even anybody alive who remembers many of the things or maybe they have moʻolelo that was passed down from their family. We know there's heiau in this area that haven't been desecrated. However, in this particular area, we can't even say for sure because it's just been bulldozed to make more land for the cane (sugar). It took away that resource that we did have. So now we're left with just fields. But on the other hand, now we can make these fields for people for growing plants. Because we know the fields are fertile. Now we're giving it back to the people and now they can farm. They can do subsistence living. We can encourage all these things."

Recommendations

- What changes in the landscape, practices and uses of natural and cultural resources have you observed in your lifetime?
  - Chad comments, "To be honest, when you're young, you really don't take notice of things. You just take things for granted. Today, I see Hanapēpē becoming more vibrant with Hanapēpē artwork, a lot of local businesses, communities are coming together. Usually you just pass through here on your way to Waimea. But now, it's becoming a place to stop because there all kinds of good local food that you can grab. You have more of a variety now. We have two stop lights with so much resources in between those two stop lights…food to shopping to art galleries. And with that comes a negative effect with the more people coming through…more construction, more infrastructure. The biggest one right now we see in Hanapēpē is the helicopter companies that are affecting the local paʻakai. That's the last resource we have here. There's a big fight however there's not a lot of support higher up than just the people here to kind of support that."

- Do you have any recommendations or concerns regarding cultural and natural resource management or protection, and land use in the area?
  - » Chad mentions drainage, "Is the biggest concern. When they started building the access and the amount of traffic because going up Moi Road, it's pretty simple. There's a small community up there. There's not a lot of traffic. But they started bringing in machinery, loud noises that are right there. How is all of this going to be affected? Right now, when a big storm hits, many of the houses get flooded because of the terrain it was built on. The engineers really don't take that into consideration. They put ditches but they don't work. Then you have the gully, plus all this area was an old dump with metal parts. These are things that have to be taken into account. Where will the rubbish go? We take one double negative, basically, and it was turned into something, we're in the good. But ultimately what they're trying to do, it's only going to be beneficial. We know there's a lot of people on the list. It's going to increase or decrease the amount of names of the list (DHHL). But there's a limited amount of people who can apply now."
- What solutions do you think would be helpful towards these concerns?
  - » Chad mentions there may be solutions, but he doesn't know the best solution, "You're going to have ten different people with different solutions and outcomes. So it's really hard. Wherever the drainage goes, it heads to the kai. Right now, we're in line with our local paʻakai in Hanapēpē Bay. When it rains mauka, the Bay is constantly brown. I've never seen the Bay clear or blue. It's brown. There is effects from construction that far up with everything rolling downhill."
- How would you like your ʻohana and other to culturally interact with Hanapēpē? Do you think there can be improvements to sharing about cultural resources in the area? If so, how?
  - » Chad comments talking to the kūpuna is most important, "They're from here and they know this place. The State was trying to give out this land and make a place for the community to go to but they never got in touch with the community. They didn't give anybody in this area that respect their families deserved. If things are back-door, you're going to receive a lot of resistance from the communities, particularly on this side – Waimea, Kekaha. The smartest thing is to make it really transparent as far as what you want to do and get the good and the bad from the community but listen to what the community has to say. That's the biggest thing. We don't want this to turn out to be like Līhuʻe. We want it simple. We want it country when you drive by. That's what keeps Kauaʻi, Kauaʻi. That's the simple way and everybody's family on this side. Finding out what the people want <u>first</u> versus what you think is the smartest way to do things here."

Manaʻo:

- Referrals to other individuals or organizations with knowledge of Hanapēpē
  - Chad refers aunty Janet Kahalekomo who was also kupuna at ʻEleʻele school for many years. Malia Nobrega Olivera. Three families in the community: Santos, Kaʻohi, Kali.
- I just need to get verbal consent, may we use the information from todays interview for our write up to SSFM for DDHL?
  - Chad gave verbal consent, "Yes."

HANAPĒPĒ CIA INTERVIEW QUESTIONS

Kuʻulei Santos

<u>Background Information:</u>

- Name: Kuʻulei Santos
- When and where were you born?
  - ➢ Born and raised on Kauaʻi
- Where did you grow up?
  - ➢ West side of Kauaʻi
- Can you share about your personal family connection to the Hanapēpē area?
  - ➢ Kuʻulei shares her father was born and raised in Hanapēpē, "He lived right by Port Allen and he started making Hawaiian salt when he was a little kid, probably 10 or 11, I think. That's kind of my family connection. My grandmother lived on Niʻihau for a really long time. My dad's brothers were raised on Niʻihau so my family has pretty much been from that side of the Island."

<u>Moʻolelo, Place Names, Mele, Hula:</u>

- Do you know any traditional accounts including place names, moʻolelo, ʻōlelo noʻeau for the Hanapēpē area ?
  - » Kuʻulei shares about salt making stories, "The two that I share is how Hawaiian salt was made and its connection between why Pele was always hanging out in the area. Back in the day, Hawaiian salt was made and Hawaiians believe you only gather, you only hunt, you only fish for what you can use. So there was a woman, she was on the beach called Puolo Point or Salt Pond Beach Park. She caught too many fish and tried to give them away. She walked up and down the shoreline to try and give away all the fish but she couldn't so she felt really bad. She started to cry. A woman appeared from the bushes and said, 'Please don't cry. Follow me.' The woman followed her to an area, dug a hole, and she taught her how to preserve the fish using salt. They said the lady who appeared from the bushes was Pele. They say Pele was hanging out over there because she liked the shark god who liked to visit her so he would swim underground in the tunnels. The way Hawaiian salt is made, water flows underground into our wells. So they say that's why, she wasn't allowed to go to the ocean. They also call that bay right there before Salt Pond or Puolo Point, Sharks Bay."

<u>Natural Landscapes, Resources, Uses:</u>

- Can you share about the mauka-makai resources and their relationship and connection?
  - Kuʻulei comments that where Hawaiian salt is made is the lowest area which is surrounded by everything, "So all the entities matters to us. The way the water flows underground into our tunnels. The way the clay appears in certain areas, that helps us build the clay pods. The way the brine shrimp kind of just shows up in our wells, it's all due to how everything flows together. If you look at the kind of water that in the salt making area, it's not 100% saltwater.
  - It's a little bit of fresh water. And so the combination of it helps. It can't just be all salt water. So that's not just coming from the ocean. We don't really know what exactly happens underneath to give it all those elements to help us make Hawaiian salt. Cause you figure

you've got the clay going on over there, not sure how that happens. You got the brine shrimp, not really sure how all of a sudden people have brine shrimp. And then you've got the water that flows underground into our actual wells, which is not really always a combination of salt and fresh water."

Recommendations

- What changes in the landscape, practices and uses of natural and cultural resources have you observed in your lifetime?
  - Kuʻulei shares, "It's not the native plants that surround the area anymore. We don't have a lot of protection because we have a parking lot that's eroding and nothing is offering enough protection. A bunch of native plants (unsure of company helping as recording was inaudible) are being started for us so we can plant them back for protection. So before the salt season. It's a lot harder to find some of the things that were so abundant in the past. Like the clay that we use to make the actual salt beds used to be so easy. Now it's like, you know, you ever watch that movie *Holes* and then you see all the like piles of dirt? There is that movie where it's holes and they're digging for treasure. And so you look on the desert and then there's all of these like mounds of dirt. That's what salt makers look like now. We're trying to dig for clay. During the summer, you'll see like all these hills of clay but you can't find it anymore. So it's harder and harder to find the clay to make Hawaiian salt."
- What concerns do you have about potential impacts to the cultural resources in the area?
  - Kuʻulei comments, "Back in the day, we used to give away five-gallon buckets. If you asked me for Hawaiian salt, I would give you a five-gallon bucket. Now, we can't give. Someone asked me yesterday for 25-pounds of Hawaiian salt. I'm like, 'We haven't made Hawaiian salt last year. I can't give you that as much as I would like to.' And it's just because my father's generation, the way his mom taught him and that whole generation prior to me, they all believe that you just go into the salt making area and you just work. That is your goal. You work, you will make a product, and you will give it away. You give it away because you love your culture, you love your history and that's just what we do. So you don't talk about it to anybody. Everybody will understand that you are creating something because everybody asks you for it. So they'll just leave you alone and they'll help you protect the area. But when they didn't talk about it, everybody either forgot about them or didn't even think to, they had to deal with it or had to protect it or had to care about it. You know what I'm saying? So what happens when that happens is that everything bad flows to us and no one cares. So people come and they'll party in our parking lot. They'll throw their glass bottles, and there's not a year goes by that we don't get hurt. We did an on excursion with a hālau this past summer and someone had to go to the emergency room and get stitches because they got cut on glass. But that happens every single year. We've got people who drive on the sand. It's illegal to drive on the sand. Every time you drive on the sand, right in front of our salt making area, you take that sand away from the beach, which is our protection against the ocean and all that kind of stuff. So when the waves come up, it floods us. You have the County who illegally dumped all this old asphalt right in between the beach and our salt patch. So water doesn't flow like it used to underground anymore. The way we make Hawaiian salt is water flows underground. You throw old asphalt in that drainage system. What happened? Water won't be able to flow in and out as it used to. So we're not able to make salt as we used to make salt. You've got a helicopter company that continues to fly over us creating more dust and debris. I mean, they just don't care about what kind of neighbors they want to be. You know what I'm saying?"

  - Kuʻulei shares about the helicopter company, "When it comes to that helicopter company, the salt makers have been fighting that entity for probably 50-years. If you look at they're planning records, there is a really good intervention when the helicopter company tried to put in the fuel tank. Wilma Holi went in and they interviewed her. She tells a lot of history of the area and why they shouldn't have expanded. Then if you look at the history of that helicopter company, they have done nothing but be bad neighbors. They fly over us; they try to expand. They do things that are so shady. So the owner's prior, Smokey Mountain Helicopters, didn't pay his taxes or didn't pay his tax fees. So then what happens? They came in and wanted to transfer the lease to Maverick. We came in and we said, 'No! You haven't paid your leases. You have to go out to bid and you haven't paid your taxes. So why do all of a sudden you get to transfer your lease? You really should be voided because you haven't paid the rent for a year.' So Maverick came in, paid all their bills, paid off all their things. So then they came back and said, 'Okay, well we want to now transfer over the lease.' So they went to BLNR, because they have to go through that to get it passed. So we went again and said, 'No! These are the rules. These are the regulations. This is why we should hold space first.' (This helicopter company is the biggest helicopter company in the United States) They can only do so many flights. They can't fly over us. So BLNR said, 'Yes, you can have the lease until you guys meet with the salt makers and go over this.' They found a loophole. As soon as Maverick came in, they started doing all this expansion. We came into the Planning Department, we said, 'Wait a minute, they're doing all this stuff.' We had to send pictures before the Planning Commission would go in and do an investigation. The Planning Commission went in, did an investigation, and tried to get them, 'Wait a minute, you have all these unregistered buildings. You have a bathroom, which we told you guys not to put it, specifically told you guys to not put it in a bathroom. You did it anyway. You expanded your offices and built concrete slabs and all this kind of stuff that they weren't supposed to do.' So Maverick came back and said, 'We don't give a shit. We don't care. We're going to fight this.' So we're like, okay, bring it on! So we had to go prove our worth to everybody trying to get money, trying an attorney, try and do all this stuff. They got hit with a fine because they were like, we don't give a shit. They paid the fine. Then they came back and said, 'We don't care. We're going to keep testifying.' So we're like, okay, let's play. So then we started doing the social media and all that kind of stuff, and getting a lot of traction. So then they said, 'Okay, you know what? We're going to withdraw.' So they have withdrawn but now they're trying to find another way to get. So they couldn't hire any engineers or consultants here (Kauaʻi). So now they're on Oʻahu trying to redo all the research to get it in. Also, when they went in for their permits or after the fact permits, they hired a cultural advisor that said that the helicopters have no impact whatsoever on the salt makers. That cultural person that they hired, who's from Maui, never stepped in the salt patch, never made salt, never even called us. Never even had a conversation with any of us. I can go on and on about all the bad things that the helicopter company has done and continues to do. We have so many videos of them. They're not supposed to fly over us. They say, 'We don't fly over you.' But we ask them, 'Oh yeah, but you circle around us, you hover and circle.'"
- Do you have any recommendations or concerns regarding cultural and natural resource management or protection, and land use in the area?
  - Kuʻulei comments, "It would be nice to close the airport down so we can have that parking area for people to park there. Every time you drive around that area, it compacts the ground. So when you drive on a tunnel that brings in the water to and from us, the more people drive on it, the more you compact it down. So it's harder and harder for the water to flow in and

out and around. So closing the airport would be a good one. Closing the camp or at least lessening the amount of permits they give out would be great. More education for kids or locals not to destroy the area would be beneficial. And people always say, it's the tourists. It's not the tourists. The tourists don't come and party in the parking lot and break beer bottles and cans."

- How would you like others to culturally interact with Hanapēpē? Do you think there can be improvements to sharing about cultural resources in the area? If there's any ask, what would you ask?
  - Kuʻulei responds, "For me as a salt maker, I always have to prove my worth. Taro farmers don't have to prove their worth or a hula dancer doesn't need to prove that the hula is important. But for salt makers, for some strange reason, we are constantly having to tell people that we are important and it's important to protect the area. It's important to have your kids not burn rubber in the parking lot constantly or throw their beer bottles."
  - Kuʻulei talks about improvements, "I would like to see the salt making parking lot closed off and closed off so that people can't drive in that parking lot. There's a middle road that the County illegally put in, so we would like to have that taken out. We would like to close the beach park from all the campers because it's destroying the resources and the resources at that beach park cannot hold the amount of campers that they're allowing in the area. That would be another one. The homeless camp across the street just got internet service. Don't ask me how. They don't have water, they don't have electric, but they have a generator and solar panels and so the electric company just went and installed cable for them. How can you be a homeless camp and you go to install cable? It's just mind boggling to me like! Why is it that a lady can raise a hundred cats in our borders? Because she's a little old lady and wants to start a cat colony that lines our salt area. Why is that ok? It's going to take years to get rid of her. You know what I mean? Like why is it okay that a homeless camp can pop up right in our salt patch. But for us to get somebody to kick them out, it's a process, they have to be 30 days' notice. And then you know you have to schedule a time so that they can come and do all this stuff. It's like, wait a minute, they're in our area. We are salt makers. Everyone on Kauaʻi or in the State pretty much who has lived here for a certain time has consumed Hawaiian salt. We're the only place in the world that makes it yet it's shared throughout so many people and so many people have partaken in it. But yet it's so difficult to prove that we are important. We're important part of history, culture, and we continue to practice just because we love it and we're just going to give it away. It's not ever sold."
  - Kuʻulei continues to add about the mauka side and improvements, "I wish everybody would just leave it alone and let it breathe. It would just be a place where it could be allowed to breathe. Let the salt makers be the most important part of the area and let us figure out the plan for the whole entire palena."
  - For others to culturally interact with Hanapēpē, Kuʻulei comments about the proposed project with 482 homes in the next 20-years, "For me, I like to tell everyone that my house is bigger than the home that I live in and everybody has to remember that. If everybody would take the time to understand the area that they call home and what makes that part important and how can we help protect or how can we be mindful. For example, if you go to Hanalei, I understand now why you shouldn't drive on the beach or why you shouldn't do those kinds of things. People just need to remember that when you're calling a place home for all these 400 people, it would be nice if there was a little packet to say, 'These are the important things in Hanapēpē. These are the historical sites in Hanapēpē. This is what makes it unique or important and this is what you should do to help perpetuate or protect or at least learn

about your town.' Please understand why you're choosing Hanapēpē to be the place that you want to call for the next 30 years."

Manaʻo:

- Is there any information you shared with us that you do not want to be public –
  - Kuʻulei comments, "No, I'm very vocal about what I do and why I do it and what I think is important."
- Referrals to other individuals or organizations with knowledge of Hanapēpē
  - Kuʻulei referred Janet Kahelekoma, Malia, and Kēhaulani Kekua
    - Regarding Kēhaulani Kekua, Kuʻulei shares, "I love her legends because they encompass all the way up to Bougainvillea Hill and ʻEleʻele School that kind of reflect on the salt making area. So she has a lot more legends of the whole spot. I only know the salt making one."
- I just need to get verbal consent, may we use the information from todays interview for our write up to SSFM for DDHL?
  - Kuʻulei comments, "Yes."

HANAPĒPĒ CIA INTERVIEW QUESTIONS

[Waiting for consent]

Background Information:

- Name: Waiting for consent form

HANAPĒPĒ CIA INTERVIEW QUESTIONS

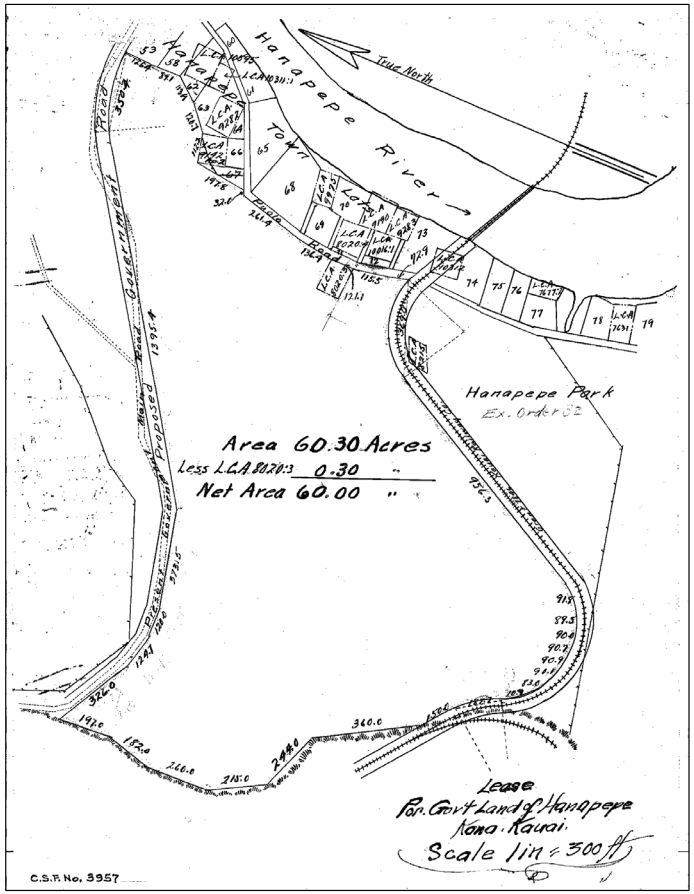
[Waiting for consent]

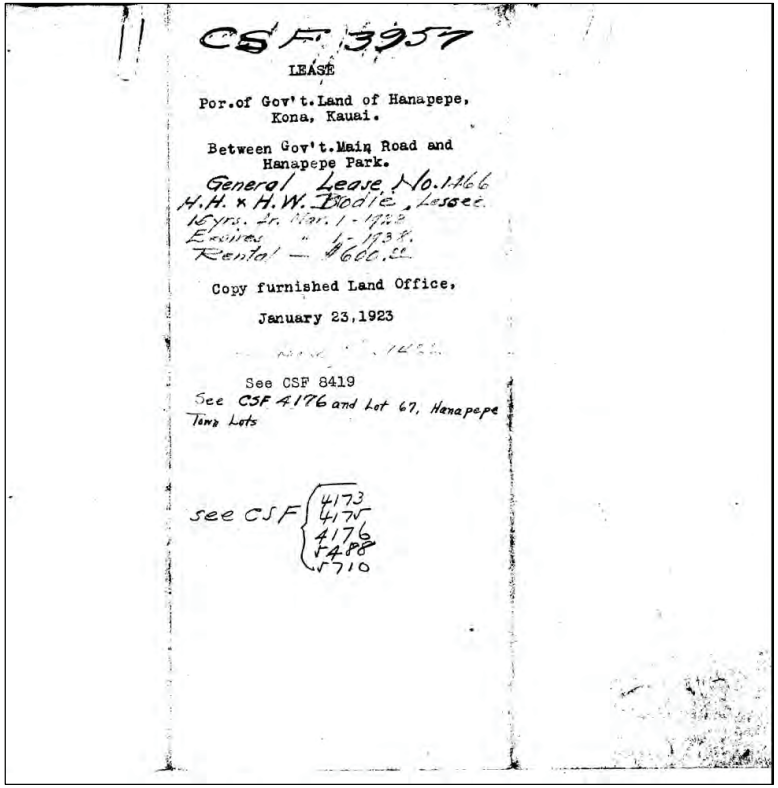
Background Information:

- Name: Waiting for consent form

Appendix J: Copy Survey Furnished (CSF) 3957

Showing CSF 3957 map and description, clarifying location of H.H. Brodie lease.





CSF 3957

LEASE

Por. of Gov't. Land of Hanapepe,
Kona, Kauai.

Between Gov't. Main Road and
Hanapepe Park.

General Lease No. 1466
H.H. & H.W. Brodie, Lessee.
15 yrs. fr. Nov. 1 - 1922
Expires " 1 - 1937
Rental — $600.00

Copy furnished Land Office,

January 23, 1923

See CSF 8419
See CSF 4176 and Lot 67, Hanapepe Town Lots

see CSF 4173, 4175, 4176, 4198, 5710

Territory of Hawaii.

Office of the Government Survey.

Honolulu, T. H., January 16, 1923

LEASE.

Portion of Government Land of Hanapepe,
Kona, Kauai.

Situate between Government Main Road and
Hanapepe Park.

Beginning at a pipe at the Northeast corner of this piece, the Northwest corner of Lot 53, Hanapepe Town Lots, and on the South side of Government Main Road, the coordinates of said point of beginning referred to Government Survey Trig. Station "Puolo" being 6421.9 feet North and 4444.8 feet East, as shown on Government Survey Registered Map No.2615, and running by true azimuths:-

1. 4° 49' 126.4 feet along Lot 53, Hanapepe Town Lots, to a stake;
2. 359° 41' 89.1 feet along Lot 58, Hanapepe Town Lots, to a stake;
3. 38° 11' 113.9 feet along Lot 62, Hanapepe Town Lots, to a stake;
4. 51° 47' 120.7 feet along Lot 63, Hanapepe Town Lots;
5. 77° 15' 112.2 feet along L.C.A.9142 Apana 2, to Kapekue;
6. 7° 10' 197.8 feet along Lot 67, Hanapepe Town Lots;
7. 68° 21' 32.4 feet along Puolo Road;
8. 16° 23' 261.4 feet along same;
9. 7° 26' 136.4 feet along same;
10. 359° 27' 121.1 feet along same;
11. 350° 07' 115.5 feet along same;
12. 344° 52' ~~92.5~~ 76.4 feet along same;
13. Thence along Grant ~~8196~~ 6796 to the Kauai Railway Co. on a curve to the left with a radius of 282.2 feet, the direct azimuth and distance being: ~~69° 09' 369.0 feet~~; 69°13'24" 367.5 feet;
14. 28° 42' 956.3 feet along same;

Thence along same on a curve to the right, the direct azimuths and distances being, as follows:-

15. 40° 05' 91.8 feet;
16. 59° 56' 89.5 feet;
17. 80° 01' 90.0 feet;
18. 98° 06' 90.7 feet;
19. 115° 19' 90.9 feet;
20. 132° 36' 91.1 feet;
21. 148° 58' 83.0 feet;
22. 157° 30' 10.9 feet along same;
23. Thence along same on a curve to the left with a radius of 365.4 feet, the direct azimuth and distance being: 142° 39' 187.7 feet;
24. 127° 44' 150.0 feet along same;

Thence along the foot of a bluff, the direct azimuths and distances being, as follows:-

25. 150° 30' 360 feet;
26. 111° 20' 244 feet;
27. 154° 10' 215 feet;
28. 179° 30' 260 feet;
29. 195° 00' ~~180~~ 182 feet;
30. 175° 10' ~~194~~ 198.4 feet to the South side of Government Main Road;
31. 298° 00' ~~356.0~~ 328.7 feet along the South side of proposed Government Main Road;
32. 285° 47' 124.7 feet along same;
33. 267° 55' 120.0 feet along same;
34. 256° 56' 373.5 feet along same;
35. 237° 07' 1395.4 feet along same;
36. Thence along same on a curve to the right with a radius of 526.6 feet, the direct azimuth and distance being: 256° 53' 350.4 feet to the point of beginning.

Area 60-30/100 Acres.

Excepting and reserving therefrom L.C.A. 8020 Apana 3, to Kapoi, which is located within the above described area, as shown on plan hereto attached and made a part hereof, Area 30/100 of an Acre, and LEAVING A NET AREA OF 60-00/100 ACRES.

See C.S.F. 5710

Compiled from Gov't.
Survey Records, by
J.M. Dunn
Feb. 27, 1930

James M. Dunn
Assistant Government Surveyor.

NOTE: See letter File 240 herein dated 2/27/1930 re-writing this description

Appendix E - Traffic Impact Analysis Report

Hanapēpē Kaua‘i Homestead
Hanapēpē-‘Ele‘ele, Kaua‘i

Draft
Traffic Impact Analysis Report
March 25, 2020

Prepared for
Department of Hawaiian Home Lands,
Kapolei, O‘ahu,
Hawai‘i

Prepared by

SSFM
INTERNATIONAL

Table of Contents

I. INTRODUCTION 1
II. EXISTING (2019) CONDITIONS 4
A. Geometric Configuration 4
1. Roadway Configuration 4
2. Intersection Configuration 4
B. Multimodal Infrastructure 5
1. Pedestrian and Bicycle Facilities 5
2. Bus Transit System 5
C. Volumes 8
1. Vehicular Volume 8
2. Pedestrian Volumes 8
D. Level of Service 13
1. Methodology 13
2. Intersection Results 14
III. FUTURE (2025) CONDITIONS 17
A. Geometric Configuration 17
B. Multimodal Infrastructure 17
C. Volumes 17
1. Future (2025) Without Project 17
2. Phase 2 - Project Related 18
3. Future (2025) With Project 18
D. Level of Service 25
1. Future (2025) Without Project 25
2. Future (2025) With Project 28
IV. FUTURE (2040) CONDITIONS 32
A. Geometric Configuration 32
B. Multimodal Infrastructure 32
C. Volumes 32
1. Future (2040) Without Project 32
2. Phase 3 - Project Related 35

3. Future (2040) With Project 36
D. Level of Service 41
1. Future (2040) Without Project 41
2. Future (2040) With Project 45
E. Mitigation Measures 49
V. SUMMARY 54
VI. REFERENCES 57

List of Appendices

APPENDIX A: HDOT 24-Hour Traffic Volumes and Intersection Peak Hour Turning Movement Counts
APPENDIX B: Analysis Reports Existing (2019) Conditions
APPENDIX C: Analysis Reports Future (2025) Without Project Conditions
APPENDIX D: Analysis Reports Future (2025) With Project Conditions
APPENDIX E: Analysis Reports Future (2040) Without Project Conditions
APPENDIX F: Analysis Reports Future (2040) With Project Conditions
APPENDIX G: Signal Warrants

List of Figures

Figure 1: Proposed Development Site Plan 2
Figure 2: Project Location Map 3
Figure 3: Existing (2019) Lane Configuration (Part 1) 6
Figure 4: Existing (2019) Lane Configuration (Part 2) 7
Figure 5: Kaumuali'i Highway, 24-Hour Vehicle Volume Distribution 9
Figure 6: Moi Road, 24-Hour Vehicle Volume Distribution 10
Figure 7: Existing (2019) Peak Hour Volumes (Part 1) 11
Figure 8: Existing (2019) Peak Hour Volumes (Part 2) 12
Figure 9: Future (2025) Without Project Peak Hour Volumes (Part 1) 19
Figure 10 Future (2025) Without Project Peak Hour Volumes (Part 2) 20
Figure 11: Phase 2 - Project Related Peak Hour Volumes (Part 1) 21
Figure 12: Phase 2 - Project Related Peak Hour Volumes (Part 2) 22
Figure 13: Future (2025) With Project Peak Hour Volumes (Part 1) 23
Figure 14: Future (2025) With Project Peak Hour Volumes (Part 2) 24
Figure 15: Future (2040) Without Project Peak Hour Volumes (Part 1) 33
Figure 16: Future (2040) Without Project Peak Hour Volumes (Part 2) 34
Figure 17: Phase 3 - Project Related Peak Hour Volumes (Part 1) 37
Figure 18: Phase 3 - Project Related Peak Hour Volumes (Part 2) 38
Figure 19: Future (2040) With Project Peak Hour Volumes (Part 1) 39
Figure 20: Future (2040) With Project Peak Hour Volumes (Part 2) 40
Figure 21: Proposed Transportation Network 53

List of Tables

Table 1: Roadway Annual Average Daily Traffic (2016) 8
Table 2: LOS Criteria for Unsignalized Intersections 13
Table 3: LOS Criteria for Signalized Intersections 14
Table 4: Existing (2019) Intersection Level of Service (Part 1) 15
Table 5: Existing (2019) Intersection Level of Service (Part 2) 16
Table 6: Phase 2 - Trip Generation Rates 18
Table 7: Phase 2 - Trip Generation Volumes 18
Table 8: Future (2025) Without Project Intersection Level of Service (Part 1) 26
Table 9: Future (2025) Without Project Intersection Level of Service (Part 2) 27
Table 10: Future (2025) Without Project Intersection Level of Service (Part 3) 28
Table 11: Future (2025) With Project Intersection Level of Service (Part 1) 29
Table 12: Future (2025) With Project Intersection Level of Service (Part 2) 30
Table 13: Future (2025) With Project Intersection Level of Service (Part 3) 31
Table 14: Phase 3 - Trip Generation Volumes by Residential 35
Table 15: Phase 3 - Trip Generation Volumes by Commercial 35
Table 16: Phase 3 – Internal Trips for Commercial 36
Table 17: Phase 3 – Pass-by Trips for Commercial 36
Table 18: Phase 3 – Total Trips Generated by Commercial 36
Table 19: Future (2040) Without Project Intersection Level of Service (Part 1) 42
Table 20: Future (2040) Without Project Intersection Level of Service (Part 2) 43
Table 21: Future (2040) Without Project Intersection Level of Service (Part 3) 44
Table 22: Future (2040) With Project Intersection Level of Service (Part 1) 46
Table 23: Future (2040) With Project Intersection Level of Service (Part 2) 47
Table 24: Future (2040) With Project Intersection Level of Service (Part 3) 48
Table 25: Future (2040) With Mitigations Level of Service (Part 1) 50
Table 26: Future (2040) With Mitigations Level of Service (Part 2) 51
Table 27: Future (2040) With Mitigations Level of Service (Part 3) 52

I. INTRODUCTION

The State Department of Hawaiian Home Lands (DHHL) is proposing to expand development on 365 acres of gently rolling former agricultural land west of historic Hanapēpē Town and Moi Road/Puolo Road on the Island of Kaua'i. The proposed development is in line with details from the Kaua`i Island Plan (DHHL, 2004) and includes residential and agriculture homesteading lots, community use, and commercial area including the redevelopment of an existing warehouse. It also includes the development of an internal transportation network that provides secondary access to existing and future residents.

The proposed two-phased development will be located on 359-acres (TMK: (4) 1-8-007:003) of undeveloped land mauka (towards the mountains) of Kaumuali'i Highway and adjacent to 59 single-family homes built on DHHL lots as a part of Phase 1. The current development is planned to include 449 residential lots, 111 subsistence agricultural lots, and 6.96 acres of commercial area to be developed over two phases (Phase 2 and 3). A 6.21-acre lot (TMK: (4) 1-8-008:035, 081, 086, and 087) with an existing operational warehouse makai (towards the ocean) of Kaumuali'i Highway between Puolo Road and Lele Road will also be redeveloped as commercial area as a part of Phase 3.

In total, Phase 2 plans to have 75 residential lots with an expected full buildout and occupancy by 2025. Phase 3 will have 374 residential units, 111 subsistence lots, and 13.17 acres of commercial area with an expected full buildout and occupancy by 2040. The southwest corner portion of the mauka lot is planned to have community use areas for shared homestead uses and facilities that may include spaces for parks, recreation, cultural activities utilities and other amenities. The proposed development is shown in Figure 1.

This traffic impact analysis report (TIAR) is being prepared to assess traffic impacts as a result of the proposed development of Phase 2 and 3. Multimodal turning movement traffic counts were taken at 15 study intersections in the vicinity of proposed project and analyzed for Existing (2019), Future (2025, 2040) Without Project, and Future (2025, 2040) With Project conditions. The project location and study intersections are shown in Figure 2.

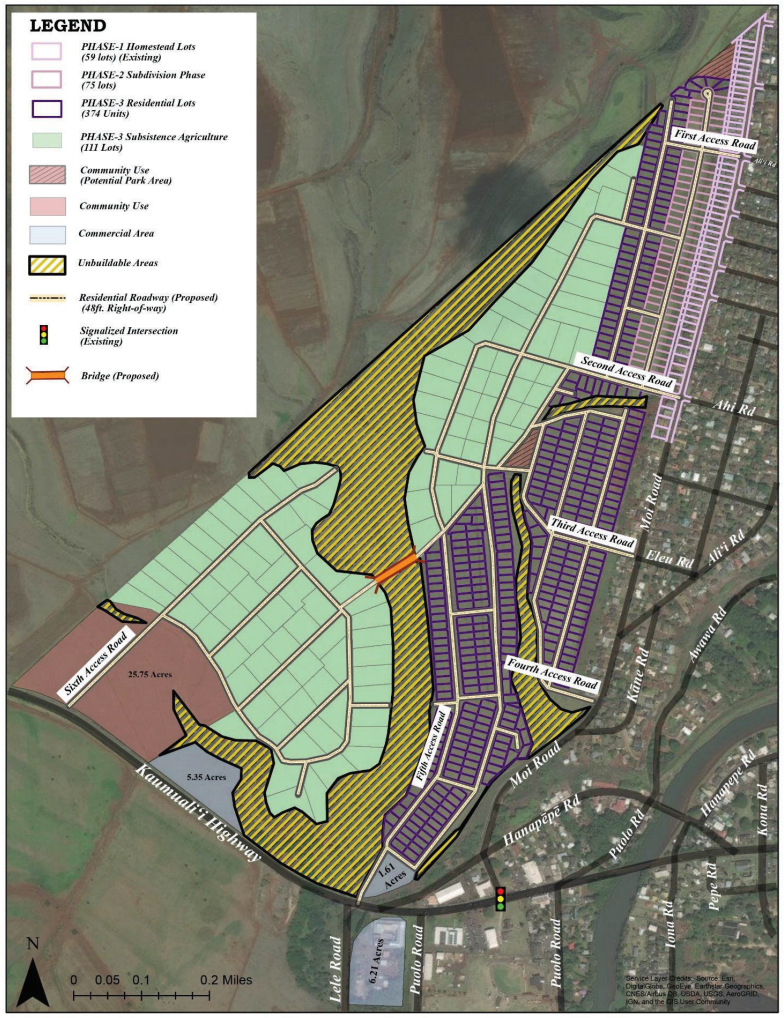


Figure 1: Proposed Development Site Plan

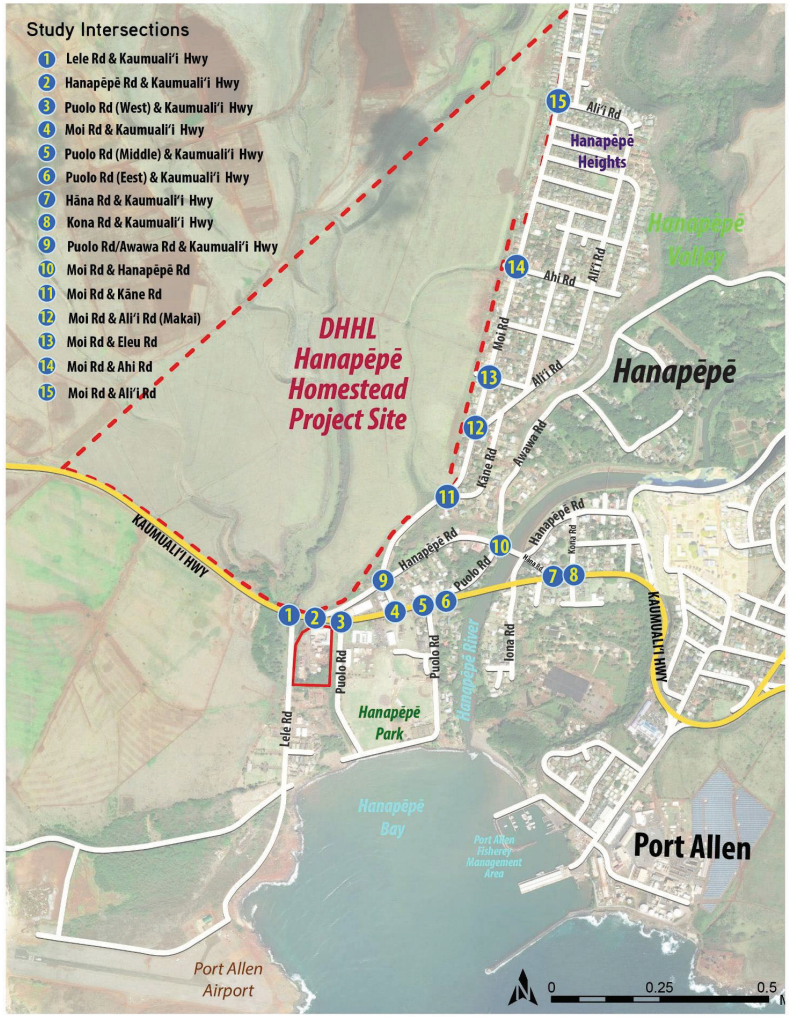


Figure 2: Project Location Map

II. EXISTING (2019) CONDITIONS

Hanapēpē is a historical town with commercial, residential, and industrial uses. Makai of Kaumuali'i Highway is Hanapēpē Park and Hanapēpē Bay, which is the location of culturally significant salt ponds and public beach. Port Allen is located east of Hanapēpē and is one of the island's main industrial hubs, with a harbor, power plant and solar farm. Port Allen Airport is located west of Hanapēpē.

A. Geometric Configuration

1. Roadway Configuration

Kaumuali'i Highway (State Route 50) is an undivided, two lane, two-way thoroughfare, classified as minor arterial, and which traverses in the east-west direction in the project area. It connects Hanapēpē to Kaumakani Village in the west and 'Ele'ele Town in the east. The posted speed limit is 35-mph in the study area. Six-foot-wide shoulders are present on both sides of the road. No sidewalks, bikeways, or bike facilities exist along Kaumuali'i Highway in the study area.

Moi Road starts from the signalized intersection with Kaumuali'i Highway and ends mauka of its intersection with Ali'i Road. It is a two-lane, two-way mauka-makai thoroughfare with a 25-mph posted speed limit. It connects Kaumuali'i Highway to the existing DHHL and Hanapēpē Heights residential neighborhoods. Dedicated left turn lanes are present for both east and westbound movements at the intersection of Moi Road and Kaumuali'i Highway. No shoulders, sidewalks, bikeways, or bike facilities exist along Moi Road.

Hanapēpē Road starts from the stop-controlled intersection with Kaumuali'i Highway, east of Puna road and ends at another stop-controlled with Kaumuali'i Highway west of Puolo Road. It is a two-lane, two-way, east-west thoroughfare with a 25-mph posted speed limit. No shoulders, sidewalks, bikeways, or bike facilities exist along Hanapēpē Road.

Lele Road starts from the stop-controlled intersection with Kaumuali'i Highway, west of Puolo Road, and ends makai of its intersection with Salt Pond Road. It is a two-lane, two-way, mauka-makai thoroughfare with a 25-mph posted speed limit. It connects Kaumuali'i Highway to the Salt Pond Park and Port Allen Airport. No shoulders, sidewalks, bikeways, or bike facilities exist along Lele Road.

2. Intersection Configuration

Considering existing traffic movements in the project area and the anticipated impact of the proposed development, the following intersections were selected for study:

1. Lele Road and Kaumuali'i Highway
2. Hanapēpē Road and Kaumuali'i Highway
3. Puolo Road (West) and Kaumuali'i Highway
4. Moi Road and Kaumuali'i Highway
5. Puolo Road (Middle) and Kaumuali'i Highway
6. Puolo Road (East) and Kaumuali'i Highway
7. Hāna Road and Kaumuali'i Highway
8. Kona Road and Kaumuali'i Highway
9. Hanapēpē Road and Moi Road
10. Puolo Road/Awawa Road and Hanapēpē Road

11. Kāne Road and Moi Road
12. Ali'i Road (Makai) and Moi Road
13. Eleu Road and Moi Road
14. Ahi Road and Moi Road
15. Ali'i Road and Moi Road

Existing (2019) lane configurations, marked pedestrian crosswalks, and traffic control at the study intersections are shown in Figure 3 and Figure 4.

B. Multimodal Infrastructure

1. Pedestrian and Bicycle Facilities

Minimal dedicated pedestrian or bicycle facilities exist in the study area. Six-foot-wide shoulders are present on both sides of Kaumuali'i Highway, however no other roads in the study area have dedicated space for pedestrians or bicycles, limiting the ability for people to get around the community by means other than passenger vehicle.

2. Bus Transit System

Kaua'i Bus provides service to the island of Kaua'i from Kehaka to Hānalei. Route 100, Kekaha-Lihue mainline passes through Hanapēpē once per hour from 5:40am to 8:40pm. Bus stops are located at Hanapēpē Multipurpose Building on Puolo Road, Hanapēpē Armory and Hanapēpē 1st United Church on Kaumuali'i Highway. Route 200, Lihue-Kekaha mainline passes through Hanapēpē once per hour from 6:30am to 10:30pm. Bus stops are located at Westside Pharmacy, Mariko Store on Kaumuali'i Highway and Hanapēpē Multipurpose Building on Puolo Road.

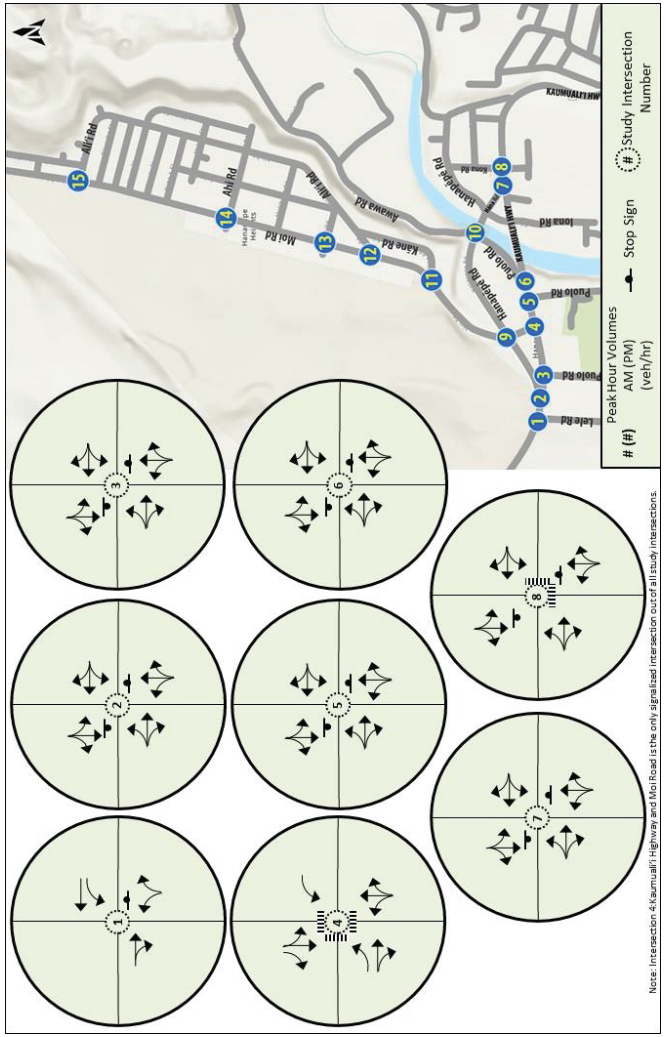


Figure 3: Existing (2019) Lane Configuration (Part 1)

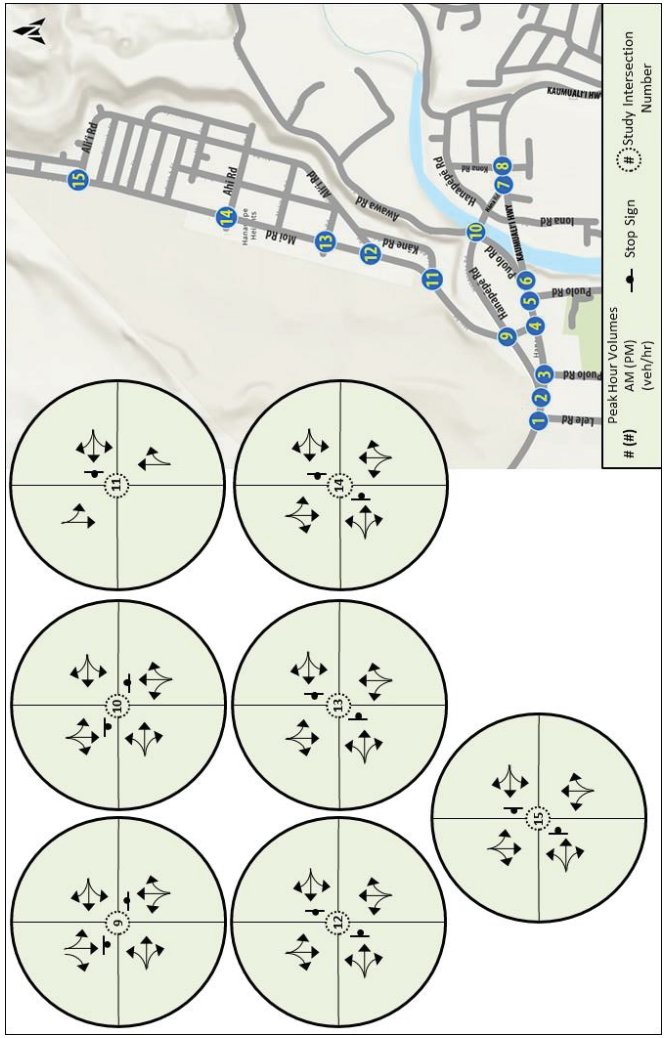


Figure 4: Existing (2019) Lane Configuration (Part 2)

C. Volumes

1. Vehicular Volume

a) Roadway Traffic Volumes

The most recent historical average daily traffic (AADT) along the roadways in the project area in the year 2016 is shown in Table 1. The data comes from annual traffic counts completed by the Hawaii Department of Transportation (HDOT) and provided in *Historical Traffic Station Maps*.

Table 1: Roadway Annual Average Daily Traffic (2016)

Roadway	Station	Location	ADT
Kaumuali'i Hwy	B730 050 01702	Between Lele Road and Kaumakani Village Road	11,200
Moi Road	B730 543 00006	Between Hanapēpē Road and Kāne Road	4,600

The 24-hour traffic volume distribution along Kaumuali'i Highway is shown in Figure 5. Along the highway, during the morning peak hour of 6:45am - 7:45am, there were approximately 340 vehicles travelling eastbound and 540 travelling northbound for a total of 880 vehicles. During the afternoon peak hour of 3:45pm - 4:45pm, there were approximately 590 vehicles travelling eastbound and 400 travelling westbound for a total of 990 vehicles.

The 24-hour traffic volume distribution along Moi Road is shown in Figure 6. Along the highway, during the morning peak hour of 6:30am - 7:30am, there were approximately 55 vehicles travelling eastbound and 235 travelling northbound for a total of 290 vehicles. During the afternoon peak hour of 4:15pm - 5:15pm, there were approximately 250 vehicles travelling eastbound and 155 travelling westbound for a total of 405 vehicles. Detailed 24-hour counts are included in Appendix A.

b) Intersection Peak Hour Volumes

Intersection peak period turning movement traffic counts for 13 study intersections were taken on Tuesday, May 14, 2019. The intersection of Moi Road and Ali'i Road was counted on Wednesday, May 22, 2019. For the intersection of Eleu Road and Moi Road, traffic counts were estimated through balancing that referenced adjacent intersections.

These counts also included classification of heavy vehicles as well as the tabulation of pedestrian and bicycle movements at all intersections. Counts were taken during the AM and PM peak periods from 6:00am – 9:00am and 3:00pm – 6:00pm. Peak hours in the study area are identified as 7:00am to 8:00am in the morning and 3:30pm to 4:30pm in the evening. Peak hour vehicle volumes were balanced and are shown in Figure 7 and 8. Appendix A includes the detailed traffic count data.

2. Pedestrian Volumes

No significant pedestrian activity was observed in the study area. During the morning peak hour, a total of eight pedestrians were observed crossing the intersection of Kaumuali'i Highway and Kona Road. During the afternoon peak hour, a total of 13 pedestrians were observed crossing the intersection of Moi Road and Ali'i Road.

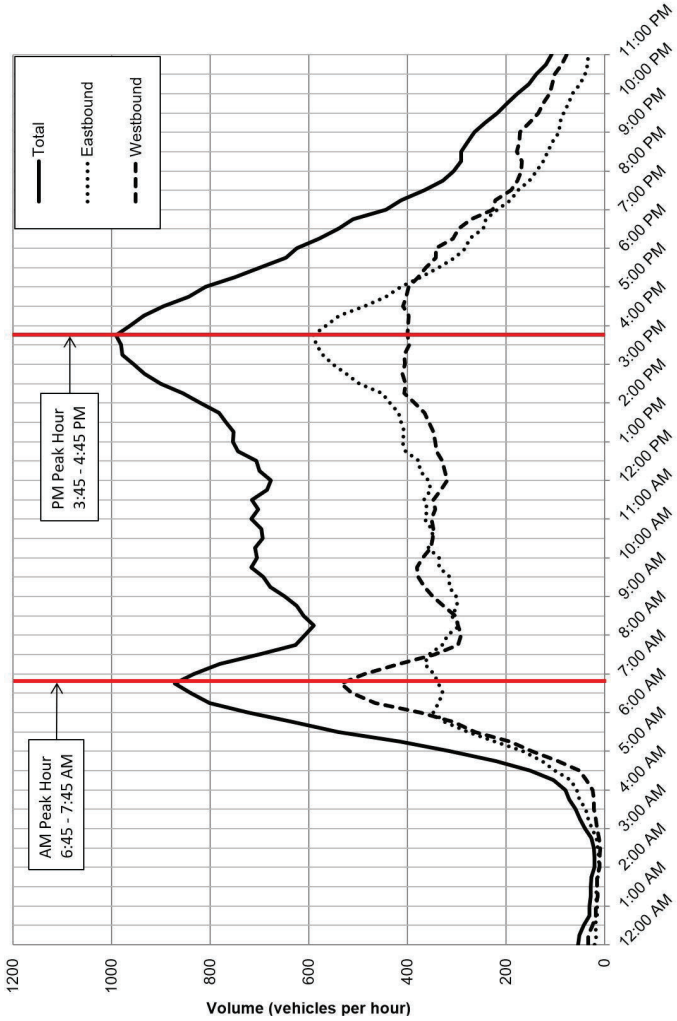


Figure 5: Kaumuali'i Highway, 24-Hour Vehicle Volume Distribution

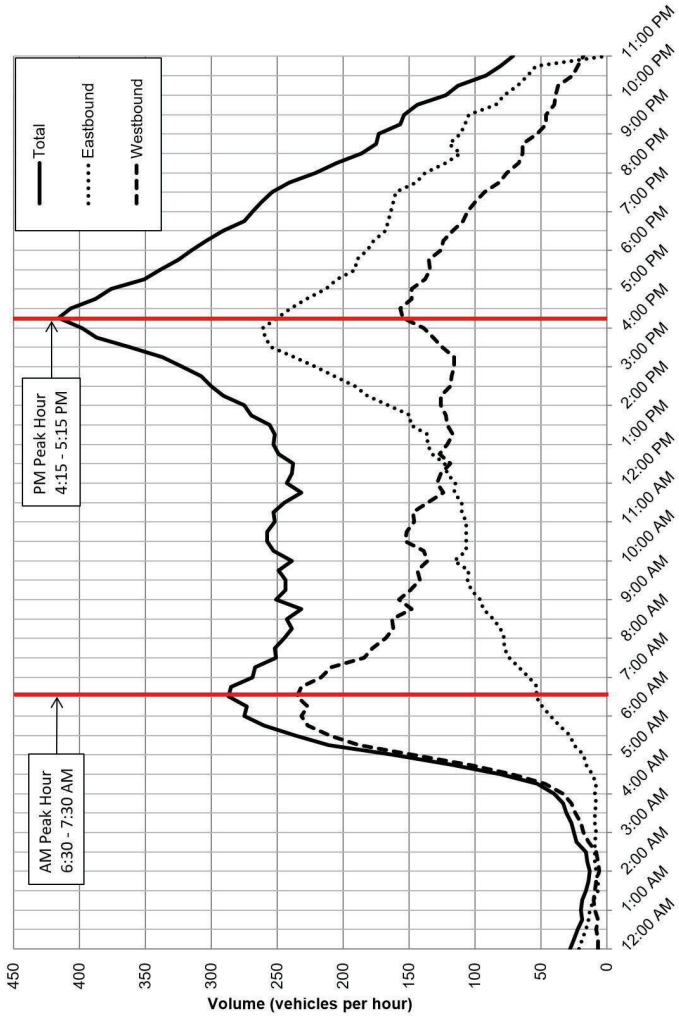


Figure 6: Moi Road, 24-Hour Vehicle Volume Distribution

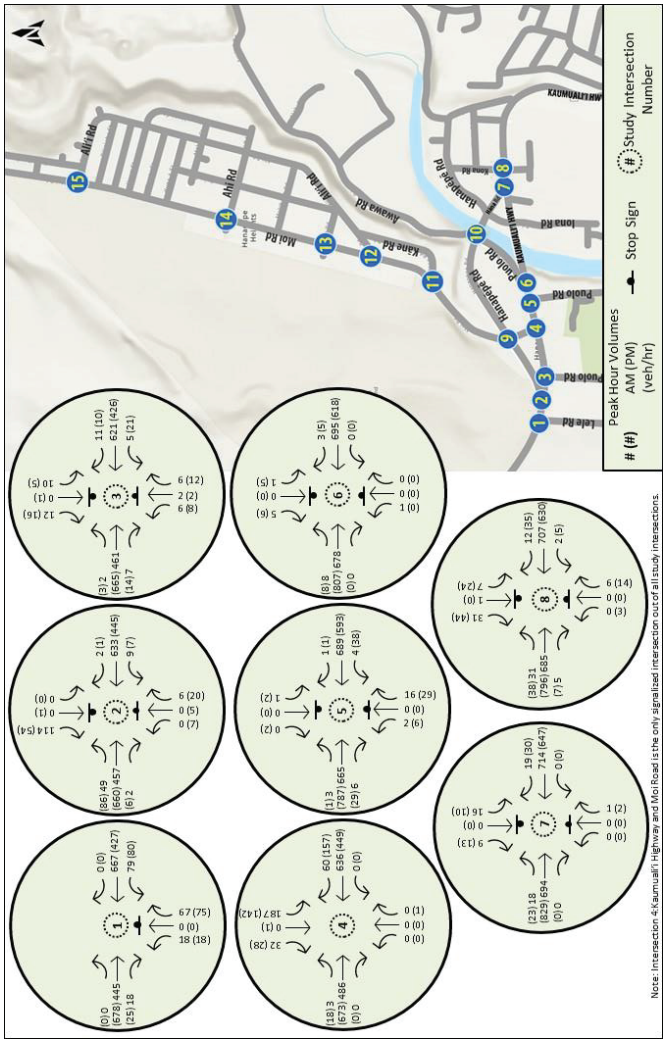


Figure 7: Existing (2019) Peak Hour Volumes (Part 1)

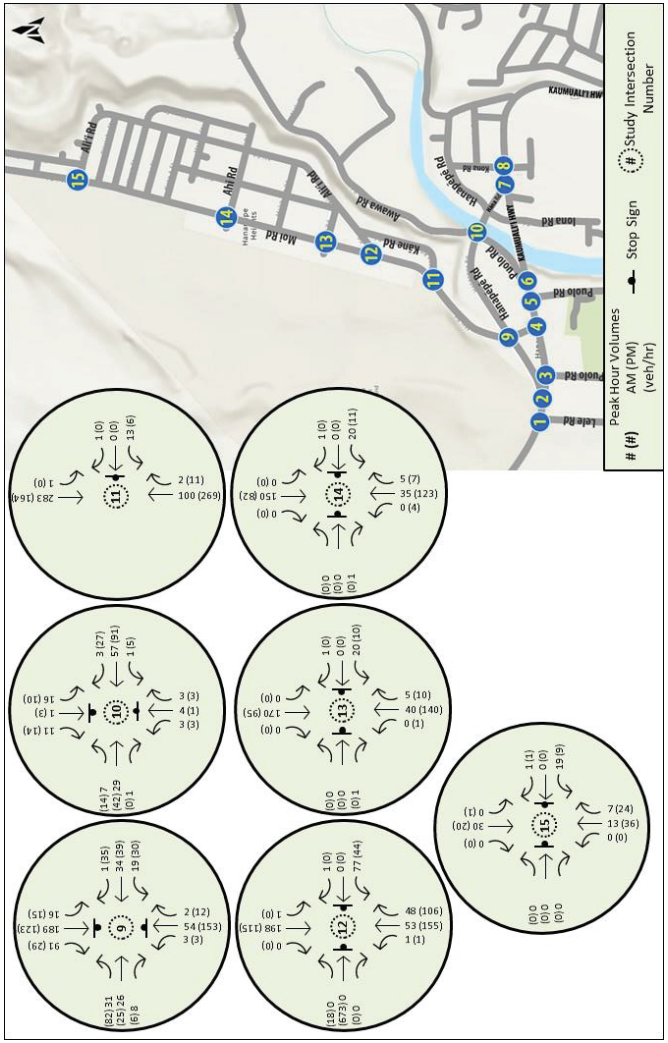


Figure 8: Existing (2019) Peak Hour Volumes (Part 2)

D. Level of Service

1. Methodology

Level of service (LOS) is an operational analysis rating system used in traffic engineering to measure the effectiveness of roadway operating conditions. There are six LOS ranging from A to F. LOS A is defined as being the least interrupted flow conditions with little or no delays, whereas LOS F is defined as conditions where extreme delays exist. Guidelines from the *Statewide Uniform Design Manual for Streets and Highways* (HDOT, 1980) and *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2011) state that an appropriate peak hour LOS for an urban arterial is LOS C or D. The *County of Kaua'i Street Design Manual* (COK, 2018) states that the desired LOS for intersections is LOS E in town centers and LOS D in less densely populated areas for the peak hour of traffic. Intersection LOS and delay were determined for the AM and PM peak hours using *Synchro 10* traffic analysis software and analyzed using *HCM* 6th Edition (TRB, 2016) methodologies.

As stated in the *Highway Capacity Manual* (*HCM*) 6th Edition (TRB, 2016), LOS for a two-way stop controlled (TWSC) intersection is determined by the measured control delay (see Table 2) and is defined for each minor movement, not for the intersection as a whole. Vehicles traveling along the major, free-flow road, of a TWSC intersection, proceed through with minimal delay or no delay at all. Those vehicles approaching the intersection along the minor movement are controlled by a stop sign and thus experience delay attributable to the volume of vehicles passing along the free-flow road and the gaps available.

Table 2: LOS Criteria for Unsignalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	<=1.0	>1.0
≤ 10.0	A	F
>10 and ≤15	B	F
>15 and ≤25	C	F
>25 and ≤35	D	F
>35 and ≤50	E	F
>50	F	F

Source: *HCM* (TRB, 2016)

The LOS analysis for signalized intersections is based on average total vehicle delay based on the methodologies of the *HCM* (TRB, 2016), as shown in Table 3. High numbers of vehicles passing the intersection, long cycle lengths, inappropriate signal phasing, or poor signal progression can result in long delays, and consequently poor LOS.

Another measure of intersection delay is the volume to capacity (v/c) ratio. This is the ratio of the volume of traffic utilizing the intersection compared to the maximum volume of vehicles that can be accommodated by the intersection during a specific period of time. A v/c ratio under 0.85 means the intersection is operating under capacity and excessive delays are not experienced. An intersection is operating near its capacity when v/c ratios range from 0.85 to 0.95. Unstable flows are expected when the v/c ratio is between 0.95 and 1.0. Any v/c ratio greater than or equal to 1.0 indicates that the intersection is operating at or above capacity which results in a LOS F. A traffic movement can have a poor LOS but low v/c which suggests that the traffic volumes along that movement are low but have to wait a long time to make the movement. This is

common for low volume protected turn movements or side streets that have to wait through a long cycle length for their split to come up.

Table 3: LOS Criteria for Signalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	<=1.0	>1.0
≤ 10.0	A	F
>10 and ≤20	B	F
>20 and ≤35	C	F
>35 and ≤55	D	F
>55 and ≤80	E	F
>80	F	F

Source: *HCM* (TRB, 2016)

2. Intersection Results

Existing intersection/movement LOS and average delay (in seconds per vehicle) were determined for the AM and PM weekday peak hours. The signalized intersection of Kaumuali'i Highway and Moi Road resulted in acceptable LOS C or better for the intersection and movements. All stop-controlled intersection turning movements resulted in acceptable LOS D or better except for following approaches:

- Puolo Road (Middle) and Kaumuali'i Highway (Intersection #5): southbound approach resulted in LOS E for both AM and PM peak hours.
- Puolo Road (East) and Kaumuali'i Highway (Intersection #6): northbound approach resulted in LOS E for the AM peak hour.
- Hāna Road and Kaumuali'i Highway (Intersection #7): southbound approach resulted in LOS E for both AM and PM peak hours.
- Kona Road (East) and Kaumuali'i Highway (Intersection #8): southbound approach resulted in LOS F with volume-to-capacity (v/c) ratio less than 1.0 for the PM peak hour.

All poorly operating approaches are for the side streets and are due to the lack of gaps in heavy traffic volumes on Kaumuali'i Highway during the peak hours.

The Existing (2019) intersection and movement LOS are shown in Tables 4 and 5.

Table 4: Existing (2019) Intersection Level of Service (Part 1)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
1. Lele Rd and Kaumuali'i Hwy			1.70	-	-	2.20	-	-
Northbound	**LR**	**Stop**	18.40	0.25	C	22.30	0.32	C
Westbound	**L**	**Free**	8.70	0.08	A	9.70	0.10	A
2. Hanapēpē Rd and Kaumuali'i Hwy			1.90	-	-	1.80	-	-
Northbound	**LTR**	**Stop**	12.70	0.01	B	28.60	0.18	D
Eastbound	**L**	**Free**	9.40	0.06	A	8.80	0.09	A
Westbound	**L**	**Free**	8.50	0.01	A	9.20	0.01	A
Southbound	**LTR**	**Stop**	15.70	0.26	C	12.30	0.11	B
3. Puolo Rd (West) and Kaumuali'i Hwy			0.70	-	-	0.90	-	-
Northbound	**LTR**	**Stop**	21.10	0.06	C	22.40	0.10	C
Eastbound	**L**	**Free**	8.90	0.00	A	8.30	0.00	A
Westbound	**L**	**Free**	8.40	0.01	A	9.20	0.03	A
Southbound	**LTR**	**Stop**	21.00	0.09	C	17.00	0.07	C
4. Moi Rd and Kaumuali'i Hwy			9.40	-	A	17.70	-	B
Eastbound	**L**	**Signal**	10.00	0.01	B	20.00	0.08	C
	TR		6.10	0.46	A	18.90	0.79	B
Westbound	**TR**		8.90	0.67	A	17.30	0.74	B
Northbound	**LTR**		0.00	0.00	A	12.50	0.00	B
Southbound	**LT**		18.50	0.46	B	14.80	0.25	B
	R		15.70	0.11	B	12.80	0.06	B
5. Puolo Rd (Middle) and Kaumuali'i Hwy			0.30	-	-	1.00	-	-
Northbound	**LTR**	**Stop**	17.30	0.06	C	24.90	0.17	C
Eastbound	**L**	**Free**	9.20	0.00	A	8.90	0.00	A
Westbound	**L**	**Free**	10.20	0.01	B	11.50	0.07	B
Southbound	**LTR**	**Stop**	43.30	0.01	E	36.10	0.04	E
6. Puolo Rd (East) and Kaumuali'i Hwy			13.70	-	-	0.30	-	-
Northbound	**LTR**	**Stop**	44.20	0.01	E	0.00	0.00	A
Eastbound	**L**	**Free**	3.90	0.01	A	9.00	0.01	A
Southbound	**LTR**	**Stop**	19.20	0.03	C	30.40	0.08	D
7. Hāna Rd and Kaumuali'i Hwy			0.80	-	-	0.70	-	-
Northbound	**LTR**	**Stop**	13.70	0.00	B	15.60	0.01	C
Eastbound	**L**	**Free**	9.40	0.02	A	9.20	0.03	A
Southbound	**LTR**	**Stop**	43.50	0.22	E	36.70	0.18	E

Table 5: Existing (2019) Intersection Level of Service (Part 2)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
8. Kona Rd and Kaumuali'i Hwy			0.90	-	-	2.80	-	-
Northbound	**LTR**	**Stop**	14.70	0.02	B	27.00	0.10	D
Eastbound	**L**	**Free**	9.50	0.04	A	9.30	0.05	A
Westbound	**L**	**Free**	9.20	0.00	A	9.70	0.01	A
Southbound	**LTR**	**Stop**	25.30	0.19	D	53.20	0.51	F
9. Hanapēpē Rd and Moi Rd			9.60	-	-	10.90	-	-
Northbound	**LTR**	**Stop**	11.10	0.10	B	16.10	0.38	C
Eastbound	**L**	**Free**	7.40	0.02	A	7.60	0.07	A
Westbound	**L**	**Free**	7.40	0.01	A	7.40	0.02	A
Southbound	**LT**	**Stop**	13.30	0.36	B	16.00	0.33	C
	R		8.90	0.10	A	8.70	0.03	A
10. Puolo Rd/Awawa Rd and Hanapēpē Rd			3.10	-	-	2.30	-	-
Northbound	**LTR**	**Stop**	9.30	0.01	A	9.40	0.01	A
Eastbound	**L**	**Free**	7.80	0.01	A	8.00	0.01	A
Westbound	**L**	**Free**	7.30	0.00	A	7.30	0.00	A
Southbound	**LTR**	**Stop**	9.30	0.04	A	9.80	0.04	A
11. Kāne Rd and Moi Rd			0.40	-	-	0.20	-	-
Westbound	**LR**	**Stop**	11.90	0.03	B	12.70	0.02	B
Southbound	**L**	**Free**	7.50	0.00	A	0.00	-	A
12. Ali'i Rd (Makai) and Moi Rd			2.40	-	-	1.20	-	-
Northbound	**L**	**Free**	7.70	0.00	A	7.50	0.00	A
Westbound	**LTR**	**Stop**	11.60	0.14	B	11.70	0.09	B
Southbound	**L**	**Free**	7.40	0.00	A	0.00	0.00	A
13. Eleu Rd and Moi Rd			1.00	-	-	0.40	-	-
Northbound	**L**	**Free**	0.00	0.00	A	7.40	0.00	A
Eastbound	**LTR**	**Stop**	9.20	0.00	A	0.00	0.00	A
Westbound	**LTR**	**Stop**	10.10	0.03	B	10.30	0.02	B
14. Ahi Rd and Moi Rd			1.00	-	-	0.60	-	-
Northbound	**L**	**Free**	0.00	0.00	A	7.40	0.00	A
Eastbound	**LTR**	**Stop**	9.20	0.00	A	0.00	0.00	A
Westbound	**LTR**	**Stop**	10.10	0.03	B	10.30	0.02	B
15. Ali'i Rd and Moi Rd			2.50	-	-	1.10	-	-
Westbound	**LTR**	**Stop**	8.90	0.02	A	9.00	0.01	A
Southbound	**L**	**Free**	0.00	0.00	A	7.40	0.00	A

III. FUTURE (2025) CONDITIONS

DHHL is planning on building out the new development in two phases, Phase 2 and 3, with projected buildout years of 2025 and 2040 respectively. Phase 2 is proposing to develop 75 residential lots and the associated access roads with an expected full buildout and occupancy by 2025. These residential lots will be located to the west of the existing homestead lots (see Figure 2) that were built in Phase 1and are intended to include a single-family home on each lot.

A. Geometric Configuration

An internal transportation network will be developed that provides connectivity by extending existing roadway stubouts in the existing residential community. In order to maintain connectivity throughout the development, it is likely that a bridge will be needed to span the existing gulch on the western side of the property. Two new access roads are proposed off of Kaumuali'i Highway for traffic circulation and emergency access (see Figure 1).

- The first access road travels in the east-west direction, intersecting Moi Road at the intersection with Ali'i Road (mauka) as the west leg of intersection (#15).
- The second access road also travels in the east-west direction, intersecting Moi Road at the intersection with Ahi Road as the west leg of intersection (#14).

B. Multimodal Infrastructure

With the development of residential lots, it is recommended to include dedicated space for bicycles and pedestrians as a part of new roadway buildout. This may look like one of the Residential Street cross-sections provided in the County of Kaua`i Street Design Manual, with minimum five-foot-wide sidewalks included on either side and travel speeds low enough for people on bicycles to share the road.

C. Volumes

The County of Kaua'i Housing Agency is proposing to build an affordable housing project mauka of the intersection of Halewilli Road and Kaumuali'i Highway in the town of Ele'ele. The proposed project would include approximately 550 residential units (single family, multi-family and senior residential units) at full buildout. The project would be designed with roadways, green sustainable energy efficiency features, a community center, vegetable drainage swales, landscape areas, a water storage tank, and bike and pedestrian paths. This project is projected to be completed and fully occupied by the year 2040.

No other developments or construction projects which effect the travel patterns, in close proximity to the project area were identified, based on the best available information from research completed on January 2020 at the State of Hawaii Office of Environmental Quality Control (OEQC) website and the Statewide Transportation Improvements Program (STIP).

1. Future (2025) Without Project

The Kaua'i County General Plan forecasts a socio-economic growth rates of 1.10% for population, 1.06% for jobs, 1.07% for housing per annum between 2010 and 2035 for County of Kaua'i. Out of the projected growth, 47 % of the future growth is allocated to the Lihue District, 26% to South Kaua'i, 13% to East Kaua'i and 14 % to the remaining three districts – North Shore, Waimea-Kekaha, and Hanapēpē- Ele'ele combined to provide for natural population increase.

Traffic forecasting for the study area for Future (2025) Without Project conditions were based on known surrounding developments as well as background growth anticipated in the area. Therefore, a 0.25% growth rate per annum was applied to all intersection movements in the study area from 2019 till 2025. Resulting Future (2025) Without Project intersection volumes are shown in Figures 9 and 10.

2. Phase 2 - Project Related

Phase 2 of the development proposes to include 75 residential lots. Trips generated from Phase 2 of the proposed development were estimated using nationally accepted land use rates from *Trip Generation, 10th Edition* (ITE, 2016). The estimates for new trips generation rates and volumes are shown in Table 6 and 7 respectively.

Table 6: Phase 2 - Trip Generation Rates

Land Use [ITE Code]	Qty	Units	Trip Generation Average Rate	
			AM	PM
Single Family Housing [210]	75	Dwelling Units	0.74	0.99

Table 7: Phase 2 - Trip Generation Volumes

Land Use [ITE Code]	Project Related Trips					
	AM			PM		
	In	Out	Total	In	Out	Total
Single Family Housing [210]	14	42	56	47	27	74

The volumes of entering and exiting vehicles were estimated equally distributed between the two access roads which intersect the Moi Road. The resulting project-related peak hour volumes are shown in Figures 11 and 12.

3. Future (2025) With Project

Project related trips were added to the Future (2025) Without Project volumes to estimate Future (2025) With Project peak hour volumes. The volumes for Future (2025) With Project conditions are shown in Figures 13 and 14.

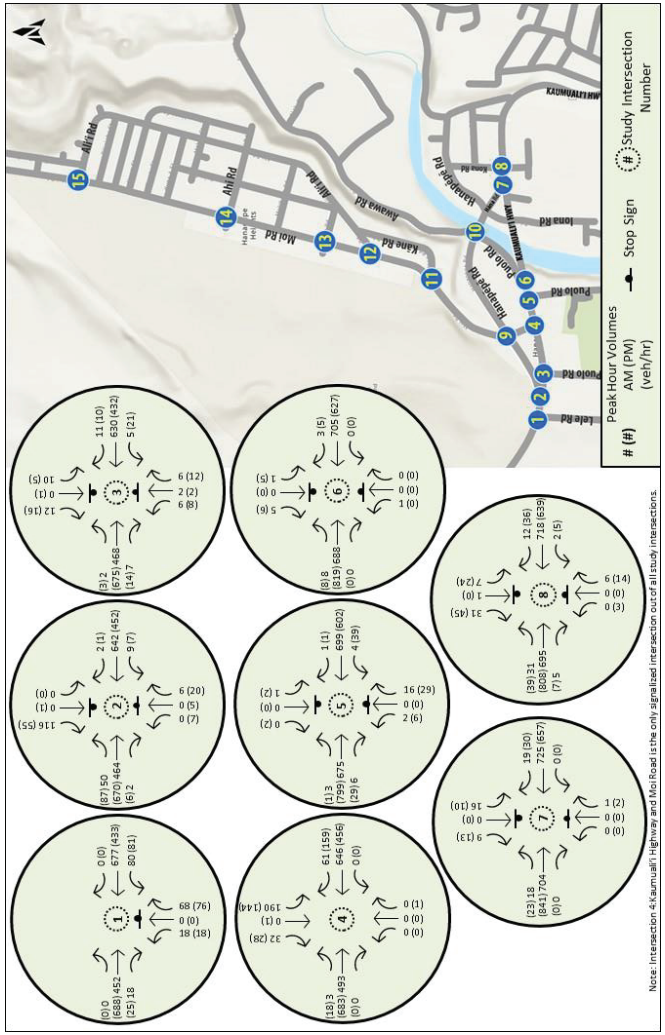


Figure 9: Future (2025) Without Project Peak Hour Volumes (Part 1)

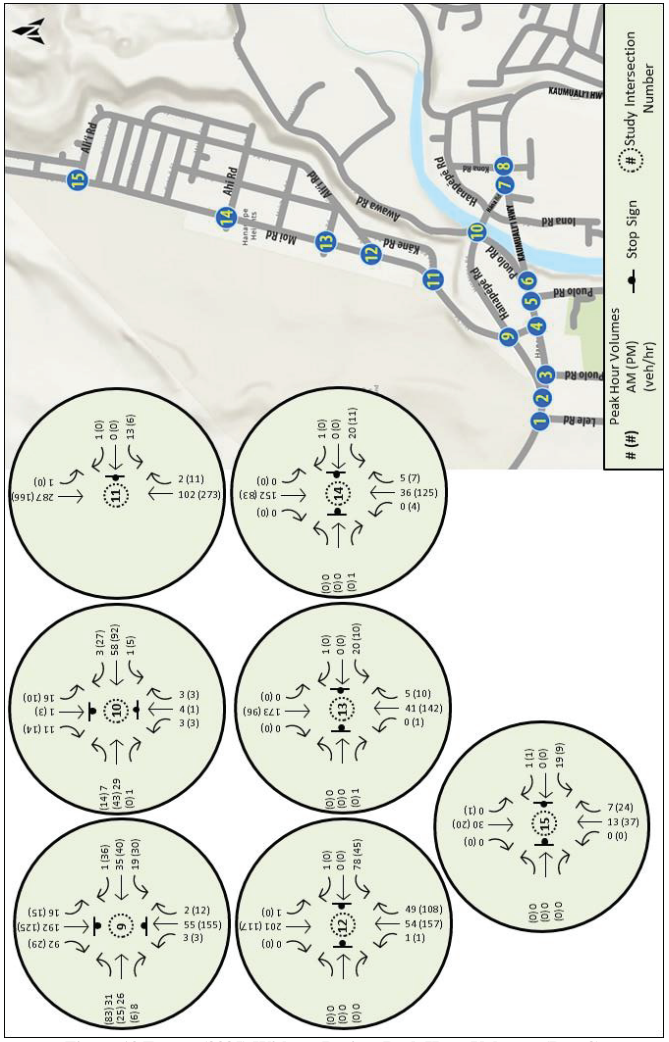


Figure 10 Future (2025) Without Project Peak Hour Volumes (Part 2)

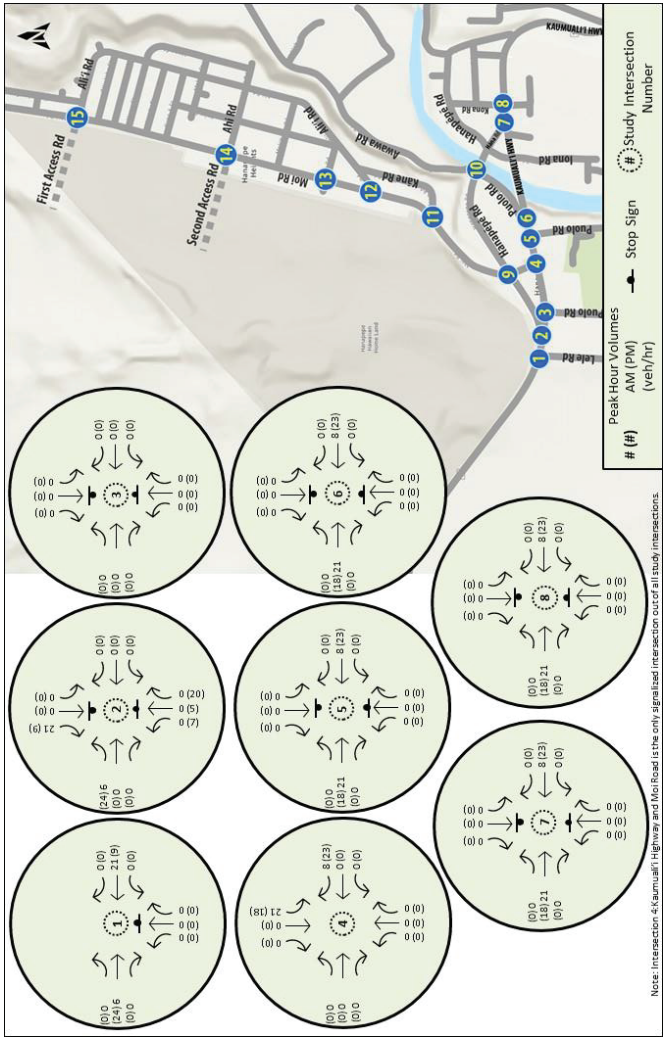


Figure 11: Phase 2 - Project Related Peak Hour Volumes (Part 1)

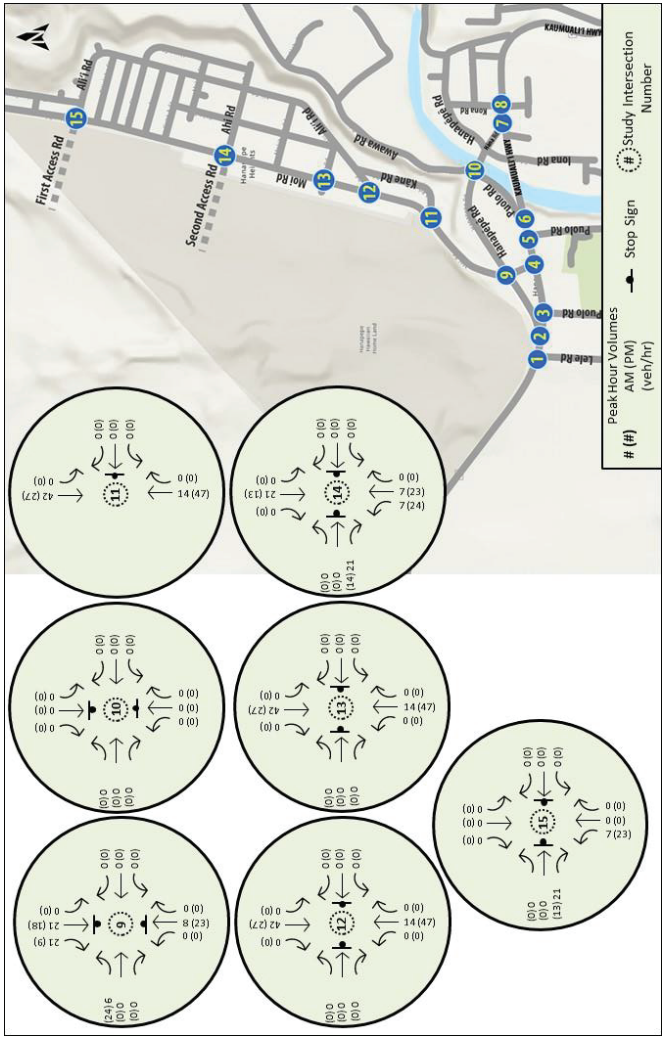


Figure 12: Phase 2 - Project Related Peak Hour Volumes (Part 2)

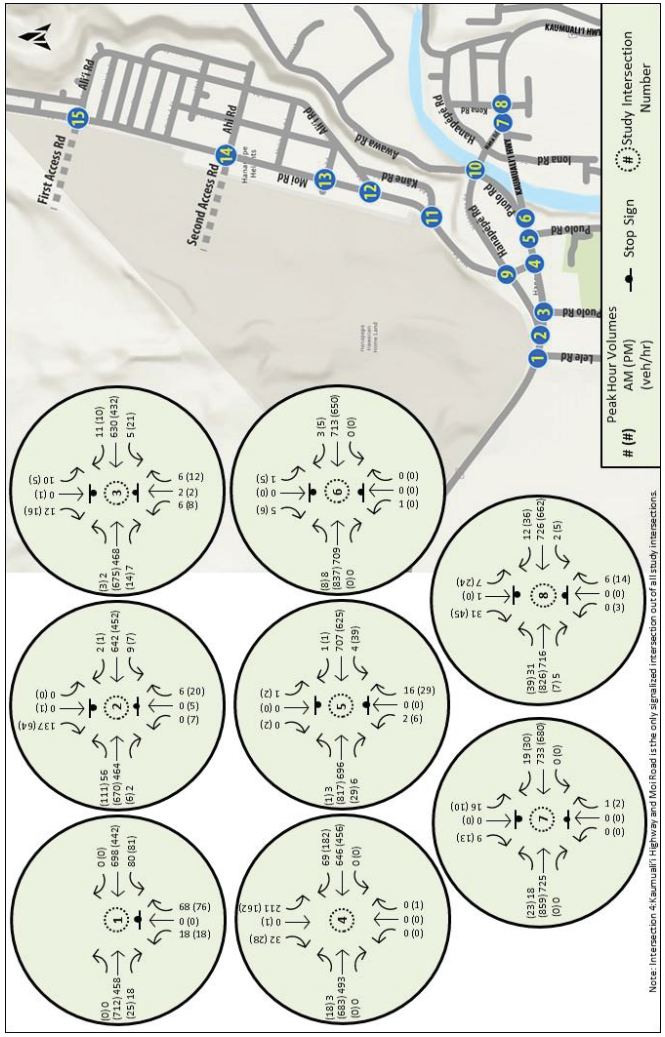


Figure 13: Future (2025) With Project Peak Hour Volumes (Part 1)

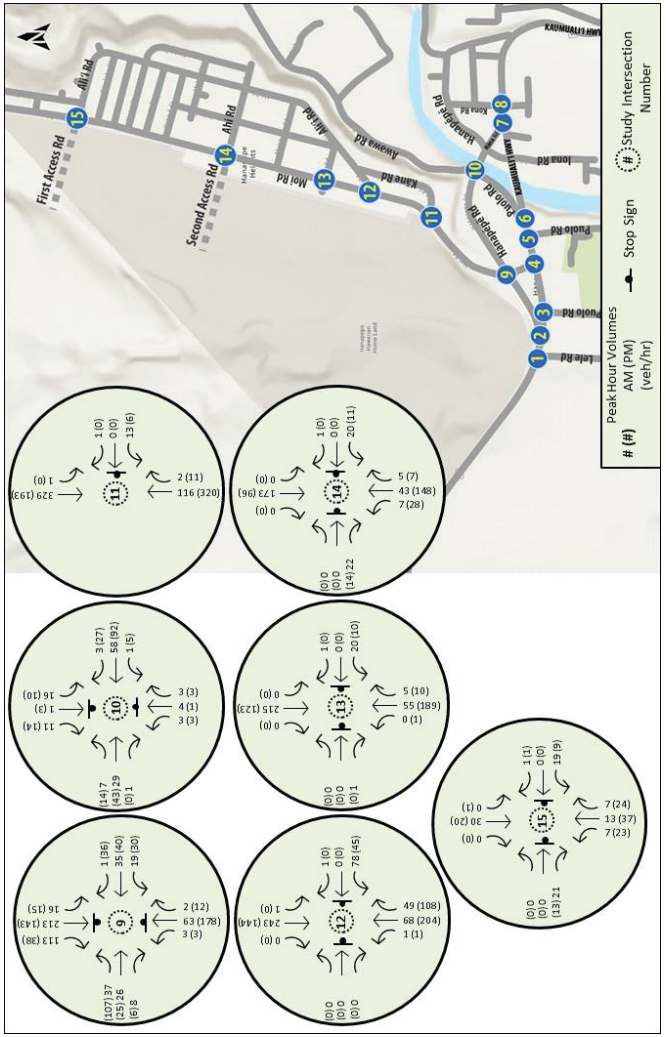


Figure 14: Future (2025) With Project Peak Hour Volumes (Part 2)

D. Level of Service

1. Future (2025) Without Project

Future (2025) Without Project intersection/movement LOS and average delay (in seconds per vehicle) were determined for the AM and PM weekday peak hours. At the signalized intersection of Kaumuali'i Highway and Moi Road all intersection movements resulted in acceptable LOS C or better. All stop-controlled intersection turning movements resulted in acceptable LOS D or better except for following turning movements:

- Puolo Road (Middle) and Kaumuali'i Highway (Intersection #5): southbound movements resulted in LOS E for both AM and PM peak hours.
- Puolo Road (East) and Kaumuali'i Highway (Intersection #6): northbound movements resulted in LOS E for AM peak hour.
- Hāna Road and Kaumuali'i Highway (Intersection #7): southbound movements resulted in LOS E for both AM and PM peak hours.
- Kona Road (East) and Kaumuali'i Highway (Intersection #8): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for PM peak hour.

All poorly operating approaches are for the side streets and are due to the lack of gaps in heavy traffic volumes on Kaumuali'i Highway during the peak hours.

The Future (2025) Without Project intersection and movement LOS are shown in Tables 8 through 10.

Table 8: Future (2025) Without Project Intersection Level of Service (Part 1)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
1. Lele Rd and Kaumuali'i Hwy			1.70	-	-	2.20	-	-
Northbound	**LR**	**Stop**	18.70	0.26	C	22.90	0.33	C
Westbound	**L**	**Free**	8.70	0.08	A	9.70	0.10	A
2. Hanapēpē Rd and Kaumuali'i Hwy			1.90	-	-	1.90	-	-
Northbound	**LTR**	**Stop**	12.80	0.01	B	29.40	0.19	D
Eastbound	**L**	**Free**	9.40	0.06	A	8.80	0.09	A
Westbound	**L**	**Free**	8.50	0.01	A	9.30	0.01	A
Southbound	**LTR**	**Stop**	15.90	0.27	C	12.40	0.11	B
3. Puolo Rd (West) and Kaumuali'i Hwy			0.70	-	-	0.90	-	-
Northbound	**LTR**	**Stop**	21.40	0.06	C	22.80	0.10	C
Eastbound	**L**	**Free**	9.00	0.00	A	8.30	0.00	A
Westbound	**L**	**Free**	8.40	0.01	A	9.20	0.03	A
Southbound	**LTR**	**Stop**	21.40	0.10	C	17.20	0.07	C
4. Moi Rd and Kaumuali'i Hwy			17.70	-	B	18.10	-	B
Eastbound	**L**	**Signal**	22.30	0.02	C	20.40	0.08	C
	TR		13.00	0.58	B	19.40	0.80	B
Westbound	**TR**		21.70	0.84	C	17.70	0.75	B
Northbound	**LTR**		0.00	0.00	A	12.50	0.00	B
Southbound	**LT**		15.80	0.33	B	14.90	0.25	B
	R		12.80	0.07	B	12.80	0.06	B
5. Puolo Rd (Middle) and Kaumuali'i Hwy			0.30	-	-	1.00	-	-
Northbound	**LTR**	**Stop**	17.60	0.06	C	25.70	0.18	D
Eastbound	**L**	**Free**	9.30	0.00	A	8.90	0.00	A
Westbound	**L**	**Free**	10.30	0.01	B	11.60	0.07	B
Southbound	**LTR**	**Stop**	44.60	0.01	E	37.20	0.04	E
6. Puolo Rd (East) and Kaumuali'i Hwy			0.20	-	-	0.30	-	-
Northbound	**LTR**	**Stop**	46.00	0.01	E	0.00	0.00	A
Eastbound	**L**	**Free**	9.40	0.01	A	9.00	0.01	A
Southbound	**LTR**	**Stop**	19.60	0.03	C	31.30	0.08	D

Table 9: Future (2025) Without Project Intersection Level of Service (Part 2)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
7. Hāna Rd and Kaumuali'i Hwy			0.90	-	-	0.70	-	-
Northbound	**LTR**	**Stop**	13.80	0.00	B	15.80	0.01	C
Eastbound	**L**	**Free**	9.50	0.02	A	9.30	0.03	A
Southbound	**LTR**	**Stop**	45.20	0.23	E	38.20	0.19	E
8. Kona Rd and Kaumuali'i Hwy			0.90	-	-	3.00	-	-
Northbound	**LTR**	**Stop**	14.80	0.02	B	28.00	0.11	D
Eastbound	**L**	**Free**	9.60	0.04	A	9.40	0.05	A
Westbound	**L**	**Free**	9.30	0.00	A	9.80	0.01	A
Southbound	**LTR**	**Stop**	26.10	0.20	D	57.10	0.54	F
9. Hanapēpē Rd and Moi Rd			9.60	-	-	11.10	-	-
Northbound	**LTR**	**Stop**	11.10	0.11	B	16.50	0.39	C
Eastbound	**L**	**Free**	7.40	0.02	A	7.70	0.07	A
Westbound	**L**	**Free**	7.40	0.01	A	7.40	0.02	A
Southbound	**LT**	**Stop**	13.40	0.36	B	16.20	0.34	C
	R		8.90	0.10	A	8.80	0.03	A
10. Puolo Rd/Awawa Rd and Hanapēpē Rd			3.10	-	-	2.20	-	-
Northbound	**LTR**	**Stop**	9.30	0.01	A	9.50	0.01	A
Eastbound	**L**	**Free**	7.80	0.01	A	8.00	0.01	A
Westbound	**L**	**Free**	7.30	0.00	A	7.30	0.00	A
Southbound	**LTR**	**Stop**	9.40	0.04	A	9.80	0.04	A
11. Kāne Rd and Moi Rd			0.40	-	-	0.20	-	-
Westbound	**LR**	**Stop**	12.00	0.03	B	12.80	0.02	B
Southbound	**L**	**Free**	7.50	0.00	A	0.00	0.00	A
12. Ali'i Rd (Makai) and Moi Rd			2.40	-	-	1.20	-	-
Northbound	**L**	**Free**	7.70	0.00	A	7.50	0.00	A
Westbound	**LTR**	**Stop**	11.60	0.14	B	11.80	0.09	B
Southbound	**L**	**Free**	7.40	0.00	A	0.00	0.00	A
13. Eleu Rd and Moi Rd			0.90	-	-	0.40	-	-
Northbound	**L**	**Free**	0.00	0.00	A	7.40	0.00	A
Eastbound	**LTR**	**Stop**	9.20	0.00	A	0.00	0.00	A
Westbound	**LTR**	**Stop**	10.10	0.03	B	10.30	0.02	B

Table 10: Future (2025) Without Project Intersection Level of Service (Part 3)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
14. Ahi Rd and Moi Rd			1.00	-	-	0.60	-	-
Northbound	**L**	**Free**	0.00	0.00	A	7.40	0.00	A
Eastbound	**LTR**	**Stop**	9.20	0.00	A	0.00	0.00	A
Westbound	**LTR**	**Stop**	10.10	0.03	B	10.40	0.02	B
15. Ali'i Rd and Moi Rd			2.50	-	-	1.10	-	-
Westbound	**LTR**	**Stop**	8.90	0.02	A	9.00	0.01	A
Southbound	**L**	**Free**	0.00	0.00	A	7.40	0.00	A

2. Future (2025) With Project

Future (2025) With Project intersection/movement LOS and average delay (in seconds per vehicle) were determined for the AM and PM weekday peak hours. The signalized intersection of Kaumuali'i Highway and Moi Road resulted in acceptable LOS C or better for the intersection and movements. All the two-way stop controlled (TWSC) intersection turning movements resulted in acceptable LOS of D or better except for following turning movements:

- Puolo Road (Middle) and Kaumuali'i Highway (Intersection #5): southbound movements resulted in LOS E for both AM and PM peak hours.
- Puolo Road (East) and Kaumuali'i Highway (Intersection #6): northbound movements resulted in LOS E for AM peak hour.
- Hāna Road and Kaumuali'i Highway (Intersection #7): southbound movements resulted in LOS E for both AM and PM peak hours.
- Kona Road (East) and Kaumuali'i Highway (Intersection #8): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for PM peak hour.

All poorly operating approaches are for the side streets and are due to the lack of gaps in heavy traffic volumes on Kaumuali'i Highway during the peak hours.

The Future (2025) With Project intersection and movement LOS are shown in Tables 11 through 13.

Table 11: Future (2025) With Project Intersection Level of Service (Part 1)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
1. Lele Rd and Kaumuali'i Hwy			1.80	-	-	2.20	-	-
Northbound	**LR**	**Stop**	19.20	0.26	C	24.00	0.35	C
Westbound	**L**	**Free**	8.70	0.08	A	9.80	0.10	A
2. Hanapēpē Rd and Kaumuali'i Hwy			2.20	-	-	2.20	-	-
Northbound	**LTR**	**Stop**	12.80	0.01	B	32.30	0.20	D
Eastbound	**L**	**Free**	9.40	0.07	A	8.90	0.11	A
Westbound	**L**	**Free**	8.50	0.01	A	9.30	0.01	A
Southbound	**LTR**	**Stop**	16.70	0.32	C	12.50	0.13	B
3. Puolo Rd (West) and Kaumuali'i Hwy			0.70	-	-	0.90	-	-
Northbound	**LTR**	**Stop**	21.40	0.06	C	22.80	0.10	C
Eastbound	**L**	**Free**	9.00	0.00	A	8.30	0.00	A
Westbound	**L**	**Free**	8.40	0.01	A	9.20	0.03	A
Southbound	**LTR**	**Stop**	21.40	0.10	C	17.20	0.07	C
4. Moi Rd and Kaumuali'i Hwy			18.20	-	B	18.70	-	B
Eastbound	**L**	**Signal**	22.80	0.02	C	21.60	0.09	C
	TR		13.00	0.58	B	19.40	0.80	B
Westbound	**TR**		22.60	0.85	C	19.10	0.79	B
Northbound	**LTR**		0.00	0.00	A	12.50	0.00	B
Southbound	**LT**		16.30	0.36	B	15.20	0.28	B
	R		12.80	0.07	B	12.80	0.06	B
5. Puolo Rd (Middle) and Kaumuali'i Hwy			0.30	-	-	1.00	-	-
Northbound	**LTR**	**Stop**	18.10	0.07	C	26.90	0.18	D
Eastbound	**L**	**Free**	9.30	0.00	A	9.00	0.00	A
Westbound	**L**	**Free**	10.40	0.01	B	11.70	0.07	B
Southbound	**LTR**	**Stop**	46.90	0.01	E	40.10	0.04	E
6. Puolo Rd (East) and Kaumuali'i Hwy			0.20	-	-	0.30	-	-
Northbound	**LTR**	**Stop**	47.40	0.01	E	0.00	0.00	A
Eastbound	**L**	**Free**	9.40	0.01	A	9.10	0.01	A
Southbound	**LTR**	**Stop**	20.00	0.03	C	33.40	0.09	D

Table 12: Future (2025) With Project Intersection Level of Service (Part 2)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
7. Hāna Rd and Kaumuali'i Hwy			0.90	-	-	0.70	-	-
Northbound	**LTR**	**Stop**	14.10	0.00	B	16.10	0.01	C
Eastbound	**L**	**Free**	9.50	0.02	A	9.40	0.03	A
Southbound	**LTR**	**Stop**	48.50	0.25	E	41.10	0.20	E
8. Kona Rd and Kaumuali'i Hwy			0.90	-	-	3.20	-	-
Northbound	**LTR**	**Stop**	15.10	0.02	C	29.60	0.11	D
Eastbound	**L**	**Free**	9.60	0.04	A	9.50	0.05	A
Westbound	**L**	**Free**	9.40	0.00	A	9.90	0.01	A
Southbound	**LTR**	**Stop**	26.80	0.21	D	63.20	0.57	F
9. Hanapēpē Rd and Moi Rd			10.20	-	-	13.00	-	-
Northbound	**LTR**	**Stop**	11.40	0.12	B	19.80	0.48	C
Eastbound	**L**	**Free**	7.40	0.03	A	7.70	0.09	A
Westbound	**L**	**Free**	7.40	0.01	A	7.40	0.02	A
Southbound	**LT**	**Stop**	14.30	0.41	B	19.20	0.42	C
	R		9.00	0.13	A	8.80	0.04	A
10. Puolo Rd/Awawa Rd and Hanapēpē Rd			3.10	-	-	2.20	-	-
Northbound	**LTR**	**Stop**	9.30	0.01	A	9.50	0.01	A
Eastbound	**L**	**Free**	7.80	0.01	A	8.00	0.01	A
Westbound	**L**	**Free**	7.30	0.00	A	7.30	0.00	A
Southbound	**LTR**	**Stop**	9.40	0.04	A	9.80	0.04	A
11. Kāne Rd and Moi Rd			0.40	-	-	0.20	-	-
Westbound	**LR**	**Stop**	12.70	0.04	B	13.80	0.02	B
Southbound	**L**	**Free**	7.50	0.00	A	0.00	0.00	A
12. Ali'i Rd (Makai) and Moi Rd			2.20	-	-	1.10	-	-
Northbound	**L**	**Free**	7.80	0.00	A	7.50	0.00	A
Westbound	**LTR**	**Stop**	12.40	0.16	B	12.80	0.10	B
Southbound	**L**	**Free**	7.50	0.00	A	0.00	0.00	A
13. Eleu Rd and Moi Rd			0.80	-	-	0.30	-	-
Northbound	**L**	**Free**	0.00	0.00	A	7.50	0.00	A
Eastbound	**LTR**	**Stop**	9.50	0.00	A	0.00	0.00	A
Westbound	**LTR**	**Stop**	10.60	0.03	B	11.00	0.02	B

Table 13: Future (2025) With Project Intersection Level of Service (Part 3)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s)	v/c	LOS	Delay (s)	v/c	LOS
14. Ahi Rd and Moi Rd			1.80	-	-	1.50	-	-
Northbound	**L**	**Free**	7.70	0.01	A	7.50	0.02	A
Eastbound	**LTR**	**Stop**	9.50	0.03	A	8.90	0.02	A
Westbound	**LTR**	**Stop**	10.80	0.04	B	11.60	0.02	B
15. Ali'i Rd and Moi Rd			4.20	-	-	3.00	-	-
Northbound	**L**	**Free**	7.30	0.01	A	7.30	0.02	A
Eastbound	**LTR**	**Stop**	8.50	0.02	A	8.50	0.01	A
Westbound	**LTR**	**Stop**	9.20	0.03	A	9.50	0.01	A
Southbound	**L**	**Free**	0.00	0.00	A	7.40	0.00	A

IV. FUTURE (2040) CONDITIONS

Phase 3 of the development proposes the construction of 374 residential lots, 111 subsistence agricultural lots, 13.17 acres of commercial area, and the associated transportation network with an expected full buildout and occupancy by 2040. All of the residential lots, 50 (out of 111) subsistence agricultural lots, and 1.61 acres of commercial area are proposed to be constructed immediately adjacent to the existing residential lots with homes, including those built in Phase 2. The remaining 61 subsistence agricultural lots and 5.3 acres of commercial area are separated from these by a gulch resulting in unbuildable area/terrain, of which a bridge is likely needed to ensure connectivity between communities. 6.21 acres of commercial area, currently housing an operational warehouse and separated by all other proposed development by Kaumuali'i Highway, will also be redeveloped as a part of Phase 3.

A. Geometric Configuration

The following new access roads are planned for connection to the existing transportation network:

- Third access road: Oriented in east-west direction intersecting Moi Road at the intersection with Eleu Road. Will be referred to as the west leg of Intersection #13.
- Fourth access road: Oriented in east-west direction intersecting Moi Road 300' north of the intersection with Kāne Road. For analysis purposes this access road is assumed to intersect at Moi Road and Kāne Road and will be referred to as the west leg of Intersection #11.
- Fifth access road: Oriented north-south direction intersects Kaumuali'i Highway at the intersection with Lele Road. Will be referred to as the north leg of Intersection #1.
- Sixth access road: Oriented north-south intersects Kaumuali'i Highway, 0.5 miles west to the intersection of Kaumuali'i Highway and Lele Road. Will be referred to as a Driveway that intersects with Kaumuali'i Highway at Intersection #16.

In addition, the west end of Hanapēpē Road will be dead-ended prior to the intersection with Kaumuali'i Highway so as to improve traffic flow through consolidated access control along the highway.

B. Multimodal Infrastructure

With the development of residential lots, it is recommended to include dedicated space for bicycles and pedestrians as a part of new roadway buildout. This may look like one of the Residential Street cross-sections provided in the County of Kaua`i Street Design Manual, with minimum five-foot-wide sidewalks included on either side and travel speeds low enough for people on bicycles to share the road. A continuous off-street path may also be considered to connect the residential neighborhood mauka of the highway to the commercial center and beach makai of the highway. Enhanced crosswalks should be included where appropriate.

C. Volumes

1. Future (2040) Without Project

Traffic forecasting for the study area for future year 2040 without project conditions was based on known surrounding developments as well as background growth anticipated in the area. This includes the Lima Ola Workforce Housing Project, Waimea sports complex, and internal developments that will likely impact travel. Therefore, a 0.25% growth rate per annum was applied to all roadways in the study area from 2019 till 2040. Resulting Future (2040) Without Project intersection volumes are shown in Figures 15 and 16.

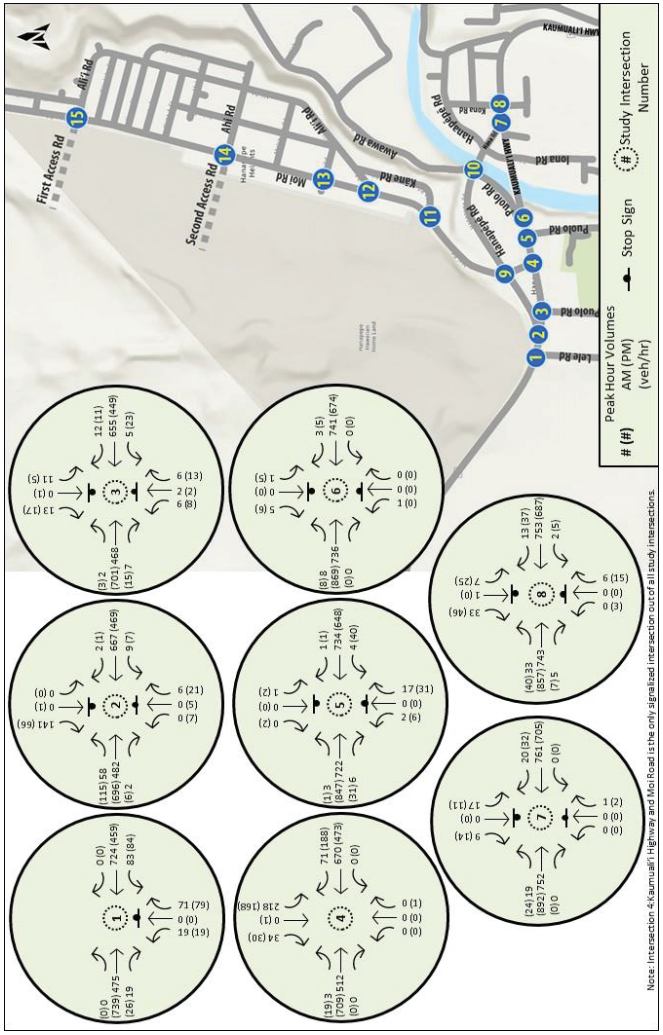


Figure 15: Future (2040) Without Project Peak Hour Volumes (Part 1)

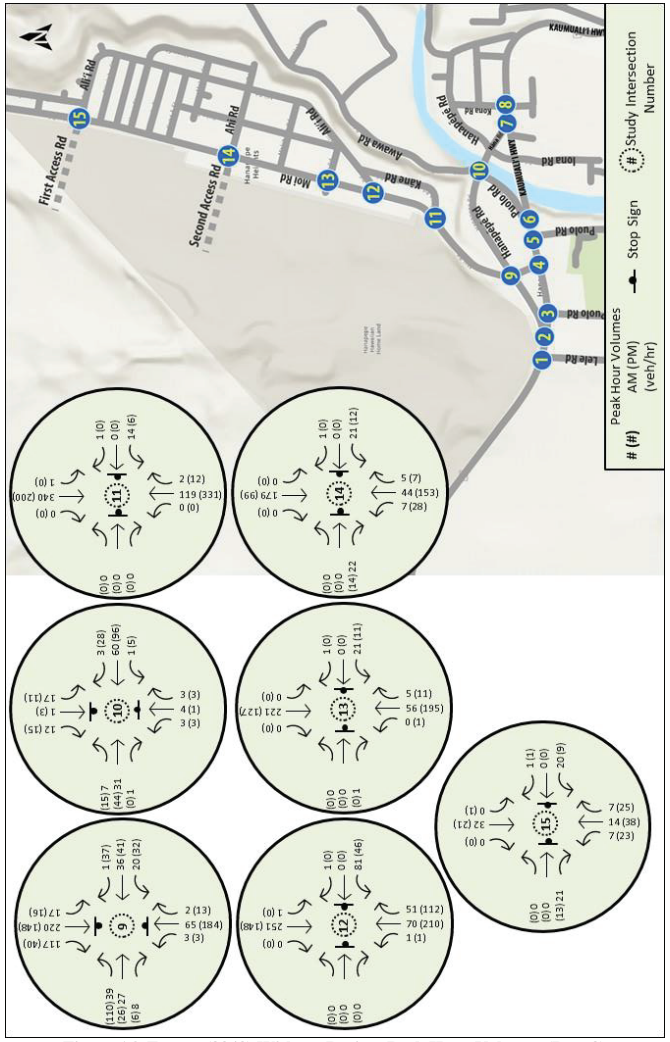


Figure 16: Future (2040) Without Project Peak Hour Volumes (Part 2)

2. Phase 3 - Project Related

Phase 3 of the development proposes the construction of 374 residential lots, 111 subsistence agricultural lots, 6.96 acres of new commercial area, and 6.21 acres of redeveloped existing commercial area.

DHHL's 2004 Kaua'i Island Plan envisions the commercial areas located along the highway to cater services to the resident, highway travelers and to generate income for the department. For use in calculating the potential land use/development associated with this commercial area, the following assumptions were made:

- In the 1.61 acres of new commercial area proposed adjacent to the existing homes, a Gas Station with convenience store was assumed. For trip generation purposes, the Gross Floor Area (GFA) was assumed to be 1000 sq. ft, which is equivalent to trips generated by a gas station with four to six vehicle fueling positions. This Gas Station will have access off Lele Street.
- In the remaining 5.35 acres of new commercial area mauka of Kaumuali'i Highway, a Shopping Center was assumed. For trip generation purposes, Gross Leasable Area (GLA) is assumed to be 50,000 sq. ft, which is equivalent to the trips generated by a shopping center with approximately 100 employees. The access for this development will be off Sixth Access Road.
- In the 6.21 acres makai of Kaumuali'i Highway, it was assumed that warehouse use will be retained and limited only to a portion of the lot. With operations remaining as exists, no new trips were estimated.
- In the remaining area, the development of multiple small restaurants/food carts was assumed. For trip generation purposes, the trips generated are assumed equivalent to the trips generated by 10 food carts. The access for the restaurants will be off Lele Road.

Trips generated from the proposed development were estimated using nationally accepted land use rates from *Trip Generation, 10th Edition* (ITE, 2016). The estimates for new trips generation rates and volumes are shown in Tables 14 and 15.

Table 14: Phase 3 - Trip Generation Volumes by Residential

Land Use [ITE Code]	Qty	Project Related Trips					
		AM			PM		
		In	Out	Total	In	Out	Total
Single Family Housing [210]	485	90	269	359	302	178	480

Table 15: Phase 3 - Trip Generation Volumes by Commercial

Land Use [ITE Code]	Qty	Project Related Trips					
		AM			PM		
		In	Out	Total	In	Out	Total
Gas Station with store [945]	GFA: 1000 sq. ft.	39	37	76	45	43	88
Shopping Center [820]	GLA: 50,000 sq. ft.	29	18	47	91	100	191
Food Cart Pod [926]	Food Carts: 10	0	0	0	31	31	62

The bridge proposed over the gulch connects the residential and commercial developments in the project site mauka of Kaumuali'i Highway. The trips made from the residential to commercial uses will be considered as internal trips as they are entering the adjacent street on the existing networks. NCHRP 684:

Enhancing Internal Trip Capture Estimation for Mixed-Use Developments (MXD), estimates unconstrained internal trip capture rates within MXD, between residential and retail, as 31% during PM Peak Hour on the adjacent streets. Internal trips for commercial are shown in Table 16.

Table 16: Phase 3 – Internal Trips for Commercial

Land Use [ITE Code]	Qty	Project Related Trips					
		AM			PM		
		In	Out	Total	In	Out	Total
Shopping Center [820]	GLA: 50,000 sq. ft.	0	0	0	28	31	59

The commercial developments proposed mauka of Kaumuali'i Highway also attract vehicles for intermediate stops passing on the adjacent streets. These are the pass-by trips. The percentage of pass-by trips generated by the commercial use was estimated using the data provided in the Trip Generation Handbook, ITE, September 2017. Gas Stations have a pass-by rate of 62% during the AM peak period and 58% during the PM peak period. Shopping Centers have a pass-by rate of 34% during the PM peak period. Pass-by trips for commercial are shown in Table 17. The total trips generated by the commercial development, after the reduction of internal and pass-by trips are shown in Table 18.

Table 17: Phase 3 – Pass-by Trips for Commercial

Land Use [ITE Code]	Qty	Project Related Trips					
		AM			PM		
		In	Out	Total	In	Out	Total
Gas Station with store [945]	GFA: 1000 sq. ft.	24	23	47	25	24	49
Shopping Center [820]	GLA: 50,000 sq. ft.	0	0	0	31	34	65

Table 18: Phase 3 – Total Trips Generated by Commercial

Land Use [ITE Code]	Qty	Project Related Trips					
		AM			PM		
		In	Out	Total	In	Out	Total
Gas Station with store [945]	GFA: 1000 sq. ft.	15	14	29	20	19	39
Shopping Center [820]	GLA: 50,000 sq. ft.	29	18	47	32	35	67
Food Cart Pod [926]	Food Carts: 10	0	0	0	31	31	62

3. Future (2040) With Project

Project related trips for Phases 2 and 3 were added to the Future (2040) Without Project volumes to estimate Future (2040) With Project peak hour volumes. The volumes for Future (2040) With Project conditions are shown in Figures 19 and 20.

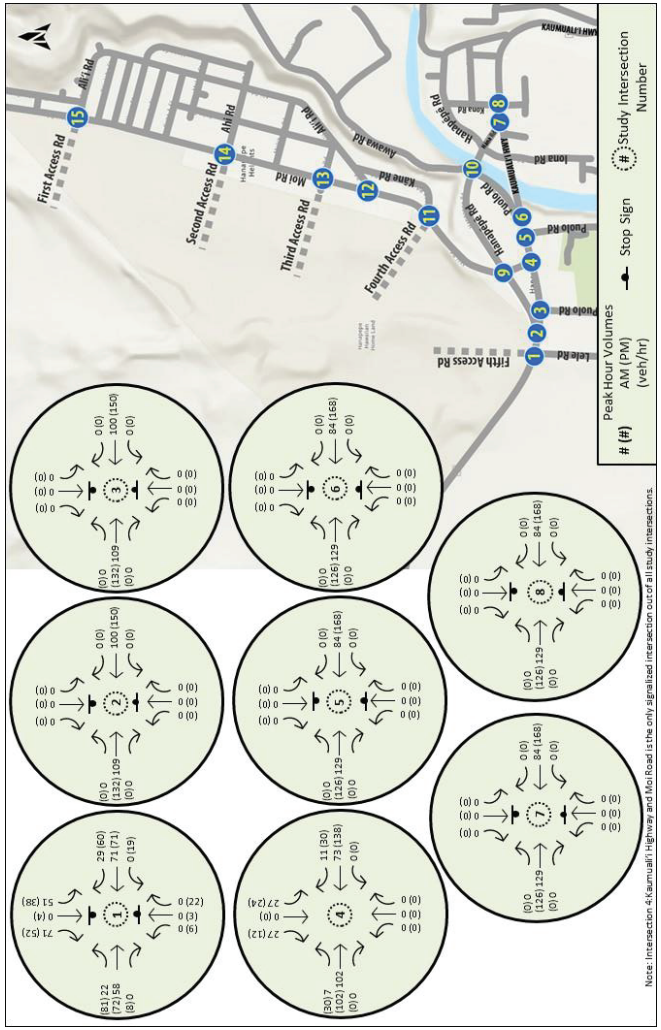


Figure 17: Phase 3 - Project Related Peak Hour Volumes (Part 1)

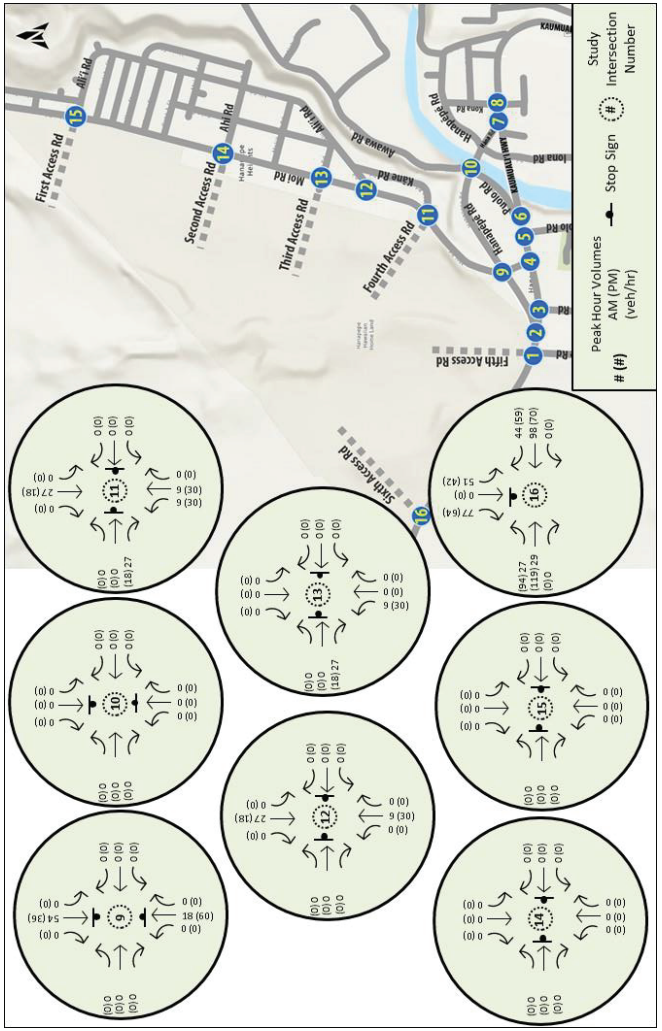


Figure 18: Phase 3 - Project Related Peak Hour Volumes (Part 2)

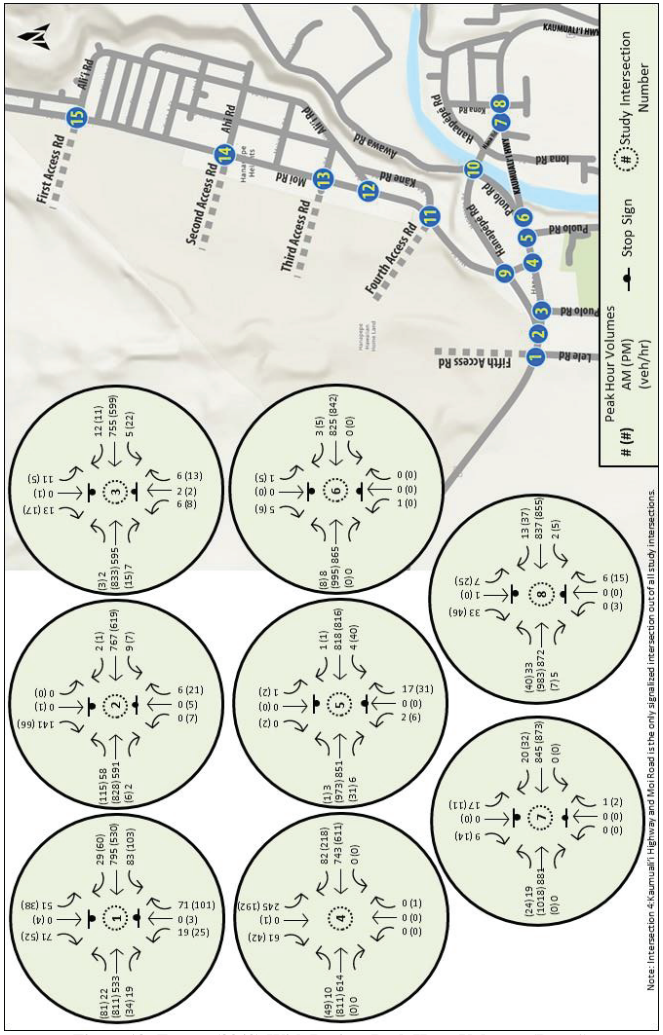


Figure 19: Future (2040) With Project Peak Hour Volumes (Part 1)

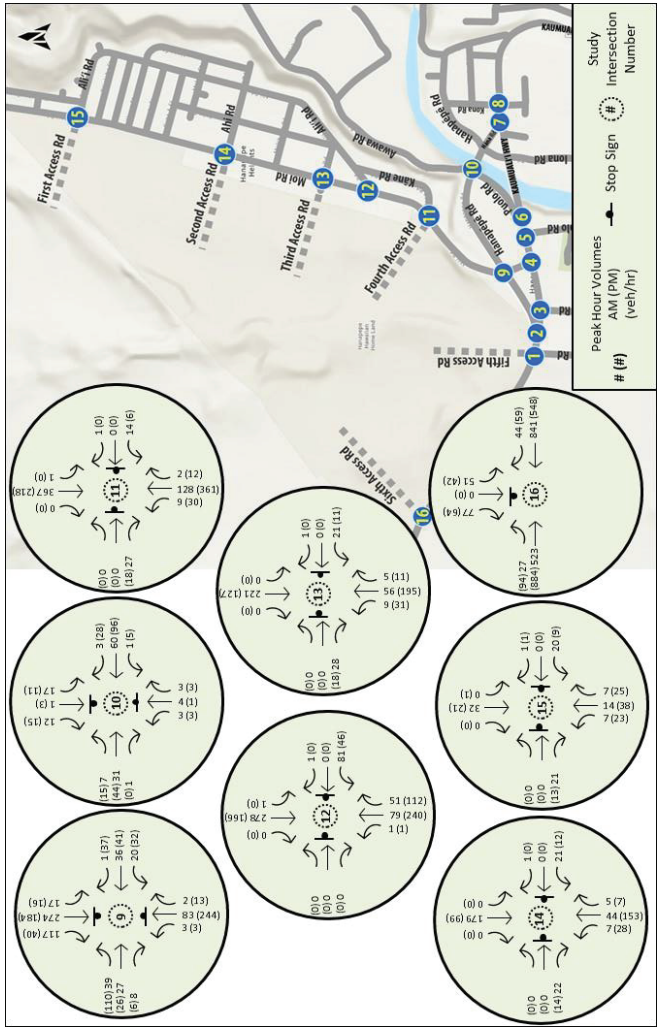


Figure 20: Future (2040) With Project Peak Hour Volumes (Part 2)

D. Level of Service

1. Future (2040) Without Project

Future (2040) without project intersection/movement LOS and average delay (in seconds per vehicle) were determined for the AM and PM weekday peak hours. The signalized intersection of Kaumuali'i Highway and Moi Road resulted in acceptable LOS C or better for the intersection and movements. All the two-way stop controlled (TWSC) intersection turning movements resulted in acceptable LOS D or better except for following turning movements:

- Puolo Road (Middle) and Kaumuali'i Highway (Intersection #5): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for AM and LOS E for PM peak hours.
- Puolo Road (East) and Kaumuali'i Highway (Intersection #6): northbound movements resulted in LOS E for AM peak hour and southbound movements resulted in LOS E for PM peak hour.
- Hāna Road and Kaumuali'i Highway (Intersection #7): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for AM and LOS E for PM peak hours.
- Kona Road (East) and Kaumuali'i Highway (Intersection #8): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for PM peak hour.

All poorly operating approaches are for the side streets and are due to the lack of gaps in heavy traffic volumes on Kaumuali'i Highway during the peak hours.

The Future (2040) Without Project intersection and movement LOS are shown in Tables 19 through 21.

Table 19: Future (2040) Without Project Intersection Level of Service (Part 1)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
1. Lele Rd and Kaumuali'i Hwy			1.80	-	-	2.40	-	-
Northbound	**LR**	**Stop**	20.50	0.29	C	26.30	0.38	D
Westbound	**L**	**Free**	8.80	0.08	A	10.00	0.11	A
2. Hanapēpē Rd and Kaumuali'i Hwy			2.30	-	-	2.20	-	-
Northbound	**LTR**	**Stop**	13.00	0.01	B	34.80	0.22	D
Eastbound	**L**	**Free**	9.60	0.07	A	9.00	0.12	A
Westbound	**L**	**Free**	8.60	0.01	A	9.40	0.01	A
Southbound	**LTR**	**Stop**	17.50	0.34	C	12.80	0.13	B
3. Puolo Rd (West) and Kaumuali'i Hwy			0.80	-	-	0.90	-	-
Northbound	**LTR**	**Stop**	22.70	0.07	C	23.90	0.11	C
Eastbound	**L**	**Free**	9.10	0.00	A	8.40	0.00	A
Westbound	**L**	**Free**	8.50	0.01	A	9.40	0.03	A
Southbound	**LTR**	**Stop**	22.90	0.11	C	17.80	0.08	C
4. Moi Rd and Kaumuali'i Hwy			19.60	-	B	20.10	-	C
Eastbound	**L**	**Signal**	24.10	0.02	C	22.80	0.10	C
	TR		13.40	0.50	B	21.10	0.83	C
Westbound	**TR**		25.00	0.80	C	20.40	0.81	C
Northbound	**LTR**		0.00	0.00	A	12.50	0.00	B
Southbound	**LT**		16.50	0.38	B	15.40	0.29	B
	R		12.80	0.07	B	12.90	0.06	B
5. Puolo Rd (Middle) and Kaumuali'i Hwy			0.30	-	-	1.10	-	-
Northbound	**LTR**	**Stop**	18.80	0.07	C	28.80	0.21	D
Eastbound	**L**	**Free**	9.40	0.00	A	9.10	0.00	A
Westbound	**L**	**Free**	10.60	0.01	B	12.00	0.08	B
Southbound	**LTR**	**Stop**	51.20	0.01	F	44.30	0.05	E
6. Puolo Rd (East) and Kaumuali'i Hwy			0.20	-	-	0.30	-	-
Northbound	**LTR**	**Stop**	52.40	0.01	F	0.00	0.00	A
Eastbound	**L**	**Free**	9.50	0.01	A	9.20	0.01	A
Southbound	**LTR**	**Stop**	21.20	0.03	C	36.00	0.09	E

Table 20: Future (2040) Without Project Intersection Level of Service (Part 2)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
7. Hāna Rd and Kaumuali'i Hwy			1.00	-	-	0.80	-	-
Northbound	**LTR**	**Stop**	14.50	0.00	B	16.60	0.01	C
Eastbound	**L**	**Free**	9.60	0.03	A	9.50	0.03	A
Southbound	**LTR**	**Stop**	55.10	0.28	F	47.50	0.24	E
8. Kona Rd and Kaumuali'i Hwy			1.00	-	-	3.90	-	-
Northbound	**LTR**	**Stop**	15.60	0.02	C	31.20	0.13	D
Eastbound	**L**	**Free**	9.70	0.05	A	9.60	0.05	A
Westbound	**L**	**Free**	9.50	0.00	A	10.00	0.01	B
Southbound	**LTR**	**Stop**	29.00	0.23	D	81.70	0.66	F
9. Hanapēpē Rd and Moi Rd			10.40	-	-	13.70	-	-
Northbound	**LTR**	**Stop**	11.50	0.13	B	20.80	0.51	C
Eastbound	**L**	**Free**	7.50	0.03	A	7.70	0.09	A
Westbound	**L**	**Free**	7.40	0.02	A	7.40	0.02	A
Southbound	**LT**	**Stop**	14.70	0.43	B	20.50	0.45	C
	R		9.00	0.13	A	8.80	0.05	A
10. Puolo Rd/Awawa Rd and Hanapēpē Rd			3.00	-	-	2.30	-	-
Northbound	**LTR**	**Stop**	9.30	0.01	A	9.50	0.01	A
Eastbound	**L**	**Free**	7.80	0.01	A	8.00	0.01	A
Westbound	**L**	**Free**	7.30	0.00	A	7.30	0.00	A
Southbound	**LTR**	**Stop**	9.40	0.04	A	9.80	0.04	A
11. Kāne Rd and Moi Rd			0.40	-	-	0.20	-	-
Westbound	**LR**	**Stop**	12.90	0.04	B	14.10	0.02	B
Southbound	**L**	**Free**	7.50	0.00	A	0.00	0.00	A
12. Ali'i Rd (Makai) and Moi Rd			2.30	-	-	1.20	-	-
Northbound	**L**	**Free**	7.80	0.00	A	7.60	0.00	A
Westbound	**LTR**	**Stop**	12.70	0.17	B	13.00	0.11	B
Southbound	**L**	**Free**	7.50	0.00	A	0.00	0.00	A
13. Eleu Rd and Moi Rd			0.80	-	-	0.40	-	-
Northbound	**L**	**Free**	0.00	0.00	A	7.50	0.00	A
Eastbound	**LTR**	**Stop**	9.50	0.00	A	0.00	0.00	A
Westbound	**LTR**	**Stop**	10.70	0.04	B	11.20	0.02	B

Table 21: Future (2040) Without Project Intersection Level of Service (Part 3)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
14. Ahi Rd and Moi Rd			1.80	-	-	1.50	-	-
Northbound	**L**	**Free**	7.70	0.01	A	7.50	0.02	A
Eastbound	**LTR**	**Stop**	9.50	0.03	A	8.90	0.02	A
Westbound	**LTR**	**Stop**	10.90	0.04	B	11.70	0.03	B
15. Ali'i Rd and Moi Rd			4.20	-	-	2.90	-	-
Northbound	**L**	**Free**	7.30	0.01	A	7.30	0.02	A
Eastbound	**LTR**	**Stop**	8.60	0.02	A	8.50	0.01	A
Westbound	**LTR**	**Stop**	9.20	0.03	A	9.50	0.01	A
Southbound	**L**	**Free**	0.00	0.00	A	7.40	0.00	A

2. Future (2040) With Project

Future (2040) With Project intersection/movement LOS and average delay (in seconds per vehicle) were determined for the AM and PM weekday peak hours. The signalized intersection of Kaumuali'i Highway and Moi Road resulted in acceptable LOS C or better for the intersection and movements. All the two-way stop controlled (TWSC) intersection turning movements resulted in acceptable LOS D or better except for following turning movements:

- Lele Road and Kaumuali'i Highway (Intersection #1): northbound movements resulted in LOS E for AM peak hour and LOS F with volume-to-capacity (v/c) ratio greater than 1 for PM peak hours; southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio greater than 1 for both AM and PM peak hours.
- Hanapēpē Road and Kaumuali'i Highway (Intersection #2): northbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for the PM peak hour.
- Puolo Road (West) and Kaumuali'i Highway (Intersection #3): northbound movements resulted in LOS E for the PM peak hour.
- Puolo Road (Middle) and Kaumuali'i Highway (Intersection #5): northbound movements resulted in LOS E for the PM peak hour; southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for both AM and PM peak hours.
- Puolo Road (East) and Kaumuali'i Highway (Intersection #6): northbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for the AM peak hour; southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for the PM peak hour.
- Hāna Road and Kaumuali'i Highway (Intersection #7): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for both AM and PM peak hours.
- Kona Road (East) and Kaumuali'i Highway (Intersection #8): northbound movements resulted in LOS E for PM peak hour; southbound movements resulted in LOS E for the AM peak hour and LOS F with volume-to-capacity (v/c) ratio greater than 1 for PM peak hour.
- Sixth Access Road and Kaumuali'i Highway(Intersection #16): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for both AM and PM peak hours.

The Future (2040) With Project signalized and unsignalized intersection LOS are shown in Tables 22 through 24.

Table 22: Future (2040) With Project Intersection Level of Service (Part 1)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
1. Lele Rd and Kaumuali'i Hwy			19.00	-	-	43.90	-	-
Northbound	**LTR**	**Stop**	46.20	0.53	E	212.50	1.18	F
Eastbound	**L**	**Free**	9.80	0.03	A	9.10	0.09	A
Westbound	**L**	**Free**	9.00	0.09	A	10.60	0.14	B
Southbound	**LTR**	**Stop**	215.80	1.18	F	534.10	1.79	F
2. Hanapēpē Rd and Kaumuali'i Hwy			2.30	-	-	2.50	-	-
Northbound	**LTR**	**Stop**	14.50	0.02	B	60.70	0.35	F
Eastbound	**L**	**Free**	10.00	0.08	B	9.70	0.14	A
Westbound	**L**	**Free**	9.00	0.01	A	10.00	0.01	A
Southbound	**LTR**	**Stop**	20.50	0.39	C	15.20	0.17	C
3. Puolo Rd (West) and Kaumuali'i Hwy			0.90	-	-	1.00	-	-
Northbound	**LTR**	**Stop**	30.10	0.09	D	35.30	0.17	E
Eastbound	**L**	**Free**	9.40	0.00	A	8.90	0.00	A
Westbound	**L**	**Free**	8.80	0.01	A	9.90	0.03	A
Southbound	**LTR**	**Stop**	30.20	0.15	D	24.70	0.12	C
4. Moi Rd and Kaumuali'i Hwy			18.80	-	B	22.50	-	C
Eastbound	**L**	**Signal**	26.00	0.06	C	35.20	0.33	D
	TR		12.80	0.63	B	19.80	0.83	B
Westbound	**TR**		21.80	0.86	C	24.70	0.89	C
Northbound	**LTR**		0.00	0.00	A	17.00	0.00	B
Southbound	**LT**		23.80	0.49	C	21.90	0.39	C
	R		18.20	0.14	B	17.80	0.10	B
5. Puolo Rd (Middle) and Kaumuali'i Hwy			0.30	-	-	1.30	-	-
Northbound	**LTR**	**Stop**	23.10	0.09	C	45.10	0.31	E
Eastbound	**L**	**Free**	9.80	0.00	A	9.70	0.00	A
Westbound	**L**	**Free**	11.40	0.01	B	13.10	0.09	B
Southbound	**LTR**	**Stop**	73.00	0.02	F	76.00	0.08	F
6. Puolo Rd (East) and Kaumuali'i Hwy			0.20	-	-	0.40	-	-
Northbound	**LTR**	**Stop**	75.70	0.02	F	0.00	0.00	A
Eastbound	**L**	**Free**	9.90	0.01	A	10.00	0.01	A
Southbound	**LTR**	**Stop**	26.10	0.04	D	59.40	0.16	F

Table 23: Future (2040) With Project Intersection Level of Service (Part 2)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
7. Hāna Rd and Kaumuali'i Hwy			1.40	-	-	1.30	-	-
Northbound	**LTR**	**Stop**	16.40	0.00	C	19.00	0.01	C
Eastbound	**L**	**Free**	10.00	0.03	B	10.30	0.04	B
Southbound	**LTR**	**Stop**	88.90	0.41	F	89.00	0.40	F
8. Kona Rd and Kaumuali'i Hwy			1.20	-	-	9.20	-	-
Northbound	**LTR**	**Stop**	17.80	0.02	C	48.50	0.19	E
Eastbound	**L**	**Free**	10.20	0.05	B	10.40	0.06	B
Westbound	**L**	**Free**	10.10	0.00	B	10.70	0.01	B
Southbound	**LTR**	**Stop**	40.10	0.31	E	240.90	1.10	F
9. Hanapēpē Rd and Moi Rd			11.80	-	-	18.10	-	-
Northbound	**LTR**	**Stop**	11.80	0.16	B	27.60	0.67	D
Eastbound	**L**	**Free**	7.50	0.03	A	7.70	0.09	A
Westbound	**L**	**Free**	7.40	0.02	A	7.40	0.02	A
Southbound	**LT**	**Stop**	16.70	0.53	C	25.00	0.57	D
	R		9.00	0.13	A	8.80	0.05	A
10. Puolo Rd/Awawa Rd and Hanapēpē Rd			3.00	-	-	2.30	-	-
Northbound	**LTR**	**Stop**	9.30	0.01	A	9.50	0.01	A
Eastbound	**L**	**Free**	7.80	0.01	A	8.00	0.01	A
Westbound	**L**	**Free**	7.30	0.00	A	7.30	0.00	A
Southbound	**LTR**	**Stop**	9.40	0.04	A	9.80	0.04	A
11. Kāne Rd and Moi Rd			1.10	-	-	0.70	-	-
Northbound	**L**	**Free**	8.20	0.01	A	7.80	0.03	A
Eastbound	**LTR**	**Stop**	11.20	0.05	B	9.80	0.03	A
Westbound	**LTR**	**Stop**	15.60	0.05	C	18.50	0.03	C
Southbound	**L**	**Free**	7.50	0.00	A	0.00	0.00	A
12. Ali'i Rd (Makai) and Moi Rd			2.20	-	-	1.10	-	-
Northbound	**L**	**Free**	7.90	0.00	A	7.60	0.00	A
Westbound	**LTR**	**Stop**	13.30	0.18	B	13.80	0.11	B
Southbound	**L**	**Free**	7.50	0.00	A	0.00	0.00	A
13. Eleu Rd and Moi Rd			1.70	-	-	1.40	-	-
Northbound	**L**	**Free**	7.70	0.01	A	7.50	0.02	A
Eastbound	**LTR**	**Stop**	9.70	0.04	A	9.00	0.02	A
Westbound	**LTR**	**Stop**	11.30	0.04	B	12.20	0.02	B

Table 24: Future (2040) With Project Intersection Level of Service (Part 3)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
14. Ahi Rd and Moi Rd			1.80	-	-	1.50	-	-
Northbound	**L**	**Free**	7.70	0.01	A	7.50	0.02	A
Eastbound	**LTR**	**Stop**	9.50	0.03	A	8.90	0.02	A
Westbound	**LTR**	**Stop**	10.90	0.04	B	11.70	0.03	B
15. Ali'i Rd and Moi Rd			4.20	-	-		-	-
Northbound	**L**	**Free**	7.30	0.01	A	7.30	0.02	A
Eastbound	**LTR**	**Stop**	8.60	0.02	A	8.50	0.01	A
Westbound	**LTR**	**Stop**	9.20	0.03	A	9.50	0.01	A
Southbound	**L**	**Free**	0.00	0.00	A	7.40	0.00	A
16. Sixth Access Road and Kaumuali'i Hwy			5.50	-	-	6.50	-	-
Eastbound	**L**	**Free**	10.20	0.04	B	9.40	0.11	A
Southbound	**LR**	**Stop**	64.60	0.74	F	94.70	0.82	F

E. Mitigation Measures

Mitigation measures were analyzed to alleviate the congestion at the intersections which resulted in higher delays for Future (2040) With Project conditions. The following changes in geometric configurations or change in control-type at the intersection were applied as mitigation measures and results shown in Tables 25 through 27.

- Lele Road and Kaumuali'i Highway (Intersection #1): The intersection resulted in LOS F with volume-to-capacity (v/c) ratio 1.18 (> 1) and 1.79 (> 1) for the AM and PM peak hours respectively. Signal Warrant from MUTCD were analyzed with 70% factor as Hanapēpē is an isolated community with population less than 10,000. County of Kaua'i General Plan forecasts the population Hanapēpē-'Ele'ele district will grow to 7,094 by 2035 (Table 1-1 Kaua'i County Population, Island-Wide and By District (1990-2035). Four Hour Signal Warrants passed by using the existing volumes and Peak Hour Signal Warrants passed for Future (2040) With Project Conditions. Warrants are included in Appendix G. Per the County of Kaua'i's Street Design Manual, "a roundabout shall be used at any location where MUTCD signal warrants or all-way stop control warrants are met". The resulting roundabout had appropriate LOS C or better for all approaches.
- Hanapēpē Road and Kaumuali'i Highway (Intersection #2): The Future Transportation Network proposes the removal of the misaligned (< 90-degrees) north leg at the intersection Hanapēpē Road and Kaumuali'i Road. As a result, Hanapēpē Road is turned into a dead-end street north of the intersection. The right turning vehicles from Hanapēpē Road to Kaumuali'i Highway were redistributed to make a right turn at the signalized intersection of Moi Road and Kaumuali'i Highway (Intersection #4). The resulting intersection had an appropriate LOS D or better.
- Puolo Road (West) and Kaumuali'i Highway (Intersection #3): northbound movements resulted in LOS E for both AM and PM peak hours, southbound movements resulted in LOS E for the AM peak hour.
- Puolo Road (Middle) and Kaumuali'i Highway (Intersection #5) and Puolo Road (East) and Kaumuali'i Highway (Intersection #6): The closely spaced intersections were proposed for consolidation so as to form a single intersection, reducing the number of access points along Kaumuali'i Highway which should reduce delay. The resulting intersection resulted in LOS F for the AM peak Northbound approach and PM peak Southbound approach. However, each had acceptable v/c.
- Kona Road and Kaumuali'i Highway (Intersection #8): Delay can be reduced for southbound vehicles turning right from Kona Street onto Kaumuali'i Highway by providing a dedicated right-turn lane. However, the southbound shared left/thru movement resulted in LOS F with v/c < 1.0 for both AM and PM peak hours.
- Hanapēpē Road and Moi Road (Intersection #9): With the reconfiguration of the west end of Hanapēpē Road to a dead-end, and the volumes redistributed, the intersection of Hanapēpē Road and Moi Road was reconfigured with STOP signs for the Hanapēpē Road approaches only. The resulting intersection had an appropriate LOS C or better for all approaches.
- Sixth access Road and Kaumuali'i Highway (Intersection #16): Delay can be reduced for southbound vehicles turning right from Sixth access Road onto Kaumuali'i Highway by providing a dedicated right-turn lane. However, the southbound shared left movement resulted in LOS F with v/c < 1.0 for both AM and PM peak hours.

Table 25: Future (2040) With Mitigations Level of Service (Part 1)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
1. Lele Rd and Kaumuali'i Hwy			12.20	-	B	17.40	-	C
Eastbound	**LTR**	**Roundabout**	9.30	0.53	A	23.80	0.87	C
Westbound	**LTR**		14.70	0.75	B	11.10	0.62	B
Northbound	**LTR**		7.30	0.15	A	13.10	0.30	B
Southbound	**LTR**		11.20	0.27	B	7.40	0.16	A
2. Hanapēpē Rd and Kaumuali'i Hwy			0.10	-	-	0.60	-	-
Northbound	**LTR**	**Stop**	13.40	0.02	B	31.30	0.18	D
Westbound	**L**	**Free**	9.10	0.01	A	10.50	0.01	A
3. Puolo Rd (West) and Kaumuali'i Hwy			1.00	-	-	1.20	-	-
Northbound	**LTR**	**Stop**	41.30	0.13	E	48.90	0.23	E
Eastbound	**L**	**Free**	10.10	0.00	B	9.20	0.00	A
Westbound	**L**	**Free**	9.00	0.01	A	10.50	0.04	B
Southbound	**LTR**	**Stop**	42.50	0.21	E	32.30	0.16	D
4. Moi Rd and Kaumuali'i Hwy			19.80	-	B	20.00	-	C
Eastbound	**L**	**Signal**	36.20	0.41	D	54.70	0.77	D
	TR		12.70	0.63	B	13.00	0.72	B
Westbound	**TR**		21.60	0.86	C	14.90	0.77	B
Northbound	**LTR**		0.00	0.00	A	26.30	0.00	C
Southbound	**LT**		23.90	0.49	C	34.90	0.50	C
	R		23.90	0.51	C	31.60	0.38	C
6. Puolo Rd (East) and Kaumuali'i Hwy			0.20	-	-	0.40	-	-
Northbound	**LTR**	**Stop**	73.00	0.02	F	0.00	0.00	A
Eastbound	**L**	**Free**	9.80	0.01	A	9.90	0.01	A
Southbound	**LTR**	**Stop**	25.50	0.04	D	59.30	0.15	F
7. Hāna Rd and Kaumuali'i Hwy			1.40	-	-	1.30	-	-
Northbound	**LTR**	**Stop**	16.40	0.00	C	19.00	0.01	C
Eastbound	**L**	**Free**	10.00	0.03	B	10.30	0.04	B
Southbound	**LTR**	**Stop**	88.90	0.41	F	89.00	0.40	F

Table 26: Future (2040) With Mitigations Level of Service (Part 2)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
8. Kona Rd and Kaumuali'i Hwy			1.00	-	-		-	-
Northbound	**LTR**	**Stop**	17.80	0.02	C	48.50	0.19	E
Eastbound	**L**	**Free**	10.20	0.05	B	10.40	0.06	B
Westbound	**L**	**Free**	10.10	0.00	B	10.70	0.01	B
Southbound	**LT**	**Stop**	106.00	0.20	F	344.20	0.94	F
	R		17.30	0.11	C	18.60	0.16	C
9. Hanapēpē Rd and Moi Rd			2.10	-	-	3.50	-	-
Northbound	**L**	**Free**	8.30	0.00	A	7.80	0.00	A
Eastbound	**LTR**	**Stop**	13.10	0.04	B	16.30	0.09	C
Westbound	**LTR**	**Stop**	17.00	0.18	C	18.70	0.33	C
Southbound	**L**	**Free**	17.30	0.01	A	8.20	0.02	A
10. Puolo Rd/Awawa Rd and Hanapēpē Rd			3.00	-	-	2.30	-	-
Northbound	**LTR**	**Stop**	9.30	0.01	A	9.50	0.01	A
Eastbound	**L**	**Free**	7.80	0.01	A	8.00	0.01	A
Westbound	**L**	**Free**	7.30	0.00	A	7.30	0.00	A
Southbound	**LTR**	**Stop**	9.40	0.04	A	9.80	0.04	A
11. Kāne Rd and Moi Rd			1.10	-	-		-	-
Northbound	**L**	**Free**	8.20	0.01	A	7.80	0.03	A
Eastbound	**LTR**	**Stop**	11.20	0.05	B	9.80	0.03	A
Westbound	**LTR**	**Stop**	15.60	0.05	C	18.50	0.03	C
Southbound	**L**	**Free**	7.50	0.00	A	0.00	0.00	A
12. Ali'i Rd (Makai) and Moi Rd			2.20	-	-	1.10	-	-
Northbound	**L**	**Free**	7.90	0.00	A	7.60	0.00	A
Westbound	**LTR**	**Stop**	13.30	0.18	B	13.80	0.11	B
Southbound	**L**	**Free**	7.50	0.00	A	0.00	0.00	A
13. Eleu Rd and Moi Rd			1.70	-	-	1.40	-	-
Northbound	**L**	**Free**	7.70	0.01	A	7.50	0.02	A
Eastbound	**LTR**	**Stop**	9.70	0.04	A	9.00	0.02	A
Westbound	**LTR**	**Stop**	11.30	0.04	B	12.20	0.02	A
14. Ahi Rd and Moi Rd			1.80	-	-	1.50	-	-
Northbound	**L**	**Free**	7.70	0.01	A	7.50	0.02	A
Eastbound	**LTR**	**Stop**	9.50	0.03	A	8.90	0.02	A
Westbound	**LTR**	**Stop**	10.90	0.04	B	11.70	0.03	B

Table 27: Future (2040) With Mitigations Level of Service (Part 3)

Intersection		Intersection/ Approach Control	AM			PM		
Approach	Movement		Delay (s/veh)	v/c	LOS	Delay (s/veh)	v/c	LOS
15. Ali'i Rd and Moi Rd			4.20	-	-	2.90	-	-
Northbound	**L**	**Free**	7.30	0.01	A	7.30	0.02	A
Eastbound	**LTR**	**Stop**	8.60	0.02	A	8.50	0.01	A
Westbound	**LTR**	**Stop**	9.20	0.03	A	9.50	0.01	A
Southbound	**L**	**Free**	0.00	0.00	A	7.40	0.00	A
16. Sixth Access Road and Kaumuali'i Hwy			3.20	-	-	4.30	-	-
Eastbound	**L**	**Free**	10.20	0.04	B	9.40	0.11	A
Southbound	**L**	**Stop**	61.60	0.48	F	130.50	0.67	F
	R		20.10	0.26	C	13.70	0.14	B

The proposed transportation network improvements are shown in Figure 21.

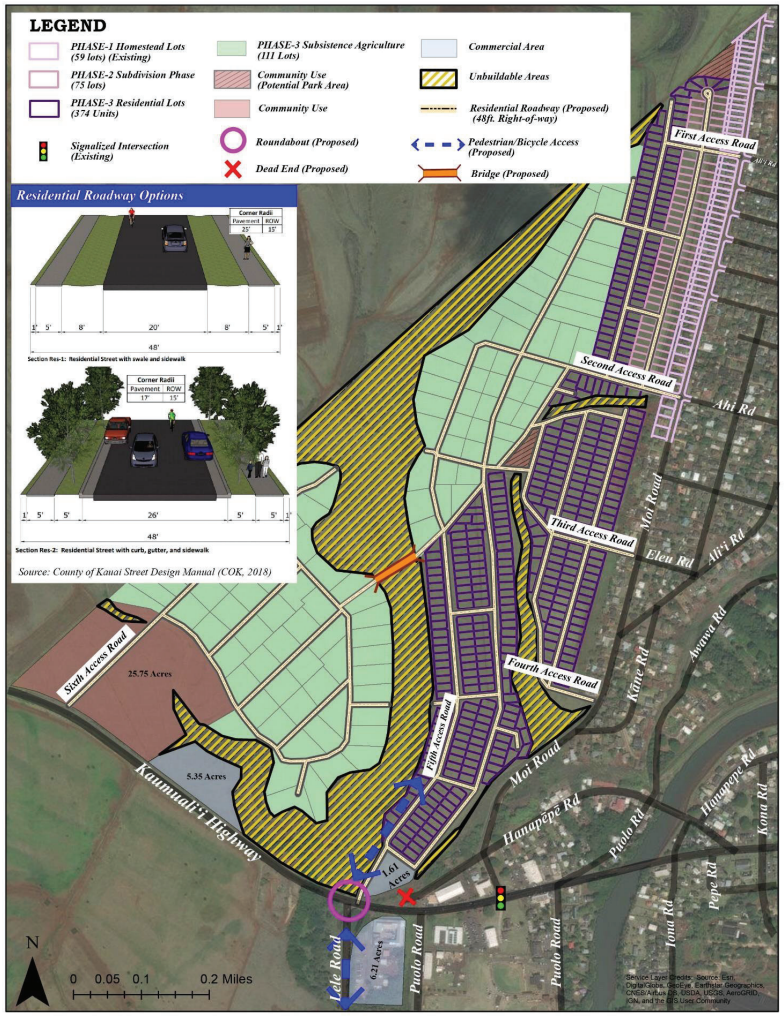


Figure 21: Proposed Transportation Network

V. SUMMARY

The State Department of Hawaiian Home Lands (DHHL) is proposing to expand development on 365 acres of gently rolling former agricultural land west of historic Hanapēpē Town and Moi Road/Puolo Road on the Island of Kaua'i. The project is being proposed for development over two phases (Phase 2 and 3). In total, Phase 2 plans to have 75 residential lots with an expected full buildout and occupancy by 2025. Phase 3 will have 374 residential units, 111 subsistence lots, and 13.17 acres of commercial area with an expected full buildout and occupancy by 2040.

Intersection/movement LOS and average delay were determined for the AM and PM weekday peak hours for existing, future without project, and future with project conditions:

- Existing (2019) Conditions:
  - The signalized intersection of Kaumuali'i Highway and Moi Road resulted in acceptable LOS C or better for the intersection and movements.
  - All stop-controlled intersection turning movements resulted in acceptable LOS D or better except for following approaches:
    - Puolo Road (Middle) and Kaumuali'i Highway (Intersection #5): southbound approach resulted in LOS E for both AM and PM peak hours.
    - Puolo Road (East) and Kaumuali'i Highway (Intersection #6): northbound approach resulted in LOS E for the AM peak hour.
    - Hāna Road and Kaumuali'i Highway (Intersection #7): southbound approach resulted in LOS E for both AM and PM peak hours.
    - Kona Road (East) and Kaumuali'i Highway (Intersection #8): southbound approach resulted in LOS F with volume-to-capacity (v/c) ratio less than 1.0 for the PM peak hour.
- Future (2040) Without Project conditions:
  - The signalized intersection of Kaumuali'i Highway and Moi Road resulted in acceptable LOS C or better for the intersection and movements.
  - All the two-way stop controlled (TWSC) intersection turning movements resulted in acceptable LOS D or better except for following turning movements:
    - Puolo Road (Middle) and Kaumuali'i Highway (Intersection #5): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for AM and LOS E for PM peak hours.
    - Puolo Road (East) and Kaumuali'i Highway (Intersection #6): northbound movements resulted in LOS E for AM peak hour and southbound movements resulted in LOS E for PM peak hour.
    - Hāna Road and Kaumuali'i Highway (Intersection #7): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for AM and LOS E for PM peak hours.
    - Kona Road (East) and Kaumuali'i Highway (Intersection #8): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for PM peak hour.
- Future (2040) With Project conditions:

- The signalized intersection of Kaumuali'i Highway and Moi Road resulted in acceptable LOS C or better for the intersection and movements.
- All the two-way stop controlled (TWSC) intersection turning movements resulted in acceptable LOS D or better except for following turning movements:
  - Lele Road and Kaumuali'i Highway (Intersection #1): northbound movements resulted in LOS E for AM peak hour and LOS F with volume-to-capacity (v/c) ratio greater than 1 for PM peak hours; southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio greater than 1 for both AM and PM peak hours.
  - Hanapēpē Road and Kaumuali'i Highway (Intersection #2): northbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for the PM peak hour.
  - Puolo Road (West) and Kaumuali'i Highway (Intersection #3): northbound movements resulted in LOS E for the PM peak hour.
  - Puolo Road (Middle) and Kaumuali'i Highway (Intersection #5): northbound movements resulted in LOS E for the PM peak hour; southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for both AM and PM peak hours.
  - Puolo Road (East) and Kaumuali'i Highway (Intersection #6): northbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for the AM peak hour; southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for the PM peak hour.
  - Hāna Road and Kaumuali'i Highway (Intersection #7): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for both AM and PM peak hours.
  - Kona Road (East) and Kaumuali'i Highway (Intersection #8): northbound movements resulted in LOS E for PM peak hour; southbound movements resulted in LOS E for the AM peak hour and LOS F with volume-to-capacity (v/c) ratio greater than 1 for PM peak hour.
  - Sixth Access Road and Kaumuali'i Highway(Intersection #16): southbound movements resulted in LOS F with volume-to-capacity (v/c) ratio less than 1 for both AM and PM peak hours.

Mitigation measures were analyzed to alleviate the congestion at the intersections which resulted in higher delays for Future (2040) With Project conditions. The following changes in geometric configurations or change in control-type at the intersection were applied as mitigation measures which resulted in the following:

- Lele Road and Kaumuali'i Highway (Intersection #1): Signal warrants passed and a roundabout resulted in appropriate LOS C or better for all approaches.
- Hanapēpē Road and Kaumuali'i Highway (Intersection #2): The Future Transportation Network proposes the removal of the misaligned (< 90-degrees) north leg at the intersection Hanapēpē Road and Kaumuali'i Road. As a result, Hanapēpē Road is turned into a dead-end street north of the intersection. The right turning vehicles from Hanapēpē Road to Kaumuali'i Highway were redistributed to make a right turn at the signalized intersection of Moi Road and Kaumuali'i Highway (Intersection #4). The resulting intersection had an appropriate LOS D or better.

- Puolo Road (West) and Kaumuali'i Highway (Intersection #3): northbound movements resulted in LOS E for both AM and PM peak hours, southbound movements resulted in LOS E for the AM peak hour.
- Puolo Road (Middle) and Kaumuali'i Highway (Intersection #5) and Puolo Road (East) and Kaumuali'i Highway (Intersection #6): The closely spaced intersections were proposed for consolidation so as to form a single intersection, reducing the number of access points along Kaumuali'i Highway which should reduce delay. The resulting intersection resulted in LOS F for the AM peak Northbound approach and PM peak Southbound approach. However, each had acceptable v/c.
- Kona Road and Kaumuali'i Highway (Intersection #8): Delay can be reduced for southbound vehicles turning right from Kona Street onto Kaumuali'i Highway by providing a dedicated right-turn lane. However, the southbound shared left/thru movement resulted in LOS F with v/c < 1.0 for both AM and PM peak hours.
- Hanapēpē Road and Moi Road (Intersection #9): With the reconfiguration of the west end of Hanapēpē Road to a dead-end, and the volumes redistributed, the intersection of Hanapēpē Road and Moi Road was reconfigured with STOP signs for the Hanapēpē Road approaches only. The resulting intersection had an appropriate LOS C or better for all approaches.
- Sixth access Road and Kaumuali'i Highway (Intersection #16): Delay can be reduced for southbound vehicles turning right from Sixth access Road onto Kaumuali'i Highway by providing a dedicated right-turn lane. However, the southbound shared left movement resulted in LOS F with v/c < 1.0 for both AM and PM peak hours.

With the development of residential lots, it is recommended to include dedicated space for bicycles and pedestrians as a part of new roadway buildout. This may look like one of the Residential Street cross-sections provided in the County of Kaua`i Street Design Manual, with minimum five-foot-wide sidewalks included on either side and travel speeds low enough for people on bicycles to share the road. A continuous off-street path may be an appropriate solution to connect the residential neighborhood mauka of the highway to the commercial center and beach makai of the highway. Enhanced crosswalks should be included where appropriate.

VI. REFERENCES

1. American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets*, 2011.
2. County of Kaua'i, The Kaua'i Bus, < https://www.kauai.gov/Bus>, Accessed October 2014.
3. Federal Highway Administration, *Manual on Uniform Traffic Control Devices for Streets and Highways*, 2009 Edition.
4. Institute of Transportation Engineers, *Trip Generation, 10th Edition: An ITE Informational Report*, September 2017.
5. County of Kaua'i, West Kaua'i Community Plan, August 2019.
6. State of Hawaii, Department of Transportation, *Historical Traffic Station Maps,* 2016.
7. State of Hawaii, Office of Environmental Quality Control, *Map-Based Library of EA's and EIS's.*
8. State of Hawaii, Department of Transportation, *Hawaii Statewide Uniform Design Manual For Streets and Highways*, October 1980.
9. Transportation Research Board, National Research Council, *Highway Capacity Manual 2000,* Washington, D.C., 2000 Edition.
10. Transportation Research Board, National Research Council, *Highway Capacity Manual,* Washington, D.C., 2010 Edition.

APPENDIX

APPENDIX A

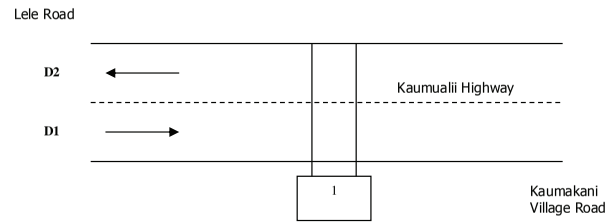
HDOT 24-Hour Traffic Volumes and Intersection Peak Hour Turning Movement Counts

Traffic Data Service
Traffic Station Sketch

N

Island: Kauai
Area: Waimea

Section ID/Station #: B73005001702



	Meter #	File Name	GPS
1.	W542	D0425015_B73005001702	21.91647, -159.6166
2.		D0425016_B73005001702	

Station Description:
Kaumualii Highway: Lele Road to Kaumakani Village Road

Survey Beginning Date/Time: 4/25/16 @ 0000		Survey Ending Date/Time: 4/26/16 @ 2400

Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:	825		

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Kaumualii Highway		6		0050	

D1= Direction to End	D1: Kaumakani Village Rd/ N. entrance gate of Pacific Missile Range Facility
D2= Direction to Begin	D2: Lele Rd/Rice St

Run Date: 2017/08/10

Hawaii Department of Transportation
Highways Division **Highways Planning Survey Section**
2016 Program Count - Summary

Site ID: B73005001702 **Town:** Kauai **DIR 1:** +MP **DIR 2:**-MP **Final AADT:** 11200
Functional Class: RURAL:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 50
Location: Kaumualii Hwy - Lele Rd to Kaumakani Village Rd

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 04/25/2016															
12:00-12:15	4	7	11	06:00-06:15	62	64	126	12:00-12:15	80	104	184	06:00-06:15	81	73	154
12:15-12:30	15	6	21	06:15-06:30	90	95	185	12:15-12:30	89	102	191	06:15-06:30	70	77	147
12:30-12:45	8	9	17	06:30-06:45	72	71	143	12:30-12:45	81	85	166	06:30-06:45	74	57	131
12:45-01:00	5	3	8	06:45-07:00	108	69	177	12:45-01:00	76	106	182	06:45-07:00	87	86	173
01:00-01:15	3	3	6	07:00-07:15	110	66	176	01:00-01:15	83	77	160	07:00-07:15	60	60	120
01:15-01:30	3	7	10	07:15-07:30	94	80	174	01:15-01:30	79	91	170	07:15-07:30	59	47	106
01:30-01:45	4	3	7	07:30-07:45	99	70	169	01:30-01:45	84	97	181	07:30-07:45	54	48	102
01:45-02:00	6	4	10	07:45-08:00	76	75	151	01:45-02:00	79	84	163	07:45-08:00	48	47	95
02:00-02:15	3	4	7	08:00-08:15	78	84	162	02:00-02:15	75	89	164	08:00-08:15	40	40	80
02:15-02:30	6	6	12	08:15-08:30	64	81	145	02:15-02:30	93	85	178	08:15-08:30	43	47	90
02:30-02:45	3	4	7	08:30-08:45	85	84	169	02:30-02:45	88	99	187	08:30-08:45	41	30	71
02:45-03:00	1	2	3	08:45-09:00	72	73	145	02:45-03:00	106	119	225	08:45-09:00	45	32	77
03:00-03:15	3	6	9	09:00-09:15	80	74	154	03:00-03:15	110	99	209	09:00-09:15	42	18	60
03:15-03:30	4	5	9	09:15-09:30	75	84	159	03:15-03:30	89	140	229	09:15-09:30	47	12	59
03:30-03:45	6	5	11	09:30-09:45	76	64	140	03:30-03:45	89	133	222	09:30-09:45	36	18	54
03:45-04:00	5	7	12	09:45-10:00	89	88	177	03:45-04:00	107	141	248	09:45-10:00	31	15	46
04:00-04:15	6	18	24	10:00-10:15	107	87	194	04:00-04:15	106	134	240	10:00-10:15	27	20	47
04:15-04:30	4	13	17	10:15-10:30	92	97	189	04:15-04:30	90	164	254	10:15-10:30	26	20	46
04:30-04:45	7	14	21	10:30-10:45	96	85	181	04:30-04:45	126	127	253	10:30-10:45	32	12	44
04:45-05:00	5	19	24	10:45-11:00	86	83	169	04:45-05:00	102	115	217	10:45-11:00	24	14	38
05:00-05:15	14	22	36	11:00-11:15	87	103	190	05:00-05:15	121	110	231	11:00-11:15	26	7	33
05:15-05:30	24	41	65	11:15-11:30	80	88	168	05:15-05:30	99	117	216	11:15-11:30	20	2	22
05:30-05:45	54	41	95	11:30-11:45	96	102	198	05:30-05:45	90	102	192	11:30-11:45	18	10	28
05:45-06:00	67	59	126	11:45-12:00	92	103	195	05:45-06:00	81	101	182	11:45-12:00	16	11	27

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	411	285	696
AM - K FACTOR (%)			6.16
AM - D (%)	59.05	40.95	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM	07:45 AM to 08:45 AM	
AM - PEAK HR VOLUME	411	324	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	429	566	995
PM - K FACTOR (%)			8.81
PM - D (%)	43.12	56.88	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:30 PM to 05:30 PM	03:30 PM to 04:30 PM	
PM - PEAK HR VOLUME	448	572	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	11:00 AM to 12:00 PM		
AM - PEAK HR VOLUME	355	396	751
AM - K FACTOR (%)			6.65
AM - D (%)	47.27	52.73	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	429	566	995
PM - K FACTOR (%)			8.81
PM - D (%)	43.12	56.88	100.00

NON-COMMUTER PERIOD (09:00-15:00)		
TWO DIRECTIONAL PEAK		
PEAK HR TIME	11:30 AM to 12:30 PM	
PEAK HR VOLUME	357	411	768
DIRECTIONAL PEAK		
PEAK HR TIME	09:45 AM to 10:45 AM	11:30 AM to 12:30 PM
PEAK HR VOLUME	384	411

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	2,066	1,970	4,036
AM 12-HR PERIOD (00:00-12:00)	2,326	2,278	4,604
PM 6-HR PERIOD (12:00-18:00)	2,223	2,621	4,844
PM 12-HR PERIOD (12:00-24:00)	3,270	3,424	6,694
24 HOUR PERIOD	5,596	5,702	11,298
D (%)	49.53	50.47	100.00

Run Date: 2017/08/10

Hawaii Department of Transportation
Highways Division **Highways Planning Survey Section**
2016 Program Count - Summary

Site ID: B73005001702 **Town:** Kauai **DIR 1:** +MP **DIR 2:**-MP **Final AADT:** 11200
Functional Class: RURAL:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 50
Location: Kaumualii Hwy - Lele Rd to Kaumakani Village Rd

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 04/26/2016															
12:00-12:15	6	6	12	06:00-06:15	57	96	153	12:00-12:15	74	79	153	06:00-06:15	96	75	171
12:15-12:30	8	2	10	06:15-06:30	91	103	194	12:15-12:30	82	86	168	06:15-06:30	91	77	168
12:30-12:45	11	7	18	06:30-06:45	115	109	224	12:30-12:45	75	63	138	06:30-06:45	89	63	152
12:45-01:00	7	0	7	06:45-07:00	152	89	241	12:45-01:00	79	90	169	06:45-07:00	94	55	149
01:00-01:15	9	3	12	07:00-07:15	189	72	261	01:00-01:15	83	140	223	07:00-07:15	47	71	118
01:15-01:30	2	4	6	07:15-07:30	183	99	282	01:15-01:30	103	100	203	07:15-07:30	78	51	129
01:30-01:45	1	4	5	07:30-07:45	133	130	263	01:30-01:45	93	104	197	07:30-07:45	60	62	122
01:45-02:00	5	1	6	07:45-08:00	90	99	189	01:45-02:00	82	126	208	07:45-08:00	46	49	95
02:00-02:15	1	5	6	08:00-08:15	80	91	171	02:00-02:15	98	119	217	08:00-08:15	58	38	96
02:15-02:30	1	1	2	08:15-08:30	70	83	153	02:15-02:30	105	121	226	08:15-08:30	30	21	51
02:30-02:45	2	0	2	08:30-08:45	52	61	113	02:30-02:45	107	112	219	08:30-08:45	46	33	79
02:45-03:00	1	0	1	08:45-09:00	80	76	156	02:45-03:00	98	126	224	08:45-09:00	35	34	69
03:00-03:15	2	3	5	09:00-09:15	91	53	144	03:00-03:15	105	138	243	09:00-09:15	52	32	84
03:15-03:30	0	6	6	09:15-09:30	68	111	179	03:15-03:30	103	160	263	09:15-09:30	46	37	83
03:30-03:45	5	4	9	09:30-09:45	109	60	169	03:30-03:45	119	130	249	09:30-09:45	41	30	71
03:45-04:00	5	12	17	09:45-10:00	107	68	175	03:45-04:00	87	158	245	09:45-10:00	47	23	70
04:00-04:15	4	6	10	10:00-10:15	97	66	163	04:00-04:15	114	146	260	10:00-10:15	29	25	54
04:15-04:30	7	10	17	10:15-10:30	79	97	176	04:15-04:30	80	162	242	10:15-10:30	31	14	45
04:30-04:45	4	20	24	10:30-10:45	93	83	176	04:30-04:45	90	149	239	10:30-10:45	26	15	41
04:45-05:00	10	12	22	10:45-11:00	87	72	159	04:45-05:00	89	132	221	10:45-11:00	27	9	36
05:00-05:15	20	26	46	11:00-11:15	82	94	176	05:00-05:15	96	117	213	11:00-11:15	17	6	23
05:15-05:30	16	49	65	11:15-11:30	84	83	167	05:15-05:30	93	107	200	11:15-11:30	28	12	40
05:30-05:45	45	43	88	11:30-11:45	92	73	165	05:30-05:45	113	85	198	11:30-11:45	11	8	19
05:45-06:00	56	53	109	11:45-12:00	90	83	173	05:45-06:00	101	84	185	11:45-12:00	15	8	23

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	657	390	1047
AM - K FACTOR (%)			8.71
AM - D (%)	62.75	37.25	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM	07:15 AM to 08:15 AM	
AM - PEAK HR VOLUME	657	419	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 PM to 04:15 PM		
PM - PEAK HR VOLUME	423	594	1017
PM - K FACTOR (%)			8.46
PM - D (%)	41.59	58.41	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 PM to 04:15 PM	03:45 PM to 04:45 PM	
PM - PEAK HR VOLUME	423	615	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	657	390	1047
AM - K FACTOR (%)			8.71
AM - D (%)	62.75	37.25	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 PM to 04:15 PM		
PM - PEAK HR VOLUME	423	594	1017
PM - K FACTOR (%)			8.46
PM - D (%)	41.59	58.41	100.00

NON-COMMUTER PERIOD (09:00-15:00)		
TWO DIRECTIONAL PEAK		
PEAK HR TIME	02:00 PM to 03:00 PM	
PEAK HR VOLUME	408	478	886
DIRECTIONAL PEAK		
PEAK HR TIME	02:00 PM to 03:00 PM	01:45 PM to 02:45 PM
PEAK HR VOLUME	408	478

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	2,371	2,051	4,422
AM 12-HR PERIOD (00:00-12:00)	2,599	2,328	4,927
PM 6-HR PERIOD (12:00-18:00)	2,269	2,834	5,103
PM 12-HR PERIOD (12:00-24:00)	3,409	3,682	7,091
24 HOUR PERIOD	6,008	6,010	12,018
D (%)	49.99	50.01	100.00

Run Date: 2017/08/10

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2016

Site ID: B73005001702 **Route No:** 50 **Date From:** 2016/04/25 0:00
Town: Kauai **Direction:** +MP **Date To:** 2016/04/26 23:45
Location: Kaumualii Hwy - Lele Rd to Kaumakani Village Rd

Functional Classification: 6 RURAL:MINOR ARTERIAL
REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	121	0.52%	242
PC	15169	65.06%	30338
2A-4T	7435	31.89%	14870
LIGHT VEHICLE TOTALS	22725	97.47%	45450
HEAVY VEHICLES			
Bus	129	0.55%	323
SINGLE UNIT TRUCK			
2A-6T	223	0.96%	446
3A-SU	100	0.43%	300
4A-SU	11	0.05%	44
SINGLE-TRAILER TRUCKS			
4A-ST	25	0.11%	100
5A-ST	88	0.38%	440
6A-ST	9	0.04%	54
MULTI-TRAILER TRUCKS			
5A-MT	1	0.00%	5
6A-MT	2	0.01%	12
7A-MT	2	0.01%	14
HEAVY VEHICLE TOTALS	590	2.53%	1738
CLASSIFIED VEHICLES TOTALS	23315 (A)	100.00%	47188 (B)
UNCLASSIFIED VEHICLES TOTALS	1	0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.988

ROADTUBE EQUIVALENT(B/2) = 23594 (C)

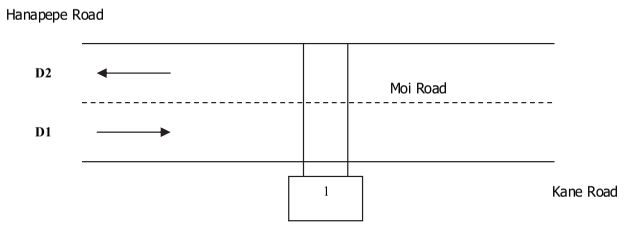
PEAK HOUR VOLUME : 1000 2016/04/26 15:00	PEAK HOUR TRUCK VOLUME	% TOTAL PEAK HOUR VOLUME	24 HOUR TRUCK VOLUME	AADT	% OF AADT	HPMS K-FACTOR (PEAK/AADT) (ITEM 66)
SINGLE UNIT TRUCKS (TYPE 4-7)	29	(65A-1) 2.90%	231	11200	(65A-2) 2.06%	8.93%
COMBINATION (TYPE 8-13)	1	(65B-1) 0.10%	63		(65B-2) 0.56%	8.93%

Traffic Data Service
Traffic Station Sketch

N

Island: Kauai
Area: Hanapepe

Section ID/Station #: B73054300006



Meter #	File Name	GPS
1. v561	D0226003_B73054300006	21.91163, -159.5925
2.	D0226004_B73054300006	

Station Description:
Moi Road: Hanapepe Road to Kane Road

Survey Beginning Date/Time: 2/26/2016 @ 0000		Survey Ending Date/Time: 3/11/2016 @ 2400

Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:	764		

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Moi Road		18		0543	

D1= Direction to End
D2= Direction to Begin

D1: Kane Road / end of road
D2: Hanapepe Road / Kaumualii Highway (Rte 50)

Run Date: 2017/08/08

Hawaii Department of Transportation
Highways Division **Highways Planning Survey Section**
2016 Program Count - Summary

Site ID: B73054300006 **Town:** Kauai **DIR 1:** +MP **DIR 2:**-MP **Final AADT:** 4600
Functional Class: TEST NEW URBAN: MINOR COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 543
Location: Moi Rd - Hanapepe Rd to Kane Rd

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 03/08/2016															
12:00-12:15	5	2	7	06:00-06:15	8	64	72	12:00-12:15	24	36	60	06:00-06:15	51	28	79
12:15-12:30	9	3	12	06:15-06:30	7	55	62	12:15-12:30	20	34	54	06:15-06:30	51	23	74
12:30-12:45	6	4	10	06:30-06:45	10	54	64	12:30-12:45	19	21	40	06:30-06:45	44	35	79
12:45-01:00	3	0	3	06:45-07:00	15	66	81	12:45-01:00	22	35	57	06:45-07:00	46	37	83
01:00-01:15	1	0	1	07:00-07:15	13	47	60	01:00-01:15	27	24	51	07:00-07:15	41	35	76
01:15-01:30	3	2	5	07:15-07:30	16	59	75	01:15-01:30	34	29	63	07:15-07:30	33	20	53
01:30-01:45	2	1	3	07:30-07:45	16	65	81	01:30-01:45	33	30	63	07:30-07:45	28	24	52
01:45-02:00	2	2	4	07:45-08:00	16	50	66	01:45-02:00	44	31	75	07:45-08:00	50	20	70
02:00-02:15	1	2	3	08:00-08:15	21	52	73	02:00-02:15	31	33	64	08:00-08:15	39	25	64
02:15-02:30	1	2	3	08:15-08:30	22	38	60	02:15-02:30	35	31	66	08:15-08:30	31	13	44
02:30-02:45	1	0	1	08:30-08:45	19	50	69	02:30-02:45	44	29	73	08:30-08:45	34	11	45
02:45-03:00	5	1	6	08:45-09:00	17	39	56	02:45-03:00	48	32	80	08:45-09:00	35	21	56
03:00-03:15	1	3	4	09:00-09:15	20	43	63	03:00-03:15	50	25	75	09:00-09:15	38	20	58
03:15-03:30	1	2	3	09:15-09:30	23	41	64	03:15-03:30	47	27	74	09:15-09:30	29	16	45
03:30-03:45	2	5	7	09:30-09:45	28	34	62	03:30-03:45	57	28	85	09:30-09:45	21	13	34
03:45-04:00	1	4	5	09:45-10:00	28	46	74	03:45-04:00	54	38	92	09:45-10:00	41	13	54
04:00-04:15	4	5	9	10:00-10:15	21	31	52	04:00-04:15	64	31	95	10:00-10:15	29	10	39
04:15-04:30	2	9	11	10:15-10:30	30	37	67	04:15-04:30	73	36	109	10:15-10:30	17	13	30
04:30-04:45	0	11	11	10:30-10:45	29	41	70	04:30-04:45	60	42	102	10:30-10:45	20	9	29
04:45-05:00	4	11	15	10:45-11:00	24	41	65	04:45-05:00	57	29	86	10:45-11:00	20	7	27
05:00-05:15	1	19	20	11:00-11:15	20	44	64	05:00-05:15	70	46	116	11:00-11:15	10	8	18
05:15-05:30	4	35	39	11:15-11:30	24	46	70	05:15-05:30	52	38	90	11:15-11:30	9	1	10
05:30-05:45	3	36	39	11:30-11:45	21	31	52	05:30-05:45	64	37	101	11:30-11:45	13	2	15
05:45-06:00	5	53	58	11:45-12:00	21	31	52	05:45-06:00	48	35	83	11:45-12:00	14	3	17

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	60	237	297
AM - K FACTOR (%)			6.11
AM - D (%)	20.20	79.80	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM	06:00 AM to 07:00 AM	
AM - PEAK HR VOLUME	79	239	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:15 PM to 05:15 PM		
PM - PEAK HR VOLUME	260	153	413
PM - K FACTOR (%)			8.50
PM - D (%)	62.95	37.05	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:15 PM to 05:15 PM	05:00 PM to 06:00 PM	
PM - PEAK HR VOLUME	260	156	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	60	237	297
AM - K FACTOR (%)			6.11
AM - D (%)	20.20	79.80	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:15 PM to 05:15 PM		
PM - PEAK HR VOLUME	260	153	413
PM - K FACTOR (%)			8.50
PM - D (%)	62.95	37.05	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	158	125	283
DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM	10:30 AM to 11:30 AM	
PEAK HR VOLUME	158	172	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	469	1,105	1,574
AM 12-HR PERIOD (00:00-12:00)	536	1,317	1,853
PM 6-HR PERIOD (12:00-18:00)	1,077	777	1,854
PM 12-HR PERIOD (12:00-24:00)	1,821	1,184	3,005
24 HOUR PERIOD	2,357	2,501	4,858
D (%)	48.52	51.48	100.00

Run Date: 2017/08/08

Hawaii Department of Transportation
Highways Division **Highways Planning Survey Section**
2016 Program Count - Summary

Site ID: B73054300006 **Town:** Kauai **DIR 1:** +MP **DIR 2:**-MP **Final AADT:** 4600
Functional Class: TEST NEW URBAN: MINOR COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 543
Location: Moi Rd - Hanapepe Rd to Kane Rd

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 03/09/2016															
12:00-12:15	6	0	6	06:00-06:15	10	54	64	12:00-12:15	37	34	71	06:00-06:15	51	40	91
12:15-12:30	6	1	7	06:15-06:30	8	53	61	12:15-12:30	34	34	68	06:15-06:30	41	39	80
12:30-12:45	1	2	3	06:30-06:45	13	66	79	12:30-12:45	36	28	64	06:30-06:45	47	28	75
12:45-01:00	3	1	4	06:45-07:00	12	52	64	12:45-01:00	37	34	71	06:45-07:00	48	21	69
01:00-01:15	6	1	7	07:00-07:15	10	61	71	01:00-01:15	33	40	73	07:00-07:15	44	28	72
01:15-01:30	6	3	9	07:15-07:30	13	64	77	01:15-01:30	31	25	56	07:15-07:30	48	27	75
01:30-01:45	2	2	4	07:30-07:45	10	49	59	01:30-01:45	26	36	62	07:30-07:45	46	23	69
01:45-02:00	2	3	5	07:45-08:00	10	37	47	01:45-02:00	35	26	61	07:45-08:00	39	31	70
02:00-02:15	1	2	3	08:00-08:15	15	40	55	02:00-02:15	34	23	57	08:00-08:15	42	27	69
02:15-02:30	3	1	4	08:15-08:30	24	36	60	02:15-02:30	31	30	61	08:15-08:30	46	21	67
02:30-02:45	2	1	3	08:30-08:45	21	52	73	02:30-02:45	42	38	80	08:30-08:45	35	15	50
02:45-03:00	0	1	1	08:45-09:00	16	28	44	02:45-03:00	32	33	65	08:45-09:00	25	19	44
03:00-03:15	3	3	6	09:00-09:15	16	36	52	03:00-03:15	49	30	79	09:00-09:15	30	13	43
03:15-03:30	3	4	7	09:15-09:30	29	35	64	03:15-03:30	51	21	72	09:15-09:30	17	12	29
03:30-03:45	1	9	10	09:30-09:45	21	37	58	03:30-03:45	47	37	84	09:30-09:45	27	12	39
03:45-04:00	2	5	7	09:45-10:00	22	41	63	03:45-04:00	58	23	81	09:45-10:00	36	5	41
04:00-04:15	1	4	5	10:00-10:15	19	30	49	04:00-04:15	63	25	88	10:00-10:15	21	10	31
04:15-04:30	1	5	6	10:15-10:30	35	25	60	04:15-04:30	56	30	86	10:15-10:30	23	14	37
04:30-04:45	1	9	10	10:30-10:45	26	34	60	04:30-04:45	80	38	118	10:30-10:45	21	4	25
04:45-05:00	1	10	11	10:45-11:00	23	30	53	04:45-05:00	63	46	109	10:45-11:00	15	9	24
05:00-05:15	2	18	20	11:00-11:15	41	24	65	05:00-05:15	61	42	103	11:00-11:15	27	7	34
05:15-05:30	5	29	34	11:15-11:30	24	44	68	05:15-05:30	56	31	87	11:15-11:30	11	4	15
05:30-05:45	8	49	57	11:30-11:45	35	42	77	05:30-05:45	56	25	81	11:30-11:45	13	4	17
05:45-06:00	4	54	58	11:45-12:00	26	28	54	05:45-06:00	47	41	88	11:45-12:00	10	5	15

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:30 AM to 07:30 AM		
AM - PEAK HR VOLUME	48	243	291
AM - K FACTOR (%)			6.05
AM - D (%)	16.49	83.51	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM	06:30 AM to 07:30 AM	
AM - PEAK HR VOLUME	76	243	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:30 PM to 05:30 PM		
PM - PEAK HR VOLUME	260	157	417
PM - K FACTOR (%)			8.67
PM - D (%)	62.35	37.65	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM	04:30 PM to 05:30 PM	
PM - PEAK HR VOLUME	262	157	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:30 AM to 07:30 AM		
AM - PEAK HR VOLUME	48	243	291
AM - K FACTOR (%)			6.05
AM - D (%)	16.49	83.51	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:30 PM to 05:30 PM		
PM - PEAK HR VOLUME	260	157	417
PM - K FACTOR (%)			8.67
PM - D (%)	62.35	37.65	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	12:15 PM to 01:15 PM		
PEAK HR VOLUME	140	136	276
DIRECTIONAL PEAK			
PEAK HR TIME	12:00 PM to 01:00 PM	09:00 AM to 10:00 AM	
PEAK HR VOLUME	144	149	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	479	998	1,477
AM 12-HR PERIOD (00:00-12:00)	549	1,215	1,764
PM 6-HR PERIOD (12:00-18:00)	1,095	770	1,865
PM 12-HR PERIOD (12:00-24:00)	1,858	1,188	3,046
24 HOUR PERIOD	2,407	2,403	4,810
D (%)	50.04	49.96	100.00

Run Date: 2017/08/08

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2016

Site ID: B73054300006 **Route No:** 543 **Date From:** 2016/02/26 0:00
Town: Kauai **Direction:** +MP **Date To:** 2016/03/10 23:45
Location: Moi Rd - Hanapepe Rd to Kane Rd

Functional Classification: 18 TEST NEW URBAN: MINOR COLLECTOR
REPORT TOTALS - 336 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	445	0.82%	890
PC	33477	61.66%	66954
2A-4T	19864	36.59%	39728
LIGHT VEHICLE TOTALS	53786	99.07%	107572
HEAVY VEHICLES			
Bus	71	0.13%	178
SINGLE UNIT TRUCK			
2A-6T	306	0.56%	612
3A-SU	40	0.07%	120
4A-SU	4	0.01%	16
SINGLE-TRAILER TRUCKS			
4A-ST	53	0.10%	212
5A-ST	18	0.03%	90
6A-ST	0	0.00%	0
MULTI-TRAILER TRUCKS			
5A-MT	0	0.00%	0
6A-MT	11	0.02%	66
7A-MT	0	0.00%	0
HEAVY VEHICLE TOTALS	503	0.93%	1294
CLASSIFIED VEHICLES TOTALS	54289 (A)	100.00%	108866 (B)
UNCLASSIFIED VEHICLES TOTALS	1	0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.997

ROADTUBE EQUIVALENT(B/2) = 54433 (C)

PEAK HOUR VOLUME : 401 2016/03/09 16:00	PEAK HOUR TRUCK VOLUME	% TOTAL PEAK HOUR VOLUME	24 HOUR TRUCK VOLUME	AADT	% OF AADT	HPMS K-FACTOR (PEAK/AADT) (ITEM 66)
SINGLE UNIT TRUCKS (TYPE 4-7)	3	(65A-1) 0.75%	30	4600	(65A-2) 0.65%	8.72%
COMBINATION (TYPE 8-13)	0	(65B-1) 0.00%	5		(65B-2) 0.11%	8.72%

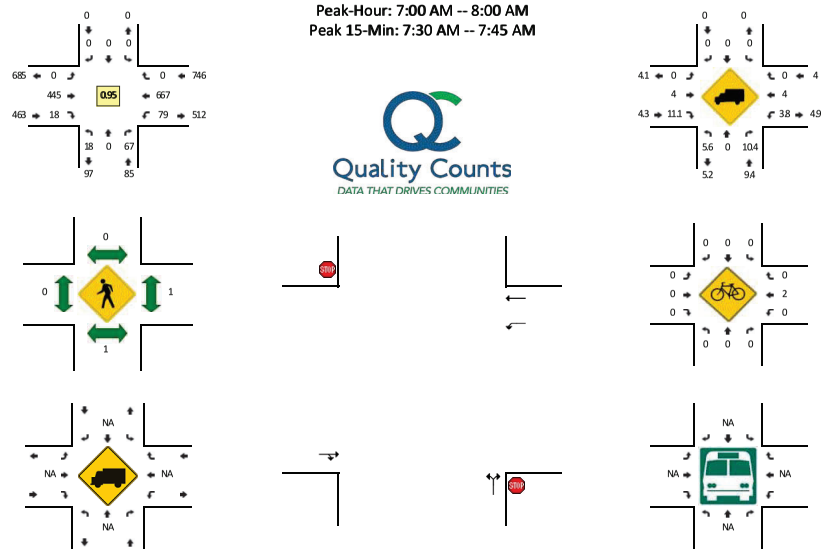
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Lele Rd -- Kaumualii Hwy
CITY/STATE: Kauai, HI

QC JOB #: 14959101
DATE: Tue, May 14 2019

Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:30 AM -- 7:45 AM



Quality Counts
DATA THAT DRIVES COMMUNITIES

15-Min Count Period Beginning At	Lele Rd (Northbound)				Lele Rd (Southbound)				Kaumualii Hwy (Eastbound)				Kaumualii Hwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	7	0	0	0	0	0	0	112	0	0	10	68	0	0	197	
6:15 AM	0	0	15	0	0	0	0	0	0	115	3	0	2	108	0	0	243	
6:30 AM	9	0	11	0	0	0	0	0	0	79	1	0	11	158	0	0	269	
6:45 AM	5	0	12	0	0	0	0	0	0	88	2	0	10	166	0	0	283	992
7:00 AM	1	0	12	0	0	0	0	0	0	86	3	0	16	195	0	0	313	1108
7:15 AM	5	0	21	0	0	0	0	0	0	116	5	0	17	173	0	0	337	1202
7:30 AM	5	0	17	0	0	0	0	0	0	125	6	0	18	171	0	0	342	1275
7:45 AM	7	0	17	0	0	0	0	0	0	118	4	0	28	128	0	0	302	1294
8:00 AM	7	0	24	0	0	0	0	0	0	96	4	0	21	109	0	0	261	1242
8:15 AM	2	0	15	0	0	0	0	0	0	101	3	0	18	90	0	0	229	1134
8:30 AM	4	0	25	0	0	0	0	0	0	113	8	0	22	90	0	0	262	1054
8:45 AM	4	0	32	0	0	0	0	0	0	77	6	0	17	95	0	0	231	983

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	20	0	68	0	0	0	0	0	0	500	24	0	72	684	0	0	1368
Heavy Trucks	4	0	8		0	0	0		0	20	8		0	36	0		76
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	2	0		2
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/24/2019 2:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

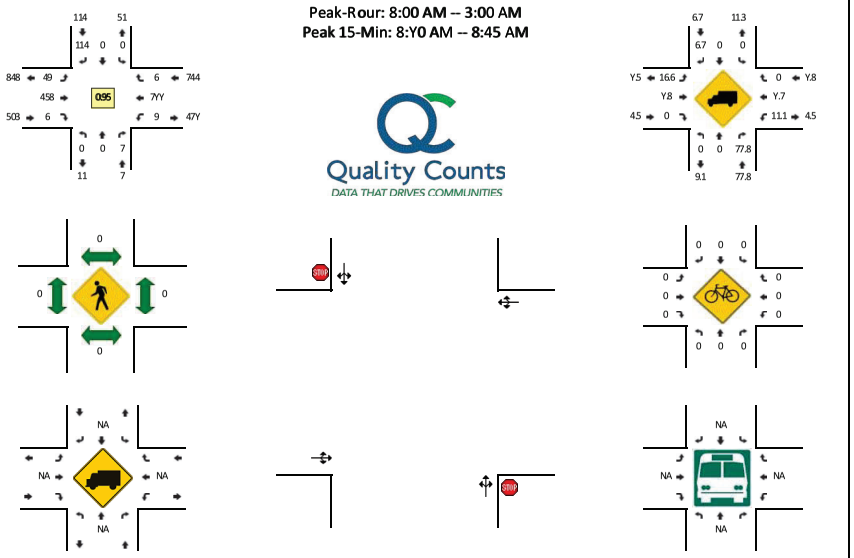
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Ranapepe Kd -- Haumualii Rwy
CIT/S, TATE: Hauai2RI

QC JOB #: 1495910Y
DATE: Tue2May 14 6019

Peak-Rour: 8:00 AM -- 3:00 AM
Peak 15-Min: 8:Y0 AM -- 8:45 AM



15-Min Count Period Beginning At	Ranapepe Kd (Northbound)				Ranapepe Kd (, outhbound)				Haumualii Rwy (Eastbound)				Haumualii Rwy (Westbound)				Total	Rourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
7:00 AM	0	0	0	0	0	0	6	0	4	50	0	0	0	64	1	0	31	
7:15 AM	0	0	1	0	0	0	10	0	5	164	0	0	Y	100	0	0	64Y	
7:Y0 AM	0	0	0	0	0	0	69	0	Y	33	0	0	0	1Y3	0	0	653	
7:45 AM	0	0	0	0	0	0	60	0	3	9Y	1	0	0	158	0	0	689	371
8:00 AM	0	0	Y	0	0	0	Y9	0	17	88	0	0	1	186	6	0	Y10	1090
8:15 AM	0	0	1	0	0	0	68	0	11	163	1	0	6	175	0	0	YY5	1136
8:Y0 AM	0	0	1	0	0	0	68	0	16	169	1	0	6	174	0	0	YY7	1670
8:45 AM	0	0	1	0	0	0	61	0	10	16Y	0	0	4	1Y6	0	0	691	1686
3:00 AM	0	0	0	0	0	0	60	0	17	104	1	0	4	111	0	0	657	1613
3:15 AM	1	0	1	0	0	1	16	0	11	10Y	1	0	0	98	1	0	663	1111
3:Y0 AM	0	1	1	0	0	0	16	0	17	113	0	0	Y	99	1	0	651	1067
3:45 AM	6	0	0	0	0	1	10	0	11	98	1	0	1	106	0	0	665	970

Peak 15-Min Flowrates	Northbound				, outhbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	0	0	4	0	0	0	103	0	43	517	4	0	3	757	0	0	1Y44
Reavy Trucks	0	0	4		0	0	4		3	17	0		4	64	0		70
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Kailroad																	
, topped Buses																	

Comments:

Keport generated on 5S64S6019 6:14 PM

, OUKCE: Quality Counts2LLC (http:SSwww.qualitycounts.net) 1-388-530-6616

Page 1 of 1

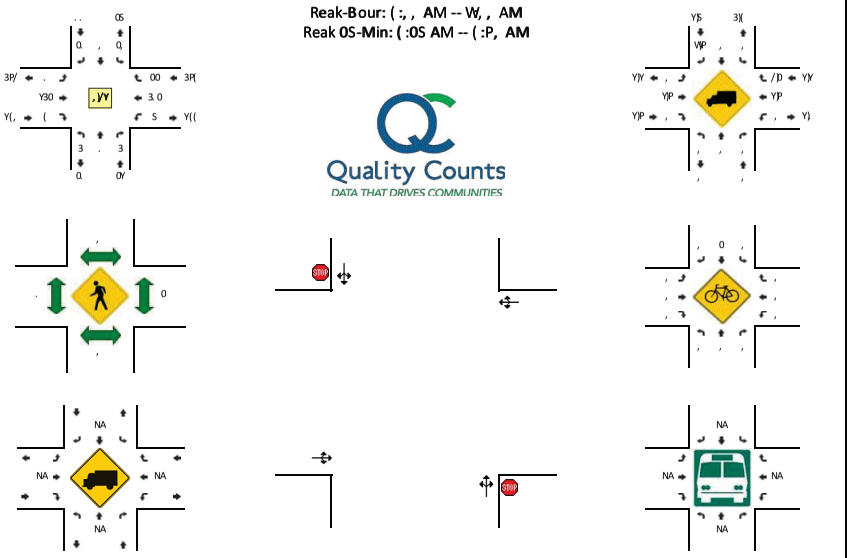
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Ruolo Kd Hw estQ - J aumualii B# y
CIT268TATE: J auai7B I

1 C 409 5: 0Y/ S/0, S
DATE: Tue7May 0Y . , 0/

Reak-Bour: (:, , AM -- W, , AM
Reak 0S-Min: (:0S AM -- (:P, AM



0S-Min Count Period 9eginning At	Ruolo Kd Hv estQ HNorthboundQ				Ruolo Kd Hv estQ H8outhboundQ				J aumualii B# y HEastboundQ				J aumualii B# y Hw estboundQ				Total	Bourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
3:, , AM	,	,	0	,	,	,	,	,	,	Y/	.	,	0	. .	,	,	(S	
3:0S AM	.	,	,	,	0	,	.	,	,	0. .	,	,	0	0, 0	.	,	. P0	
3:P, AM	0	0	.	,	,	0	3	,	0	/,	,	,	.	0PY	0	,	. P/	
3:YS AM	0	0	0	,	.	,	.	,	0	W8	0	,	,	0S.	0	,	. Y(	(/.
(:, , AM	.	0	,	,	P	,	0	,	0	W	0	,	0	0(0	.	,	. 3P	/ W
(:0S AM	P	,	0	,	.	,	Y	,	0	0. 3	.	,	P	0S(	S	,	P, Y	0, SP
(:P, AM	0	,	Y	,	.	,	3	,	,	0. 3	0	,	0	0S/	.	,	P, .	0003
(:YS AM	,	0	0	,	P	,	0	,	,	0. /	P	,	.	0PY	.	,	. (Y	00YP
W, , AM	0	,	0	,	,	,	0	,	0	/(	0	,	0	000	P	,	. 0(	0, /(
W0S AM	,	,	,	,	,	0	,	,	,	0, (	0	,	.	/.	.	,	. , S	//W
WP, AM	0	,	,	,	,	,	P	,	0	00W	Y	,	,	/P	,	,	. . ,	/03
WYS AM	0	,	P	,	,	,	P	,	0	/0	P	,	,	/3	,	,	0/W	W,

Reak 0S-Min Flo# rates	Northbound				8outhbound				Eastbound				w estbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	0.	,	Y	,	W	,	03	,	Y	S, Y	W	,	0.	3. W	. ,	,	0. 03
Beavy Trucks	,	,	,		,	,	,		,	0.	,		,	. W	,		Y,
Redestrians		,				,				,				,			,
9icycles	,	,	,		,	0	,		,	,	,		,	,	,		0
Kailroad																	
8topped 9uses																	

Comments:

Keport generated on S6. Y6. , 0/ . :0Y RM

8OUKCE: 1 uality Counts7LLC Hhttp:66# # #)qualitycounts)netQ0-W(-SW -. . 0.

Page 1 of 1

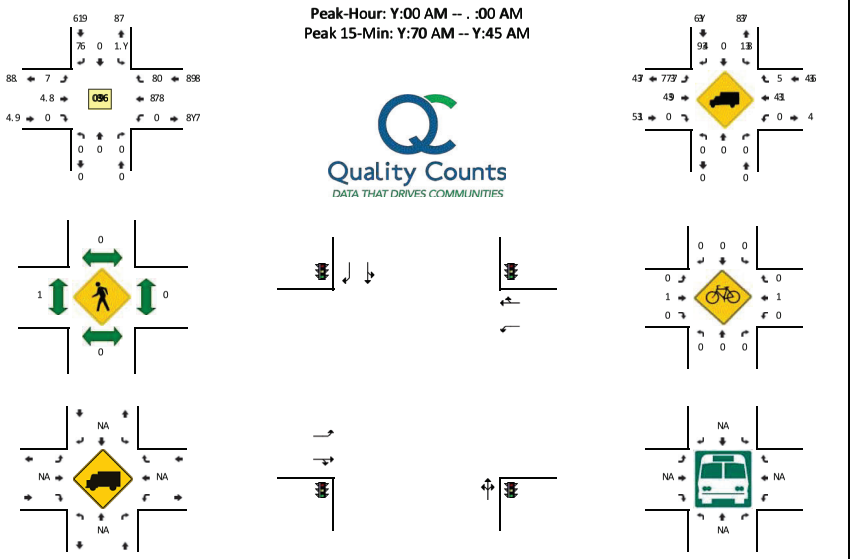
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Kaumualii Hwy
CIT/S, TATE: Kauai2HI

QC JOB #: 1495910Y
DATE: Tue2May 14 6019

Peak-Hour: Y:00 AM -- . :00 AM
Peak 15-Min: Y:70 AM -- Y:45 AM



15-Min Count Period Beginning At	Moi Rd (Northbound)				Moi Rd (, outhbound)				Kaumualii Hwy (Eastbound)				Kaumualii Hwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
8:00 AM	0	0	0	0	50	0	Y	0	6	118	0	0	0	87	7	0	641	
8:15 AM	0	0	0	0	51	0	.	0	0	164	0	0	0	107	5	0	691	
8:70 AM	0	0	0	0	5.	0	5	0	6	99	0	0	0	174	8	0	704	
8:45 AM	0	0	0	0	4Y	0	6	0	1	. Y	0	0	0	15Y	.	0	706	117.
Y:00 AM	0	0	0	0	55	0	.	0	1	. .	0	0	0	1Y1	Y	0	770	166Y
Y:15 AM	0	0	0	0	45	0	16	0	1	167	0	0	0	181	17	0	755	1691
Y:70 AM	0	0	0	0	81	0	5	0	1	17Y	0	0	0	187	18	0	7. 7	17Y0
Y:45 AM	0	0	0	0	68	0	Y	0	0	17.	0	0	0	141	64	0	778	1404
. :00 AM	1	0	0	0	40	0	1	0	0	106	0	0	1	160	15	0	6. 0	1754
. :15 AM	1	0	0	0	69	0	4	0	0	10Y	0	0	0	91	17	0	645	1644
. :70 AM	0	0	0	0	76	0	8	0	0	160	0	0	1	9Y	1.	0	6Y4	1175
. :45 AM	0	0	1	0	65	0	5	0	0	98	0	0	0	9Y	11	0	675	1074

Peak 15-Min Flowrates	Northbound				, outhbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	644	0	60	0	4	54.	0	0	0	856	84	0	1576
Heavy Trucks	0	0	0		0	0	4		0	64	0		0	76	4		84
Pedestrians		0				0				4				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
, topped Buses																	

Comments:

Report generated on 5S64S6019 6:14 PM

, OURCE: Quality Counts2LLC (http:SSwww3quality counts3net) 1-. YY-5. 0-6616

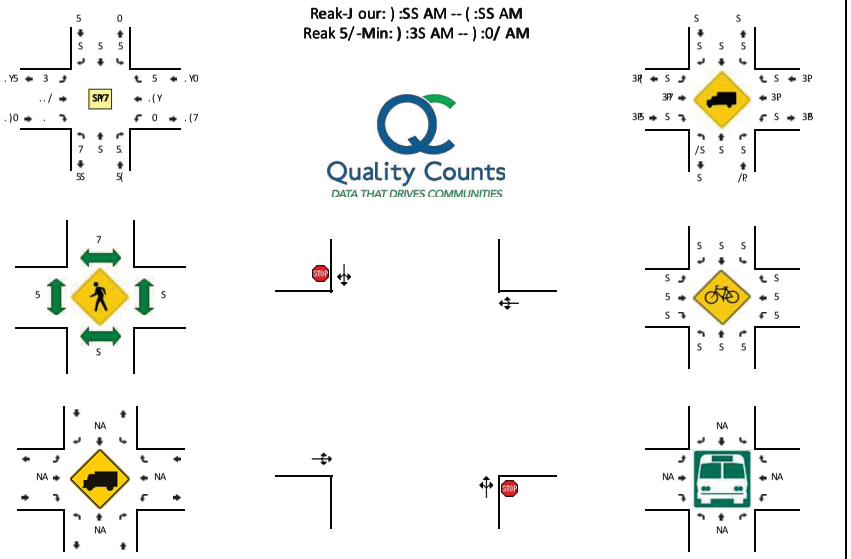
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Ruolo Kd HMiddlew-- Qaumualii J B y
CIT, 26TATE: Qauai8J I

 # C 1O4 9: 50Y/Y5SY
DATE: Tue8May 50 7S5Y

Reak-J our:) :SS AM -- (:SS AM
Reak 5/-Min:) :3S AM --) :0/ AM



5/-Min Count Reriod 4eginning At	Ruolo Kd HMiddlew HNorthboundw				Ruolo Kd HMiddlew H6outhboundw				Qaumualii J B y HEastboundw				Qaumualii J B y HWestboundw				Total	J ourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
. :SS AM	5	S	0	S	S	S	S	S	S	5.)	5	S	S	. /	S	S	73(	
. :5/ AM	S	S	7	S	S	S	S	S	S	5) 0	S	S	7	5SY	S	S	7( )	
. :3S AM	S	S	7	S	S	S	S	S	S	5/3	0	S	7	500	5	S	3S.	
. :0/ AM	S	S	0	S	S	S	S	S	5	537	7	S	3	5.)	S	S	3SY	550S
) :SS AM	S	S	7	S	S	S	S	S	S	505	7	S	5	5))	S	S	373	577/
) :5/ AM	S	S	)	S	S	S	S	S	5	5. (	5	S	7	5(S	5	S	3. S	57Y(
) :3S AM	5	S	/	S	S	S	S	S	5	5Y.	S	S	5	5)/	S	S	3) (	53) S
) :0/ AM	5	S	7	S	S	S	S	S	5	5.)	3	S	5	5/)	S	S	37.	53( )
(:SS AM	5	S	0	S	S	S	S	S	S	53(	0	S	7	505	5	S	7YS	53/ 0
(:5/ AM	S	S	/	S	S	S	S	S	S	53)	5	S	57	55S	S	S	7. /	57/ Y
(:3S AM	5	S	0	S	S	S	S	S	S	5/S	3	S	.	55)	S	S	7(5	55. 7
(:0/ AM	7	S	.	S	S	S	S	S	S	575	5	S	7	55/	S	S	73)	5S) 3

Reak 5/-Min FloB rates	Northbound				6outhbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	0	S	7S	S	S	S	S	S	0	) (0	S	S	S	) SS	S	S	5/ 57
J eavy Trucks	S	S	S		S	S	S		S	5.	S		S	70	S		0S
Redestrians		S				0				S				S			0
4icycles	S	S	5		S	S	S		S	S	S		S	S	S		5
Kailroad																	
6topped 4uses																	

Comments:

Keport generated on / 27027S5Y 7:50 RM

6OUKCE: # uality Counts8LLC Hhttp:22B B B RqualitycountsRhetw5-( )) -/ (S-7757

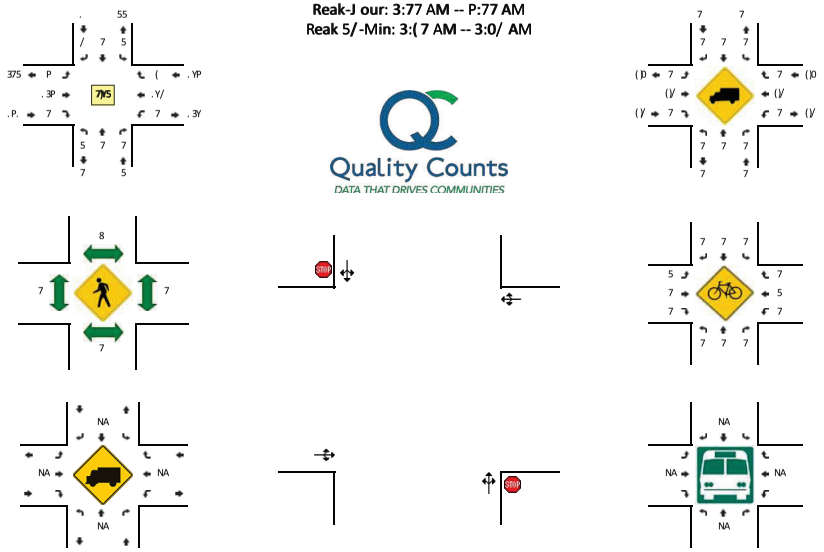
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Ruolo Kd HEastw-- Qaumualii J B y
CITS, 2TATE: Qauai6J I

 # C 1O4 9: 50Y/Y555
DATE: Tue6May 50 875Y

Reak-J our: 3:77 AM -- P:77 AM
Reak 5/-Min: 3:(7 AM -- 3:0/ AM



5/-Min Count Period 4eginning At	Ruolo Kd HEastw HNorthboundw				Ruolo Kd HEastw H2outhboundw				Qaumualii J B y HEastboundw				Qaumualii J B y HWestboundw				Total	J ourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
. :77 AM	7	7	7	7	5	7	7	7	7	5. 3	7	7	7	. /	7	7	8((	
. :5/ AM	7	7	7	7	8	7	8	7	7	53Y	7	7	7	558	7	7	8Y/	
. :(7 AM	7	7	7	7	8	7	5	7	7	5/ /	7	7	7	50.	5	7	(7/	
. :0/ AM	5	7	7	7	7	7	7	7	8	5(5	7	7	5	5. Y	8	7	(7.	55(Y
3:77 AM	7	7	7	7	7	7	5	7	7	50P	7	7	7	53P	5	7	(8P	58(0
3:5/ AM	5	7	7	7	7	7	8	7	(	5. 3	7	7	7	53P	7	7	(/5	58Y7
3:(7 AM	7	7	7	7	7	7	7	7	(	877	7	7	7	5P5	7	7	(P0	5(. Y
3:0/ AM	7	7	7	7	5	7	8	7	8	5. (	7	7	7	5/P	8	7	(8P	5(Y5
P:77 AM	7	7	7	7	8	7	5	7	8	5(P	7	7	7	505	7	7	8P0	5(03
P:5/ AM	7	7	7	7	5	7	7	7	5	507	7	7	7	585	7	7	8. (	58/ Y
P:(7 AM	7	7	7	7	8	7	5	7	7	5/0	7	7	7	55Y	8	7	83P	55/ (
P:0/ AM	7	7	7	7	7	7	7	7	0	58/	7	7	7	557	7	7	8(Y	57. 0

Reak 5/-Min FloB rates	Northbound				2outhbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	7	7	7	7	7	7	7	7	58	P77	7	7	7	380	7	7	5/ (.
J eavy Trucks	7	7	7		7	7	7		7	87	7		7	8P	7		0P
Redestrians		7				7				7				7			7
4icycles	7	7	7		7	7	7		5	7	7		7	7	7		5
Kailroad																	
2topped 4uses																	

Comments:

Keport generated on /, 80, 875Y 8:50 RM

2OUKCE: # uality Counts6LLC Hhttp:, , B B B)qualitycounts)netw5-P33-/P7-8858

Page 1 of 1

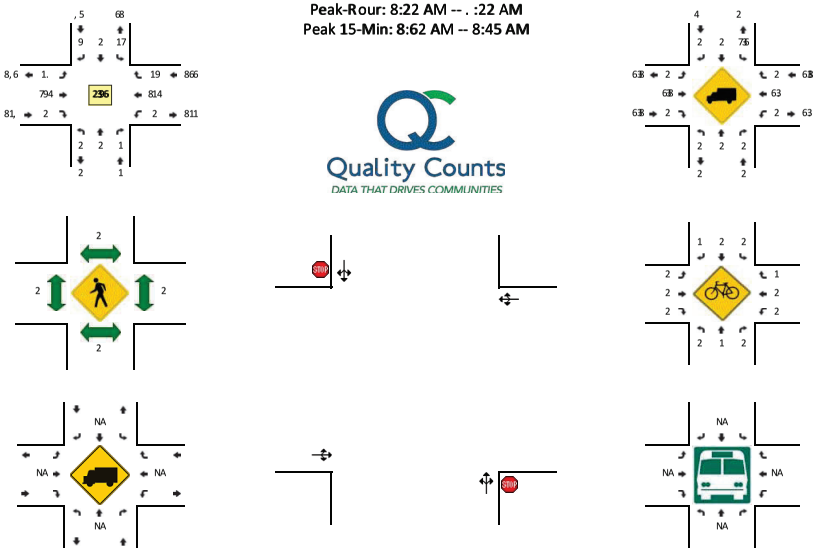
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Rana Kd -- Haumualii R wy
CITOY/TATE: HauaiSR I

QC JOB #: 14959115
DATE: TueSMay 14 , 219

Peak-Rour: 8:22 AM -- . :22 AM
Peak 15-Min: 8:62 AM -- 8:45 AM



15-Min Count Period Beginning At	Rana Kd (Northbound)				Rana Kd (/outhbound)				Haumualii R wy (Eastbound)				Haumualii R wy (Westbound)				Total	R ourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
7:22 AM	2	2	1	2	1	2	1	2	6	179	2	2	1	82	5	2	, 51	
7:15 AM	1	2	2	2	6	2	1	2	1	1. .	2	1	2	111	6	2	629	
7:62 AM	2	2	2	2	4	2	2	2	1	17,	2	,	2	15,	,	2	6, 6	
7:45 AM	2	2	1	2	,	2	4	2	,	14,	2	2	2	179	2	2	6, 2	1, 26
8:22 AM	2	2	2	2	7	2	6	2	5	147	2	2	2	189	6	2	64,	1, 94
8:15 AM	2	2	1	2	4	2	1	2	5	177	2	2	2	195	4	2	687	1671
8:62 AM	2	2	2	2	6	2	6	2	5	, 25	2	2	2	184	8	2	698	1465
8:45 AM	2	2	2	2	6	2	,	2	6	188	2	2	2	177	5	2	657	1481
. :22 AM	,	2	2	2	6	2	,	2	1	146	2	2	2	14.	5	2	624	1466
. :15 AM	2	2	2	2	6	2	1	2	6	147	2	2	2	1, 2	6	2	, 87	1666
. :62 AM	6	2	2	2	,	2	2	2	6	15,	2	2	2	161	6	2	, 94	1, 62
. :45 AM	2	2	2	2	1	2	,	2	,	1, 7	2	1	1	129	,	2	, 44	111.

Peak 15-Min Flowrates	Northbound				/outhbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	2	2	2	2	1,	2	1,	2	, 2	. , 2	2	2	2	797	, .	2	15. .
Reavy Trucks	2	2	2		2	2	2		2	, 4	2		2	6,	2		57
Pedestrians		2				2				2				2			2
Bicycles	2	2	2		2	2	2		2	2	2		2	2	2		2
Kailroad																	
/topped Buses																	

Comments:

Keport generated on 5Y, 4Y, 219 , :14 PM

/OUKCE: Quality CountsSLLC (http:YWwww3qualitycounts3net) 1-. 88-5. 2-, , 1,

Page 1 of 1

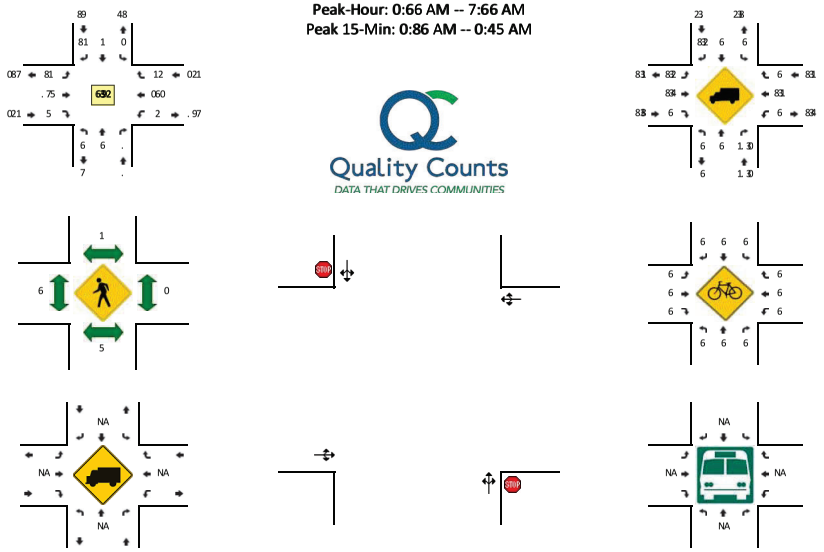
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Rona Kd -- Raumualii Hwy
CITY/STATE: Rauai, HI

QC JOB #: 14959110
DATE: Tue, May 14 2619

Peak-Hour: 0:66 AM -- 7:66 AM
Peak 15-Min: 0:86 AM -- 0:45 AM



15-Min Count Period Beginning At	Rona Kd (Northbound)				Rona Kd (Southbound)				Raumualii Hwy (Eastbound)				Raumualii Hwy (Westbound)				Total	Hourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
. :66 AM	1	6	4	6	8	6	6	6	1	1. 4	8	6	1	0.	1	6	254	
. :15 AM	1	6	8	6	1	6	8	6	4	178	0	6	6	169	8	6	814	
. :86 AM	6	6	5	6	2	6	8	6	1	1. 7	6	6	1	152	5	6	880	
. :45 AM	2	6	1	6	8	6	5	6	8	146	2	6	4	1. 4	4	6	827	1288
0:66 AM	6	6	2	6	1	1	9	6	2	149	1	6	6	104	8	6	842	1821
0:15 AM	6	6	6	6	1	6	7	6	16	1. 2	6	6	6	194	5	6	876	1870
0:86 AM	6	6	6	6	4	6	9	6	16	268	1	6	1	108	1	6	462	1452
0:45 AM	6	6	4	6	1	6	5	6	9	101	8	6	1	1. .	8	6	8. 8	1470
7:66 AM	6	6	1	6	8	6	9	6	7	180	2	6	6	148	9	6	812	1450
7:15 AM	6	6	6	6	5	6	0	6	5	141	4	6	7	110	8	6	296	18. 0
7:86 AM	6	6	8	6	2	6	7	6	7	146	4	6	4	124	4	6	290	12. 2
7:45 AM	1	6	2	6	0	1	.	6	7	121	8	6	2	160	1	6	259	1157

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	6	6	6	6	1.	6	8.	6	46	712	4	6	4	. 92	4	6	1. 67
Heavy Trucks	6	6	6		6	6	6		6	26	6		6	24	6		44
Pedestrians		12				6				6				1.			27
Bicycles	6	6	6		6	6	6		6	6	6		6	6	6		6
Kailroad																	
Stopped Buses																	

Comments:

Keport generated on 5/24/2619 2:14 PM

SOUKCE: Quality Counts, LLC (http://www3qualitycounts3net) 1-700-576-2212

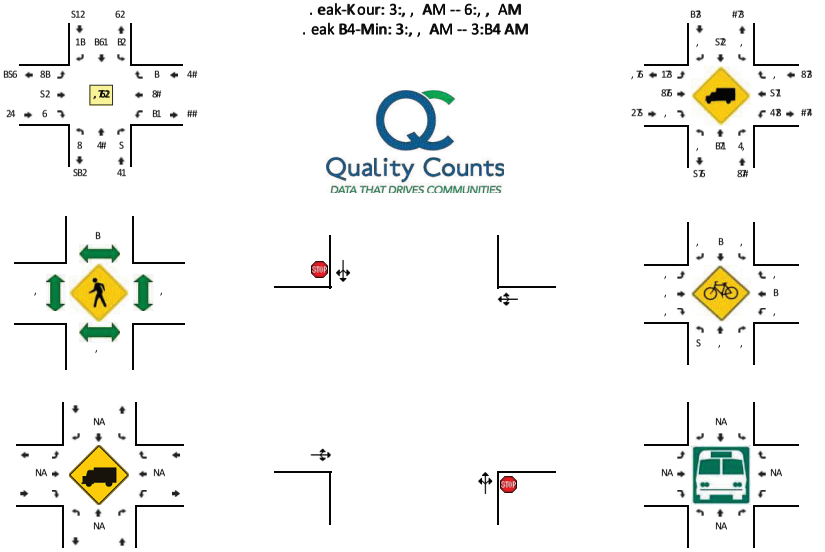
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Kanapepe Rd
CIT950TATE: Yauai/K I

HC v0QJ : B#141BB1
DATE: Tue/May B# S, B1

. eak-Kour: 3:, , AM -- 6:, , AM
. eak B4-Min: 3:, , AM -- 3:B4 AM



B4-Min Count . eriod Qeginning At	Moi Rd (Northbound)				Moi Rd (Southbound)				Kanapepe Rd (Eastbound)				Kanapepe Rd (Westbound)				Total	Kourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:, , AM	,	#	B	,	8	41	1	,	#	8	,	,	,	4	S	,	1,	
2:B4 AM	,	2	,	,	#	4,	B8	,	#	8	,	,	#	4	B	,	1,	
2:8, AM	,	1	B	,	S	44	S3	,	3	S	,	,	S	#	B	,	BB,	
2:#4 AM	S	2	B	,	B8	#,	S4	,	2	S	,	,	#	8	S	,	B, #	81#
3:, , AM	,	3	,	,	3	44	8S	,	1	B,	S	,	4	BB	,	,	B86	##S
3:B4 AM	,	BS	,	,	4	#3	B1	,	4	1	B	,	4	BB	,	,	BB#	#22
3:8, AM	S	B4	B	,	8	44	S5	,	6	8	8	,	4	2	,	,	BS8	#31
3:#4 AM	B	S,	B	,	B	8S	B6	,	1	#	S	,	#	2	B	,	11	#3#
6:, , AM	,	BB	S	,	#	S3	B4	,	B,	3	4	,	4	3	,	,	18	#51
6:B4 AM	,	B,	S	,	8	8S	1	B	B,	3	B	,	S	2	B	,	6#	811
6:8, AM	B	B4	,	,	3	8#	3	,	BS	3	B	,	S	6	S	,	12	83S
6:#4 AM	,	B,	B	,	8	S6	8	,	3	2	,	,	S	3	B	,	26	8#B

. eak B4-Min VioF rates	Northbound				0outhbound				Eastbound				) estbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	,	S6	,	,	S6	SS,	BS6	,	82	#,	6	,	S,	##	,	,	44S
Keavy Trucks	,	,	,		,	6	,		6	#	,		#	,	,		S#
. edestrians		,				#				,				,			#
Qicycles	,	,	,		,	,	,		,	,	,		,	,	,		,
Railroad																	
Otopped Quses																	

Comments:

Report generated on 45S#5S, B1 S:B# . M

0OURCE: Huality Counts/ LLC Fhttp:55F F F 7qualitycounts7net(B-633-46, -SSBS

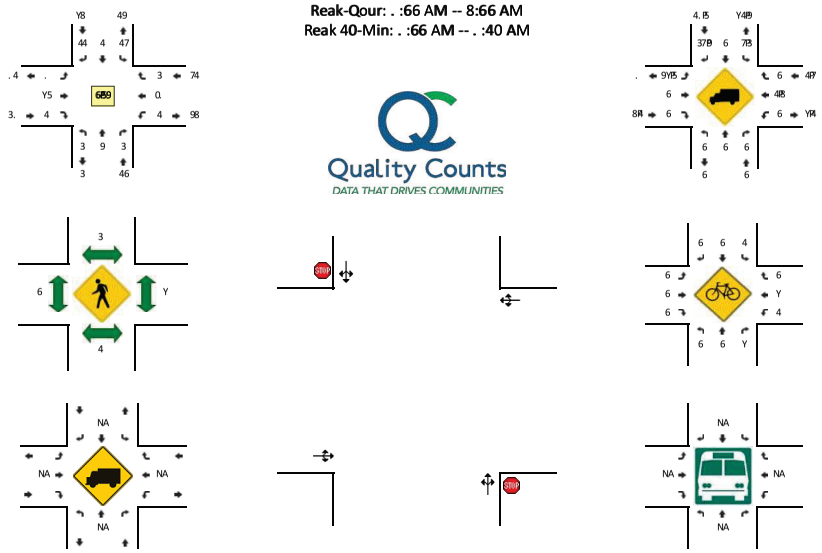
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Ruolo KdHAwawa Kd -- Qanapepe Kd
CIT/HSTATE: , auai2QJ

J CBO# 1: 495054Y4
DATE: Tue2May 49 Y645

Reak-Qour: . :66 AM -- 8:66 AM
Reak 40-Min: . :66 AM -- . :40 AM



40-Min Count Period #eginning At	Ruolo KdHAwawa Kd (Northbound)				Ruolo KdHAwawa Kd (Southbound)				Qanapepe Kd (Eastbound)				Qanapepe Kd (Westbound)				Total	Qourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
7:66 AM	4	6	6	6	6	4	Y	6	4	Y	6	6	6	7	6	6	43	
7:40 AM	6	6	6	6	7	4	9	6	4	Y	6	6	6	7	Y	6	YY	
7:36 AM	6	6	4	6	3	6	3	6	3	9	6	6	4	0	Y	6	YY	
7:90 AM	4	4	4	6	3	6	0	6	3	8	6	6	6	Y	4	6	Y0	8Y
. :66 AM	6	6	4	6	9	4	7	6	Y	46	6	6	6	4Y	6	6	37	460
. :40 AM	Y	4	6	6	9	6	Y	6	3	5	6	6	6	4Y	4	6	39	44.
. :36 AM	6	3	6	6	3	6	3	6	Y	0	6	6	4	47	4	6	39	4Y5
. :90 AM	4	6	Y	6	0	6	6	6	6	0	4	6	6	4.	4	6	3Y	437
8:66 AM	6	6	4	6	3	4	0	6	4	5	6	6	Y	46	Y	6	39	439
8:40 AM	6	4	Y	6	Y	6	Y	6	0	0	4	6	6	0	4	6	Y9	4Y9
8:36 AM	6	6	Y	6	9	3	3	6	0	7	4	6	4	44	3	6	35	4Y5
8:90 AM	6	Y	4	6	4	6	7	6	Y	5	6	6	4	5	6	6	34	4Y8

Reak 40-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	6	6	9	6	47	9	Y9	6	8	96	6	6	6	98	6	6	499
Qeavy Trucks	6	6	6		6	6	4Y		8	6	6		6	6	6		Y6
Redestrians		6				4Y				6				9			47
#icycles	6	6	6		6	6	6		6	6	6		6	4	6		4
Kailroad Stopped #uses																	

Comments:

Keport generated on 0HY9HY645 Y:49 RM

SOUKCE: J uality Counts2LLC (http:HHwwwRqualitycountsRnet) 4-8. . -086-YY4Y

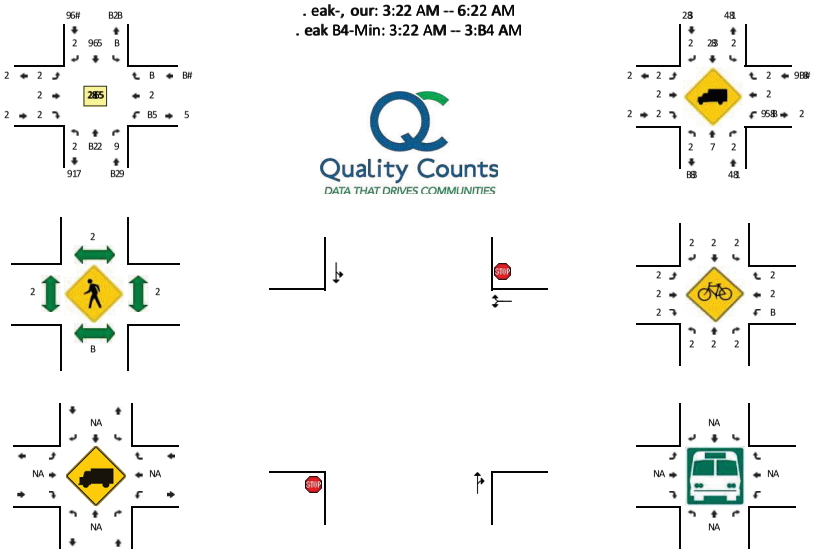
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Kane Rd
CITOY/TATE: KauaiS, I

HC vOQJ : B#141B95
DATE: TueSMay B# 92B1

. eak-, our: 3:22 AM -- 6:22 AM
. eak B4-Min: 3:22 AM -- 3:B4 AM



B4-Min Count . eriod Qeginning At	Moi Rd RNorthbound(				Moi Rd R/outhbound(				Kane Rd REastbound(				Kane Rd R) estbound(				Total	. ourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:22 AM	2	B2	B	2	2	76	2	2	2	2	2	2	9	2	2	2	6B	
7:B4 AM	2	3	B	2	B	77	2	2	2	2	2	2	#	2	2	2	31	
7:52 AM	2	9B	2	2	2	34	2	2	2	2	2	2	7	2	2	2	B29	
7:#4 AM	2	B#	9	2	2	37	2	2	2	2	2	2	9	2	2	2	1#	547
3:22 AM	2	99	9	2	B	1B	2	2	2	2	2	2	5	2	B	2	B92	514
3:B4 AM	2	B3	2	2	2	75	2	2	2	2	2	2	#	2	2	2	6#	#22
3:52 AM	2	91	2	2	2	69	2	2	2	2	2	2	5	2	2	2	BB#	#B9
3:#4 AM	2	59	2	2	2	#3	2	2	2	2	2	2	5	2	2	2	69	#22
6:22 AM	2	99	3	2	2	#9	2	2	2	2	2	2	#	2	2	2	34	544
6:B4 AM	2	9#	B	2	B	#9	2	2	2	2	2	2	#	2	2	2	39	5#5
6:52 AM	2	96	9	B	2	#9	2	2	2	2	2	2	5	2	B	2	33	527
6:#4 AM	2	B3	9	2	2	54	2	2	2	2	2	2	B	2	2	2	44	931

. eak B4-Min VioF rates	Northbound				/outhbound				Eastbound				) estbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	2	66	6	2	#	57#	2	2	2	2	2	2	B9	2	#	2	#62
, eavy Trucks	2	B9	2		2	2	2		2	2	2		6	2	2		92
. edestrians		2				2				2				2			2
Qicycles	2	2	2		2	2	2		2	2	2		2	2	2		2
Railroad /topped Quses																	

Comments:

Report generated on 4Y9#Y92B1 9:B# . M

/OURCE: Huality CountsSLLC Rhttp:YYF F F 8quality counts8net(B-633-462-99B9

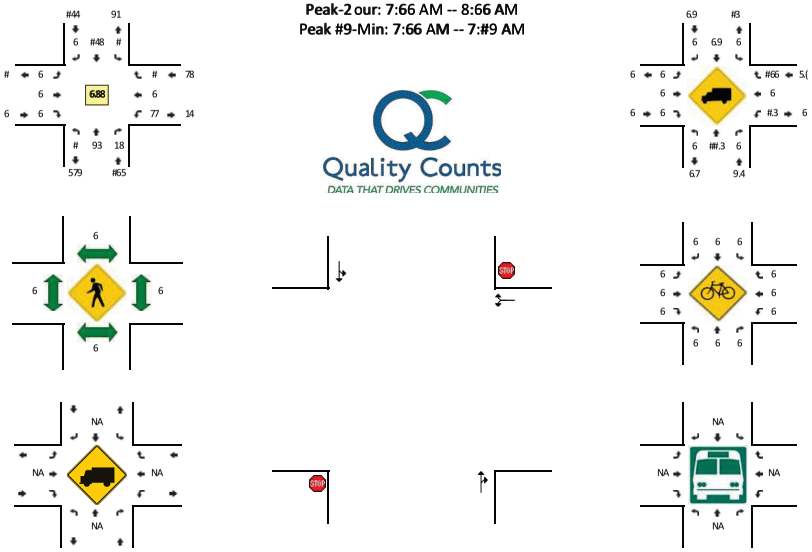
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Alii Rd K MakaiH
CITOY/TATE: Sauai, 2I

wC CDJ B: #1494#59
DATE: Tue, May #1 56#4

Peak-2our: 7:66 AM -- 8:66 AM
Peak #9-Min: 7:66 AM -- 7:#9 AM



#9-Min Count Period J eginning At	Moi Rd K Northbound H				Moi Rd K/ outhbound H				Alii Rd K MakaiH K Eastbound H				Alii Rd K MakaiH K) estbound H				Total	2 ourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
(:66 AM	6	8	1	6	6	11	6	6	6	6	6	6	55	6	6	6	78	
(:#9 AM	6	3	9	6	6	17	6	6	6	6	6	6	#1	#	6	6	76	
(:36 AM	6	#3	3	6	6	96	6	6	6	6	6	6	54	6	6	6	49	
(:19 AM	6	##	1	6	6	1(	6	6	6	6	6	6	3#	6	6	6	45	339
7:66 AM	6	4	##	6	6	(#	6	6	6	6	6	6	57	6	6	6	#68	3(9
7:#9 AM	6	4	#6	6	6	14	6	6	6	6	6	6	5#	6	#	6	46	389
7:36 AM	#	#9	#5	6	6	96	6	6	6	6	6	6	#4	6	6	6	47	387
7:19 AM	6	56	#9	6	#	38	6	6	6	6	6	6	#6	6	6	6	81	374
8:66 AM	6	4	#6	6	6	58	6	6	6	6	6	6	#1	6	6	6	(#	335
8:#9 AM	6	#5	#6	6	6	36	6	6	6	6	6	6	##	6	6	6	(3	369
8:36 AM	6	#7	#3	6	6	35	6	6	6	6	6	6	##	6	6	6	73	58#
8:19 AM	6	#5	1	6	6	5#	6	6	6	6	6	6	##	6	6	6	18	519

Peak #9-Min VloF rates	Northbound				/outhbound				Eastbound				) estbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	6	3(	11	6	6	511	6	6	6	6	6	6	#68	6	6	6	135
2 eavy Trucks	6	#5	6		6	6	6		6	6	6		6	6	6		#5
Pedestrians		6				6				6				6			6
J icycles	6	6	6		6	6	6		6	6	6		6	6	6		6
Railroad																	
/topped J uses																	

Comments:

Report generated on 9Y51Y56#4 5:#1 PM

/OURCE: wuality Counts, LLC Khttp:YYF F F .qualitycounts.netH#-877-986-55#5

Page 1 of 1

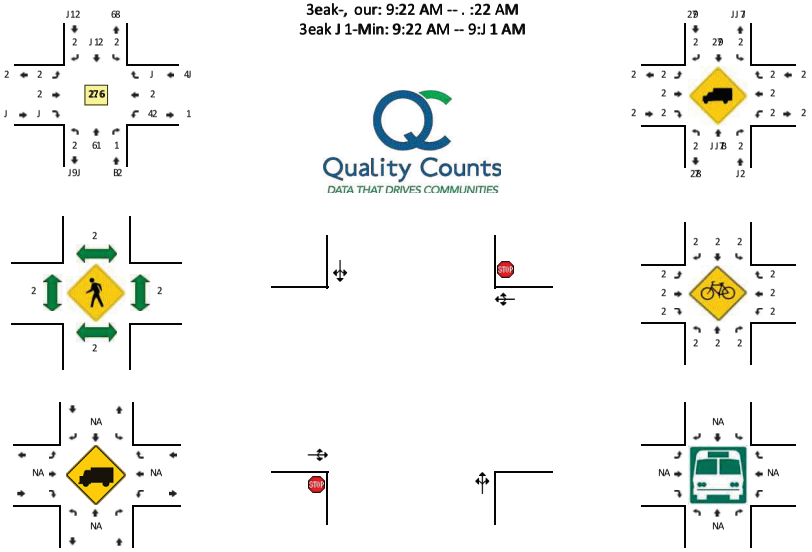
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Ahi Rd
CIT50YTATE: / auaiS, I

K C HOwQ: J B#1#J 49
DATE: TueSMay J B 42J #

3eak-, our: 9:22 AM -- . :22 AM
3eak J 1-Min: 9:22 AM -- 9:J 1 AM



J 1-Min Count 3eriod weginning At	Moi Rd R Northbound(				Moi Rd P/outhbound(				Ahi Rd R Eastbound(				Ahi Rd P) estbound(				Total	,ourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
8:22 AM	2	B	2	2	2	68	2	2	2	2	2	2	4	2	2	2	B4	
8:J 1 AM	2	8	2	2	2	6B	2	2	2	2	J	2	4	2	2	2	B6	
8:62 AM	2	#	2	2	2	69	2	2	2	2	2	2	B	2	2	2	12	
8:B1 AM	2	9	2	J	2	66	2	2	2	2	2	2	6	2	2	2	BB	J 9#
9:22 AM	2	#	4	2	2	B.	2	2	2	2	2	2	1	2	2	2	8B	42J
9:J 1 AM	2	B	J	2	2	68	2	2	2	2	2	2	.	2	2	2	B#	429
9:62 AM	2	.	J	2	2	69	2	2	2	2	2	2	B	2	2	2	12	429
9:B1 AM	2	J B	J	2	2	4#	2	2	2	2	J	2	6	2	J	2	B#	4J 4
. :22 AM	2	#	2	2	J	J .	2	2	2	2	J	2	1	2	2	2	6B	J . 4
. :J 1 AM	J	.	J	2	2	J 9	2	2	2	2	2	2	B	2	2	J	64	J 81
. :62 AM	2	J 6	2	2	2	41	2	2	2	2	2	2	B	2	2	2	B4	J 19
. :B1 AM	2	J 2	2	2	2	J #	2	2	2	2	2	2	J	2	2	2	62	J 6.

3eak J 1-Min VloF rates	Northbound				Youthbound				Eastbound				) estbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	2	68	.	2	2	J #4	2	2	2	2	2	2	42	2	2	2	418
, eavy Trucks	2	J 4	2		2	2	2		2	2	2		2	2	2		J 4
3edestrians		2				2				2				2			2
wicycles	2	2	2		2	2	2		2	2	2		2	2	2		2
Railroad																	
Ytopped wuses																	

Comments:

Report generated on 104B042J # 4:J B 3M

YOURCE: K uality CountsSLLC Rhttp:00F F F 7qualitycounts7net(J -. 99-1. 2-44J 4

Page 1 of 1

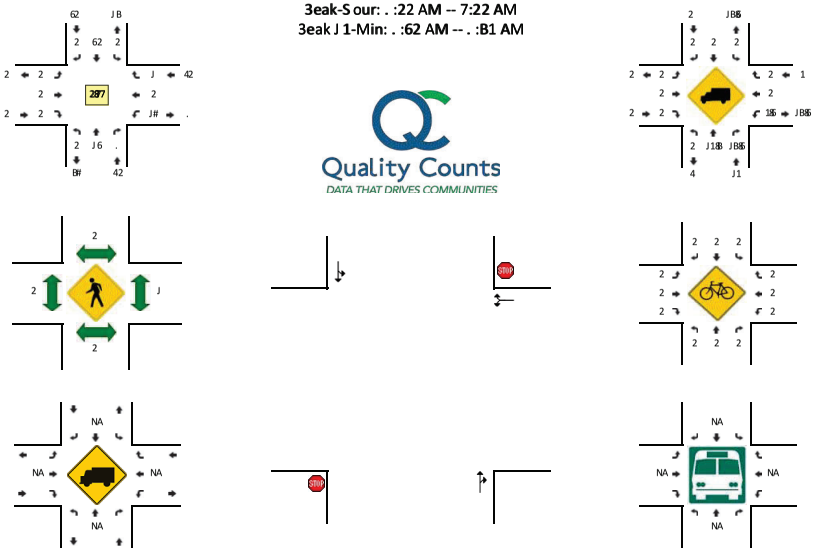
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Alii Rd
CIT950TATE: Yauai/S I

K C HDwQ J B#1#J 4#
DATE: , ed/May 44 42J #

3eak-S our: . :22 AM -- 7:22 AM
3eak J 1-Min: . :62 AM -- . :B1 AM



J 1-Min Count 3eriod weginning At	Moi Rd RNorthbound(				Moi Rd R0outhbound(				Alii Rd REastbound(				Alii Rd R, estbound(				Total	S ourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
) :22 AM	2	J	4	2	2	1	2	2	2	2	2	2	4	2	2	2	J 2	
) :J 1 AM	2	2	4	2	2	#	2	2	2	2	2	2	J J	2	J	2	46	
) :62 AM	2	J	J	2	2	J .	2	2	2	2	2	2	)	2	2	2	41	
) :B1 AM	2	B	J	2	2	.	2	2	2	2	2	2	7	2	2	2	42	. 7
. :22 AM	2	B	J	2	2	7	2	2	2	2	2	2	6	2	J	2	J .	71
. :J 1 AM	2	4	J	2	2	7	2	2	2	2	2	2	)	2	2	2	J .	. #
. :62 AM	2	6	4	2	2	J 2	2	2	2	2	2	2	1	2	2	2	42	. B
. :B1 AM	2	B	6	2	2	B	2	2	2	2	2	2	1	2	2	2	J J	. 2
7:22 AM	2	6	2	2	2	B	2	2	2	2	2	2	B	2	2	2	J J	) B
7:J 1 AM	2	J	J	2	2	7	2	2	2	2	2	2	)	2	2	2	J)	) 6
7:62 AM	2	J	4	2	2	)	2	2	2	2	2	2	6	2	2	2	J 4	11
7:B1 AM	2	2	4	2	2	6	2	2	2	2	2	2	B	2	2	2	#	B7

3eak J 1-Min VloF rates	Northbound				0outhbound				Eastbound				, estbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	2	J 4	7	2	2	B2	2	2	2	2	2	2	42	2	2	2	72
S eavy Trucks	2	2	B		2	2	2		2	2	2		B	2	2		7
3edestrians		2				2				2				2			2
wlcycles	2	2	2		2	2	2		2	2	2		2	2	2		2
Railroad																	
0topped wuses																	

Comments:

Report generated on 154B542J # 4:J B 3M

0OURCE: K uality Counts/LLC Fhttp:55F F F 8qualitycounts8net(J -7. . -172-44J 4

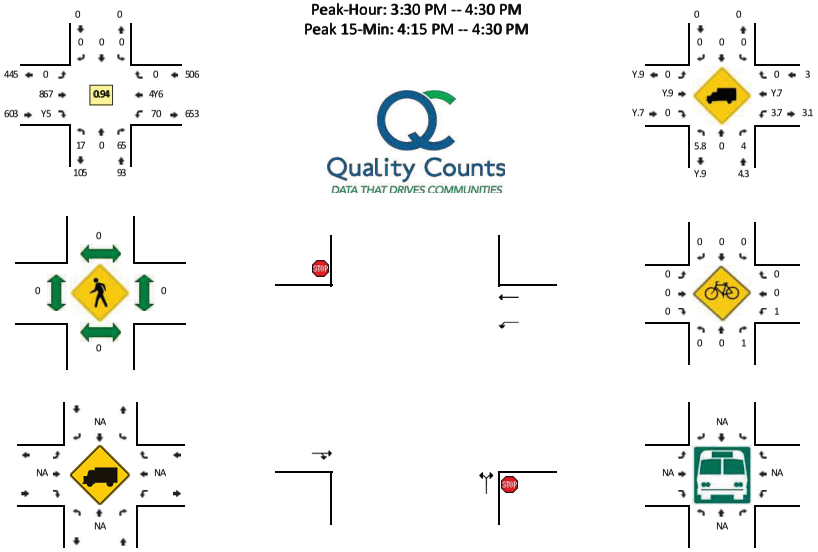
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Lele Rd -- Kaumualii Hwy
CIT/S, TATE: Kauai2HI

QC JOB #: 1495910Y
DATE: Tue2May 14 Y019

Peak-Hour: 3:30 PM -- 4:30 PM
Peak 15-Min: 4:15 PM -- 4:30 PM



15-Min Count Period Beginning At	Lele Rd (Northbound)				Lele Rd (, outhbound)				Kaumualii Hwy (Eastbound)				Kaumualii Hwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	4	0	35	0	0	0	0	0	0	139	9	0	Y9	118	0	0	33Y	
3:15 PM	5	0	Y3	0	0	0	0	0	0	153	8	0	YY	1Y5	0	0	334	
3:30 PM	5	0	Y4	0	0	0	0	0	0	168	Y	0	15	119	0	0	341	
3:45 PM	3	0	16	0	0	0	0	0	0	171	11	0	YY	99	0	0	333	1340
4:00 PM	Y	0	19	0	0	0	0	0	0	144	7	0	16	9Y	0	0	Y7Y	1Y90
4:15 PM	7	0	15	0	0	0	0	0	0	166	4	0	Y8	116	0	0	346	1303
4:30 PM	Y	0	18	0	0	0	0	0	0	Y10	5	0	17	99	0	0	350	131Y
4:45 PM	3	0	Y1	0	0	0	0	0	0	114	4	0	Y5	103	0	1	Y61	1Y50
5:00 PM	9	0	Y5	0	0	0	0	0	0	117	7	0	Y3	106	0	0	Y90	1Y57
5:15 PM	0	0	13	0	0	0	0	0	0	114	5	0	Y7	93	0	0	Y53	1184
5:30 PM	3	0	Y7	0	0	0	0	0	0	78	6	0	Y1	104	0	0	Y49	1083
5:45 PM	5	0	Y8	0	0	0	0	0	0	75	4	0	31	98	0	0	Y46	1039

Peak 15-Min Flowrates	Northbound				, outhbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	3Y	0	80	0	0	0	0	0	0	607	18	0	104	487	0	0	1377
Heavy Trucks	4	0	0		0	0	0		0	18	0		4	18	0		40
Pedestrians		0				0				0				0			0
Bicycles	0	0	1		0	0	0		0	0	0		1	0	0		Y
Railroad																	
, topped Buses																	

Comments:

Report generated on 5SY4SY019 Y:1Y PM

, OURCE: Quality Counts2LLC (http:SSwww.qualitycounts.net) 1-766-570-YY1Y

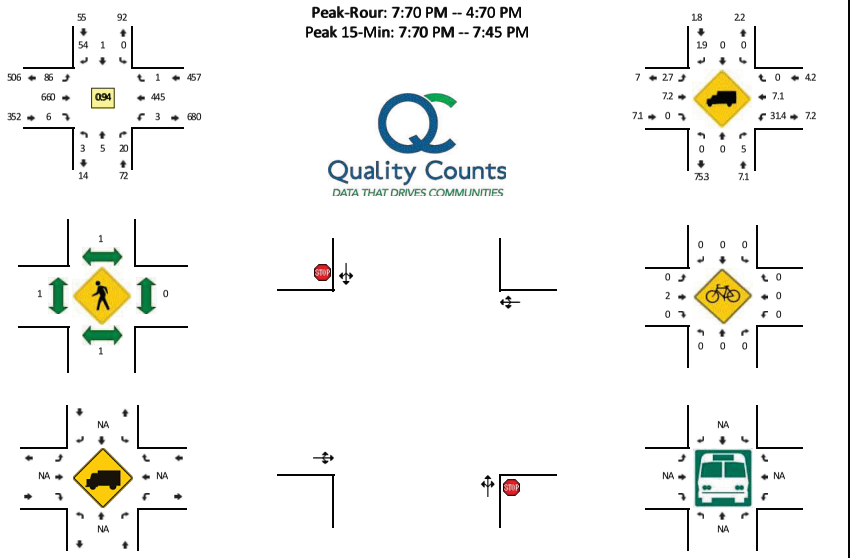
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Ranapepe Kd -- Haumualii Rwy
CITY/STATE: Hauai, RI

QC JOB #: 14959104
DATE: Tue, May 14 2019

Peak-Rour: 7:70 PM -- 4:70 PM
Peak 15-Min: 7:70 PM -- 7:45 PM



15-Min Count Period Beginning At	Ranapepe Kd (Northbound)				Ranapepe Kd (Southbound)				Haumualii Rwy (Eastbound)				Haumualii Rwy (Westbound)				Total	Rourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
7:00 PM	0	0	4	0	0	0	16	1	19	152	2	0	4	123	0	1	726	
7:15 PM	2	1	1	0	0	0	19	0	13	158	0	0	8	128	0	0	774	
7:70 PM	2	1	3	0	0	0	10	0	24	169	4	0	7	124	0	0	744	
7:45 PM	1	2	2	0	0	0	12	0	19	182	0	0	7	105	1	0	723	1771
4:00 PM	7	1	3	0	0	0	18	0	20	141	1	0	1	88	0	0	280	1285
4:15 PM	1	1	4	0	0	1	14	0	27	168	1	0	0	128	0	0	741	1292
4:70 PM	0	1	7	0	0	0	8	0	71	196	0	0	0	110	0	0	749	1293
4:45 PM	0	0	0	0	1	1	18	0	3	129	0	1	2	110	0	0	269	1279
5:00 PM	0	0	2	0	0	0	17	0	18	127	0	0	1	116	0	0	237	1272
5:15 PM	0	0	0	0	0	0	14	0	6	119	0	0	1	108	0	0	248	1179
5:70 PM	0	0	1	0	0	0	16	0	3	109	0	0	2	109	0	0	244	1074
5:45 PM	1	1	2	0	0	0	14	0	16	97	0	0	1	112	0	0	240	1005

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	8	4	28	0	0	0	40	0	96	636	16	0	12	496	0	0	1736
Reavy Trucks	0	0	4		0	0	0		4	76	0		8	20	0		32
Pedestrians		4				0				4				0			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Kailroad																	
Stopped Buses																	

Comments:

Keport generated on 5/24/2019 2:12 PM

SOUKCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-833-580-2212

Page 1 of 1

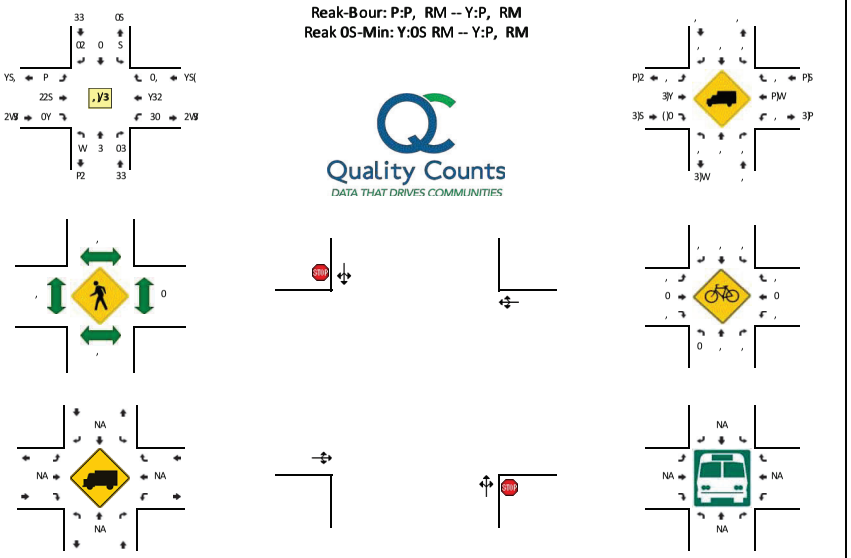
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Ruolo Kd Hw estQ - J aumualii B# y
CIT687TATE: J auai. B I

1 C 409 5: 0Y/ S/0, 2
DATE: Tue. May 0Y 3, 0/

Reak-Bour: P:P, RM -- Y:P, RM
Reak 0S-Min: Y:0S RM -- Y:P, RM



0S-Min Count Period 9eginning At	Ruolo Kd Hv estQ HNorthboundQ				Ruolo Kd Hv estQ H7outhboundQ				J aumualii B# y HEastboundQ				J aumualii B# y Hw estboundQ				Total	Bourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
P:, , RM	,	,	,	,	,	,	2	,	3	0S2	0	,	0	03Y	0	,	3/0	
P:0S RM	,	,	,	,	0	,	W	,	0	0SW	0	,	0	03W	,	,	3/W	
P:P, RM	0	,	3	,	3	,	P	,	,	0(P	3	,	P	03P	Y	,	P0P	
P:YS RM	3	0	0	,	,	,	Y	,	0	0(/	P	,	P	0, 3	,	,	3/2	00/W
Y:, , RM	,	,	Y	,	0	0	S	,	3	0Y3	2	,	(	W	P	,	3SY	0020
Y:0S RM	S	0	S	,	3	,	Y	,	,	0(0	P	,	W	00W	P	,	P3,	00W
Y:P, RM	P	0	0	,	0	0	Y	,	0	0/S	3	,	2	0, 2	P	,	P3Y	00/Y
Y:YS RM	P	,	P	,	3	0	S	,	0	03Y	W	,	0P	0, Y	0	,	32S	002P
S:, , RM	Y	0	P	,	,	,	S	,	0	00/	S	,	2	00,	,	,	3SY	002P
S:0S RM	0	0	3	,	0	0	3	,	3	03,	S	,	Y	0, /	0	,	3Y/	0, /3
S:P, RM	P	0	Y	,	,	0	S	,	3	0, (	,	,	(	0, P	2	,	3P/	0, , (
S:YS RM	3	,	3	,	0	,	2	,	P	W	P	,	S	0, Y	3	,	30S	/ S(

Reak 0S-Min Flo# rates	Northbound				7outhbound				Eastbound				w estbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	3,	Y	3,	,	W	,	02	,	,	2W	03	,	P3	Y(3	03	,	03W
Beavy Trucks	,	,	,		,	,	,		,	W	,		,	02	,		3Y
Redestrians		,				,				,				Y			Y
9icycles	,	,	,		,	,	,		,	0	,		,	0	,		3
Kailroad																	
7topped 9uses																	

Comments:

Keport generated on S83Y83, 0/ 3:03 RM

7OUKCE: 1 uality Counts. LLC Hhttp:88# # #)qualitycounts)netQ0-W(-SW -3303

Page 1 of 1

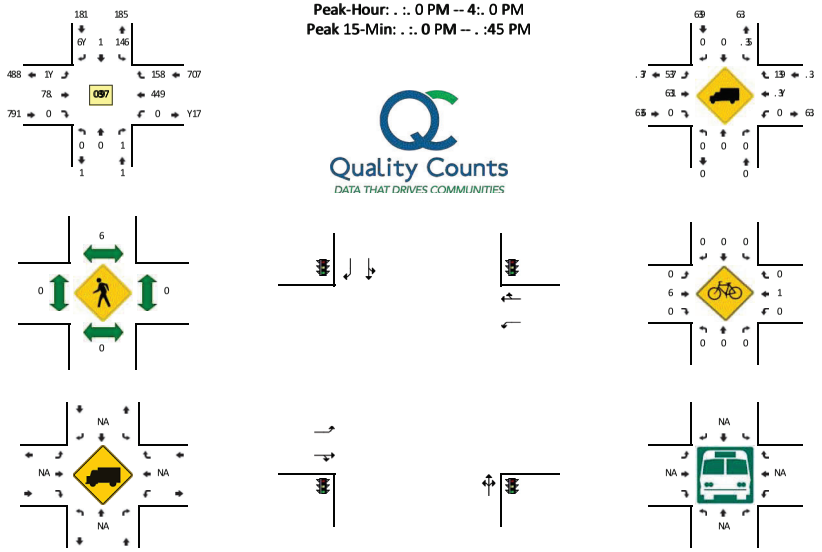
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Kaumualii Hwy
CIT/S, TATE: Kauai2HI

QC JOB #: 1495910Y
DATE: Tue2May 14 6019

Peak-Hour: . :. 0 PM -- 4:. 0 PM
Peak 15-Min: . :. 0 PM -- . :45 PM



15-Min Count Period Beginning At	Moi Rd (Northbound)				Moi Rd (, outhbound)				Kaumualii Hwy (Eastbound)				Kaumualii Hwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
. :00 PM	0	0	1	0	69	0	Y	0	5	155	0	0	0	1. 1	6Y	0	. 58	
. :15 PM	0	0	0	0	64	0	1	0	8	154	0	0	1	1. 6	.0	0	. 49	
. :. 0 PM	0	0	1	0	.5	0	9	0	4	184	0	0	0	16.	.8	0	.Y.	
. :45 PM	0	0	0	0	.Y	0	7	0	7	181	0	0	0	10Y	49	0	.8Y	1478
4:00 PM	0	0	0	0	.7	0	7	0	5	150	0	0	0	95	.7	0	.6Y	14. Y
4:15 PM	0	0	0	0	..	1	8	0	.	18Y	0	0	0	16.	.5	0	.Y0	1479
4:. 0 PM	0	0	0	0	65	0	.	0	1	191	0	0	0	116	41	0	.8.	1459
4:45 PM	0	0	0	0	.6	0	9	0	1	165	0	0	1	119	48	0	.. 4	1415
5:00 PM	0	0	0	0	.6	0	4	0	6	168	0	0	0	110	4Y	0	.6.	1410
5:15 PM	0	0	1	0	.1	0	9	0	6	119	0	0	0	105	45	0	.16	1. 46
5:. 0 PM	0	0	0	0	61	0	5	0	5	109	0	0	0	11.	.9	0	696	1671
5:45 PM	0	0	0	0	6.	0	7	0	.	90	0	0	0	109	68	0	65Y	11Y5

Peak 15-Min Flowrates	Northbound				, outhbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	4	0	140	0	. 7	0	17	797	0	0	0	496	14Y	0	15. 6
Heavy Trucks	0	0	0		4	0	0		4	60	0		0	6Y	4		70
Pedestrians		0				4				0				0			4
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1
Railroad																	
, topped Buses																	

Comments:

Report generated on 5S64S6019 6:16 PM

, OURCE: Quality Counts2LLC (http:SSwww3qualitycounts3net) 1-Y88-5Y0-6616

Page 1 of 1

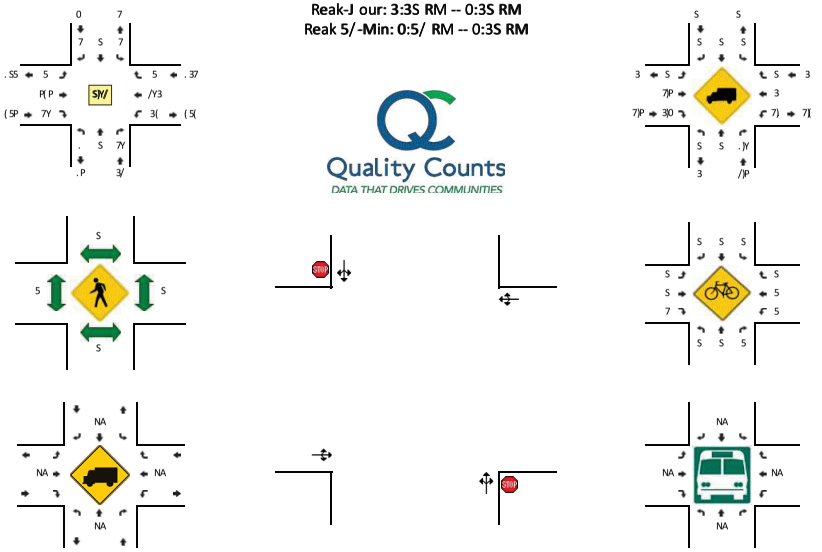
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Ruolo Kd HMiddlew-- Qaumualii J B y
CIT, 26TATE: Qauai8J I

 # C 1O4 9: 50Y/Y55S
DATE: Tue8May 50 7S5Y

Reak-J our: 3:3S RM -- 0:3S RM
Reak 5/-Min: 0:5/ RM -- 0:3S RM



5/-Min Count Period 4eginning At	Ruolo Kd HMiddlew HNorthboundw				Ruolo Kd HMiddlew H6outhboundw				Qaumualii J B y HEastboundw				Qaumualii J B y HWestboundw				Total	J ourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
3:5S RM	5	S	7	S	S	S	S	S	5	5(5	7	S	5	5..	S	S	3/0	
3:5/ RM	7	S	0	S	S	S	S	S	S	5P0	3	S	3	5//	S	S	305	
3:3S RM	5	S	5	S	7	S	5	S	5	7SP	7	S	P	5/Y	5	S	3(7	
3:0/ RM	5	S	.	S	S	S	5	S	S	7SP	/	S	.	50(	S	S	3P0	50/5
0:5S RM	5	S	53	S	S	S	S	S	S	5PP	P	S	Y	530	S	S	305	503(
0:5/ RM	3	S	Y	S	S	S	S	S	S	5Y.	5/	S	5.	5/7	S	S	3Y5	50((
0:3S RM	3	S	55	S	S	S	5	S	S	7SY	0	S	Y	5/7	S	S	3(Y	50Y/
0:0/ RM	3	S	P	S	S	S	S	S	S	5/P	3	S	Y	5/Y	S	S	33(	50/Y
/:5S RM	5	S	Y	S	S	S	S	S	S	5/.	0	S	57	5. 0	S	S	30P	50. /
/:5/ RM	7	S	.	S	5	S	S	S	S	50P	S	S	0	50(	S	S	3S(	53(7
/:3S RM	7	S	3	S	S	S	5	S	S	535	5	S	.	50S	S	S	7(0	57PP
/:0/ RM	3	S	Y	S	S	S	S	S	5	5S/	.	S	3	533	S	S	7. S	55YY

Reak 5/-Min FloB rates	Northbound				6outhbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	57	S	3.	S	S	S	S	S	S	P(0	. S	S	. 0	. S(	S	S	5/ . 0
J eavy Trucks	S	S	0		S	S	S		S	5.	S		S	(	S		7(
Redestrians		S				S				S				S			S
4icycles	S	S	S		S	S	S		S	S	5		S	5	S		7
Kailroad																	
6topped 4uses																	

Comments:

Keport generated on / 27027S5Y 7:57 RM

6OUKCE: # uality Counts8LLC Hhttp:22B B)qualitycounts)netw5-(PP-/ (S-7757

Page 1 of 1

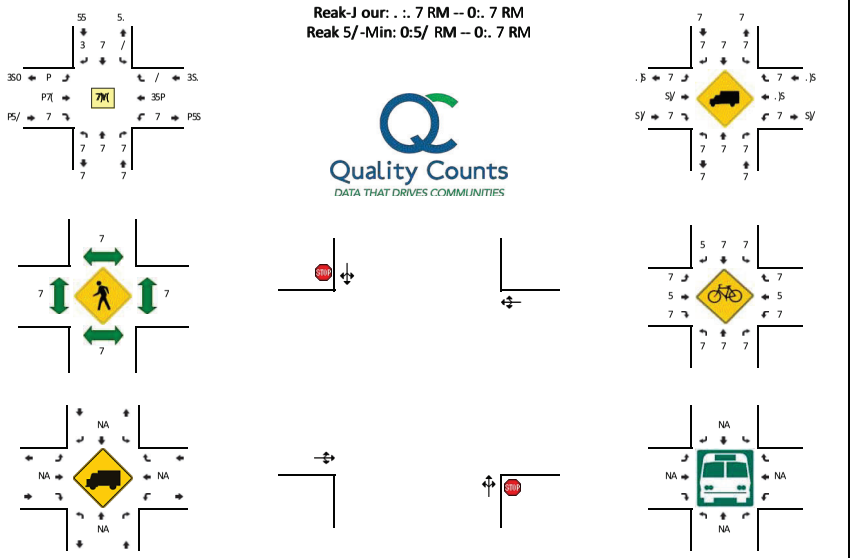
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Ruolo Kd HEastw-- Qaumualii J B y
CIT, 26TATE: Qauai8J I

 # C 1O4 9: 50Y/Y55S
DATE: Tue8May 50 S75Y

Reak-J our: . :. 7 RM -- 0:. 7 RM
Reak 5/-Min: 0:5/ RM -- 0:. 7 RM



5/-Min Count Period 4eginning At	Ruolo Kd HEastw HNorthboundw				Ruolo Kd HEastw H6outhboundw				Qaumualii J B y HEastboundw				Qaumualii J B y HWestboundw				Total	J ourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
. :77 RM	7	7	7	7	5	7	S	7	5	5P5	7	7	7	53S	7	7	. 0(	
. :5/ RM	7	7	7	7	7	7	S	7	7	5P.	7	7	7	5/ 0	7	7	. . Y	
. :. 7 RM	7	7	7	7	.	7	S	7	7	S7(	7	7	7	5/ Y	S	7	. (.	
. :0/ RM	7	7	7	7	5	7	5	7	.	S7/	7	7	7	5/.	S	7	. 3/	50S0
0:77 RM	7	7	7	7	7	7	5	7	.	5Y7	7	7	7	50.	7	7	. . (	5050
0:5/ RM	7	7	7	7	5	7	S	7	S	S7/	7	7	7	53.	5	7	. (0	500Y
0:. 7 RM	7	5	7	7	7	7	S	7	5	SSS	7	7	7	5/ P	5	7	. P/	503S
0:0/ RM	7	7	7	7	/	7	7	7	/	537	7	7	7	53Y	5	7	. 07	50. 3
/:77 RM	7	7	5	7	7	7	.	7	5	53.	7	7	7	53Y	5	7	. . P	50. (
/:5/ RM	7	7	7	7	7	7	S	7	7	537	7	7	7	50(	.	7	. 5S	5. (/
/:. 7 RM	7	7	7	7	7	7	S	7	/	5S3	7	7	7	50/	5	7	S(Y	5S3Y
/:0/ RM	7	7	7	7	5	7	S	7	0	55S	7	7	7	5. /	7	7	S/ 0	55P.

Reak 5/-Min FloB rates	Northbound				6outhbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	7	7	7	7	0	7	P	7	P	P57	7	7	7	3/ S	0	7	50Y3
J eavy Trucks	7	7	7		7	7	7		7	53	7		7	5S	7		SP
Redestrians		7				7				7				7			7
4icycles	7	7	7		7	7	5		7	7	7		7	7	7		5
Kailroad																	
6topped 4uses																	

Comments:

Keport generated on / 2S02S75Y S:5S RM

6OUKCE: # uality Counts8LLC Hhttp:22B B B)qualitycounts)netw5-P((-/ P7-SS5S

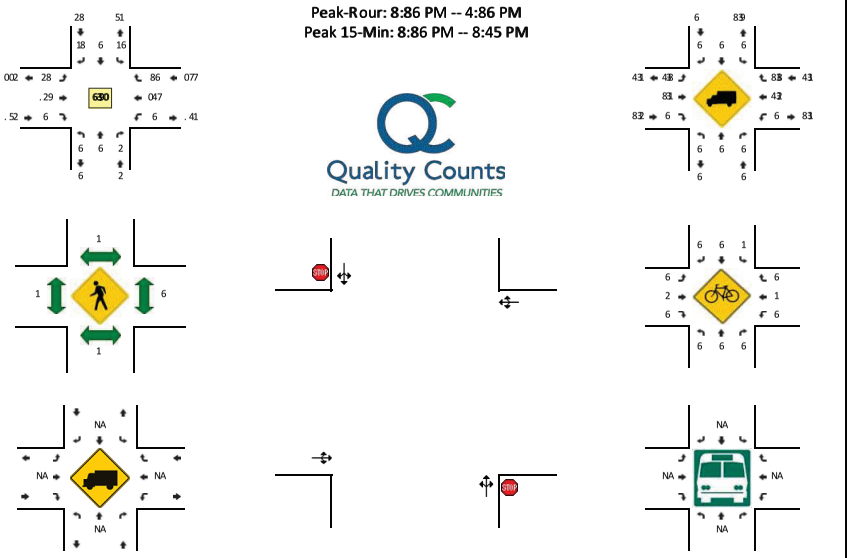
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Rana Kd -- Haumualii Rwy
CITY/STATE: Hauai, R I

QC JOB #: 14959110
DATE: Tue, May 14 2619

Peak-Rour: 8:86 PM -- 4:86 PM
Peak 15-Min: 8:86 PM -- 8:45 PM



15-Min Count Period Beginning At	Rana Kd (Northbound)				Rana Kd (Southbound)				Haumualii Rwy (Eastbound)				Haumualii Rwy (Westbound)				Total	Rourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
8:66 PM	6	6	1	6	4	6	2	6	8	1. .	6	6	6	178	5	6	870	
8:15 PM	1	6	1	6	0	6	8	6	4	1. 0	6	6	6	101	16	6	872	
8:86 PM	6	6	1	6	2	6	8	6	8	211	6	6	6	179	7	6	460	
8:45 PM	6	6	6	6	5	6	8	6	7	212	6	6	6	151	5	6	8. 8	1587
4:66 PM	6	6	6	6	1	6	0	6	7	192	6	6	6	154	7	6	807	152.
4:15 PM	6	6	1	6	2	6	1	6	4	214	6	2	6	108	11	6	89.	1554
4:86 PM	1	6	2	6	2	6	8	6	2	21.	6	2	6	107	16	6	467	1555
4:45 PM	1	6	6	6	6	6	5	6	8	176	6	6	6	174	4	6	857	1529
5:66 PM	2	6	6	6	8	6	2	6	5	10.	6	6	6	1. 7	12	6	879	1541
5:15 PM	1	6	8	6	1	6	4	6	5	150	6	6	6	154	14	6	88.	14. 1
5:86 PM	6	6	6	6	1	6	2	6	4	181	6	6	6	152	12	6	862	1870
5:45 PM	6	6	6	6	6	6	4	1	0	117	6	6	6	185	14	6	277	1290

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	6	6	4	6	.	6	12	6	12	. 44	6	6	6	710	2.	6	1024
Reavy Trucks	6	6	6		6	6	6		6	44	6		6	80	6		. 6
Pedestrians		6				6				6				6			6
Bicycles	6	6	6		6	6	6		6	6	6		6	1	6		1
Kailroad																	
Stopped Buses																	

Comments:

Keport generated on 5/24/2619 2:12 PM

SOUKCE: Quality Counts, LLC (http://www3qualitycounts3net) 1-. 77-5. 6-2212

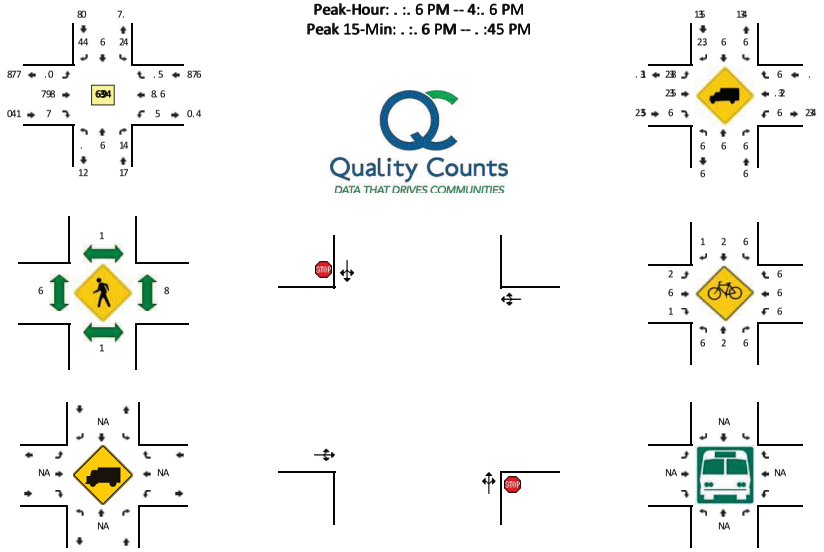
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Rona Kd -- Raumualii Hwy
CITY/STATE: Rauai, HI

QC JOB #: 14959110
DATE: Tue, May 14 2619

Peak-Hour: . :. 6 PM -- 4:. 6 PM
Peak 15-Min: . :. 6 PM -- . :45 PM



15-Min Count Period Beginning At	Rona Kd (Northbound)				Rona Kd (Southbound)				Raumualii Hwy (Eastbound)				Raumualii Hwy (Westbound)				Total	Hourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
. :66 PM	5	6	5	6	0	6	12	6	1.	177	1	6	6	18.	8	6	. 96	
. :15 PM	1	6	1	6	5	6	15	6	11	177	2	6	1	154	18	6	. 0.	
. :. 6 PM	1	6	7	6	16	6	14	6	9	264	1	6	.	176	8	6	425	
. :45 PM	6	6	7	6	5	6	9	6	0	267	.	6	1	147	11	6	. 90	1598
4:66 PM	6	6	6	6	.	6	0	6	0	170	.	6	6	152	7	6	. 59	1585
4:15 PM	2	6	6	6	8	6	1.	6	1.	267	6	6	1	181	11	6	414	1598
4: . 6 PM	1	6	6	6	8	6	0	6	8	218	1	6	6	189	2	6	469	1506
4:45 PM	2	6	6	6	4	6	7	6	5	184	1	6	1	188	0	6	. 50	1546
5:66 PM	1	1	.	6	4	6	5	6	.	184	.	6	6	109	7	6	. 06	1581
5:15 PM	6	6	6	6	.	6	0	6	0	151	.	6	5	152	5	6	. . 5	1402
5: . 6 PM	6	6	1	6	1	1	7	6	.	125	1	6	6	15.	16	6	. 62	1. 75
5:45 PM	6	6	1	6	4	6	4	6	8	167	6	6	6	147	7	6	278	129.

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	4	6	20	6	46	6	58	6	. 8	018	4	6	12	806	24	6	1766
Heavy Trucks	6	6	6		6	6	6		6	20	6		6	24	6		52
Pedestrians		6				4				6				6			4
Bicycles	6	6	6		6	6	1		6	6	6		6	6	6		1
Kailroad																	
Stopped Buses																	

Comments:

Keport generated on 5/24/2619 2:12 PM

SOUKCE: Quality Counts, LLC (http://www3qualitycounts3net) 1-077-506-2212

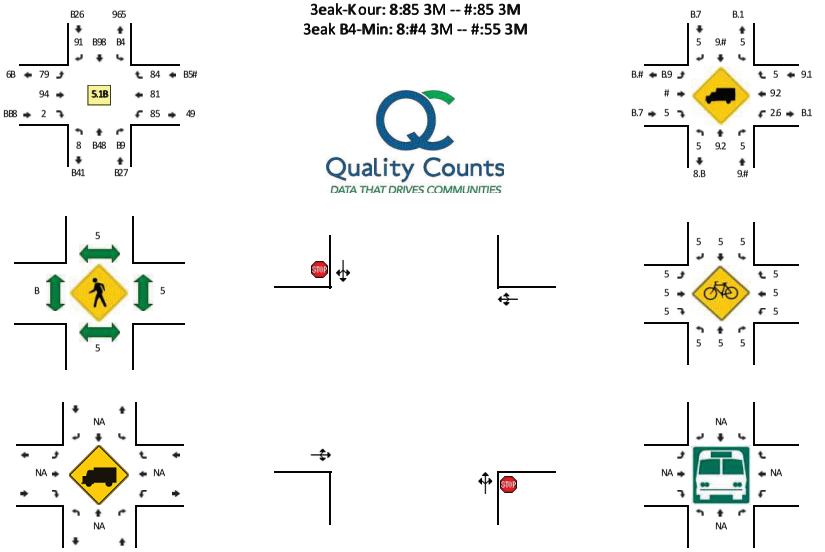
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Kanapepe Rd
CITOY/TATE: Sauai, KI

HC vOOQJ : B#141B95
DATE: Tue, May B# 95B1

3eak-Kour: 8:85 3M -- #:85 3M
3eak B4-Min: 8:#4 3M -- #:55 3M



B4-Min Count 3eriod Qeginning At	Moi Rd (Northbound)				Moi Rd (/outhbound)				Kanapepe Rd (Eastbound)				Kanapepe Rd (/estbound)				Total	Kourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
8:55 3M	9	97	8	5	4	97	B5	5	B2	6	9	5	8	B9	8	5	BB1	
8:B4 3M	5	92	6	5	8	92	2	5	B9	2	9	5	9	B4	B9	5	BB6	
8:85 3M	5	8#	2	5	9	92	4	5	98	6	9	5	1	7	B5	5	B89	
8:#4 3M	5	#2	4	5	#	8#	7	5	B7	8	B	5	BB	1	B8	5	B49	495
#:55 3M	9	81	B	5	4	89	B5	5	95	6	9	5	2	1	1	5	B#9	4#8
#:B4 3M	B	8#	5	5	#	8B	2	5	9B	7	B	5	#	B8	8	5	B92	449
#:85 3M	5	84	B	5	B	9B	2	5	9#	1	#	5	6	6	6	5	B99	4#9
#:#4 3M	5	#2	B	5	8	92	B5	5	6	B	B	5	7	7	8	5	BB#	45#
4:55 3M	B	45	5	5	7	89	BB	5	B#	4	5	5	4	#	2	5	B82	#17
4:B4 3M	B	#4	5	5	4	97	B5	5	6	B	5	5	7	7	BB	5	B9#	#12
4:85 3M	5	82	9	5	#	95	1	5	B8	B	8	5	8	1	4	5	B54	#61
4:#4 3M	5	85	5	5	2	99	6	5	B#	1	5	5	#	6	#	5	B58	#27

3eak B4-Min VioF rates	Northbound				/outhbound				Eastbound				) estbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	5	B7#	95	5	B2	B82	89	5	69	B9	#	5	##	82	49	5	257
Keavy Trucks	5	7	5		5	#	5		#	5	5		#	5	5		95
3edestrians		5				5				5				5			5
Qicycles	5	5	5		5	5	5		5	5	5		5	5	5		5
Railroad																	
/topped Quses																	

Comments:

Report generated on 4Y9#Y95B1 9:B9 3M

/OURCE: Huality Counts, LLC Fhttp:YF F F .qualitycounts.net(B-766-475-99B9

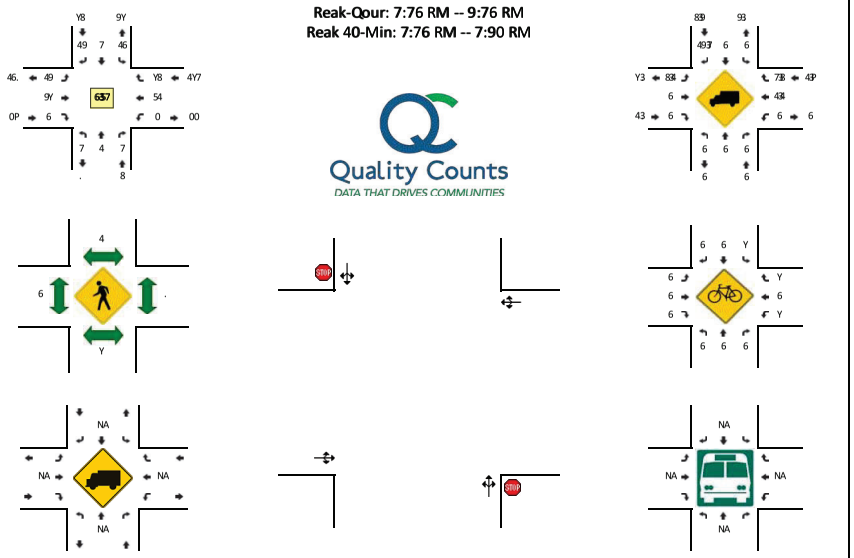
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Ruolo KdHAwawa Kd -- Qanapepe Kd
CIT/HSTATE: , auai2QJ

J CBO# 1: 495054YY
DATE: Tue2May 49 Y645

Reak-Qour: 7:76 RM -- 9:76 RM
Reak 40-Min: 7:76 RM -- 7:90 RM



40-Min Count Period #eginning At	Ruolo KdHAwawa Kd (Northbound)				Ruolo KdHAwawa Kd (Southbound)				Qanapepe Kd (Eastbound)				Qanapepe Kd (Westbound)				Total	Qourly Totals
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U		
7:66 RM	6	6	4	6	Y	4	6	6	7	46	6	6	Y	Y4	0	6	90	
7:40 RM	6	6	4	6	7	4	7	6	Y	44	4	6	Y	Y8	46	6	P4	
7:76 RM	6	6	6	6	4	Y	Y	6	0	40	6	6	Y	YY	.	6	08	
7:90 RM	6	4	4	6	9	6	9	6	Y	46	6	6	4	76	7	6	0P	Y45
9:66 RM	7	6	6	6	7	6	0	6	4	5	6	6	4	40	46	6	98	YY4
9:40 RM	6	6	Y	6	Y	4	7	6	P	.	6	6	4	Y9	P	6	07	Y47
9:76 RM	4	4	4	6	4	Y	0	6	7	5	6	6	Y	45	5	6	07	Y65
9:90 RM	Y	4	4	6	6	Y	9	6	4	P	4	6	6	47	P	6	78	456
0:66 RM	4	6	6	6	7	4	Y	6	Y	5	4	6	7	YY	P	6	06	457
0:40 RM	6	6	6	4	7	6	9	6	6	8	Y	6	6	Y0	P	6	9.	4..
0:76 RM	Y	Y	Y	6	Y	6	7	6	4	7	6	6	6	49	9	6	77	4P.
0:90 RM	6	4	4	6	7	6	7	6	4	5	6	6	4	4P	P	6	94	48Y

Reak 40-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	Left	Thru	Kight	U	
All Vehicles	6	6	6	6	9	.	.	6	Y6	P6	6	6	.	. .	7Y	6	YY.
Qeavy Trucks	6	6	6		6	6	6		9	6	6		6	6	6		9
Redestrians		6				6				6				9			9
#icycles	6	6	6		6	6	6		6	6	6		6	6	6		6
Kailroad																	
Stopped #uses																	

Comments:

Keport generated on 0H/9H/Y645 Y:4Y RM

SOUKCE: J uality Counts2LLC (http:HHwww3quality counts3net) 4-. 88-0. 6-YY4Y

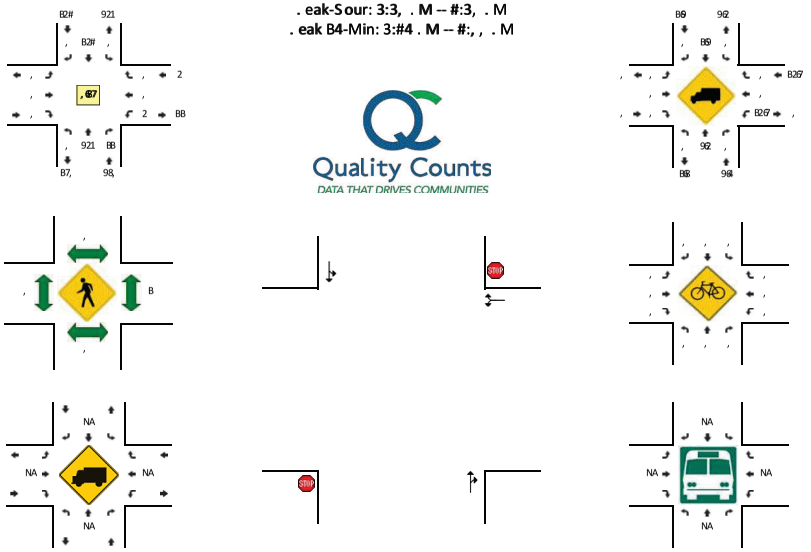
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Kane Rd
CIT50YTATE: Kauai/S I

HCvØQJ : B#141B9#
DATE: Tue/May B# 9, B1

. eak-Sour: 3:3, . M -- #:3, . M
. eak B4-Min: 3:#4 . M -- #:, , . M



B4-Min Count . eriod Qeginning At	Moi Rd RNorthbound(				Moi Rd Pouthbound(				Kane Rd REastbound(				Kane Rd P) estbound(				Total	Sourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:, , . M	,	#3	#	,	,	#,	,	,	,	,	,	,	9	,	,	,	81	
3:B4 . M	,	#1	9	,	,	39	,	,	,	,	,	,	B	,	,	,	8#	
3:3, . M	,	24	3	,	,	33	,	,	,	,	,	,	9	,	,	,	B, 3	
3:#4 . M	,	89	3	,	,	#9	,	,	,	,	,	,	9	,	,	,	B91	#, 4
#:, , . M	,	48	9	,	,	#8	,	,	,	,	,	,	B	,	,	,	B, 1	#94
#:B4 . M	,	2#	3	,	,	#B	,	,	,	,	,	,	B	,	,	,	B, 1	#4,
#:3, . M	,	24	9	,	,	9#	,	,	,	,	,	,	,	,	,	,	1B	#38
#:#4 . M	,	49	7	,	,	34	,	,	,	,	,	,	3	,	B	,	18	#, 7
4:, , . M	,	24	#	,	,	4B	,	,	,	,	,	,	B	,	,	,	B9B	#B1
4:B4 . M	,	24	#	,	,	#9	,	,	,	,	,	,	9	,	,	,	BB3	#93
4:3, . M	,	2,	3	,	,	3,	,	,	,	,	,	,	,	,	,	,	13	#94
4:#4 . M	,	#2	B	,	,	34	,	,	,	,	,	,	9	,	,	,	8#	#BB

. eak B4-Min VioF rates	Northbound				Youthbound				Eastbound				) estbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	,	398	B9	,	,	B28	,	,	,	,	,	,	8	,	,	,	4B2
S eavy Trucks	,	B9	,		,	,	,		,	,	,		#	,	,		B2
. edestrians		,				,				,				#			#
Qicycles	,	,	,		,	,	,		,	,	,		,	,	,		,
Railroad																	
Ytopped Quses																	

Comments:

Report generated on 4O9#O9, B1 9:B9 . M

YOURCE: Huality Counts/ LLC Rhttp:OOF F F 6qualitycounts6net(B-877-48, -99B9

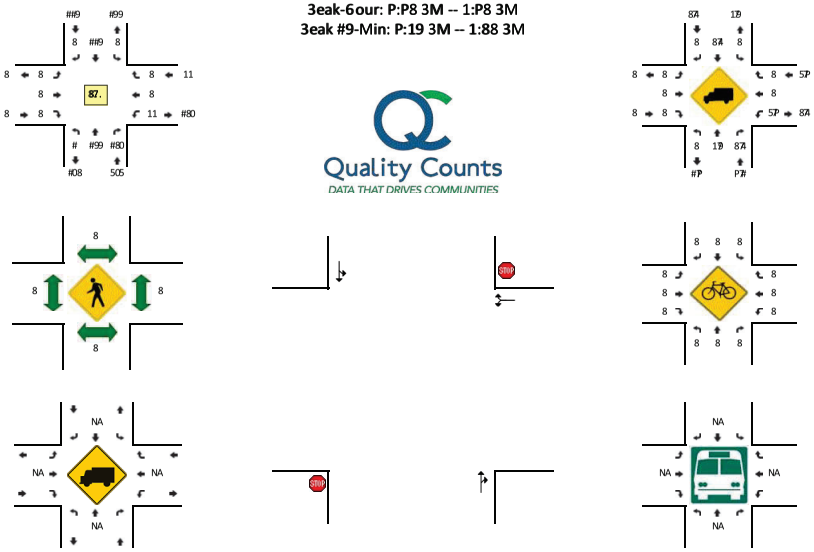
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Alii Rd KMakaiH
CITY/STATE: , auai26I

wC CDJ B: #1494#50
DATE: Tue2May #1 58#4

3eak-6our: P:P8 3M -- 1:P8 3M
3eak #9-Min: P:19 3M -- 1:88 3M



#9-Min Count 3eriod J eginning At	Moi Rd KNorthboundH				Moi Rd KSouthboundH				Alii Rd KMakaiH KEastboundH				Alii Rd KMakaiH K(estboundH				Total	6ourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
P:88 3M	8	54	#9	8	8	59	8	8	8	8	8	8	#P	8	#	8	. P	
P:#9 3M	8	59	51	8	8	51	8	8	8	8	8	8	0	8	8	8	) 4	
P:P8 3M	8	P0	5)	8	8	59	8	8	8	8	8	8	4	8	8	8	4)	
P:19 3M	8	1)	54	8	8	P5	8	8	8	8	8	8	##	8	8	8	##4	P).
1:88 3M	8	PP	54	#	8	5)	8	8	8	8	8	8	#9	8	8	8	#89	188
1:#9 3M	8	P4	5#	8	8	P#	8	8	8	8	8	8	4	8	8	8	#88	15#
1:P8 3M	8	P9	54	8	8	#0	8	8	8	8	8	8	#5	8	8	8	45	1#0
1:19 3M	8	P1	#0	8	8	5#	8	8	8	8	8	8	#5	8	8	8	. P	P. 8
9:88 3M	8	19	51	8	8	P#	8	8	8	8	8	8	#4	8	8	8	##4	P41
9:#9 3M	8	P4	#4	8	8	P8	8	8	8	8	8	8	#8	8	8	8	4.	P45
9:P8 3M	8	P8	59	8	8	5)	8	8	8	8	8	8	)	8	8	8	. 4	P. 4
9:19 3M	8	55	5)	8	8	5#	8	8	8	8	8	8	##	8	8	8	. #	P.)

3eak #9-Min VloF rates	Northbound				Southbound				Eastbound				(estbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	8	#. .	##0	8	8	#5.	8	8	8	8	8	8	11	8	8	8	1) 0
6 eavy Trucks	8	#5	8		8	8	8		8	8	8		8	8	8		#5
3edestrians		8				8				8				8			8
J icycles	8	8	8		8	8	8		8	8	8		8	8	8		8
Railroad																	
Stopped J uses																	

Comments:

Report generated on 9/51/58#4 5:#5 3M

SOURCE: wuality Counts2LLC Khttp://F F F 7quality counts7 netH#-.)) -9. 8-55#5

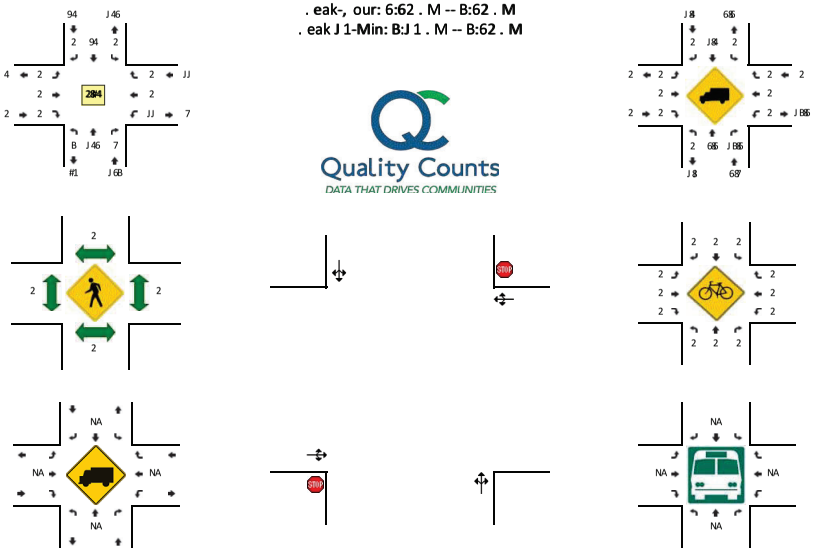
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Ahi Rd
CIT50YTATE: / auaiS, I

K C HOwQ: J B#1#J 49
DATE: TueSMay J B 42J #

. eak-, our: 6:62 . M -- B:62 . M
. eak J 1-Min: B:J 1 . M -- B:62 . M



J 1-Min Count . eriod weginning At	Moi Rd 3NorthboundP				Moi Rd 3YouthboundP				Ahi Rd 3EastboundP				Ahi Rd 3(estboundP				Total	. ourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:22 . M	2	44	J	2	J	42	2	2	2	2	2	2	J	2	2	2	B1	
6:J 1 . M	2	4J	2	2	J	J 1	2	2	2	2	2	2	4	2	2	2	6#	
6:62 . M	J	64	4	2	2	J 9	2	2	2	2	2	2	B	2	2	2	17	
6:B1 . M	2	62	4	J	2	46	2	2	2	2	2	2	J	2	2	2	17	J #9
B:22 . M	2	62	2	2	2	J #	2	2	2	2	2	2	4	2	2	2	1J	42B
B:J 1 . M	J	6I	6	J	2	44	2	2	2	2	2	2	B	2	2	2	) 4	447
B:62 . M	2	49	J	2	J	J B	2	2	2	2	2	2	J	2	2	2	B1	4J 1
B:B1 . M	2	64	4	2	J	J 9	2	2	2	2	2	2	4	2	2	J	1)	4J B
1:22 . M	2	66	2	2	J	4B	2	2	2	2	J	2	2	2	4	2	J J	44B
1:J 1 . M	2	67	J	2	J	42	2	2	2	2	2	2	4	2	J	2	) 4	44B
1:62 . M	2	4#	2	2	2	J 1	2	2	2	2	2	2	1	2	2	2	B#	449
1:B1 . M	2	4J	J	2	2	J 7	2	J	2	2	J	2	J	2	2	2	B4	4J B

. eak J 1-Min VloF rates	Northbound				Youthbound				Eastbound				(estbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	B	J 4B	J 4	B	2	99	2	2	2	2	2	2	J)	2	2	2	4B9
, eavy Trucks	2	2	B		2	2	2		2	2	2		2	2	2		B
. edestrians		2				2				2				2			2
wicycles	2	2	2		2	2	2		2	2	2		2	2	2		2
Railroad																	
Ytopped wuses																	

Comments:

Report generated on 104B042J # 4:J 4 . M

YOURCE: K uality CountsSLLC 3http:00F F F 8quality counts8 netPJ -977-192-44J 4

Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Moi Rd -- Alii Rd
CIT50YTATE: /auaiS, I

K C HDwQ J B#1#J 49
DATE: 2 edSMay 66 69J #

3eak-, our: 4:49 3M -- B:49 3M
3eak J 1-Min: 4:B1 3M -- B:99 3M

Quality Counts
DATA THAT DRIVES COMMUNITIES

J 1-Min Count 3eriod weginning At	Moi Rd (Northbound)				Moi Rd (Youthbound)				Alii Rd (Eastbound)				Alii Rd (2 estbound)				Total	,ourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:99 3M	9	8	4	9	9	B	9	9	9	9	9	9	J	9	9	9	J 1	
4:J 1 3M	9	B	4	9	9	1	9	9	9	9	9	9	J	9	9	9	J 4	
4:49 3M	9	J 6	B	9	9	1	9	9	9	9	9	9	J	9	9	9	66	
4:B1 3M	9	J J	B	9	9	.	9	9	9	9	9	9	B	9	9	9	61	81
B:99 3M	9	.	P	9	J	B	9	9	9	9	9	9	J	9	9	9	69	P9
B:J 1 3M	9	8	P	9	9	1	9	9	9	9	9	9	4	9	J	9	6B	#J
B:49 3M	9	J J	1	9	9	1	9	9	9	9	9	9	9	9	9	9	6J	#9
B:B1 3M	9	J 9	4	9	9	B	9	9	9	9	9	9	4	9	9	9	69	P1
1:99 3M	9	P	1	9	9	4	9	9	9	9	9	9	B	9	9	9	69	P1
1:J 1 3M	9	.	B	9	9	.	9	9	9	9	9	9	B	9	9	9	69	PJ
1:49 3M	9	J 9	4	9	J	B	9	9	9	9	9	9	4	9	9	9	6J	PJ
1:B1 3M	9	8	B	9	9	.	9	9	9	9	9	9	6	9	9	9	J #	P9

3eak J 1-Min VloF rates	Northbound				Youthbound				Eastbound				2 estbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	9	BB	J .	9	9	6B	9	9	9	9	9	9	J .	9	9	9	J 99
, eavy Trucks	9	9	9		9	9	9		9	9	9		9	9	9		9
3edestrians		9				9				9				P			P
wicycles	9	9	9		9	9	9		9	9	9		9	9	9		9
Railroad																	
Ytopped wuses																	

Comments:

Report generated on 106B069J # 6:J 6 3M

YOURCE: K uality CountsSLLC (http:00F F F 7qualitycounts7net) J -P88-1P9-66J 6

APPENDIX B

Analysis Reports Existing (2019) Conditions

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	445	18	79	667	18	67
Future Vol, veh/h	445	18	79	667	18	67
Conflicting Peds, #/hr	0	1	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	11	4	4	6	10
Mvmt Flow	468	19	83	702	19	71

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	488	0	1347	480
Stage 1	-	-	-	-	479	-
Stage 2	-	-	-	-	868	-
Critical Hdwy	-	-	4.14	-	6.46	6.3
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.236	-	3.554	3.39
Pot Cap-1 Maneuver	-	-	1065	-	163	570
Stage 1	-	-	-	-	615	-
Stage 2	-	-	-	-	404	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1064	-	150	569
Mov Cap-2 Maneuver	-	-	-	-	150	-
Stage 1	-	-	-	-	614	-
Stage 2	-	-	-	-	372	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	18.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	358	-	-	1064	-
HCM Lane V/C Ratio	0.25	-	-	0.078	-
HCM Control Delay (s)	18.4	-	-	8.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1	-	-	0.3	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	49	457	2	9	633	2	0	0	6	0	0	114
Future Vol, veh/h	49	457	2	9	633	2	0	0	6	0	0	114
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	12	4	2	11	4	2	2	2	67	2	2	3
Mvmt Flow	52	481	2	9	666	2	0	0	6	0	0	120

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	668	0	0	483	0	0	1331	1272	482	1274	1272	667
Stage 1	-	-	-	-	-	-	586	586	-	685	685	-
Stage 2	-	-	-	-	-	-	745	686	-	589	587	-
Critical Hdwy	4.22	-	-	4.21	-	-	7.12	6.52	6.87	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.308	-	-	2.299	-	-	3.518	4.018	3.903	3.518	4.018	3.327
Pot Cap-1 Maneuver	876	-	-	1034	-	-	132	168	472	144	168	457
Stage 1	-	-	-	-	-	-	496	497	-	438	448	-
Stage 2	-	-	-	-	-	-	406	448	-	494	497	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	876	-	-	1034	-	-	90	152	472	132	152	457
Mov Cap-2 Maneuver	-	-	-	-	-	-	90	152	-	132	152	-
Stage 1	-	-	-	-	-	-	456	457	-	403	442	-
Stage 2	-	-	-	-	-	-	295	442	-	448	457	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.1	12.7	15.7
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	472	876	-	-	1034	-	-	457
HCM Lane V/C Ratio	0.013	0.059	-	-	0.009	-	-	0.263
HCM Control Delay (s)	12.7	9.4	0	-	8.5	0	-	15.7
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0.2	-	-	0	-	-	1

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	461	7	5	621	11	6	2	6	10	0	12
Future Vol, veh/h	2	461	7	5	621	11	6	2	6	10	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	1	1	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	4	2	2	4	9	2	2	2	2	2	8
Mvmt Flow	2	490	7	5	661	12	6	2	6	11	0	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	673	0	0	497	0	0	1184	1181	495	1180	1178	669
Stage 1	-	-	-	-	-	-	498	498	-	677	677	-
Stage 2	-	-	-	-	-	-	686	683	-	503	501	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.372
Pot Cap-1 Maneuver	918	-	-	1067	-	-	166	190	575	167	191	447
Stage 1	-	-	-	-	-	-	554	544	-	443	452	-
Stage 2	-	-	-	-	-	-	438	449	-	551	543	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	918	-	-	1067	-	-	160	188	574	162	189	446
Mov Cap-2 Maneuver	-	-	-	-	-	-	160	188	-	162	189	-
Stage 1	-	-	-	-	-	-	552	542	-	442	449	-
Stage 2	-	-	-	-	-	-	422	446	-	541	541	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	21.1	21
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	239	918	-	-	1067	-	-	248
HCM Lane V/C Ratio	0.062	0.002	-	-	0.005	-	-	0.094
HCM Control Delay (s)	21.1	8.9	0	-	8.4	0	-	21
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	486	0	0	636	60	0	0	0	187	0	32
Future Volume (veh/h)	3	486	0	0	636	60	0	0	0	187	0	32
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		0.98	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	1411	1826	1826	1870	1841	1841	1870	1870	1870	1870	1870	1767
Adj Flow Rate, veh/h	3	528	0	0	691	65	0	0	0	203	0	35
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, %	33	5	5	2	4	4	2	2	2	2	2	9
Cap, veh/h	341	1145	0	149	1036	97	0	388	0	443	0	310
Arrive On Green	0.63	0.63	0.00	0.00	0.63	0.62	0.00	0.00	0.00	0.21	0.00	0.21
Sat Flow, veh/h	534	1826	0	875	1653	156	0	1870	0	1414	0	1494
Grp Volume(v), veh/h	3	528	0	0	0	756	0	0	0	203	0	35
Grp Sat Flow(s),veh/h/ln	534	1826	0	875	0	1809	0	1870	0	1414	0	1494
Q Serve(g_s), s	0.2	7.3	0.0	0.0	0.0	13.0	0.0	0.0	0.0	6.4	0.0	0.9
Cycle Q Clear(g_c), s	13.1	7.3	0.0	0.0	0.0	13.0	0.0	0.0	0.0	6.4	0.0	0.9
Prop In Lane	1.00		0.00	1.00		0.09	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	341	1145	0	149	0	1134	0	388	0	443	0	310
V/C Ratio(X)	0.01	0.46	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.46	0.00	0.11
Avail Cap(c_a), veh/h	341	1145	0	149	0	1134	0	840	0	784	0	671
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.0	4.7	0.0	0.0	0.0	5.8	0.0	0.0	0.0	17.7	0.0	15.5
Incr Delay (d2), s/veh	0.0	1.3	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.7	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	0.0	2.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	1.9	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.0	6.1	0.0	0.0	0.0	8.9	0.0	0.0	0.0	18.5	0.0	15.7
LnGrp LOS	B	A	A	A	A	A	A	A	A	B	A	B
Approach Vol, veh/h		531			756			0			238	
Approach Delay, s/veh		6.1			8.9			0.0			18.1	
Approach LOS		A			A						B	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	14.0	34.3	14.0	34.3
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	21.2	29.8	21.2	29.8
Max Q Clear Time (g_c+I1), s	0.0	15.1	8.4	15.0
Green Ext Time (p_c), s	0.0	3.0	1.0	4.9

Intersection Summary	
HCM 6th Ctrl Delay	9.4
HCM 6th LOS	A

Intersection												
Int Delay, s/veh	0.3											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	3	665	6	4	689	1	2	0	16	1	0	0
Future Vol, veh/h	3	665	6	4	689	1	2	0	16	1	0	0
Conflicting Peds, #/hr	2	0	0	0	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	3	2	50	2	2	2	4	2	2	2	2
Mvmt Flow	3	723	7	4	749	1	2	0	17	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	752	0	0	730	0	0	1492	1493	727	1501	1496	753
Stage 1	-	-	-	-	-	-	733	733	-	760	760	-
Stage 2	-	-	-	-	-	-	759	760	-	741	736	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.12	6.54	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	3.518	4.036	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	858	-	-	691	-	-	102	122	424	100	123	410
Stage 1	-	-	-	-	-	-	412	423	-	398	414	-
Stage 2	-	-	-	-	-	-	399	412	-	408	425	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	856	-	-	691	-	-	101	120	424	95	121	409
Mov Cap-2 Maneuver	-	-	-	-	-	-	101	120	-	95	121	-
Stage 1	-	-	-	-	-	-	410	420	-	395	409	-
Stage 2	-	-	-	-	-	-	395	407	-	389	422	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	17.3	43.3
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	313	856	-	-	691	-	-	95
HCM Lane V/C Ratio	0.063	0.004	-	-	0.006	-	-	0.011
HCM Control Delay (s)	17.3	9.2	0	-	10.2	0	-	43.3
HCM Lane LOS	C	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection												
Int Delay, s/veh	0.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	8	678	0	0	695	3	1	0	0	1	0	5
Future Vol, veh/h	8	678	0	0	695	3	1	0	0	1	0	5
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	2	2	2
Mvmt Flow	9	745	0	0	764	3	1	0	0	1	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	769	0	0	745	0	0	1531	1532	745	1531	1531	768
Stage 1	-	-	-	-	-	-	763	763	-	768	768	-
Stage 2	-	-	-	-	-	-	768	769	-	763	763	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	845	-	-	863	-	-	96	117	414	96	117	402
Stage 1	-	-	-	-	-	-	397	413	-	394	411	-
Stage 2	-	-	-	-	-	-	394	411	-	397	413	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	843	-	-	863	-	-	93	115	414	94	115	401
Mov Cap-2 Maneuver	-	-	-	-	-	-	93	115	-	94	115	-
Stage 1	-	-	-	-	-	-	390	406	-	386	410	-
Stage 2	-	-	-	-	-	-	389	410	-	390	406	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	44.2	19.2
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	93	843	-	-	863	-	-	260
HCM Lane V/C Ratio	0.012	0.01	-	-	-	-	-	0.025
HCM Control Delay (s)	44.2	9.3	0	-	0	-	-	19.2
HCM Lane LOS	E	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	694	0	0	714	19	0	0	1	16	0	9
Future Vol, veh/h	18	694	0	0	714	19	0	0	1	16	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	6	2	2
Mvmt Flow	19	746	0	0	768	20	0	0	1	17	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	788	0	0	746	0	0	1567	1572	746	1563	1562	778
Stage 1	-	-	-	-	-	-	784	784	-	778	778	-
Stage 2	-	-	-	-	-	-	783	788	-	785	784	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.318
Pot Cap-1 Maneuver	831	-	-	862	-	-	90	110	413	89	112	396
Stage 1	-	-	-	-	-	-	386	404	-	383	407	-
Stage 2	-	-	-	-	-	-	387	402	-	380	404	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	831	-	-	862	-	-	85	106	413	86	108	396
Mov Cap-2 Maneuver	-	-	-	-	-	-	85	106	-	86	108	-
Stage 1	-	-	-	-	-	-	371	388	-	368	407	-
Stage 2	-	-	-	-	-	-	378	402	-	364	388	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	13.7	43.5
HCM LOS			B	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	413	831	-	-	862	-	-	120
HCM Lane V/C Ratio	0.003	0.023	-	-	-	-	-	0.224
HCM Control Delay (s)	13.7	9.4	0	-	0	-	-	43.5
HCM Lane LOS	B	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.8

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	31	685	5	2	707	12	0	0	6	7	1	31
Future Vol, veh/h	31	685	5	2	707	12	0	0	6	7	1	31
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	7	7	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	3	3	2	2	3	2	2	2	17	2	2	3
Mvmt Flow	34	745	5	2	768	13	0	0	7	8	1	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	782	0	0	755	0	0	1617	1607	760	1606	1603	776
Stage 1	-	-	-	-	-	-	821	821	-	780	780	-
Stage 2	-	-	-	-	-	-	796	786	-	826	823	-
Critical Hdwy	4.13	-	-	4.12	-	-	7.12	6.52	6.37	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.227	-	-	2.218	-	-	3.518	4.018	3.453	3.518	4.018	3.327
Pot Cap-1 Maneuver	831	-	-	855	-	-	83	105	383	85	106	396
Stage 1	-	-	-	-	-	-	369	389	-	388	406	-
Stage 2	-	-	-	-	-	-	380	403	-	366	388	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	830	-	-	851	-	-	71	97	379	78	98	396
Mov Cap-2 Maneuver	-	-	-	-	-	-	71	97	-	78	98	-
Stage 1	-	-	-	-	-	-	342	360	-	360	404	-
Stage 2	-	-	-	-	-	-	345	401	-	332	359	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	14.7	25.3
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	379	830	-	-	851	-	-	219
HCM Lane V/C Ratio	0.017	0.041	-	-	0.003	-	-	0.194
HCM Control Delay (s)	14.7	9.5	0	-	9.2	0	-	25.3
HCM Lane LOS	B	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.7

Intersection	
Int Delay, s/veh	9.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			⊣	↱
Traffic Vol, veh/h	31	26	8	19	34	1	3	54	2	16	189	91
Future Vol, veh/h	31	26	8	19	34	1	3	54	2	16	189	91
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	-	-	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	10	4	2	5	3	2	2	2	50	2	3	2
Mvmt Flow	36	30	9	22	40	1	3	63	2	19	220	106

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	42	0	0	39	0	0	302	193	35	225	197	42
Stage 1	-	-	-	-	-	-	107	107	-	86	86	-
Stage 2	-	-	-	-	-	-	195	86	-	139	111	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.12	6.52	6.7	7.12	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.518	4.018	3.75	3.518	4.027	3.318
Pot Cap-1 Maneuver	1517	-	-	1552	-	-	650	702	916	730	697	1029
Stage 1	-	-	-	-	-	-	898	807	-	922	822	-
Stage 2	-	-	-	-	-	-	807	824	-	864	802	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1516	-	-	1552	-	-	423	674	916	656	669	1028
Mov Cap-2 Maneuver	-	-	-	-	-	-	423	674	-	656	669	-
Stage 1	-	-	-	-	-	-	876	788	-	899	809	-
Stage 2	-	-	-	-	-	-	519	811	-	774	783	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.5	2.6	11.1	11.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	660	1516	-	-	1552	-	-	668	1028
HCM Lane V/C Ratio	0.104	0.024	-	-	0.014	-	-	0.357	0.103
HCM Control Delay (s)	11.1	7.4	0	-	7.4	0	-	13.3	8.9
HCM Lane LOS	B	A	A	-	A	A	-	B	A
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	1.6	0.3

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	7	29	1	1	57	3	3	4	3	16	1	11
Future Vol, veh/h	7	29	1	1	57	3	3	4	3	16	1	11
Conflicting Peds, #/hr	3	0	1	1	0	3	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	43	2	2	2	2	2	2	2	2	6	2	36
Mvmt Flow	7	31	1	1	61	3	3	4	3	17	1	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	67	0	0	33	0	0	118	116	35	119	115	66
Stage 1	-	-	-	-	-	-	47	47	-	68	68	-
Stage 2	-	-	-	-	-	-	71	69	-	51	47	-
Critical Hdwy	4.53	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.56
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.587	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.624
Pot Cap-1 Maneuver	1310	-	-	1579	-	-	858	774	1038	847	775	910
Stage 1	-	-	-	-	-	-	967	856	-	932	838	-
Stage 2	-	-	-	-	-	-	939	837	-	952	856	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1306	-	-	1577	-	-	842	766	1035	833	767	907
Mov Cap-2 Maneuver	-	-	-	-	-	-	842	766	-	833	767	-
Stage 1	-	-	-	-	-	-	961	851	-	925	835	-
Stage 2	-	-	-	-	-	-	925	834	-	938	851	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.5	0.1	9.3	9.3
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	856	1306	-	-	1577	-	-	858
HCM Lane V/C Ratio	0.012	0.006	-	-	0.001	-	-	0.035
HCM Control Delay (s)	9.3	7.8	0	-	7.3	0	-	9.3
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	1	100	2	1	283
Future Vol, veh/h	13	1	100	2	1	283
Conflicting Peds, #/hr	1	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	23	2	6	2	2	2
Mvmt Flow	16	1	120	2	1	341

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	465	121	0	0	122	0
Stage 1	121	-	-	-	-	-
Stage 2	344	-	-	-	-	-
Critical Hdwy	6.63	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.63	-	-	-	-	-
Critical Hdwy Stg 2	5.63	-	-	-	-	-
Follow-up Hdwy	3.707	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	519	930	-	-	1465	-
Stage 1	855	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	518	930	-	-	1465	-
Mov Cap-2 Maneuver	518	-	-	-	-	-
Stage 1	855	-	-	-	-	-
Stage 2	672	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	535	1465	-
HCM Lane V/C Ratio	-	-	0.032	0.001	-
HCM Control Delay (s)	-	-	11.9	7.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	77	0	1	1	53	48	1	198	0
Future Vol, veh/h	0	0	0	77	0	1	1	53	48	1	198	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	100	2	11	2	2	2	2
Mvmt Flow	0	0	0	88	0	1	1	60	55	1	225	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	317	344	225	317	317	88	225	0	0	115	0	0
Stage 1	227	227	-	90	90	-	-	-	-	-	-	-
Stage 2	90	117	-	227	227	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	7.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	4.2	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	636	579	814	636	599	756	1344	-	-	1474	-	-
Stage 1	776	716	-	917	820	-	-	-	-	-	-	-
Stage 2	917	799	-	776	716	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	634	578	814	635	598	756	1344	-	-	1474	-	-
Mov Cap-2 Maneuver	634	578	-	635	598	-	-	-	-	-	-	-
Stage 1	775	715	-	916	819	-	-	-	-	-	-	-
Stage 2	915	798	-	775	715	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	11.6	0.1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1344	-	-	-	636	1474	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.139	0.001	-	-
HCM Control Delay (s)	7.7	0	-	0	11.6	7.4	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.5	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	20	0	1	0	40	5	0	170	0
Future Vol, veh/h	0	0	1	20	0	1	0	40	5	0	170	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	1	22	0	1	0	43	5	0	185	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	231	233	185	232	231	46	185	0	0	48	0	0
Stage 1	185	185	-	46	46	-	-	-	-	-	-	-
Stage 2	46	48	-	186	185	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	724	667	857	723	669	1023	1390	-	-	1559	-	-
Stage 1	817	747	-	968	857	-	-	-	-	-	-	-
Stage 2	968	855	-	816	747	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	723	667	857	722	669	1023	1390	-	-	1559	-	-
Mov Cap-2 Maneuver	723	667	-	722	669	-	-	-	-	-	-	-
Stage 1	817	747	-	968	857	-	-	-	-	-	-	-
Stage 2	967	855	-	815	747	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.2	10.1	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1390	-	-	857	732	1559	-	-
HCM Lane V/C Ratio	-	-	-	0.001	0.031	-	-	-
HCM Control Delay (s)	0	-	-	9.2	10.1	0	-	-
HCM Lane LOS	A	-	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	20	0	1	0	35	5	0	150	0
Future Vol, veh/h	0	0	1	20	0	1	0	35	5	0	150	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	11	2	2	2	2
Mvmt Flow	0	0	1	24	0	1	0	42	6	0	181	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	227	229	181	227	226	45	181	0	0	48	0	0
Stage 1	181	181	-	45	45	-	-	-	-	-	-	-
Stage 2	46	48	-	182	181	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	728	671	862	728	673	1025	1394	-	-	1559	-	-
Stage 1	821	750	-	969	857	-	-	-	-	-	-	-
Stage 2	968	855	-	820	750	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	727	671	862	727	673	1025	1394	-	-	1559	-	-
Mov Cap-2 Maneuver	727	671	-	727	673	-	-	-	-	-	-	-
Stage 1	821	750	-	969	857	-	-	-	-	-	-	-
Stage 2	967	855	-	819	750	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.2	10.1	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1394	-	-	862	737	1559	-	-
HCM Lane V/C Ratio	-	-	-	0.001	0.034	-	-	-
HCM Control Delay (s)	0	-	-	9.2	10.1	0	-	-
HCM Lane LOS	A	-	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	19	0	1	0	13	7	0	30	0
Future Vol, veh/h	0	0	0	19	0	1	0	13	7	0	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	5	2	2	2	15	14	2	2	2
Mvmt Flow	0	0	0	22	0	1	0	15	8	0	34	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	54	58	34	54	54	20	34	0	0	24	0	0
Stage 1	34	34	-	20	20	-	-	-	-	-	-	-
Stage 2	20	24	-	34	34	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	944	833	1039	937	837	1058	1578	-	-	1591	-	-
Stage 1	982	867	-	991	879	-	-	-	-	-	-	-
Stage 2	999	875	-	974	867	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	943	832	1039	936	836	1057	1578	-	-	1589	-	-
Mov Cap-2 Maneuver	943	832	-	936	836	-	-	-	-	-	-	-
Stage 1	982	867	-	990	878	-	-	-	-	-	-	-
Stage 2	998	874	-	974	867	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	8.9	0	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1578	-	-	-	941	1589	-	-
HCM Lane V/C Ratio	-	-	-	-	0.024	-	-	-
HCM Control Delay (s)	0	-	-	0	8.9	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	678	25	80	427	18	75
Future Vol, veh/h	678	25	80	427	18	75
Conflicting Peds, #/hr	0	1	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	11	4	4	6	10
Mvmt Flow	714	26	84	449	19	79

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	741	0	1345	729
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	617	-
Critical Hdwy	-	-	4.14	-	6.46	6.3
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.236	-	3.554	3.39
Pot Cap-1 Maneuver	-	-	857	-	164	410
Stage 1	-	-	-	-	471	-
Stage 2	-	-	-	-	531	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	856	-	148	409
Mov Cap-2 Maneuver	-	-	-	-	148	-
Stage 1	-	-	-	-	471	-
Stage 2	-	-	-	-	479	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	22.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	305	-	-	856	-
HCM Lane V/C Ratio	0.321	-	-	0.098	-
HCM Control Delay (s)	22.3	-	-	9.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1.3	-	-	0.3	-

Intersection												
Int Delay, s/veh	1.8											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	86	660	6	7	445	1	7	5	20	0	1	54
Future Vol, veh/h	86	660	6	7	445	1	7	5	20	0	1	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	12	4	2	11	4	2	2	2	67	2	2	3
Mvmt Flow	91	695	6	7	468	1	7	5	21	0	1	57

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	469	0	0	701	0	0	1392	1363	698	1376	1366	469
Stage 1	-	-	-	-	-	-	880	880	-	483	483	-
Stage 2	-	-	-	-	-	-	512	483	-	893	883	-
Critical Hdwy	4.22	-	-	4.21	-	-	7.12	6.52	6.87	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.308	-	-	2.299	-	-	3.518	4.018	3.903	3.518	4.018	3.327
Pot Cap-1 Maneuver	1042	-	-	856	-	-	119	148	347	122	147	592
Stage 1	-	-	-	-	-	-	342	365	-	565	553	-
Stage 2	-	-	-	-	-	-	545	553	-	336	364	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1042	-	-	856	-	-	94	126	347	98	125	592
Mov Cap-2 Maneuver	-	-	-	-	-	-	94	126	-	98	125	-
Stage 1	-	-	-	-	-	-	293	313	-	484	547	-
Stage 2	-	-	-	-	-	-	486	547	-	266	312	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0.1	28.6	12.3
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	186	1042	-	-	856	-	-	554
HCM Lane V/C Ratio	0.181	0.087	-	-	0.009	-	-	0.105
HCM Control Delay (s)	28.6	8.8	0	-	9.2	-	-	12.3
HCM Lane LOS	D	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.6	0.3	-	-	0	-	-	0.3

Intersection												
Int Delay, s/veh	0.9											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	665	14	21	426	10	8	2	12	5	1	16
Future Vol, veh/h	3	665	14	21	426	10	8	2	12	5	1	16
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	1	1	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	4	2	2	4	9	2	2	2	2	2	8
Mvmt Flow	3	707	15	22	453	11	9	2	13	5	1	17

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	464	0	0	722	0	0	1235	1229	716	1232	1231	461
Stage 1	-	-	-	-	-	-	721	721	-	503	503	-
Stage 2	-	-	-	-	-	-	514	508	-	729	728	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.372
Pot Cap-1 Maneuver	1097	-	-	880	-	-	153	178	430	154	177	588
Stage 1	-	-	-	-	-	-	419	432	-	551	541	-
Stage 2	-	-	-	-	-	-	543	539	-	414	429	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1097	-	-	880	-	-	143	171	430	144	170	587
Mov Cap-2 Maneuver	-	-	-	-	-	-	143	171	-	144	170	-
Stage 1	-	-	-	-	-	-	417	430	-	548	523	-
Stage 2	-	-	-	-	-	-	507	521	-	397	427	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	22.4	17
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	230	1097	-	-	880	-	-	324
HCM Lane V/C Ratio	0.102	0.003	-	-	0.025	-	-	0.072
HCM Control Delay (s)	22.4	8.3	0	-	9.2	0	-	17
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	673	0	0	449	157	0	0	1	142	1	28
Future Volume (veh/h)	18	673	0	0	449	157	0	0	1	142	1	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		0.98	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	1411	1826	1826	1870	1841	1841	1870	1870	1870	1870	1870	1767
Adj Flow Rate, veh/h	20	732	0	0	488	171	0	0	1	154	1	30
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, %	33	5	5	2	4	4	2	2	2	2	2	9
Cap, veh/h	243	928	0	120	658	231	0	0	567	623	4	536
Arrive On Green	0.51	0.51	0.00	0.00	0.51	0.50	0.00	0.00	0.35	0.36	0.36	0.36
Sat Flow, veh/h	585	1826	0	724	1294	454	0	0	1583	1406	10	1495
Grp Volume(v), veh/h	20	732	0	0	0	659	0	0	1	155	0	30
Grp Sat Flow(s),veh/h/ln	585	1826	0	724	0	1748	0	0	1583	1416	0	1495
Q Serve(g_s), s	1.7	19.7	0.0	0.0	0.0	17.9	0.0	0.0	0.0	4.7	0.0	0.8
Cycle Q Clear(g_c), s	19.6	19.7	0.0	0.0	0.0	17.9	0.0	0.0	0.0	4.7	0.0	0.8
Prop In Lane	1.00		0.00	1.00		0.26	0.00		1.00	0.99		1.00
Lane Grp Cap(c), veh/h	243	928	0	120	0	888	0	0	567	627	0	536
V/C Ratio(X)	0.08	0.79	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.25	0.00	0.06
Avail Cap(c_a), veh/h	243	928	0	120	0	888	0	0	567	627	0	536
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.4	12.1	0.0	0.0	0.0	11.7	0.0	0.0	12.5	13.9	0.0	12.6
Incr Delay (d2), s/veh	0.7	6.8	0.0	0.0	0.0	5.6	0.0	0.0	0.0	0.9	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	0.3	8.2	0.0	0.0	0.0	7.0	0.0	0.0	0.0	1.5	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.0	18.9	0.0	0.0	0.0	17.3	0.0	0.0	12.5	14.8	0.0	12.8
LnGrp LOS	C	B	A	A	A	B	A	A	B	B	A	B
Approach Vol, veh/h		752			659			1			185	
Approach Delay, s/veh		18.9			17.3			12.5			14.5	
Approach LOS		B			B			B			B	

Timer - Assigned Phs				
Phs Duration (G+Y+Rc), s	25.5	34.5	25.5	34.5
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	21.0	30.0	21.0	30.0
Max Q Clear Time (g_c+I1), s	2.0	21.7	6.7	19.9
Green Ext Time (p_c), s	0.0	3.3	0.7	3.3

Intersection Summary	
HCM 6th Ctrl Delay	17.7
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	787	29	38	593	1	6	0	29	2	0	2
Future Vol, veh/h	1	787	29	38	593	1	6	0	29	2	0	2
Conflicting Peds, #/hr	2	0	0	0	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	3	2	50	2	2	2	4	2	2	2	2
Mvmt Flow	1	855	32	41	645	1	7	0	32	2	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	648	0	0	887	0	0	1603	1603	871	1619	1619	649
Stage 1	-	-	-	-	-	-	873	873	-	730	730	-
Stage 2	-	-	-	-	-	-	730	730	-	889	889	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.12	6.54	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	3.518	4.036	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	938	-	-	596	-	-	85	104	350	83	103	470
Stage 1	-	-	-	-	-	-	345	365	-	414	428	-
Stage 2	-	-	-	-	-	-	414	425	-	338	361	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	936	-	-	596	-	-	78	92	350	69	92	469
Mov Cap-2 Maneuver	-	-	-	-	-	-	78	92	-	69	92	-
Stage 1	-	-	-	-	-	-	344	364	-	412	381	-
Stage 2	-	-	-	-	-	-	368	379	-	307	360	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.7	24.9	36.1
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	219	936	-	-	596	-	-	120
HCM Lane V/C Ratio	0.174	0.001	-	-	0.069	-	-	0.036
HCM Control Delay (s)	24.9	8.9	0	-	11.5	0	-	36.1
HCM Lane LOS	C	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	0.6	0	-	-	0.2	-	-	0.1

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	8	807	0	0	618	5	0	0	0	5	0	6
Future Vol, veh/h	8	807	0	0	618	5	0	0	0	5	0	6
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	2	2	2
Mvmt Flow	9	887	0	0	679	5	0	0	0	5	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	686	0	0	887	0	0	1590	1591	887	1589	1589	684
Stage 1	-	-	-	-	-	-	905	905	-	684	684	-
Stage 2	-	-	-	-	-	-	685	686	-	905	905	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	908	-	-	763	-	-	87	107	343	87	108	449
Stage 1	-	-	-	-	-	-	331	355	-	439	449	-
Stage 2	-	-	-	-	-	-	438	448	-	331	355	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	906	-	-	763	-	-	84	105	343	86	106	448
Mov Cap-2 Maneuver	-	-	-	-	-	-	84	105	-	86	106	-
Stage 1	-	-	-	-	-	-	324	348	-	429	448	-
Stage 2	-	-	-	-	-	-	432	447	-	324	348	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	30.4
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	906	-	-	763	-	-	154
HCM Lane V/C Ratio	-	0.01	-	-	-	-	-	0.078
HCM Control Delay (s)	0	9	0	-	0	-	-	30.4
HCM Lane LOS	A	A	A	-	A	-	-	D
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	23	829	0	0	647	30	0	0	2	10	0	13
Future Vol, veh/h	23	829	0	0	647	30	0	0	2	10	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	6	2	2
Mvmt Flow	25	891	0	0	696	32	0	0	2	11	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	728	0	0	891	0	0	1660	1669	891	1654	1653	712
Stage 1	-	-	-	-	-	-	941	941	-	712	712	-
Stage 2	-	-	-	-	-	-	719	728	-	942	941	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.318
Pot Cap-1 Maneuver	876	-	-	761	-	-	78	96	341	77	98	432
Stage 1	-	-	-	-	-	-	316	342	-	417	436	-
Stage 2	-	-	-	-	-	-	420	429	-	310	342	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	876	-	-	761	-	-	72	91	341	73	92	432
Mov Cap-2 Maneuver	-	-	-	-	-	-	72	91	-	73	92	-
Stage 1	-	-	-	-	-	-	298	323	-	393	436	-
Stage 2	-	-	-	-	-	-	406	429	-	290	323	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	15.6	36.7
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	341	876	-	-	761	-	-	138
HCM Lane V/C Ratio	0.006	0.028	-	-	-	-	-	0.179
HCM Control Delay (s)	15.6	9.2	0	-	0	-	-	36.7
HCM Lane LOS	C	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.6

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	38	796	7	5	630	35	3	0	14	24	0	44
Future Vol, veh/h	38	796	7	5	630	35	3	0	14	24	0	44
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	7	7	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	3	3	2	2	3	2	2	2	17	2	2	3
Mvmt Flow	41	865	8	5	685	38	3	0	15	26	0	48

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	724	0	0	878	0	0	1694	1690	881	1681	1675	705
Stage 1	-	-	-	-	-	-	956	956	-	715	715	-
Stage 2	-	-	-	-	-	-	738	734	-	966	960	-
Critical Hdwy	4.13	-	-	4.12	-	-	7.12	6.52	6.37	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.227	-	-	2.218	-	-	3.518	4.018	3.453	3.518	4.018	3.327
Pot Cap-1 Maneuver	874	-	-	769	-	-	73	93	325	75	95	435
Stage 1	-	-	-	-	-	-	310	336	-	422	434	-
Stage 2	-	-	-	-	-	-	410	426	-	306	335	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	873	-	-	765	-	-	60	83	321	65	85	435
Mov Cap-2 Maneuver	-	-	-	-	-	-	60	83	-	65	85	-
Stage 1	-	-	-	-	-	-	281	304	-	383	429	-
Stage 2	-	-	-	-	-	-	361	421	-	263	303	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.1	27	53.2
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	182	873	-	-	765	-	-	145
HCM Lane V/C Ratio	0.102	0.047	-	-	0.007	-	-	0.51
HCM Control Delay (s)	27	9.3	0	-	9.7	0	-	53.2
HCM Lane LOS	D	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	2.4

Intersection	
Int Delay, s/veh	10.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	82	25	6	30	39	35	3	153	12	15	123	29
Future Vol, veh/h	82	25	6	30	39	35	3	153	12	15	123	29
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	-	-	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	10	4	2	5	3	2	2	2	50	2	3	2
Mvmt Flow	95	29	7	35	45	41	3	178	14	17	143	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	87	0	0	36	0	0	430	380	33	456	363	67
Stage 1	-	-	-	-	-	-	223	223	-	137	137	-
Stage 2	-	-	-	-	-	-	207	157	-	319	226	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.12	6.52	6.7	7.12	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.518	4.018	3.75	3.518	4.027	3.318
Pot Cap-1 Maneuver	1460	-	-	1556	-	-	535	552	918	515	563	997
Stage 1	-	-	-	-	-	-	780	719	-	866	781	-
Stage 2	-	-	-	-	-	-	795	768	-	693	715	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1459	-	-	1556	-	-	379	503	918	344	513	996
Mov Cap-2 Maneuver	-	-	-	-	-	-	379	503	-	344	513	-
Stage 1	-	-	-	-	-	-	729	672	-	808	761	-
Stage 2	-	-	-	-	-	-	609	749	-	469	668	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.5	2.1	16.1	14.7
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	517	1459	-	-	1556	-	-	487	996
HCM Lane V/C Ratio	0.378	0.065	-	-	0.022	-	-	0.329	0.034
HCM Control Delay (s)	16.1	7.6	0	-	7.4	0	-	16	8.7
HCM Lane LOS	C	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	1.7	0.2	-	-	0.1	-	-	1.4	0.1

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	42	0	5	91	27	3	1	3	10	3	14
Future Vol, veh/h	14	42	0	5	91	27	3	1	3	10	3	14
Conflicting Peds, #/hr	3	0	1	1	0	3	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	43	2	2	2	2	2	2	2	2	6	2	36
Mvmt Flow	15	45	0	5	97	29	3	1	3	11	3	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	129	0	0	46	0	0	207	215	48	204	201	115
Stage 1	-	-	-	-	-	-	76	76	-	125	125	-
Stage 2	-	-	-	-	-	-	131	139	-	79	76	-
Critical Hdwy	4.53	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.56
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.587	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.624
Pot Cap-1 Maneuver	1239	-	-	1562	-	-	751	683	1021	745	695	853
Stage 1	-	-	-	-	-	-	933	832	-	869	792	-
Stage 2	-	-	-	-	-	-	873	782	-	920	832	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1235	-	-	1561	-	-	726	670	1018	730	682	851
Mov Cap-2 Maneuver	-	-	-	-	-	-	726	670	-	730	682	-
Stage 1	-	-	-	-	-	-	921	821	-	856	787	-
Stage 2	-	-	-	-	-	-	852	777	-	903	821	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0.3	9.4	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	817	1235	-	-	1561	-	-	782
HCM Lane V/C Ratio	0.009	0.012	-	-	0.003	-	-	0.037
HCM Control Delay (s)	9.4	8	0	-	7.3	0	-	9.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	0	269	11	0	164
Future Vol, veh/h	6	0	269	11	0	164
Conflicting Peds, #/hr	1	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	23	2	6	2	2	2
Mvmt Flow	7	0	324	13	0	198

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	530	331	0	0	337	0
Stage 1	331	-	-	-	-	-
Stage 2	199	-	-	-	-	-
Critical Hdwy	6.63	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.63	-	-	-	-	-
Critical Hdwy Stg 2	5.63	-	-	-	-	-
Follow-up Hdwy	3.707	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	475	711	-	-	1222	-
Stage 1	683	-	-	-	-	-
Stage 2	787	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	475	711	-	-	1222	-
Mov Cap-2 Maneuver	475	-	-	-	-	-
Stage 1	683	-	-	-	-	-
Stage 2	786	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	475	1222	-
HCM Lane V/C Ratio	-	-	0.015	-	-
HCM Control Delay (s)	-	-	12.7	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection												
Int Delay, s/veh	1.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	44	0	0	1	155	106	0	115	0
Future Vol, veh/h	0	0	0	44	0	0	1	155	106	0	115	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	100	2	11	2	2	2	2
Mvmt Flow	0	0	0	50	0	0	1	176	120	0	131	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	369	429	131	369	369	236	131	0	0	296	0	0
Stage 1	131	131	-	238	238	-	-	-	-	-	-	-
Stage 2	238	298	-	131	131	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	7.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	4.2	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	588	518	919	588	560	612	1454	-	-	1265	-	-
Stage 1	873	788	-	765	708	-	-	-	-	-	-	-
Stage 2	765	667	-	873	788	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	587	517	919	587	559	612	1454	-	-	1265	-	-
Mov Cap-2 Maneuver	587	517	-	587	559	-	-	-	-	-	-	-
Stage 1	872	788	-	764	707	-	-	-	-	-	-	-
Stage 2	764	666	-	873	788	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	11.7	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1454	-	-	-	587	1265	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.085	-	-	-
HCM Control Delay (s)	7.5	0	-	0	11.7	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.3	0	-	-

Intersection												
Int Delay, s/veh	0.4											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	10	0	0	1	140	10	0	95	0
Future Vol, veh/h	0	0	0	10	0	0	1	140	10	0	95	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	11	0	0	1	152	11	0	103	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	263	268	103	263	263	158	103	0	0	163	0	0
Stage 1	103	103	-	160	160	-	-	-	-	-	-	-
Stage 2	160	165	-	103	103	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	690	638	952	690	642	887	1489	-	-	1416	-	-
Stage 1	903	810	-	842	766	-	-	-	-	-	-	-
Stage 2	842	762	-	903	810	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	689	637	952	689	641	887	1489	-	-	1416	-	-
Mov Cap-2 Maneuver	689	637	-	689	641	-	-	-	-	-	-	-
Stage 1	902	810	-	841	765	-	-	-	-	-	-	-
Stage 2	841	761	-	903	810	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	10.3	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1489	-	-	-	689	1416	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.016	-	-	-
HCM Control Delay (s)	7.4	0	-	0	10.3	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0	-	-

Intersection												
Int Delay, s/veh	0.6											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	11	0	0	4	123	7	0	82	0
Future Vol, veh/h	0	0	0	11	0	0	4	123	7	0	82	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	11	2	2	2	2
Mvmt Flow	0	0	0	13	0	0	5	148	8	0	99	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	261	265	99	261	261	152	99	0	0	156	0	0
Stage 1	99	99	-	162	162	-	-	-	-	-	-	-
Stage 2	162	166	-	99	99	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	692	640	957	692	644	894	1494	-	-	1424	-	-
Stage 1	907	813	-	840	764	-	-	-	-	-	-	-
Stage 2	840	761	-	907	813	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	690	637	957	690	641	894	1494	-	-	1424	-	-
Mov Cap-2 Maneuver	690	637	-	690	641	-	-	-	-	-	-	-
Stage 1	903	813	-	837	761	-	-	-	-	-	-	-
Stage 2	837	758	-	907	813	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	10.3	0.2	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1494	-	-	-	690	1424	-	-
HCM Lane V/C Ratio	0.003	-	-	-	0.019	-	-	-
HCM Control Delay (s)	7.4	0	-	0	10.3	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0	-	-

Intersection												
Int Delay, s/veh	1.1											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	9	0	1	0	36	24	1	20	0
Future Vol, veh/h	0	0	0	9	0	1	0	36	24	1	20	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	5	2	2	2	15	14	2	2	2
Mvmt Flow	0	0	0	10	0	1	0	41	27	1	23	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	80	94	23	81	81	56	23	0	0	69	0	0
Stage 1	25	25	-	56	56	-	-	-	-	-	-	-
Stage 2	55	69	-	25	25	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	908	796	1054	900	809	1011	1592	-	-	1532	-	-
Stage 1	993	874	-	949	848	-	-	-	-	-	-	-
Stage 2	957	837	-	985	874	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	906	794	1054	898	807	1010	1592	-	-	1531	-	-
Mov Cap-2 Maneuver	906	794	-	898	807	-	-	-	-	-	-	-
Stage 1	993	873	-	948	847	-	-	-	-	-	-	-
Stage 2	956	836	-	984	873	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	9	0	0.4
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1592	-	-	-	908	1531	-	-
HCM Lane V/C Ratio	-	-	-	-	0.013	0.001	-	-
HCM Control Delay (s)	0	-	-	0	9	7.4	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0	-	-

APPENDIX C

Analysis Reports Future (2025) Without Project Conditions

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	452	18	80	677	18	68
Future Vol, veh/h	452	18	80	677	18	68
Conflicting Peds, #/hr	0	1	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	11	4	4	6	10
Mvmt Flow	476	19	84	713	19	72

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	496	0	1368	488
Stage 1	-	-	-	-	487	-
Stage 2	-	-	-	-	881	-
Critical Hdwy	-	-	4.14	-	6.46	6.3
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.236	-	3.554	3.39
Pot Cap-1 Maneuver	-	-	1058	-	159	564
Stage 1	-	-	-	-	610	-
Stage 2	-	-	-	-	399	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1057	-	146	563
Mov Cap-2 Maneuver	-	-	-	-	146	-
Stage 1	-	-	-	-	609	-
Stage 2	-	-	-	-	367	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	18.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	352	-	-	1057	-
HCM Lane V/C Ratio	0.257	-	-	0.08	-
HCM Control Delay (s)	18.7	-	-	8.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1	-	-	0.3	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	50	464	2	9	642	2	0	0	6	0	0	116
Future Vol, veh/h	50	464	2	9	642	2	0	0	6	0	0	116
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	12	4	2	11	4	2	2	2	67	2	2	3
Mvmt Flow	53	488	2	9	676	2	0	0	6	0	0	122

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	678	0	0	490	0	0	1351	1291	489	1293	1291	677
Stage 1	-	-	-	-	-	-	595	595	-	695	695	-
Stage 2	-	-	-	-	-	-	756	696	-	598	596	-
Critical Hdwy	4.22	-	-	4.21	-	-	7.12	6.52	6.87	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.308	-	-	2.299	-	-	3.518	4.018	3.903	3.518	4.018	3.327
Pot Cap-1 Maneuver	869	-	-	1028	-	-	127	163	467	140	163	451
Stage 1	-	-	-	-	-	-	491	492	-	433	444	-
Stage 2	-	-	-	-	-	-	400	443	-	489	492	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	869	-	-	1028	-	-	86	147	467	128	147	451
Mov Cap-2 Maneuver	-	-	-	-	-	-	86	147	-	128	147	-
Stage 1	-	-	-	-	-	-	450	451	-	397	438	-
Stage 2	-	-	-	-	-	-	288	437	-	442	451	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.1	12.8	15.9
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	467	869	-	-	1028	-	-	451
HCM Lane V/C Ratio	0.014	0.061	-	-	0.009	-	-	0.271
HCM Control Delay (s)	12.8	9.4	0	-	8.5	-	-	15.9
HCM Lane LOS	B	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0.2	-	-	0	-	-	1.1

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	468	7	5	630	11	6	2	6	10	0	12
Future Vol, veh/h	2	468	7	5	630	11	6	2	6	10	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	1	1	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	4	2	2	4	9	2	2	2	2	2	8
Mvmt Flow	2	498	7	5	670	12	6	2	6	11	0	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	682	0	0	505	0	0	1201	1198	503	1197	1195	678
Stage 1	-	-	-	-	-	-	506	506	-	686	686	-
Stage 2	-	-	-	-	-	-	695	692	-	511	509	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.372
Pot Cap-1 Maneuver	911	-	-	1060	-	-	162	186	569	163	186	442
Stage 1	-	-	-	-	-	-	549	540	-	438	448	-
Stage 2	-	-	-	-	-	-	433	445	-	545	538	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	911	-	-	1060	-	-	156	184	568	158	184	441
Mov Cap-2 Maneuver	-	-	-	-	-	-	156	184	-	158	184	-
Stage 1	-	-	-	-	-	-	547	538	-	437	444	-
Stage 2	-	-	-	-	-	-	416	441	-	535	536	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	21.4	21.4
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	234	911	-	-	1060	-	-	243
HCM Lane V/C Ratio	0.064	0.002	-	-	0.005	-	-	0.096
HCM Control Delay (s)	21.4	9	0	-	8.4	0	-	21.4
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	493	0	0	646	61	0	0	0	190	0	32
Future Volume (veh/h)	3	493	0	0	646	61	0	0	0	190	0	32
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		0.98	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	1411	1826	1826	1870	1841	1841	1870	1870	1870	1870	1870	1767
Adj Flow Rate, veh/h	3	536	0	0	702	66	0	0	0	207	0	35
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, %	33	5	5	2	4	4	2	2	2	2	2	9
Cap, veh/h	195	925	0	120	838	79	0	673	0	630	0	538
Arrive On Green	0.51	0.51	0.00	0.00	0.51	0.50	0.00	0.00	0.00	0.36	0.00	0.36
Sat Flow, veh/h	528	1826	0	869	1653	155	0	1870	0	1416	0	1495
Grp Volume(v), veh/h	3	536	0	0	0	768	0	0	0	207	0	35
Grp Sat Flow(s),veh/h/ln	528	1826	0	869	0	1809	0	1870	0	1416	0	1495
Q Serve(g_s), s	0.3	12.3	0.0	0.0	0.0	21.8	0.0	0.0	0.0	6.6	0.0	0.9
Cycle Q Clear(g_c), s	22.1	12.3	0.0	0.0	0.0	21.8	0.0	0.0	0.0	6.6	0.0	0.9
Prop In Lane	1.00		0.00	1.00		0.09	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	195	925	0	120	0	916	0	673	0	630	0	538
V/C Ratio(X)	0.02	0.58	0.00	0.00	0.00	0.84	0.00	0.00	0.00	0.33	0.00	0.07
Avail Cap(c_a), veh/h	195	925	0	120	0	916	0	673	0	630	0	538
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.2	10.3	0.0	0.0	0.0	12.7	0.0	0.0	0.0	14.4	0.0	12.6
Incr Delay (d2), s/veh	0.1	2.6	0.0	0.0	0.0	9.0	0.0	0.0	0.0	1.4	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	0.0	4.7	0.0	0.0	0.0	9.4	0.0	0.0	0.0	2.1	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.3	13.0	0.0	0.0	0.0	21.7	0.0	0.0	0.0	15.8	0.0	12.8
LnGrp LOS	C	B	A	A	A	C	A	A	A	B	A	B
Approach Vol, veh/h		539			768			0			242	
Approach Delay, s/veh		13.0			21.7			0.0			15.4	
Approach LOS		B			C						B	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	25.6	34.4	25.6	34.4
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	21.1	29.9	21.1	29.9
Max Q Clear Time (g_c+I1), s	0.0	24.1	8.6	23.8
Green Ext Time (p_c), s	0.0	1.7	1.0	2.7

Intersection Summary	
HCM 6th Ctrl Delay	17.7
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	675	6	4	699	1	2	0	16	1	0	0
Future Vol, veh/h	3	675	6	4	699	1	2	0	16	1	0	0
Conflicting Peds, #/hr	2	0	0	0	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	3	2	50	2	2	2	4	2	2	2	2
Mvmt Flow	3	734	7	4	760	1	2	0	17	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	763	0	0	741	0	0	1514	1515	738	1523	1518	764
Stage 1	-	-	-	-	-	-	744	744	-	771	771	-
Stage 2	-	-	-	-	-	-	770	771	-	752	747	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.12	6.54	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	3.518	4.036	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	850	-	-	684	-	-	98	118	418	97	119	404
Stage 1	-	-	-	-	-	-	407	419	-	393	410	-
Stage 2	-	-	-	-	-	-	393	407	-	402	420	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	848	-	-	684	-	-	97	116	418	92	117	403
Mov Cap-2 Maneuver	-	-	-	-	-	-	97	116	-	92	117	-
Stage 1	-	-	-	-	-	-	405	416	-	390	405	-
Stage 2	-	-	-	-	-	-	389	402	-	383	417	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	17.6	44.6
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	306	848	-	-	684	-	-	92
HCM Lane V/C Ratio	0.064	0.004	-	-	0.006	-	-	0.012
HCM Control Delay (s)	17.6	9.3	0	-	10.3	0	-	44.6
HCM Lane LOS	C	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	688	0	0	705	3	1	0	0	1	0	5
Future Vol, veh/h	8	688	0	0	705	3	1	0	0	1	0	5
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	2	2	2
Mvmt Flow	9	756	0	0	775	3	1	0	0	1	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	780	0	0	756	0	0	1553	1554	756	1553	1553	779
Stage 1	-	-	-	-	-	-	774	774	-	779	779	-
Stage 2	-	-	-	-	-	-	779	780	-	774	774	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	837	-	-	855	-	-	92	113	408	92	113	396
Stage 1	-	-	-	-	-	-	391	408	-	389	406	-
Stage 2	-	-	-	-	-	-	389	406	-	391	408	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	835	-	-	855	-	-	89	111	408	91	111	395
Mov Cap-2 Maneuver	-	-	-	-	-	-	89	111	-	91	111	-
Stage 1	-	-	-	-	-	-	384	400	-	381	405	-
Stage 2	-	-	-	-	-	-	384	405	-	384	400	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	46	19.6
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	89	835	-	-	855	-	-	254
HCM Lane V/C Ratio	0.012	0.011	-	-	-	-	-	0.026
HCM Control Delay (s)	46	9.4	0	-	0	-	-	19.6
HCM Lane LOS	E	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	704	0	0	725	19	0	0	1	16	0	9
Future Vol, veh/h	18	704	0	0	725	19	0	0	1	16	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	6	2	2
Mvmt Flow	19	757	0	0	780	20	0	0	1	17	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	800	0	0	757	0	0	1590	1595	757	1586	1585	790
Stage 1	-	-	-	-	-	-	795	795	-	790	790	-
Stage 2	-	-	-	-	-	-	795	800	-	796	795	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.318
Pot Cap-1 Maneuver	823	-	-	854	-	-	87	107	408	86	108	390
Stage 1	-	-	-	-	-	-	381	399	-	378	402	-
Stage 2	-	-	-	-	-	-	381	397	-	375	399	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	823	-	-	854	-	-	82	103	408	83	104	390
Mov Cap-2 Maneuver	-	-	-	-	-	-	82	103	-	83	104	-
Stage 1	-	-	-	-	-	-	366	383	-	363	402	-
Stage 2	-	-	-	-	-	-	372	397	-	359	383	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	13.8	45.2
HCM LOS			B	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	408	823	-	-	854	-	-	116
HCM Lane V/C Ratio	0.003	0.024	-	-	-	-	-	0.232
HCM Control Delay (s)	13.8	9.5	0	-	0	-	-	45.2
HCM Lane LOS	B	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.8

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	31	695	5	2	718	12	0	0	6	7	1	31
Future Vol, veh/h	31	695	5	2	718	12	0	0	6	7	1	31
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	7	7	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	3	3	2	2	3	2	2	2	17	2	2	3
Mvmt Flow	34	755	5	2	780	13	0	0	7	8	1	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	794	0	0	765	0	0	1639	1629	770	1628	1625	788
Stage 1	-	-	-	-	-	-	831	831	-	792	792	-
Stage 2	-	-	-	-	-	-	808	798	-	836	833	-
Critical Hdwy	4.13	-	-	4.12	-	-	7.12	6.52	6.37	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.227	-	-	2.218	-	-	3.518	4.018	3.453	3.518	4.018	3.327
Pot Cap-1 Maneuver	823	-	-	848	-	-	80	102	378	82	102	390
Stage 1	-	-	-	-	-	-	364	384	-	382	401	-
Stage 2	-	-	-	-	-	-	375	398	-	362	384	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	822	-	-	844	-	-	68	94	374	75	94	390
Mov Cap-2 Maneuver	-	-	-	-	-	-	68	94	-	75	94	-
Stage 1	-	-	-	-	-	-	336	354	-	354	399	-
Stage 2	-	-	-	-	-	-	340	396	-	328	354	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	14.8	26.1
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	374	822	-	-	844	-	-	213
HCM Lane V/C Ratio	0.017	0.041	-	-	0.003	-	-	0.199
HCM Control Delay (s)	14.8	9.6	0	-	9.3	0	-	26.1
HCM Lane LOS	B	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.7

Intersection	
Int Delay, s/veh	9.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	31	26	8	19	35	1	3	55	2	16	192	92
Future Vol, veh/h	31	26	8	19	35	1	3	55	2	16	192	92
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	-	-	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	10	4	2	5	3	2	2	2	50	2	3	2
Mvmt Flow	36	30	9	22	41	1	3	64	2	19	223	107

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	43	0	0	39	0	0	304	194	35	227	198	43
Stage 1	-	-	-	-	-	-	107	107	-	87	87	-
Stage 2	-	-	-	-	-	-	197	87	-	140	111	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.12	6.52	6.7	7.12	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.518	4.018	3.75	3.518	4.027	3.318
Pot Cap-1 Maneuver	1516	-	-	1552	-	-	648	701	916	728	696	1027
Stage 1	-	-	-	-	-	-	898	807	-	921	821	-
Stage 2	-	-	-	-	-	-	805	823	-	863	802	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1515	-	-	1552	-	-	418	673	916	653	668	1026
Mov Cap-2 Maneuver	-	-	-	-	-	-	418	673	-	653	668	-
Stage 1	-	-	-	-	-	-	876	788	-	898	808	-
Stage 2	-	-	-	-	-	-	514	810	-	772	783	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.5	2.5	11.1	12
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	659	1515	-	-	1552	-	-	667	1026
HCM Lane V/C Ratio	0.106	0.024	-	-	0.014	-	-	0.363	0.104
HCM Control Delay (s)	11.1	7.4	0	-	7.4	0	-	13.4	8.9
HCM Lane LOS	B	A	A	-	A	A	-	B	A
HCM 95th %tile Q(veh)	0.4	0.1	-	-	0	-	-	1.7	0.3

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	7	29	1	1	58	3	3	4	3	16	1	11
Future Vol, veh/h	7	29	1	1	58	3	3	4	3	16	1	11
Conflicting Peds, #/hr	3	0	1	1	0	3	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	43	2	2	2	2	2	2	2	2	6	2	36
Mvmt Flow	7	31	1	1	62	3	3	4	3	17	1	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	68	0	0	33	0	0	119	117	35	120	116	67
Stage 1	-	-	-	-	-	-	47	47	-	69	69	-
Stage 2	-	-	-	-	-	-	72	70	-	51	47	-
Critical Hdwy	4.53	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.56
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.587	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.624
Pot Cap-1 Maneuver	1309	-	-	1579	-	-	857	773	1038	846	774	909
Stage 1	-	-	-	-	-	-	967	856	-	931	837	-
Stage 2	-	-	-	-	-	-	938	837	-	952	856	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1305	-	-	1577	-	-	841	765	1035	832	766	906
Mov Cap-2 Maneuver	-	-	-	-	-	-	841	765	-	832	766	-
Stage 1	-	-	-	-	-	-	961	851	-	924	834	-
Stage 2	-	-	-	-	-	-	924	834	-	938	851	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.5	0.1	9.3	9.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	855	1305	-	-	1577	-	-	857
HCM Lane V/C Ratio	0.012	0.006	-	-	0.001	-	-	0.035
HCM Control Delay (s)	9.3	7.8	0	-	7.3	0	-	9.4
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	1	102	2	1	287
Future Vol, veh/h	13	1	102	2	1	287
Conflicting Peds, #/hr	1	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	23	2	6	2	2	2
Mvmt Flow	16	1	123	2	1	346

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	473	124	0	0	125	0
Stage 1	124	-	-	-	-	-
Stage 2	349	-	-	-	-	-
Critical Hdwy	6.63	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.63	-	-	-	-	-
Critical Hdwy Stg 2	5.63	-	-	-	-	-
Follow-up Hdwy	3.707	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	513	927	-	-	1462	-
Stage 1	852	-	-	-	-	-
Stage 2	670	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	512	927	-	-	1462	-
Mov Cap-2 Maneuver	512	-	-	-	-	-
Stage 1	852	-	-	-	-	-
Stage 2	669	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	529	1462	-
HCM Lane V/C Ratio	-	-	0.032	0.001	-
HCM Control Delay (s)	-	-	12	7.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	78	0	1	1	54	49	1	201	0
Future Vol, veh/h	0	0	0	78	0	1	1	54	49	1	201	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	100	2	11	2	2	2	2
Mvmt Flow	0	0	0	89	0	1	1	61	56	1	228	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	322	349	228	321	321	89	228	0	0	117	0	0
Stage 1	230	230	-	91	91	-	-	-	-	-	-	-
Stage 2	92	119	-	230	230	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	7.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	4.2	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	631	575	811	632	596	755	1340	-	-	1471	-	-
Stage 1	773	714	-	916	820	-	-	-	-	-	-	-
Stage 2	915	797	-	773	714	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	629	574	811	631	595	755	1340	-	-	1471	-	-
Mov Cap-2 Maneuver	629	574	-	631	595	-	-	-	-	-	-	-
Stage 1	772	713	-	915	819	-	-	-	-	-	-	-
Stage 2	913	796	-	772	713	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	11.6	0.1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1340	-	-	-	632	1471	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.142	0.001	-	-
HCM Control Delay (s)	7.7	0	-	0	11.6	7.4	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.5	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	20	0	1	0	41	5	0	173	0
Future Vol, veh/h	0	0	1	20	0	1	0	41	5	0	173	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	1	22	0	1	0	45	5	0	188	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	236	238	188	237	236	48	188	0	0	50	0	0
Stage 1	188	188	-	48	48	-	-	-	-	-	-	-
Stage 2	48	50	-	189	188	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	718	663	854	717	665	1021	1386	-	-	1557	-	-
Stage 1	814	745	-	965	855	-	-	-	-	-	-	-
Stage 2	965	853	-	813	745	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	717	663	854	716	665	1021	1386	-	-	1557	-	-
Mov Cap-2 Maneuver	717	663	-	716	665	-	-	-	-	-	-	-
Stage 1	814	745	-	965	855	-	-	-	-	-	-	-
Stage 2	964	853	-	812	745	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.2	10.1	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1386	-	-	854	726	1557	-	-
HCM Lane V/C Ratio	-	-	-	0.001	0.031	-	-	-
HCM Control Delay (s)	0	-	-	9.2	10.1	0	-	-
HCM Lane LOS	A	-	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection												
Int Delay, s/veh	1											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	0	1	20	0	1	0	36	5	0	152	0
Future Vol, veh/h	0	0	1	20	0	1	0	36	5	0	152	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	11	2	2	2	2
Mvmt Flow	0	0	1	24	0	1	0	43	6	0	183	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	230	232	183	230	229	46	183	0	0	49	0	0
Stage 1	183	183	-	46	46	-	-	-	-	-	-	-
Stage 2	47	49	-	184	183	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	725	668	859	725	671	1023	1392	-	-	1558	-	-
Stage 1	819	748	-	968	857	-	-	-	-	-	-	-
Stage 2	967	854	-	818	748	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	724	668	859	724	671	1023	1392	-	-	1558	-	-
Mov Cap-2 Maneuver	724	668	-	724	671	-	-	-	-	-	-	-
Stage 1	819	748	-	968	857	-	-	-	-	-	-	-
Stage 2	966	854	-	817	748	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.2	10.1	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1392	-	-	859	734	1558	-	-
HCM Lane V/C Ratio	-	-	-	0.001	0.034	-	-	-
HCM Control Delay (s)	0	-	-	9.2	10.1	0	-	-
HCM Lane LOS	A	-	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection												
Int Delay, s/veh	2.5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	0	0	19	0	1	0	13	7	0	30	0
Future Vol, veh/h	0	0	0	19	0	1	0	13	7	0	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	5	2	2	2	15	14	2	2	2
Mvmt Flow	0	0	0	22	0	1	0	15	8	0	34	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	54	58	34	54	54	20	34	0	0	24	0	0
Stage 1	34	34	-	20	20	-	-	-	-	-	-	-
Stage 2	20	24	-	34	34	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	944	833	1039	937	837	1058	1578	-	-	1591	-	-
Stage 1	982	867	-	991	879	-	-	-	-	-	-	-
Stage 2	999	875	-	974	867	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	943	832	1039	936	836	1057	1578	-	-	1589	-	-
Mov Cap-2 Maneuver	943	832	-	936	836	-	-	-	-	-	-	-
Stage 1	982	867	-	990	878	-	-	-	-	-	-	-
Stage 2	998	874	-	974	867	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	8.9	0	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1578	-	-	-	941	1589	-	-
HCM Lane V/C Ratio	-	-	-	-	0.024	-	-	-
HCM Control Delay (s)	0	-	-	0	8.9	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	688	25	81	433	18	76
Future Vol, veh/h	688	25	81	433	18	76
Conflicting Peds, #/hr	0	1	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	11	4	4	6	10
Mvmt Flow	724	26	85	456	19	80

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	751	0	1364	739
Stage 1	-	-	-	-	738	-
Stage 2	-	-	-	-	626	-
Critical Hdwy	-	-	4.14	-	6.46	6.3
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.236	-	3.554	3.39
Pot Cap-1 Maneuver	-	-	849	-	159	404
Stage 1	-	-	-	-	466	-
Stage 2	-	-	-	-	525	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	848	-	143	403
Mov Cap-2 Maneuver	-	-	-	-	143	-
Stage 1	-	-	-	-	466	-
Stage 2	-	-	-	-	473	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	22.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	299	-	-	848	-
HCM Lane V/C Ratio	0.331	-	-	0.101	-
HCM Control Delay (s)	22.9	-	-	9.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1.4	-	-	0.3	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	87	670	6	7	452	1	7	5	20	0	1	55
Future Vol, veh/h	87	670	6	7	452	1	7	5	20	0	1	55
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	12	4	2	11	4	2	2	2	67	2	2	3
Mvmt Flow	92	705	6	7	476	1	7	5	21	0	1	58

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	477	0	0	711	0	0	1412	1383	708	1396	1386	477
Stage 1	-	-	-	-	-	-	892	892	-	491	491	-
Stage 2	-	-	-	-	-	-	520	491	-	905	895	-
Critical Hdwy	4.22	-	-	4.21	-	-	7.12	6.52	6.87	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.308	-	-	2.299	-	-	3.518	4.018	3.903	3.518	4.018	3.327
Pot Cap-1 Maneuver	1035	-	-	848	-	-	116	144	342	119	143	586
Stage 1	-	-	-	-	-	-	337	360	-	559	548	-
Stage 2	-	-	-	-	-	-	539	548	-	331	359	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1035	-	-	848	-	-	91	122	342	95	121	586
Mov Cap-2 Maneuver	-	-	-	-	-	-	91	122	-	95	121	-
Stage 1	-	-	-	-	-	-	287	307	-	477	542	-
Stage 2	-	-	-	-	-	-	479	542	-	260	306	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0.1	29.4	12.4
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	181	1035	-	-	848	-	-	548
HCM Lane V/C Ratio	0.186	0.088	-	-	0.009	-	-	0.108
HCM Control Delay (s)	29.4	8.8	0	-	9.3	-	-	12.4
HCM Lane LOS	D	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.7	0.3	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	675	14	21	432	10	8	2	12	5	1	16
Future Vol, veh/h	3	675	14	21	432	10	8	2	12	5	1	16
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	1	1	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	4	2	2	4	9	2	2	2	2	2	8
Mvmt Flow	3	718	15	22	460	11	9	2	13	5	1	17

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	471	0	0	733	0	0	1253	1247	727	1250	1249	468
Stage 1	-	-	-	-	-	-	732	732	-	510	510	-
Stage 2	-	-	-	-	-	-	521	515	-	740	739	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.372
Pot Cap-1 Maneuver	1091	-	-	872	-	-	149	173	424	150	173	583
Stage 1	-	-	-	-	-	-	413	427	-	546	538	-
Stage 2	-	-	-	-	-	-	539	535	-	409	424	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1091	-	-	872	-	-	139	166	424	140	166	582
Mov Cap-2 Maneuver	-	-	-	-	-	-	139	166	-	140	166	-
Stage 1	-	-	-	-	-	-	411	425	-	543	520	-
Stage 2	-	-	-	-	-	-	503	517	-	392	422	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	22.8	17.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	225	1091	-	-	872	-	-	318
HCM Lane V/C Ratio	0.104	0.003	-	-	0.026	-	-	0.074
HCM Control Delay (s)	22.8	8.3	0	-	9.2	0	-	17.2
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	683	0	0	456	159	0	0	1	144	1	28
Future Volume (veh/h)	18	683	0	0	456	159	0	0	1	144	1	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		0.98	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	1411	1826	1826	1870	1841	1841	1870	1870	1870	1870	1870	1767
Adj Flow Rate, veh/h	20	742	0	0	496	173	0	0	1	157	1	30
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, %	33	5	5	2	4	4	2	2	2	2	2	9
Cap, veh/h	238	928	0	120	659	230	0	0	567	623	4	536
Arrive On Green	0.51	0.51	0.00	0.00	0.51	0.50	0.00	0.00	0.35	0.36	0.36	0.36
Sat Flow, veh/h	579	1826	0	718	1296	452	0	0	1583	1406	10	1495
Grp Volume(v), veh/h	20	742	0	0	0	669	0	0	1	158	0	30
Grp Sat Flow(s),veh/h/ln	579	1826	0	718	0	1748	0	0	1583	1416	0	1495
Q Serve(g_s), s	1.7	20.2	0.0	0.0	0.0	18.3	0.0	0.0	0.0	4.8	0.0	0.8
Cycle Q Clear(g_c), s	20.0	20.2	0.0	0.0	0.0	18.3	0.0	0.0	0.0	4.8	0.0	0.8
Prop In Lane	1.00		0.00	1.00		0.26	0.00		1.00	0.99		1.00
Lane Grp Cap(c), veh/h	238	928	0	120	0	889	0	0	567	627	0	536
V/C Ratio(X)	0.08	0.80	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.25	0.00	0.06
Avail Cap(c_a), veh/h	238	928	0	120	0	889	0	0	567	627	0	536
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.7	12.2	0.0	0.0	0.0	11.8	0.0	0.0	12.5	13.9	0.0	12.6
Incr Delay (d2), s/veh	0.7	7.2	0.0	0.0	0.0	5.9	0.0	0.0	0.0	1.0	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	0.3	8.5	0.0	0.0	0.0	7.2	0.0	0.0	0.0	1.6	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.4	19.4	0.0	0.0	0.0	17.7	0.0	0.0	12.5	14.9	0.0	12.8
LnGrp LOS	C	B	A	A	A	B	A	A	B	B	A	B
Approach Vol, veh/h		762			669			1			188	
Approach Delay, s/veh		19.4			17.7			12.5			14.5	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	25.5	34.5	25.5	34.5
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	21.0	30.0	21.0	30.0
Max Q Clear Time (g_c+I1), s	2.0	22.2	6.8	20.3
Green Ext Time (p_c), s	0.0	3.3	0.7	3.3

Intersection Summary	
HCM 6th Ctrl Delay	18.1
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	799	29	39	602	1	6	0	29	2	0	2
Future Vol, veh/h	1	799	29	39	602	1	6	0	29	2	0	2
Conflicting Peds, #/hr	2	0	0	0	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	3	2	50	2	2	2	4	2	2	2	2
Mvmt Flow	1	868	32	42	654	1	7	0	32	2	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	657	0	0	900	0	0	1627	1627	884	1643	1643	658
Stage 1	-	-	-	-	-	-	886	886	-	741	741	-
Stage 2	-	-	-	-	-	-	741	741	-	902	902	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.12	6.54	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	3.518	4.036	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	931	-	-	588	-	-	82	101	344	80	100	464
Stage 1	-	-	-	-	-	-	339	360	-	408	423	-
Stage 2	-	-	-	-	-	-	408	420	-	332	356	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	929	-	-	588	-	-	74	89	344	66	88	463
Mov Cap-2 Maneuver	-	-	-	-	-	-	74	89	-	66	88	-
Stage 1	-	-	-	-	-	-	338	359	-	406	375	-
Stage 2	-	-	-	-	-	-	360	372	-	301	355	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.7	25.7	37.2
HCM LOS			D	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	212	929	-	-	588	-	-	116
HCM Lane V/C Ratio	0.179	0.001	-	-	0.072	-	-	0.037
HCM Control Delay (s)	25.7	8.9	0	-	11.6	0	-	37.2
HCM Lane LOS	D	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	0.6	0	-	-	0.2	-	-	0.1

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	819	0	0	627	5	0	0	0	5	0	6
Future Vol, veh/h	8	819	0	0	627	5	0	0	0	5	0	6
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	2	2	2
Mvmt Flow	9	900	0	0	689	5	0	0	0	5	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	696	0	0	900	0	0	1613	1614	900	1612	1612	694
Stage 1	-	-	-	-	-	-	918	918	-	694	694	-
Stage 2	-	-	-	-	-	-	695	696	-	918	918	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	900	-	-	755	-	-	84	104	337	84	104	443
Stage 1	-	-	-	-	-	-	326	350	-	433	444	-
Stage 2	-	-	-	-	-	-	433	443	-	326	350	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	898	-	-	755	-	-	81	102	337	83	102	442
Mov Cap-2 Maneuver	-	-	-	-	-	-	81	102	-	83	102	-
Stage 1	-	-	-	-	-	-	319	343	-	423	443	-
Stage 2	-	-	-	-	-	-	427	442	-	319	343	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	31.3
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	898	-	-	755	-	-	149
HCM Lane V/C Ratio	-	0.01	-	-	-	-	-	0.081
HCM Control Delay (s)	0	9	0	-	0	-	-	31.3
HCM Lane LOS	A	A	A	-	A	-	-	D
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	23	841	0	0	657	30	0	0	2	10	0	13
Future Vol, veh/h	23	841	0	0	657	30	0	0	2	10	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	6	2	2
Mvmt Flow	25	904	0	0	706	32	0	0	2	11	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	738	0	0	904	0	0	1683	1692	904	1677	1676	722
Stage 1	-	-	-	-	-	-	954	954	-	722	722	-
Stage 2	-	-	-	-	-	-	729	738	-	955	954	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.318
Pot Cap-1 Maneuver	868	-	-	752	-	-	75	93	335	74	95	427
Stage 1	-	-	-	-	-	-	311	337	-	412	431	-
Stage 2	-	-	-	-	-	-	414	424	-	305	337	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	868	-	-	752	-	-	69	88	335	70	89	427
Mov Cap-2 Maneuver	-	-	-	-	-	-	69	88	-	70	89	-
Stage 1	-	-	-	-	-	-	293	317	-	388	431	-
Stage 2	-	-	-	-	-	-	400	424	-	285	317	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	15.8	38.2
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	335	868	-	-	752	-	-	133
HCM Lane V/C Ratio	0.006	0.028	-	-	-	-	-	0.186
HCM Control Delay (s)	15.8	9.3	0	-	0	-	-	38.2
HCM Lane LOS	C	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.7

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	39	808	7	5	639	36	3	0	14	24	0	45
Future Vol, veh/h	39	808	7	5	639	36	3	0	14	24	0	45
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	7	7	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	3	3	2	2	3	2	2	2	17	2	2	3
Mvmt Flow	42	878	8	5	695	39	3	0	15	26	0	49

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	735	0	0	891	0	0	1720	1716	894	1707	1701	716
Stage 1	-	-	-	-	-	-	971	971	-	726	726	-
Stage 2	-	-	-	-	-	-	749	745	-	981	975	-
Critical Hdwy	4.13	-	-	4.12	-	-	7.12	6.52	6.37	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.227	-	-	2.218	-	-	3.518	4.018	3.453	3.518	4.018	3.327
Pot Cap-1 Maneuver	866	-	-	761	-	-	70	90	319	72	92	428
Stage 1	-	-	-	-	-	-	304	331	-	416	430	-
Stage 2	-	-	-	-	-	-	404	421	-	300	330	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	865	-	-	757	-	-	57	80	315	62	82	428
Mov Cap-2 Maneuver	-	-	-	-	-	-	57	80	-	62	82	-
Stage 1	-	-	-	-	-	-	274	298	-	376	425	-
Stage 2	-	-	-	-	-	-	354	416	-	256	297	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.1	28	57.1
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	175	865	-	-	757	-	-	140
HCM Lane V/C Ratio	0.106	0.049	-	-	0.007	-	-	0.536
HCM Control Delay (s)	28	9.4	0	-	9.8	0	-	57.1
HCM Lane LOS	D	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.3	0.2	-	-	0	-	-	2.6

Intersection	
Int Delay, s/veh	11.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	83	25	6	30	40	36	3	155	12	15	125	29
Future Vol, veh/h	83	25	6	30	40	36	3	155	12	15	125	29
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	-	-	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	10	4	2	5	3	2	2	2	50	2	3	2
Mvmt Flow	97	29	7	35	47	42	3	180	14	17	145	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	90	0	0	36	0	0	438	387	33	463	369	69
Stage 1	-	-	-	-	-	-	227	227	-	139	139	-
Stage 2	-	-	-	-	-	-	211	160	-	324	230	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.12	6.52	6.7	7.12	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.518	4.018	3.75	3.518	4.027	3.318
Pot Cap-1 Maneuver	1456	-	-	1556	-	-	529	547	918	509	559	994
Stage 1	-	-	-	-	-	-	776	716	-	864	780	-
Stage 2	-	-	-	-	-	-	791	766	-	688	712	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1455	-	-	1556	-	-	372	497	918	336	508	993
Mov Cap-2 Maneuver	-	-	-	-	-	-	372	497	-	336	508	-
Stage 1	-	-	-	-	-	-	723	667	-	804	761	-
Stage 2	-	-	-	-	-	-	603	747	-	461	664	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.6	2.1	16.5	14.9
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	510	1455	-	-	1556	-	-	482	993
HCM Lane V/C Ratio	0.388	0.066	-	-	0.022	-	-	0.338	0.034
HCM Control Delay (s)	16.5	7.7	0	-	7.4	0	-	16.2	8.8
HCM Lane LOS	C	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	1.8	0.2	-	-	0.1	-	-	1.5	0.1

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	43	0	5	92	27	3	1	3	10	3	14
Future Vol, veh/h	14	43	0	5	92	27	3	1	3	10	3	14
Conflicting Peds, #/hr	3	0	1	1	0	3	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	43	2	2	2	2	2	2	2	2	6	2	36
Mvmt Flow	15	46	0	5	98	29	3	1	3	11	3	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	130	0	0	47	0	0	209	217	49	206	203	116
Stage 1	-	-	-	-	-	-	77	77	-	126	126	-
Stage 2	-	-	-	-	-	-	132	140	-	80	77	-
Critical Hdwy	4.53	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.56
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.587	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.624
Pot Cap-1 Maneuver	1238	-	-	1560	-	-	748	681	1020	743	693	852
Stage 1	-	-	-	-	-	-	932	831	-	868	792	-
Stage 2	-	-	-	-	-	-	871	781	-	919	831	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1234	-	-	1559	-	-	723	668	1017	728	680	850
Mov Cap-2 Maneuver	-	-	-	-	-	-	723	668	-	728	680	-
Stage 1	-	-	-	-	-	-	920	820	-	855	787	-
Stage 2	-	-	-	-	-	-	850	776	-	902	820	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0.3	9.5	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	814	1234	-	-	1559	-	-	780
HCM Lane V/C Ratio	0.009	0.012	-	-	0.003	-	-	0.037
HCM Control Delay (s)	9.5	8	0	-	7.3	0	-	9.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	0	273	11	0	166
Future Vol, veh/h	6	0	273	11	0	166
Conflicting Peds, #/hr	1	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	23	2	6	2	2	2
Mvmt Flow	7	0	329	13	0	200

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	537	336	0	0	342	0
Stage 1	336	-	-	-	-	-
Stage 2	201	-	-	-	-	-
Critical Hdwy	6.63	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.63	-	-	-	-	-
Critical Hdwy Stg 2	5.63	-	-	-	-	-
Follow-up Hdwy	3.707	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	470	706	-	-	1217	-
Stage 1	679	-	-	-	-	-
Stage 2	785	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	470	706	-	-	1217	-
Mov Cap-2 Maneuver	470	-	-	-	-	-
Stage 1	679	-	-	-	-	-
Stage 2	784	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	470	1217	-
HCM Lane V/C Ratio	-	-	0.015	-	-
HCM Control Delay (s)	-	-	12.8	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	45	0	0	1	157	108	0	117	0
Future Vol, veh/h	0	0	0	45	0	0	1	157	108	0	117	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	100	2	11	2	2	2	2
Mvmt Flow	0	0	0	51	0	0	1	178	123	0	133	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	375	436	133	375	375	240	133	0	0	301	0	0
Stage 1	133	133	-	242	242	-	-	-	-	-	-	-
Stage 2	242	303	-	133	133	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	7.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	4.2	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	582	514	916	582	556	608	1452	-	-	1260	-	-
Stage 1	870	786	-	762	705	-	-	-	-	-	-	-
Stage 2	762	664	-	870	786	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	581	513	916	581	555	608	1452	-	-	1260	-	-
Mov Cap-2 Maneuver	581	513	-	581	555	-	-	-	-	-	-	-
Stage 1	869	786	-	761	704	-	-	-	-	-	-	-
Stage 2	761	663	-	870	786	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	11.8	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1452	-	-	-	581	1260	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.088	-	-	-
HCM Control Delay (s)	7.5	0	-	0	11.8	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.3	0	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	10	0	0	1	142	10	0	96	0
Future Vol, veh/h	0	0	0	10	0	0	1	142	10	0	96	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	11	0	0	1	154	11	0	104	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	266	271	104	266	266	160	104	0	0	165	0	0
Stage 1	104	104	-	162	162	-	-	-	-	-	-	-
Stage 2	162	167	-	104	104	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	687	636	951	687	640	885	1488	-	-	1413	-	-
Stage 1	902	809	-	840	764	-	-	-	-	-	-	-
Stage 2	840	760	-	902	809	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	686	635	951	686	639	885	1488	-	-	1413	-	-
Mov Cap-2 Maneuver	686	635	-	686	639	-	-	-	-	-	-	-
Stage 1	901	809	-	839	763	-	-	-	-	-	-	-
Stage 2	839	759	-	902	809	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	10.3	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1488	-	-	-	686	1413	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.016	-	-	-
HCM Control Delay (s)	7.4	0	-	0	10.3	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	11	0	0	4	125	7	0	83	0
Future Vol, veh/h	0	0	0	11	0	0	4	125	7	0	83	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	11	2	2	2	2
Mvmt Flow	0	0	0	13	0	0	5	151	8	0	100	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	265	269	100	265	265	155	100	0	0	159	0	0
Stage 1	100	100	-	165	165	-	-	-	-	-	-	-
Stage 2	165	169	-	100	100	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	688	637	956	688	640	891	1493	-	-	1420	-	-
Stage 1	906	812	-	837	762	-	-	-	-	-	-	-
Stage 2	837	759	-	906	812	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	686	634	956	686	637	891	1493	-	-	1420	-	-
Mov Cap-2 Maneuver	686	634	-	686	637	-	-	-	-	-	-	-
Stage 1	902	812	-	834	759	-	-	-	-	-	-	-
Stage 2	834	756	-	906	812	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	10.4	0.2	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1493	-	-	-	686	1420	-	-
HCM Lane V/C Ratio	0.003	-	-	-	0.019	-	-	-
HCM Control Delay (s)	7.4	0	-	0	10.4	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	9	0	1	0	37	24	1	20	0
Future Vol, veh/h	0	0	0	9	0	1	0	37	24	1	20	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	5	2	2	2	15	14	2	2	2
Mvmt Flow	0	0	0	10	0	1	0	42	27	1	23	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	81	95	23	82	82	57	23	0	0	70	0	0
Stage 1	25	25	-	57	57	-	-	-	-	-	-	-
Stage 2	56	70	-	25	25	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	907	795	1054	898	808	1009	1592	-	-	1531	-	-
Stage 1	993	874	-	947	847	-	-	-	-	-	-	-
Stage 2	956	837	-	985	874	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	905	793	1054	896	806	1008	1592	-	-	1530	-	-
Mov Cap-2 Maneuver	905	793	-	896	806	-	-	-	-	-	-	-
Stage 1	993	873	-	946	846	-	-	-	-	-	-	-
Stage 2	955	836	-	984	873	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	9	0	0.4
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1592	-	-	-	906	1530	-	-
HCM Lane V/C Ratio	-	-	-	-	0.013	0.001	-	-
HCM Control Delay (s)	0	-	-	0	9	7.4	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0	-	-

APPENDIX D

Analysis Reports Future (2025) With Project Conditions

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	458	18	80	698	18	68
Future Vol, veh/h	458	18	80	698	18	68
Conflicting Peds, #/hr	0	1	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	11	4	4	6	10
Mvmt Flow	482	19	84	735	19	72

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	502	0	1396	494
Stage 1	-	-	-	-	493	-
Stage 2	-	-	-	-	903	-
Critical Hdwy	-	-	4.14	-	6.46	6.3
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.236	-	3.554	3.39
Pot Cap-1 Maneuver	-	-	1052	-	152	559
Stage 1	-	-	-	-	606	-
Stage 2	-	-	-	-	389	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1051	-	140	558
Mov Cap-2 Maneuver	-	-	-	-	140	-
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	358	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	19.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	343	-	-	1051	-
HCM Lane V/C Ratio	0.264	-	-	0.08	-
HCM Control Delay (s)	19.2	-	-	8.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1	-	-	0.3	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	56	464	2	9	642	2	0	0	6	0	0	137
Future Vol, veh/h	56	464	2	9	642	2	0	0	6	0	0	137
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	12	4	2	11	4	2	2	2	67	2	2	3
Mvmt Flow	59	488	2	9	676	2	0	0	6	0	0	144

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	678	0	0	490	0	0	1374	1303	489	1305	1303	677
Stage 1	-	-	-	-	-	-	607	607	-	695	695	-
Stage 2	-	-	-	-	-	-	767	696	-	610	608	-
Critical Hdwy	4.22	-	-	4.21	-	-	7.12	6.52	6.87	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.308	-	-	2.299	-	-	3.518	4.018	3.903	3.518	4.018	3.327
Pot Cap-1 Maneuver	869	-	-	1028	-	-	123	161	467	137	161	451
Stage 1	-	-	-	-	-	-	483	486	-	433	444	-
Stage 2	-	-	-	-	-	-	395	443	-	482	486	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	869	-	-	1028	-	-	77	144	467	124	144	451
Mov Cap-2 Maneuver	-	-	-	-	-	-	77	144	-	124	144	-
Stage 1	-	-	-	-	-	-	438	441	-	393	438	-
Stage 2	-	-	-	-	-	-	265	437	-	431	441	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0.1	12.8	16.7
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	467	869	-	-	1028	-	-	451
HCM Lane V/C Ratio	0.014	0.068	-	-	0.009	-	-	0.32
HCM Control Delay (s)	12.8	9.4	0	-	8.5	-	-	16.7
HCM Lane LOS	B	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0.2	-	-	0	-	-	1.4

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	468	7	5	630	11	6	2	6	10	0	12
Future Vol, veh/h	2	468	7	5	630	11	6	2	6	10	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	1	1	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	4	2	2	4	9	2	2	2	2	2	8
Mvmt Flow	2	498	7	5	670	12	6	2	6	11	0	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	682	0	0	505	0	0	1201	1198	503	1197	1195	678
Stage 1	-	-	-	-	-	-	506	506	-	686	686	-
Stage 2	-	-	-	-	-	-	695	692	-	511	509	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.372
Pot Cap-1 Maneuver	911	-	-	1060	-	-	162	186	569	163	186	442
Stage 1	-	-	-	-	-	-	549	540	-	438	448	-
Stage 2	-	-	-	-	-	-	433	445	-	545	538	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	911	-	-	1060	-	-	156	184	568	158	184	441
Mov Cap-2 Maneuver	-	-	-	-	-	-	156	184	-	158	184	-
Stage 1	-	-	-	-	-	-	547	538	-	437	444	-
Stage 2	-	-	-	-	-	-	416	441	-	535	536	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	21.4	21.4
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	234	911	-	-	1060	-	-	243
HCM Lane V/C Ratio	0.064	0.002	-	-	0.005	-	-	0.096
HCM Control Delay (s)	21.4	9	0	-	8.4	0	-	21.4
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	493	0	0	646	69	0	0	0	211	0	32
Future Volume (veh/h)	3	493	0	0	646	69	0	0	0	211	0	32
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		0.98	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	1411	1826	1826	1870	1841	1841	1870	1870	1870	1870	1870	1767
Adj Flow Rate, veh/h	3	536	0	0	702	75	0	0	0	229	0	35
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, %	33	5	5	2	4	4	2	2	2	2	2	9
Cap, veh/h	190	925	0	120	826	88	0	673	0	630	0	538
Arrive On Green	0.51	0.51	0.00	0.00	0.51	0.50	0.00	0.00	0.00	0.36	0.00	0.36
Sat Flow, veh/h	524	1826	0	869	1631	174	0	1870	0	1416	0	1495
Grp Volume(v), veh/h	3	536	0	0	0	777	0	0	0	229	0	35
Grp Sat Flow(s),veh/h/ln	524	1826	0	869	0	1805	0	1870	0	1416	0	1495
Q Serve(g_s), s	0.3	12.3	0.0	0.0	0.0	22.4	0.0	0.0	0.0	7.4	0.0	0.9
Cycle Q Clear(g_c), s	22.7	12.3	0.0	0.0	0.0	22.4	0.0	0.0	0.0	7.4	0.0	0.9
Prop In Lane	1.00		0.00	1.00		0.10	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	190	925	0	120	0	915	0	673	0	630	0	538
V/C Ratio(X)	0.02	0.58	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.36	0.00	0.07
Avail Cap(c_a), veh/h	190	925	0	120	0	915	0	673	0	630	0	538
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.6	10.3	0.0	0.0	0.0	12.8	0.0	0.0	0.0	14.7	0.0	12.6
Incr Delay (d2), s/veh	0.2	2.6	0.0	0.0	0.0	9.7	0.0	0.0	0.0	1.6	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	0.0	4.7	0.0	0.0	0.0	9.8	0.0	0.0	0.0	2.4	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.8	13.0	0.0	0.0	0.0	22.6	0.0	0.0	0.0	16.3	0.0	12.8
LnGrp LOS	C	B	A	A	A	C	A	A	A	B	A	B
Approach Vol, veh/h		539			777			0			264	
Approach Delay, s/veh		13.0			22.6			0.0			15.8	
Approach LOS		B			C						B	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	25.6	34.4	25.6	34.4
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	21.1	29.9	21.1	29.9
Max Q Clear Time (g_c+I1), s	0.0	24.7	9.4	24.4
Green Ext Time (p_c), s	0.0	1.6	1.0	2.6

Intersection Summary	
HCM 6th Ctrl Delay	18.2
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	696	6	4	707	1	2	0	16	1	0	0
Future Vol, veh/h	3	696	6	4	707	1	2	0	16	1	0	0
Conflicting Peds, #/hr	2	0	0	0	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	3	2	50	2	2	2	4	2	2	2	2
Mvmt Flow	3	757	7	4	768	1	2	0	17	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	771	0	0	764	0	0	1545	1546	761	1554	1549	772
Stage 1	-	-	-	-	-	-	767	767	-	779	779	-
Stage 2	-	-	-	-	-	-	778	779	-	775	770	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.12	6.54	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	3.518	4.036	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	844	-	-	669	-	-	93	113	405	92	114	400
Stage 1	-	-	-	-	-	-	395	408	-	389	406	-
Stage 2	-	-	-	-	-	-	389	403	-	391	410	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	842	-	-	669	-	-	92	111	405	87	112	399
Mov Cap-2 Maneuver	-	-	-	-	-	-	92	111	-	87	112	-
Stage 1	-	-	-	-	-	-	393	406	-	386	401	-
Stage 2	-	-	-	-	-	-	385	398	-	372	408	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	18.1	46.9
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	294	842	-	-	669	-	-	87
HCM Lane V/C Ratio	0.067	0.004	-	-	0.006	-	-	0.012
HCM Control Delay (s)	18.1	9.3	0	-	10.4	0	-	46.9
HCM Lane LOS	C	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	709	0	0	713	3	1	0	0	1	0	5
Future Vol, veh/h	8	709	0	0	713	3	1	0	0	1	0	5
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	2	2	2
Mvmt Flow	9	779	0	0	784	3	1	0	0	1	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	789	0	0	779	0	0	1585	1586	779	1585	1585	788
Stage 1	-	-	-	-	-	-	797	797	-	788	788	-
Stage 2	-	-	-	-	-	-	788	789	-	797	797	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	831	-	-	838	-	-	88	108	396	88	108	391
Stage 1	-	-	-	-	-	-	380	399	-	384	402	-
Stage 2	-	-	-	-	-	-	384	402	-	380	399	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	829	-	-	838	-	-	86	106	396	87	106	390
Mov Cap-2 Maneuver	-	-	-	-	-	-	86	106	-	87	106	-
Stage 1	-	-	-	-	-	-	373	391	-	376	401	-
Stage 2	-	-	-	-	-	-	379	401	-	373	391	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	47.4	20
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	86	829	-	-	838	-	-	247
HCM Lane V/C Ratio	0.013	0.011	-	-	-	-	-	0.027
HCM Control Delay (s)	47.4	9.4	0	-	0	-	-	20
HCM Lane LOS	E	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection												
Int Delay, s/veh	0.9											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	725	0	0	733	19	0	0	1	16	0	9
Future Vol, veh/h	18	725	0	0	733	19	0	0	1	16	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	6	2	2
Mvmt Flow	19	780	0	0	788	20	0	0	1	17	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	808	0	0	780	0	0	1621	1626	780	1617	1616	798
Stage 1	-	-	-	-	-	-	818	818	-	798	798	-
Stage 2	-	-	-	-	-	-	803	808	-	819	818	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.318
Pot Cap-1 Maneuver	817	-	-	837	-	-	83	102	395	81	104	386
Stage 1	-	-	-	-	-	-	370	390	-	374	398	-
Stage 2	-	-	-	-	-	-	377	394	-	364	390	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	817	-	-	837	-	-	78	98	395	78	100	386
Mov Cap-2 Maneuver	-	-	-	-	-	-	78	98	-	78	100	-
Stage 1	-	-	-	-	-	-	355	374	-	359	398	-
Stage 2	-	-	-	-	-	-	368	394	-	348	374	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	14.1	48.5
HCM LOS			B	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	395	817	-	-	837	-	-	109
HCM Lane V/C Ratio	0.003	0.024	-	-	-	-	-	0.247
HCM Control Delay (s)	14.1	9.5	0	-	0	-	-	48.5
HCM Lane LOS	B	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.9

Intersection												
Int Delay, s/veh	0.9											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	31	716	5	2	726	12	0	0	6	7	1	31
Future Vol, veh/h	31	716	5	2	726	12	0	0	6	7	1	31
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	7	7	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	3	3	2	2	3	2	2	2	17	2	2	3
Mvmt Flow	34	778	5	2	789	13	0	0	7	8	1	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	803	0	0	788	0	0	1671	1661	793	1660	1657	797
Stage 1	-	-	-	-	-	-	854	854	-	801	801	-
Stage 2	-	-	-	-	-	-	817	807	-	859	856	-
Critical Hdwy	4.13	-	-	4.12	-	-	7.12	6.52	6.37	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.227	-	-	2.218	-	-	3.518	4.018	3.453	3.518	4.018	3.327
Pot Cap-1 Maneuver	816	-	-	831	-	-	76	97	366	78	98	385
Stage 1	-	-	-	-	-	-	353	375	-	378	397	-
Stage 2	-	-	-	-	-	-	370	394	-	351	374	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	815	-	-	827	-	-	64	89	362	72	90	385
Mov Cap-2 Maneuver	-	-	-	-	-	-	64	89	-	72	90	-
Stage 1	-	-	-	-	-	-	325	345	-	350	395	-
Stage 2	-	-	-	-	-	-	335	392	-	317	344	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	15.1	26.8
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	362	815	-	-	827	-	-	207
HCM Lane V/C Ratio	0.018	0.041	-	-	0.003	-	-	0.205
HCM Control Delay (s)	15.1	9.6	0	-	9.4	0	-	26.8
HCM Lane LOS	C	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.7

Intersection	
Int Delay, s/veh	10.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	37	26	8	19	35	1	3	63	2	16	213	113
Future Vol, veh/h	37	26	8	19	35	1	3	63	2	16	213	113
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	-	-	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	10	4	2	5	3	2	2	2	50	2	3	2
Mvmt Flow	43	30	9	22	41	1	3	73	2	19	248	131

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	43	0	0	39	0	0	331	208	35	245	212	43
Stage 1	-	-	-	-	-	-	121	121	-	87	87	-
Stage 2	-	-	-	-	-	-	210	87	-	158	125	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.12	6.52	6.7	7.12	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.518	4.018	3.75	3.518	4.027	3.318
Pot Cap-1 Maneuver	1516	-	-	1552	-	-	622	689	916	709	684	1027
Stage 1	-	-	-	-	-	-	883	796	-	921	821	-
Stage 2	-	-	-	-	-	-	792	823	-	844	791	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1515	-	-	1552	-	-	371	658	916	625	653	1026
Mov Cap-2 Maneuver	-	-	-	-	-	-	371	658	-	625	653	-
Stage 1	-	-	-	-	-	-	857	773	-	893	808	-
Stage 2	-	-	-	-	-	-	472	810	-	740	768	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.9	2.5	11.4	12.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	641	1515	-	-	1552	-	-	651	1026
HCM Lane V/C Ratio	0.123	0.028	-	-	0.014	-	-	0.409	0.128
HCM Control Delay (s)	11.4	7.4	0	-	7.4	0	-	14.3	9
HCM Lane LOS	B	A	A	-	A	A	-	B	A
HCM 95th %tile Q(veh)	0.4	0.1	-	-	0	-	-	2	0.4

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	7	29	1	1	58	3	3	4	3	16	1	11
Future Vol, veh/h	7	29	1	1	58	3	3	4	3	16	1	11
Conflicting Peds, #/hr	3	0	1	1	0	3	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	43	2	2	2	2	2	2	2	2	6	2	36
Mvmt Flow	7	31	1	1	62	3	3	4	3	17	1	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	68	0	0	33	0	0	119	117	35	120	116	67
Stage 1	-	-	-	-	-	-	47	47	-	69	69	-
Stage 2	-	-	-	-	-	-	72	70	-	51	47	-
Critical Hdwy	4.53	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.56
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.587	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.624
Pot Cap-1 Maneuver	1309	-	-	1579	-	-	857	773	1038	846	774	909
Stage 1	-	-	-	-	-	-	967	856	-	931	837	-
Stage 2	-	-	-	-	-	-	938	837	-	952	856	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1305	-	-	1577	-	-	841	765	1035	832	766	906
Mov Cap-2 Maneuver	-	-	-	-	-	-	841	765	-	832	766	-
Stage 1	-	-	-	-	-	-	961	851	-	924	834	-
Stage 2	-	-	-	-	-	-	924	834	-	938	851	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.5	0.1	9.3	9.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	855	1305	-	-	1577	-	-	857
HCM Lane V/C Ratio	0.012	0.006	-	-	0.001	-	-	0.035
HCM Control Delay (s)	9.3	7.8	0	-	7.3	0	-	9.4
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	1	116	2	1	329
Future Vol, veh/h	13	1	116	2	1	329
Conflicting Peds, #/hr	1	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	23	2	6	2	2	2
Mvmt Flow	16	1	140	2	1	396

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	540	141	0	0	142	0
Stage 1	141	-	-	-	-	-
Stage 2	399	-	-	-	-	-
Critical Hdwy	6.63	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.63	-	-	-	-	-
Critical Hdwy Stg 2	5.63	-	-	-	-	-
Follow-up Hdwy	3.707	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	468	907	-	-	1441	-
Stage 1	837	-	-	-	-	-
Stage 2	635	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	467	907	-	-	1441	-
Mov Cap-2 Maneuver	467	-	-	-	-	-
Stage 1	837	-	-	-	-	-
Stage 2	634	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	484	1441	-
HCM Lane V/C Ratio	-	-	0.035	0.001	-
HCM Control Delay (s)	-	-	12.7	7.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	78	0	1	1	68	49	1	243	0
Future Vol, veh/h	0	0	0	78	0	1	1	68	49	1	243	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	100	2	11	2	2	2	2
Mvmt Flow	0	0	0	89	0	1	1	77	56	1	276	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	386	413	276	385	385	105	276	0	0	133	0	0
Stage 1	278	278	-	107	107	-	-	-	-	-	-	-
Stage 2	108	135	-	278	278	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	7.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	4.2	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	573	529	763	573	549	738	1287	-	-	1452	-	-
Stage 1	728	680	-	898	807	-	-	-	-	-	-	-
Stage 2	897	785	-	728	680	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	571	528	763	572	548	738	1287	-	-	1452	-	-
Mov Cap-2 Maneuver	571	528	-	572	548	-	-	-	-	-	-	-
Stage 1	727	679	-	897	806	-	-	-	-	-	-	-
Stage 2	895	784	-	727	679	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	12.4	0.1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1287	-	-	-	574	1452	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.156	0.001	-	-
HCM Control Delay (s)	7.8	0	-	0	12.4	7.5	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.6	0	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	20	0	1	0	55	5	0	215	0
Future Vol, veh/h	0	0	1	20	0	1	0	55	5	0	215	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	1	22	0	1	0	60	5	0	234	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	297	299	234	298	297	63	234	0	0	65	0	0
Stage 1	234	234	-	63	63	-	-	-	-	-	-	-
Stage 2	63	65	-	235	234	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	655	613	805	654	615	1002	1333	-	-	1537	-	-
Stage 1	769	711	-	948	842	-	-	-	-	-	-	-
Stage 2	948	841	-	768	711	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	654	613	805	653	615	1002	1333	-	-	1537	-	-
Mov Cap-2 Maneuver	654	613	-	653	615	-	-	-	-	-	-	-
Stage 1	769	711	-	948	842	-	-	-	-	-	-	-
Stage 2	947	841	-	767	711	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	10.6	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1333	-	-	805	664	1537	-	-
HCM Lane V/C Ratio	-	-	-	0.001	0.034	-	-	-
HCM Control Delay (s)	0	-	-	9.5	10.6	0	-	-
HCM Lane LOS	A	-	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	22	20	0	1	7	43	5	0	173	0
Future Vol, veh/h	0	0	22	20	0	1	7	43	5	0	173	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	11	2	2	2	2
Mvmt Flow	0	0	27	24	0	1	8	52	6	0	208	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	280	282	208	293	279	55	208	0	0	58	0	0
Stage 1	208	208	-	71	71	-	-	-	-	-	-	-
Stage 2	72	74	-	222	208	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	672	627	832	659	629	1012	1363	-	-	1546	-	-
Stage 1	794	730	-	939	836	-	-	-	-	-	-	-
Stage 2	938	833	-	780	730	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	668	623	832	635	625	1012	1363	-	-	1546	-	-
Mov Cap-2 Maneuver	668	623	-	635	625	-	-	-	-	-	-	-
Stage 1	789	730	-	933	831	-	-	-	-	-	-	-
Stage 2	931	828	-	755	730	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	10.8	1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1363	-	-	832	646	1546	-	-
HCM Lane V/C Ratio	0.006	-	-	0.032	0.039	-	-	-
HCM Control Delay (s)	7.7	0	-	9.5	10.8	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

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	0	0	21	19	0	1	7	13	7	0	30	0
Future Vol, veh/h	0	0	21	19	0	1	7	13	7	0	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	5	2	2	2	15	14	2	2	2
Mvmt Flow	0	0	24	22	0	1	8	15	8	0	34	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	70	74	34	82	70	20	34	0	0	24	0	0
Stage 1	34	34	-	36	36	-	-	-	-	-	-	-
Stage 2	36	40	-	46	34	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	922	816	1039	898	821	1058	1578	-	-	1591	-	-
Stage 1	982	867	-	972	865	-	-	-	-	-	-	-
Stage 2	980	862	-	960	867	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	917	811	1039	873	816	1057	1578	-	-	1589	-	-
Mov Cap-2 Maneuver	917	811	-	873	816	-	-	-	-	-	-	-
Stage 1	977	867	-	966	860	-	-	-	-	-	-	-
Stage 2	974	857	-	938	867	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.5	9.2	1.9	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1578	-	-	1039	881	1589	-	-
HCM Lane V/C Ratio	0.005	-	-	0.023	0.026	-	-	-
HCM Control Delay (s)	7.3	0	-	8.5	9.2	0	-	-
HCM Lane LOS	A	A	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	712	25	81	442	18	76
Future Vol, veh/h	712	25	81	442	18	76
Conflicting Peds, #/hr	0	1	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	11	4	4	6	10
Mvmt Flow	749	26	85	465	19	80

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	776	0	1398	764
Stage 1	-	-	-	-	763	-
Stage 2	-	-	-	-	635	-
Critical Hdwy	-	-	4.14	-	6.46	6.3
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.236	-	3.554	3.39
Pot Cap-1 Maneuver	-	-	831	-	152	391
Stage 1	-	-	-	-	453	-
Stage 2	-	-	-	-	520	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	830	-	136	390
Mov Cap-2 Maneuver	-	-	-	-	136	-
Stage 1	-	-	-	-	453	-
Stage 2	-	-	-	-	467	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	24
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	287	-	-	830	-
HCM Lane V/C Ratio	0.345	-	-	0.103	-
HCM Control Delay (s)	24	-	-	9.8	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1.5	-	-	0.3	-

Intersection												
Int Delay, s/veh	2.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	111	670	6	7	452	1	7	5	20	0	1	64
Future Vol, veh/h	111	670	6	7	452	1	7	5	20	0	1	64
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	12	4	2	11	4	2	2	2	67	2	2	3
Mvmt Flow	117	705	6	7	476	1	7	5	21	0	1	67

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	477	0	0	711	0	0	1467	1433	708	1446	1436	477
Stage 1	-	-	-	-	-	-	942	942	-	491	491	-
Stage 2	-	-	-	-	-	-	525	491	-	955	945	-
Critical Hdwy	4.22	-	-	4.21	-	-	7.12	6.52	6.87	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.308	-	-	2.299	-	-	3.518	4.018	3.903	3.518	4.018	3.327
Pot Cap-1 Maneuver	1035	-	-	848	-	-	106	134	342	109	133	586
Stage 1	-	-	-	-	-	-	316	342	-	559	548	-
Stage 2	-	-	-	-	-	-	536	548	-	310	340	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1035	-	-	848	-	-	79	108	342	84	107	586
Mov Cap-2 Maneuver	-	-	-	-	-	-	79	108	-	84	107	-
Stage 1	-	-	-	-	-	-	257	278	-	454	542	-
Stage 2	-	-	-	-	-	-	468	542	-	232	276	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	0.1	32.3	12.5
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	165	1035	-	-	848	-	-	548
HCM Lane V/C Ratio	0.204	0.113	-	-	0.009	-	-	0.125
HCM Control Delay (s)	32.3	8.9	0	-	9.3	-	-	12.5
HCM Lane LOS	D	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.7	0.4	-	-	0	-	-	0.4

Intersection												
Int Delay, s/veh	0.9											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	675	14	21	432	10	8	2	12	5	1	16
Future Vol, veh/h	3	675	14	21	432	10	8	2	12	5	1	16
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	1	1	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	4	2	2	4	9	2	2	2	2	2	8
Mvmt Flow	3	718	15	22	460	11	9	2	13	5	1	17

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	471	0	0	733	0	0	1253	1247	727	1250	1249	468
Stage 1	-	-	-	-	-	-	732	732	-	510	510	-
Stage 2	-	-	-	-	-	-	521	515	-	740	739	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.372
Pot Cap-1 Maneuver	1091	-	-	872	-	-	149	173	424	150	173	583
Stage 1	-	-	-	-	-	-	413	427	-	546	538	-
Stage 2	-	-	-	-	-	-	539	535	-	409	424	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1091	-	-	872	-	-	139	166	424	140	166	582
Mov Cap-2 Maneuver	-	-	-	-	-	-	139	166	-	140	166	-
Stage 1	-	-	-	-	-	-	411	425	-	543	520	-
Stage 2	-	-	-	-	-	-	503	517	-	392	422	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	22.8	17.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	225	1091	-	-	872	-	-	318
HCM Lane V/C Ratio	0.104	0.003	-	-	0.026	-	-	0.074
HCM Control Delay (s)	22.8	8.3	0	-	9.2	0	-	17.2
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	683	0	0	456	182	0	0	1	162	1	28
Future Volume (veh/h)	18	683	0	0	456	182	0	0	1	162	1	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		0.98	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	1411	1826	1826	1870	1841	1841	1870	1870	1870	1870	1870	1767
Adj Flow Rate, veh/h	20	742	0	0	496	198	0	0	1	176	1	30
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, %	33	5	5	2	4	4	2	2	2	2	2	9
Cap, veh/h	223	928	0	120	632	252	0	0	567	624	3	536
Arrive On Green	0.51	0.51	0.00	0.00	0.51	0.50	0.00	0.00	0.35	0.36	0.36	0.36
Sat Flow, veh/h	566	1826	0	718	1243	496	0	0	1583	1407	9	1495
Grp Volume(v), veh/h	20	742	0	0	0	694	0	0	1	177	0	30
Grp Sat Flow(s),veh/h/ln	566	1826	0	718	0	1739	0	0	1583	1416	0	1495
Q Serve(g_s), s	1.8	20.2	0.0	0.0	0.0	19.6	0.0	0.0	0.0	5.5	0.0	0.8
Cycle Q Clear(g_c), s	21.4	20.2	0.0	0.0	0.0	19.6	0.0	0.0	0.0	5.5	0.0	0.8
Prop In Lane	1.00		0.00	1.00		0.29	0.00		1.00	0.99		1.00
Lane Grp Cap(c), veh/h	223	928	0	120	0	884	0	0	567	627	0	536
V/C Ratio(X)	0.09	0.80	0.00	0.00	0.00	0.79	0.00	0.00	0.00	0.28	0.00	0.06
Avail Cap(c_a), veh/h	223	928	0	120	0	884	0	0	567	627	0	536
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.8	12.2	0.0	0.0	0.0	12.1	0.0	0.0	12.5	14.1	0.0	12.6
Incr Delay (d2), s/veh	0.8	7.2	0.0	0.0	0.0	6.9	0.0	0.0	0.0	1.1	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	0.3	8.5	0.0	0.0	0.0	7.9	0.0	0.0	0.0	1.8	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.6	19.4	0.0	0.0	0.0	19.1	0.0	0.0	12.5	15.2	0.0	12.8
LnGrp LOS	C	B	A	A	A	B	A	A	B	B	A	B
Approach Vol, veh/h		762			694			1			207	
Approach Delay, s/veh		19.4			19.1			12.5			14.9	
Approach LOS		B			B			B			B	

Timer - Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		25.5		34.5		25.5		34.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		21.0		30.0		21.0		30.0
Max Q Clear Time (g_c+I1), s		2.0		23.4		7.5		21.6
Green Ext Time (p_c), s		0.0		2.9		0.8		3.2

Intersection Summary		
HCM 6th Ctrl Delay		18.7
HCM 6th LOS		B

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	817	29	39	625	1	6	0	29	2	0	2
Future Vol, veh/h	1	817	29	39	625	1	6	0	29	2	0	2
Conflicting Peds, #/hr	2	0	0	0	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	3	2	50	2	2	2	4	2	2	2	2
Mvmt Flow	1	888	32	42	679	1	7	0	32	2	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	682	0	0	920	0	0	1672	1672	904	1688	1688	683
Stage 1	-	-	-	-	-	-	906	906	-	766	766	-
Stage 2	-	-	-	-	-	-	766	766	-	922	922	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.12	6.54	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	3.518	4.036	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	911	-	-	577	-	-	76	95	335	74	94	449
Stage 1	-	-	-	-	-	-	331	352	-	395	412	-
Stage 2	-	-	-	-	-	-	395	409	-	324	349	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	909	-	-	577	-	-	69	84	335	61	83	448
Mov Cap-2 Maneuver	-	-	-	-	-	-	69	84	-	61	83	-
Stage 1	-	-	-	-	-	-	330	351	-	393	363	-
Stage 2	-	-	-	-	-	-	347	360	-	293	348	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.7	26.9	40.1
HCM LOS			D	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	202	909	-	-	577	-	-	107
HCM Lane V/C Ratio	0.188	0.001	-	-	0.073	-	-	0.041
HCM Control Delay (s)	26.9	9	0	-	11.7	0	-	40.1
HCM Lane LOS	D	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	0.7	0	-	-	0.2	-	-	0.1

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	837	0	0	650	5	0	0	0	5	0	6
Future Vol, veh/h	8	837	0	0	650	5	0	0	0	5	0	6
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	2	2	2
Mvmt Flow	9	920	0	0	714	5	0	0	0	5	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	721	0	0	920	0	0	1658	1659	920	1657	1657	719
Stage 1	-	-	-	-	-	-	938	938	-	719	719	-
Stage 2	-	-	-	-	-	-	720	721	-	938	938	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	881	-	-	742	-	-	78	98	328	78	98	428
Stage 1	-	-	-	-	-	-	317	343	-	420	433	-
Stage 2	-	-	-	-	-	-	419	432	-	317	343	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	879	-	-	742	-	-	76	96	328	77	96	427
Mov Cap-2 Maneuver	-	-	-	-	-	-	76	96	-	77	96	-
Stage 1	-	-	-	-	-	-	310	336	-	410	432	-
Stage 2	-	-	-	-	-	-	413	431	-	310	336	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	33.4
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	879	-	-	742	-	-	139
HCM Lane V/C Ratio	-	0.01	-	-	-	-	-	0.087
HCM Control Delay (s)	0	9.1	0	-	0	-	-	33.4
HCM Lane LOS	A	A	A	-	A	-	-	D
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	23	859	0	0	680	30	0	0	2	10	0	13
Future Vol, veh/h	23	859	0	0	680	30	0	0	2	10	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	6	2	2
Mvmt Flow	25	924	0	0	731	32	0	0	2	11	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	763	0	0	924	0	0	1728	1737	924	1722	1721	747
Stage 1	-	-	-	-	-	-	974	974	-	747	747	-
Stage 2	-	-	-	-	-	-	754	763	-	975	974	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.318
Pot Cap-1 Maneuver	850	-	-	739	-	-	70	87	327	69	89	413
Stage 1	-	-	-	-	-	-	303	330	-	399	420	-
Stage 2	-	-	-	-	-	-	401	413	-	297	330	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	850	-	-	739	-	-	65	82	327	65	84	413
Mov Cap-2 Maneuver	-	-	-	-	-	-	65	82	-	65	84	-
Stage 1	-	-	-	-	-	-	285	310	-	375	420	-
Stage 2	-	-	-	-	-	-	387	413	-	277	310	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	16.1	41.1
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	327	850	-	-	739	-	-	124
HCM Lane V/C Ratio	0.007	0.029	-	-	-	-	-	0.199
HCM Control Delay (s)	16.1	9.4	0	-	0	-	-	41.1
HCM Lane LOS	C	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.7

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	39	826	7	5	662	36	3	0	14	24	0	45
Future Vol, veh/h	39	826	7	5	662	36	3	0	14	24	0	45
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	7	7	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	3	3	2	2	3	2	2	2	17	2	2	3
Mvmt Flow	42	898	8	5	720	39	3	0	15	26	0	49

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	760	0	0	911	0	0	1765	1761	914	1752	1746	741
Stage 1	-	-	-	-	-	-	991	991	-	751	751	-
Stage 2	-	-	-	-	-	-	774	770	-	1001	995	-
Critical Hdwy	4.13	-	-	4.12	-	-	7.12	6.52	6.37	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.227	-	-	2.218	-	-	3.518	4.018	3.453	3.518	4.018	3.327
Pot Cap-1 Maneuver	847	-	-	748	-	-	65	84	311	67	86	415
Stage 1	-	-	-	-	-	-	296	324	-	403	418	-
Stage 2	-	-	-	-	-	-	391	410	-	293	323	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	846	-	-	744	-	-	52	74	307	58	76	415
Mov Cap-2 Maneuver	-	-	-	-	-	-	52	74	-	58	76	-
Stage 1	-	-	-	-	-	-	265	290	-	362	413	-
Stage 2	-	-	-	-	-	-	341	405	-	249	289	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.1	29.6	63.2
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	165	846	-	-	744	-	-	132
HCM Lane V/C Ratio	0.112	0.05	-	-	0.007	-	-	0.568
HCM Control Delay (s)	29.6	9.5	0	-	9.9	0	-	63.2
HCM Lane LOS	D	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.4	0.2	-	-	0	-	-	2.8

Intersection	
Int Delay, s/veh	13

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			↰	↱
Traffic Vol, veh/h	107	25	6	30	40	36	3	178	12	15	143	38
Future Vol, veh/h	107	25	6	30	40	36	3	178	12	15	143	38
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	-	-	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	10	4	2	5	3	2	2	2	50	2	3	2
Mvmt Flow	124	29	7	35	47	42	3	207	14	17	166	44

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	90	0	0	36	0	0	502	441	33	530	423	69
Stage 1	-	-	-	-	-	-	281	281	-	139	139	-
Stage 2	-	-	-	-	-	-	221	160	-	391	284	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.12	6.52	6.7	7.12	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.518	4.018	3.75	3.518	4.027	3.318
Pot Cap-1 Maneuver	1456	-	-	1556	-	-	480	510	918	460	521	994
Stage 1	-	-	-	-	-	-	726	678	-	864	780	-
Stage 2	-	-	-	-	-	-	781	766	-	633	675	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1455	-	-	1556	-	-	305	454	918	269	464	993
Mov Cap-2 Maneuver	-	-	-	-	-	-	305	454	-	269	464	-
Stage 1	-	-	-	-	-	-	663	619	-	788	761	-
Stage 2	-	-	-	-	-	-	569	747	-	379	616	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6	2.1	19.8	17.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	465	1455	-	-	1556	-	-	434	993
HCM Lane V/C Ratio	0.483	0.086	-	-	0.022	-	-	0.423	0.044
HCM Control Delay (s)	19.8	7.7	0	-	7.4	0	-	19.2	8.8
HCM Lane LOS	C	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	2.6	0.3	-	-	0.1	-	-	2.1	0.1

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	43	0	5	92	27	3	1	3	10	3	14
Future Vol, veh/h	14	43	0	5	92	27	3	1	3	10	3	14
Conflicting Peds, #/hr	3	0	1	1	0	3	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	43	2	2	2	2	2	2	2	2	6	2	36
Mvmt Flow	15	46	0	5	98	29	3	1	3	11	3	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	130	0	0	47	0	0	209	217	49	206	203	116
Stage 1	-	-	-	-	-	-	77	77	-	126	126	-
Stage 2	-	-	-	-	-	-	132	140	-	80	77	-
Critical Hdwy	4.53	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.56
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.587	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.624
Pot Cap-1 Maneuver	1238	-	-	1560	-	-	748	681	1020	743	693	852
Stage 1	-	-	-	-	-	-	932	831	-	868	792	-
Stage 2	-	-	-	-	-	-	871	781	-	919	831	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1234	-	-	1559	-	-	723	668	1017	728	680	850
Mov Cap-2 Maneuver	-	-	-	-	-	-	723	668	-	728	680	-
Stage 1	-	-	-	-	-	-	920	820	-	855	787	-
Stage 2	-	-	-	-	-	-	850	776	-	902	820	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0.3	9.5	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	814	1234	-	-	1559	-	-	780
HCM Lane V/C Ratio	0.009	0.012	-	-	0.003	-	-	0.037
HCM Control Delay (s)	9.5	8	0	-	7.3	0	-	9.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	0	320	11	0	193
Future Vol, veh/h	6	0	320	11	0	193
Conflicting Peds, #/hr	1	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	23	2	6	2	2	2
Mvmt Flow	7	0	386	13	0	233

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	627	393	0	0	399	0
Stage 1	393	-	-	-	-	-
Stage 2	234	-	-	-	-	-
Critical Hdwy	6.63	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.63	-	-	-	-	-
Critical Hdwy Stg 2	5.63	-	-	-	-	-
Follow-up Hdwy	3.707	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	415	656	-	-	1160	-
Stage 1	639	-	-	-	-	-
Stage 2	758	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	415	656	-	-	1160	-
Mov Cap-2 Maneuver	415	-	-	-	-	-
Stage 1	639	-	-	-	-	-
Stage 2	757	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	415	1160	-
HCM Lane V/C Ratio	-	-	0.017	-	-
HCM Control Delay (s)	-	-	13.8	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	45	0	0	1	204	108	0	144	0
Future Vol, veh/h	0	0	0	45	0	0	1	204	108	0	144	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	100	2	11	2	2	2	2
Mvmt Flow	0	0	0	51	0	0	1	232	123	0	164	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	460	521	164	460	460	294	164	0	0	355	0	0
Stage 1	164	164	-	296	296	-	-	-	-	-	-	-
Stage 2	296	357	-	164	164	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	7.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	4.2	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	512	460	881	512	498	562	1414	-	-	1204	-	-
Stage 1	838	762	-	712	668	-	-	-	-	-	-	-
Stage 2	712	628	-	838	762	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	511	460	881	511	498	562	1414	-	-	1204	-	-
Mov Cap-2 Maneuver	511	460	-	511	498	-	-	-	-	-	-	-
Stage 1	837	762	-	711	667	-	-	-	-	-	-	-
Stage 2	711	627	-	838	762	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	12.8	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1414	-	-	-	511	1204	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.1	-	-	-
HCM Control Delay (s)	7.5	0	-	0	12.8	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.3	0	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	10	0	0	1	189	10	0	123	0
Future Vol, veh/h	0	0	0	10	0	0	1	189	10	0	123	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	11	0	0	1	205	11	0	134	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	347	352	134	347	347	211	134	0	0	216	0	0
Stage 1	134	134	-	213	213	-	-	-	-	-	-	-
Stage 2	213	218	-	134	134	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	607	573	915	607	576	829	1451	-	-	1354	-	-
Stage 1	869	785	-	789	726	-	-	-	-	-	-	-
Stage 2	789	723	-	869	785	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	606	572	915	606	575	829	1451	-	-	1354	-	-
Mov Cap-2 Maneuver	606	572	-	606	575	-	-	-	-	-	-	-
Stage 1	868	785	-	788	725	-	-	-	-	-	-	-
Stage 2	788	722	-	869	785	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	11	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1451	-	-	-	606	1354	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.018	-	-	-
HCM Control Delay (s)	7.5	0	-	0	11	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	14	11	0	0	28	148	7	0	96	0
Future Vol, veh/h	0	0	14	11	0	0	28	148	7	0	96	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	11	2	2	2	2
Mvmt Flow	0	0	17	13	0	0	34	178	8	0	116	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	366	370	116	375	366	182	116	0	0	186	0	0
Stage 1	116	116	-	250	250	-	-	-	-	-	-	-
Stage 2	250	254	-	125	116	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	590	560	936	582	562	861	1473	-	-	1388	-	-
Stage 1	889	800	-	754	700	-	-	-	-	-	-	-
Stage 2	754	697	-	879	800	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	578	545	936	560	547	861	1473	-	-	1388	-	-
Mov Cap-2 Maneuver	578	545	-	560	547	-	-	-	-	-	-	-
Stage 1	866	800	-	734	682	-	-	-	-	-	-	-
Stage 2	734	679	-	863	800	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.9	11.6	1.1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1473	-	-	936	560	1388	-	-
HCM Lane V/C Ratio	0.023	-	-	0.018	0.024	-	-	-
HCM Control Delay (s)	7.5	0	-	8.9	11.6	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0	-	-

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	0	0	13	9	0	1	23	37	24	1	20	0
Future Vol, veh/h	0	0	13	9	0	1	23	37	24	1	20	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	5	2	2	2	15	14	2	2	2
Mvmt Flow	0	0	15	10	0	1	26	42	27	1	23	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	133	147	23	142	134	57	23	0	0	70	0	0
Stage 1	25	25	-	109	109	-	-	-	-	-	-	-
Stage 2	108	122	-	33	25	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	839	744	1054	821	757	1009	1592	-	-	1531	-	-
Stage 1	993	874	-	889	805	-	-	-	-	-	-	-
Stage 2	897	795	-	976	874	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	826	730	1054	798	743	1008	1592	-	-	1530	-	-
Mov Cap-2 Maneuver	826	730	-	798	743	-	-	-	-	-	-	-
Stage 1	976	873	-	873	791	-	-	-	-	-	-	-
Stage 2	881	781	-	961	873	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.5	9.5	2	0.4
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1592	-	-	1054	815	1530	-	-
HCM Lane V/C Ratio	0.016	-	-	0.014	0.014	0.001	-	-
HCM Control Delay (s)	7.3	0	-	8.5	9.5	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0	0	-	-

APPENDIX E

Analysis Reports Future (2040) Without Project Conditions

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	475	19	83	724	19	71
Future Vol, veh/h	475	19	83	724	19	71
Conflicting Peds, #/hr	0	1	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	11	4	4	6	10
Mvmt Flow	500	20	87	762	20	75

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	521	0	1447	512
Stage 1	-	-	-	-	511	-
Stage 2	-	-	-	-	936	-
Critical Hdwy	-	-	4.14	-	6.46	6.3
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.236	-	3.554	3.39
Pot Cap-1 Maneuver	-	-	1035	-	142	546
Stage 1	-	-	-	-	594	-
Stage 2	-	-	-	-	375	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1034	-	130	545
Mov Cap-2 Maneuver	-	-	-	-	130	-
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	344	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	20.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	326	-	-	1034	-
HCM Lane V/C Ratio	0.291	-	-	0.084	-
HCM Control Delay (s)	20.5	-	-	8.8	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1.2	-	-	0.3	-

Intersection												
Int Delay, s/veh	2.3											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	58	482	2	9	667	2	0	0	6	0	0	141
Future Vol, veh/h	58	482	2	9	667	2	0	0	6	0	0	141
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	12	4	2	11	4	2	2	2	67	2	2	3
Mvmt Flow	61	507	2	9	702	2	0	0	6	0	0	148

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	704	0	0	509	0	0	1425	1352	508	1354	1352	703
Stage 1	-	-	-	-	-	-	630	630	-	721	721	-
Stage 2	-	-	-	-	-	-	795	722	-	633	631	-
Critical Hdwy	4.22	-	-	4.21	-	-	7.12	6.52	6.87	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.308	-	-	2.299	-	-	3.518	4.018	3.903	3.518	4.018	3.327
Pot Cap-1 Maneuver	849	-	-	1011	-	-	113	150	455	127	150	436
Stage 1	-	-	-	-	-	-	470	475	-	419	432	-
Stage 2	-	-	-	-	-	-	381	431	-	468	474	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	849	-	-	1011	-	-	68	133	455	114	133	436
Mov Cap-2 Maneuver	-	-	-	-	-	-	68	133	-	114	133	-
Stage 1	-	-	-	-	-	-	423	428	-	377	426	-
Stage 2	-	-	-	-	-	-	248	425	-	415	427	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0.1	13	17.5
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	455	849	-	-	1011	-	-	436
HCM Lane V/C Ratio	0.014	0.072	-	-	0.009	-	-	0.34
HCM Control Delay (s)	13	9.6	0	-	8.6	-	-	17.5
HCM Lane LOS	B	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0.2	-	-	0	-	-	1.5

Intersection												
Int Delay, s/veh	0.8											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	486	7	5	655	12	6	2	6	11	0	13
Future Vol, veh/h	2	486	7	5	655	12	6	2	6	11	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	1	1	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	4	2	2	4	9	2	2	2	2	2	8
Mvmt Flow	2	517	7	5	697	13	6	2	6	12	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	710	0	0	524	0	0	1248	1245	522	1244	1242	706
Stage 1	-	-	-	-	-	-	525	525	-	714	714	-
Stage 2	-	-	-	-	-	-	723	720	-	530	528	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.372
Pot Cap-1 Maneuver	889	-	-	1043	-	-	150	174	555	151	175	426
Stage 1	-	-	-	-	-	-	536	529	-	422	435	-
Stage 2	-	-	-	-	-	-	417	432	-	533	528	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	889	-	-	1043	-	-	144	172	554	146	173	425
Mov Cap-2 Maneuver	-	-	-	-	-	-	144	172	-	146	173	-
Stage 1	-	-	-	-	-	-	534	527	-	421	432	-
Stage 2	-	-	-	-	-	-	399	429	-	523	526	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	22.7	22.9
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	218	889	-	-	1043	-	-	227
HCM Lane V/C Ratio	0.068	0.002	-	-	0.005	-	-	0.112
HCM Control Delay (s)	22.7	9.1	0	-	8.5	0	-	22.9
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	512	0	0	670	71	0	0	0	218	0	34
Future Volume (veh/h)	3	512	0	0	670	71	0	0	0	218	0	34
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		0.98	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	1411	1826	1826	1870	1841	1841	1870	1870	1870	1870	1870	1767
Adj Flow Rate, veh/h	3	557	0	0	728	77	0	0	0	237	0	37
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, %	33	5	5	2	4	4	2	2	2	2	2	9
Cap, veh/h	176	925	0	120	827	87	0	673	0	630	0	538
Arrive On Green	0.51	0.51	0.00	0.00	0.51	0.50	0.00	0.00	0.00	0.36	0.00	0.36
Sat Flow, veh/h	510	1826	0	852	1633	173	0	1870	0	1416	0	1495
Grp Volume(v), veh/h	3	557	0	0	0	805	0	0	0	237	0	37
Grp Sat Flow(s),veh/h/ln	510	1826	0	852	0	1805	0	1870	0	1416	0	1495
Q Serve(g_s), s	0.3	13.0	0.0	0.0	0.0	23.8	0.0	0.0	0.0	7.7	0.0	1.0
Cycle Q Clear(g_c), s	24.1	13.0	0.0	0.0	0.0	23.8	0.0	0.0	0.0	7.7	0.0	1.0
Prop In Lane	1.00		0.00	1.00		0.10	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	176	925	0	120	0	915	0	673	0	630	0	538
V/C Ratio(X)	0.02	0.60	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.38	0.00	0.07
Avail Cap(c_a), veh/h	176	925	0	120	0	915	0	673	0	630	0	538
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.9	10.5	0.0	0.0	0.0	13.2	0.0	0.0	0.0	14.8	0.0	12.6
Incr Delay (d2), s/veh	0.2	2.9	0.0	0.0	0.0	11.8	0.0	0.0	0.0	1.7	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	0.0	5.0	0.0	0.0	0.0	10.8	0.0	0.0	0.0	2.5	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.1	13.4	0.0	0.0	0.0	25.0	0.0	0.0	0.0	16.5	0.0	12.8
LnGrp LOS	C	B	A	A	A	C	A	A	A	B	A	B
Approach Vol, veh/h		560			805			0			274	
Approach Delay, s/veh		13.5			25.0			0.0			16.0	
Approach LOS		B			C						B	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	25.6	34.4	25.6	34.4
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	21.1	29.9	21.1	29.9
Max Q Clear Time (g_c+I1), s	0.0	26.1	9.7	25.8
Green Ext Time (p_c), s	0.0	1.3	1.1	2.1

Intersection Summary	
HCM 6th Ctrl Delay	19.6
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	722	6	4	734	1	2	0	17	1	0	0
Future Vol, veh/h	3	722	6	4	734	1	2	0	17	1	0	0
Conflicting Peds, #/hr	2	0	0	0	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	3	2	50	2	2	2	4	2	2	2	2
Mvmt Flow	3	785	7	4	798	1	2	0	18	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	801	0	0	792	0	0	1603	1604	789	1613	1607	802
Stage 1	-	-	-	-	-	-	795	795	-	809	809	-
Stage 2	-	-	-	-	-	-	808	809	-	804	798	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.12	6.54	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	3.518	4.036	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	822	-	-	652	-	-	85	104	391	84	105	384
Stage 1	-	-	-	-	-	-	381	397	-	374	394	-
Stage 2	-	-	-	-	-	-	375	391	-	377	398	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	820	-	-	652	-	-	84	102	391	79	103	383
Mov Cap-2 Maneuver	-	-	-	-	-	-	84	102	-	79	103	-
Stage 1	-	-	-	-	-	-	378	394	-	371	389	-
Stage 2	-	-	-	-	-	-	371	386	-	357	395	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	18.8	51.2
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	282	820	-	-	652	-	-	79
HCM Lane V/C Ratio	0.073	0.004	-	-	0.007	-	-	0.014
HCM Control Delay (s)	18.8	9.4	0	-	10.6	0	-	51.2
HCM Lane LOS	C	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection												
Int Delay, s/veh	0.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	736	0	0	741	3	1	0	0	1	0	5
Future Vol, veh/h	8	736	0	0	741	3	1	0	0	1	0	5
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	2	2	2
Mvmt Flow	9	809	0	0	814	3	1	0	0	1	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	819	0	0	809	0	0	1645	1646	809	1645	1645	818
Stage 1	-	-	-	-	-	-	827	827	-	818	818	-
Stage 2	-	-	-	-	-	-	818	819	-	827	827	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	810	-	-	817	-	-	79	99	380	79	99	376
Stage 1	-	-	-	-	-	-	366	386	-	370	390	-
Stage 2	-	-	-	-	-	-	370	389	-	366	386	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	808	-	-	817	-	-	77	97	380	78	97	375
Mov Cap-2 Maneuver	-	-	-	-	-	-	77	97	-	78	97	-
Stage 1	-	-	-	-	-	-	359	378	-	362	389	-
Stage 2	-	-	-	-	-	-	365	388	-	359	378	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	52.4	21.2
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	77	808	-	-	817	-	-	229
HCM Lane V/C Ratio	0.014	0.011	-	-	-	-	-	0.029
HCM Control Delay (s)	52.4	9.5	0	-	0	-	-	21.2
HCM Lane LOS	F	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection												
Int Delay, s/veh	1											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	19	752	0	0	761	20	0	0	1	17	0	9
Future Vol, veh/h	19	752	0	0	761	20	0	0	1	17	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	6	2	2
Mvmt Flow	20	809	0	0	818	22	0	0	1	18	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	840	0	0	809	0	0	1683	1689	809	1679	1678	829
Stage 1	-	-	-	-	-	-	849	849	-	829	829	-
Stage 2	-	-	-	-	-	-	834	840	-	850	849	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.318
Pot Cap-1 Maneuver	795	-	-	817	-	-	75	93	380	74	95	370
Stage 1	-	-	-	-	-	-	356	377	-	359	385	-
Stage 2	-	-	-	-	-	-	362	381	-	350	377	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	795	-	-	817	-	-	71	89	380	71	91	370
Mov Cap-2 Maneuver	-	-	-	-	-	-	71	89	-	71	91	-
Stage 1	-	-	-	-	-	-	340	360	-	342	385	-
Stage 2	-	-	-	-	-	-	353	381	-	333	360	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	14.5	55.1
HCM LOS			B	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	380	795	-	-	817	-	-	99
HCM Lane V/C Ratio	0.003	0.026	-	-	-	-	-	0.282
HCM Control Delay (s)	14.5	9.6	0	-	0	-	-	55.1
HCM Lane LOS	B	A	A	-	A	-	-	F
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	1.1

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	33	743	5	2	753	13	0	0	6	7	1	33
Future Vol, veh/h	33	743	5	2	753	13	0	0	6	7	1	33
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	7	7	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	3	3	2	2	3	2	2	2	17	2	2	3
Mvmt Flow	36	808	5	2	818	14	0	0	7	8	1	36

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	833	0	0	818	0	0	1736	1725	823	1723	1720	826
Stage 1	-	-	-	-	-	-	888	888	-	830	830	-
Stage 2	-	-	-	-	-	-	848	837	-	893	890	-
Critical Hdwy	4.13	-	-	4.12	-	-	7.12	6.52	6.37	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.227	-	-	2.218	-	-	3.518	4.018	3.453	3.518	4.018	3.327
Pot Cap-1 Maneuver	796	-	-	810	-	-	69	89	351	70	89	370
Stage 1	-	-	-	-	-	-	338	362	-	364	385	-
Stage 2	-	-	-	-	-	-	356	382	-	336	361	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	795	-	-	806	-	-	57	81	347	64	81	370
Mov Cap-2 Maneuver	-	-	-	-	-	-	57	81	-	64	81	-
Stage 1	-	-	-	-	-	-	309	330	-	333	383	-
Stage 2	-	-	-	-	-	-	319	380	-	300	329	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	15.6	29
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	347	795	-	-	806	-	-	194
HCM Lane V/C Ratio	0.019	0.045	-	-	0.003	-	-	0.23
HCM Control Delay (s)	15.6	9.7	0	-	9.5	0	-	29
HCM Lane LOS	C	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.9

Intersection	
Int Delay, s/veh	10.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	39	27	8	20	36	1	3	65	2	17	220	117
Future Vol, veh/h	39	27	8	20	36	1	3	65	2	17	220	117
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	-	-	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	10	4	2	5	3	2	2	2	50	2	3	2
Mvmt Flow	45	31	9	23	42	1	3	76	2	20	256	136

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	44	0	0	40	0	0	343	216	36	255	220	44
Stage 1	-	-	-	-	-	-	126	126	-	90	90	-
Stage 2	-	-	-	-	-	-	217	90	-	165	130	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.12	6.52	6.7	7.12	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.518	4.018	3.75	3.518	4.027	3.318
Pot Cap-1 Maneuver	1514	-	-	1550	-	-	611	682	915	698	677	1026
Stage 1	-	-	-	-	-	-	878	792	-	917	818	-
Stage 2	-	-	-	-	-	-	785	820	-	837	787	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1513	-	-	1550	-	-	355	651	915	613	646	1025
Mov Cap-2 Maneuver	-	-	-	-	-	-	355	651	-	613	646	-
Stage 1	-	-	-	-	-	-	852	768	-	889	805	-
Stage 2	-	-	-	-	-	-	457	807	-	730	763	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.9	2.6	11.5	12.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	634	1513	-	-	1550	-	-	644	1025
HCM Lane V/C Ratio	0.128	0.03	-	-	0.015	-	-	0.428	0.133
HCM Control Delay (s)	11.5	7.5	0	-	7.4	0	-	14.7	9
HCM Lane LOS	B	A	A	-	A	A	-	B	A
HCM 95th %tile Q(veh)	0.4	0.1	-	-	0	-	-	2.1	0.5

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	7	31	1	1	60	3	3	4	3	17	1	12
Future Vol, veh/h	7	31	1	1	60	3	3	4	3	17	1	12
Conflicting Peds, #/hr	3	0	1	1	0	3	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	43	2	2	2	2	2	2	2	2	6	2	36
Mvmt Flow	7	33	1	1	64	3	3	4	3	18	1	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	70	0	0	35	0	0	124	121	37	124	120	69
Stage 1	-	-	-	-	-	-	49	49	-	71	71	-
Stage 2	-	-	-	-	-	-	75	72	-	53	49	-
Critical Hdwy	4.53	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.56
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.587	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.624
Pot Cap-1 Maneuver	1307	-	-	1576	-	-	850	769	1035	841	770	907
Stage 1	-	-	-	-	-	-	964	854	-	929	836	-
Stage 2	-	-	-	-	-	-	934	835	-	950	854	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1303	-	-	1574	-	-	832	761	1032	827	762	904
Mov Cap-2 Maneuver	-	-	-	-	-	-	832	761	-	827	762	-
Stage 1	-	-	-	-	-	-	958	849	-	922	833	-
Stage 2	-	-	-	-	-	-	919	832	-	936	849	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0.1	9.3	9.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	850	1303	-	-	1574	-	-	854
HCM Lane V/C Ratio	0.013	0.006	-	-	0.001	-	-	0.037
HCM Control Delay (s)	9.3	7.8	0	-	7.3	0	-	9.4
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	1	119	2	1	340
Future Vol, veh/h	14	1	119	2	1	340
Conflicting Peds, #/hr	1	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	23	2	6	2	2	2
Mvmt Flow	17	1	143	2	1	410

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	557	144	0	0	145	0
Stage 1	144	-	-	-	-	-
Stage 2	413	-	-	-	-	-
Critical Hdwy	6.63	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.63	-	-	-	-	-
Critical Hdwy Stg 2	5.63	-	-	-	-	-
Follow-up Hdwy	3.707	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	457	903	-	-	1437	-
Stage 1	834	-	-	-	-	-
Stage 2	625	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	456	903	-	-	1437	-
Mov Cap-2 Maneuver	456	-	-	-	-	-
Stage 1	834	-	-	-	-	-
Stage 2	624	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	472	1437	-
HCM Lane V/C Ratio	-	-	0.038	0.001	-
HCM Control Delay (s)	-	-	12.9	7.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	81	0	1	1	70	51	1	251	0
Future Vol, veh/h	0	0	0	81	0	1	1	70	51	1	251	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	100	2	11	2	2	2	2
Mvmt Flow	0	0	0	92	0	1	1	80	58	1	285	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	399	427	285	398	398	109	285	0	0	138	0	0
Stage 1	287	287	-	111	111	-	-	-	-	-	-	-
Stage 2	112	140	-	287	287	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	7.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	4.2	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	561	520	754	562	540	734	1277	-	-	1446	-	-
Stage 1	720	674	-	894	804	-	-	-	-	-	-	-
Stage 2	893	781	-	720	674	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	559	519	754	561	539	734	1277	-	-	1446	-	-
Mov Cap-2 Maneuver	559	519	-	561	539	-	-	-	-	-	-	-
Stage 1	719	673	-	893	803	-	-	-	-	-	-	-
Stage 2	891	780	-	719	673	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	12.7	0.1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1277	-	-	-	563	1446	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.166	0.001	-	-
HCM Control Delay (s)	7.8	0	-	0	12.7	7.5	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.6	0	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	21	0	1	0	56	5	0	221	0
Future Vol, veh/h	0	0	1	21	0	1	0	56	5	0	221	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	1	23	0	1	0	61	5	0	240	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	304	306	240	305	304	64	240	0	0	66	0	0
Stage 1	240	240	-	64	64	-	-	-	-	-	-	-
Stage 2	64	66	-	241	240	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	648	608	799	647	609	1000	1327	-	-	1536	-	-
Stage 1	763	707	-	947	842	-	-	-	-	-	-	-
Stage 2	947	840	-	762	707	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	647	608	799	646	609	1000	1327	-	-	1536	-	-
Mov Cap-2 Maneuver	647	608	-	646	609	-	-	-	-	-	-	-
Stage 1	763	707	-	947	842	-	-	-	-	-	-	-
Stage 2	946	840	-	761	707	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	10.7	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1327	-	-	799	657	1536	-	-
HCM Lane V/C Ratio	-	-	-	0.001	0.036	-	-	-
HCM Control Delay (s)	0	-	-	9.5	10.7	0	-	-
HCM Lane LOS	A	-	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	22	21	0	1	7	44	5	0	179	0
Future Vol, veh/h	0	0	22	21	0	1	7	44	5	0	179	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	11	2	2	2	2
Mvmt Flow	0	0	27	25	0	1	8	53	6	0	216	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	289	291	216	302	288	56	216	0	0	59	0	0
Stage 1	216	216	-	72	72	-	-	-	-	-	-	-
Stage 2	73	75	-	230	216	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	663	619	824	650	622	1011	1354	-	-	1545	-	-
Stage 1	786	724	-	938	835	-	-	-	-	-	-	-
Stage 2	937	833	-	773	724	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	659	615	824	626	618	1011	1354	-	-	1545	-	-
Mov Cap-2 Maneuver	659	615	-	626	618	-	-	-	-	-	-	-
Stage 1	781	724	-	932	830	-	-	-	-	-	-	-
Stage 2	930	828	-	748	724	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	10.9	1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1354	-	-	824	637	1545	-	-
HCM Lane V/C Ratio	0.006	-	-	0.032	0.042	-	-	-
HCM Control Delay (s)	7.7	0	-	9.5	10.9	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

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	0	0	21	20	0	1	7	14	7	0	32	0
Future Vol, veh/h	0	0	21	20	0	1	7	14	7	0	32	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	5	2	2	2	15	14	2	2	2
Mvmt Flow	0	0	24	23	0	1	8	16	8	0	36	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	73	77	36	85	73	21	36	0	0	25	0	0
Stage 1	36	36	-	37	37	-	-	-	-	-	-	-
Stage 2	37	41	-	48	36	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	918	813	1037	894	817	1056	1575	-	-	1589	-	-
Stage 1	980	865	-	971	864	-	-	-	-	-	-	-
Stage 2	978	861	-	958	865	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	913	808	1037	869	812	1055	1575	-	-	1587	-	-
Mov Cap-2 Maneuver	913	808	-	869	812	-	-	-	-	-	-	-
Stage 1	975	865	-	965	859	-	-	-	-	-	-	-
Stage 2	972	856	-	936	865	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.6	9.2	1.8	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1575	-	-	1037	876	1587	-	-
HCM Lane V/C Ratio	0.005	-	-	0.023	0.027	-	-	-
HCM Control Delay (s)	7.3	0	-	8.6	9.2	0	-	-
HCM Lane LOS	A	A	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	739	26	84	459	19	79
Future Vol, veh/h	739	26	84	459	19	79
Conflicting Peds, #/hr	0	1	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	11	4	4	6	10
Mvmt Flow	778	27	88	483	20	83

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	806	0	1452	794
Stage 1	-	-	-	-	793	-
Stage 2	-	-	-	-	659	-
Critical Hdwy	-	-	4.14	-	6.46	6.3
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.236	-	3.554	3.39
Pot Cap-1 Maneuver	-	-	810	-	141	376
Stage 1	-	-	-	-	439	-
Stage 2	-	-	-	-	507	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	809	-	125	375
Mov Cap-2 Maneuver	-	-	-	-	125	-
Stage 1	-	-	-	-	439	-
Stage 2	-	-	-	-	452	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	26.3
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	270	-	-	809	-
HCM Lane V/C Ratio	0.382	-	-	0.109	-
HCM Control Delay (s)	26.3	-	-	10	-
HCM Lane LOS	D	-	-	A	-
HCM 95th %tile Q(veh)	1.7	-	-	0.4	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	115	696	6	7	469	1	7	5	21	0	1	66
Future Vol, veh/h	115	696	6	7	469	1	7	5	21	0	1	66
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	12	4	2	11	4	2	2	2	67	2	2	3
Mvmt Flow	121	733	6	7	494	1	7	5	22	0	1	69

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	495	0	0	739	0	0	1522	1487	736	1501	1490	495
Stage 1	-	-	-	-	-	-	978	978	-	509	509	-
Stage 2	-	-	-	-	-	-	544	509	-	992	981	-
Critical Hdwy	4.22	-	-	4.21	-	-	7.12	6.52	6.87	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.308	-	-	2.299	-	-	3.518	4.018	3.903	3.518	4.018	3.327
Pot Cap-1 Maneuver	1019	-	-	828	-	-	97	124	329	100	124	573
Stage 1	-	-	-	-	-	-	301	329	-	547	538	-
Stage 2	-	-	-	-	-	-	523	538	-	296	328	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1019	-	-	828	-	-	71	98	329	75	98	573
Mov Cap-2 Maneuver	-	-	-	-	-	-	71	98	-	75	98	-
Stage 1	-	-	-	-	-	-	240	263	-	437	532	-
Stage 2	-	-	-	-	-	-	453	532	-	216	262	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	0.1	34.8	12.8
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	155	1019	-	-	828	-	-	534
HCM Lane V/C Ratio	0.224	0.119	-	-	0.009	-	-	0.132
HCM Control Delay (s)	34.8	9	0	-	9.4	-	-	12.8
HCM Lane LOS	D	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.8	0.4	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	701	15	22	449	11	8	2	13	5	1	17
Future Vol, veh/h	3	701	15	22	449	11	8	2	13	5	1	17
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	1	1	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	4	2	2	4	9	2	2	2	2	2	8
Mvmt Flow	3	746	16	23	478	12	9	2	14	5	1	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	490	0	0	762	0	0	1302	1296	755	1299	1298	486
Stage 1	-	-	-	-	-	-	760	760	-	530	530	-
Stage 2	-	-	-	-	-	-	542	536	-	769	768	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.372
Pot Cap-1 Maneuver	1073	-	-	850	-	-	138	162	409	138	162	569
Stage 1	-	-	-	-	-	-	398	414	-	533	527	-
Stage 2	-	-	-	-	-	-	525	523	-	394	411	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1073	-	-	850	-	-	128	155	409	128	155	568
Mov Cap-2 Maneuver	-	-	-	-	-	-	128	155	-	128	155	-
Stage 1	-	-	-	-	-	-	396	412	-	530	508	-
Stage 2	-	-	-	-	-	-	488	504	-	376	409	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	23.9	17.8
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	215	1073	-	-	850	-	-	305
HCM Lane V/C Ratio	0.114	0.003	-	-	0.028	-	-	0.08
HCM Control Delay (s)	23.9	8.4	0	-	9.4	0	-	17.8
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	709	0	0	473	188	0	0	1	168	1	30
Future Volume (veh/h)	19	709	0	0	473	188	0	0	1	168	1	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		0.98	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	1411	1826	1826	1870	1841	1841	1870	1870	1870	1870	1870	1767
Adj Flow Rate, veh/h	21	771	0	0	514	204	0	0	1	183	1	33
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, %	33	5	5	2	4	4	2	2	2	2	2	9
Cap, veh/h	210	928	0	120	633	251	0	0	567	624	3	536
Arrive On Green	0.51	0.51	0.00	0.00	0.51	0.50	0.00	0.00	0.35	0.36	0.36	0.36
Sat Flow, veh/h	554	1826	0	698	1245	494	0	0	1583	1407	9	1495
Grp Volume(v), veh/h	21	771	0	0	0	718	0	0	1	184	0	33
Grp Sat Flow(s),veh/h/ln	554	1826	0	698	0	1739	0	0	1583	1415	0	1495
Q Serve(g_s), s	2.0	21.6	0.0	0.0	0.0	20.8	0.0	0.0	0.0	5.7	0.0	0.9
Cycle Q Clear(g_c), s	22.8	21.6	0.0	0.0	0.0	20.8	0.0	0.0	0.0	5.8	0.0	0.9
Prop In Lane	1.00		0.00	1.00		0.28	0.00		1.00	0.99		1.00
Lane Grp Cap(c), veh/h	210	928	0	120	0	884	0	0	567	627	0	536
V/C Ratio(X)	0.10	0.83	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.29	0.00	0.06
Avail Cap(c_a), veh/h	210	928	0	120	0	884	0	0	567	627	0	536
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.9	12.6	0.0	0.0	0.0	12.4	0.0	0.0	12.5	14.2	0.0	12.6
Incr Delay (d2), s/veh	1.0	8.6	0.0	0.0	0.0	8.0	0.0	0.0	0.0	1.2	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	0.3	9.3	0.0	0.0	0.0	8.5	0.0	0.0	0.0	1.9	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.8	21.1	0.0	0.0	0.0	20.4	0.0	0.0	12.5	15.4	0.0	12.9
LnGrp LOS	C	C	A	A	A	C	A	A	B	B	A	B
Approach Vol, veh/h		792			718			1			217	
Approach Delay, s/veh		21.2			20.4			12.5			15.0	
Approach LOS		C			C			B			B	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	25.5	34.5	25.5	34.5
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	21.0	30.0	21.0	30.0
Max Q Clear Time (g_c+I1), s	2.0	24.8	7.8	22.8
Green Ext Time (p_c), s	0.0	2.5	0.9	3.0

Intersection Summary	
HCM 6th Ctrl Delay	20.1
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	847	31	40	648	1	6	0	31	2	0	2
Future Vol, veh/h	1	847	31	40	648	1	6	0	31	2	0	2
Conflicting Peds, #/hr	2	0	0	0	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	3	2	50	2	2	2	4	2	2	2	2
Mvmt Flow	1	921	34	43	704	1	7	0	34	2	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	707	0	0	955	0	0	1733	1733	938	1750	1750	708
Stage 1	-	-	-	-	-	-	940	940	-	793	793	-
Stage 2	-	-	-	-	-	-	793	793	-	957	957	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.12	6.54	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	3.518	4.036	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	891	-	-	558	-	-	69	87	321	67	86	435
Stage 1	-	-	-	-	-	-	316	340	-	382	400	-
Stage 2	-	-	-	-	-	-	382	397	-	310	336	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	889	-	-	558	-	-	62	76	321	54	75	434
Mov Cap-2 Maneuver	-	-	-	-	-	-	62	76	-	54	75	-
Stage 1	-	-	-	-	-	-	315	339	-	380	348	-
Stage 2	-	-	-	-	-	-	331	346	-	277	335	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.7	28.8	44.3
HCM LOS			D	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	191	889	-	-	558	-	-	96
HCM Lane V/C Ratio	0.211	0.001	-	-	0.078	-	-	0.045
HCM Control Delay (s)	28.8	9.1	0	-	12	0	-	44.3
HCM Lane LOS	D	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	0.8	0	-	-	0.3	-	-	0.1

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	869	0	0	674	5	0	0	0	5	0	6
Future Vol, veh/h	8	869	0	0	674	5	0	0	0	5	0	6
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	2	2	2
Mvmt Flow	9	955	0	0	741	5	0	0	0	5	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	748	0	0	955	0	0	1720	1721	955	1719	1719	746
Stage 1	-	-	-	-	-	-	973	973	-	746	746	-
Stage 2	-	-	-	-	-	-	747	748	-	973	973	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	861	-	-	720	-	-	70	89	313	71	90	413
Stage 1	-	-	-	-	-	-	303	330	-	405	421	-
Stage 2	-	-	-	-	-	-	405	420	-	303	330	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	859	-	-	720	-	-	68	87	313	70	88	412
Mov Cap-2 Maneuver	-	-	-	-	-	-	68	87	-	70	88	-
Stage 1	-	-	-	-	-	-	296	323	-	395	420	-
Stage 2	-	-	-	-	-	-	399	419	-	296	323	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	36
HCM LOS			A	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	859	-	-	720	-	-	128
HCM Lane V/C Ratio	-	0.01	-	-	-	-	-	0.094
HCM Control Delay (s)	0	9.2	0	-	0	-	-	36
HCM Lane LOS	A	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	892	0	0	705	32	0	0	2	11	0	14
Future Vol, veh/h	24	892	0	0	705	32	0	0	2	11	0	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	6	2	2
Mvmt Flow	26	959	0	0	758	34	0	0	2	12	0	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	792	0	0	959	0	0	1794	1803	959	1787	1786	775
Stage 1	-	-	-	-	-	-	1011	1011	-	775	775	-
Stage 2	-	-	-	-	-	-	783	792	-	1012	1011	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.318
Pot Cap-1 Maneuver	829	-	-	717	-	-	62	79	312	62	81	398
Stage 1	-	-	-	-	-	-	289	317	-	385	408	-
Stage 2	-	-	-	-	-	-	387	401	-	284	317	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	829	-	-	717	-	-	57	74	312	58	76	398
Mov Cap-2 Maneuver	-	-	-	-	-	-	57	74	-	58	76	-
Stage 1	-	-	-	-	-	-	270	296	-	359	408	-
Stage 2	-	-	-	-	-	-	372	401	-	263	296	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	16.6	47.5
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	312	829	-	-	717	-	-	111
HCM Lane V/C Ratio	0.007	0.031	-	-	-	-	-	0.242
HCM Control Delay (s)	16.6	9.5	0	-	0	-	-	47.5
HCM Lane LOS	C	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.9

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	40	857	7	5	687	37	3	0	15	25	0	46
Future Vol, veh/h	40	857	7	5	687	37	3	0	15	25	0	46
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	7	7	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	3	3	2	2	3	2	2	2	17	2	2	3
Mvmt Flow	43	932	8	5	747	40	3	0	16	27	0	50

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	788	0	0	945	0	0	1829	1825	948	1815	1809	768
Stage 1	-	-	-	-	-	-	1027	1027	-	778	778	-
Stage 2	-	-	-	-	-	-	802	798	-	1037	1031	-
Critical Hdwy	4.13	-	-	4.12	-	-	7.12	6.52	6.37	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.227	-	-	2.218	-	-	3.518	4.018	3.453	3.518	4.018	3.327
Pot Cap-1 Maneuver	827	-	-	726	-	-	59	77	297	60	79	400
Stage 1	-	-	-	-	-	-	283	312	-	389	407	-
Stage 2	-	-	-	-	-	-	378	398	-	279	310	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	826	-	-	723	-	-	47	67	294	51	69	400
Mov Cap-2 Maneuver	-	-	-	-	-	-	47	67	-	51	69	-
Stage 1	-	-	-	-	-	-	251	277	-	346	402	-
Stage 2	-	-	-	-	-	-	327	393	-	233	275	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.1	31.2	81.7
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	157	826	-	-	723	-	-	117
HCM Lane V/C Ratio	0.125	0.053	-	-	0.008	-	-	0.66
HCM Control Delay (s)	31.2	9.6	0	-	10	0	-	81.7
HCM Lane LOS	D	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	0.4	0.2	-	-	0	-	-	3.4

Intersection	
Int Delay, s/veh	13.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	110	26	6	32	41	37	3	184	13	16	148	40
Future Vol, veh/h	110	26	6	32	41	37	3	184	13	16	148	40
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	-	-	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	10	4	2	5	3	2	2	2	50	2	3	2
Mvmt Flow	128	30	7	37	48	43	3	214	15	19	172	47

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	92	0	0	37	0	0	520	456	34	549	438	71
Stage 1	-	-	-	-	-	-	290	290	-	145	145	-
Stage 2	-	-	-	-	-	-	230	166	-	404	293	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.12	6.52	6.7	7.12	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.518	4.018	3.75	3.518	4.027	3.318
Pot Cap-1 Maneuver	1454	-	-	1554	-	-	467	501	917	446	511	991
Stage 1	-	-	-	-	-	-	718	672	-	858	775	-
Stage 2	-	-	-	-	-	-	773	761	-	623	668	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1453	-	-	1554	-	-	288	444	917	251	453	990
Mov Cap-2 Maneuver	-	-	-	-	-	-	288	444	-	251	453	-
Stage 1	-	-	-	-	-	-	653	612	-	780	755	-
Stage 2	-	-	-	-	-	-	555	741	-	363	608	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6	2.1	20.8	18.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	456	1453	-	-	1554	-	-	420	990
HCM Lane V/C Ratio	0.51	0.088	-	-	0.024	-	-	0.454	0.047
HCM Control Delay (s)	20.8	7.7	0	-	7.4	0	-	20.5	8.8
HCM Lane LOS	C	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	2.8	0.3	-	-	0.1	-	-	2.3	0.1

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	44	0	5	96	28	3	1	3	11	3	15
Future Vol, veh/h	15	44	0	5	96	28	3	1	3	11	3	15
Conflicting Peds, #/hr	3	0	1	1	0	3	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	43	2	2	2	2	2	2	2	2	6	2	36
Mvmt Flow	16	47	0	5	102	30	3	1	3	12	3	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	135	0	0	48	0	0	217	225	50	213	210	120
Stage 1	-	-	-	-	-	-	80	80	-	130	130	-
Stage 2	-	-	-	-	-	-	137	145	-	83	80	-
Critical Hdwy	4.53	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.56
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.587	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.624
Pot Cap-1 Maneuver	1232	-	-	1559	-	-	739	674	1018	735	687	847
Stage 1	-	-	-	-	-	-	929	828	-	864	789	-
Stage 2	-	-	-	-	-	-	866	777	-	915	828	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1228	-	-	1558	-	-	713	661	1015	720	673	845
Mov Cap-2 Maneuver	-	-	-	-	-	-	713	661	-	720	673	-
Stage 1	-	-	-	-	-	-	916	816	-	850	784	-
Stage 2	-	-	-	-	-	-	844	772	-	897	816	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0.3	9.5	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	807	1228	-	-	1558	-	-	774
HCM Lane V/C Ratio	0.009	0.013	-	-	0.003	-	-	0.04
HCM Control Delay (s)	9.5	8	0	-	7.3	0	-	9.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	0	331	12	0	200
Future Vol, veh/h	6	0	331	12	0	200
Conflicting Peds, #/hr	1	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	23	2	6	2	2	2
Mvmt Flow	7	0	399	14	0	241

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	648	406	0	0	413	0
Stage 1	406	-	-	-	-	-
Stage 2	242	-	-	-	-	-
Critical Hdwy	6.63	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.63	-	-	-	-	-
Critical Hdwy Stg 2	5.63	-	-	-	-	-
Follow-up Hdwy	3.707	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	404	645	-	-	1146	-
Stage 1	630	-	-	-	-	-
Stage 2	751	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	404	645	-	-	1146	-
Mov Cap-2 Maneuver	404	-	-	-	-	-
Stage 1	630	-	-	-	-	-
Stage 2	750	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	404	1146	-
HCM Lane V/C Ratio	-	-	0.018	-	-
HCM Control Delay (s)	-	-	14.1	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	46	0	0	1	210	112	0	148	0
Future Vol, veh/h	0	0	0	46	0	0	1	210	112	0	148	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	100	2	11	2	2	2	2
Mvmt Flow	0	0	0	52	0	0	1	239	127	0	168	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	473	536	168	473	473	303	168	0	0	366	0	0
Stage 1	168	168	-	305	305	-	-	-	-	-	-	-
Stage 2	305	368	-	168	168	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	7.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	4.2	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	501	451	876	501	490	555	1410	-	-	1193	-	-
Stage 1	834	759	-	705	662	-	-	-	-	-	-	-
Stage 2	705	621	-	834	759	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	500	451	876	500	490	555	1410	-	-	1193	-	-
Mov Cap-2 Maneuver	500	451	-	500	490	-	-	-	-	-	-	-
Stage 1	833	759	-	704	661	-	-	-	-	-	-	-
Stage 2	704	620	-	834	759	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	13	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1410	-	-	-	500	1193	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.105	-	-	-
HCM Control Delay (s)	7.6	0	-	0	13	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.3	0	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	11	0	0	1	195	11	0	127	0
Future Vol, veh/h	0	0	0	11	0	0	1	195	11	0	127	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	12	0	0	1	212	12	0	138	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	358	364	138	358	358	218	138	0	0	224	0	0
Stage 1	138	138	-	220	220	-	-	-	-	-	-	-
Stage 2	220	226	-	138	138	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	597	564	910	597	568	822	1446	-	-	1345	-	-
Stage 1	865	782	-	782	721	-	-	-	-	-	-	-
Stage 2	782	717	-	865	782	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	596	563	910	596	567	822	1446	-	-	1345	-	-
Mov Cap-2 Maneuver	596	563	-	596	567	-	-	-	-	-	-	-
Stage 1	864	782	-	781	720	-	-	-	-	-	-	-
Stage 2	781	716	-	865	782	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	11.2	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1446	-	-	-	596	1345	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.02	-	-	-
HCM Control Delay (s)	7.5	0	-	0	11.2	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	14	12	0	0	28	153	7	0	99	0
Future Vol, veh/h	0	0	14	12	0	0	28	153	7	0	99	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	11	2	2	2	2
Mvmt Flow	0	0	17	14	0	0	34	184	8	0	119	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	375	379	119	384	375	188	119	0	0	192	0	0
Stage 1	119	119	-	256	256	-	-	-	-	-	-	-
Stage 2	256	260	-	128	119	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	582	553	933	574	556	854	1469	-	-	1381	-	-
Stage 1	885	797	-	749	696	-	-	-	-	-	-	-
Stage 2	749	693	-	876	797	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	570	539	933	552	542	854	1469	-	-	1381	-	-
Mov Cap-2 Maneuver	570	539	-	552	542	-	-	-	-	-	-	-
Stage 1	862	797	-	730	678	-	-	-	-	-	-	-
Stage 2	730	675	-	860	797	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.9	11.7	1.1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1469	-	-	933	552	1381	-	-
HCM Lane V/C Ratio	0.023	-	-	0.018	0.026	-	-	-
HCM Control Delay (s)	7.5	0	-	8.9	11.7	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	13	9	0	1	23	38	25	1	21	0
Future Vol, veh/h	0	0	13	9	0	1	23	38	25	1	21	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	5	2	2	2	15	14	2	2	2
Mvmt Flow	0	0	15	10	0	1	26	43	28	1	24	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	136	150	24	144	136	58	24	0	0	72	0	0
Stage 1	26	26	-	110	110	-	-	-	-	-	-	-
Stage 2	110	124	-	34	26	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	835	742	1052	818	755	1008	1591	-	-	1528	-	-
Stage 1	992	874	-	888	804	-	-	-	-	-	-	-
Stage 2	895	793	-	974	874	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	822	728	1052	795	741	1007	1591	-	-	1527	-	-
Mov Cap-2 Maneuver	822	728	-	795	741	-	-	-	-	-	-	-
Stage 1	975	873	-	872	790	-	-	-	-	-	-	-
Stage 2	879	779	-	959	873	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.5	9.5	2	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1591	-	-	1052	812	1527	-	-
HCM Lane V/C Ratio	0.016	-	-	0.014	0.014	0.001	-	-
HCM Control Delay (s)	7.3	0	-	8.5	9.5	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0	0	-	-

APPENDIX F

Analysis Reports Future (2040) With Project Conditions

Intersection	
Int Delay, s/veh	19

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	533	19	83	795	29	19	0	71	51	0	71
Future Vol, veh/h	22	533	19	83	795	29	19	0	71	51	0	71
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	1	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	95	95	95	95	92	95	92	95	92	92	92
Heavy Vehicles, %	2	4	11	4	4	2	6	2	10	2	2	2
Mvmt Flow	24	561	20	87	837	32	20	0	75	55	0	77

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	869	0	0	582	0	0	1686	1663	573	1685	1657	853
Stage 1	-	-	-	-	-	-	620	620	-	1027	1027	-
Stage 2	-	-	-	-	-	-	1066	1043	-	658	630	-
Critical Hdwy	4.12	-	-	4.14	-	-	7.16	6.52	6.3	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.236	-	-	3.554	4.018	3.39	3.518	4.018	3.318
Pot Cap-1 Maneuver	775	-	-	982	-	-	73	97	504	75	98	359
Stage 1	-	-	-	-	-	-	469	480	-	283	312	-
Stage 2	-	-	-	-	-	-	264	306	-	453	475	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	775	-	-	981	-	-	52	84	503	57	85	359
Mov Cap-2 Maneuver	-	-	-	-	-	-	52	84	-	57	85	-
Stage 1	-	-	-	-	-	-	447	457	-	270	284	-
Stage 2	-	-	-	-	-	-	189	279	-	368	453	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.8	46.2	215.8
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	178	775	-	-	981	-	-	112
HCM Lane V/C Ratio	0.532	0.031	-	-	0.089	-	-	1.184
HCM Control Delay (s)	46.2	9.8	0	-	9	-	-	215.8
HCM Lane LOS	E	A	A	-	A	-	-	F
HCM 95th %tile Q(veh)	2.7	0.1	-	-	0.3	-	-	8.5

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	58	591	2	9	767	2	0	0	6	0	0	141
Future Vol, veh/h	58	591	2	9	767	2	0	0	6	0	0	141
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	12	4	2	11	4	2	2	2	67	2	2	3
Mvmt Flow	61	622	2	9	807	2	0	0	6	0	0	148

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	809	0	0	624	0	0	1645	1572	623	1574	1572	808
Stage 1	-	-	-	-	-	-	745	745	-	826	826	-
Stage 2	-	-	-	-	-	-	900	827	-	748	746	-
Critical Hdwy	4.22	-	-	4.21	-	-	7.12	6.52	6.87	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.308	-	-	2.299	-	-	3.518	4.018	3.903	3.518	4.018	3.327
Pot Cap-1 Maneuver	774	-	-	915	-	-	79	110	386	89	110	379
Stage 1	-	-	-	-	-	-	406	421	-	366	387	-
Stage 2	-	-	-	-	-	-	333	386	-	404	421	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	774	-	-	915	-	-	43	95	386	78	95	379
Mov Cap-2 Maneuver	-	-	-	-	-	-	43	95	-	78	95	-
Stage 1	-	-	-	-	-	-	357	370	-	322	380	-
Stage 2	-	-	-	-	-	-	199	379	-	349	370	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.1	14.5	20.5
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	386	774	-	-	915	-	-	379
HCM Lane V/C Ratio	0.016	0.079	-	-	0.01	-	-	0.392
HCM Control Delay (s)	14.5	10	0	-	9	-	-	20.5
HCM Lane LOS	B	B	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0.3	-	-	0	-	-	1.8

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	595	7	5	755	12	6	2	6	11	0	13
Future Vol, veh/h	2	595	7	5	755	12	6	2	6	11	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	1	1	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	4	2	2	4	9	2	2	2	2	2	8
Mvmt Flow	2	633	7	5	803	13	6	2	6	12	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	816	0	0	640	0	0	1470	1467	638	1466	1464	812
Stage 1	-	-	-	-	-	-	641	641	-	820	820	-
Stage 2	-	-	-	-	-	-	829	826	-	646	644	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.372
Pot Cap-1 Maneuver	812	-	-	944	-	-	105	128	477	106	128	370
Stage 1	-	-	-	-	-	-	463	469	-	369	389	-
Stage 2	-	-	-	-	-	-	365	387	-	460	468	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	812	-	-	944	-	-	100	126	477	102	126	369
Mov Cap-2 Maneuver	-	-	-	-	-	-	100	126	-	102	126	-
Stage 1	-	-	-	-	-	-	461	467	-	368	385	-
Stage 2	-	-	-	-	-	-	347	383	-	450	466	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	30.1	30.2
HCM LOS			D	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	158	812	-	-	944	-	-	168
HCM Lane V/C Ratio	0.094	0.003	-	-	0.006	-	-	0.152
HCM Control Delay (s)	30.1	9.4	0	-	8.8	0	-	30.2
HCM Lane LOS	D	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	614	0	0	743	82	0	0	0	245	0	61
Future Volume (veh/h)	10	614	0	0	743	82	0	0	0	245	0	61
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		0.98	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	1411	1826	1826	1870	1841	1841	1870	1870	1870	1870	1870	1767
Adj Flow Rate, veh/h	11	667	0	0	808	89	0	0	0	266	0	66
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, %	33	5	5	2	4	4	2	2	2	2	2	9
Cap, veh/h	177	1054	0	103	938	103	0	577	0	540	0	461
Arrive On Green	0.58	0.58	0.00	0.00	0.58	0.57	0.00	0.00	0.00	0.31	0.00	0.31
Sat Flow, veh/h	468	1826	0	769	1625	179	0	1870	0	1415	0	1495
Grp Volume(v), veh/h	11	667	0	0	0	897	0	0	0	266	0	66
Grp Sat Flow(s),veh/h/ln	468	1826	0	769	0	1804	0	1870	0	1415	0	1495
Q Serve(g_s), s	1.4	17.0	0.0	0.0	0.0	29.3	0.0	0.0	0.0	11.2	0.0	2.2
Cycle Q Clear(g_c), s	30.7	17.0	0.0	0.0	0.0	29.3	0.0	0.0	0.0	11.2	0.0	2.2
Prop In Lane	1.00		0.00	1.00		0.10	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	177	1054	0	103	0	1041	0	577	0	540	0	461
V/C Ratio(X)	0.06	0.63	0.00	0.00	0.00	0.86	0.00	0.00	0.00	0.49	0.00	0.14
Avail Cap(c_a), veh/h	177	1054	0	103	0	1041	0	577	0	540	0	461
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.4	9.9	0.0	0.0	0.0	12.5	0.0	0.0	0.0	20.6	0.0	17.5
Incr Delay (d2), s/veh	0.7	2.9	0.0	0.0	0.0	9.4	0.0	0.0	0.0	3.2	0.0	0.7
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	6.4	0.0	0.0	0.0	12.2	0.0	0.0	0.0	3.9	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.0	12.8	0.0	0.0	0.0	21.8	0.0	0.0	0.0	23.8	0.0	18.2
LnGrp LOS	C	B	A	A	A	C	A	A	A	C	A	B
Approach Vol, veh/h		678			897			0			332	
Approach Delay, s/veh		13.0			21.8			0.0			22.7	
Approach LOS		B			C						C	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	25.6	44.4	25.6	44.4
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	21.1	39.9	21.1	39.9
Max Q Clear Time (g_c+I1), s	0.0	32.7	13.2	31.3
Green Ext Time (p_c), s	0.0	2.7	1.1	4.3

Intersection Summary	
HCM 6th Ctrl Delay	18.8
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	851	6	4	818	1	2	0	17	1	0	0
Future Vol, veh/h	3	851	6	4	818	1	2	0	17	1	0	0
Conflicting Peds, #/hr	2	0	0	0	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	3	2	50	2	2	2	4	2	2	2	2
Mvmt Flow	3	925	7	4	889	1	2	0	18	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	892	0	0	932	0	0	1834	1835	929	1844	1838	893
Stage 1	-	-	-	-	-	-	935	935	-	900	900	-
Stage 2	-	-	-	-	-	-	899	900	-	944	938	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.12	6.54	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	3.518	4.036	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	760	-	-	571	-	-	59	75	324	58	76	340
Stage 1	-	-	-	-	-	-	318	341	-	333	357	-
Stage 2	-	-	-	-	-	-	334	355	-	315	343	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	759	-	-	571	-	-	58	73	324	54	74	339
Mov Cap-2 Maneuver	-	-	-	-	-	-	58	73	-	54	74	-
Stage 1	-	-	-	-	-	-	315	338	-	330	351	-
Stage 2	-	-	-	-	-	-	329	349	-	295	340	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	23.1	73
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	219	759	-	-	571	-	-	54
HCM Lane V/C Ratio	0.094	0.004	-	-	0.008	-	-	0.02
HCM Control Delay (s)	23.1	9.8	0	-	11.4	0	-	73
HCM Lane LOS	C	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	865	0	0	825	3	1	0	0	1	0	5
Future Vol, veh/h	8	865	0	0	825	3	1	0	0	1	0	5
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	2	2	2
Mvmt Flow	9	951	0	0	907	3	1	0	0	1	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	912	0	0	951	0	0	1880	1881	951	1880	1880	911
Stage 1	-	-	-	-	-	-	969	969	-	911	911	-
Stage 2	-	-	-	-	-	-	911	912	-	969	969	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	747	-	-	722	-	-	54	71	315	54	71	332
Stage 1	-	-	-	-	-	-	305	332	-	328	353	-
Stage 2	-	-	-	-	-	-	328	353	-	305	332	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	746	-	-	722	-	-	52	69	315	53	69	331
Mov Cap-2 Maneuver	-	-	-	-	-	-	52	69	-	53	69	-
Stage 1	-	-	-	-	-	-	297	323	-	319	352	-
Stage 2	-	-	-	-	-	-	323	352	-	297	323	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	75.7	26.1
HCM LOS			F	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	52	746	-	-	722	-	-	177
HCM Lane V/C Ratio	0.021	0.012	-	-	-	-	-	0.037
HCM Control Delay (s)	75.7	9.9	0	-	0	-	-	26.1
HCM Lane LOS	F	A	A	-	A	-	-	D
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	19	881	0	0	845	20	0	0	1	17	0	9
Future Vol, veh/h	19	881	0	0	845	20	0	0	1	17	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	6	2	2
Mvmt Flow	20	947	0	0	909	22	0	0	1	18	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	931	0	0	947	0	0	1912	1918	947	1908	1907	920
Stage 1	-	-	-	-	-	-	987	987	-	920	920	-
Stage 2	-	-	-	-	-	-	925	931	-	988	987	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.318
Pot Cap-1 Maneuver	735	-	-	725	-	-	52	67	317	51	68	328
Stage 1	-	-	-	-	-	-	298	325	-	319	350	-
Stage 2	-	-	-	-	-	-	323	346	-	292	325	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	735	-	-	725	-	-	48	63	317	49	64	328
Mov Cap-2 Maneuver	-	-	-	-	-	-	48	63	-	49	64	-
Stage 1	-	-	-	-	-	-	281	306	-	301	350	-
Stage 2	-	-	-	-	-	-	313	346	-	274	306	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	16.4	88.9
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	317	735	-	-	725	-	-	69
HCM Lane V/C Ratio	0.003	0.028	-	-	-	-	-	0.405
HCM Control Delay (s)	16.4	10	0	-	0	-	-	88.9
HCM Lane LOS	C	B	A	-	A	-	-	F
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	1.6

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	33	872	5	2	837	13	0	0	6	7	1	33
Future Vol, veh/h	33	872	5	2	837	13	0	0	6	7	1	33
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	7	7	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	3	3	2	2	3	2	2	2	17	2	2	3
Mvmt Flow	36	948	5	2	910	14	0	0	7	8	1	36

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	925	0	0	958	0	0	1968	1957	963	1955	1952	918
Stage 1	-	-	-	-	-	-	1028	1028	-	922	922	-
Stage 2	-	-	-	-	-	-	940	929	-	1033	1030	-
Critical Hdwy	4.13	-	-	4.12	-	-	7.12	6.52	6.37	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.227	-	-	2.218	-	-	3.518	4.018	3.453	3.518	4.018	3.327
Pot Cap-1 Maneuver	735	-	-	718	-	-	47	64	291	48	64	328
Stage 1	-	-	-	-	-	-	283	311	-	324	349	-
Stage 2	-	-	-	-	-	-	316	346	-	281	311	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	734	-	-	715	-	-	38	57	288	43	57	328
Mov Cap-2 Maneuver	-	-	-	-	-	-	38	57	-	43	57	-
Stage 1	-	-	-	-	-	-	252	277	-	290	347	-
Stage 2	-	-	-	-	-	-	279	344	-	244	277	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	17.8	40.1
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	288	734	-	-	715	-	-	146
HCM Lane V/C Ratio	0.023	0.049	-	-	0.003	-	-	0.305
HCM Control Delay (s)	17.8	10.2	0	-	10.1	0	-	40.1
HCM Lane LOS	C	B	A	-	B	A	-	E
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	1.2

Intersection	
Int Delay, s/veh	11.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	39	27	8	20	36	1	3	83	2	17	274	117
Future Vol, veh/h	39	27	8	20	36	1	3	83	2	17	274	117
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	-	-	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	10	4	2	5	3	2	2	2	50	2	3	2
Mvmt Flow	45	31	9	23	42	1	3	97	2	20	319	136

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	44	0	0	40	0	0	374	216	36	265	220	44
Stage 1	-	-	-	-	-	-	126	126	-	90	90	-
Stage 2	-	-	-	-	-	-	248	90	-	175	130	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.12	6.52	6.7	7.12	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.518	4.018	3.75	3.518	4.027	3.318
Pot Cap-1 Maneuver	1514	-	-	1550	-	-	583	682	915	688	677	1026
Stage 1	-	-	-	-	-	-	878	792	-	917	818	-
Stage 2	-	-	-	-	-	-	756	820	-	827	787	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1513	-	-	1550	-	-	300	651	915	588	646	1025
Mov Cap-2 Maneuver	-	-	-	-	-	-	300	651	-	588	646	-
Stage 1	-	-	-	-	-	-	852	768	-	889	805	-
Stage 2	-	-	-	-	-	-	390	807	-	700	763	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.9	2.6	11.8	14.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	630	1513	-	-	1550	-	-	642	1025
HCM Lane V/C Ratio	0.162	0.03	-	-	0.015	-	-	0.527	0.133
HCM Control Delay (s)	11.8	7.5	0	-	7.4	0	-	16.7	9
HCM Lane LOS	B	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0	-	-	3.1	0.5

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	7	31	1	1	60	3	3	4	3	17	1	12
Future Vol, veh/h	7	31	1	1	60	3	3	4	3	17	1	12
Conflicting Peds, #/hr	3	0	1	1	0	3	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	43	2	2	2	2	2	2	2	2	6	2	36
Mvmt Flow	7	33	1	1	64	3	3	4	3	18	1	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	70	0	0	35	0	0	124	121	37	124	120	69
Stage 1	-	-	-	-	-	-	49	49	-	71	71	-
Stage 2	-	-	-	-	-	-	75	72	-	53	49	-
Critical Hdwy	4.53	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.56
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.587	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.624
Pot Cap-1 Maneuver	1307	-	-	1576	-	-	850	769	1035	841	770	907
Stage 1	-	-	-	-	-	-	964	854	-	929	836	-
Stage 2	-	-	-	-	-	-	934	835	-	950	854	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1303	-	-	1574	-	-	832	761	1032	827	762	904
Mov Cap-2 Maneuver	-	-	-	-	-	-	832	761	-	827	762	-
Stage 1	-	-	-	-	-	-	958	849	-	922	833	-
Stage 2	-	-	-	-	-	-	919	832	-	936	849	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0.1	9.3	9.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	850	1303	-	-	1574	-	-	854
HCM Lane V/C Ratio	0.013	0.006	-	-	0.001	-	-	0.037
HCM Control Delay (s)	9.3	7.8	0	-	7.3	0	-	9.4
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	27	14	0	1	9	128	2	1	367	0
Future Vol, veh/h	0	0	27	14	0	1	9	128	2	1	367	0
Conflicting Peds, #/hr	0	0	0	1	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	83	92	83	92	83	83	83	83	92
Heavy Vehicles, %	2	2	2	23	2	2	2	6	2	2	2	2
Mvmt Flow	0	0	29	17	0	1	10	154	2	1	442	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	620	620	443	635	619	155	442	0	0	156	0	0
Stage 1	444	444	-	175	175	-	-	-	-	-	-	-
Stage 2	176	176	-	460	444	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.33	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.33	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.33	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.707	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	400	404	615	363	404	891	1118	-	-	1424	-	-
Stage 1	593	575	-	780	754	-	-	-	-	-	-	-
Stage 2	826	753	-	543	575	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	396	400	614	342	400	891	1118	-	-	1424	-	-
Mov Cap-2 Maneuver	396	400	-	342	400	-	-	-	-	-	-	-
Stage 1	587	574	-	772	746	-	-	-	-	-	-	-
Stage 2	817	745	-	516	574	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.2	15.6	0.5	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1118	-	-	614	357	1424	-	-
HCM Lane V/C Ratio	0.009	-	-	0.048	0.051	0.001	-	-
HCM Control Delay (s)	8.2	0	-	11.2	15.6	7.5	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	81	0	1	1	79	51	1	278	0
Future Vol, veh/h	0	0	0	81	0	1	1	79	51	1	278	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	100	2	11	2	2	2	2
Mvmt Flow	0	0	0	92	0	1	1	90	58	1	316	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	440	468	316	439	439	119	316	0	0	148	0	0
Stage 1	318	318	-	121	121	-	-	-	-	-	-	-
Stage 2	122	150	-	318	318	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	7.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	4.2	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	527	493	724	528	512	724	1244	-	-	1434	-	-
Stage 1	693	654	-	883	796	-	-	-	-	-	-	-
Stage 2	882	773	-	693	654	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	525	492	724	527	511	724	1244	-	-	1434	-	-
Mov Cap-2 Maneuver	525	492	-	527	511	-	-	-	-	-	-	-
Stage 1	692	653	-	882	795	-	-	-	-	-	-	-
Stage 2	880	772	-	692	653	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	13.3	0.1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1244	-	-	-	529	1434	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.176	0.001	-	-
HCM Control Delay (s)	7.9	0	-	0	13.3	7.5	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.6	0	-	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	28	21	0	1	9	56	5	0	221	0
Future Vol, veh/h	0	0	28	21	0	1	9	56	5	0	221	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	30	23	0	1	10	61	5	0	240	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	324	326	240	339	324	64	240	0	0	66	0	0
Stage 1	240	240	-	84	84	-	-	-	-	-	-	-
Stage 2	84	86	-	255	240	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	629	592	799	615	594	1000	1327	-	-	1536	-	-
Stage 1	763	707	-	924	825	-	-	-	-	-	-	-
Stage 2	924	824	-	749	707	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	625	587	799	588	589	1000	1327	-	-	1536	-	-
Mov Cap-2 Maneuver	625	587	-	588	589	-	-	-	-	-	-	-
Stage 1	757	707	-	917	818	-	-	-	-	-	-	-
Stage 2	916	817	-	720	707	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.7	11.3	1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1327	-	-	799	599	1536	-	-
HCM Lane V/C Ratio	0.007	-	-	0.038	0.04	-	-	-
HCM Control Delay (s)	7.7	0	-	9.7	11.3	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	22	21	0	1	7	44	5	0	179	0
Future Vol, veh/h	0	0	22	21	0	1	7	44	5	0	179	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	11	2	2	2	2
Mvmt Flow	0	0	27	25	0	1	8	53	6	0	216	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	289	291	216	302	288	56	216	0	0	59	0	0
Stage 1	216	216	-	72	72	-	-	-	-	-	-	-
Stage 2	73	75	-	230	216	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	663	619	824	650	622	1011	1354	-	-	1545	-	-
Stage 1	786	724	-	938	835	-	-	-	-	-	-	-
Stage 2	937	833	-	773	724	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	659	615	824	626	618	1011	1354	-	-	1545	-	-
Mov Cap-2 Maneuver	659	615	-	626	618	-	-	-	-	-	-	-
Stage 1	781	724	-	932	830	-	-	-	-	-	-	-
Stage 2	930	828	-	748	724	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	10.9	1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1354	-	-	824	637	1545	-	-
HCM Lane V/C Ratio	0.006	-	-	0.032	0.042	-	-	-
HCM Control Delay (s)	7.7	0	-	9.5	10.9	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

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	0	0	21	20	0	1	7	14	7	0	32	0
Future Vol, veh/h	0	0	21	20	0	1	7	14	7	0	32	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	5	2	2	2	15	14	2	2	2
Mvmt Flow	0	0	24	23	0	1	8	16	8	0	36	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	73	77	36	85	73	21	36	0	0	25	0	0
Stage 1	36	36	-	37	37	-	-	-	-	-	-	-
Stage 2	37	41	-	48	36	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	918	813	1037	894	817	1056	1575	-	-	1589	-	-
Stage 1	980	865	-	971	864	-	-	-	-	-	-	-
Stage 2	978	861	-	958	865	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	913	808	1037	869	812	1055	1575	-	-	1587	-	-
Mov Cap-2 Maneuver	913	808	-	869	812	-	-	-	-	-	-	-
Stage 1	975	865	-	965	859	-	-	-	-	-	-	-
Stage 2	972	856	-	936	865	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.6	9.2	1.8	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1575	-	-	1037	876	1587	-	-
HCM Lane V/C Ratio	0.005	-	-	0.023	0.027	-	-	-
HCM Control Delay (s)	7.3	0	-	8.6	9.2	0	-	-
HCM Lane LOS	A	A	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	27	523	841	44	51	77
Future Vol, veh/h	27	523	841	44	51	77
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	568	914	48	55	84

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	962	0	-	0	1564	938
Stage 1	-	-	-	-	938	-
Stage 2	-	-	-	-	626	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	715	-	-	-	123	321
Stage 1	-	-	-	-	381	-
Stage 2	-	-	-	-	533	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	715	-	-	-	116	321
Mov Cap-2 Maneuver	-	-	-	-	116	-
Stage 1	-	-	-	-	359	-
Stage 2	-	-	-	-	533	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	64.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	715	-	-	-	188
HCM Lane V/C Ratio	0.041	-	-	-	0.74
HCM Control Delay (s)	10.2	0	-	-	64.6
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	4.8

Intersection	
Int Delay, s/veh	43.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	81	811	34	103	530	60	25	3	101	38	4	52
Future Vol, veh/h	81	811	34	103	530	60	25	3	101	38	4	52
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	1	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	95	95	95	95	92	95	92	95	92	92	92
Heavy Vehicles, %	2	4	11	4	4	2	6	2	10	2	2	2
Mvmt Flow	88	854	36	108	558	65	26	3	106	41	4	57

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	623	0	0	891	0	0	1886	1888	874	1911	1874	591
Stage 1	-	-	-	-	-	-	1049	1049	-	807	807	-
Stage 2	-	-	-	-	-	-	837	839	-	1104	1067	-
Critical Hdwy	4.12	-	-	4.14	-	-	7.16	6.52	6.3	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.236	-	-	3.554	4.018	3.39	3.518	4.018	3.318
Pot Cap-1 Maneuver	958	-	-	752	-	-	52	70	338	52	72	507
Stage 1	-	-	-	-	-	-	270	304	-	375	394	-
Stage 2	-	-	-	-	-	-	355	381	-	256	299	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	958	-	-	751	-	-	33	49	337	~ 26	50	507
Mov Cap-2 Maneuver	-	-	-	-	-	-	33	49	-	~ 26	50	-
Stage 1	-	-	-	-	-	-	220	248	-	306	337	-
Stage 2	-	-	-	-	-	-	267	326	-	141	244	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	1.6	212.5	$ 534.1
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	115	958	-	-	751	-	-	57
HCM Lane V/C Ratio	1.182	0.092	-	-	0.144	-	-	1.793
HCM Control Delay (s)	212.5	9.1	0	-	10.6	0	-	$ 534.1
HCM Lane LOS	F	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	8.6	0.3	-	-	0.5	-	-	9.6

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	115	828	6	7	619	1	7	5	21	0	1	66
Future Vol, veh/h	115	828	6	7	619	1	7	5	21	0	1	66
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	12	4	2	11	4	2	2	2	67	2	2	3
Mvmt Flow	121	872	6	7	652	1	7	5	22	0	1	69

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	653	0	0	878	0	0	1819	1784	875	1798	1787	653
Stage 1	-	-	-	-	-	-	1117	1117	-	667	667	-
Stage 2	-	-	-	-	-	-	702	667	-	1131	1120	-
Critical Hdwy	4.22	-	-	4.21	-	-	7.12	6.52	6.87	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.308	-	-	2.299	-	-	3.518	4.018	3.903	3.518	4.018	3.327
Pot Cap-1 Maneuver	888	-	-	733	-	-	60	82	269	62	81	466
Stage 1	-	-	-	-	-	-	252	283	-	448	457	-
Stage 2	-	-	-	-	-	-	429	457	-	247	282	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	888	-	-	733	-	-	40	59	269	42	59	466
Mov Cap-2 Maneuver	-	-	-	-	-	-	40	59	-	42	59	-
Stage 1	-	-	-	-	-	-	185	208	-	329	450	-
Stage 2	-	-	-	-	-	-	359	450	-	162	207	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.2	0.1	60.7	15.2
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	98	888	-	-	733	-	-	422
HCM Lane V/C Ratio	0.354	0.136	-	-	0.01	-	-	0.167
HCM Control Delay (s)	60.7	9.7	0	-	10	-	-	15.2
HCM Lane LOS	F	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	1.4	0.5	-	-	0	-	-	0.6

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	833	15	22	599	11	8	2	13	5	1	17
Future Vol, veh/h	3	833	15	22	599	11	8	2	13	5	1	17
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	1	1	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	4	2	2	4	9	2	2	2	2	2	8
Mvmt Flow	3	886	16	23	637	12	9	2	14	5	1	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	649	0	0	902	0	0	1601	1595	895	1598	1597	645
Stage 1	-	-	-	-	-	-	900	900	-	689	689	-
Stage 2	-	-	-	-	-	-	701	695	-	909	908	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.372
Pot Cap-1 Maneuver	937	-	-	754	-	-	85	107	339	86	106	462
Stage 1	-	-	-	-	-	-	333	357	-	436	446	-
Stage 2	-	-	-	-	-	-	429	444	-	329	354	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	937	-	-	754	-	-	78	101	339	78	100	461
Mov Cap-2 Maneuver	-	-	-	-	-	-	78	101	-	78	100	-
Stage 1	-	-	-	-	-	-	331	355	-	433	425	-
Stage 2	-	-	-	-	-	-	391	423	-	312	352	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.3	35.3	24.7
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	143	937	-	-	754	-	-	207
HCM Lane V/C Ratio	0.171	0.003	-	-	0.031	-	-	0.118
HCM Control Delay (s)	35.3	8.9	0	-	9.9	0	-	24.7
HCM Lane LOS	E	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.6	0	-	-	0.1	-	-	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	49	811	0	0	611	218	0	0	1	192	1	42
Future Volume (veh/h)	49	811	0	0	611	218	0	0	1	192	1	42
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		0.98	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	1411	1826	1826	1870	1841	1841	1870	1870	1870	1870	1870	1767
Adj Flow Rate, veh/h	53	882	0	0	664	237	0	0	1	209	1	46
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, %	33	5	5	2	4	4	2	2	2	2	2	9
Cap, veh/h	163	1056	0	103	745	266	0	0	486	535	2	459
Arrive On Green	0.58	0.58	0.00	0.00	0.58	0.57	0.00	0.00	0.30	0.31	0.31	0.31
Sat Flow, veh/h	466	1826	0	629	1287	459	0	0	1582	1407	7	1495
Grp Volume(v), veh/h	53	882	0	0	0	901	0	0	1	210	0	46
Grp Sat Flow(s),veh/h/ln	466	1826	0	629	0	1747	0	0	1582	1414	0	1495
Q Serve(g_s), s	7.8	27.6	0.0	0.0	0.0	31.5	0.0	0.0	0.0	8.5	0.0	1.5
Cycle Q Clear(g_c), s	39.3	27.6	0.0	0.0	0.0	31.5	0.0	0.0	0.0	8.5	0.0	1.5
Prop In Lane	1.00		0.00	1.00		0.26	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	163	1056	0	103	0	1011	0	0	486	537	0	459
V/C Ratio(X)	0.33	0.83	0.00	0.00	0.00	0.89	0.00	0.00	0.00	0.39	0.00	0.10
Avail Cap(c_a), veh/h	163	1056	0	103	0	1011	0	0	486	537	0	459
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.0	12.0	0.0	0.0	0.0	12.9	0.0	0.0	17.0	19.8	0.0	17.3
Incr Delay (d2), s/veh	5.2	7.8	0.0	0.0	0.0	11.8	0.0	0.0	0.0	2.1	0.0	0.4
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	1.1	11.3	0.0	0.0	0.0	13.2	0.0	0.0	0.0	2.9	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.2	19.8	0.0	0.0	0.0	24.7	0.0	0.0	17.0	21.9	0.0	17.8
LnGrp LOS	D	B	A	A	A	C	A	A	B	C	A	B
Approach Vol, veh/h		935			901			1			256	
Approach Delay, s/veh		20.7			24.7			17.0			21.2	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	25.5	44.5	25.5	44.5
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	21.0	40.0	21.0	40.0
Max Q Clear Time (g_c+I1), s	2.0	41.3	10.5	33.5
Green Ext Time (p_c), s	0.0	0.0	0.9	3.6

Intersection Summary	
HCM 6th Ctrl Delay	22.5
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	973	31	40	816	1	6	0	31	2	0	2
Future Vol, veh/h	1	973	31	40	816	1	6	0	31	2	0	2
Conflicting Peds, #/hr	2	0	0	0	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	3	2	50	2	2	2	4	2	2	2	2
Mvmt Flow	1	1058	34	43	887	1	7	0	34	2	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	890	0	0	1092	0	0	2053	2053	1075	2070	2070	891
Stage 1	-	-	-	-	-	-	1077	1077	-	976	976	-
Stage 2	-	-	-	-	-	-	976	976	-	1094	1094	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.12	6.54	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	3.518	4.036	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	761	-	-	490	-	-	41	55	267	40	54	341
Stage 1	-	-	-	-	-	-	265	293	-	302	329	-
Stage 2	-	-	-	-	-	-	302	327	-	259	290	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	760	-	-	490	-	-	35	45	267	30	44	340
Mov Cap-2 Maneuver	-	-	-	-	-	-	35	45	-	30	44	-
Stage 1	-	-	-	-	-	-	264	292	-	300	271	-
Stage 2	-	-	-	-	-	-	248	270	-	226	289	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	45.1	76
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	129	760	-	-	490	-	-	55
HCM Lane V/C Ratio	0.312	0.001	-	-	0.089	-	-	0.079
HCM Control Delay (s)	45.1	9.7	0	-	13.1	0	-	76
HCM Lane LOS	E	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	1.2	0	-	-	0.3	-	-	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	995	0	0	842	5	0	0	0	5	0	6
Future Vol, veh/h	8	995	0	0	842	5	0	0	0	5	0	6
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	2	2	2
Mvmt Flow	9	1093	0	0	925	5	0	0	0	5	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	932	0	0	1093	0	0	2042	2043	1093	2041	2041	930
Stage 1	-	-	-	-	-	-	1111	1111	-	930	930	-
Stage 2	-	-	-	-	-	-	931	932	-	1111	1111	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	734	-	-	638	-	-	42	56	261	42	56	324
Stage 1	-	-	-	-	-	-	254	285	-	321	346	-
Stage 2	-	-	-	-	-	-	320	345	-	254	285	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	733	-	-	638	-	-	40	54	261	41	54	323
Mov Cap-2 Maneuver	-	-	-	-	-	-	40	54	-	41	54	-
Stage 1	-	-	-	-	-	-	246	276	-	310	345	-
Stage 2	-	-	-	-	-	-	313	344	-	246	276	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	59.4
HCM LOS			A	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	733	-	-	638	-	-	78
HCM Lane V/C Ratio	-	0.012	-	-	-	-	-	0.155
HCM Control Delay (s)	0	10	0	-	0	-	-	59.4
HCM Lane LOS	A	A	A	-	A	-	-	F
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	1018	0	0	873	32	0	0	2	11	0	14
Future Vol, veh/h	24	1018	0	0	873	32	0	0	2	11	0	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	4	2	2	4	2	2	2	2	6	2	2
Mvmt Flow	26	1095	0	0	939	34	0	0	2	12	0	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	973	0	0	1095	0	0	2111	2120	1095	2104	2103	956
Stage 1	-	-	-	-	-	-	1147	1147	-	956	956	-
Stage 2	-	-	-	-	-	-	964	973	-	1148	1147	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.318
Pot Cap-1 Maneuver	709	-	-	637	-	-	37	50	260	37	52	313
Stage 1	-	-	-	-	-	-	242	274	-	305	336	-
Stage 2	-	-	-	-	-	-	307	330	-	237	274	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	709	-	-	637	-	-	33	45	260	34	47	313
Mov Cap-2 Maneuver	-	-	-	-	-	-	33	45	-	34	47	-
Stage 1	-	-	-	-	-	-	219	248	-	276	336	-
Stage 2	-	-	-	-	-	-	292	330	-	213	248	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	19	89
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	260	709	-	-	637	-	-	68
HCM Lane V/C Ratio	0.008	0.036	-	-	-	-	-	0.395
HCM Control Delay (s)	19	10.3	0	-	0	-	-	89
HCM Lane LOS	C	B	A	-	A	-	-	F
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	1.5

Intersection	
Int Delay, s/veh	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	983	7	5	855	37	3	0	15	25	0	46
Future Vol, veh/h	40	983	7	5	855	37	3	0	15	25	0	46
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	7	7	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	3	3	2	2	3	2	2	2	17	2	2	3
Mvmt Flow	43	1068	8	5	929	40	3	0	16	27	0	50

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	970	0	0	1081	0	0	2147	2143	1084	2133	2127	950
Stage 1	-	-	-	-	-	-	1163	1163	-	960	960	-
Stage 2	-	-	-	-	-	-	984	980	-	1173	1167	-
Critical Hdwy	4.13	-	-	4.12	-	-	7.12	6.52	6.37	7.12	6.52	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.227	-	-	2.218	-	-	3.518	4.018	3.453	3.518	4.018	3.327
Pot Cap-1 Maneuver	706	-	-	645	-	-	35	49	246	36	50	314
Stage 1	-	-	-	-	-	-	237	269	-	308	335	-
Stage 2	-	-	-	-	-	-	299	328	-	234	268	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	705	-	-	642	-	-	26	41	243	29	41	314
Mov Cap-2 Maneuver	-	-	-	-	-	-	26	41	-	29	41	-
Stage 1	-	-	-	-	-	-	200	227	-	261	329	-
Stage 2	-	-	-	-	-	-	247	322	-	184	226	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.1	48.5	240.9
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	102	705	-	-	642	-	-	70
HCM Lane V/C Ratio	0.192	0.062	-	-	0.008	-	-	1.102
HCM Control Delay (s)	48.5	10.4	0	-	10.7	0	-	240.9
HCM Lane LOS	E	B	A	-	B	A	-	F
HCM 95th %tile Q(veh)	0.7	0.2	-	-	0	-	-	5.8

Intersection	
Int Delay, s/veh	18.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	110	26	6	32	41	37	3	244	13	16	184	40
Future Vol, veh/h	110	26	6	32	41	37	3	244	13	16	184	40
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	-	-	-	-	-	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	10	4	2	5	3	2	2	2	50	2	3	2
Mvmt Flow	128	30	7	37	48	43	3	284	15	19	214	47

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	92	0	0	37	0	0	541	456	34	584	438	71
Stage 1	-	-	-	-	-	-	290	290	-	145	145	-
Stage 2	-	-	-	-	-	-	251	166	-	439	293	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.12	6.52	6.7	7.12	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.53	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.518	4.018	3.75	3.518	4.027	3.318
Pot Cap-1 Maneuver	1454	-	-	1554	-	-	452	501	917	423	511	991
Stage 1	-	-	-	-	-	-	718	672	-	858	775	-
Stage 2	-	-	-	-	-	-	753	761	-	597	668	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1453	-	-	1554	-	-	250	444	917	187	453	990
Mov Cap-2 Maneuver	-	-	-	-	-	-	250	444	-	187	453	-
Stage 1	-	-	-	-	-	-	653	612	-	780	755	-
Stage 2	-	-	-	-	-	-	501	741	-	287	608	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6	2.1	27.6	22.3
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	452	1453	-	-	1554	-	-	407	990
HCM Lane V/C Ratio	0.669	0.088	-	-	0.024	-	-	0.571	0.047
HCM Control Delay (s)	27.6	7.7	0	-	7.4	0	-	25	8.8
HCM Lane LOS	D	A	A	-	A	A	-	D	A
HCM 95th %tile Q(veh)	4.8	0.3	-	-	0.1	-	-	3.5	0.1

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	44	0	5	96	28	3	1	3	11	3	15
Future Vol, veh/h	15	44	0	5	96	28	3	1	3	11	3	15
Conflicting Peds, #/hr	3	0	1	1	0	3	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	43	2	2	2	2	2	2	2	2	6	2	36
Mvmt Flow	16	47	0	5	102	30	3	1	3	12	3	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	135	0	0	48	0	0	217	225	50	213	210	120
Stage 1	-	-	-	-	-	-	80	80	-	130	130	-
Stage 2	-	-	-	-	-	-	137	145	-	83	80	-
Critical Hdwy	4.53	-	-	4.12	-	-	7.12	6.52	6.22	7.16	6.52	6.56
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.16	5.52	-
Follow-up Hdwy	2.587	-	-	2.218	-	-	3.518	4.018	3.318	3.554	4.018	3.624
Pot Cap-1 Maneuver	1232	-	-	1559	-	-	739	674	1018	735	687	847
Stage 1	-	-	-	-	-	-	929	828	-	864	789	-
Stage 2	-	-	-	-	-	-	866	777	-	915	828	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1228	-	-	1558	-	-	713	661	1015	720	673	845
Mov Cap-2 Maneuver	-	-	-	-	-	-	713	661	-	720	673	-
Stage 1	-	-	-	-	-	-	916	816	-	850	784	-
Stage 2	-	-	-	-	-	-	844	772	-	897	816	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0.3	9.5	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	807	1228	-	-	1558	-	-	774
HCM Lane V/C Ratio	0.009	0.013	-	-	0.003	-	-	0.04
HCM Control Delay (s)	9.5	8	0	-	7.3	0	-	9.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	18	6	0	0	30	361	12	0	218	0
Future Vol, veh/h	0	0	18	6	0	0	30	361	12	0	218	0
Conflicting Peds, #/hr	0	0	0	1	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	83	92	83	92	83	83	83	83	92
Heavy Vehicles, %	2	2	2	23	2	2	2	6	2	2	2	2
Mvmt Flow	0	0	20	7	0	0	33	435	14	0	263	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	771	778	264	782	771	442	263	0	0	449	0	0
Stage 1	263	263	-	508	508	-	-	-	-	-	-	-
Stage 2	508	515	-	274	263	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.33	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.33	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.33	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.707	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	317	328	775	288	331	615	1301	-	-	1111	-	-
Stage 1	742	691	-	511	539	-	-	-	-	-	-	-
Stage 2	547	535	-	688	691	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	309	317	774	273	320	615	1301	-	-	1111	-	-
Mov Cap-2 Maneuver	309	317	-	273	320	-	-	-	-	-	-	-
Stage 1	717	691	-	494	521	-	-	-	-	-	-	-
Stage 2	528	517	-	670	691	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.8	18.5	0.5	0
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1301	-	-	774	273	1111	-	-
HCM Lane V/C Ratio	0.025	-	-	0.025	0.026	-	-	-
HCM Control Delay (s)	7.8	0	-	9.8	18.5	0	-	-
HCM Lane LOS	A	A	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	46	0	0	1	240	112	0	166	0
Future Vol, veh/h	0	0	0	46	0	0	1	240	112	0	166	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	100	2	11	2	2	2	2
Mvmt Flow	0	0	0	52	0	0	1	273	127	0	189	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	528	591	189	528	528	337	189	0	0	400	0	0
Stage 1	189	189	-	339	339	-	-	-	-	-	-	-
Stage 2	339	402	-	189	189	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	7.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	4.2	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	461	420	853	461	456	528	1385	-	-	1159	-	-
Stage 1	813	744	-	676	640	-	-	-	-	-	-	-
Stage 2	676	600	-	813	744	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	461	420	853	461	456	528	1385	-	-	1159	-	-
Mov Cap-2 Maneuver	461	420	-	461	456	-	-	-	-	-	-	-
Stage 1	812	744	-	675	639	-	-	-	-	-	-	-
Stage 2	675	599	-	813	744	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	13.8	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1385	-	-	-	461	1159	-	-
HCM Lane V/C Ratio	0.001	-	-	-	0.113	-	-	-
HCM Control Delay (s)	7.6	0	-	0	13.8	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.4	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	18	11	0	0	31	195	11	0	127	0
Future Vol, veh/h	0	0	18	11	0	0	31	195	11	0	127	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	20	12	0	0	34	212	12	0	138	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	424	430	138	434	424	218	138	0	0	224	0	0
Stage 1	138	138	-	286	286	-	-	-	-	-	-	-
Stage 2	286	292	-	148	138	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	540	518	910	532	522	822	1446	-	-	1345	-	-
Stage 1	865	782	-	721	675	-	-	-	-	-	-	-
Stage 2	721	671	-	855	782	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	529	504	910	510	508	822	1446	-	-	1345	-	-
Mov Cap-2 Maneuver	529	504	-	510	508	-	-	-	-	-	-	-
Stage 1	842	782	-	702	657	-	-	-	-	-	-	-
Stage 2	702	653	-	837	782	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	12.2	1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1446	-	-	910	510	1345	-	-
HCM Lane V/C Ratio	0.023	-	-	0.022	0.023	-	-	-
HCM Control Delay (s)	7.5	0	-	9	12.2	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	14	12	0	0	28	153	7	0	99	0
Future Vol, veh/h	0	0	14	12	0	0	28	153	7	0	99	0
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	11	2	2	2	2
Mvmt Flow	0	0	17	14	0	0	34	184	8	0	119	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	375	379	119	384	375	188	119	0	0	192	0	0
Stage 1	119	119	-	256	256	-	-	-	-	-	-	-
Stage 2	256	260	-	128	119	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	582	553	933	574	556	854	1469	-	-	1381	-	-
Stage 1	885	797	-	749	696	-	-	-	-	-	-	-
Stage 2	749	693	-	876	797	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	570	539	933	552	542	854	1469	-	-	1381	-	-
Mov Cap-2 Maneuver	570	539	-	552	542	-	-	-	-	-	-	-
Stage 1	862	797	-	730	678	-	-	-	-	-	-	-
Stage 2	730	675	-	860	797	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.9	11.7	1.1	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1469	-	-	933	552	1381	-	-
HCM Lane V/C Ratio	0.023	-	-	0.018	0.026	-	-	-
HCM Control Delay (s)	7.5	0	-	8.9	11.7	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	13	9	0	1	23	38	25	1	21	0
Future Vol, veh/h	0	0	13	9	0	1	23	38	25	1	21	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	5	2	2	2	15	14	2	2	2
Mvmt Flow	0	0	15	10	0	1	26	43	28	1	24	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	136	150	24	144	136	58	24	0	0	72	0	0
Stage 1	26	26	-	110	110	-	-	-	-	-	-	-
Stage 2	110	124	-	34	26	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	835	742	1052	818	755	1008	1591	-	-	1528	-	-
Stage 1	992	874	-	888	804	-	-	-	-	-	-	-
Stage 2	895	793	-	974	874	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	822	728	1052	795	741	1007	1591	-	-	1527	-	-
Mov Cap-2 Maneuver	822	728	-	795	741	-	-	-	-	-	-	-
Stage 1	975	873	-	872	790	-	-	-	-	-	-	-
Stage 2	879	779	-	959	873	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.5	9.5	2	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1591	-	-	1052	812	1527	-	-
HCM Lane V/C Ratio	0.016	-	-	0.014	0.014	0.001	-	-
HCM Control Delay (s)	7.3	0	-	8.5	9.5	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	94	884	548	59	42	64
Future Vol, veh/h	94	884	548	59	42	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	102	961	596	64	46	70

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	660	0	-	0	1793	628
Stage 1	-	-	-	-	628	-
Stage 2	-	-	-	-	1165	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	928	-	-	-	89	483
Stage 1	-	-	-	-	532	-
Stage 2	-	-	-	-	297	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	928	-	-	-	68	483
Mov Cap-2 Maneuver	-	-	-	-	68	-
Stage 1	-	-	-	-	406	-
Stage 2	-	-	-	-	297	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	94.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	928	-	-	-	141
HCM Lane V/C Ratio	0.11	-	-	-	0.817
HCM Control Delay (s)	9.4	0	-	-	94.7
HCM Lane LOS	A	A	-	-	F
HCM 95th %tile Q(veh)	0.4	-	-	-	5.2

APPENDIX G
Signal Warrants

Four-Hour Signal Warrants

Existing (2019) Traffic Volumes

Intersection: Lele Rd and Kaumualii Hwy
County: Kauai
Town: Hanapēpē

Major Street: Kaumualii Hwy
Critical Approach Speed: 35 mph
Lanes: 2 or more lanes

Minor Street: Lele Rd
Critical Approach Speed: 25 mph
Lanes: 2 or more lanes

% Right Turns Included
From North (SB) 100%
From East (WB) 100%
From South (NB) 100%
From West (EB) 100%

In built-up area of isolated community of < 10,000 population? No
Total number of approaches at intersection? 3
If it is a "T" intersection, inflate minor threshold to 150%? No
Manually set volume level? 70%

Analysis based on EXISTING volume data.

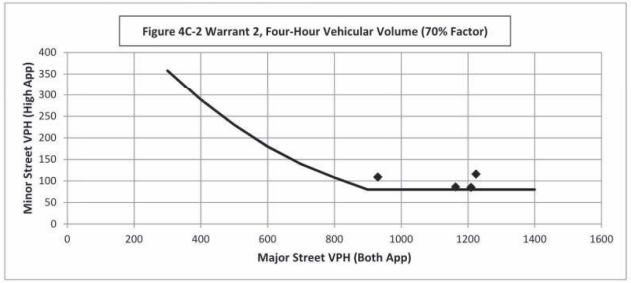
Date	Day of the Week	Time (HH:MM)			
		From	AM / PM	To	AM / PM
5/14/2019	Tuesday	7:00	AM	6:00	PM

Warrant 2: Four-Hour Volume

70%

Warrant Evaluated? Yes
Warrant Satisfied? Yes
Manually Set To: Yes

Hour Start	15:00	7:00	16:00	17:00
Major Road Vol.	1224	1209	1163	930
Minor Road Vol.	116	85	86	109



Warrant 3: Peak Hour Volume 70%

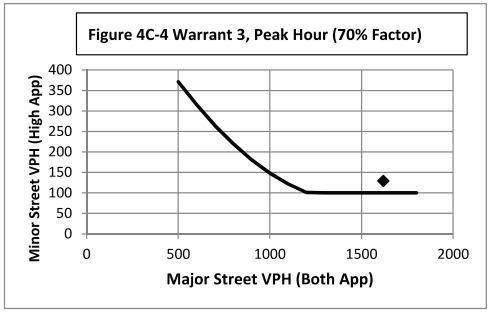
Warrant Evaluated? Yes **Warrant Satisfied? Yes** **Manually Set To: Yes**

Condition justifying use of warrant:

Criteria		Met?
Delay on Minor Approach	5	Yes
Volume on Minor Approach	150	No
Total Entering Volume (veh/h)	650	

Manually Set Peak Hour? Yes

Peak Hour	Major Road Vol. (Both App.)	Minor Road Vol. (High App.)
2040 PM	1619	129
2040 PM	1619	129



Appendix F - Community Outreach Meeting Summaries

HANAPĒPĒ LESSEES MEETING SUMMARY

Time: 6:00pm- 8:00 pm
Date: December 13, 2018
Location: Hanapēpē Library

Event Description
The purpose of the lessees meeting was to introduce the project team and meet the existing lessees, share information regarding the process and timeline for the project, hear and collect lessee manaʻo on existing homesteads, project site, and the relationship of the homesteads to the greater community and island. The project team shared a presentation and distributed fact sheets with the plans and timeline for the project. A copy of the presentation is appended to this summary.

Agenda

6:00- 6:15pm Introductions and welcome

6:15- 6:35pm Presentation

6:35- 7:10pm Question and Answer Session

7:10- 8:00pm Discussion

Project Team Attendees
DHHL: Andrew Choy, Kaleo Manuel, Erna Kamibayashi
SSFM: Jared Chang, Melissa White, Carlos Kelton
Subconsultants: Rachel Hoerman, Dudek; Dominique Cordy, Nohopapa

DEPARTMENT OF HAWAIIAN HOME LANDS
Hanapēpē Homestead Environmental Assessment Project

Stakeholder Attendees
Attendees at the meeting included both existing lessees and applicants as indicated below.

Lessees

1. Carlie Kaohelaulii
2. Danny Kanahele
3. Debbie Apo
4. Ellen Albarado
5. Jerry Albarado
6. Kuulei Kaaumoana
7. Lavonne Kanahele
8. Leonard Kanahele
9. Pua Chin
10. Pualei Kaohelaulii
11. Winna Kaohelauii

Applicants

1. Kehau Decosta
2. Kukui Lang
3. Kuulei Vidinha
4. Laceyann Kanahele
5. Myrna Bucasas
6. Michael Karratti
7. Odetta Borja
8. Pauline Kupo
9. Piilani Aguon
10. Sharon Nerpio
11. Thomas Nizo

Notes from Q & A and Group Discussion

Following the presentation, attendees were given the opportunity to ask questions of the project team, followed by a discussion of existing conditions, issues, and opportunities pertaining to the project area. The discussion is documented in the section below. Input gathered from lessees can be grouped into nine main themes:

- Vehicular Access
- Fire management
- Natural disasters & hazards
- Land uses and product types
- Homestead lot density & size
- Timing of project
- Tsunami
- Uses behind existing lessee lots
- Water supply

Input and questions pertaining to each of the eleven discussion themes is summarized below.

Vehicular Access to Phase II Development

- Where will the entry for the new lots be located? A: Will be determined by site studies and community outreach.
- Access from the roads to the parcel is difficult because the locked gates prevent entry.
- There is only one road to enter and exit the community.
- Traffic is generally not an issue except in an emergency. Another exit from the community is needed.
- No one currently uses the site.
- Is it possible to improve the road west of the site as a second access? It's owned by Gay & Robinson (G&R).
- Prefer there not be roads behind the lots, because homes would be stuck between two roads.
- Adding more homes to the community will increase congestion.

Fire Management

- Community is concerned with fire because the parcel behind their homes is overgrown and dry, and there is no fire break to prevent a fire from spreading.
- Some of the land should be managed to provide protection from fires.
- Fire breaks are a priority issue.
- Roads on this site are overgrown with shrubbery.
- G&R road is an important access for fire management
- Develop a partnership with the local Fire Department. Would be good to have a fire station on the site.

- As a fire prevention solution, lessees would like to steward area behind their lots (i.e., clear & maintain brush; create a firebreak).

Natural Disasters & Hazards

- Make sure residential areas are safe from flooding.
- Heavy rains create sheet flow runoff across the highway.
- Lack of drainage causes runoff from roads onto properties.
- Some residents are creating their own slopes and berms to alleviate pooling and runoff.
- Are there better locations for new home lots? The top portion of the project area is cooler, and the lower elevations flood.
- Use drones for topographic survey of all 365 acres of the project area.
- Drainage concerns should be addressed as a priority.
- Sinkholes are a concern. There are some behind existing lots and others forming.
- Would water run up into the gulch from a tsunami?
- Can there be a buffer for homes?

Land Use and Product Type

- How to determine agricultural areas and residential areas?
- Are the new homes going to be turnkey or habitat, rent to own, self-help, or a mix of products? **A:** will be determined by site studies and beneficiary input.
- Most beneficiaries at the meeting expressed a preference for turnkey because developing own homes has proven difficult.
- **Q.** How much will be allocated for residential vs. agriculture? **A:** depends on findings of site studies and beneficiary outreach.
- Make the upper lands green and provide opportunities for subsistence agriculture.
- Homestead residents would like to see a community center with uses such as a playground, emergency Shelter, disaster response, DHHL office, and a County DMV. Create as a shared space for all lessees, not just Hanapepe.
- Even though the Hanapēpē lots are not pastoral, many West Side beneficiaries raise animals and some may want to do small scale grazing on their homesteads.
- There is an active bartering economy on the West Side- people trade meat, fruit, and other food products. It would be beneficial to have communal butchering and food processing/prep facilities in the community use areas.
- One beneficiary 'ohana submitted a written letter asking for consideration of including a church in the Hanapēpē Homestead area. The letter is appended to this summary.

Homestead Lot Density & Size

- Consider not building houses so close to each other.
- **Question posed by project team to lessees:** What is the Homesteads' relationship to the community? **A:** Everyone gets along well. We all treat each other like family.
- Most beneficiaries and program participants are from the West Side of Kauai.

Timing of Project

- Waitlist applicants are concerned with the length of the process, hope it will be faster than ten years. DHHL clarified that the process is limited by sufficient funding. DHHL is working through the Legislature to secure funding for the project.
- If sufficient funds are made available, project implementation can proceed more quickly.

Uses Behind Existing Lessee Lots

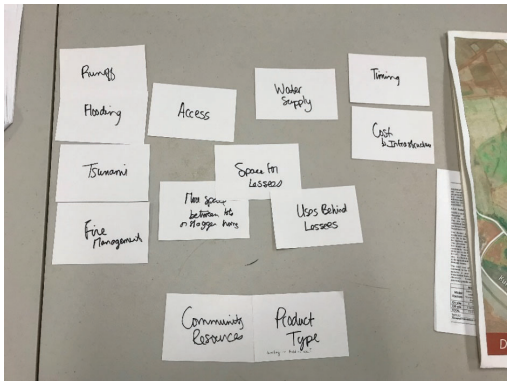
- The land at the top of the homestead lots behind the homes were previously used as gardens to grow food. Other lessees have extended their yards into this area.
- Lessees would like to see areas behind homestead lots extended to allow the lessees to maintain a firebreak in order to protect their homes.

Water Supply

- **Q:** The community needs a new well for water because Hanapepe only has one well and pump. How much water is being used for potable water? **A:** This will be determined through the site studies and infrastructure assessment.

DEPARTMENT OF HAWAIIAN HOME LANDS
Hanapēpē Homestead Environmental Assessment Project

Meeting Photos



Written Comments

13 October 2018

Aloha Hawaiian Homes Commission:

Na Ohana Haipule Iloko O Kristo Hawaiian Church, would like to ask for you consideration for a Church in the Hanapepe Hawaiian Homes Area. We have been serving the community since 2015. Prophet Evan-Louis-Kanahele and Poo Kahu Leonard Kanahele both live in the Hanapepe Hawaiian Homes Subdivision. When we first started it was in the garage of Evans parents Danny & Linda Kanahele. We also held services at Evans' home in Waimea, before he moved in with his dad after the passing of his mom over a year ago. We are now holding services at the Waimea Baptist Church, which we are sharing with the Baptist Congregation. The Baptist Church uses it on their set days and any Holidays or Special occassions. As of now, we only have one service Sundays at 4 pm. Any Holidays or Special occassions has to approved before hand. If the Baptist Congregation are using the Church we either do our service on another day and time. They have been great to partner with, but we can't do what we want as a Church. The Church is not ours but theirs. We did have 3 services a week; Thursday at 5pm, Saturday at 6am, and on Sunday at 4 pm. We cancelled services to be easier for the Baptist Church schedule. If we want to have gatherings or meetings, we use the Waimea Neighborhood Center. We use it for Pastor meetings, conference, surpise baby party for Prophet Evans' daughters 1st birthday and much more. We don't use the Hall at the Baptist Church because a wrestling team is using it. They have a long standing relationship with the Baptist Church. In 2017, Na Ohana Haipule Iloko O Kristo Hawaiian Church, painted the Waimea Baptist Churchs' exterior walls. The Church had not been painted for over 20 plus years. We went and got a local paint company to donate 4- 5 gallon buckets of paint, a local trucking company to tend, deliver, and pickup a skylift for painting. We also fed all that came to help which was the congregation of our church. We also give the Baptist Church a donation monthly for electricity and water. If we have any special function in a particular month we donate more. It is very hard to do the things that you want to when the Church does't belong to you. We have a very good partnership with the Baptist Church. We feel that we can do more for our Church and Community, if we had our own Church. All we are asking is for you to consider what we are asking for. It will not only benefit us as a Church, but the Community as a whole. Mahalo nui loa and Iesu Pu.

Mahalo,

"for we walk by faith and not by sight"
2 Corinthians 5:7

Na Ohana Haipule Iloko O Kristo

HANAPĒPĒ BENEFICIARY MEETING #1 SUMMARY

Time: 6:00pm- 8:00 pm
Date: July 24, 2019
Location: ʻEleʻele Elementary School

Event Description

The purpose of the meeting was to introduce the project, share findings from work done to date, share preliminary findings from the beneficiary survey, gather input on preliminary land use plan alternatives, and gather input on desired qualities and land uses for a Hanapēpē Homestead community.

The project team shared a presentation in English, and it was also translated into ʻŌlelo Niʻihau by an interpreter. During the meeting, informative and interactive boards were on display in an open house format. Attendees received copies of the agenda in English and ʻŌlelo Niʻihau, as well as copies of the presentation and project fact sheet. A copy of the presentation is appended to this summary.

Agenda

6:00- 6:05 pm Introductions and welcome

6:05 - 6:40 pm Presentation (English and Niʻihau Hawaiian)

6:40 - 7:00 pm Question and Answer Session

7:00 - 8:00pm Open House and Refreshments

Project Team Attendees

- DHHL: Andrew Choy, Nancy McPherson, Erna Kamibayashi, Bryan Toda
- Hawaiian Homes Commission: Commissioner Dennis Neves
- SSFM: Jared Chang, Melissa White, Carlos Kelton, Matt Fernandez
- Interpreter: Hokulani Cleeland

Stakeholder Attendees

Attendees at the meeting included both existing lessees and applicants as indicated below.

Lessees

1. Avery Puaoi
2. Chris Kanahu
3. Christina Trugillo
4. Dwyle Lee
5. Ellen Albarado
6. Harold Vidinha
7. James Poe
8. Jasmine Aviguetero
9. Jerry Albarado
10. James S. Beniamina
11. Kuulei Kaaumoana
12. Leonard Kanahele, Jr
13. Lavonne Kanahele
14. Lorna Poe
15. Lyle Keith Bargamento
16. Nani Jean DeMotta
17. Sue Ann Char
18. Tracey Camara
19. Victoria N. Mahuka
20. William K. Akau

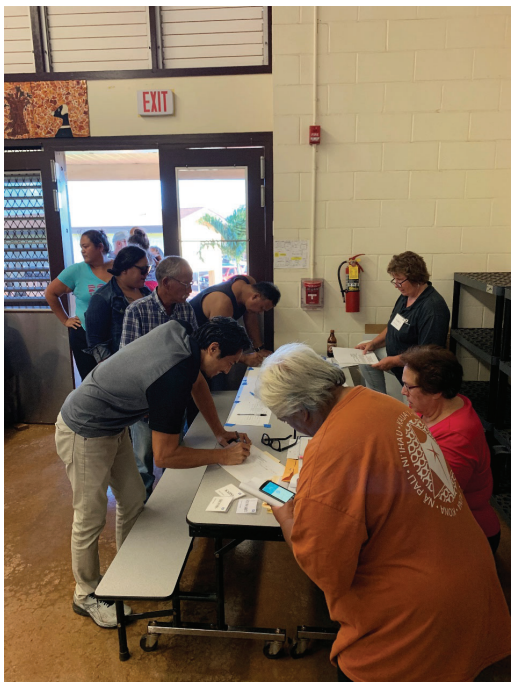
Applicants

1. Adelaide Emura
2. Annie Kanahele
3. Angela L. Kahaulelio-Yadao
4. Anuenue Kanahele
5. Billi Topp
6. Brandee Kahalekomo Coughlin
7. Charity Kanahele
8. Chris Kanahele
9. Dianna Kaulili Phillips
10. Dynamite Lee
11. Elvira Kimokeo
12. Ermine Akuna
13. Eula Mae Taala
14. F. Kaawa
15. Gilroy Yorkman
16. Golden Wong
17. Grace Makuaole Acain
18. Hualani Duncan
19. James I. Beniamina
20. Jamesette Johnson
21. Jimmy Beniamina
22. Judie L. Shintani
23. Frederick J. Kahaulelio
24. Kahaulelio
25. Kainalu Wong
26. Kalalena Lum Won
27. Kaleo (Jake) Kanahele
28. Kainalu Wong
29. Kalalena Lum Won
30. Kay Kanahele
31. Katelyn Kanehele
32. Kaui Castillo
33. Kekoa Woo
34. Keoki Puaoi
35. Kuulei Vidinha
36. Laurie Pahulehua
37. Liberta Albao
38. Liselle Lee
39. Marilyn Beniamina
40. Melanie Okamoto
41. Myna Bucasas
42. Odetta Borja
43. Ori Soto
44. Pauline Kupo
45. Penny P. Anakalea
46. Piilani Aguon
47. Randy Ortiz
48. Ray K. Holt
49. Romayne Matsuyoshi
50. Scott Topp

51. Stanley K. Wong
52. Tamra Medeiros
53. Telissa Agbulos
54. Thelma Ruiz
55. Verlie Anne Aiu
56. Wilson Kanahele

Other

1. Annette Lazaro
2. Angela L. Kahaulelio-Yadao
3. Anuhea Anakalea
4. Billie Topp
5. Britnee Swain
6. Bryce Boeder
7. Chelise Kahalekomo Schmidt
8. Clyde H. Anakalea
9. Cynthia K. Kalikini Blair
10. Diane Rodrigues
11. Ellen Albarado
12. Faa Taala
13. Fredna Kahelelio-Me
14. James Poe
15. Jim Beniamina
16. Kimi Vidinha
17. Lavonne Kanahele
17. Lori Cosier
18. Marissa Lilo
19. Patrick Pereira
20. Roland Sagum
21. Rolina Faagai
22. Tim Albao Jr.
23. Taryn Silva
24. Tony Camara
25. Wendy Vidinha
26. Yvette Nakaahiki



Notes from Q & A and Group Discussion

Following the presentation, attendees were given the opportunity to ask questions of the project team, followed by an open house. The comments from the open house are documented in the section below.

Comments, Question and Answer Session

- **Q.**What is the status of increasing lot size of existing Hanapēpē lessee lots?
  - **A.** To be determined. We have heard lessee desires for more space and it is being considered. The more space we provide existing lessees, the less we have to accommodate those on the waiting list.
- **Q.** If there is sewer, will that mean lot sizes are smaller than 10,000 SF? Will the lots get bigger for existing lessees?
  - **A.** To be determined. We are gathering input on the appropriate lot size through this process.
- **Q.** How much funding has been secured for the project?
  - **A.** $1 million for planning and design work
- **Q.** How soon will subsistence agriculture lots be awarded?
  - **A.** Awards are contingent on securing funding.
- **Q.** Will there be a solar farm on the agricultural land like in Anahola?
  - **A.** We are asking for everyone's input regarding what they would like to see on the land. You can also share if there are things you would not like to see.
- **Q.** For agriculture land, is there an option to live on or not? Will there be self-help, turnkey options?
  - **A.** Occupancy is optional on subsistence agricultural lots. We are surveying applicants on their preferences for housing type, and that will inform the options. You can provide your input here tonight also.
- **Q.** Will fiber optics be installed?
  - **A**. To be determined. We don't know the status of the technology or companies providing it.
- **Q.** When will decisions be made? You are asking us questions but we need answers. We need a proposal to react to.
  - **A.** The planning process is meant to make sure that the homestead community meets the needs of the applicants. We understand many have been waiting a long time. We are close to building this one and want to make sure it's done right.
- **Q.** Do the gulches flood when it rains a lot?
  - **A.** Yes. We will look at utilizing and capturing water from gulches and agriculture lots.
- **Q**. How many people are on the agriculture waiting list on Kaua'i?
  - **A.** There are about 2,200 people on the agriculture waitlist.
- **Q**. How will subsistence agriculture lots be awarded? **A.** From the waitlist.

DEPARTMENT OF HAWAIIAN HOME LANDS
Hanapēpē Homestead Environmental Assessment Project

Input from Open House: Envisioning a Future Hanapēpē Homestead Community

An open house was set up to enable people to learn more about the project, talk with team members, and provide input on what they would like to see in a future Hanapēpē Homestead community. The open house included seven stations, described below. Input received during the open house follows this page.

Open House Stations

Project Orientation:

- Informational poster about project (based on fact sheet)

Beneficiary Survey:

- Board explaining purpose of survey, highlighting preliminary findings

Land Use Types:

- One board each for Residential, Subsistence Ag, Community Use, and Commercial Designations that showed examples, provided definitions of each land use, and asked people what they would like to see in each land use type.
- Beneficiaries used sticky notes to add their input to these boards.

Land Use Plan Alternatives:

- One board for each of the two alternatives, with acreage tables and highlights of each alternative.
- Beneficiaries used dots to indicate which alternative they preferred.

Alternatives for Next Phase of Homes:

- One board for each of the two alternatives, with bullet point highlights.
- Beneficiaries used dots to indicate which alternative they preferred.

Parking Lot:

- Easel with markers for general comments

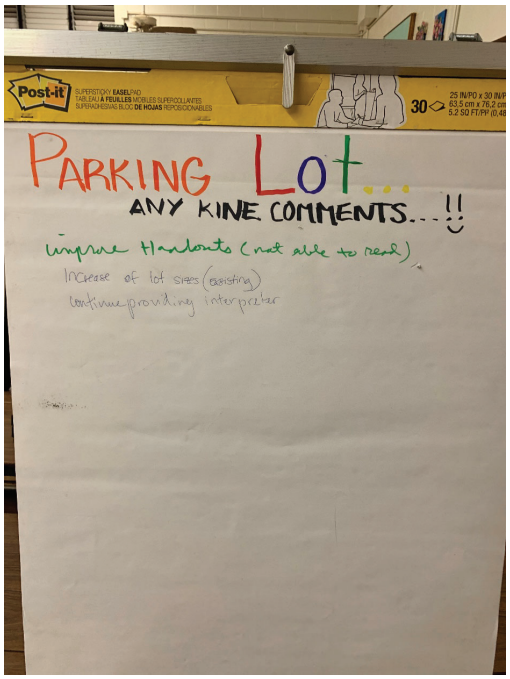
Keiki Coloring Station:

- Coloring sheets with crayons and markers

Refreshments

"Parking Lot" – General Comments

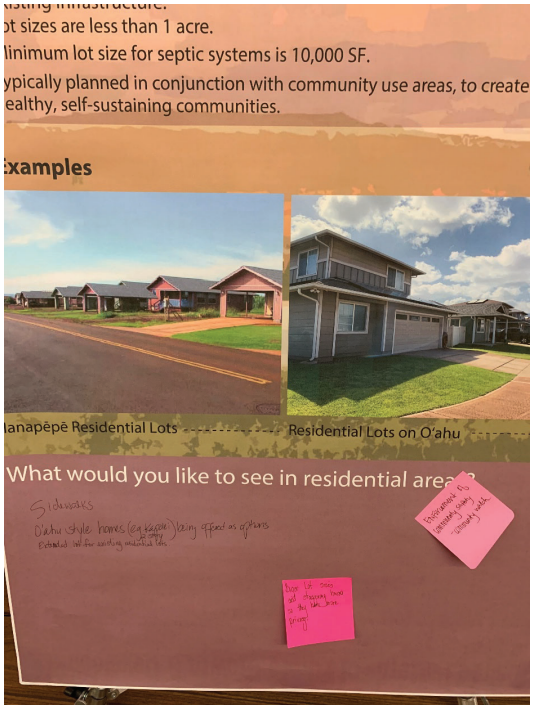
- Existing lessees would like expansion of their lots to match other homestead lot sizes.
- Not able to read handouts
- Increase lot sizes
- Continue providing interpreter



Residential Areas

What would you like to see in residential areas?

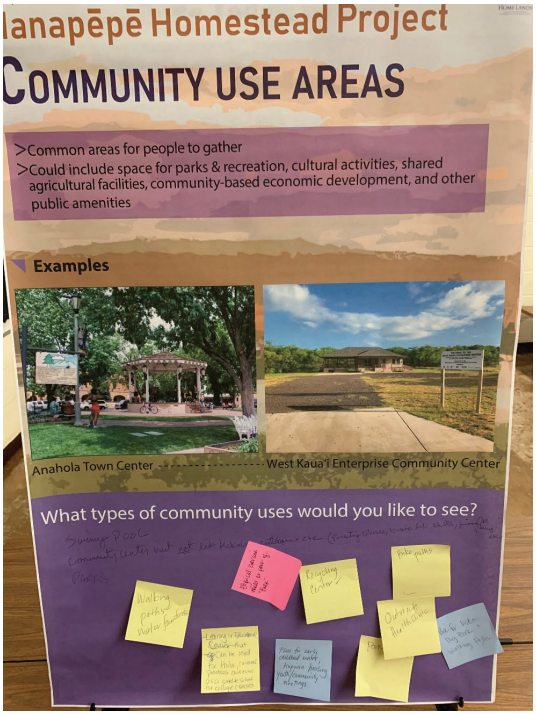
- Sidewalks
- O'ahu Style Homes, like Kapolei, being offered as options.
- Extended lot for existing residential lots
- Larger lot sizes and staggering houses so they have more privacy.
- Enforcement of Community Safety (Community Watch)



Community Use Areas

What types of community uses would you like to see?

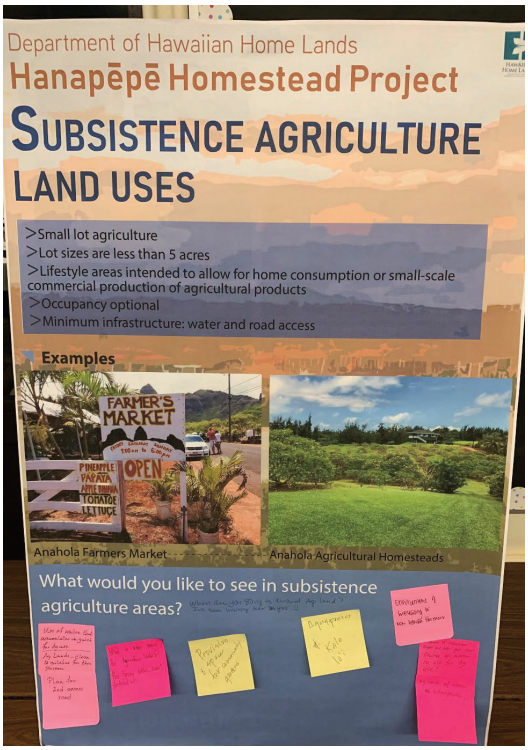
- Walking path and water fountains
- Place for early childhood center
- Kupuna housing
- Youth community meeting center
- A learning or educational center that can be used for hula, cultural practices and even as a satellite school for college courses
- An outreach health clinic
- Park for kids
- Dog parks
- Bike paths
- Walking paths
- Physical exercise area as part of park
- Community center, but not like Kekaha neighborhood center
- Parenting classes, basic life skills, financial planning, etc.



Subsistence Agriculture Land Uses

What would you like to see in subsistence agriculture land use areas?

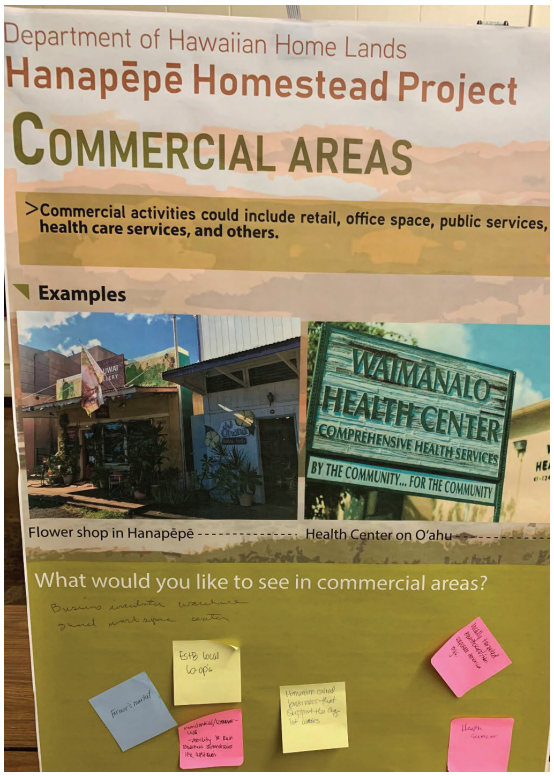
- Use of water that accumulates in gulch for agriculture use. Agriculture lands – close to gulches for this purpose
- Plan for a second access road.
- Where is water coming for agriculture lands? Plus having water over electrical.
- Provision some space for community gardens.
- When are you going to award agriculture land? Have been waiting for over 20 years.
- Aquaponics and Kalo Lo'i.
- Enforcement of subleasing to non-Hawaiian farmers.
- Have a reservoir that we can get our source of water to use for agriculture lands.
- Agriculture land with home enforcement.



Commercial Areas

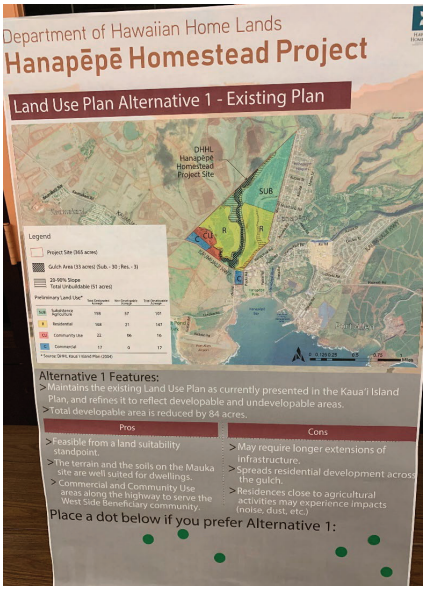
What would you like to see in commercial areas?

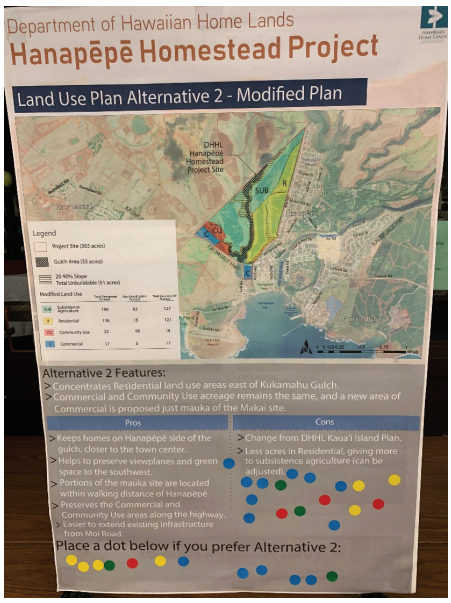
- Business incubator
- Warehouse
- Shared workspace center
- Farmers market
- Establish local Co-ops
- Health Sciences Center
- Locally targeted businesses/ non corporate American organizations
- Hawaiian owned businesses that support the agriculture lot leases



Land Use Plan Alternatives 1 and 2

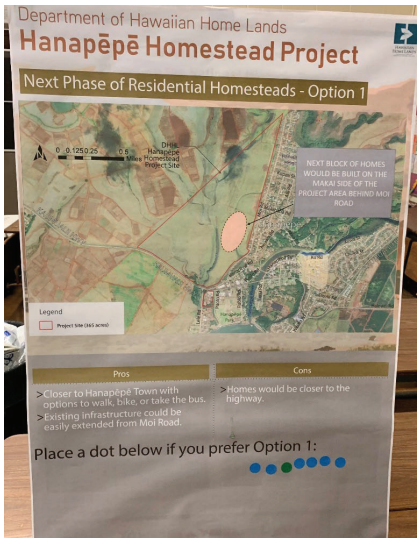
- Open house participants preferred Land Use Plan Alternative 2 (Modified Land Use Plan) over the Alternative 1 (Existing Land Use Plan). 29 dots were placed on the Alternative 2 plan.
- 6 dots were placed on Alternative 1 Plan.

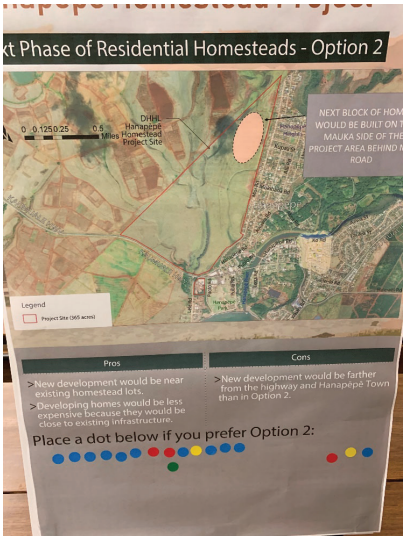




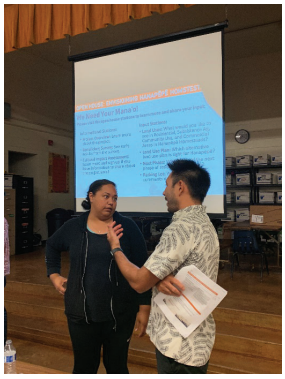
Next Phase of Residential Homesteads

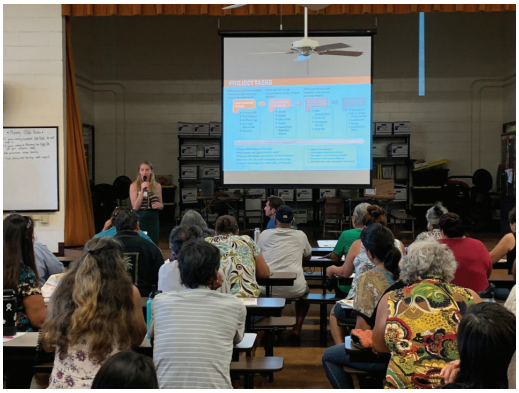
- Open house participants preferred Option 2 with 17 dots placed on the board.
- Open house participants placed 7 dots on the Option 1 board.





Meeting Photos





HANAPĒPĒ BENEFICIARY MEETING #2 SUMMARY

Time: 6:30pm- 8:30 pm
Date: December 5, 2019
Location: ‘Ele‘ele Elementary School

Event Description
The purpose of the meeting was to present and gather input on two proposed layout scenarios for full buildout, as well as preferred uses within Community Use and Commercial areas. Additionally, input was gathered on what should be addressed in the Environmental Assessment. The project team provided a brief overview of the project and a re-cap of beneficiary input and findings from early consultations, technical studies, and the beneficiary survey and meetings. The project team also presented land use plan alternatives for the Environmental Assessment including the preferred layout and the alternative layout. The project team shared the presentation in English, and it was also translated into ‘Ōlelo Ni‘ihau by an interpreter. Map stations were set up to allow attendees to review and mark up the proposed site layout, as well as provide input on preferred uses within Community Use and Commercial Areas. Informational and interactive boards were on display in an open house format. Attendees received copies of the agenda in English, as well as copies of the presentation and project fact sheet. A copy of the presentation is appended to this summary.

Agenda

6:30- 6:40 pm Introductions and welcome

6:40 - 7:15 pm Presentation (English and ‘Ōlelo Ni‘ihau)

7:15 - 7:30 pm Question and Answer Session

7:30 - 8:30 pm Mapping Stations, Open House and Refreshments

Project Team Attendees

- DHHL: Stewart Matsunaga, Andrew Choy, Nancy McPherson, Erna Kamibayashi
- Hawaiian Homes Commission: Commissioner Dennis Neves
- SSFM: Jared Chang, Melissa White, Carlos Kelton, Matt Fernandez
- Interpreter: Hokulani Cleeland

Stakeholder Attendees
Attendees at the meeting included both existing lessees and applicants as indicated below.

Applicants

1. Marvaleen Vidinha
2. May K Gallion
3. Lynette Neves
4. Alice Morris
5. Cheryl Kahokuloa
6. John Kahokuloa
7. Luella Lemn
8. Kekoa Woo
9. Pauline Kupo
10. Blossom L. Kanahele
11. Blossom H. Kanahele
12. Sharon Nerpio
13. Ruth Garza
14. James I Beniamina
15. Jimmy K Beniamina
16. Nani Jean Demotta
17. Solomon (Sa'ce) Potts
18. Loui Cabebe
19. Waylon Kanahele
20. Delayne Pai
21. May Adams
22. John Ruiz
23. Myrnadette Bucasas
24. Dwyle Lee
25. Princess A. Pahulehua
26. Angela Mahoe-Yamamoto
27. June Aviguetero
28. Thelma Ruiz
29. Laurie Ann Ruiz
30. Connie (Tano) Castaneda

Lessees

1. Virginia Nizo-Keamoai
2. Allice Morris
3. Kuulei Kaaumoana
4. William (Billy) Lemn
5. Ruth Garza
6. Nani Jean Demotta
7. Christina Trugillo
8. Dwyle Lee
9. Leonard Kanahele

Other

1. Devi (Keala) Nordmeier
2. Marilyn Beniamina
3. Kimo Beniamina
4. Kyle Kelley
5. Telissa Agbulos
6. Holly Pahulehua
7. Susan Kanahele
8. Marian K. Beniamina
9. Mike Demotta
10. Lauren Yamamoto
11. Felicia Cowden

Notes from Q & A and Group Discussion
Following the presentation, attendees were given the opportunity to ask questions of the project team, followed by an open house. No questions were posed during the Q&A discussion. Written comments from the open house are documented below.

Open House Comments

- If I'm on the county's first-time homebuyer waiting list, can I use it on Hawaiian Home Lands?
- Like the locations of community spaces in residential areas.
- Think about putting solar farm along the gulch. Make most use of the land.
- Think about developing DHHL-owned sewer treatment.
- Need new elementary school to handle increased population. Locate school in makai community use area, not on highway.
- Put terraces in the gulch.

Input from Map Study and Open House: Envisioning a Future Hanapēpē Homestead Community

An open house was set up to enable people to learn more about the project, talk with team members, and provide input. Mapping stations focused on gathering feedback on the proposed layouts for the next residential phase and full buildout.

Open House Stations

Project Orientation:

- Informational poster about project (based on fact sheet).

Beneficiary Input:

- Highlights of input from beneficiary survey, lessee/beneficiary meeting.

Land Use Types:

- One board each for Residential, Subsistence Ag, Community Use, and Commercial Designations that showed examples, provided definitions of each land use, and asked people what they would like to see in each land use type.
- Beneficiaries used sticky notes to add their input to these boards.

Land Use Alternatives:

- Board showing preferred and alternative land use plans for the site.

Site Layout Maps:

- Showing two layout scenarios for proposed lots, road network, and next phase of homes for the preferred alternative.

Parking Lot:

- For miscellaneous comments.

Keiki Coloring Station

Map Study Station 1

For review and comments on overall layout, including road network, lot layout, on number of lots.

Overall comments

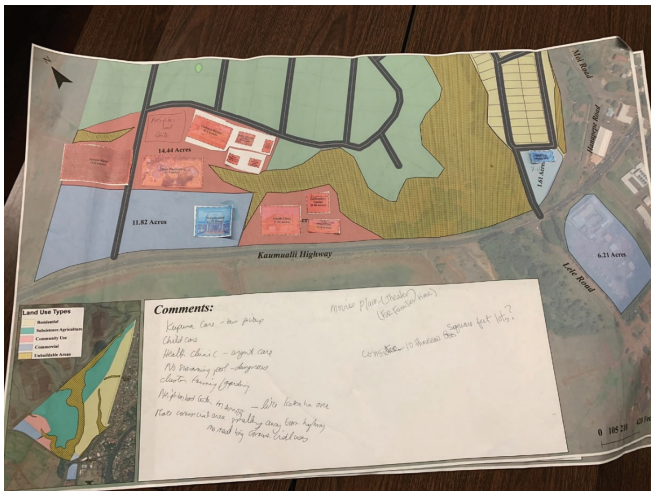
- No swimming pool – dangerous
- Cluster farming/ag services near ag lots
- Neighborhood center for events
- Move commercial area away from highway
- No need for big commercial uses
- Consider 10,000 sq. ft lots.
- Movie theater for family time
- Roundabout at exit of entrance road

Preferred Commercial Uses

- Small supermarket
- Gas station/convenience store

Preferred Community Uses

- Soccer field
- Kupuna Center
- Neighborhood center
- Large playground
- Farmers market
- Health clinic / Urgent care
- Preschool / Child Care
- Commercial kitchen/ag uses



Map Study Station 2

For review and comments on overall layout, including road network, lot layout, on number of lots.

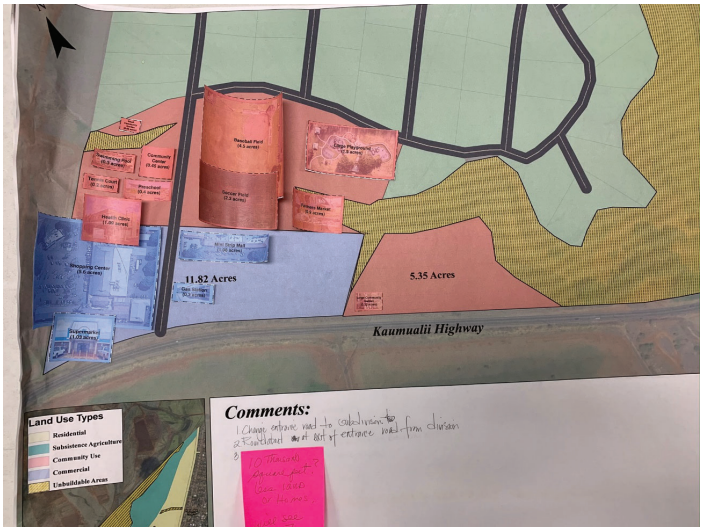
- Change entrance road to subdivision
- Roundabout at exit of entrance road from division

Preferred Commercial Uses

- Supermarket
- Shopping center
- Gas station
- Mini strip mall

Preferred Community Uses

- Health clinic
- Preschool
- Tennis court
- Community center
- Swimming pool
- Baseball field
- Soccer field
- Large Playground
- Farmers Market



Map Study Station 3

For review and comments on overall layout, including road network, lot layout, on number of lots.

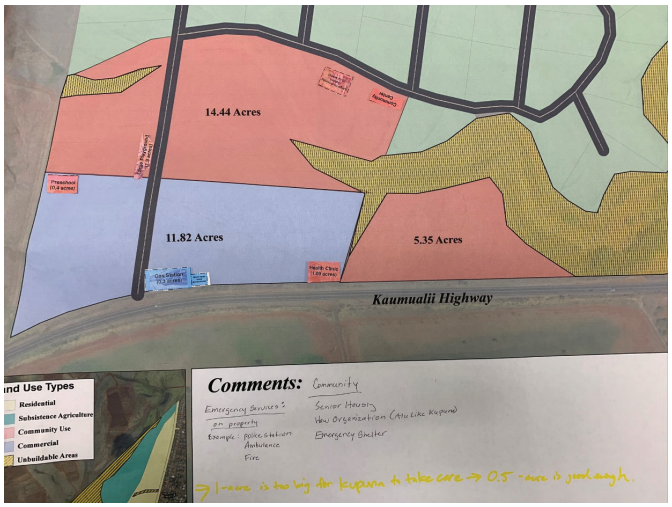
- Emergency Services on property
- Emergency shelters
- Hawaiian Organizations
- "1 acre is too big for Kupuna to take care of"

Preferred Commercial Uses

- Gas station
- Convenience store
- Health clinic

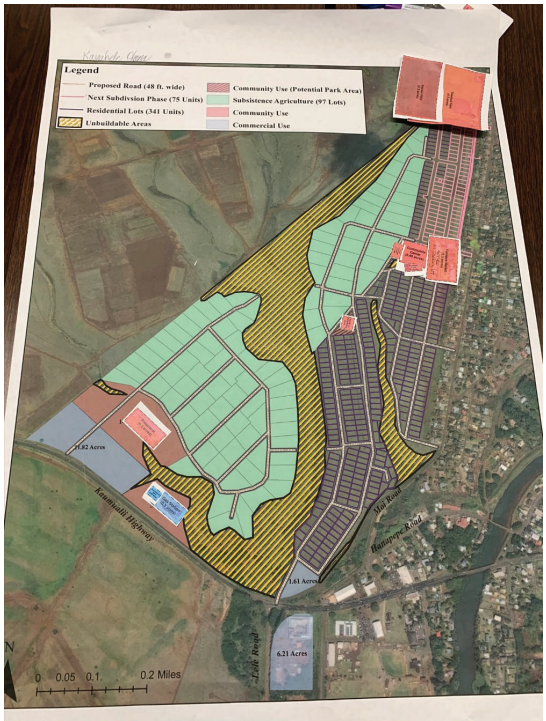
Preferred Community Uses

- Preschool
- Large Playground
- Community Center
- Health Clinic
- Large Community Garden
- Community Center



Map Study Station 4

For review and comments on overall layout, including road network, lot layout, on number of lots.



Preferred Commercial Uses

- Gas station

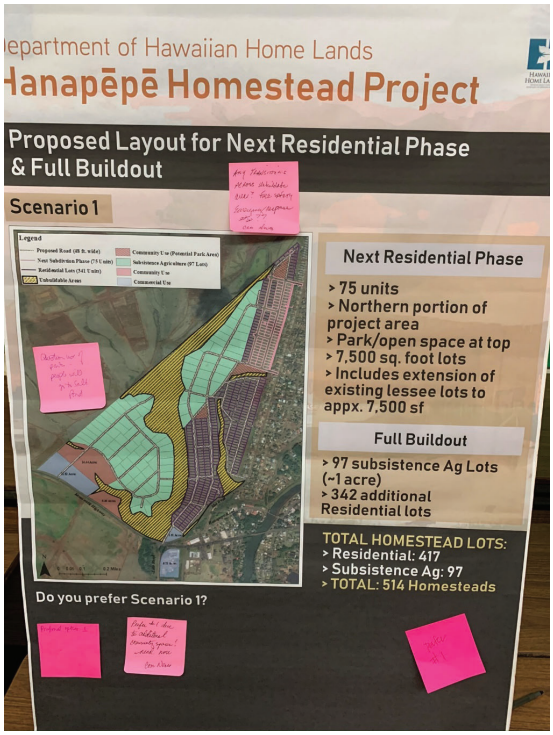
Preferred Community Uses

- Preschool
- Small Playground
- Large Playground
- Soccer field
- Baseball Field
- Community Center
- Basketball Court
- Farmers Market
- Health Clinic

Proposed Layout for Next Residential Phase & Full Buildout (Scenario 1)

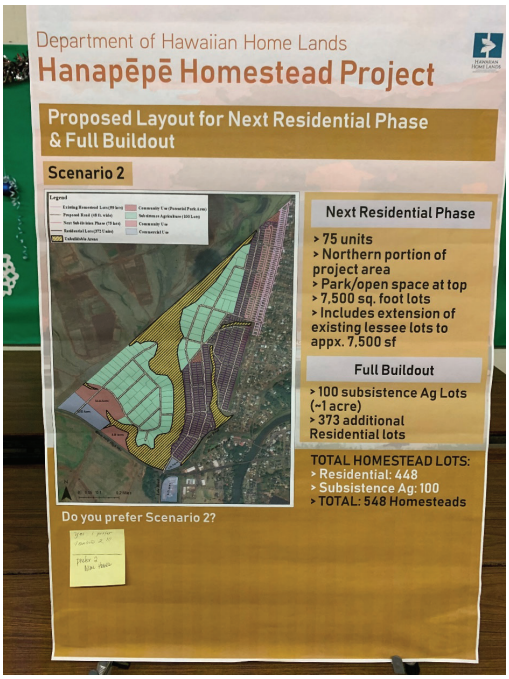
Comments

- Any transitions across unbuildable areas?
- Fire safety or emergency response access?
- Question use of parks. People will go to Salt Ponds.
- Prefer scenario 1 due to additional community space. Need more!



Proposed Layout for Next Residential Phase & Full Buildout (Scenario 2)

- Two votes for scenario 2 layout
- Prefer scenario 2 because it includes more homes



Meeting Photos

HANAPĒPĒ COMMUNITY MEETING #1 SUMMARY

Time: 9:30am- 1:30 pm
Date: October 26, 2019
Location: ‘Ele‘ele Elementary School

Event Description
The purpose of the meeting was to introduce the project, share findings from work done to date, share preliminary findings from the beneficiary survey, present land us plan alternatives for EA, gather input on what’s important to residents of Hanapēpē and how they view their community, and gather input on what should be addressed in the EA.

The project team shared a presentation and developed informative and interactive boards on display in an open house format. Attendees received copies of the agenda, as well as copies of the presentation and project fact sheet. A copy of the presentation is appended to this summary.

Agenda

- Introductions and welcome
- Presentation (repeated at 10:00 and 12:00 pm)
- Question and Answer Session (following each presentation)
- Open House and Refreshments (throughout)

Project Team Attendees

- DHHL: Andrew Choy, Nancy McPherson, Erna Kamibayashi
- Hawaiian Homes Commission: Commissioner Dennis Neves
- SSFM: Jared Chang, Carlos Kelton, Abbey Seitz

Stakeholder Attendees

Attendees at the meeting included both existing lessees and applicants as indicated below.

Lessees

1. James S. Beniamina
2. John Beniamina
3. Kuulei Kaaumoana
4. Leonard Kanahele, Jr
5. Lavonne Kanahele
6. Tracey Camara
7. Marian Beniamina
8. Sherlin Beniamina

Applicants

1. Brad Akana
2. Dianna Kaulili-Phillips
3. Elvira Kimokeo
4. Golden Wong
5. James Beniamina
6. Jasmine Taniguchi-Kahepuu
7. John Beniamina
8. John Ruiz
9. Lana Kukona (Pua Ayau)
10. Laurie Ann Ruiz
11. Marilyn Beniamina
12. Myrnadette Bucasas
13. Olivia Kimoko
14. Penny P. Anakalea
15. Sharon C.K. Nerpio
16. Thelma Lauhiwa Ruiz

Anuenue Kanahele

Other

1) Alex Wong
2) Kalawaia Lee
3) Kaimana Castaneda
4) Malcolm Azeka
5) Richard Harter
6) Susan Remoaldo
7) Terilynn Denson
8) Wendy Vidinha
9) Kathleen Lee
10) Arnette Lee
11) Roland Lee
12) Don Mitchell
13) Jinna Mitchell
14) Marylynn Naumu
15) Gerald Naumu
16) Jonathan Rivera
17) Russel Beniamina
18) Marian K. Beniamina
19) Jared Chang

Notes from Q & A and Group Discussion

Following the presentation, attendees were given the opportunity to ask questions of the project team, followed by an open house. They were also given comment cards to provide written comments. The discussion from the Q&A and input received on comment cards are documented below.

Comments, Question and Answer Session

- **Q.** Even if you finish on schedule, what happens in the 5-8 years?
  - **A.** We need to do the design- nail down location, lots, specs, drainage. Need approvals, coordinate with the County. Timing depends on funding availability.
- **Q.** How old is General Plan?
  - **A.** County just updated general plan in 2018. Prior that that, it was last updated in 2000. The DHHL Island Plan was finalized in 2004. In the process of updating now.
- **Q.** What is the funding for?
  - **A.** Planning, Environmental Assessment, Design
- **Q.** If residential is a priority, when will Ag happen?
  - **A.** It depends on funding. We are doing EA for entire lot, not just residential. We are doing EA for entire lot, not just residential. Awarding will take place during construction.
- **Q.** Your funding is for what portion of the project?
  - **A.** Phase 2 of the project – up to 75 homes.
- **Q.** Funding could delay this project – is there a way to pre-award if we know the project is coming?
  - **A.** In the past we have given out accelerated awards. Waited for infrastructure- looking at ways to expedite the process.
- **Q.** Most of us will be in our 70's, 80's, and 90's- most of our kids cannot be beneficiaries because they are not 50%. Is there a way to have relatives or children of beneficiaries qualify?
  - **A.** We acknowledge this and is an area DHHL is working on.
- **Q.** What assistance is provided for Subsistence Agriculture?
  - **A.** Currently no assistance on Kaua'i – looking to expand this. Technical assistance needs to be included in the DHHL budget.
- **Q.** Will Hanapēpē have undivided interest?
  - **A.** We don't want to repeat the same mistakes from Anahola. We can go back and review this and the legal implications.
- **Q.** How far along is the Pu'u 'Ōpae Project?
  - **A**. It is a couple years down the road, we're trying to work with the department to figure out the best balance.
- Would like to see a Hanapēpē homeowners association with non-profit arm.

Comment Cards

- Need more funding to help expedite projects and award the Kupunas their land
- Drop the blood quantum to 45 percent so there are beneficiaries that can be awarded these lands if their Kupunas pass.
- Need someone to ask for grants to help with funding these projects.
- Need a community center with an emergency shelter because there are not enough disaster centers for locals.
- Drop the blood quantum to 45% those that fit the 50% blood quantum or higher are now older retirement age with no way to make the required down payment.
- Hire someone to follow up on grant money or ask for funding necessary to complete projects.
- On behalf of neighbor beneficiary: Uncle has been maintaining DHHL behind his land for over 40 years. Now (2019) DHHL is taking custody of those lands (gardens, grass, trees) in anticipation of development. His worry: now that DHHL "cutting and maintaining grass" will they continue to do that timely and responsibly as a fire break? Because he had been doing it previously. He is worried it won't be maintained.
- Eventually there needs to be an easement for and land set aside for another access road. Infrastructure cost money, but the set aside shouldn't cost much.
- Funding is an issue and need the commission to give more money to help fund these projects. so our kupunas can be awarded their lands, so they can pass it down to their moopuna.
- Have a community or cultural center available for the community to use.
- If building across the gulch, where will our water system come from?
- Need more technical assistance to help with funding projects.

Input from Open House: Envisioning a Future Hanapēpē Homestead Community

An open house was set up to enable people to learn more about the project, talk with team members, and provide input on what they would like to see in a future Hanapēpē Homestead community. The open house included eleven stations, described below. Input received during the open house follows this page.

Open House Stations

Project Orientation:
- Informational poster about project

Beneficiary Input:
- Board explaining input received from beneficiaries based on survey, lessees meeting, beneficiary meeting

Land Use Types:
- Boards explaining Residential, Subsistence Ag, Community Use, and Commercial Designations that showed examples, provided definitions of each land use, and asked people what they would like to see in Community Use and Commercial areas.
- Participants used sticky notes to add their input to these boards.

Land Use Plan Alternatives:
- One board for each of the two alternatives, with acreage tables and highlights of each alternative.

Next Phase of Homesteads:
- A board showing the two locations considered for the next phase of homesteads.

Cultural Resources:
- A board showing place names, wahi pana, and information on the Cultural Impact Assessment underway for the project.

Land Suitability Analysis:
- A board describing key findings of the Land Suitability Analysis for the project.

Community Input:
- Board asking community members what they love about Hanapēpē and what should be considered in the Environmental Assessment.

DHHL Background
- A board explaining the Hawaiian Homes Commission Act, DHHL authority, and DHHL planning system.

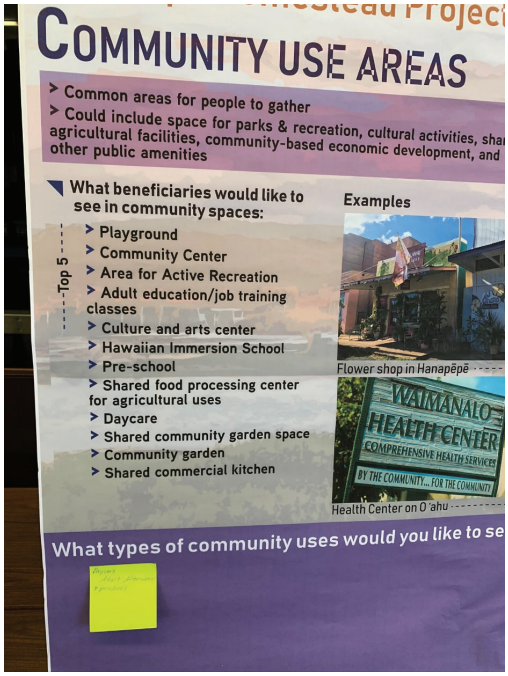
Parking Lot:
- Easel with markers for general comments

Keiki Coloring Station:
- Coloring sheets with crayons and markers

Community Use Areas

What types of community uses would you like to see?

- Daycare
- Adult school
- Afterschool
- Preschool



Department of Hawaiian Home Lands
Hanapēpē Homestead Environmental Assessment Project

Commercial Areas

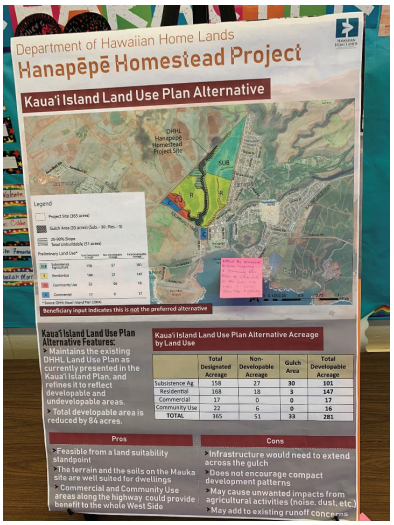
What would you like to see in commercial areas?

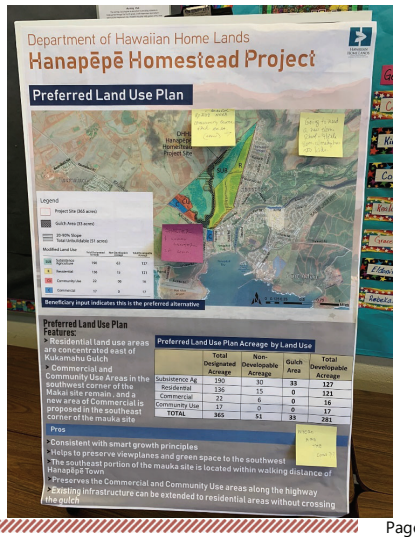
- Low rental for new starter businesses to get experience and a feel for products

Land Use Plan Alternatives 1 and 2

What would you like to see in the plan?

- Shelter and community center
- Will need a new elementary school – ʻEleʻele school already has 500 kids
- Residential needs include a community center and park
- Extend the commercial to cover highway and community use closer to residential





DEPARTMENT OF HAWAIIAN HOME LANDS
Hanapēpē Homestead Environmental Assessment Project

Meeting Photos