DEPARTMENT OF PLANNING AND PERMITTING
**CITY AND COUNTY OF HONOLULU**
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honolulu.gov/dpp • CITY WEB SITE: www.honolulu.gov

FILE

RICK BLANGIARDI
MAYOR

DAWN TAKEUCHI APUNA
DIRECTOR DESIGNATE

December 12, 2022

2022/ED-26(ZS)

Ms. Mary Alice Evans
Director
State of Hawaii
Office of Planning and Sustainable Development
Environmental Review Program
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Ms. Evans:

SUBJECT: Anticipated Finding of No Significant Impact
Hawaii Revised Statutes Chapter 343
Draft Environmental Assessment (EA) for Manoa Banyan Court
3349, 3355, 3419, 3430, 3476, and 3478
East Manoa Road - Manoa
Tax Map Keys 2-9-043: 002, 003, and 004

The Lin Yee Chung Association is proposing to construct 288 new affordable rental dwelling units for the elderly in Manoa. The Project will consist of four multi-family buildings, a community garden, and a community center. The Department of Planning and Permitting is the approving agency for the action. We have considered every phase of the proposed action, the expected impacts, and the proposed mitigation measures; and we anticipate a finding of no significant impact.

We have uploaded electronic copies of this letter and the draft EA to your online submittal site. We are also transmitting one paper copy of the draft EA and this determination to the nearest State Library (Manoa Public Library) and to the Hawaii Documents Center (at the Hawaii State Public Library) in accordance with Hawaii Administrative Rules Section 11-200.1-5(e), by way of a copy of this determination letter.

Should you have any questions, please contact Zack Stoddard, of our staff, at (808) 768-8019 or via email zachary.stoddard@honolulu.gov.

Very truly yours,

for Dawn Takeuchi Apuna
Director Designate

cc: Lin Yee Chung Association (Charles Wong)
Sullivan Meheula Lee (Ernest Martin)
Manoa Public Library (hardcopy)
Hawaii Documents Center (hardcopy)

**From:** webmaster@hawaii.gov
**Sent:** Thursday, December 15, 2022 2:59 PM
**To:** DBEDT OPSD Environmental Review Program
**Subject:** New online submission for The Environmental Notice

**Action Name**

Mānoa Banyan Court Affordable Elderly Rental Housing

**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**

Honolulu, O'ahu

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

2-9-043:002; 003; and 004

**Action type**

Applicant

**Other required permits and approvals**

NPDES Permit, Historic Preservation review, HRS 201H affordable housing exemptions, and Building, Grading, and Grubbing Permits

**Discretionary consent required**

HRS 201H affordable housing exemptions

**Approving agency**

City and County of Honolulu Department of Planning and Permitting

**Agency contact name**

Zack Stoddard

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

zachary.stoddard@honolulu.gov

**Email address or URL for receiving comments**

zachary.stoddard@honolulu.gov

**Agency contact phone**

(808) 768-8019

**Agency address**

650 South King Street
7th Floor
Honolulu, HI 96813
United States
Map It

**Applicant**

Lin Yee Chung Association

**Applicant contact name**

Charles Wong

**Applicant contact email**

charlestywong@yahoo.com

**Applicant contact phone**

(808) 779-6189

**Applicant address**

3430 East Manoa Road
Honolulu, HI 96822
United States
Map It

**Was this submittal prepared by a consultant?**

Yes

**Consultant**

Lee & Martin LLLP

**Consultant contact name**

Ernest Martin

**Consultant contact email**

martin@leemartinhi.com

**Consultant contact phone**

(808) 628-7526

**Consultant address**

Pacific Guardian Center, Mauka Tower
Suite 1450
Honolulu, HI 96813
United States
Map It

**Action summary**

The Lin Yee Chung Association is proposing to construct 288 new affordable rental dwelling units for the elderly (62 years old and over) in Mānoa. The project will consist of four apartment buildings and a community garden on land zoned P-2 General Preservation District, as well as a community center on land zoned R-7.5 Residential District. The dwelling units will be made affordable to those earning 60% of the area median income and below for a period of 65 years.

**Reasons supporting determination**

The Department of Planning and Permitting has considered every phase of the proposed action, the expected impacts, and the proposed mitigation measures; and anticipates a finding of no significant impact.

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

- 2276602.pdf
- 2262352-4.pdf

**Action location map**

- ManoaBanyanCourt_ProjectParcels.shp.zip

**Authorized individual**

Zack Stoddard

**Authorization**

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

# MĀNOA BANYAN COURT

A PROPOSAL BY

LIN YEE CHUNG ASSOCIATION

AFFORDABLE ELDERLY RENTAL HOUSING
UPPER MĀNOA, O`AHU, HONOLULU, HAWAI`I

DRAFT ENVIRONMENTAL ASSESSMENT
NOVEMBER 2022

Prepared for: Lin Yee Chung Association
3430 East Mānoa Road.
Honolulu, Hawai`i 96822

Prepared by: Harold Senter, Jr.,
Planning Consultant
640 Hind Iuka Dr.
Honolulu, Hawai`i 96821

## TABLE OF CONTENTS

**LIST OF FIGURES**

## LIST OF TABLES

## LIST OF APPENDICIES



## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| Amsl | above mean sea level |
| AQI | Air Quality Index |
| ALRFI | Archaeological Literature Report and Field Inspection |
| BMP | Best Management Practice |
| BWS | Board of Water Supply |
| C | Centigrade (Celsius) |
| CHS | Cultural Surveys Hawaiʻi |
| CIA | Cultural Impact Assessment |
| City | City and County of Honolulu |
| CWA | Clean Water Act |
| CUP | Conditional Use Permit |
| CZM | Coastal Zone Management |
| DDC | Department of Design and Construction |
| DLNR/DAR | Department of Land and Natural Resources, Division of Aquatic Resources |
| DLNR/Land | Department of Land and Natural Resources/Land Division |

| | |
|---|---|
| DLNR/FW | Department of Land and Natural Resources/Forest & Wildlife Division |
| DPP | Department of Planning and Permitting |
| DES/WWB | Department of Environmental Services/Wastewater Branch |
| DOH | Department of Health |
| EPA | Environmental Protection Agency |
| F | Fahrenheit |
| FEMA | Federal Emergency Management Agency |
| FIRM | Flood Insurance Rate Map |
| FONSI | Finding of No Significant Impact |
| Ft. | feet |
| GP | General Plan |
| HAR | Hawai‘i Administrative Rules |
| HECO | Hawaiian Electric Company |
| HFD | Honolulu Fire Department |
| HHFDC | Hawaii Housing Finance Development Corporation |
| HRS | Hawai‘i Revised Statutes |
| HUD | Housing and Urban Development |
| IBC | International Building Code |
| In. | inches |
| KOP | Key Observation Point |
| LEED | Leadership in Energy and Environmental Design |
| LRDP | Long Range Development Plan |
| M | meter |
| MNB | Manoa Neighborhood Board |
| MBTA | Migratory Bird Treaty Act |
| mg/kg | milligrams per kilograms |
| mg/l | milligrams per liter |
| Mm | millimeters |
| Mph | miles per hour |
| NAAQS | National Ambient Air Quality Standards NMFS |
| NOAA | National Oceanic and Atmospheric Administration |
| NPDES | National Pollutant Discharge Elimination System |
| P3 | Private-public partnership |
| PRU | Plan Review Use |
| PUCDP | Primary Urban Center Development Plan |
| SCS | Soil Conservation Service |
| SHPD | State Historic Preservation Division |
| SIHP | State Inventory of Historic Places |
| Sq. Ft. | square feet |
| SLR-XA | Sea level rise exposure area State of Hawai‘i |
| TOD | Transit-Oriented Development |
| TDMP | Transportation Demand Management Plan |
| UBC | Uniform Building Code |
| USACE | US Army Corps of Engineers |
| UHM | University of Hawai‘i at Mānoa |

USDA United States Department of Agriculture

## PROJECT SUMMARY

| | |
|---|---|
| PROPOSING AGENCY: | Lin Yee Chung Association (LYCA) |
| APPROVING AGENCY: | Department of Planning and Permitting |
| RECORDED FEE OWNER: | Lin Yee Chung Association |
| DEVELOPER: | Lin Yee Chung Association |
| LOCATION: | Mānoa Valley, Waikīkī Ahupuaʻa, Honolulu, Island of Oʻahu |
| TAX MAP KEY: | (1) 2-9-043:002 and (1) 2-9-043:003 |
| PROJECT SUMMARY | The Proposed Action would utilize the 201H process to build 288 affordable one bedroom rental units for income limited elderly residents and kept affordable for 65 years. The units would be in four 3 story courtyard focused structures of 72 units each (8 to 12 units per floor) built in four phases on four CPR parcels. Parking for 245 vehicles, 7 ADA spaces, 1 van accessible space and bicycle parking would be provided. There would also be ancillary common areas for elevators, porte cochère, lobby, clothes washing facilities, management office, mail boxes and waste disposal. A fifth CPR parcel of about 1.5 acres would be dedicated for a community garden. The project's structures will be designed to take advantage of prevailing winds, include solar PV panels and solar water heating, and meet LEED silver standards to reduce energy consumption.<br><br>A small triangular parcel directly across E. Mānoa Road from the housing units, currently used by LYCA as a Memorial Hall will later be redeveloped as a Community Day Room. Redevelopment of the triangular Memorial Hall parcel will not occur till Phase 3 or 4 and will require renovation of the Memorial Hall and demolition of a single small house at that time. Twenty parking stalls would be provided for the Community Day Room.<br><br>The Proposed Action will demolish the two existing small houses and storage structures to prepare site for Phases 1 & 2. The Proposed Action is adjacent to two bus stops for The Bus route #6 on E. Mānoa Rd. and is convenient to Mānoa Marketplace shopping center. |
| PROJECT SITE | Proposed Action would be built on 4 CPR parcels totaling 8.068 acres. A 5th parcel of 1.540 acres is intended for dedication as a community garden. These parcels are bounded by the Manoa Chinese Cemetery on the NE, Lower |

| | |
|---|---|
| | Rd. on SW, private residences on the SW, and E. Manoa Rd. on the NE. The triangular parcel TMK(1) 2-9-043:003 measures 0.864 acres and is bounded by E. Manoa Rd., Old E. Manoa Rd. and Pakanu St. |
| EXISTING USE: | Majority of the Project Site is a naturally wooded area with two small houses and storage sheds for cemetery groundskeepers and maintenance equipment. An adjacent small triangular parcel has one structure used as a Chinese Memorial Hall with 8 parking spaces and one small house. |
| CITY AND COUNTY ZONING: | TMK: (1) 2-9-043:003 is zoned P-2: Preservation.<br>TMK: (1) 2-9-043:003 is zoned R-7.5: Residential. |
| STATE LAND USE DISTRICT: | Urban |
| PERMITS AND APPROVALS: | Project to be developed under the 201H process. A 201H Resolution is required to allow use of P-2 Preservation zone as A-2 Apartment in consultation with the City & County of Honolulu Department of Planning and Permitting (DPP). Minor exemptions to Land Use Ordinance requirements may also be required. Because the project will utilize funds in the form of Housing Tax Credits provided by the Hawaii Housing and Finance Development Corporation (HHFDC), a State of Hawaii entity, compliance with Chapter 343, Hawaiʻi Revised Statutes (HRS) is required. *See* HRS §343-5(a)(1). |
| CONSISTENCY WITH LAND USE PLANS AND POLICIES: | **City and County of Honolulu**<br>Current Oʻahu General Plan 2022<br>Primary Urban Center Development Plan (PUCDP)<br>Proposed Revised PUCDP<br>Land Use Ordinance<br><br>**State of Hawaiʻi**<br>Hawaiʻi State Plan<br>Hawai`i State Functional Plans<br>State Land Use Law<br>State Coastal Zone Management (CZM) |
| ANTICIPATED DETERMINATION: | Finding of No Significant Impact (FONSI) |

| | |
|---|---|
| PARTIES CONSULTED: | **Federal Agencies**<br>(Awaiting responses)<br><br>**State Agencies**<br>Dept. of Land and Natural Resources (DLNR)<br>DLNR Division of Forestry and Wildlife<br>DLNR Land Division<br>DLNR Engineering Division<br>State Historic Preservation Division<br>(Awaiting additional responses)<br><br>**City Agencies**<br>Dept. of Planning and Permitting (DPP)<br>Board of Water Supply (BWS)<br>Dept. of Design and Construction (DDC)<br>DPP Waste Water Branch<br>Honolulu Fire Department (HFD)<br>(Awaiting additional responses)<br><br>**Organizations and Private Parties**<br>Hawaiian Electric<br>Hawaii Gas<br>Manoa Neighborhood Board #7<br>Letter from Mr. Dan Rubinoff |

## Consultants

**Urban Planning - Mr. Harold Senter, Jr. (Hal)**
Hal holds an MA in Urban and Regional Planning from U.H. (1974) and a BA in Landscape Architecture from N.C. State University (1972). He has about 30 years of urban planning and international experience. He served as a Planner IV with the Department of Planning and Permitting, 2004-2015. From 1982 to 1999, Hal acted as the U. N. Chief Technical Adviser for international urban planning projects, in several countries of the Pacific, South and Southeast Asia. He served as Foreign Service Staff Officer, U.S. Information Agency in Thailand 1967-1970, and as a U.S. Peace Corps Volunteer in Thailand, 1964-65.

**Flora and Fauna - Tree Solutions & Environmental Consulting Services Inc.**

Steve Nimz
ASCA Consulting Arborist
ISA Certified Arborist # WE- 0314AM
ISA Tree Risk Assessment Qualified

Ilana Nimz, MSc.
Arborist, Wildlife Biologist
ISA Certified Arborist # WE- 11029AT
ISA Tree Risk Assessment Qualified

**Traffic Impact Analysis - *Austin, Tsutsumi & Associates, Inc.,* Civil Engineers • Surveyors**

**Drainage Assessment – G70, Architects and Engineers**

# INTRODUCTION

## 1.1 BACKGROUND

The Lin Yee Chung Association (LYCA) was established by an original group of thirty Chinese businesspeople in 1851 and is the oldest Chinese Organization in Hawaii. The Association's name, Lin Yee Chung means "United in Righteousness." Between 1852 and 1896 the Association purchased several adjoining parcels to create the property comprising the Chinese Cemetery , and which now totals slightly more than twenty seven acres. The Association was granted a charter as a non-profit corporation from the Kingdom of Hawaii in June of 1889. The cemetery continues to be managed and maintained by the Lin Yee Chung Association (LYCA). The Association also facilitates traditional Chinese religious burial ceremonies and rituals annually. Whereas the majority of burials have traditionally been persons of Chinese ancestry, the cemetery is open to all persons of all religious beliefs.

Maintenance and improvements of the Chinese Cemetery have traditionally been financed through private donations and the sale of cemetery plots. With the remaining area available for burial plot sales gradually diminishing, and maintenance costs gradually increasing, the Association proposes to develop an eight-acre portion of their property adjacent to the cemetery as affordable rental apartments serving Honolulu's seniors. In addition to providing critically needed affordable rental housing, the income from this rental apartment project will not only establish a sustainable financing source for the Association to continue an appropriate level of cemetery maintenance and improvement, but also support its eleemosynary mandate and activities into the future.

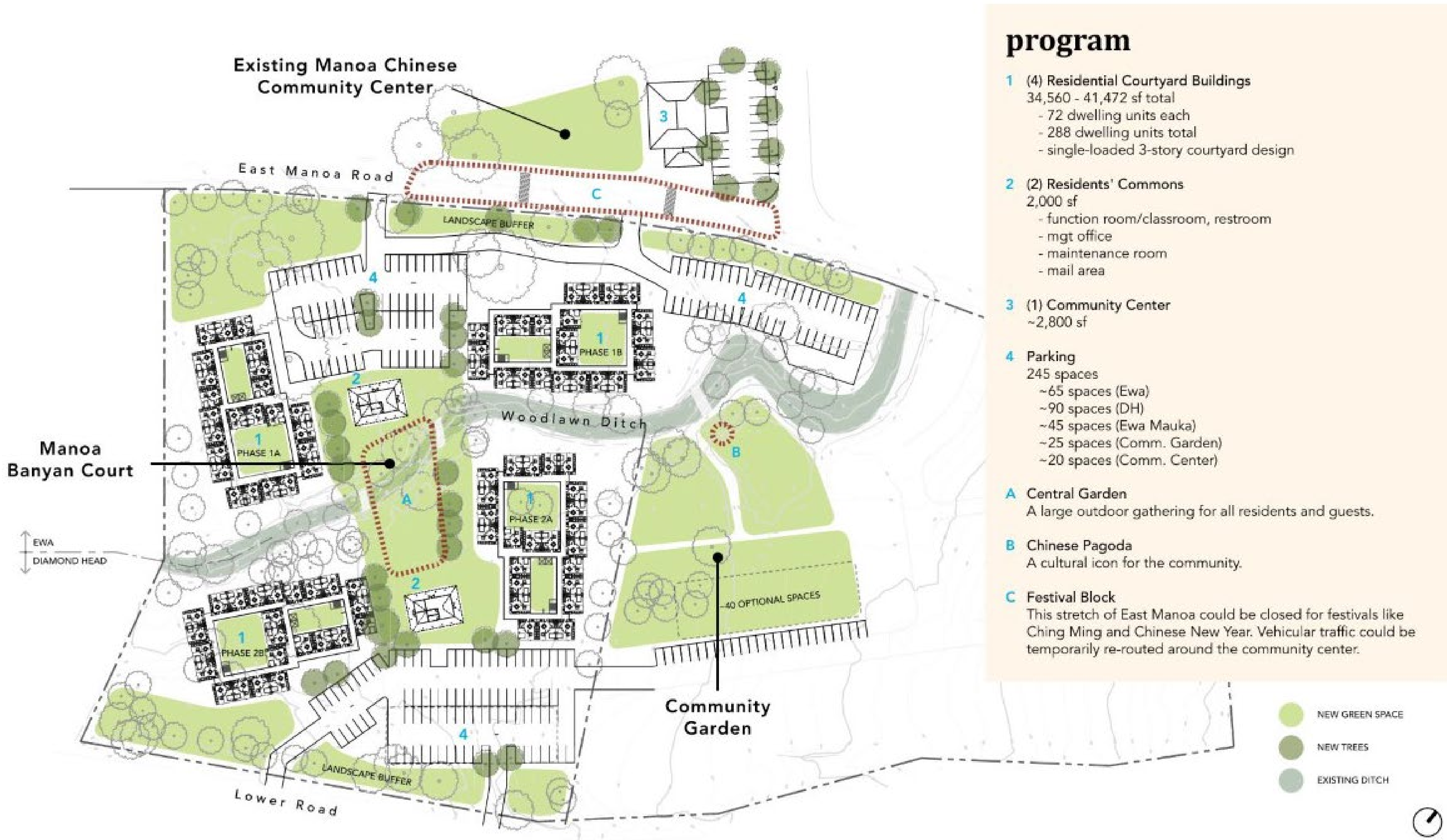
## 1.2 PROJECT LOCATION

The Project Site (TMK: 1-2-9-043:002) is located in upper Valley and is bounded by East Road to the Northwest, Alani Road on the Northeast, Lower Road to the Southeast and private residences to the Southwest. The total site area is 14.607 acres of which 6.687 acres (Lot D-2) comprises a portion the cemetery known as the "Trustee's Section". Except for the currently used cemetery portion, the site is wooded and overgrown with both large and small trees including three large banyans. The Project Site is 0.7 miles from Marketplace, 1.38 miles Northeast of the University of Hawai`i Campus, about three miles from the center of Waikiki and about 5.6 miles from Downtown Honolulu (see Figure 1-1: Project Location and Vicinity Map). The Proposed Action is planned to be built in four phases of seventy-two apartment units each. Phases one and two will be developed on the area designated as Lot D-3 of 2.411 acres (105,023.16 sq. ft.), and Lot D-4 of 1.874 acres (81,023.88 sq. ft.) accessed from E. Rd. Phases 3 and 4 are planned for Lot D-5 of 1.795 acres (78,190.20 sq. ft.) and Lot D-6 of 1.988 acres (86,597.28 sq. ft.) adjacent to Lower Road. Lots D-3 and D-4 are physically separated from Lots D-5 and D-6 by Woodlawn Ditch, a drainage channel feeding into Stream that is dry except following a heavy rain event, but which has not caused localized flooding according to long term on-site residents. There are four existing structures on the Project Site on Lots D-3 and D-4. These are two old dwellings and two maintenance/storage sheds used by cemetery groundskeepers/maintenance staff who have resided on the property since 1986. These structures are old, have no historic value, are in dubious condition, and will be razed prior to development. There are no structures on Lots D-2, D-5 and D-6.

**FIG. 1-1 Project Location and Vicinity Map**

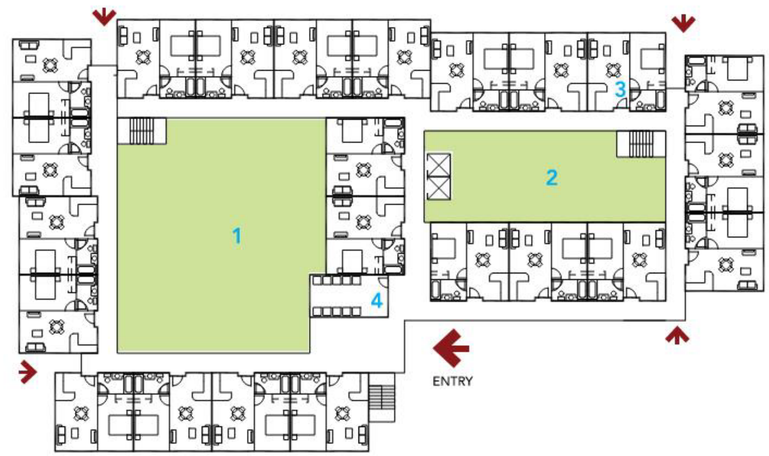
**FIG. 1-2: PROJECT DEVELOPMENT PARCELS**

## FIG. 1-3: REVISED PRELIMINARY SITE PLAN

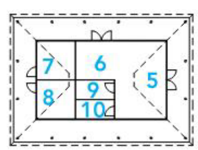


## FIG. 1-4: REVISED COURTYARD RESIDENCES PLAN


Typical 1 Bedroom Unit
480 - 576 sf nominal unit area




Typical Courtyard building
24 units/ floor x 3 floors = 72 units total




Residents' Commons
24x40 = 960 sf interior space with additional 6' wrap around lanai

## courtyard residences

1. **Cultural Courtyard**
   The heart of the residence - a gathering space where residents can learn to live together and feel a part of this community.
2. **Quiet Courtyard**
   A moment to escape - this more intimate space allows for one on one activities or solitary reflection.
3. **Typical Unit**
   480 - 576 sf (1) bedroom - Room for a Living and Dining area, along with a Kitchen with a washer/dryer option.
4. **Flex Space**
   Shared laundry room or socializing lanai.
5. **Commons**
   A gathering space outside of the community center for resident activities/leisure. Offering a small living room and function space.
6. Mailbox area
7. Manager Office
8. Maintenance Room
9. Storage
10. Restroom

## 1.3 PROJECT DESCRIPTION

The Lin Lee Chung Association proposes to develop four CPR parcels of their property as a 201H affordable multi-family elderly rental housing for residents 62 years and over. A fifth parcel, Lot D-2 (1.540 acres), will be dedicated for use as a community garden. The project's intent is to provide 288 affordable rental one-bedroom apartment units for the elderly. The project's structures will be designed to provide cross ventilation and take advantage of the natural prevailing wind pattern to minimize the long-term need for air conditioning and related energy consumption. The Proposed Action intends to incorporate photovoltaic panels on building roofs to capture solar energy and reduce electric power consumption throughout the project's life. A triangular parcel directly across East Mānoa Road from the housing units, currently occupied by the LYCA Memorial Hall (a small meeting facility), which will later be renovated and updated as a Day Room for project residents.

The Proposed Action will demolish the two existing old residential structures to create cleared areas for the new apartment buildings. The Proposed Action, as currently configured, will be comprised of four courtyard style residential structures of three stories in height (30-32 feet) with 8 to 12 units per floor and totaling 288 units. The apartment structures will also include ancillary support equipment and communal areas for elevators, porte cochère entrances, lobbies, laundry facilities, a management office, mail rooms and waste disposal. One hundred eighty five (185) parking stalls will be provided for residents and guests. Handicapped parking areas convenient to building entrances will also be designated. It is also proposed that several ground floor apartment units would be designed and configured for handicapped persons with access ramps and interiors that comply with the requirements of the Americans With Disabilities Act (ADA). The Proposed Project is adjacent to two bus stops for The Bus route #6 on East Mānoa Rd. and is a convenient short distance to Marketplace shopping center. The Project also will include a one acre portion that will be dedicated to the City for use as a community garden available to project residents and the Mānoa community at large.

The proposed project will visually have a low profile and will be obscured by both existing vegetation along East Mānoa Road and Lower Road. Existing vegetation will be augmented with both added native Hawaiian plants and other compatible plant materials as part of the overall landscape design.

The design features of the Proposed Action will be consistent with the energy efficiency status of Leadership in Energy and Environmental Design (LEED) Silver.

Design elements aim to reflect the traditions, history, and spiritual significance of Valley and Hawaiian culture, with shaded communal areas throughout the project area.

The mixed-use, multi-family rental housing facility will include 288 individual apartment units of one-bedroom each. A portion of the refurbished Memorial Hall would be re-configured as a day room for project residents since it is within convenient walking distance from the apartments.

**FIG. 1-5: REVISED SITE CROSS SECTION MAUKA-MAKAI**

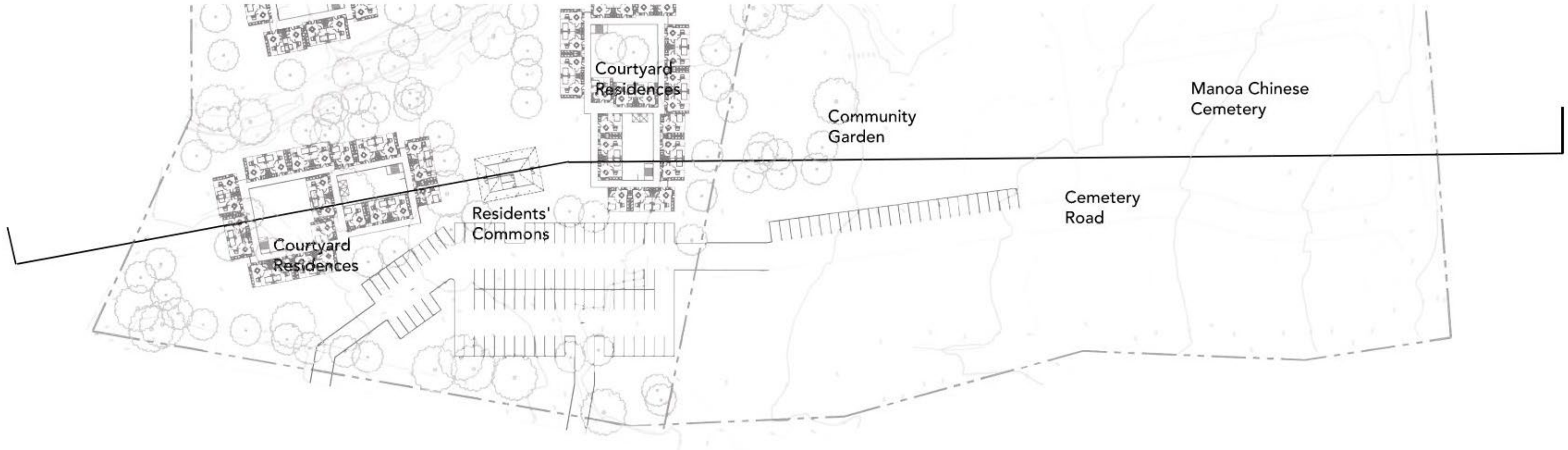



**FIG. 1-6: REVISED SITE CROSS SECTION EAST-WEST**

**FIG. 1-7: REVISED AERIAL VIEW OF PROPOSED DEVELOPMENT**

**manoa banyan court**

*Aerial View of Coming from Town*
*Looking Mauka and East*

**FIG. 1-8: REVISED INTERIOR COURTYARD VIEW**

**FIG. 1-9: REVISED RESIDENTS' COMMON AREA**

**FIG. 1-10: REVISED MAUKA VIEW ALONG E. MĀNOA ROAD**

## 1.4 PURPOSE AND NEED

The Proposed Action has two purposes. One is to provide a regenerative income stream for LYCA that will enable continued maintenance and improvement of the Manoa Chinese Cemetery in perpetuity. Another purpose of equal importance to the first, and to fulfill LYCA's eleemosynary mandate, is to provide affordable rental apartment units for Honolulu's increasing elderly population. The Proposed Action would provide long-term affordable housing to elderly residents who qualify for affordable rental housing.

The Proposed Action is consistent with the identified need for affordable elderly rental housing as indicated in the Hawai`i Housing Planning Study, 2019 which stated (page 45) *"Of the 50,156 units needed for households between 2020 and 2025, 13 percent were for elderly households statewide (6,714 units; Table 34). This is up from 9 percent in 2016. Considering just the units needed for elderly households, about 29 percent (1,967 units) are needed for low and moderate-income households (80% AMI or less)."* The Proposed Action is intended to directly contribute toward satisfying this increasing demand for elderly affordable housing units in urban Honolulu and create a "live-work-relax" environment that fosters inclusivity and connectivity with the community and the urbanized area of Honolulu's developed urban core. The proposed structures will be developed in accordance with the applicable housing objectives and policies of the Hawaii State Plan; the O`ahu General Plan (2022); the Primary Urban Center Development Plan (PUCDP); the Proposed Revised PUCDP currently in preparation and all applicable laws, rules and ordinances of the City and County of Honolulu (the "City") and the State of Hawaiʻi (the "State") supporting the provision of affordable rental housing.

A White Paper focusing on PUC Housing Trends was published in May 2018 which provides important background information. The section of the White Paper targeted at affordable rentals made the following statement. "Honolulu is in the midst of an affordable housing crisis. Twenty six percent of renter households in the PUC pay more than 50 percent of income on rent. High housing costs are also leading to high rates of crowding and doubling up. The 2016 Hawaii Housing Demand Survey estimated demand for an additional 5,565 housing units affordable to households at or below 80 percent of Area Median Income (AMI) between 2016 and 2020 in the City and County."

### 1.4.1 Compliance with State and County Housing Objectives and Policies

To broaden the policy context for the purpose and need for the Proposed Action, this DEA references pertinent housing objectives, goals and policies of both the State and County. The State of Hawaii and the City and County of Honolulu, through their approved development plans have established clearly stated specific objectives and policies intended to encourage and support the provision of affordable housing, for both sale and rent. These affordable housing objectives and policies have been codified in the:

- Hawaii State Plan, Parts I and III (Part II is not applicable to housing.);
- Hawaii State Functional Plans;
- O`ahu General Plan 2022;
- Primary Urban Center Development Plan (proposed revisions are under preparation).

There is currently no Special Area Plan or Urban Design Plan that focuses on, or places special restrictions on Mānoa. Additionally, Mānoa is not considered as a Special Design District or subject to the requirements of a Special Management Area (SMA) review and permit process.

The objectives and policies stated in these plans supporting housing, and particularly affordable housing, include the following.

### 1.4.1.1 Policies Of Hawaii State Plan Parts I and III Supporting Affordable Housing

**Hawaii State Plan Part I**

HRS § 226-19: Objectives and Policies for Socio-Cultural Advancement–Housing

**a) OBJECTIVES:** 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 Hawaiʻi'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 Hawaiʻi'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 Hawaiʻi's people.

**(b) POLICIES:**

**(1)** Effectively accommodate the housing needs of Hawaiʻi'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 Hawaiʻi through the design and maintenance of neighborhoods that reflect the culture and values of the community.

> Compliance: The Proposed Action substantially complies with and supports the Objectives and Policies of the Hawaii State Plan Part I by providing affordable housing units for low-income, moderate-income and gap-group households. It provides affordable housing units within the PUC that take advantage of existing public utilities and services. The Proposed Action has also given consideration to community concerns by reducing its footprint and visual impact.

**Hawaii State Plan Part III**

**(b)** Priority guidelines for regional growth distribution and land resource utilization.

**(1)** Encourage urban growth *primarily to existing urban areas where adequate public facilities are already available or can be provided with reasonable public expenditures* and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of lifestyles.

**HRS §226-106 Affordable Housing**

**(2)** Encourage the use of alternative construction and development methods as a means of reducing production costs.

**(4)** Create incentives for development which would increase home ownership and rental opportunities for Hawaiʻi’s low and moderate-income households, gap-group households, and residents with special needs.

**(6)** Encourage public and private sector cooperation in the development of rental housing alternatives.

**(8)** Give higher priority to the provision of quality housing that is affordable for Hawaiʻi 's residents and less priority to development of housing intended primarily for individuals outside of Hawaiʻi.

Compliance: The Proposed Action is sited within the existing urban area to minimize cost by utilizing the proximity and availability of existing public services and facilities. The Proposed Action intends to use an innovative foundation system (waffle slab) to reduce construction cost and minimize ground disturbance. The Proposed Action will provide affordable housing units for low-income, moderate-income and gap-group households. LYCA will contribute the land and will work cooperatively with HHFDC in a public private development to provide quality affordable rental housing for Hawai`i's qualifying elderly residents.

### 1.4.1.2 Housing Statement From Hawaiʻi State Functional Plans

1. **Housing - State Functional Plan (1989)**

**Purpose:** Provide affordable rental and for-sale housing; increase homeownership and amount of rental housing units; acquiring public and privately-owned lands for future residential development; maintain a statewide housing data system.

Compliance: The Proposed Action complies with the Housing component of the State Function Plan by providing affordable rental housing through cooperation between LYCA's private land holdings with assistance through HHFDC tax credit financing.

### 1.4.1.3 Housing Policies From The O`ahu General Plan (GP) 2022

Chapter 5 of this DEA - *Relationship to Land Use Plans, Policies and Controls* contains a checklist assessment of compatibility with the complete list of all O`ahu General Plan Policies. However, as the Proposed Action supports the provision of affordable housing, General Plan policies of specific relevance toward this goal are restated here to bring emphasis to the Proposed Action's conformance and support of those objectives and policies.

**Polices**

**(1)** Facilitate the full development of the primary urban center through higher-density redevelopment and the provision of adequate infrastructure.

**(4)** Require development projects to give consideration to natural features and hazards such as slope, inland and coastal erosion flood hazards, water-recharge areas, and existing vegetation, as well as to plan for coastal hazards that threaten life and property.

**(9)** Increase tree canopy and ensure its integration into new developments and protect significant trees on public and private lands

Compliance: The Proposed Action facilitates the full development of the primary urban center (PUC) by developing a suitably sized available parcel as a mid-rise, medium density elderly affordable housing development where utilities and infrastructure are readily available. The project's architectural design and site plan uses a minimal footprint that allows preservation of significant trees and the replacement of invasive species with native Hawaiian and more appropriate vegetation to the extent feasible. A drainage study was undertaken for the project (see Appendix D) which indicates that drainage issues are minimal. According to the FEMA flood map the site is in Flood Zone X.

**O`AHU GENERAL PLAN PART IV. HOUSING AND COMMUNITIES**

**Objective A - To ensure a balanced mix of housing opportunities and choices for all residents at prices they can afford.**

**(1)** Support programs, policies, and strategies which will provide decent and affordable homes for local residents, especially those in the lowest income brackets.

**3)** Encourage innovative residential developments that result in lower costs, sustainable use of resources, more efficient use of land and infrastructure, greater convenience and privacy, and a distinct community identity.

**(5)** Make full use of government programs that provide assistance for low-and moderate income renters and homebuyers.

**(6)** Maximize local funding programs available for affordable housing.

**(7)** Provide financial and other incentives to encourage the private sector to build homes for low-and moderate-income residents.

**(8)** Encourage and participate in joint public-private development of low-and moderate-income housing.

**(10)** Promote the design and construction of dwellings which take advantage of O`ahu's year round moderate climate and use other sustainable design techniques.

**(11)** Encourage the construction of affordable homes within established low-density and rural communities by such means as `ohana units, duplex dwellings, and cluster development that embraces the `ohana concept by maintaining multi-generational proximity for local families.

**(12)** Promote higher-density, mixed-use development where appropriate, including rail transit-oriented development, to increase the supply of affordable and market housing in convenient proximity to jobs, shops and public transit.

**(13)** Encourage the production and maintenance of affordable rental housing.

**(14)** Encourage the provision of affordable housing designed for the elderly and people with disabilities in locations convenient to critical services and to public transit.

> Compliance: The Proposed Action is targeted toward affordable housing for elderly in the lower income brackets (30%, 50%, and 60% of AMI). The Proposed Action will take advantage of state government funding programs for low-and moderate-income housing through a cooperative joint public-private development between HHFDC and LYCA. The site is easily accessible to public transit (The Bus), recreation (Mānoa Regional Park, and shopping (Mānoa Marketplace). Some apartments will be designed for elderly residents with disabilities in compliance with ADA requirements and which can be serviced by the Handivan.

**Objective B - To minimize speculation in land and housing.**

**(4)** Require government-assisted housing to be delivered to qualified purchasers and renters.

**(5)** Ensure that owners of housing properties, including government-subsidized housing, maintain housing affordability over the long term.

> Compliance: The Proposed Action will be kept affordable in perpetuity and prospective residents 62 and over will be screened to ensure they meet the affordable housing qualification criteria established by government subsidized housing programs. Apartments in all four phases will open to interior courtyards with exterior walkway access to enable natural cross ventilation to minimize the need for air conditioning. Solar PV panels and solar hot water heating will be installed to reduce the project's energy requirements.

**Objective C - To provide residents with a choice of living environments that are reasonably close to employment, schools, recreation, and commercial centers and that are adequately served by transportation networks and public utilities.**

**Policies**

**(1)** Ensure that residential developments offer affordable housing to people of different income levels and to families of various sizes to alleviate the existing condition of overcrowding.

**(2)** Encourage the fair distribution of low-and moderate-income housing throughout the island.

**(3)** Encourage the co-location of residential development and employment centers with commercial, educational, social and recreational amenities in the development of desirable communities.

**(4)** Encourage residential development in suburban areas where existing roads, utilities, and other community facilities are not being used to capacity, and in urban areas where higher densities can be readily accommodated.

**(5)** Support mixed-use development and higher-density redevelopment in areas surrounding rail transit stations.

**(7)** Encourage public and private investments in older communities as needed to keep the communities vibrant and livable.

> Compliance: The Proposed Action is located on The Bus Route #6 with a short trip to Mānoa Marketplace where a variety of commercial services and stores are available. The project site is also within walking distance of Mānoa Regional Park. The Proposed Action will be located on an undeveloped parcel in an older low density single family area of mauka Mānoa with all utilities readily available and where a moderate increase in density can be accommodated similar to several other multi-family developments in the makai portions of Mānoa Valley.

#### 1.4.1.4 Housing Polices from the Proposed Revised Primary Urban Center Development Plan

The Primary Urban Center Development Plan (PUCDP) is currently under revision and is anticipated to be approved by the City Council either by the end of 2022 or in early 2023. The plan's housing related policies will significantly influence the provision of housing throughout the PUC wherein the Proposed Action is located. Therefore it is considered worthwhile to review how the Proposed Action will comply with these policies.

**Draft Housing Policies**
Policy H-1.3: Encourage a greater variety of housing types, including low or middle-density multi-family housing, ADUs and ʻohana units, mid-rise apartment buildings, and shared housing models.

Policy H-2.1: Expand the supply of income-restricted affordable housing through requirements, incentives and public-private partnerships.

Policy H-2.2: Produce new income restricted units through public sector development and non-profit partnerships.

Policy H-2.3: Preserve affordable housing options and improve conditions by encouraging reinvestment and redevelopment of aging multi-family housing and investing in public infrastructure.

Policy H-2.4: Expand homeless services and supportive housing in the PUC.

**Proposed Age Friendly Policies**

Policy HC-2.1: Encourage housing designed with kūpuna in mind, and in a variety of household sizes.

Policy HC-2.2: Design parks and open space to provide increased physical activity for all ages.

Policy HC-2.3: Enhance safety, accessibility, and navigability in public gathering places and transportation networks.

> Compliance: The Proposed Action is especially focused on achieving these policies. The project provides 288 affordable rental housing units that are developed specifically to meet the needs of O`ahu's increasing elderly population. The Proposed Action is a public–private (non-profit) development which draws upon a variety of funding sources including the provision of about eleven acres of private land from LYCA, public housing tax credits through the State's HHFDC, possible Federal funding assistance from the Community Development Block Grant Program, contributions from the city's Office of Housing, and possible donations from various charitable organizations. The Proposed Action will increase the variety and availability of affordable housing in the PUC by introducing a middle-density multi-family development on an underutilized, but fully serviced parcel. A portion of the housing units will be designed to be ADA compliant for those elderly residents with disabilities. Development costs will be reduced through an innovative planning and design approach. A one acre community garden area will be dedicated to the City for use by the project residents and the Mānoa community at large. The project site is convenient to public transportation (The Bus) and to neighborhood services, shopping and recreational activities.

### 1.4.1.5 Consistency With The Ten Principles of Smart Growth

During the Mānoa Community Town Hall meeting of April 30, 2022, a Mānoa resident stated that the project was not in conformance with a principle of "*Urban Smart Growth*", specifically the principle supporting the "Preservation of Open Space", because the parcel would be cleared of its vegetation. It is worth noting therefore that the objectives and policies stated in approved State and City development plans and proposed policies in the PUCDP revisions, have strived to incorporate all ten of the basic principles of "*Urban Smart Growth*" as they apply to Honolulu. To clarify this point, a listing of all ten principles of "*Urban Smart Growth*" and how the Proposed Action is consistent with them is stated below.

**The Ten Principles of Smart Growth**

1. Mixed Land Uses – The Proposed Action adds affordable rental housing for the elderly to a neighborhood of largely single-family detached homes.

2. Take Advantage of Compact Building Design – The Proposed Action provides 288 units in four compact courtyard type structures of three stories each to minimize building footprints while preserving a significant area of the site for preserving existing viable vegetation, landscaping and common areas for community use.

3. Create a Range of Housing Opportunities and Choices – Currently the dominant housing choice in upper Mānoa is high cost (over one million dollars) single-family detached dwellings. The Proposed Action will increase the range and choice of affordable rental housing opportunities for elderly residents in an area of Honolulu where these do not currently exist.

4. Create Walkable Neighborhoods – The project site is within walkable distance to Mānoa Regional Park, but the closest commercial area is Mānoa Marketplace which may be too far to walk for some elderly residents. For less ambulatory residents, there are two bus transit stops adjacent to the project.

5. Foster Distinct Communities with a Strong Sense of Place – The upper Mānoa community which includes the historic Mānoa Chinese Cemetery already is a distinct community with a strong sense of place not found elsewhere in Mānoa. The Proposed Action will reinforce this distinctness and sense of place.

6. Preserve Open Space – The flora report identified thirty-five trees that should be considered for preservation. Many plants on the site are invasive species and replacing them with native Hawai`i plants and shade trees will enhance the comfort and natural value of the development.

7. Direct Development Toward Existing Communities – Locating the Proposed Action on an available underused site in an existing community enables capture of the advantages of existing urban infrastructure services (water, sewer, electricity, gas, public transportation). The availability of these services enables and supports the overall affordability of the project and makes the development very cost effective, especially when compared to a non-serviced greenfield site outside the established urban areas of O`ahu.

8. Provide a Variety of Transportation Choices – The project will have access to The Bus route # 6, the Handivan, Uber and private vehicles. East Mānoa Road is also designated for shared use with bicycles and has been marked accordingly.

9. Make Development Decisions Predictable, Fair and Cost-Effective – The role of Honolulu's development plans, goals, objectives, and policies is to create the framework for development decisions. The Proposed Action has been designed to both comply with and achieve the respective goals, objectives and policies as they relate to the provision of affordable rental housing for elderly residents of Honolulu.

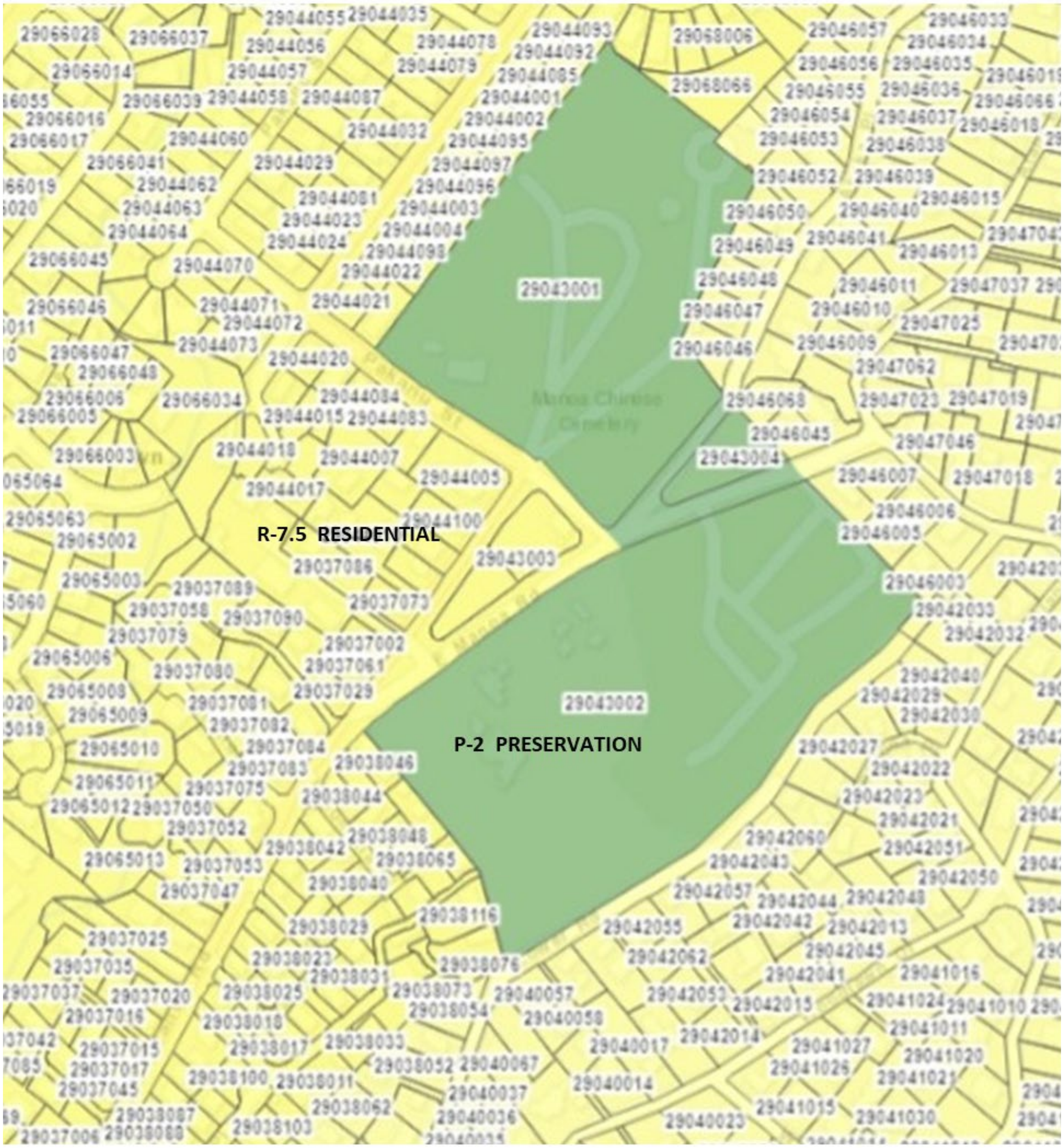
10. Encourage Community and Stakeholder Collaboration – Project representatives have met with community residents on several occasions to discuss the project and have attended several Neighborhood Board meetings as well as the Town Hall Meeting of April 30, to hear a range of views and suggestions from community members. This process will continue, and additional opportunities will be available to meet with and discuss the project with interested members of the community. Additionally, as a public-private development through participation with HHFDC provides the opportunity for development of a cost effective project to serve the urgent need for affordable rental housing.

## 1.5 LAND TENURE

The Project Site is located on land owned in fee by the Lin Yee Chung Association which has owned the property since 1896. The Lin Yee Chung Association will hold the sole responsibility to design, build, operate and maintain the proposed affordable senior rental housing project. The Project Site is zoned P-2 (preservation) under the City's Land Use Ordinance and is classified as Urban under the State Land Use statute (*see* Fig. 1-14: State Land Use Map and Figure 1-15:Parcel Zoning Map and Tax Map Keys). The Proposed Action will be permitted under an allowed modification to the Land Use Ordinance via the 201H Affordable Housing Act and following an environmental assessment review in compliance with HRS §343.

**FIG. 1-11: STATE LAND USE ZONING MAP**

**FIG. 1-12: PARCEL ZONING MAP & TAX MAP KEYS**




Source: CITY AND COUNTY OF HONOLULU

## 1.6 ANTICIPATED DEVELOPMENT SCHEDULE

Phase 1 – 72 Units plus infrastructure and site work for all four phases – late 2024.
Phase 2 – 72 Units plus detailed final site work – Jan. 2025.
Phase 3 – 72 Units plus detailed final site work – Jan. 2026.
Phase 4 – 72 Units plus detailed final site work. – Jan. 2027.

## 1.7 INDICATIVE PROFORMA DEVELOPMENT COST

The total project comprising 288 units is anticipated to cost about $20 million per phase with a total of about $80 million dollars. While a detailed construction cost estimate has been prepared by a contractor for Phase 1, the information is proprietary and therefore cannot be provided at this time. Additionally, given the current volatility of interest rates and inflation, it would be premature and only speculative to provide any cost estimate beyond Phase 1.

10 percent of the units, (28) allocated to the 30% Area Median Income (AMI) for Honolulu.
10 percent of the units, (28) allocated to the 50% Area Median Income for Honolulu.
80 percent of the units, (230 units) allocated to the 60% Area Median Income for Honolulu.

The allocation of affordable rental units for all four phases and indicative rents are shown in the table below.

**TABLE 1-1 MĀNOA BANYAN COURT**
**INDICATIVE RENTAL INCOME FOR ALL FOUR PHASES**

| Unit Type | Percent of Units | No. of Units | Percent of AMI | Est. Monthly Rent | Est. Total Monthly Rent | Est. Total Annual Rent |
|---|---|---|---|---|---|---|
| 1 Bedroom | 10% | 28 | 30% | $708.00 | $19,824.00 | $237,888.00 |
| 1 Bedroom | 10% | 28 | 50% | $1,181.00 | $33,068.00 | $396,816.00 |
| 1 Bedroom | 80% | 231 | 60% | $1,412.00 | $326,172.00 | $3,914,064.00 |
| | | | | | | |
| Vacancy Factor | 5% | | | | $18,953.00 | $227,438.00 |
| Total | 100% | 287 | | | $360,111.00 | $4,321,330.00 |
| | | | | | | |
| 2 Bedroom | Resident Manager | 1 | Common Area | 0 | 0 | 0 |

**TABLE 1-2 HAWAII COMMUNITY DEVELOPMENT AUTHORITY 2022 RESERVED HOUSING INCOME LIMITS**

| | | 1 person | 2 person |
|---|---|---|---|
| *Extremely Low Income* | **30%** | 27,450 | 31,400 |
| | 40% | 36,600 | 41,850 |
| *Very Low Income* | **50%** | 45,750 | 52,250 |
| | 60% | 54,900 | 62,750 |
| | 75% | 62,550 | 71,450 |
| *Low Income* | **80%** | 73,150 | 83,600 |
| *Area Median Income* | **100%** | 79,300 | 90,650 |

The Lin Yee Chung Association through its wholly owned subsidiary, **Mānoa Banyan Court Development Corporation 501(c)(3)** intends to keep the envisioned 288 one bedroom units as Elderly Affordable Rental Housing in perpetuity, open to qualified residents 62 years of age or older as a part of the association's eleemosynary mission.

*(This page intentionally left blank)*

# 2. EXISTING ENVIRONMENT, IMPACTS AND MITIGATION

## 2.1 EXISTING LAND USE

The Project Site has never been developed with the exception of two small dwellings and adjacent storage sheds located in two partially cleared areas. Both of these dwellings and storage sheds will be razed prior to project development. There is also a compacted gravel driveway that provides access to the two dwellings and storage sheds and forms a loop through Lots D-3 and D-4. A small area of the site has been used for a vegetable garden and this area will be expanded to about one acre and dedicated for use as a community garden. The remainder of the site is in its natural condition and is densely vegetated, with a variety of both old growth large trees, small trees, and underbrush, many of which are non-native invasive species. Several trees on the site are about eighty feet high including three large mature banyans which are intended for preservation. *(See the Flora Report in Appendix A for details on trees, their size and condition.)*

**FIG. 2-1 KEY TO SITE PHOTOS 1 – 9 FOLLOWING**

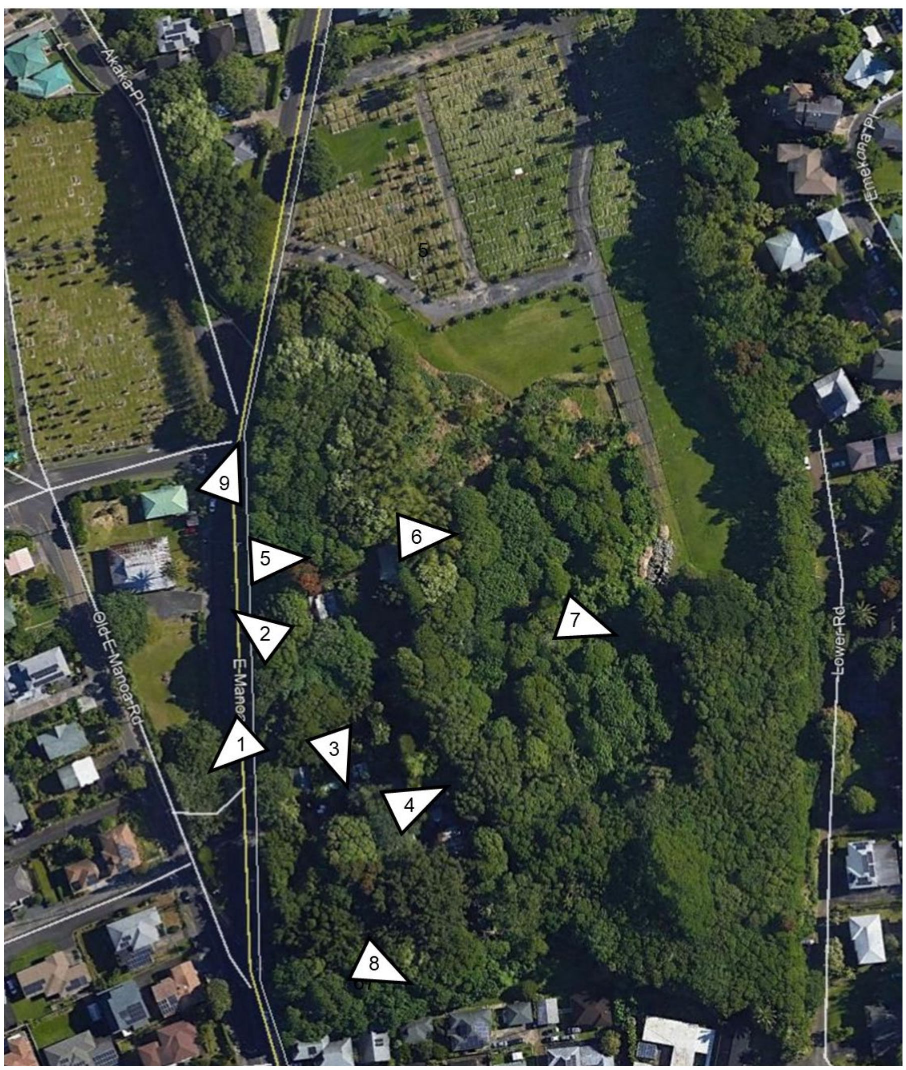


**Photo Key No. 1 - View From Memorial Hall Site To Valley Wall**

**Photo Key No. 2 - View From Site Toward Memorial Hall**

Photo Key No. 3 - Large Banyan Tree (1)

Photo Key No. 4 - Large Banyan Tree (2)

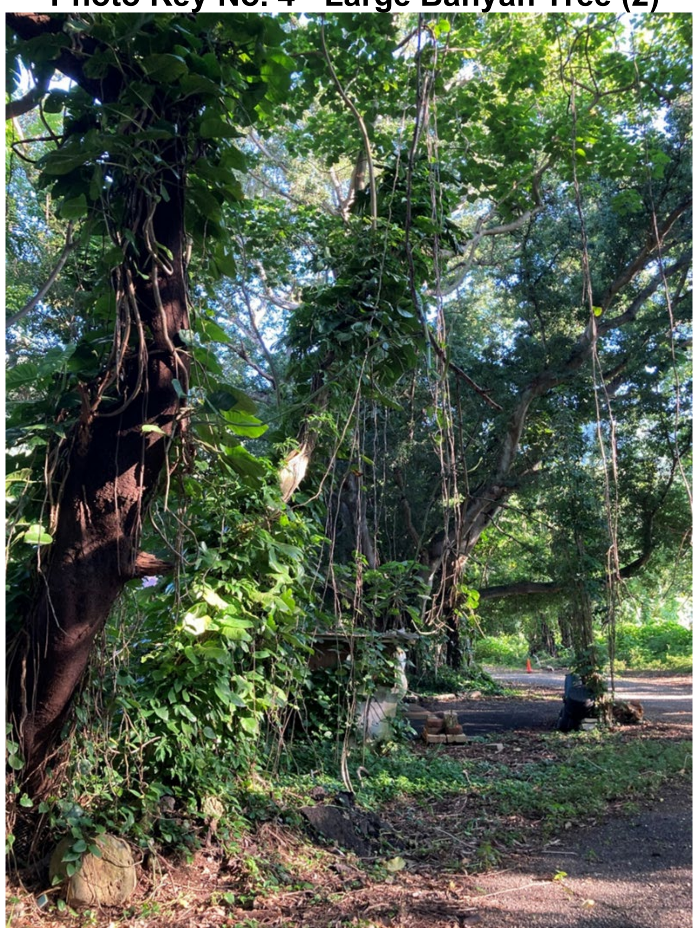


**Photo Key No. 5 - Driveway To Small House**

**PHOTO KEY NO. 6 - View Of Existing Small House**

**PHOTO KEY NO. 7 - View Of Woodlawn Ditch**

**PHOTO KEY NO. 8 - View Of Neighbor Houses Looking South From Site**

**PHOTO KEY NO. 9 - View Of Site Along East Mānoa Rd.**

**FIG. 2-2 SUPPLEMENTAL SITE VIEWS (14 Photos)**
**Dilapidated Old House**

**Old Two Story House**

**Old Two Story House**

**Existing Small House**

**Existing Storage Sheds**

**Woodlawn Ditch Emerging From Under East Mānoa Rd.**

**Gravel Loop Driveway Near Banyans**

**Paved Cemetery Entrance Drive At Northeast Site Boundary**

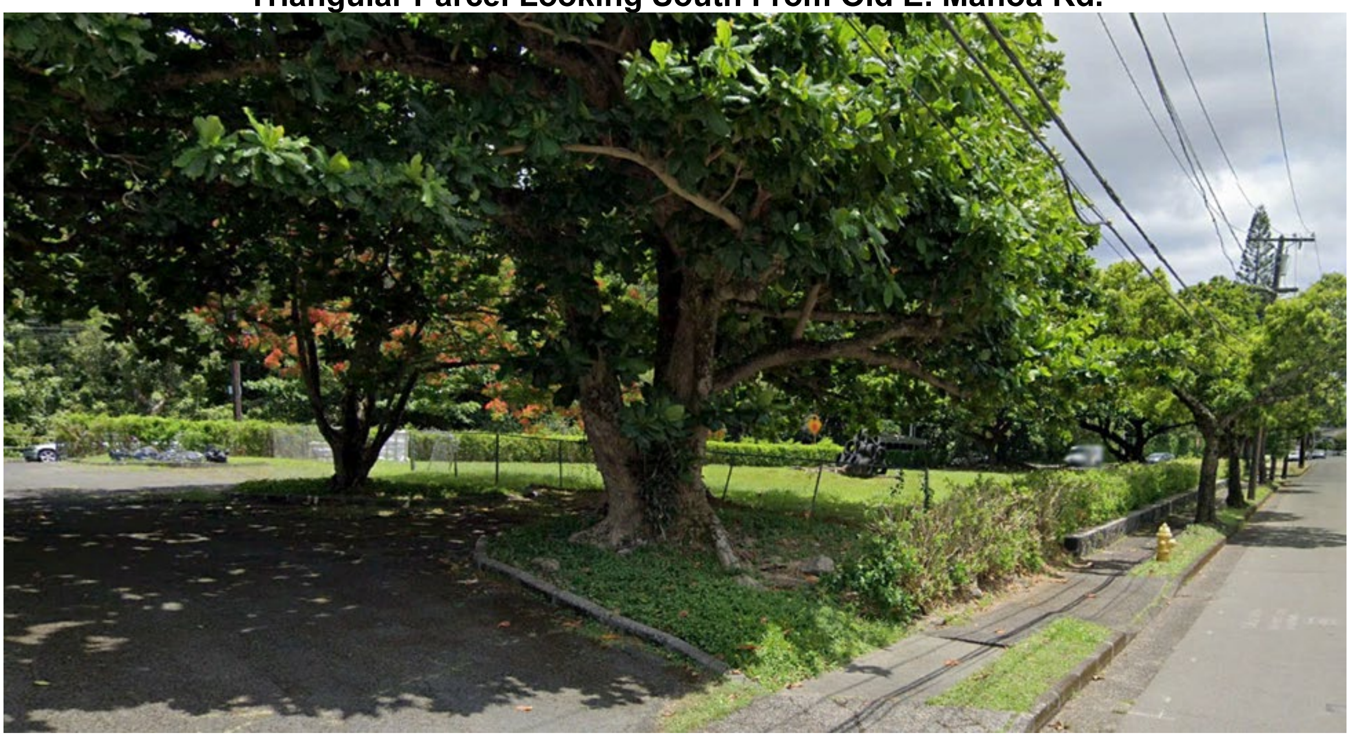
**Specimen False Kamani Trees on Triangular Parcel**

**View Of Memorial Hall From E. Mānoa Rd.**

**Driveway and Memorial Hall from E. Mānoa Road**

**House at Corner of E. Mānoa Rd. and Pakanu St.**

**Triangular Parcel Looking South From Old E. Mānoa Rd.**



**View of Memorial Hall Looking Mauka From Old E. Mānoa Rd.**

## 2.2 REGIONAL SETTING

### 2.2.1 General Description

Mānoa Valley is located in the Honolulu District and the Mānoa/Waikīkī Ahupuaʻa (USGS 1998) and is within the Primary Urban Center Development Plan (PUCDP) area. Mānoa Valley is one of the largest valleys in the urbanized area of Honolulu, being about 0.75 miles across and 2.67 miles deep from H1 to the mauka valley walls formed by the Ko`olau Range. The valley also extends about 0.88 miles beyond the project site. The valley floor is gently sloping at an average of 4.5% slope to almost flat. According to the PUCDP the population of Mānoa Valley is about 25,010 persons with 7,999 housing units and a population density of 7,792 persons per square mile.

The climate of Mānoa Valley is characterized by stable tropical temperatures, ranging from an average low of 70.9 degrees Fahrenheit (F) in January, to an average high of 77.7 degrees (F) in August. The summer season, from May through September, is warm and dry with predominant East and Northeast trade winds that range between eight to fifteen miles per hour (mph). The winter season, from October to April, is generally characterized by higher rainfall and less prevalent trade winds (SCS 2020).

The Project Site is located in the mauka portion of Mānoa Valley just below the Mānoa Chinese Cemetery and totals 9.5 acres. The site is physically bifurcated by Woodlawn Ditch into two areas. These have been further divided into five Condominium Property Regime (CPR) lots. These lots are identified on the CPR map as Lot D-2 (1.540 acres), Lot D-3 (2.411 acres), D-4 (1.874 acres), Lot D-5 (1.795 acres), and Lot D-6 (1.988 acres) for a contiguous total of 9.608 acres (TMK 29043002). Lot D-2 is intended for the community garden area. Lots D-3 and D-

4, west of Woodlawn Ditch, would be developed for Project Phases 1 and 2 and Lots D-5 and D-6, east of the ditch would be developed for Project Phases 3 and 4. An additional one acre will be dedicated in the HHFDC application for a community garden. The triangular lot (TMK: 2-9-043:003 (0.86 acres), occupied by the Memorial Hall, will be refurbished as a day room for project residents. The 288 one bedroom units on 9.5 acres yields a density of approximately 30 units per acre. This is not considered as high density which would be exemplified by the 18 story faculty and graduate student housing proposed for the U. H. Campus near the East West Center or housing in Makiki or Mō'ili'ili where densities can exceed 100 units per acre.

### 2.2.2 Notable Land Uses in the Vicinity and Throughout Mānoa

Land uses in the immediate vicinity of the project site include the Mānoa Chinese Cemetery, single family residences, the Chinese Memorial Hall on the adjacent triangular parcel, the Mānoa Regional Park with a community garden, Mānoa Elementary School and Mānoa Gardens multi-family elderly rental apartments. Other notable land uses in Mānoa include the University of Hawai`i Mānoa Campus, Lyon Arboretum, Kamanele Park, Mānoa Valley District Park, Mānoa Marketplace, Kau`iokahaloa Nui and Iki U.H. Faculty Housing, and Mid-Pacific Institute.

### 2.2.3 Multi-Family Developments in Mānoa

Mānoa is home to several existing multi-family housing developments. Some of which provide housing for the elderly, and some for families. A brief description of seven of these developments with photos follows. A photo of Mānoa Valley is provided on the following page to assist in locating the described multi-family developments in Mānoa. The multi-family developments with a brief description are shown in the following photos.

Mānoa Gardens Elderly Housing Mānoa Village, 2939 E. Mānoa Rd. (Figs. 2-4, 2-5)
Mānoa Vista Condominium 3015 E. Mānoa Rd. (Fig. 2-6)
Mānoa Village, 2939 E. Mānoa Rd. (Figs. 2-8, 2-9)
Kau'iokahaloa Iki Condominiums, 3030 Lowrey Avenue (Fig. 2-10, 2-11)
Kau'iokahaloa Nui Apartments 3029 Lowrey Ave. (Fig. 2-12 to 2-16)
Mānoa East Condominiums 2841 Kaonawai Place (Fig. 2-17, 2-18)
2948 East Mānoa Road (Fig. 2-19, 2-10)

**FIG. 2-3 Location of Existing Multi-Family Housing in Mānoa**

**Mānoa Gardens Elderly Housing** 2790 Kahaloa Drive – Mānoa Gardens, is an 80 unit (studio and one bedroom mix) senior community for persons 62 and over. Eight, two story buildings with 10 units each (5 on each floor) along with a community center were developed in 1990 by EAH Housing on 4.168 acres with a density of 19.2 units per acre. This housing complex provides housing for elderly persons making 80% and 60% of the average median income (AMI) and a few gap units at 120%. The AMI is defined annually by the U.S. Department of Housing and Urban Development (HUD). Studio units are 390 sq. ft., and one bedroom units are 448 sq. ft. As an interesting historical note, the Mānoa Neighborhood Board (MNB) Minutes of 3/1/1989 indicated the Board's opposition to the Mānoa Gardens Project. The MNB Minutes of 7/5/1989 expressed concern for loss of parking for Mānoa Regional Park as well as accusing the City of fraud and misinformation. The Board only opposed to the proposed site, but not the need for affordable housing. The MNB voted 14-0-1 against the project.[1] Similarly, 33 years later, in Sept. 2022, the MNB passed a Resolution opposing the Mānoa Banyan Court (the Proposed Action) as proposed. In spite of the opposition in 1989, the Mānoa Gardens Affordable Housing project has been very successful and remains so to this day.

**FIG. 2-4 Aerial View of Mānoa Gardens**

**FIG. 2-5 Mānoa Gardens Community Center**

**Mānoa Vista Condominium 3015 E. Mānoa Rd. (Fig. 2-6) –** Mānoa Vista is a townhouse type development with 4 units adjacent to a convenience store with gas pumps.

**FIG. 2-6 Overhead View of Mānoa Vista, 3015 E. Mānoa Rd.**

**FIG. 2-7 Ground View of Mānoa Vista Townhouse Condominium 4 Units**

**Mānoa Village, 2939 E. Mānoa Rd. (Fig. 2-8, 2-9) –** Mānoa Village is a small 2 story multi-family building with 7 condominium units on a single lot. A commercial enterprise occupies the ground floor of one unit.

**FIG. 2-8 Overhead View of Mānoa Village 2939 E. Mānoa Rd.**


**FIG. 2-9 View of Mānoa Village Condominiums**

**Kau‘iokahaloa Iki Condominiums, 3030 Lowrey Avenue (Fig. 2-10, 2-11) –** The Kau`iokahaloa Iki Condominiums were built in 1994 and serve as faculty housing for the University of Hawaii. The complex has seven residential structures and eight covered parking structures. There are 29 townhouse units of 3 bedrooms and 2.5 baths with a double covered parking. These units are available for rent by families of three or more.

**FIG. 2-10 Overhead View of Kau‘iokahaloa Iki, 3030 Lowrey Ave.**

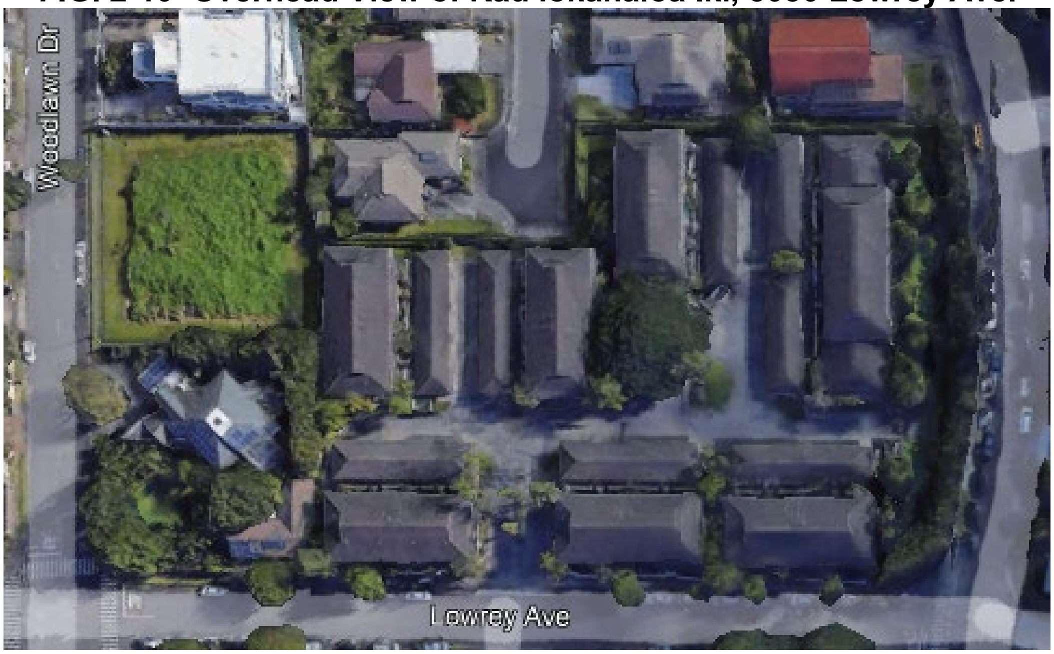



**FIG. 2-11 Ground View of Kau‘iokahaloa Iki, 3030 Lowrey Ave.**

**<u>Kau'iokahaloa Nui Apartments</u> 3029 Lowrey Ave. (Fig. 2-12 to 2-16) –** The Kau`iokahaloa Nui Apartments were built in 1995 with 136 two bedroom units and 6 three bedroom units for University of Hawaii Faculty Housing. The residential complex also provides 237 uncovered parking stalls.

**FIG. 2-12 Overhead View of Kau'iokahaloa Nui Apartments**

**FIG. 2-13 Entrance to Kau'iokahaloa Nui Apartments 3029 Lowrey Ave.**


**FIG. 2-14 Emergency Access to Kau'iokahaloa Nui From Woodlawn Dr.**

**FIG. 2-15 Kau‘iokahaloa Nui Apartments 3029 Lowrey Ave.**

FIG. 2-16 View of **Kau‘iokahaloa Nui Obscured by Palms Along Kalawao St.**

**<u>Mānoa East Condominiums</u> 2841 Kaonawai Place (Fig. 2-17, 2-18) –** Mānoa East Condominiums (FIGs 2-17 and 2-18) were built in 1980 with 25 fee simple units in 5 three story buildings. Although adjacent to a channelized portion of Mānoa Stream, it is located in FEMA Flood Zone X similar to the proposed Mānoa Banyan Court site. These buildings are notable in having a height of three stories.

**FIG. 2-17 Overhead View of Mānoa East 2841 Kaonawai Place**

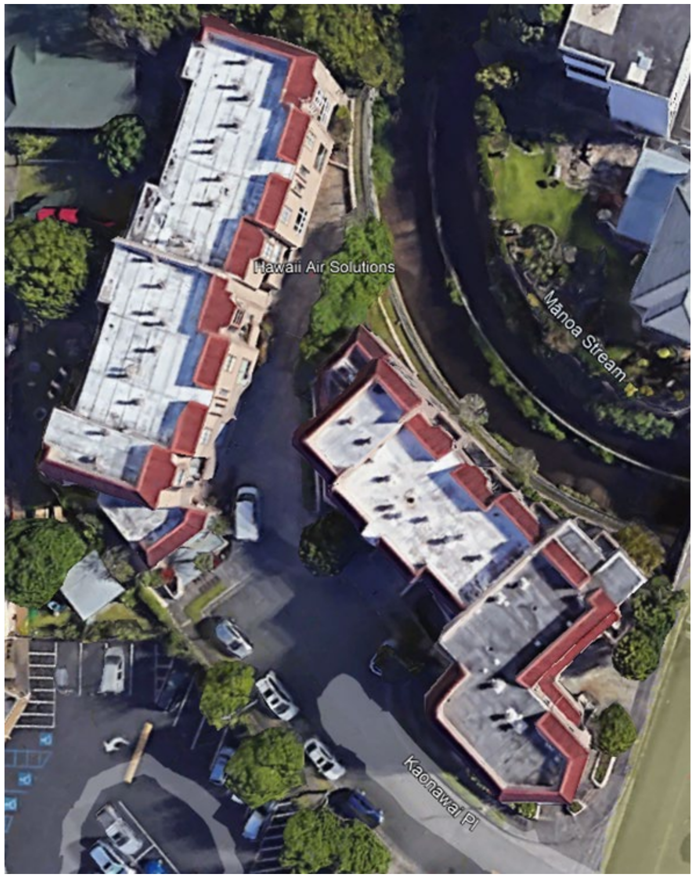



**FIG. 2-18 Mānoa East 2841 Kaonawai Pl. Viewed From E. Mānoa Rd.**

**2948 East Mānoa Road (Fig. 2-19, 2-10) –** This building was built in 1964 and has six rental units. Similarly to Mānoa East Condominiums, it is a three story structure roughly comparable in height to the Proposed Action.

**FIG. 2-19 Overhead View of 2948 E. Mānoa Rd.**


**FIG. 2-20 Street View of 2948 E. Mānoa Rd.**

#### 2.2.3.1 Impacts and Mitigation

Of the seven multi-family housing developments described previously, the Kau`iokahaloa Nui is the largest and perhaps the most comparable to the proposed Mānoa Banyan Court. In this context there are three points of comparison that are important to acknowledge.

a) Figure 2-12 Overhead View of Kau`iokahaloa Nui Apartments shows that the site has a significant number of large shade trees (12 monkey pods) as well as other smaller trees as part of the overall landscape scheme. Mānoa Banyan Court will also be landscaped to replace invasive trees and vegetation that should be removed (e.g. Macaranga). Both existing and newly added trees and site landscaping will be integrated with buildings and parking areas to ensure continued viability and maximization of natural shade and vegetation in good health that is recommended for preservation. This is not even close to a wholesale "deforestation" as has been frequently and erroneously characterized by the community.

b) Figure 2-15 shows the two story residential buildings with a peaked roof that brings the building height to about 26 or 27 feet. Mānoa Banyan Court will have three stories to total 30 to 32 feet. However, with a flat roof the height will only be 5 to 7 feet above the 25 foot allowed residential height (30 feet height is allowed for steeply sloping sites in residential districts). Even at a 30 foot height, the buildings will still be largely obscured by the site's preserved vegetation, especially along the site's perimeter.

c) Figure 2-16 shows that the thick growth of palms (McArthur Palms?) along Kalawao St. almost completely obscures the Kau`iokahaloa Nui apartments from the street. This is similar to the anticipated result achieved by retaining the existing thick perimeter vegetation that will visually obscure Mānoa Banyan Court along East Mānoa Rd. while also acting to mitigate sound transmission to and from the site.

d) These seven comparative multi-family residential developments that have existed in Mānoa for over thirty years are a significant indicator that neither multi-family housing nor three story residential structures should be characterized as an invasive building species or aberration in Mānoa. For example, 2948 E. Mānoa Road and Mānoa East townhouses across from Mānoa Marketplace are both three story multi-family cluster developments structures built in 1964 and 1980 (58 and 42 yrs. Ago) respectively. Affordable rental housing (the Proposed Action) in three story structures is therefore not incompatible with the overall residential character of the Mānoa community.

### 2.2.4 Existing Commercial Land Uses in Mānoa

The major commercial land use in Mānoa is the Mānoa Market Place, 2752 Woodlawn Drive which has 47 shops and community service establishments. The only other commercial use is Aloha Petroleum and Mānoa Mart, 3001 East Mānoa Road, which has four gas pumps and a convenience store in a central location in Mānoa. This is the one of two gasoline sales points in Mānoa. The other is a Texaco station near Mānoa Marketplace.

**FIG. 2-21 Survey Of CPR Lots D-1, D-2, D-3, D-4, D-5, & D-6**

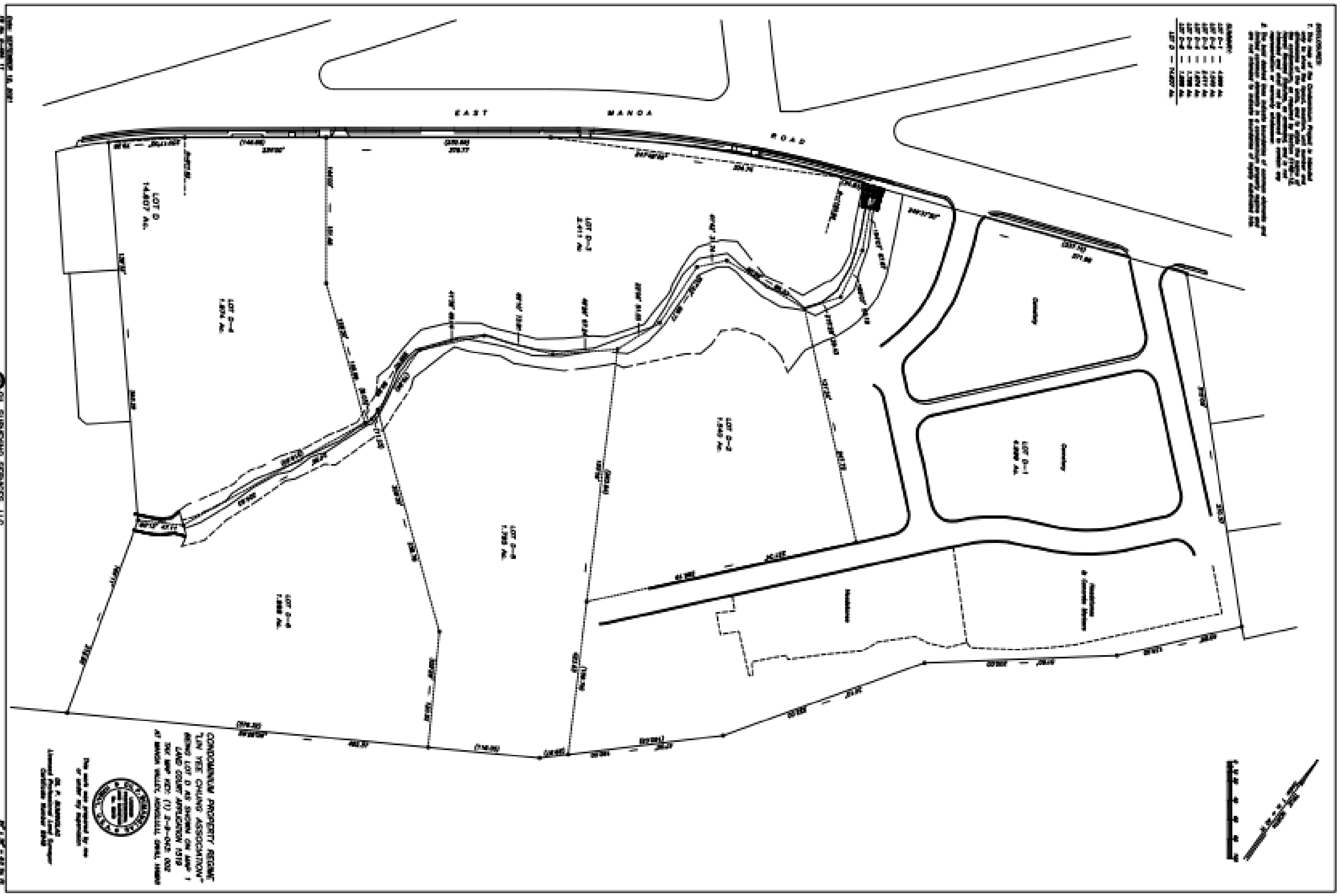
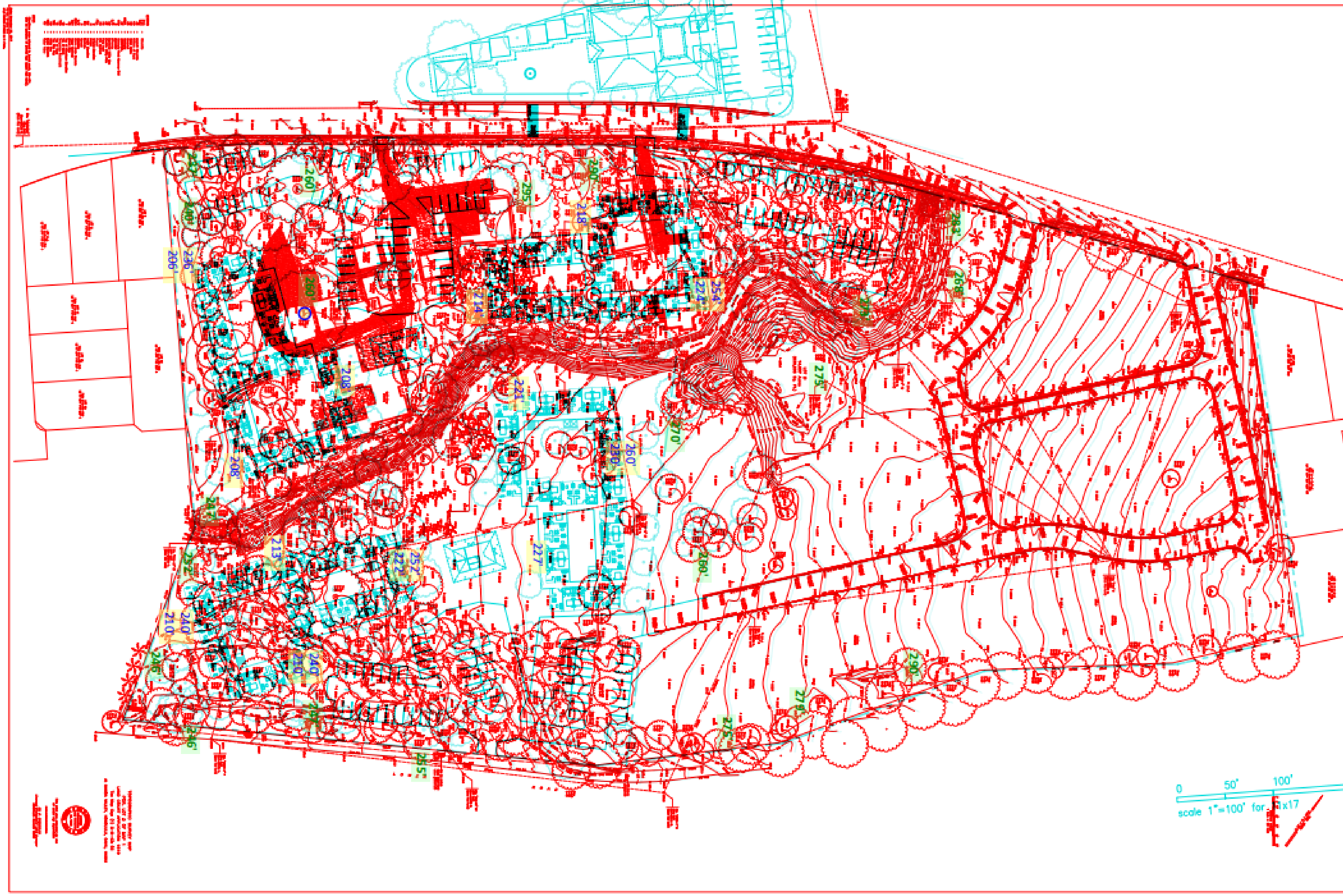


**FIG 2-22 Mānoa Banyan Court Grading Overlay**



## 2.3 PHYSIOGRAPHY

### 2.3.1 Geology

Mānoa Valley is located at the base of the Ko‘olau Mountains, formed over several hundred thousand years of eruption and erosion activity known as the Honolulu Volcanic Series. Lava and sedimentation flowing through the valley formed hard basalt underlying the valley floor.

### 2.3.2 Topography

The regional topography of Mānoa Valley slopes toward the ocean at about 4 to 5 percent inclination. The Project Site slopes down in a Southeast direction from an elevation of 240 ft. to 204 ft., with an average slope of 4.75% over an 800+ ft. distance. There is an embankment drop off of about eight feet near the top of Parcel D-2 just below the cemetery. (*see* Figure 2-23 Topography Map). The embankment defining the Woodlawn Ditch is about a 10 to 12 feet drop to the bottom of the channel and the sides are almost vertical in some areas.

### 2.3.3 Soils

According to the U.S. Department of Agriculture, Natural Resource Conservation Service (UDDA-NRCS) website, Web Soil Survey, the dominant soil type for the entire Mānoa Banyan Court development site area is Lolekaa Silty Clay (LoB). (See Fig. 2-25 Soil Map). Lolekaa Silty Clay is well drained; slow to rapid runoff depending on slope; permeability is moderately rapid. Lolekaa Silty Clay has characteristics defined as follows according to depth:

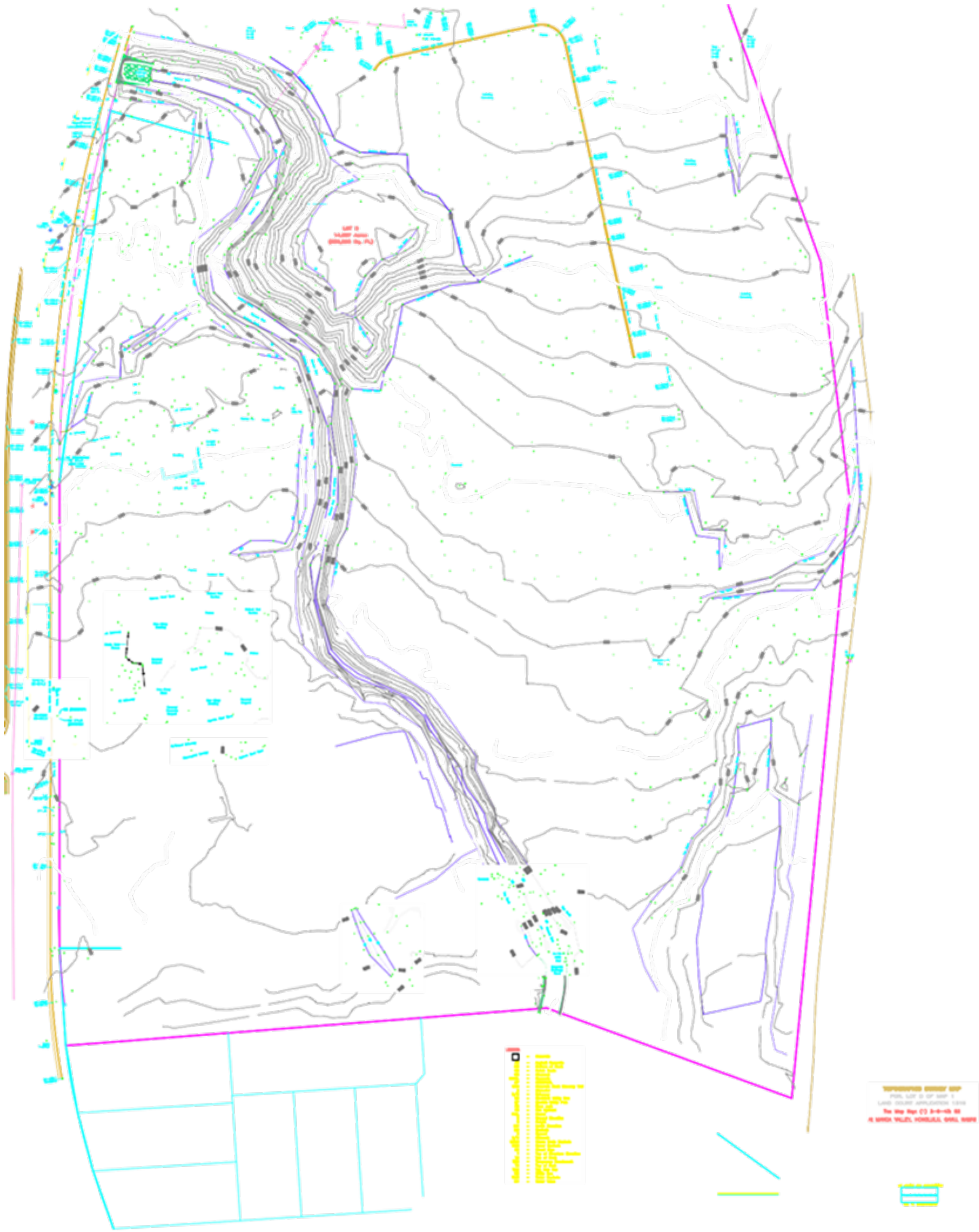
**Ap**--0 to 10 inches; dark brown (10YR 3/3) silty clay, dark yellowish brown (10YR 3/4) dry; strong very fine and fine subangular blocky structure; very hard, friable, sticky and plastic; many fine and medium roots; many very fine and fine interstitial and tubular pores; many very fine hard earthy lumps; very strongly acid (pH 4.5); abrupt smooth boundary. (8 to 10 inches thick)

**BA**--10 to 15 inches; dark brown (10YR 3/3) silty clay, dark yellowish brown (10YR 3/4) dry; moderate very fine and fine subangular blocky structure; hard, friable, sticky and plastic; compact in place; few fine roots; many very fine, fine and medium tubular pores; continuous thick coatings on peds; evidence of much worm activity; many hard earthy lumps; common soft strongly weathered pebbles that are distinctly yellower than matrix and smeary when rubbed; strongly acid (pH 5.1); clear smooth boundary. (4 to 6 inches thick)

**Bt1**--15 to 22 inches; dark brown (10YR 3/3) silty clay, brown (10YR 4/3) dry; strong very fine, fine and medium angular and subangular blocky structure; hard, friable, sticky and plastic; compact in place; few fine roots; many very fine, fine and medium tubular pores; continuous thick clay films on peds and in pores, brown (7.5YR 4/4) continuous thick clay films in pores; many hard earthy lumps; strongly acid (pH 5.2); clear smooth boundary (4 to 10 inches thick).

**Bt2**--22 to 33 inches; dark brown (10YR 3/3) silty clay, brown (10YR 4/3) dry; strong medium subangular blocky and strong very fine and fine angular blocky structure; hard, friable, sticky

**FIG. 2-23 Site Topography**



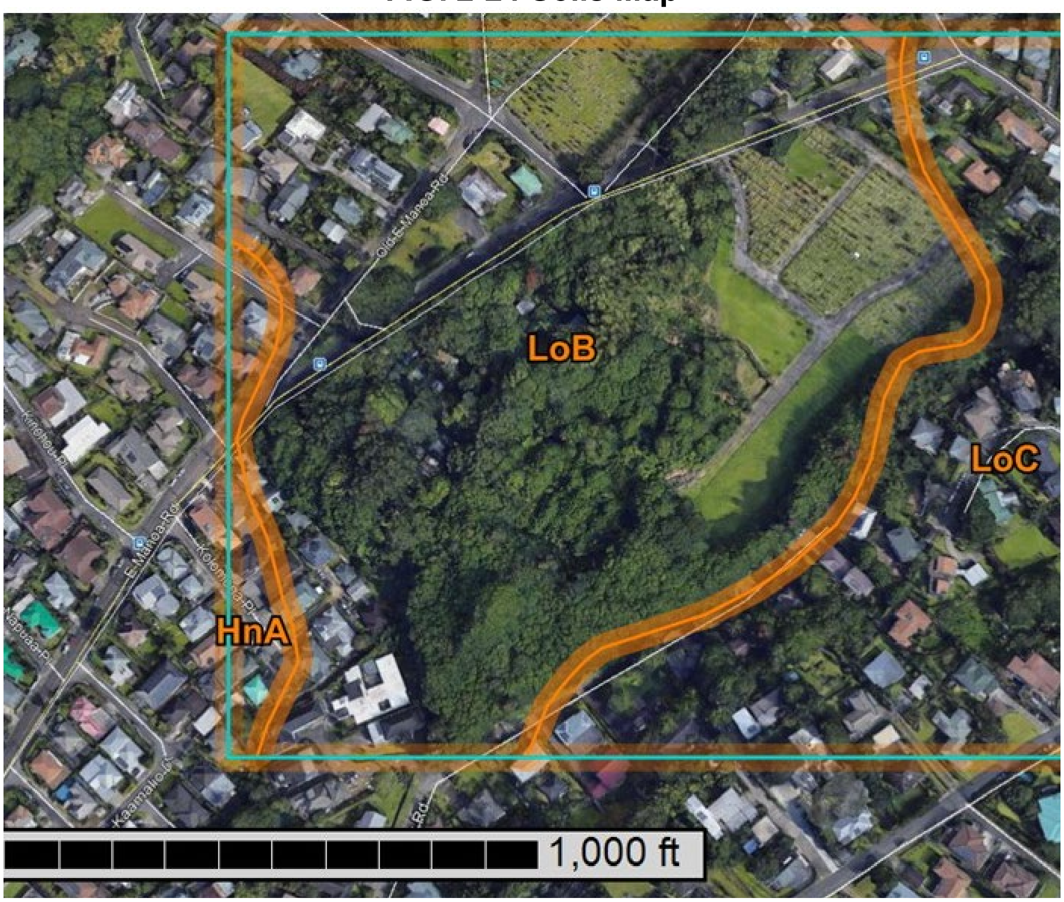
and plastic; very compact in place; few fine roots; common very fine and fine tubular pores; continuous thick clay films on peds, brown (7.5YR 4/4) continuous thick clay films in pores; many hard earthy lumps; few highly weathered rock fragments; ery strongly acidic (pH 4.9); clear wavy boundary (9 to 18 inches thick).

**Bt3**--33 to 42 inches; dark brown (10YR 3/3) silty clay; dark brown(10YR 4/3) dry; strong very fine and fine angular blocky and subangular blocky structure; hard, friable, sticky and plastic; compact in place; few fine roots; many fine and very fine tubular pores; reddish brown (5YR 4/4) continuous thin clay films on peds, reddish brown (5YR 4/4) continuous thick clay films in pores; 5 percent highly weathered soft rock fragments that are yellower than the matrix and smeary when rubbed; very strongly acid (pH 4.8); clear wavy boundary. (5 to 10 inches thick)

**Bt4**--42 to 55 inches; dark yellowish brown (10YR 4/4) loam, yellowish brown (10YR 5/4) dry; moderate very fine and fine subangular block structure; hard friable, slightly sticky and slightly plastic; compact in place; few fine roots; many very fine and fine tubular pores; reddish brown (5YR 4/4) continuous thin clay films on peds, dark brown (7.5YR 4/4) continuous thick clay films in pores; few rock fragments; very strongly acid (pH 4.8); clear smooth boundary. (13 to 15 inches thick)

**Bt5**--55 to 65 inches; dark brown (10YR 3/3) paragravelly loam, yellowish brown (10YR 5/4) dry; weak very fine and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine and fine tubular pores; reddish brown (5YR 4/4) thin continuous clay films on peds and in pores; 20 to 25 percent weathered rock fragments that are less weathered than those in layer above; very strongly acid (pH 4.7).

**FIG. 2-24 Soils Map**




***Google Earth Photo with soils data superimposed***
*Data Source: MLRA Soil Survey Regional Office (Mo) Responsible: Davis, California.*

### 2.3.4 Geotechnical Engineering Exploration

The purpose of the geotechnical engineering exploration report prepared by Kokua Geotech LLC is to observe and evaluate the general subsurface conditions at accessible locations at the project site to formulate geotechnical recommendations to assist in the design of the project. The study has focused on the project area intended for Phase 1 in the area west of Woodlawn Ditch. The primary geotechnical considerations for the project include the following:

- Adequate foundation support for the planned building structures
- Expansive clayey soils beneath foundations and concrete slabs-on-grade
- Site preparation and grading

Findings and recommendations of the Report prepared by Kokua Geotech LLC are summarized as follows:

- Surface fill materials overlying alluvial soils and weathered volcanic cinders extending down to the maximum depth explored of about 21.5 feet below the existing ground surface.
- On-site clayey soils have moderate to high expansion potential when subjected to moisture fluctuations.
- Shallow foundation system consisting of spread and/or continuous footings may be used to support the anticipated building structures and a minimum 24-inch thick layer of structural fill material below the foundations extending 24 inches beyond the foundation perimeter.
- Fill material should consist of imported, non-expansive granular material such as crushed coral or basalt, that is well-graded from coarse to fine.
- An allowable bearing pressure of up to 2,500 pounds per square foot (psf) may be utilized for the design of shallow foundations bearing on the 24-inch thick layer of non-expansive structural fill material. This bearing value is for supporting dead-plus-live loads and may be increased by one-third (⅓) for transient loads, such as those caused by wind or seismic forces.
- Prior to placing the structural fill material, a non-woven geotextile fabric, such as Mirafi 180N or equivalent, should be provided below and along the sides of the over-excavation. Placement of the non-woven geotextile fabric at the
- We anticipate that concrete slabs-on-grade will be utilized for portions of the planned building structures and new walkways at the project site.
- In general, the on-site soils may be re-used as a source of general fill material, provided they are free of vegetation, deleterious materials, and rock fragments greater than 3 inches in maximum dimension.
- The construction plans and specifications for the project should be forwarded to us for review to determine whether the recommendations contained in this report are adequately reflected in those documents.
- Kokua Geotech LLC should also be retained to monitor the foundation installation, site and subgrade preparation, fill and backfill placement, aggregate base/subbase course

placement and other aspects of earthwork construction to determine whether the recommendations of this report are followed.

Detailed discussion of the findings and geotechnical engineering recommendations are contained in the body of this report attached as Appendix E.

#### 2.3.4.1 Impacts and Mitigation

The Proposed Action would implement construction to limit the potential for surface disturbance during construction. To overcome the limits of the potentially expansive clay soils and to reduce the need for grading and soil disturbance, the architects propose to use a "waffle slab foundation"[2] system which sits on a compacted base, and which does not require a normal spread footing foundation nor considerable excavation. Most grading and foundation activities will occur up front during the development of Phases 1 and 2. This approach will minimize soil disturbance over a shorter period of time and permit soil conservation and protection actions to be put in place early on during the first phases. All excavation and grading activities will be regulated by applicable provisions of the City's grading ordinances (Hawai'i Administrative Rules (HAR) Chapter 14, Articles 13 through 16) and any SHPD requirements for archaeological monitoring. Excavation and grading activities will incorporate erosion control best management practices (BMPs) to preserve existing conditions of nearby surface waters, such as:

- Temporary sediment basins;
- Temporary diversion swales and berms to intercept and temporarily store runoff;
- Slope protection;
- Dust fences;
- Grate inlet protection;
- Silt fences;
- Use of compost filter socks;
- Truck wash down area.
- Stabilized construction vehicle entrance;

Permanent sediment control measures will be used following completion of site works and construction. No short or long-term significant impacts to soils are anticipated during construction or operation of the Proposed Action, and no additional mitigation is required.

## 2.4 HYDROLOGY

### 2.4.1 Rainfall

Rainfall in the mauka areas of Mānoa Valley is frequent can be daily during certain months of the year. The mean annual rainfall for the site is 99.5 inches. Monthly average rainfall for the Mānoa Chinese Cemetery in inches is shown in the table below.

| | | | |
|---|---|---|---|
| Jan. | 8.91 in. | Jul. | 8.89 in. |
| Feb. | 6.96 in. | Aug. | 7.70 in. |
| Mar. | 8.83 in. | Sep. | 7.72 in. |
| Apr. | 9.91 in. | Oct. | 7.49 in. |
| May | 6.97 in. | Nov. | 9.26 in. |
| Jun. | 7.44 in. | Dec. | 9.40 in. |

Source: 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 Hawaiʻi. Bull. Amer. Meteor. Soc.* 94, 313-316, doi: 10.1175/BAMS-D-11-00228.1.

Perhaps a more comprehensive record of rainfall has been recorded at Lyon Arboretum in the rear of Mānoa Valley. Since Lyon Arboretum is nestled against the rear walls of Mānoa Valley, average rainfall appears to be more than that recorded at Mānoa Regional Park and temperatures may be slightly lower.

**Mānoa Lyon Arboretum Rainfall**

Period of Record : 03/01/1975 to 06/09/2016

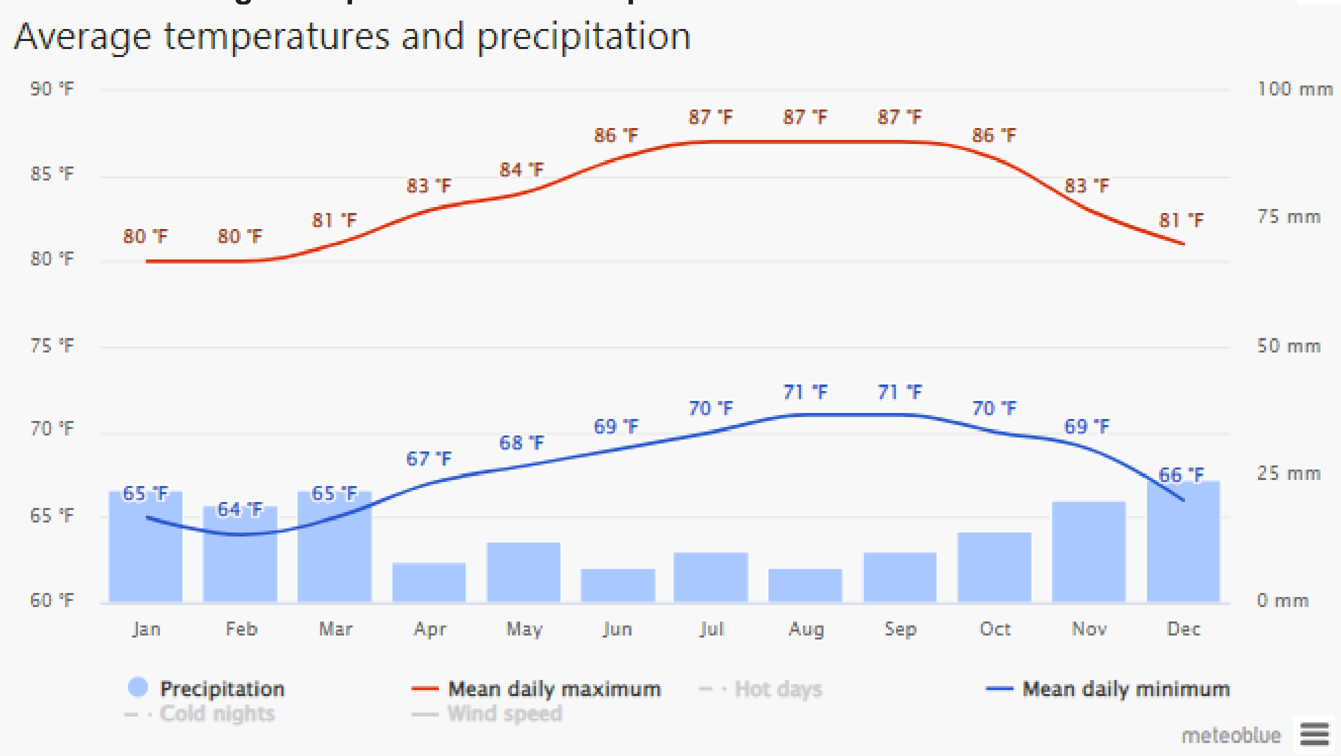
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Annual** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Max. Temperature (F) | 77.3 | 77.4 | 76.9 | 76.8 | 78.5 | 78.9 | 79.8 | 81.1 | 82.1 | 81.5 | 79.4 | 78.1 | 79.0 |
| Average Min. Temperature (F) | 63.0 | 62.8 | 63.9 | 65.0 | 66.3 | 68.0 | 69.2 | 69.9 | 69.8 | 69.1 | 67.4 | 64.9 | 66.6 |
| Average Total Precipitation (in.) | 10.97 | 9.57 | 14.54 | 14.39 | 11.15 | 12.40 | 14.85 | 12.36 | 10.76 | 12.19 | 14.50 | 13.35 | 151.05 |

Percent of possible observations for period of record.
Max. Temp.: 97.8% Min. Temp.: 97.7% Precipitation: 99.1%
Check Station Metadata or Metadata graphics for more detail about data completeness.
(See Drainage Assessment Report in Appendix D for additional soils and rainfall data)

According to the State of Hawaii Climate Change Portal, “Hawaiʻi is getting drier. Rainfall has declined significantly over the past 30 years, with widely varying rainfall patterns on each island. This means some areas are flooding and others are too dry. Since 2008, overall the islands have been drier, and when it does finally rain, it rains a lot.”

The temperature and precipitation graphs below are for Mānoa District Park (21.31°N, 157.81°W, 80m asl) as reported by Meteoblue[3] whose description states: “The "mean daily maximum" (solid red line) shows the maximum temperature of an average day for every month for Mānoa Valley District Park. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years.”

**FIG. 2-25 Average Temperature and Precipitation for Mānoa District Park Over 30 Yrs.**




## 2.4.2 Groundwater

The Project Site is located in the Honolulu Sector, Palolo Aquifer System (Geologic Code 3010111), in which the groundwater is unconfined basal in flank lava. The aquifer is currently used to supply fresh drinking water (with less than 250 milligrams per liter [mg/l] of chlorine), that is considered irreplaceable and highly vulnerable to contamination (Status Code 11111). According to Mink and Lau (1987), the water table in all unconfined basal aquifers is forty ft or less AMSL.

### 2.4.2.1 Impacts and Mitigation

The Proposed Action will utilize BMPs throughout the construction and operation of the project to protect and preserve groundwater resources. No wastewater injection wells, contaminated materials or wastes would be released into the ground. Wastewater from the car washing area will be directed into the project's wastewater collection system. Any materials or wastes produced during construction or operations will be dealt with in accordance with City and/or State regulatory requirements. No short or long-term significant impacts to groundwater are anticipated during construction or operation of the Proposed Action, and no additional mitigation should be required.

### 2.4.3 Surface Water

The primary surface waters within the project site include the Woodlawn Ditch, which separates the project's main two development areas. This Woodlawn Ditch drains into Mānoa Stream at a point well beyond the site and is dry most of the year with flows only after a heavy rain event. The ditch has an average top width of 15 to 20 feet with sides that steeply slope to a depth of 10 to 12 feet that sharply narrow bottom with an average bottom width of only 1 to 3 feet. The ditch is part of the Ala Wai Watershed (*see* Figure 2-15 ). Surface waters of Mānoa Stream descend from the Koʻolau Mountains (3,105 ft), run through Mānoa Valley and eventually discharge into the Ala Wai Canal. According to the 2016 report by AECOS entitled *Biological and Water and Sediment Quality Surveys in Mānoa Stream, Honolulu, Hawaiʻi,* the Project Site is located within the "upper reach" of Mānoa Stream, which is classified as Class 2 inland waters (AECOS 2016). HAR §11-54 defines Class 2 waters as follows:

> *"The objective of Class 2 waters is to protect their use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation. The uses to be protected in this class of waters are all uses compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation on and in these waters. These waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class. No new treated sewage discharges shall be permitted within estuaries."*

Data from the *2014 State of Hawaiʻi Water Quality Monitoring and Assessment Report* (HDOH, 2014a) determined that Mānoa Stream was not meeting criteria for its designated beneficial uses, as described above, and is therefore considered "impaired" on the Clean Water Act (CWA) §303(d) list.

#### 2.4.3.1 Impacts and Mitigation

The Proposed Action will utilize best management practices (BMPs) throughout the construction and operation of the project to protect and preserve surface water resources. No wastewater injection wells, contaminated materials or wastes would be released into the Woodlawn Ditch drainage channel. There would be no encroachment on any waters of the United States (U.S.), and therefore additional permitting with the U.S. Army Corps of Engineers would not be required. Any discharges related to the construction or operation of the Proposed Action will comply with applicable State Water Quality Standards as specified in HAR §11-54 and HAR §11-55. A National Pollutant Discharge Elimination System (NPDES) permit would be obtained for storm water runoff during construction activities since soil disturbances will exceed one acre of land at the Project Site. There are no anticipated impacts to aquatic resources, however in the extremely unlikely event that accidental discharges occur the Department of Land and Natural Resources, Division of Aquatic Resources (DAR) will be notified immediately. No short or long-term significant impacts to surface waters are anticipated during construction or operation of the Proposed Action, and no additional mitigation is required.

### 2.4.4 Coastal Water

The nearest coastal water is at Waikīkī Beach in Māmala Bay and lies 3.34 miles Southeast of the Project Site. Mānoa Stream flows into Māmala Bay after entering the Ala Wai Canal. The Ala Wai Canal also receives waters from the Palolo and Makiki Streams prior to entering Māmala Bay. According to HAR §11-54, these coastal waters are classified as Class A marine waters and recognized as follows (HDOH, 2014b):

> *"It is the objective of Class A waters that their use for recreational purposes and aesthetic enjoyment be protected. Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters. These waters shall not act as receiving water for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class. No new sewage discharges will be permitted within embayments. No new industrial discharges shall be permitted within embayments."*

#### 2.4.4.1 Impacts and Mitigation

The Proposed Action will utilize best management practices (BMPs) throughout the construction and operation of the project to protect and preserve coastal water resources. No discharges would occur to groundwater, surface waters or coastal waters. Any materials or wastes produced during construction or operations will be managed in compliance with the necessary City or State regulatory requirements. No short- or long-term significant impacts to coastal waters are anticipated during construction or operation of the Proposed Action, and no additional mitigation is required.

**FIG. 2-26 Map Of Ala Wai Watershed**

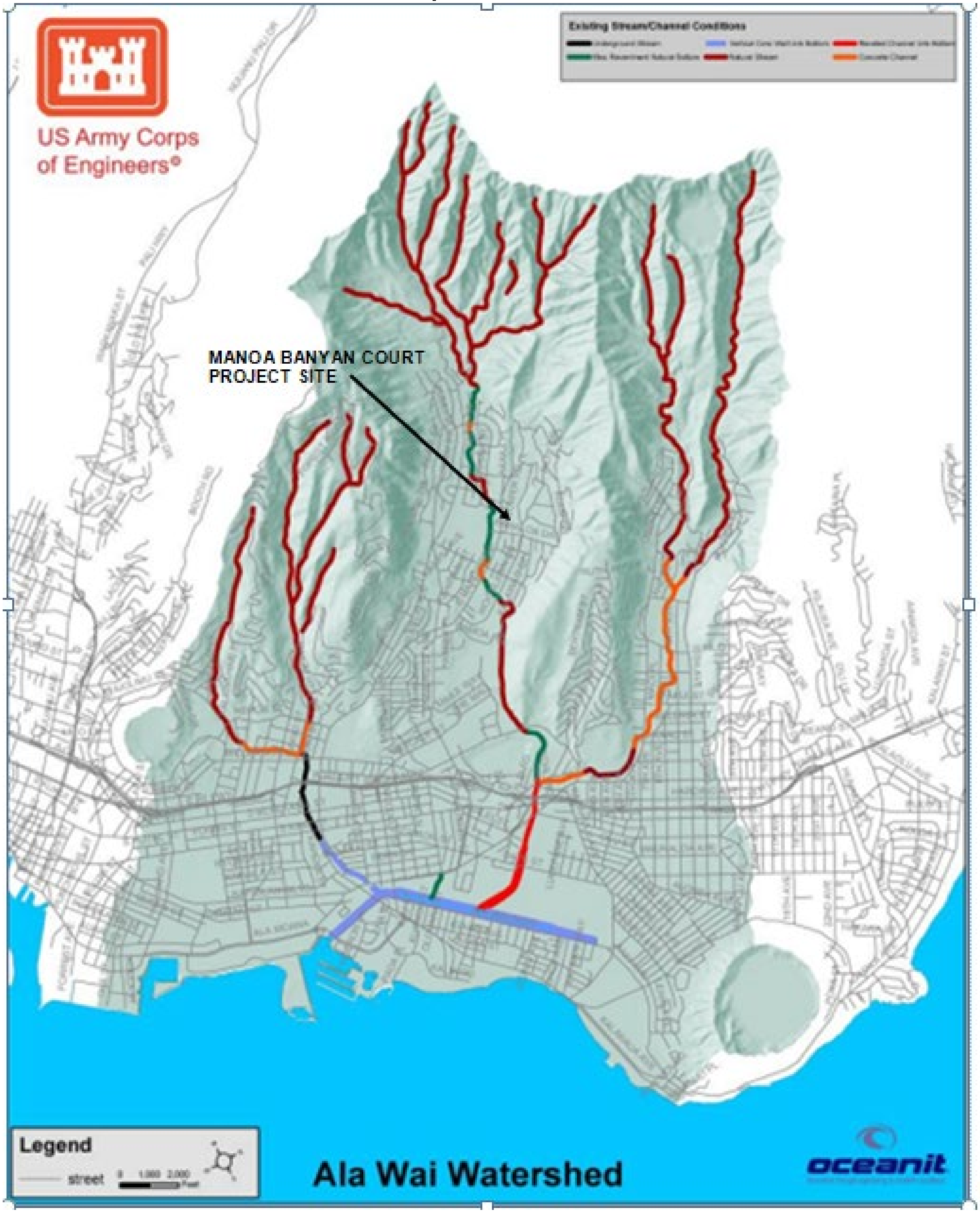
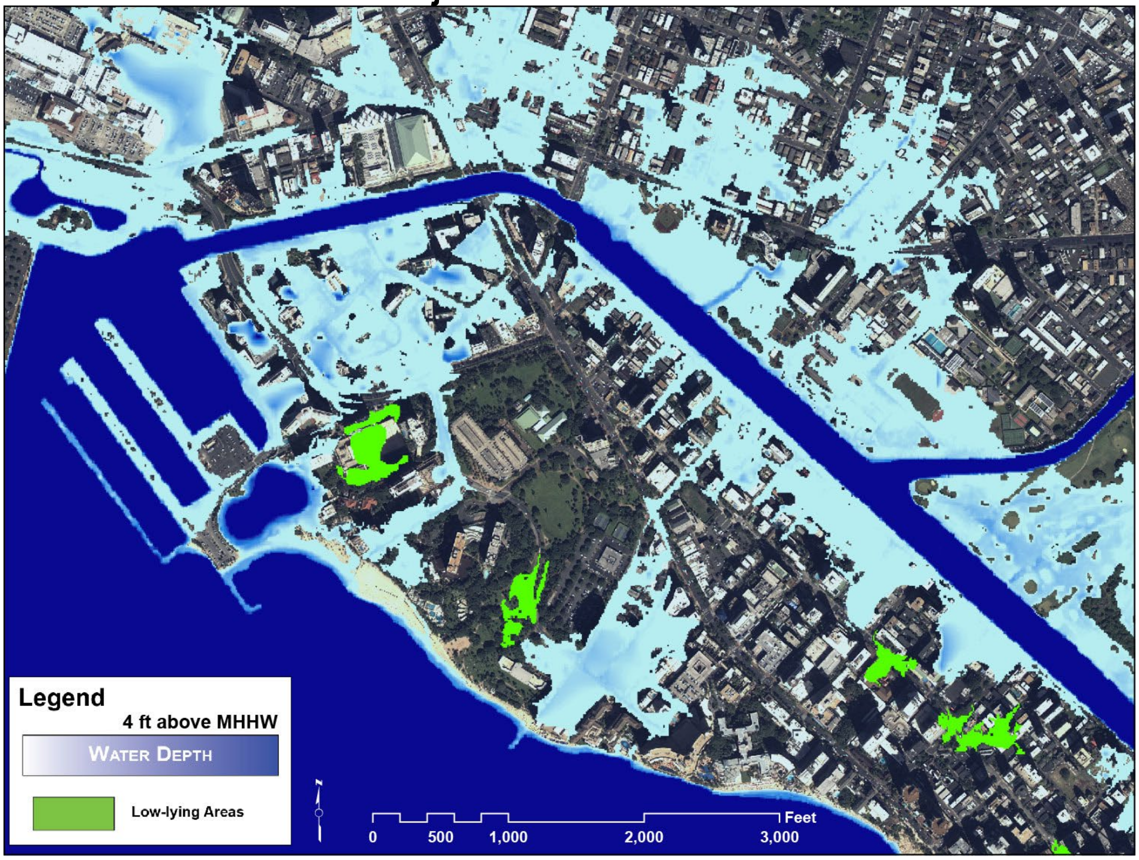


**FIG. 2-27 Waikiki Projected Maximum Sea Level Rise At 4 Ft.**




## 2.5 Natural Hazards

### 2.5.1 Climate Change

As the impacts of climate change increase, it can be expected that Pacific Island communities will suffer increased vulnerability to natural hazards including coastal erosion, flooding, sea level rise and salt water intrusion into the fresh water aquifers they depend on. Current projections anticipate a 3.2 ft sea level rise exposure area (SLR-XA) as early as 2060 (Sweet et al., 2017).

#### 2.5.1.1 Impacts and Mitigation

No significant impacts are anticipated as the Proposed Action will adhere to applicable plans and policies related to climate change mitigation and adaptation, such as:

- Mayor's Directive on Climate Change (Directive 18-2);
- Land Use and Zoning Recommendations;
- Transit-Oriented Development (TOD) Adaption Guidelines;
- Building Code Updates;
- Future Conditions Climate Resilience Design Guidelines;
- Long Term Disaster Recovery Plan; and,
- Climate Adaption Strategy,

- Climate Action Plan (CAP)

### 2.5.2 Flood (See the Drainage Assessment Report in Appendix D for additional information.)

According to the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM), the entire project site is designated as Zone "X" which is determined to be outside the 0.2% annual chance flood plain (*see* Figure 2-8). No significant risk is anticipated under normal conditions. No portion of the project site directly borders or is in the vicinity of Mānoa Stream. Woodlawn Ditch is dry most of the year and tends to only have flowing water following a heavy mauka rainfall event. In the original flood control plan for Mānoa Stream and the Ala Wai watershed, the US Army Corps of Engineers originally designated a sizable portion of the Project Site for a flood detention basin. However, this proposal was later deleted from the Ala Wai Flood Prevention Project. The Ala Wai Flood Control Project will now be reconsidered and redesigned.

Mānoa Stream has historically been subject to flooding. However, in the upper areas of Mānoa Stream such flooding has been localized to areas immediately adjacent. The distance between the flood area adjacent to Mānoa Stream and the closest point of the Project Site is about 480 feet. Moreover, this area of Mānoa Stream is also 20 feet below the closest point of the Project Site which is not impacted by any flooding of Mānoa Stream.

**FIG. 2-28 Elevation Difference Between Mānoa Stream and MBC Site**


#### 2.5.2.1 Impacts and Mitigation

The Proposed Action would incorporate appropriate safety measures to minimize any potential flood hazards at the Project Site. Therefore, no short-or long-term significant impacts from flood hazards are anticipated, and no additional mitigation is required.

### 2.5.3 Tsunami

According to the City's Tsunami Evacuation Zone map, the Project Site lies entirely within the tsunami safe zone and would not be impacted by any tsunami inundation (*see* Figure 2-9: Tsunami Hazard Map).

#### 2.5.3.1 Impacts and Mitigation

As can be seen from the Tsunami Evacuation Zone Map (Fig. 2-17), the Project Site lies several miles beyond the tsunami hazard zone and therefore no short or long-term significant impacts from tsunami hazards are anticipated, and no mitigation is required.

### 2.5.4 Hurricane

In Hawaiʻi, seasonal hurricanes have the potential to cause severe damage to life and property, primarily occurring from the late summer and early winter months (June 1 to November 30). Early warning systems, such as Civil Defense sirens, radio and television broadcasts and news reports are deployed to warn of impending storms.

#### 2.5.4.1 Impacts and Mitigation

The impacts from a hurricane in Hawai`i could vary depending on a variety of factors. The major damage would tend to occur from intense winds (Category 1-5) and flooding. The building code specifies the structural requirements with most structures required to resist a Category 3 hurricane (Speeds of 111 to 129 mph.). The Proposed Action will be constructed in strict accordance with the Building Codes of the City and County of Honolulu to ensure that required hurricane wind resistance is achieved. The other impact is from flooding (see Section 2.5.2).

### 2.5.5 Earthquake

Earthquakes associated with volcanic or tectonic activity occur frequently in Hawaiʻi; however, many are too small to cause noticeable effects. The southern shoreline of Oʻahu lies within the Molokaʻi Seismic Zone, which is classified as 2A Seismic Zone under the Uniform Building Code (UBC) with earthquakes that may cause minor damage to structures. The majority of risk associated with earthquakes come from partial or total building collapse, falling objects, debris and shattering glass. Although Oʻahu has not experienced significant impacts from earthquakes in recent decades, the Honolulu coastline is considered to have moderately high vulnerability to earthquakes (Fletcher et al., 2002).

#### 2.5.5.1 Impacts and Mitigation

The Proposed Action would adhere to local building codes to minimize potential impacts of future seismic activity. No short or long-term significant impacts from earthquake hazards are anticipated, and no additional mitigation is required.

**FIG. 2-29 Flood Insurance Rate Map & Elevation Difference**

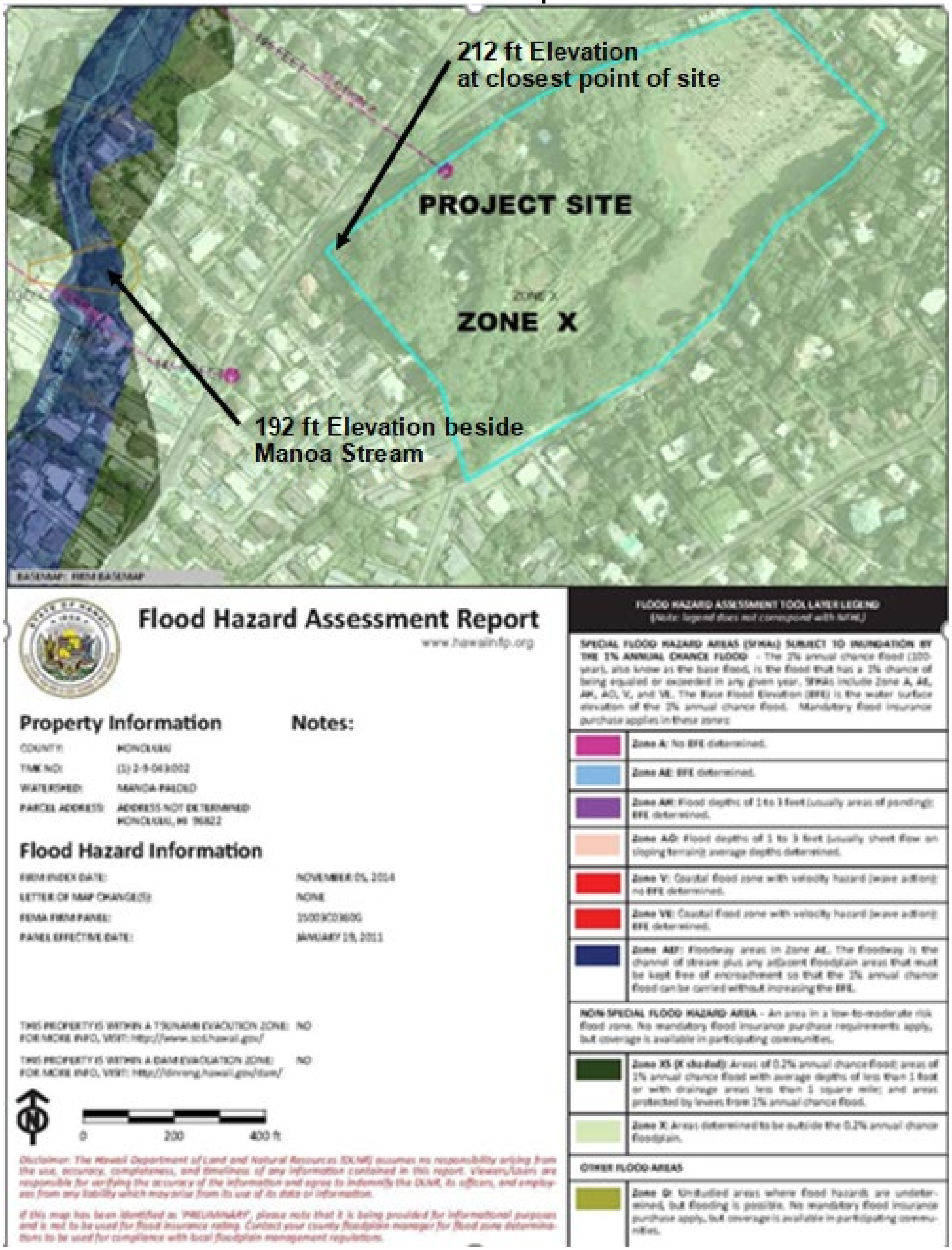
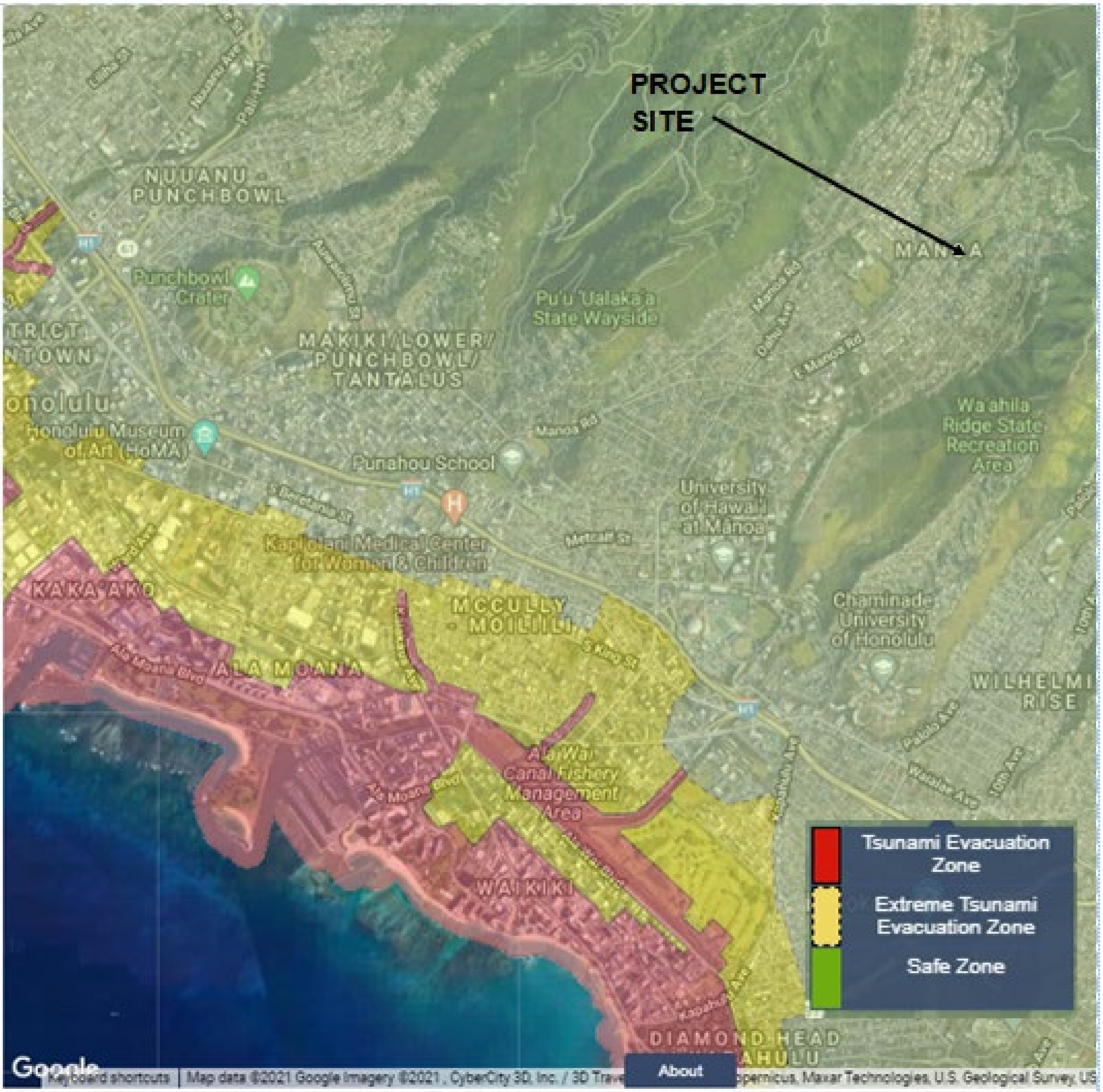


**FIG. 2-30 Tsunami Evacuation Zones**




## 2.6 HAZARDOUS MATERIALS

### 2.6.1 Building Hazards

A Hazardous Materials Assessment Survey was not conducted for the Project Site. Except for the two small residence buildings and storage sheds used by the cemetery maintenance staff to store equipment, and a small area used as a garden, the site has existed in its natural vegetated state for over one hundred years. Considering that these residential buildings are small, any quantities of hazardous materials, if they exist, would also likely be small and in a normal quantity for a small residence.

#### 2.6.1.1 Impacts and Mitigation

These old residence and storage buildings will be completely demolished prior to new construction, and all building debris will be disposed of in accordance with BMP and City and County regulations for residential construction debris disposal at a site authorized to receive such debris. Regulations for handling materials under the Occupational Safety and Health Administration (OSHA) would be implemented for worker safety. No significant impacts are anticipated, and no additional mitigation is required.

### 2.6.2 Soil Hazards

With the exception of two small caretaker dwellings and a small area used for vegetable growing, the site has remained undeveloped for decades with vegetation allowed to grow undisturbed. Therefore no boreholes were undertaken at this time. The Project Site lies far mauka (inland) of the Underground Injection Control Line, (UIC) and is therefore determined to have groundwater utility that is classified as a potential source of drinking water.

#### 2.6.2.1 Impacts and Mitigation

The Proposed Action would adhere to stringent BMPs during demolition and construction to manage any pesticide-contaminated soils at the Project Site. It is recommended that an Environmental Hazard Evaluation (EHE) and Environmental Hazard Management Plan (EHMP) are prepared to evaluate potential hazards and address long-term management requirements associated with the pesticide-impacted soil. Proper removal, storage and disposal would be conducted in accordance with all applicable City and State requirements. No short- or long-term significant impacts are anticipated, and no additional mitigation is required.

## 2.7 NATURAL ENVIRONMENT

### 2.7.1 History of Site Vegetation

Many questions have been raised by the Mānoa Community expressing concern for the preservation of the site's existing vegetation, especially concern for the vegetation that would be removed to make space for project buildings and parking areas. Some community members consider the vegetation to be exceptional and of great value to the community and should therefore be preserved in its natural state in perpetuity. To clarify the actual situation of the site's vegetation, a time series of historical aerial photos were researched which clearly show a history of the site's vegetation and use since 1945. Following are aerial photos from 1945, 1959, 1965, 1978, 2001, 2011, and 2019 which clearly show vegetation changes and housing development in upper Mānoa Valley.

**FIG. 2-31 1945 Aerial Photo Of Site Showing Farm Plots**

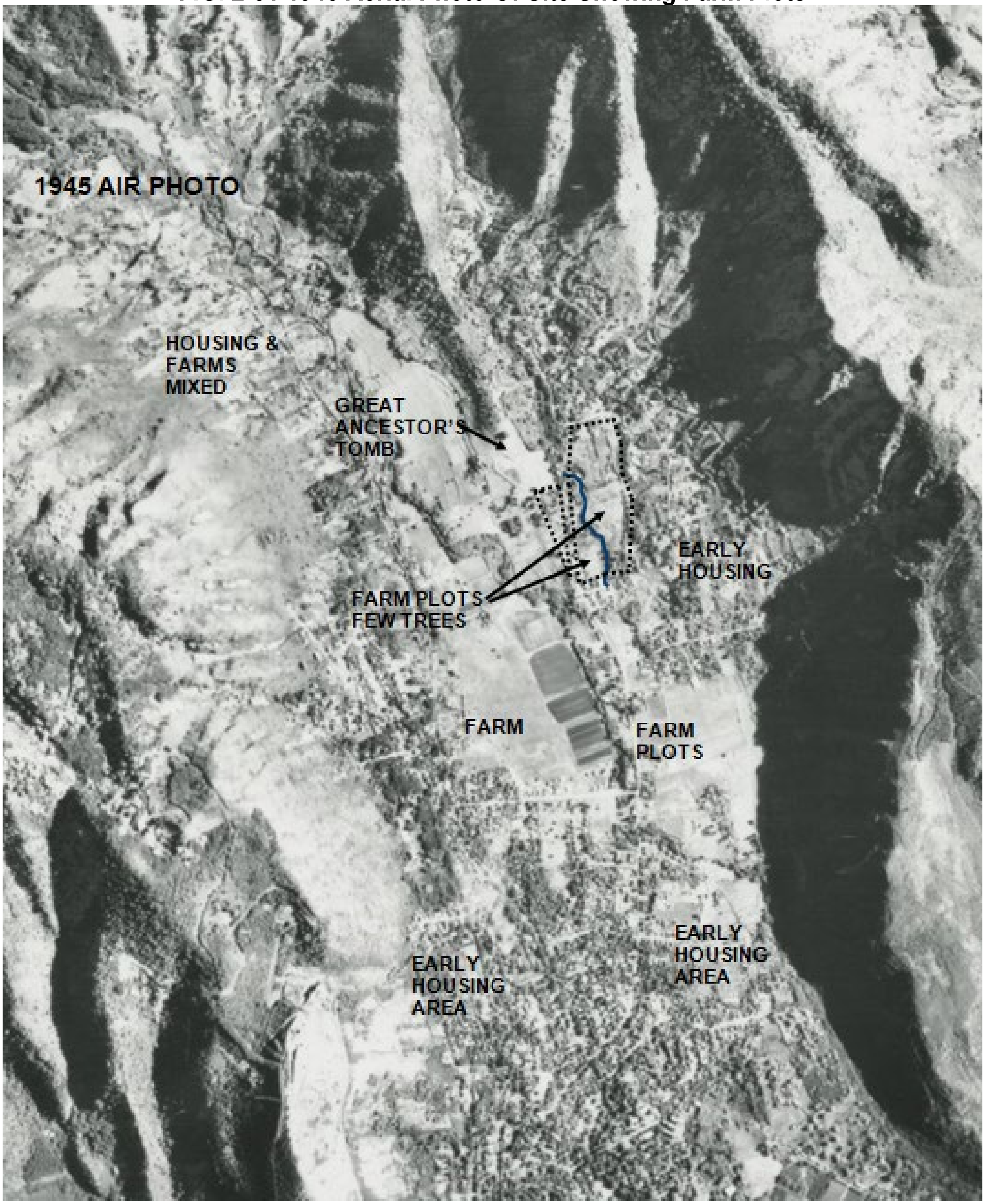
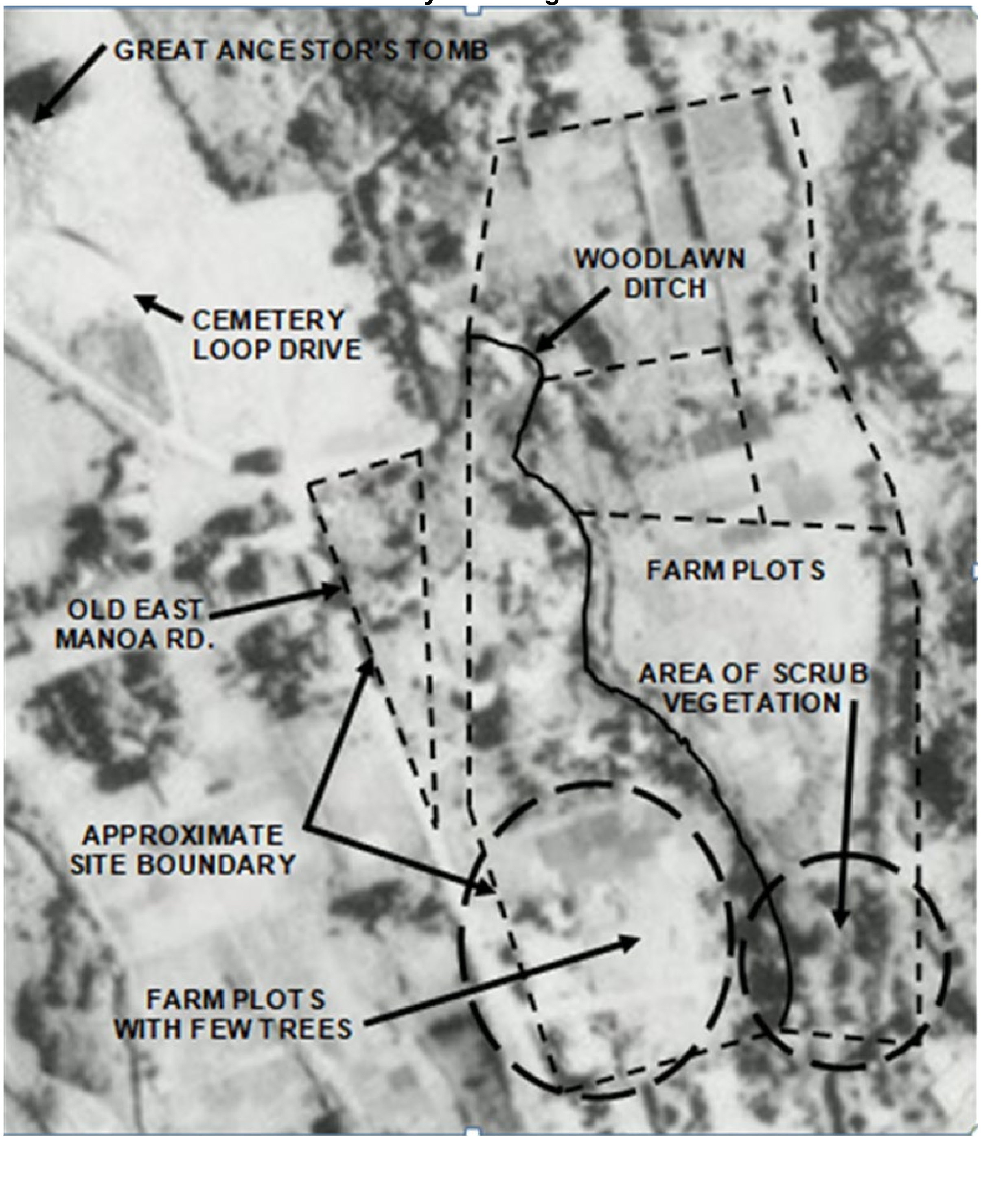


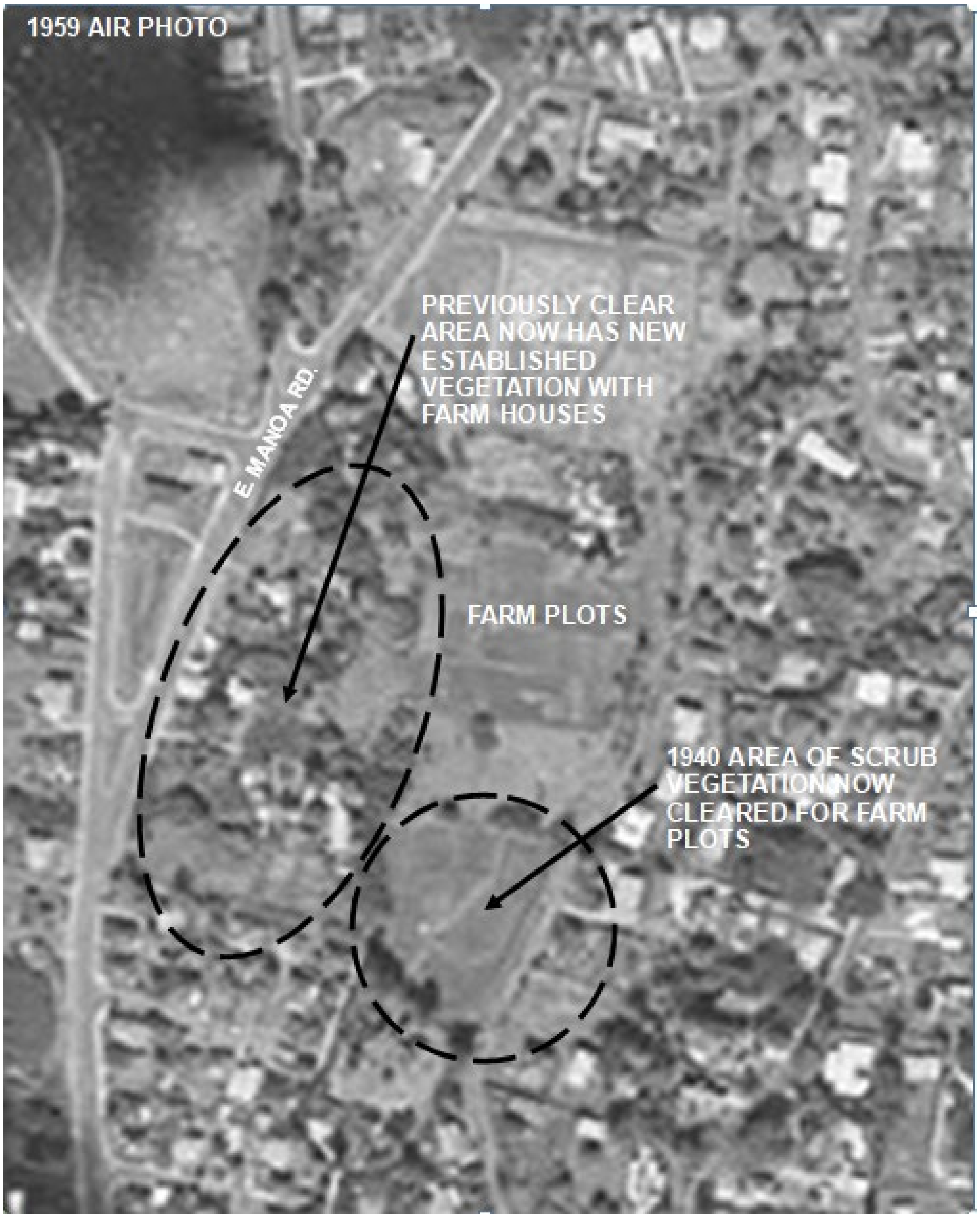
**FIG. 2-32 1945 Aerial Photo Enlargement of FIG 2-31 Showing Small Farm Plots But Very Few Large Trees**




In 1945 the site was largely used as small farm plots. An area of what appears to be scrub vegetation occupies the lower southeast corner east of Woodlawn Ditch (small circle). The area to the west of

Woodlawn Ditch is small farm plots and has very few trees, but what are probably a few of the young Banyans appear visible (larger circle), otherwise the site appears vacant except for trees growing along Woodlawn Ditch.

**FIG. 2-33 1959 Aerial Photo of Site With Cleared Vegetation Area, Farm Plots & New Trees**

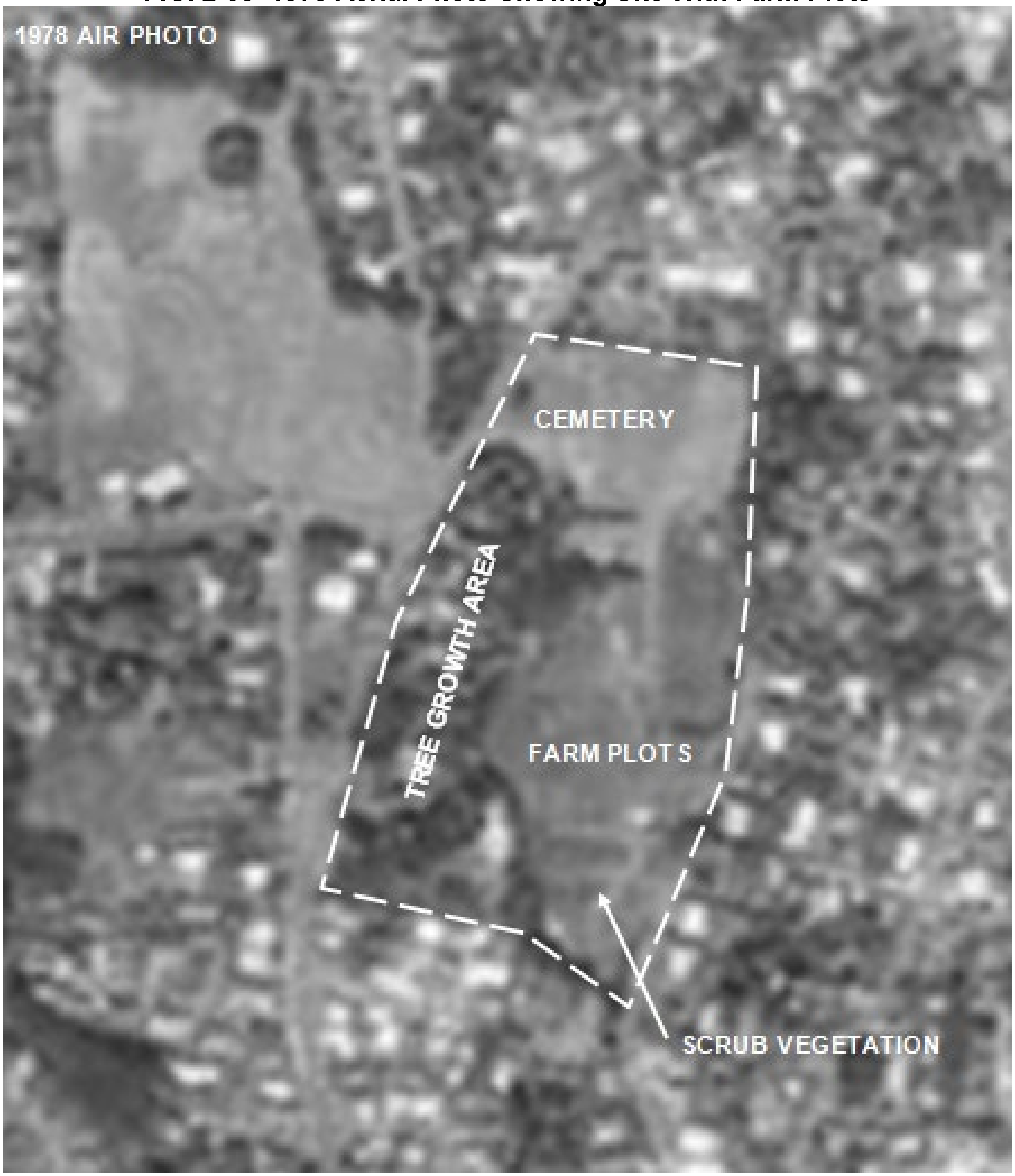



In an aerial photo taken nineteen years later in 1959 one can see the initial stages of urbanization with single family residences beginning to surround the Mānoa Chinese Cemetery. East Mānoa Road has been constructed which has created the triangular parcel where the Memorial Hall and a single family residence have been built. The false Kamani trees do not yet exist. Of note, however, is that the area (in circle) which had scrub vegetation in 1940 has now been cleared and reverted back to what appears to be farmland. The area west of Woodlawn Ditch (in oval) had few trees in 1940, but now has more established vegetation with a few scattered farm houses. Remainder of the site is still in small farm plots.

**FIG. 2-34 1965 Aerial Photo of Site & Vicinity**

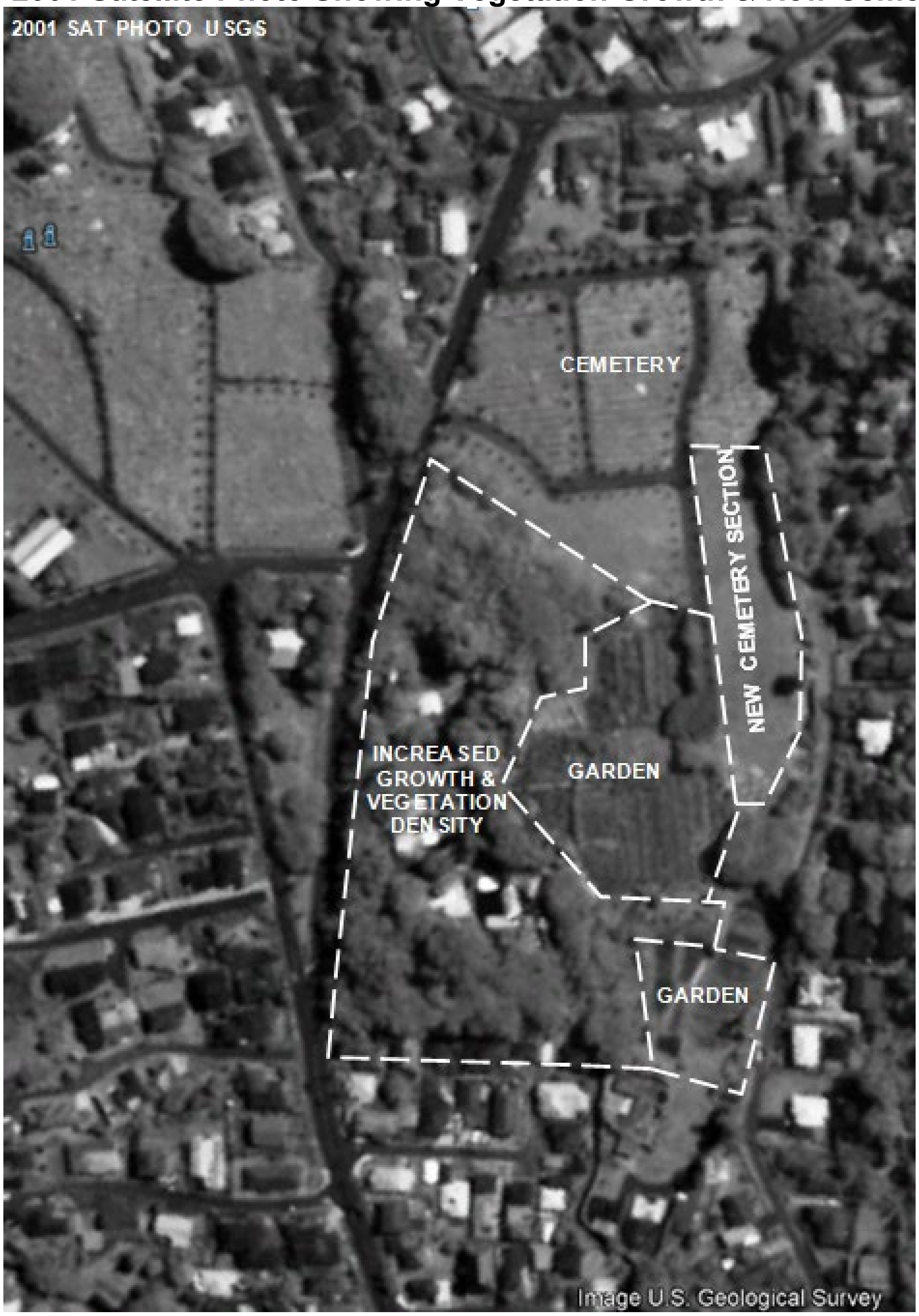
1959 to 1965 shows Mānoa Valley now almost completely urbanized with single family homes and with Mānoa Elementary School visible in lower left corner of the photo. The LYCA site has had an increase in tree growth west of Woodlawn Ditch, but the east side of Woodlawn Ditch is still cleared of vegetation for use as small farm plots.

**FIG. 2-35 1978 Aerial Photo Showing Site With Farm Plots**



An air photo from 1978, although not as clear as photos from other years, is still clear enough to see that there has been little change to the site since 1965 (previous photo). The area west of Woodlawn Ditch remains in tree cover and undergrowth vegetation while the area east of Woodlawn Ditch remains largely vacant with small farm plots and what appears to be some scrub vegetation. Young False Kamani trees are now visible on the triangular parcel.

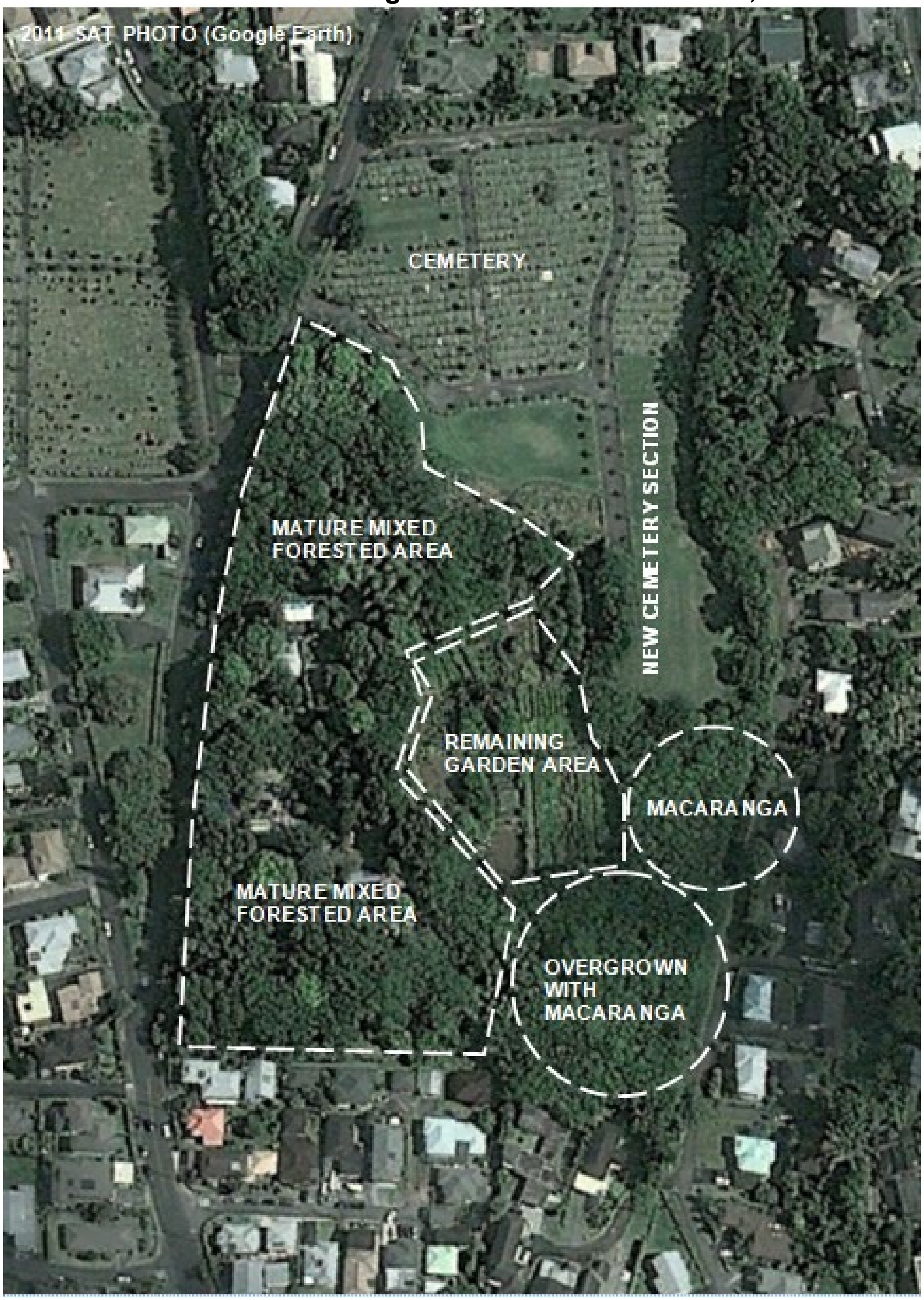
**FIG. 2-36 2001 Satellite Photo Showing Vegetation Growth & New Cemetery Area**




Flash forward to 2001 and the cleared area east of Woodlawn Ditch in 1978 is now in more intensive small garden plot use interspersed with some scrub vegetation. West of Woodlawn

Ditch the only change is that the trees have grown larger and somewhat denser. Another change is the creation of a new cemetery section along the eastern boundary of the site with trees along the side of Lower Road.

**FIG. 2-37 2011 Satellite Photo Showing Mature Mixed Forest Area, Garden & Macaranga**



By 2011, the site is beginning to take on its current tree coverage with only one area remaining for gardening. The southeast corner area is now overgrown about 85% by Macaranga which is acting as an undesirable "invasive species seed bank" and will spread macaranga throughout Mānoa. The area west of Woodlawn Ditch is covered with mixed trees and scrub vegetation except for small areas around caretaker's houses and storage sheds for cemetery maintenance supplies and equipment. New section of cemetery has its lawn in place and is ready for burials.

**FIG. 2-38 - 2019 Satellite Photo Showing Garden Area Unused and Overgrown**

Satellite photo of 2019 shows that the garden area previously visible in 2011 now appears to be completely overgrown and no longer in use. Entire site, except for houses and storage sheds is covered in vegetation. Based on the time period of these photos much of the vegetation has likely grown within the past 10 to 20 years.

In summary, the project site has undergone visibly significant changes in use and vegetation cover since 1940 when it was largely vacant land. While there are significant trees identified and suitable for preservation, much of the vegetation is either scrub or invasive species that should be removed and the site properly landscaped with native Hawaiian species and shade trees such as Monkeypod (Samanea Saman - Ohai) imported to Hawaii in 1847 and cherished as a valuable shade tree.

### 2.7.2 Flora

A *Flora and Fauna Survey* of the site's existing vegetation was conducted on August 13, 2021 by Ilana Nimz with Tree Solutions Hawaii to identify significant trees to consider for preservation on the Mānoa Banyan Court site plans. Following is a summary of the findings and the full report can be found in Appendix B. The survey was conducted by walking through the site and by using drone photos to survey the tree canopy. Significant trees were marked in the field with yellow or orange flagging tape. The approximate location of significant trees is indicated on the provided map (at the end of the report) and corresponds to a spreadsheet which details the following: Tree Number; Species; Attributes (Diameter, Height, Crown Spread); Condition Rating; Mitigation (Crown Prune); and Tree Protection Zone (for both construction activity and minimum distance from buildings and infrastructure).

Overall, the trees on the site have grown quite tall, especially west of Woodlawn Ditch, averaging 60-ft high with some species up to 90-ft high. Since trees have not been maintained, many trees are covered in pothos vines, with dead branches and overextended branches.

Significant trees to consider for preservation were determined by the following criteria: species profile (i.e. desirability, invasive status), condition (health & structure), location, and potential for restructure pruning to improve condition. Species considered for preservation have higher-quality characteristics such as aesthetics, fruit, strong branch attachment, cultural value, and non-invasive qualities.

Based on the criteria described above, thirty-five trees (or tree clusters) were identified for potential preservation. All trees will require mitigation actions to improve their condition and aesthetics, and to reduce their risk of failure. Details for each tree or tree cluster are provided on the attached spreadsheet.

Trees that were considered for preservation include.

**Kukui (4)** - Kukui trees were found throughout the property, but primarily along the stream bank. Trees are about 60-ft high and select trees (#1-4) were identified as significant based on their structure and aesthetic contribution to the site.

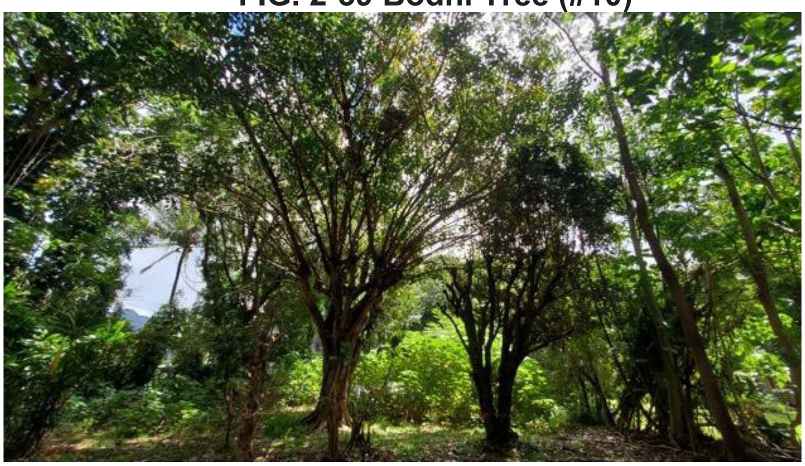
**Monkeypod (3)** - Two monkeypods were identified one on west side (#5) and a pair on the east side (#32). Monkeypod #5 is tall and lanky with a compact canopy. This is a possible specimen tree if incorporated in the site plan, otherwise, it can be removed. The two trees (cluster #32) are on east side of the stream. One is leaning, but the second has good structure and should be preserved. Both could be kept, but the second is a better preservation candidate.

**Mango (7)** - Mango trees exist throughout west side of the stream. The mango trees (#6, 7, 9, 12, 19, 23, 26) are up to 90-ft., but covered by pothos vines. Crown reduction, crown cleaning and vine removal are required for all significant mango trees to be preserved.

**False Kamani (5)** - False Kamani trees (#13, 14) along the road and sidewalk are beautiful specimens and provide a visual barrier between the road and the property. The three false kamani trees (#29 - 3 trees) on the triangle parcel are incredible specimens and should be preserved. Pruning is advised. If a structure is built below the canopies, root pruning may be required to accommodate the building.

**Ficus Trees (2) -** One large Bodhi tree (#10) was designated for preservation due to cultural significance and the tree is a potentially nice specimen. It was previously topped. To improve the tree's structure, the crown should be selectively thinned and reduced by 25%. The adjacent lychee tree (#11) has several problems difficult to correct, leaving the Bodhi tree as a better specimen than the lychee, so prioritizing improving and preserving the Bodhi tree is recommended.

**FIG. 2-39 Bodhi Tree (#10)**



**Chinese Banyan –** Three large Chinese Banyan trees are on the property which should be preserved due to their cultural significance. All of the trees are infested with an insect called the stem gall wasp. The wasp burrows into the stems and damages new growth, and this impacts the health and structure of the trees. A systemic insecticide can suppress the insects when annually treated, but the chemical does not eradicate the insects from the tree or environment. Trees #15, #24, #25 and #27 have moderate infestations and are candidates for treatment. Tree #27 has low limbs that should be removed to raise the canopy for building clearance. Trees #16 and #20 are severely impacted by the wasp and will not gain significant health or structural benefits from the insecticide treatment. Tree #16 is a large specimen with risk of branch failure and is recommended for removal. Tree #20 is also in poor condition but can be preserved as an edge tree if essential to the design. Otherwise, #20 should be removed.

**Ficus triangularis *(#18)* -** Three small *F*icus trees were observed near the caretaker's dwellings. One tree, a *Ficus triangularis* (#18), is in the ground adjacent to the row of Cook pines (#17). This is a compact tree and fairly uncommon *Ficus* species that can be transplanted as a great accent specimen tree. **Ficus benjamina trees** - Two *Ficus benjamina* trees (#22) are containerized but have outgrown the containers and have rooted. These can also be transplanted as accent specimen trees. The *Ficus benjamina* have a similar growth form to the Chinese banyans and can grow just as large but are not impacted by the stem gall wasp. Or they can be maintained as a small compact size. Keeping these trees on the property is preferred with proper location determined by the site design process. The trees can be transplanted to a permanent location while still small.

**Pines -** Four unknown juniper or pine species (#21 group of four trees) were found near the dwellings. These are not common trees in Hawaii and are interesting specimens in good health. Minor pruning to improve the aesthetics is required. If fitted into the design, preservation would enhance the complex with uncommon and interesting mature specimens.

**FIG. 2-40 Ficus triangularis (#18)**

**Cook Pines** are present on both the east and west sides of the property. Four large cook pines (#26 set of trees) in good health are on the property's west side. Two Cook pines (#31) are amongst the ironwoods (#30) on the east side of the property. One Cook Pine (#33) on the east side is near coconut trees (#34). The coconuts are transplant candidates, but the Cook pine is not. Cook pines to be retained should be structurally evaluated to ensure they are not decayed.

Several tree areas on the site were identified as invasive species. Of particular note is the sizable area covered with Macaranga tanarius. It is noteworthy, that the **Hawaii Invasive Species Council has rated Macaranga tanarius as a high risk weed** with a Hawaii-Pacific Weed Risk Assessment Score of 12, with plants exceeding a score of 6 or higher are considered as high risk invasive species.

**FIG. 2-41 Juniper Pine, "Looking Glass" and Hibiscus Hedge**

***Juniper / Pine sp.*** ***"Looking Glass" and Hibiscus Hedge***

**Bamboo** - A large clump of green bamboo (#35) is along the stream bank and could be incorporated into the design.

#### 2.7.2.1 Impacts, Mitigation and General Recommendations

- Overall, the property should be cleared of the low-quality invasive macaranga trees.
- Trees along the streambed should be cleared to 10-ft from the bank edge to reduce potential for tree failure during extreme weather or flash flood.
- Trees and shrubs along the property's west side edge creates a visual barrier from the roadway. Preservation is recommended with similar plantings to fill visual gaps.
- Since Lower Rd. side of the property lacks any high-quality plants that form a visual barrier, this side will require landscaping to reach that desired aesthetic.
- The tree protection zone radius provided in the spreadsheet is to be followed during construction activities to protect the trunk and critical root zone of these significant trees.
- Root pruning will be required for trees within this complex to put in parking and buildings. We recommend that the root pruning be evaluated on a tree by tree basis once the site designs is nearly finalized.

- Minor crown pruning and cleaning to reshape and improve tree aesthetics is required.

The Proposed Action would adhere to recommended BMPs during construction and operation to preserve the flora resources as identified in the survey. Construction and landscaping phases will act appropriately to control erosion and protect the existing natural landscape. Contractors would implement the following measures, wherever possible, to reduce the potential for unintended spreading of non-native plant species removed from the site:

- Regularly clear equipment, materials and personnel of excess soils and debris;
- Minimize the movement of soil and plant material between worksites;
- Wash and/or inspect imported equipment and materials for the presence of invasive species by a qualified botanist or entomologist prior to entering the Project Site;
- Purchase raw construction materials (e.g. fill) from on-island supplies to avoid the re-introduction of other non-native species;
- Maximize the preservation of native plant species or non-invasive plant species for landscaping;
- Sterilize gear, such as work boots and vehicles, to prevent the spread of fungal pathogens.

The Proposed Action would incorporate natural landscaping features that create shaded pedestrian walkways and gathering spaces for residents and visitors on the Project Site. No short- or long-term significant impacts to flora are anticipated during construction or operation of the Proposed Action, other than those discussed in the Flora Assessment Report and no additional mitigation is required.

| Tree # | Species | Diameter (in) | Height (ft) | Spread (ft) | Health | Structure | Mitigation | Tree Protection Zone Radius (ft) | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 1 | kukui | 16 | 60 | 40 | Good | Fair | Crown Prune, Crown Reduce | 10 | lean towards road, remove vines |
| 2 | kukui | 48 | 60 | 50 | Good | Good | Crown Prune | 10 | beautiful structure. remove vines |
| 3 | kukui | 26 | 60 | 40 | Good | Fair | Crown Prune | 10 | cluster of 3 trees near stream bank. Remove vines. |
| 4 | kukui | 24 | 60 | 50 | Good | Fair | Crown Prune | 10 | interesting branch structure, though asymmetrical with branches away from stream |
| 5 | monkeypod | 48 | 60 | 60 | Good | Fair | Crown Prune | 15 | Lanky specimen, with tall wide structure. evaluate how fits into plans- potentially remove. |
| 6 | mango | 40 | 70 | 60 | Good | Fair | Crown Prune, Crown Reduce | 12 | Near streambank but not undermined |
| 7 | mango | 60 | 80 | 50 | Good | Fair | Crown Prune | 15 | Tall specimen |
| 8 | coconut | 0 | 40 | 0 | Good | Good | Crown Prune | 3 | |
| 9 | mango | 34 | 75 | 40 | Good | Fair | Crown Prune, Crown Reduce | 12 | |
| 10 | Bodhi Tree | 48 | 50 | 50 | Good | Fair | Restructure Prune | 15 | Restructure and thin waterspouts, reduce crown. Can be a nice specimen with time and pruning. |
| 11 | lychee | 29 | 35 | 20 | Poor | Poor | Crown Prune, Remove? | 5 | Suppressed by bodhi tree and is half dead. Trunk wounds. |
| 12 | mango | 60 | 80 | 50 | Good | Fair | Restructure Prune | 12 | Large specimen, remove vines |
| 13 | False kamani | 48 | 60 | 45 | Good | Fair | Crown Prune | 12 | Remove Vines |
| 14 | False kamani | 48 | 60 | 50 | Good | Fair | Crown Prune | 12 | Leaning/asymmetrical. Prune to improve structure. Remove vines. |
| 15 | banyan Chinese | 40 | 40 | 30 | Fair | Fair | Crown Prune, Treatment | 20 | Restructure prune, crown reduce. Moderate gall wasp infestation. Treat tree if preserving. |
| 16 | banyan Chinese | 140 | 80 | 70 | Poor | Fair | Crown Prune, Remove? | 20 | Crown reduce, severe gall wasp infestation- likely a removal. |
| 17 | cook pine | 26 (4 trees) and 14 (1 tree) | 80 | 20 | Good | Good | Test | 6 | Line of 5 trees. Resistograph test before preserve. |
| 18 | ficus triangularus | 12 | 20 | 20 | Good | Fair | Crown Prune | 5 | Compact interesting specimen. Potential transplant candidate. |
| 19 | mango | 48 | 90 | 50 | Good | Fair | Crown Prune, Crown Reduce | 12 | Tall structure, remove vines |
| 20 | banyan Chinese | 80 | 90 | 50 | Poor | Poor | Crown Prune, Remove? | 20 | Not worth preserving as specimen tree, but fine for roadside jungle to block view |
| 21 | Juniper/ Pine species | 28, 26, 26, 28 | 60 | 30 | Good | Fair | Crown Prune | 10 | 4 trees, unknown juniper-like species in a row. Interesting and rare in Hawaii, consider preserving |

| Tree # | Species | Diameter (in) | Height (ft) | Spread(ft) | Health | Structure | Mitigation | Tree ProtectionZone Radius (ft) | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 22 | Ficus benjamina | 16 (2 trees) | 30 | 30 | Good | Fair | Crown Prune, Transplant Candidate | 6 | 2 containerized specimens slightly outgrowing containers. transplant candidates. |
| 23 | mango | 60 | 90 | 60 | Good | Fair | Crown Prune, crown Reduce | 6 | Tall specimen |
| 24 | banyan Chinese | 200 | 65 | 80 | Fair | Fair | Crown Prune, Treatment | 20 | Wide specimen with many aerial roots. Moderate stem gall wasp infestation, treatment recommended if preserving |
| 25 | banyan Chinese | 130 | 65 | 70 | Fair | Fair | Crown Prune, Treatment | 20 | Wide specimen with many aerial roots. Moderate stem gall wasp infestation, treatment recommended if preserving |
| 26 | mango | 48 | 90 | 50 | Good | Fair | Crown Prune, Crown Reduce | 12 | Remove Vines |
| 27 | banyan Chinese | 140 | 70 | 80 | Fair | Fair | Crown Prune, Treatment | 20 | Wide specimen, raise crown and reduce canopy overall to accommodate buildings. Moderate stem gall wasp infestation, treatment recommended if preserving |
| 28 | shower pink, white | 12 | 40 | 20 | Fair | Fair | Crown Prune | 5 | Mediocre specimen, but only shower tree observed |
| 29 | false kamani | 60, 48, 64 | 40 | 50 | Good | Good | Crown Prune, Crown Reduce | 12 | 3 trees. Crown Raise and end weight reduction pruning. Root pruning may be needed for planned structure. |
| 30 | ironwood | 28 (3 trees) | 70 | 40 | Good | Fair | Crown Prune, Crown Reduce | 12 | 3 trees in area. Many saplings nearby. |
| 31 | cook pine | 16 (3 trees) | 40 | 0 | Good | Good | Test | 6 | 2 trees, Resistograph test before preserving |
| 32 | monkeypod | 24 (2 trees) | 60 | 45 | Good | Fair | Crown Prune, | 15 | Tall, can be nice specimen trees. One tree leaning towards cemetery is potential removal, but works well next to other tree. |
| 33 | cook pine | 22 | 70 | 0 | Good | Good | Test | 6 | Resistograph test before preserve. |
| 34 | coconut | 0 | 30 | 0 | Good | Good | Transplant candidates | 3 | 3 palms and many sprouts. Transplant candidates |
| 35 | green bamboo | 0 | 0 | 0 | Fair | Fair | Crown Prune | 10 | If preserving, thin out dead stalks. |
| | | | | | | | | | |

**FIG. 2-42 Flora Survey Tree Map**

### 2.7.3 Fauna

A biological survey for avifauna and mammals on October 11 and 12, 2021. Fauna in the western side of the property was assessed on October 11, 2021 from 0630-0745. Weather was overcast, with 10-15 mph wind gusts and dry. The eastern side of the property was assessed on October 12, 2021 from 0630-0745. Weather was overcast and drizzling, with 10-15 mph wind gusts. The site was evaluated using avian point count stations distributed throughout the property (see FIG. 2-39 below).

**FIG. 2-43 Map Of Bird Survey Locations On 10/11/2021 (Yellow) And 10/12/2021 (Red).**


An avian species list was compiled, which includes common and scientific names of the individual species, the legal regulatory status, average number of individuals per station, and how many count stations were occupied.

Avian point count surveys identified 227 individual birds from 13 Species (Table 1). Of the birds observed, only the White tern (Manu O Ku) is native to Hawaii. White terns were observed flying above the property in pairs, as well as roosting and calling from kukui trees. No chicks or breeding white terns were noted during the survey, though the habitat is appropriate for breeding to occur.

All of the other avian species are alien to Hawaii, and several are considered to be “Injurious wildlife” by the State of Hawaii. The most abundant species was the Warbling White-eye (*Zostera’s japonicus),* which was observed in the macaranga-dominated forest and in kukui, mango and ficus trees. Commonly observed in the parcel were zebra doves, rose-ringed parakeets and red-vented bulbuls. Zebra doves were on communication wires, calling from high in trees, and foraging on open ground (driveways, low grass). Bulbuls were the most common species in the macaranga-dominated forest.

**Mammals**

All mammalian observations of mammalian species at Mānoa Banyan Court were made incidentally. These were based on visual and auditory detection, coupled with visual observation of scat, tracks, and other animal signs. As Hawaiian hoary bats have been documented to occur in Mānoa Valley (US Fish and Wildlife document: Recovery Plant for the Hawaiian Hoary Bat *Lasiurus cinereus semotus,* 1998), we did not conduct surveys to identify the presence of this species. The consultant did not incidentally observe any Hawaiian Hoary Bats. Four feral mammal species were observed in the Mānoa Banyan Court site (Fauna Report Table 2). One black rat was observed on a ficus tree limb. A feral pig wallow and rooting signs were observed on the eastern side of the project site, but individual pigs were not observed.

#### 2.7.3.1 Impacts and Mitigation

Fauna observed in the Mānoa Banyan Court parcel were introduced, injurious wildlife. The only observed native species of concern is the white tern. A survey to identify if white terns are breeding in trees designated for removal is recommended prior to tree removal. Tree removal should be scheduled from September 16 to May 30, to avoid the summer pupping season of the Hawaiian Hoary Bat. The Proposed Action would adhere to stringent BMPs during construction and operation to protect fauna and habitats located at the Project Site The preservation of those trees recommended in the Flora Report will continue to provide nesting habitat for avian species. No short or long-term significant impacts to fauna are anticipated, and no additional mitigation is required.

## 2.8 AIR QUALITY

### 2.8.1 Air Quality Measurement

Air quality data for the Project Site is based on the Air Quality Index reported by Honolulu, Hawai‘i Station No. 9 located at the HECO’s power plant in Downtown Honolulu. Existing air quality conditions are classified as “good” with no major pollutants exceeding the National Ambient Air Quality Standards. The six criteria pollutants set by the EPA include carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone and particulate matter. One additional criteria pollutant, hydrogen sulfide, is regulated in the State of Hawaiʻi to evaluate potential air quality impacts related to volcanic activity on Hawaiʻi Island. No major pollutant generators, such as industrial incinerators or manufacturing plants, have been identified in the area, and there are no heavily trafficked thoroughfares or intersections generating excessive exhaust. Air quality at the Project Site is maintained as "good" due to the consistent flow of northeasterly trade winds that disperse pollutants towards the ocean.

#### 2.8.1.1 Impacts and Mitigation

The Proposed Action will consistently follow stringent BMPs during construction and operation to minimize impact on existing air quality. Project phasing over 5 to 6 years will also assist in the mitigation and control of fugitive dust. This will include dust fences and watering disturbed soil areas and installing landscaping and replanting vegetation as early as feasible to control short term soil exposure and dust. Emissions would be negligible and be quickly dissipated by the frequent northeast trade winds crossing through the Project Site. The thick vegetation will also help to prevent the spread of dust particles.

The Proposed Action will encourage multi-modal transportation systems including "The Bus," bicycles and walking. These will reduce long-term vehicle emissions. It is also anticipated that Uber and Lyft services will also be available. No short or long-term significant impacts are anticipated that would be a detriment to air quality and any impacts from construction will be temporary. Construction phasing over 5 or 6 years will also reduce any detriments to air quality and no additional mitigation is required during construction of the Proposed Action.

## 2.9 ACOUSTIC ENVIRONMENT

The acoustic environment surrounding the Project Site is consistent with an urban largely single family residential neighborhood. Due to the Project Site being located in the *mauka* area of Mānoa where there is light traffic, the project vicinity is noticeably quiet when compared with more intensively urban areas of lower Mānoa and Honolulu. However, concern by neighborhood activists appears to be related more toward the potential for noise from project residents rather than exterior noise (traffic etc.) negatively impacting the elderly project residents.

### 2.9.1 Possible Sources of Periodic Non-Ambient Noise

Construction noise from excavation, grading, paving and building assembly will be short-term and phased in increments over the construction period.

Ambient sound above normal may be experienced during infrequent cultural events at the Community Center, or at the cemetery, but these are not expected to exceed 3 or 4 events per year. The three major cultural events in the vicinity include:

- Chinese New Year, January 21-February 20 according to the Lunar Calendar.
- Ching Ming Festival - Usually held on April 5th by Honolulu's Chinese Community. Ching Ming is a Chinese religious event to give honor, praise, respect and thanks to family ancestors.

The one day festival involves prayers for the dead and celebration with fire crackers (for which a permit from the City is obtained and is much less than New Year and July 4 elsewhere on O`ahu). This event is held at the Great Ancestor's Tomb at the top of the knoll in an area of the cemetery which is several hundred yards from the project site. The Ching Ming Festival has been held annually at the Mānoa Chinese Cemetery for one hundred and seventy one years. The day concludes with a celebratory dinner in the evening usually held at the Chinese Memorial Hall on the triangular parcel (intended site of the Community Center) that lies between Old East Mānoa Rd. and East Mānoa Rd. These celebrations are open to the community as well.

- Mid-Autumn Festival (Mooncake Festival) September 22 or 23, 15th day of the 8th month according to the Lunar Calendar. The Mid-Autumn Festival is a day for family to gather together and offer thanks for the fall harvest and pray for longevity and good fortune.

#### 2.9.1.1 Impacts and Mitigation

The size of the site and the thick perimeter vegetation surrounding the site on all sides will tend to reduce construction noise from the site penetrating much beyond the work site. Construction noise mitigation measures would include noise attenuating equipment, such as mufflers and adherence to allowable noise regulations and noise curfews. Each contractor would be responsible for maintaining noise levels within the regulatory limits, pursuant to HAR §11-46, "Community Noise Control." Contractors would be required to obtain a noise permit if construction noise levels are expected to exceed regulatory limits.

The Proposed Action when fully built-out and occupied would cause little noticeable increase in ambient neighborhood noise levels for the following reasons:

- Each of the four phases of the project's design would have the residential apartments facing onto a landscaped courtyard open to the sky. Noise from the apartments, usually minimal, (residents are 62+) would largely be contained within the landscaped courtyard. A scientific research study supporting this conclusion was published in 2010 by the *National Library of Medicine, National Center for Biomedical Information.*[3]
- The site is surrounded by thick vegetation, especially along the western and mauka sides of the site that parallels East Mānoa Rd. The site plan will preserve most of this natural vegetation as both a visual barrier and sound barrier with widths of approximately five feet or more and existing heights of fifteen to thirty feet. All site vegetation is tropical and therefore will dampen sound year-round. Any gaps along East Mānoa Rd. (except for driveways) can be in-filled with new suitable plant material that will effectively function as a similar visual and sound barrier (See Fig. 2-16). Existing natural vegetation separating the Proposed Action from the cemetery on the mauka side of Woodlawn ditch is quite dense and will be left largely undisturbed as both a sound and visual barrier that will effectively block views of the cemetery from the project's residential areas.
- The Proposed Action provides residential apartments for elderly residents aged 62 and over (age qualification required by HHFDC). Elderly apartment residents, as opposed to boisterous young adults, seldom create noise

disturbances that would impact areas beyond their personal apartment spaces.

- As with apartment residents everywhere, Mānoa Banyan Court residents must agree in writing as part of their lease agreement to abide by the complex's noise regulations commonly known as "house rules".

No short or long-term significant impacts to the acoustic environment are anticipated, and no additional mitigation is required.

## 2.10 SCENIC RESOURCES

### 2.10.1 SCENIC AND VIEW RESOURCES

The present visual characteristic of the portion of the Project Site to be used for the residential units is that of a natural wooded area. It is difficult to determine the extent of views from within the site until the final site plan is confirmed. Scenic views from within the site of surrounding areas, such as the ridges defining the boundary of Mānoa Valley are obscured by the existing dense vegetation. These views may be improved following selective thinning of the vegetation. Visual resources and features within the site would include the mature banyans, monkey pods and other trees identified for potential preservation in the flora report and the wooded ridge on the mauka side of Woodlawn Ditch. Following selective thinning of the Macaranga vegetation on the site's East side, an improved view of Wa‘ahila Ridge to the East may be visible from the site's landscaped common areas. A similar view of Mānoa Ridge on the West side should be visible from the parking and landscaped common areas of the site. Mauka views from the site will be largely obscured by the heavy vegetation on the site's mauka boundary and uphill slope. The view from the apartments will focus on the landscaped courtyards, but there would also be views of the landscaped common areas from the rear windows of most apartments. surrounding Mānoa Valley. The density of the 'looking glass' (aka mirror plant, *coprosma repens*) and hibiscus hedge (15 to 25 ft.) along East Mānoa Road will block most views of the project from along the road and provide visual privacy for the residents but may also limit views of the surrounding valley ridges from the project site. The Project Site is planned to have landscaped courtyards as well as protected walkways along the Woodlawn Ditch drainage channel that bifurcates the property. The cemetery will be visually obscured by the natural dense foliage on the mauka portion of the Project Site. Internally, the site will be landscaped to provide a pleasant environment for residents and visitors. The best scenic views of areas outside the site will be from the renovated Memorial Hall and day room.

#### 2.10.1.1 Impacts and Mitigation

To provide views of the surrounding ridges that enclose Mānoa Valley will require selective thinning of the existing dense invasive species vegetation as recommended in the Flora Report. Views within the site will be enhanced through preservation of trees in good condition. The Proposed Action would be consistent with the visual characteristics of similar multi-family housing developments in Mānoa Valley, the surrounding area, including both urban and natural settings. Residential structures will be low rise (30 ft.) to provide compatibility with the surrounding neighborhood residential character and will be substantially obscured from East Mānoa Rd. by existing vegetation. Additional screen planting is recommended along the site's makai boundary to provide privacy to the adjacent seven private residences. Following the recommendations in the Flora Report creative site landscaping will enhance views from the site to its surroundings and will partially obscure views of the site from the outside. Regarding views, The Proposed Action will not block, obscure or negatively impact scenic resources of Mānoa Valley or the neighborhood in the vicinity of the site. Specific views to and from the site will depend on final treatment of vegetation, and no additional mitigation is envisaged or required beyond the recommendations of the Flora Report.

**FIG. 2-44 View of Existing Site Vegetation Looking Mauka Along Lower Road.**

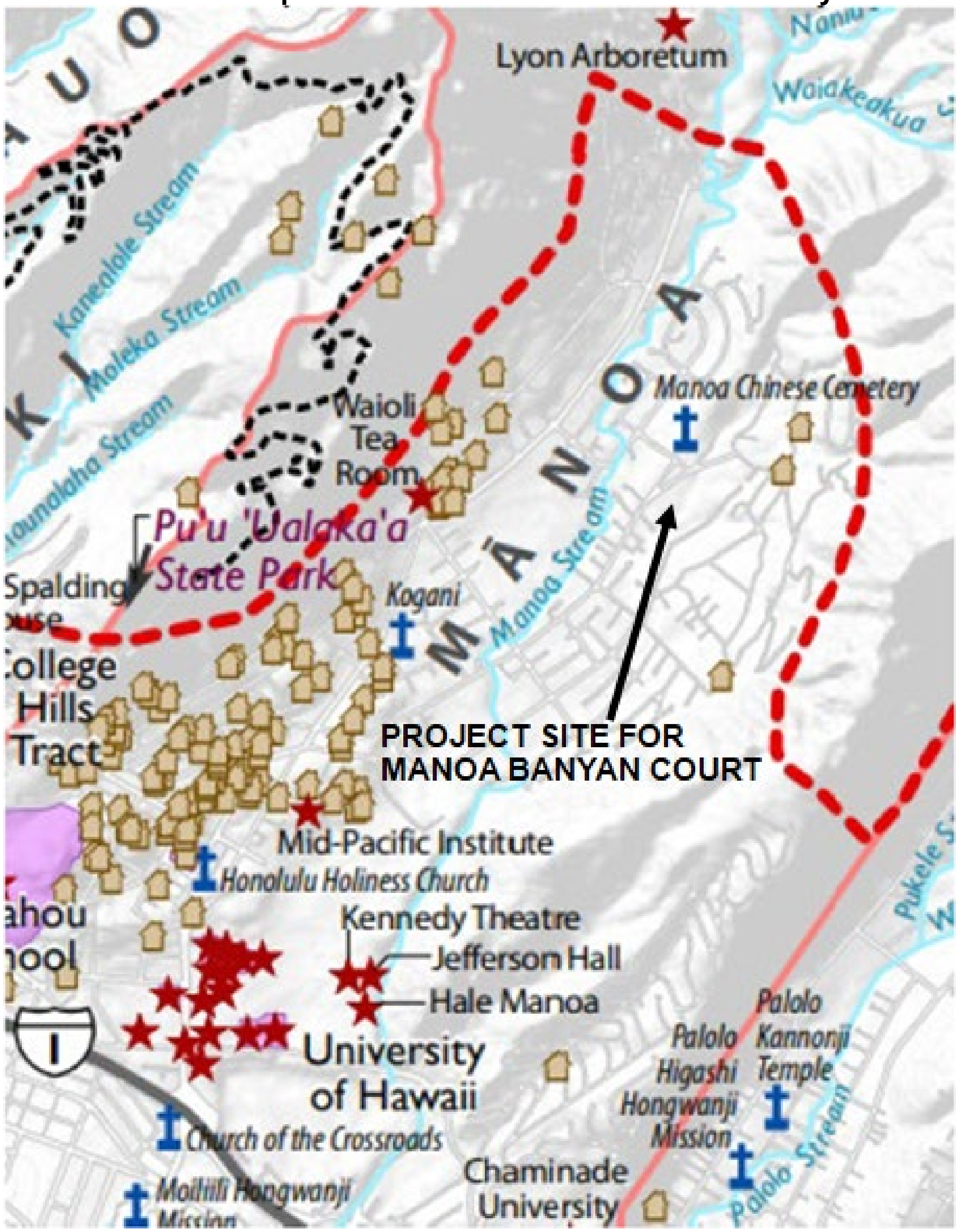
**FIG. 2-45 View of Existing Vegetation Looking Makai Along E. Mānoa Rd.**

**FIG. 2-46 View Toward Great Ancestor's Tomb From Corner Pokanu Rd. & E. Mānoa Road**

**FIG. 2-47 View Toward Ancestor's Tomb From Mid-Pakanu St. Behind Memorial Hall**

The Honolulu Public Views Study: Cultural Literature Review and Analysis 2017 by Cultural Surveys Hawaii; Dyett & Bhatia, Urban and Regional Planners,[4] was examined for important views in Mānoa Valley which might be influenced or compromised by the Proposed Action. This Public Views Study listed over 24 residences in Mānoa that were considered to have historical architectural significance as well as the Mānoa Chinese Cemetery. As seen in FIG. 2-42[5] most of these residences are concentrated along the E`wa valley wall of Mānoa and only three residences are in the mauka portion of Mānoa, but still some distance from the project site. Possible views of these residences from the Project Site are either obscured by other houses or by vegetation or both. The relatively low height of 30' of the Proposed Action will not compromise any important views from other locations within Mānoa. Views from the houses will not be obstructed or obscured by the Proposed Action. Views toward the Mānoa Chinese Cemetery from the Project Site may be obscured by vegetation.

**FIG. 2-48 Map of Historic Residences in Mānoa Valley[6]**




It is noteworthy to notice that the earliest historic homes in Mānoa were built against the eastern hillside of the western valley wall so as to catch the earliest morning sunlight and warmth during the cooler months.

**FIG. 2-49 Potential View Lines of Mānoa Walls After Vegetation Thinning**

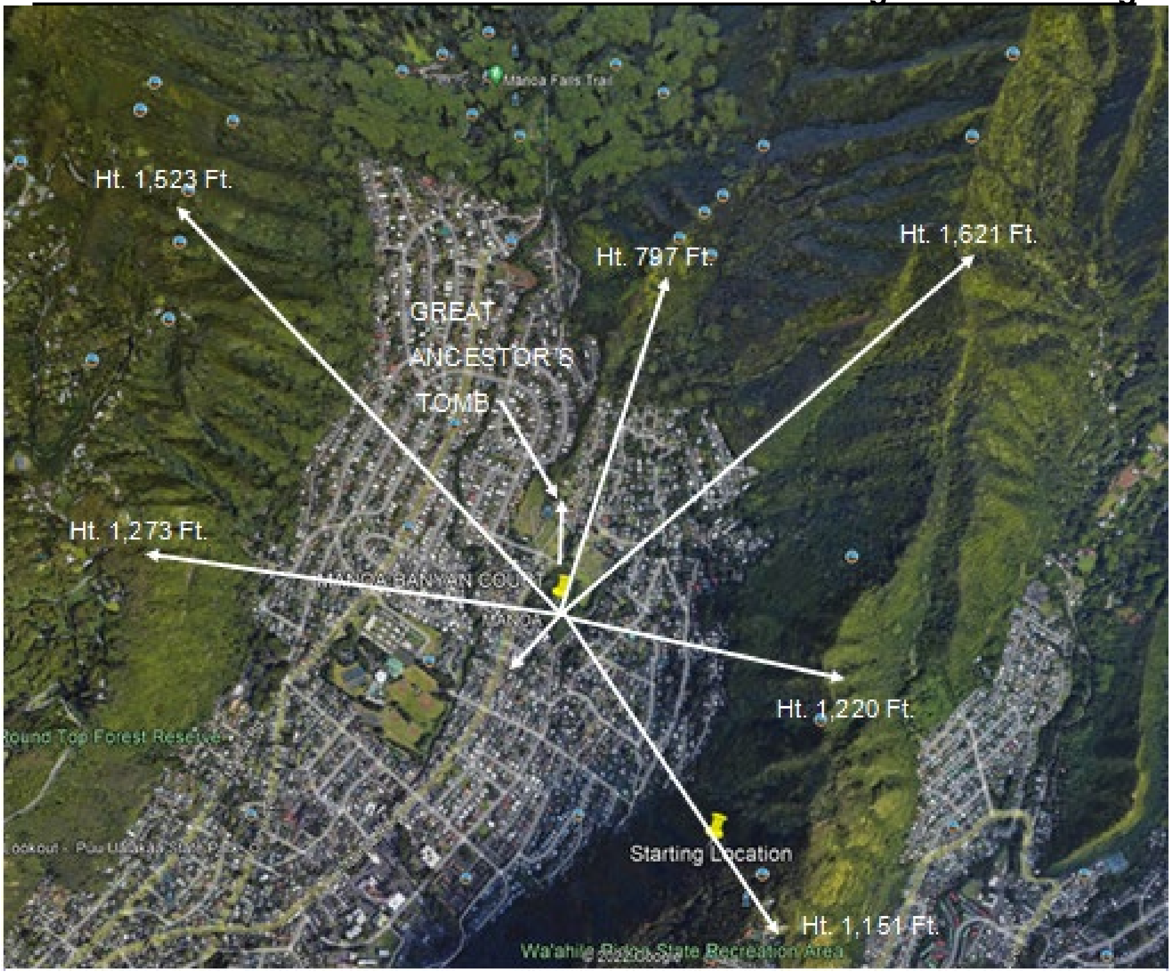
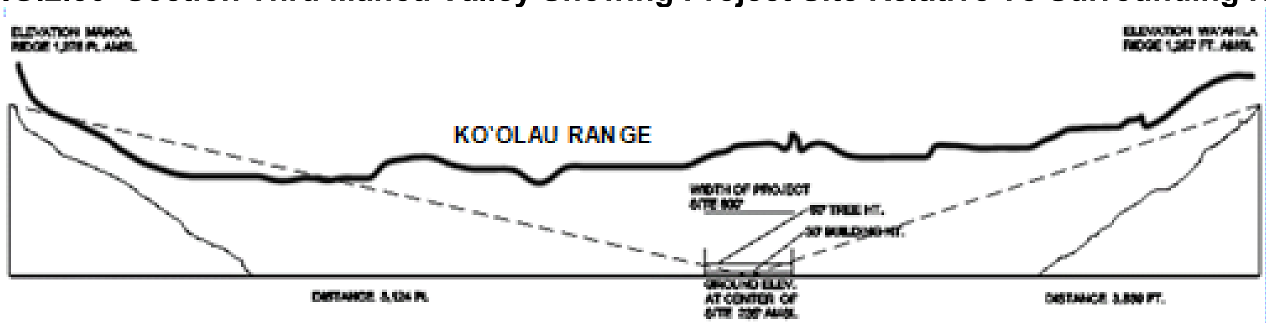
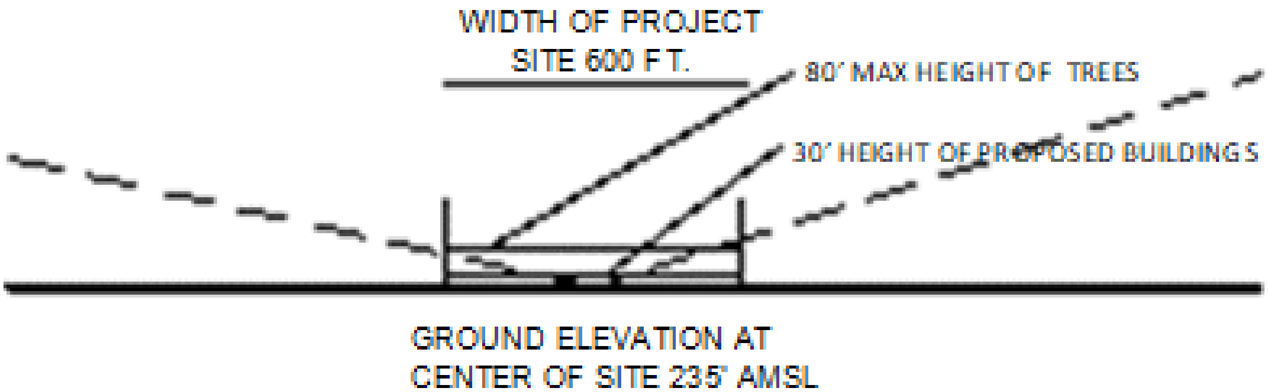



**FIG.2.50 Section Thru Mānoa Valley Showing Project Site Relative To Surrounding Hills.**




Drawn to Approximate Scale

**FIG. 2.51 Enlarged Site Section Showing Relative Height of Buildings and Trees**




Drawn to Scale

1 Mānoa Neighborhood Board Minutes of July 5, 1989
2 Wikipedia "Waffle Mat Foundation"
3 Anita Gidlöf-Gunnarsson* and Evy Öhrström; "Attractive "Quiet" Courtyards: A Potential Modifier of Urban Residents' Responses to Road Traffic Noise?"; Copyright © 2010 by the authors; licensee Molecular Diversity Preservation International, Basel, Switzerland. Int J Environ Res Public Health. 2010 Sep; 7(9): 3359–3375. Published online 2010 Aug 30.
4 This data can be used under the Creative Commons license "Attribution + Non-commercial (BY-NC)"

*This Page Purposefully Left Blank*

# 3. HISTORIC, ARCHAEOLOGICAL AND CULTURAL RESOURCES

## 3.1 HISTORIC PROPERTIES AND CONTEXT

### 3.1.1 Manoa Chinese Cemetery

The Lin Yee Chung Association (LYCA or the "Association") was established by an original group of thirty Chinese businessmen in 1851 and is the oldest Chinese benevolent and eleemosynary association in Hawaii. The Association's name, Lin Yee Chung means "*United in Righteousness*." In 1852 Lum Ching, a practitioner of the astronomy/geology study called "kum yee hok," or geomancy (the art of divination by means of lines and figures), visited Mānoa Valley and identified an area which he believed had a special spirit.[1] The cemetery lands had been used for burials prior to the society's purchase of the land since the earliest known Chinese grave in Hawaii dates to 1835 in the area of the Mānoa Chinese Cemetery.[2]

The Association subsequently purchased the property comprising the Mānoa Chinese Cemetery between 1852 and 1896 including the proposed project site which now totals slightly more than 27 acres in total. Following the Great Māhele in 1848, the first lot of land was purchased in 1852 from a Hawaiian called Moehonua. Part of the land, in the `ili of Pu`ulena, was once part of the estate of Queen Ka`ahumanu, Kamehameha's favorite wife (Mānoa School PTA 1952:6). In 1854, LYCA bought Land Grant #101, although disputes with the lot boundary delayed construction of the cemetery until 1896. The Association was granted a charter as a non-profit corporation from the Kingdom of Hawaii in June of 1889. The cemetery land continues to be owned, managed and maintained by the LYCA for the past 167 years. The Association also facilitates traditional Chinese religious burial ceremonies and annual rituals such as Ching Ming. Whereas the majority of burials have been persons of Chinese ancestry, the cemetery is open to all persons of all religious beliefs. The Mānoa Chinese Cemetery has been designated on the State Inventory of Historic Places (SIHP) #50-80-14-9809.

Land owned by the Lin Yee Chung Association not designated for cemetery use was leased out for farming purposes (Thom 1985:8). A group of 10-12 rental cottages, constructed to raise funds, were built along East Mānoa Road and on the southern boundary of the property around 1969. Other houses already on the property were condemned or moved (Thom 1985:11-13). This unused portion of the property is the wooded area intended as the site for the Proposed Action and is unsuitable for burials due to a high water table and large underground boulders which makes graves for full body burials difficult to prepare. Following the Great Māhele, Mānoa began to significantly change with an increase in surrounding housing construction.

There are two single family residential structures and two storage sheds on the Project Site's Parcels D-3, D-4 (see FIGs 2-7 & 2-11 in Part 2) . These houses have been used for several decades as residences for cemetery groundskeeper/maintenance staff. The two storage sheds have been used for general storage and for cemetery maintenance equipment. All structures are in poor condition, and none are listed on the Hawaiʻi or National Register of Historic Places. The residential structures appear to have been remodeled several times and do not exhibit any particular architectural style and cannot be economically renovated.

The nearest historic property is the Manoa Chinese Cemetery (SIHP No. 50-80-14-09809) discussed previously which was placed on the Hawaii List of Historic Places on Aug. 28, 1997. One building is on the cemetery property and is known as Manoa Chinese Cemetery Pavilion and is accessed from Pakanu Street. The “Old Section” of the Manoa Chinese Cemetery is listed as state historic place no. 50-80-14-9809 and dedicated with DCCA and Bureau of Conveyances as cemetery TMK 2-9-043:01 with an area of 10.7 acres. However, the “New Section” of the cemetery (a 4.999 acres portion of TMK 2-9-043:02) is not historical and has not been dedicated with DCCA or the Bureau of Conveyances as a cemetery.

**FIG. 3-1 Properties Map of Mānoa Chinese Cemetery**

The Project Site is located within the moku (district) of Kona, within the Waikīkī Ahupuaʻa and the ʻili of Mānoa. The Project Site was used during historic periods and the pre-European Contact periods by Native Hawaiians for agriculture with scattered dwelling sites. This is consistent with many moʻolelo (story/legend/history) of Mānoa Valley that described it as containing abundant freshwater sources such as streams and springs. Agriculture, mainly wetland kalo (taro) cultivation in loʻi and inland fishponds, covered most of the Mānoa Valley floor during the pre-European Contact and early Historic periods (see FIG. 3-2) . Historic accounts of Mānoa Valley describe the quantity and quality of agriculture production in the region being a continuous spread of loʻi and fishponds extending from the valley out to the sea. During the post-European Contact period, agriculture cultivation continued in the valley, and it was a favored spot of aliʻi. During this time, the land use and landscape appearance were similar to that of the pre-European Contact period landscape. However, this all changed following the Great Māhele of 1848, when private land ownership was established in the islands. Soon after, a total of 68 Land Commission Awards (LCA) were issued for Mānoa Valley.

**FIG. 3-2 1920 Aerial Photo of Mānoa Valley Showing Farms and Grazing Land**

**FIG. 3-3 1933 Photo of Upper Mānoa Used for Farms and Grazing**

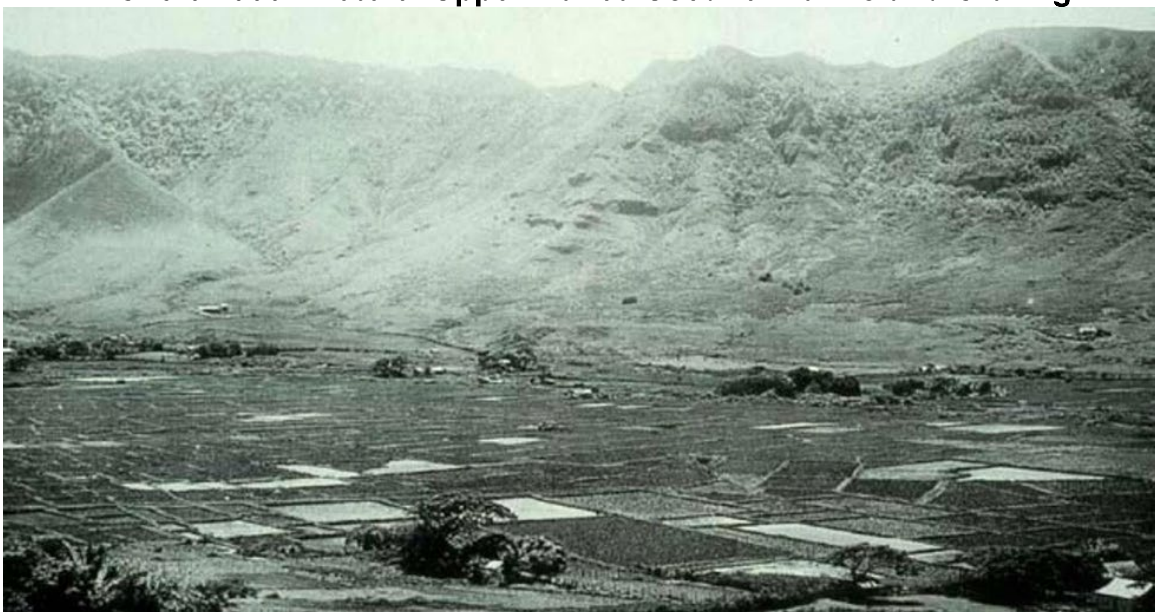
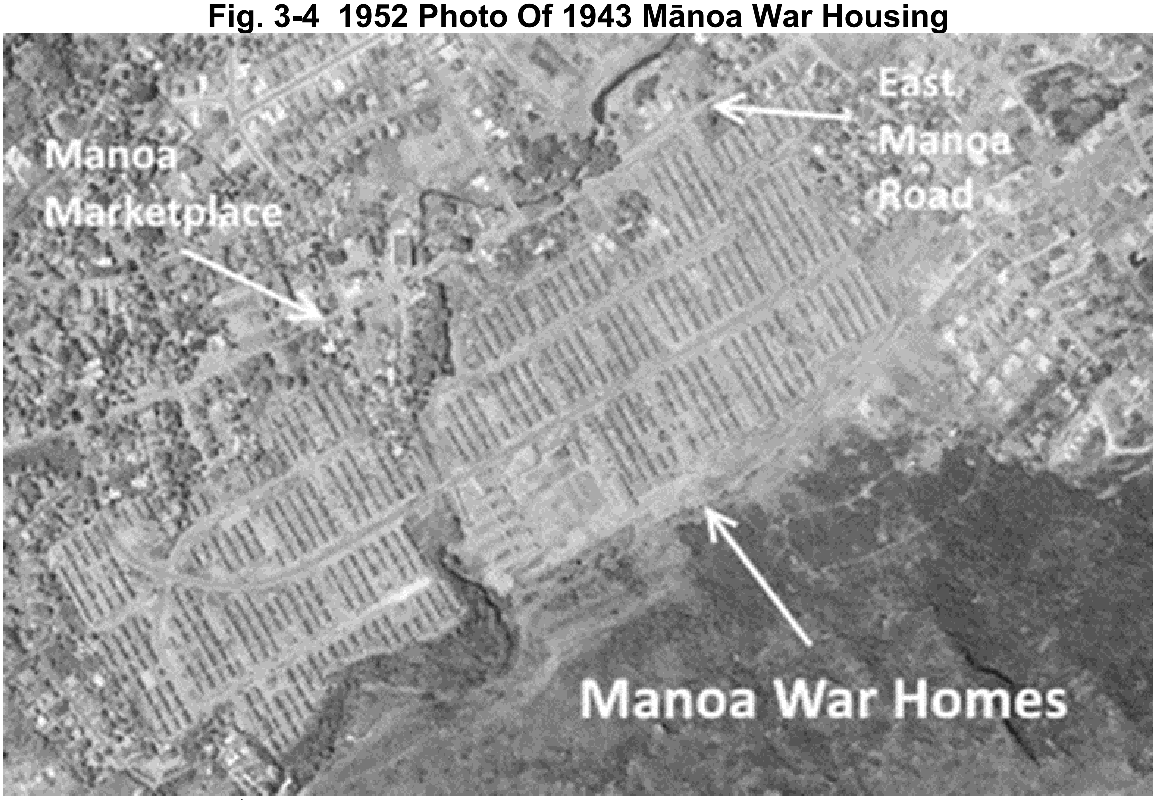


**Fig. 3-4 1952 Photo Of 1943 Mānoa War Housing**



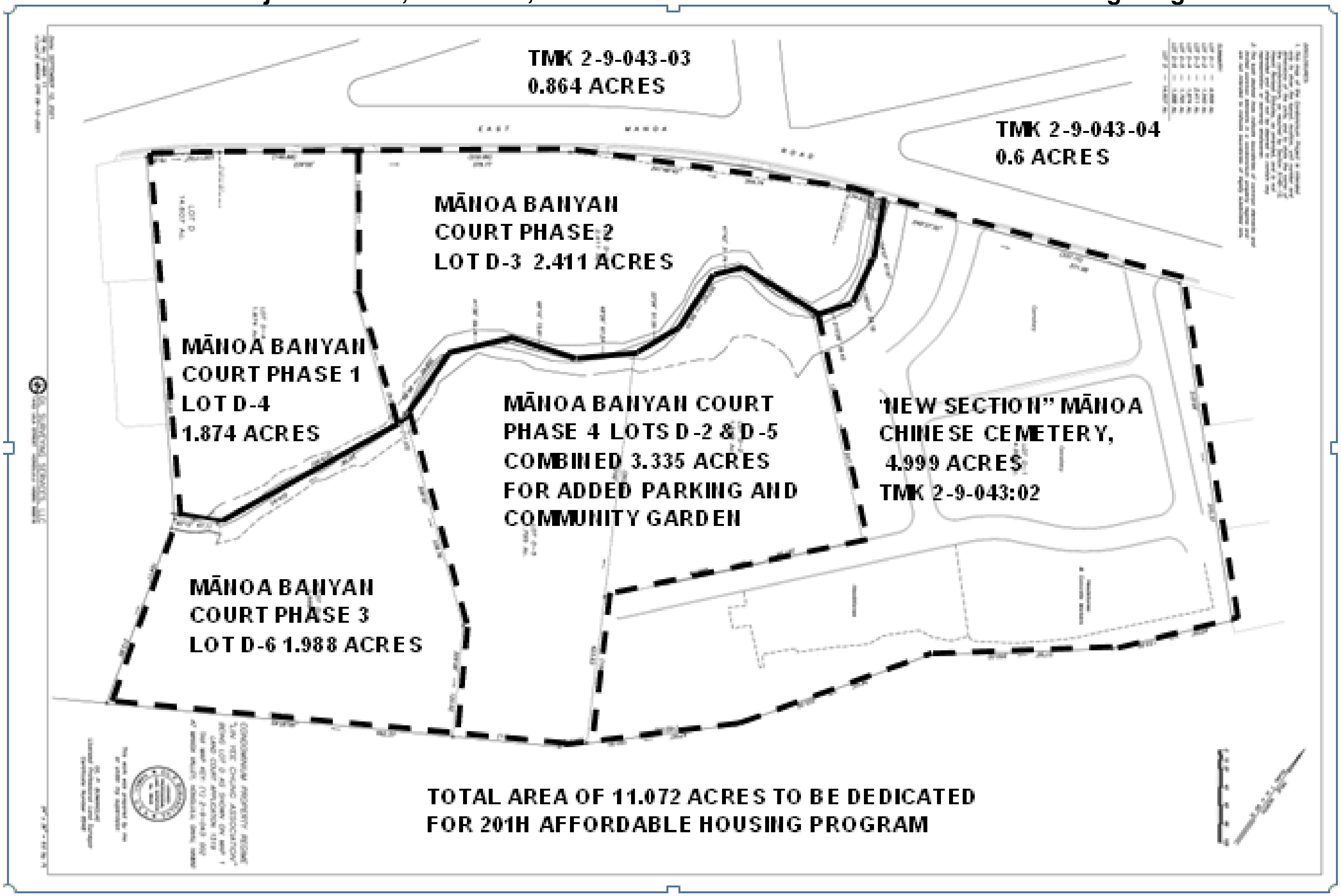

During the 2nd World War, a large area of Manoa south of the Proposed Project Site was used for War Housing (Photo by USGS 1952). This housing was later demolished and replaced with new housing development.

## FIG. 3-5 Manoa Chinese Cemetery


The Historic Hawaii Foundation describes the Manoa Chinese Cemetery as follows.

"The Manoa Chinese Cemetery is sited on a knoll nestled on the interior slopes of Manoa Valley, an amphitheater shaped valley in Honolulu. The area included in the boundaries is approximately 10,753 acres in size, with about 10,000 individual burials and defined by a low, rock wall. the head stones, mostly made of granite, stand upright in crowded rows along the sloping land facing the ocean. Founded in 1852, Lin Yee Chung (a.k.a Manoa Chinese) Cemetery is the oldest and largest Chinese cemetery on the Hawaiian Islands. Is is significant for two major reasons: 1) Under Criterion C, the cemetery has all the design elements of a "classic" Chinese cemetery, and 2) As a traditional cultural property, each year in April, the "Three Presentations Ceremony," (a traditional graveyard ritual) is performed during "Ching Ming," the Chinese memorial season. No other Chinese cemetery in Hawaii has both of these features, thus possessing integrity of relationship and condition, and maintaining a significant practice to the Chinese community in Hawaii."

**FIG. 3-6 Project Phases, CPR Lots, and Areas Dedicated to 201H Affordable Housing Program**



**Parcels & Areas Dedicated to 201H Affordable Housing Program**

| PHASE | PARCEL | AREA |
|---|---|---|
| MBC Phase 1 | CPR Parcel D-4 | 1.874 Acres |
| MBC Phase 2 | CPR Parcel D-3 | 2.411 Acres |
| MBC Phase 3 | CPR Parcel D-6 | 1.988 Acres |
| MBC Phase 4 | CPR Parcels D-3 & 5 | 3.335 Acres |
| Memorial Hall Day Room | TMK: 2-9-043:03 | 0.864 Acres |
| Use not specified | TMK: 2-9-043:04 | 0.6 Acres |
| | **TOTAL** | **11.072 Acres** |

After the Great Māhele, urbanization in the late 19th and early 20th Centuries drastically modified the land use in Mānoa Valley. The lo‘i and inland fishponds were replaced with housing. Some Chinese immigrants made a few attempts to grow rice, but the effort was not successful. There were also a few small dairy farms with part of the valley used as pastureland. Starting with construction of the Manoa War Homes in 1942, Manoa valley quickly began to urbanize with permanent housing to accommodate a rapidly growing population (see FIG. 3-4). Admission as a State in 1959 accelerated this process since Manoa was close to the government and business centers in downtown Honolulu.

With the transition to urbanization, many of the lo‘i existing in the valley were removed, but remnants of their presence remained. One example is the Ka Papa Lo‘i o Kānewai, also known as the Kānewai Cultural Garden. Located less than a quarter of a mile downstream from the University of Hawaii Campus, Ka Papa Lo‘i o Kānewai was rediscovered and restored in the 1980’s and is an actively cultivated lo‘i. It receives water from Mānoa Stream and is used to educate students and visitors about the cultural significance and historic agricultural practices of kalo cultivation.

The proposed Woodlawn Ditch Detention Basin site was examined in the EIS as a part of the broader Ala Wai Canal Flood Risk Management Study commissioned by USACE and the DLNR.

## 3.2 Background For Site Use as Woodlawn Ditch Retention Basin by USACE

In 2016, the U.S. Army Corp of Engineers (USACE) prepared a Feasibility Study and Environmental Impact Statement (EIS) for the Ala Wai Canal Project for Section 209 of the Flood Control Act of 1962 (Public Law 87-874). An initially proposed component of flood control for the Ala Wai Watershed included a retention basin which would cover about 3.3 acres (1.8211 feet, 0.376 road easement, 1.036 flowage easement, 0.057 temporary work easement) of the southern portion of the Project Site (See FIGs. 3-7, 3-8, 3-9, 3-11, 3-12) and include a portion of Woodlawn Ditch which bisects the Project Site.[3] The intent of this proposed retention basin was to capture flood waters from mauka areas of Manoa that would normally be channeled through Woodlawn Ditch. The water would be retained for a time and gradually released into Woodlawn Ditch which connects with Manoa Stream south of the Proposed Project Site. This would reduce the chance that flood waters from mauka Manoa would overwhelm Manoa Stream and eventually the downstream Ala Wai Canal.

**FIG. 3-7 Proposed Retention Basin Superimposed on Project Site**


As shown in Figure 3-9, the proposed detention basin would occupy the majority of the Proposed Project Site and total about 3.3 acres in overall area and is substantially congruent with project site.[4] The Woodlawn Ditch Detention Basin was designed as a three-sided berm, approximately 15 ft. high and 840 ft. across; with an arch culvert to allow small storm flows to pass; concrete spillway above culvert with riprap on upstream and downstream perimeter to be maintained around perimeter of berm flood area.

**FIG. 3-8 Sketch of Proposed Woodlawn Ditch Retention Basin Imposed on Site**

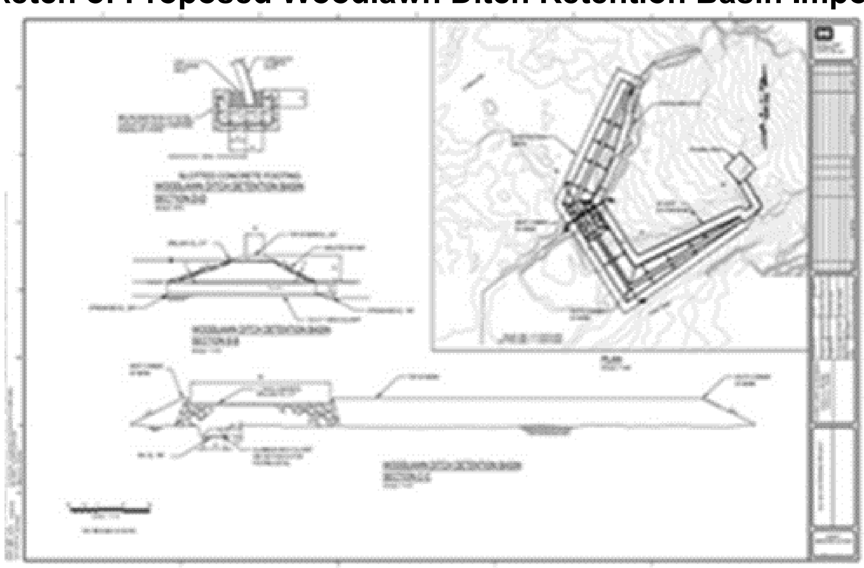


**FIG. 3-9 Sketch of Proposed Woodlawn Ditch Detention Basin on Project Site**

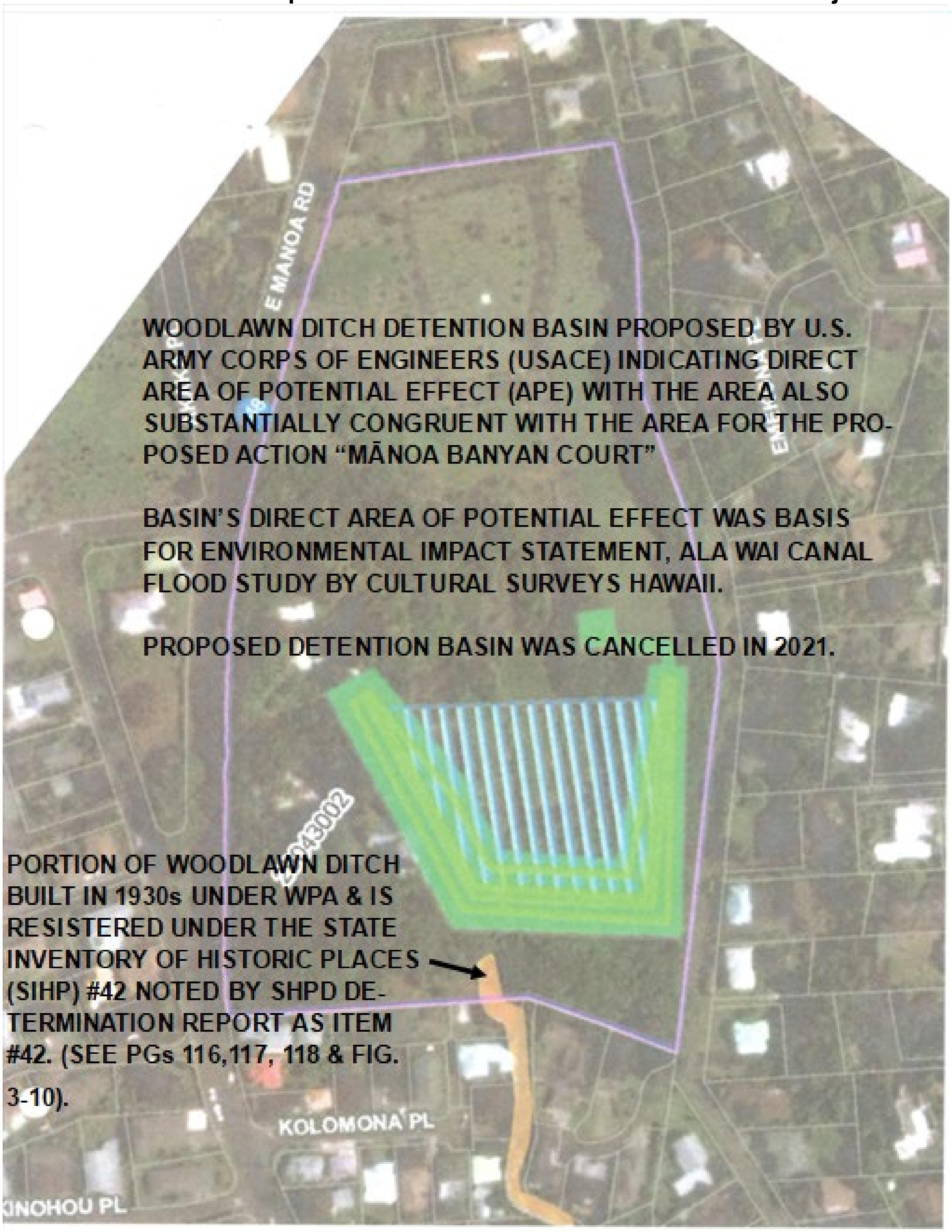


**FIG. 3-10 Lower Portion of Woodlawn Ditch Below Proposed USACE Detention Basin (SIHP #42)**

**FIG. 3-11 Artist's Rendering of Proposed Woodlawn Ditch Retention Basin**

Figure E2. Conceptual Rendering of the Woodlawn Ditch Detention Basin

**FIG. 3-12 Aerial Rendering of Proposed Woodlawn Ditch Detention Basin**

### 3.2.1 Cancellation of Proposed Woodlawn Ditch Retention Basin by USACE

In January 2021, the USACE confirmed that the Ala Wai Canal Flood Risk Management Project estimated cost had doubled to $651 million and the project had lost over $200 million in Federal funding. Plans are now in motion to undertake a completely new reevaluation of the project and to prepare a new Environmental Assessment. District Commander and District Engineer Lt. Col. Eric Marshall said "*USACE consistently engages with the City and County of Honolulu, and they want us to reevaluate the Ala Wai Watershed. This study will identify a project that optimizes the level of risk reduction to maximize benefits to the community; i.e., the study will ensure the project is cost-effective, economically justified, technically sound, and environmentally acceptable.*"

The Ala Wai Flood Control Project was contentious since its inception in 2001 with considerable neighborhood objections, especially related to the necessity to condemn private property for construction of several detention basins (including the Woodlawn Ditch Detention Basin) in Palolo, Mānoa and Makiki valleys. In August 2020, USACE released a revised flood protection plan for Honolulu neighborhoods that included fewer impacts on natural streams and residential properties within the watershed. As part of this revision, the Woodlawn Ditch Detention Basin in upper Manoa, along with five other detention basins in Palolo and Makiki valleys, were eliminated from the Ala Wai Canal Flood Risk Management Project.[5]

### 3.2.2 Historic, Archaeological and Cultural Surveys Performed for Site and Vicinity of Proposed Action for Ala Wai Watershed Project by USACE

During preparation of the Environmental Impact Statement for the USACE Ala Wai Flood Control Project; an in-depth historic, archaeological and cultural studies were completed. These studies covered the entire area affected by the Ala Wai Flood Control Project including Mānoa Valley. For the site of the Proposed Action, the studies focused on the *Area of Potential Effect* (APE) which is defined by Section 106 of the National Historic Preservation Act as the “geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.”

The *Direct Area of Potential Effect* refers to the project site and its immediate vicinity. In contrast, the *Indirect Area of Potential Effect* covers a much wider area beyond the direct area of concern. The Programmatic Agreement for historical, archaeological and cultural examination of the site for the Woodlawn Ditch Detention Basin (site for Proposed Action) examined both the direct and indirect APE as shown in Figures 3-9 and 3-10 following.

The historic, archaeological and cultural component of this environmental assessment draws upon background research and information contained in the following survey reports prepared for the U.S. Army Corps of Engineers for the Ala Wai Watershed Canal Project in 2010, 2014 and 2016. These detailed Survey Reports cover all areas of the Ala Wai watershed including Makiki, Manoa, and Palolo Ahupua`a, Honolulu District, O`ahu Island and include TMK: [1] 2–3, 2–4, 2–5, 2–6, 2–7, 2–8, and 2–9; [1] 3–1, 3–2, 3–3 and 3–4. Of specific interest for this Draft Environmental Assessment is that these surveys covered the proposed site for the Woodlawn Ditch Detention Basin.

**FIG. 3-13 Proposed Woodlawn Ditch Detention Basin Direct Area of Potential Effect**

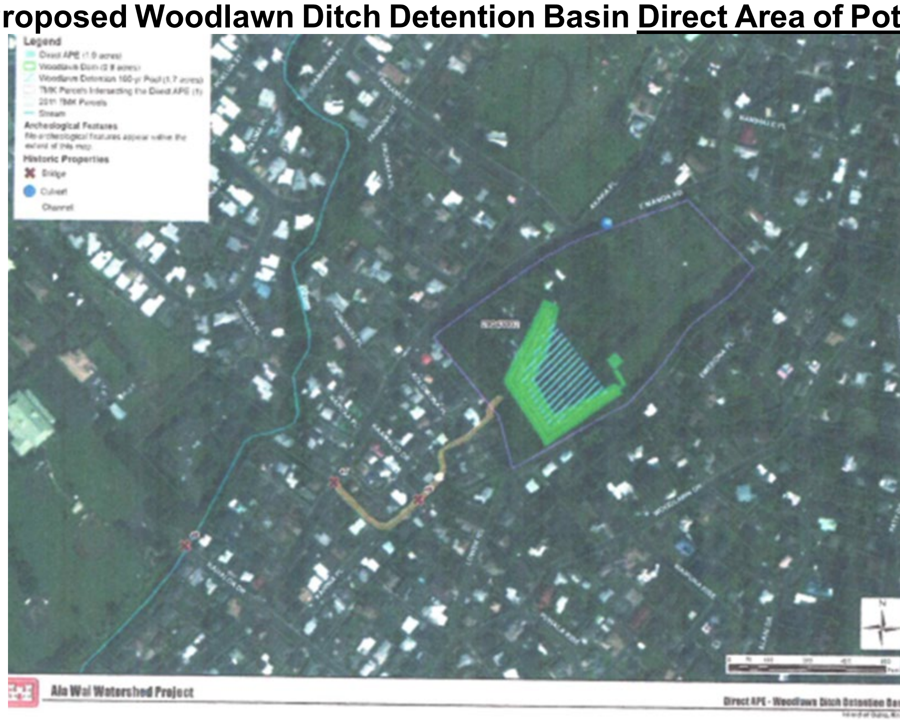
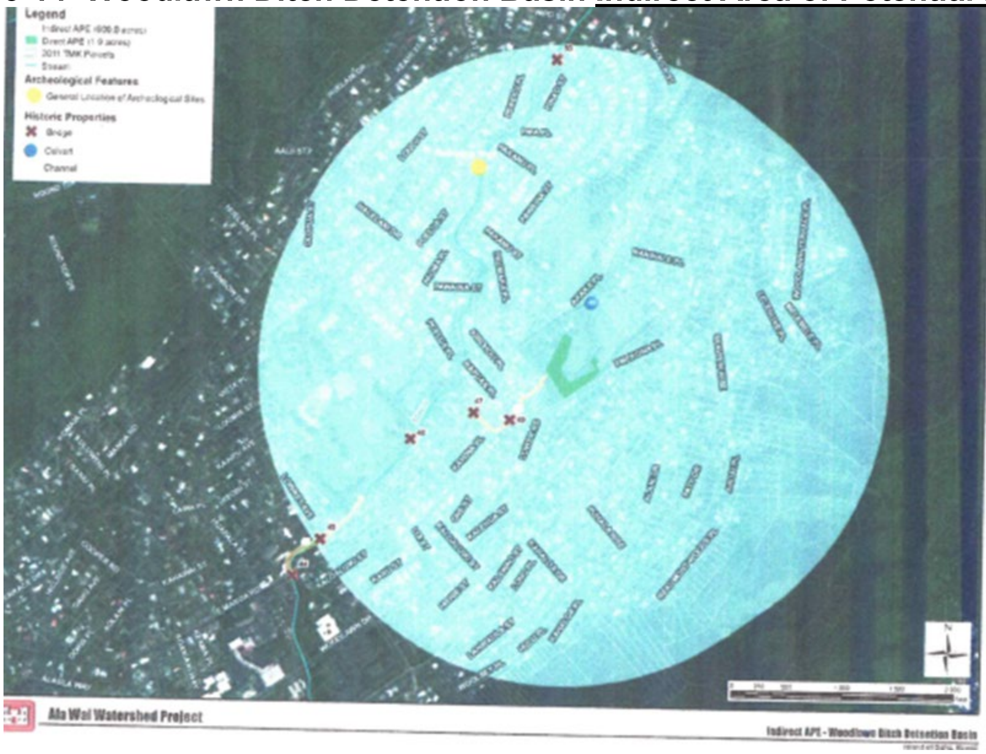


**FIG. 3-14 Woodlawn Ditch Detention Basin Indirect Area of Potential Effect**




The Cultural Resources and Ethnographic Study for the Ala Wai Watershed Project which includes the Area of Potential Effect for the Proposed Woodlawn Ditch Detention Basin (Site for Proposed Action) is contained in three volumes as listed below.

*Cultural Resources and Ethnographic Study for the Ala Wai Watershed Project: Makiki, Mānoa and Pālolo Ahupua`a, Honolulu District, O`ahu Island*, TMK: [1] 2–3, 2–4, 2–5, 2–6, 2–7, 2–8, and 2–9; [1] 3–1, 3–2, 3–3 and 3–4, **Volume I**: Cultural Resources of the Makiki, Mānoa and Pālolo Ahupua`a, prepared for CH2M Hill, prepared by Cultural Surveys Hawaii, Inc., April 2010.

*Cultural Resources and Ethnographic Study for the Ala Wai Watershed Project: Makiki, Mānoa and Pālolo Ahupua`a, Honolulu District, O`ahu Island*, TMK: [1] 2–3, 2–4, 2–5, 2–6, 2–7, 2–8, and 2–9; [1] 3–1, 3–2, 3–3 and 3–4, **Volume II**: Cultural Resources of Kaka`ako and Waikīkī Ahupua`a, prepared for CH2M Hill, prepared by Cultural Surveys Hawai`i, Inc., April 2010.

*Cultural Resources and Ethnographic Study for the Ala Wai Watershed Project: Makiki, Mānoa and Pālolo Ahupua`a, Honolulu District, O`ahu Island*, TMK: [1] 2–3, 2–4, 2–5, 2–6, 2–7, 2–8, and 2–9; [1] 3–1, 3–2, 3–3 and 3–4, **Volume III**: Ethnographic Study, prepared for CH2M Hill, prepared by Cultural Surveys Hawai`i, Inc., April 2010.

Of these three volumes, **Volume 1** contains a specific reference to a field check survey for the area intended for construction of the Woodlawn Ditch Detention Basin and which is congruent with the site for the Proposed Action (Manoa Banyan Court). On page 230 of **Volume 1** the field report for this area states the following.

> *"3.4.2.4 2009 and 2010 Field Check Results*
>
> One heavily-vegetated area was surveyed by CSH staff in Manoa Ahupua'a in January of 2010. The Manoa Woodlawn area (Woodlawn Ditch) is overgrown, with some large banyan trees; however, most of the area consists of *koa haole,* vines, and weeds. The ground is very disturbed, with eveidence [sic] of extensive grading and bulldozing, including rock bulldozer push piles. A thin wooden plank across the Woodlawn Ditch leads to a few open garden areas. The overgrown areas and the open gardens are shown in Figure 125. **No surface archaeological features were found in the area.** (boldface and underline added)"

**Volume II** covered the Cultural Resource areas of Kakaako and Waikiki Ahupua`a and is not applicable to the area of the Proposed Action in Manoa.

**Volume III** of the Cultural Resources and Ethnographic Study "presents archival research into the legends, traditions, pre-Contact history, post-Contact history, and previous archaeological research for the Makiki, Manoa, Palolo watersheds and the entire Ala Wai drainage area, including Waikiki and Kaka'ako. In addition, a field assessment of archaeological resources within IO meters of each stream system and within designated open space areas was conducted. A total of 40 sites were identified. This report presents a description of the sites, evaluates their significance, and makes recommendations for any needed further work at the sites if, in the future, they may be impacted by work associated with the Ala Wai Watershed Project. This study is also comprised of ethnographic interviews regarding the project area, to provide an understanding of the historical watershed conditions, ecological conditions, and cultural practices pertaining to the watershed as a whole."

A fourth study was also published which assessed cultural impacts for the Ala Wai Canal Project.

> *Cultural Impact Assessment for the Ala Wai Canal Project, Waikīkī, Pālolo, Makiki, and Mānoa Ahupua`a, Honolulu (Kona) District, O`ahu*. TMK: [1] 2–3, 2–4, 2–5, 2–6, 2–7, 2–8, and 2–9; [1] 3–1, 3–2, 3–3 and 3–4, prepared for CH2M Hill, prepared by Cultural Surveys Hawai`i, Inc., July 2014.

Also of relevant interest to the Proposed Action was an archaeological study by **Lee & Spear in 2015** prepared for the *Board of Water Supply 8-inch Water Main Upgrade Project* along Woodlawn Drive and Lower Road (Lower Road is directly adjacent to the east boundary lower portion of the site for the Proposed Action on TMK: 2-9-043:02) and Emekona Place adjacent to the 'New Section' of the Mānoa Chinese Cemetery. The principal finding of this study was:

*"No historic properties were identified during Phase I of the current project. Fill overlying naturally deposited clay or clay was documented throughout the project area with the exception of areas that only contained fill associated with utilities."*

This project is listed in SHPD's Table of Determination Reports covering the period June 2017 to August 25, 2018. (See Fig. 3-11)

**FIG. 3-15 SHPD List (Pg. 46) Showing Determination Report for Draft Archaeological Monitoring Report, Board of Water Supply 8 Inch Improvement Part II for Woodlawn Drive.**

State of Hawaii Historic Preservation Determination Report June 2017 to August 25 2018

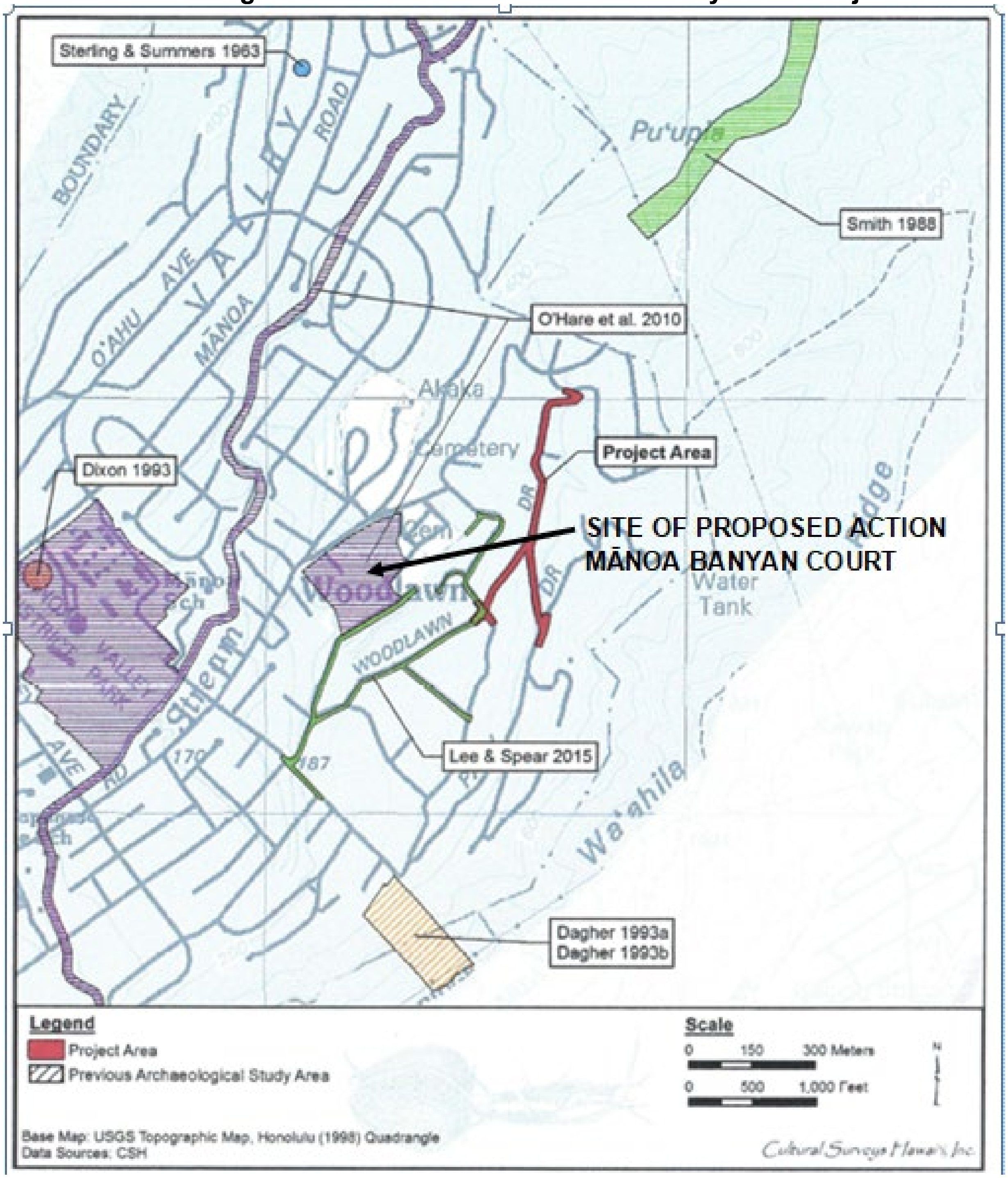
| Log Number | Jurisdiction | Project Name | Agency | Island | TMK | Date | Determination |
|---|---|---|---|---|---|---|---|
| 2017.02305 | Section 106 | More information for the National Park Service plans to replace the large glass windows at Kalahaku and Leleiwi Overlooks in the Summit District of Haleakala National Park, Maui, Hawaii | National Park Service Haleakala NP 10-10-17 | Maui | (2)2-3-005:001 | 11/22/2017 | No adverse effect. |
| 2017.02306 | 6E-42 | 757 Hoomalu Street, Kahikuonalani Church alteration to existing building. | DPP HNL A2017-10-0151 | Oahu | (1)9-7-032:001 | 10/25/2017 | More information requested. SEE LETTER. |
| 2017.02308 | 6E-42 | Archaeological Inventory Survey Report for the Mahana Lei Residential Development Project at Wiliwilinui Ridge, Wailupe, Honolulu, Oahu | | Oahu | (1)3-6-025:001 por. | 2/15/2018 | Final plan accepted. |
| 2017.02318 | Section 106 | Determination for Interstate Highway Fed. Project No. I-HI-1(82) Keehi Interchange, Moanalua, Honolulu, Oahu | SOH DOT Highways Division at Kapolei HWY-RM 3.93906 10-17-17 | Oahu | (1)1-1-003 Interstate | 2/26/2018 | More information requested. SEE LETTER. |
| 2017.02322 | 6E-42 | DRAFT Archaeological Monitoring Plan for the Block A Project, Kakaako, Honolulu, Oahu | | Oahu | (1)2-1-056:001 | 1/25/2018 | Final plan accepted. |
| 2017.02326 | 6E-8 | Draft Archaeological Monitoring Report for the Woodlawn Drive Water System Improvements Part II Project, Manoa, Waikiki, Honolulu, Oahu | | Oahu | (1)2-9-041, 042, 047 through 049, 059, 070 | 1/25/2018 | Final plan accepted. |

The State of Hawaii Historic Preservation Division Determination Report indicated that the Final plan was accepted as indicated in SHPD's list of Determination Reports for all projects June 2017 to August 25, 2018, requiring a Draft Archaeological Monitoring Report.

The proposed Woodlawn Ditch Detention Basin site was comprehensively examined in the EIS for the broader Ala Wai Canal Flood Risk Management Study commissioned by USACE and the DLNR.

This section is based on the *Cultural Resources and Ethnographic Study for the Ala Wai Watershed Project: Makiki, Manoa and Palolo Ahupua'a*, Prepared for CH2M Hill, prepared by Constance R. O'Hare, et. al, April 2010 (Job Code: AWRP 17)

**FIG. 3-16 Portion of 1998 Honolulu USGS Topographic Quadrangle Map Showing Previous Archaeological Studies Conducted in the Vicinity of the Project Area**



The proposed project site 3.4.2.4 2009 and 2010 Field Check Results on page 230 of the study states:

> "*One heavily vegetated area was surveyed by CSH staff in Manoa Ahupua'a in January 2010. The Manoa Woodlawn area (Woodlawn Ditch) is overgrown, with some large banyan trees; however, most of the area consists of koa haole, vines and weeds. The ground is very disturbed, with evidence of extensive grading and bulldozing, including rock bulldozer push piles. A thin wood plank across the Woodlawn Ditch leads to a few open garden areas. The overgrown areas and the open gardens are shown in Figure 125.* ***No surface archaeological features were found in the area***".

In the Programmatic Agreement for the Ala Wai Canal Project Table 1, Item 4-20 on Page 3, lists Historic Property within the Ala Wai Canal Project. Woodlawn Ditch was identified as Inventory Item No. 42 (see Table in FIG. 3-6). According to this chart from the Programmatic Agreement for the Ala Wai Canal Project, the Effects Determination indicated "**no effect**" and the Treatment Recommendation was "**avoidance**". This means that the Area of Potential Effect (APE), examined within the context of the Ala Wai Canal Project, was determined as having no direct impact and no effect on the Woodlawn Ditch area identified for use as a Detention Basin.

**FIG. 3-17 Programmatic Agreement, Ala Wai Canal Project**
**Archaeological Survey (Location for Proposed Woodlawn Ditch Detention Basin)**

**FIG. 3-18 (3 sheets) - Woodlawn Ditch Shown With "no effect"**
*Programmatic Agreement, Ala Wai Canal Project*

| | DESCRIPTION | SITE ID | CRITERIA | EFFECTS DETERMINATION | TREATMENT RECOMMENDATION |
|---|---|---|---|---|---|
| | Manoa Tunnel No. 1 | Inventory No. 57 | A | no effect | avoidance |
| | Manoa Tunnel No. 2 | Inventory No. 58 | A | no effect | avoidance |
| | Manoa Tunnel Pipe Crossing | Inventory No. 59 | C | no effect | avoidance |
| | Manoa Tunnel Trail Steps No. 2 | Inventory No. 60 | C | no effect | avoidance |
| | Manoa Rain Gauge | Inventory No. 61 | A | no effect | avoidance |
| | **4) Manoa: Woodlawn Ditch** | | | | |
| | Woodlawn Ditch | Inventory No. 42 | A,C | no effect | avoidance |
| | East Manoa Road Manoa Park Ditch Bridge | Inventory No. 47 | C | no effect | avoidance |
| | East Manoa Road Culvert | Inventory No. 48 | C | no effect | avoidance |
| | Kaamamilo Drive Driveway Bridge | Inventory No. 49 | C | no effect | avoidance |
| | **5) Manoa: Manoa In-Stream Debris Catchment** | | | | |
| | East Manoa Road Bridge | Inventory No. 44 | C | no effect | avoidance |
| | Lowrey Avenue Bridge | Inventory No. 45 | C | no effect | avoidance |
| | Kahaloa Drive Bridge | Inventory No. 46 | C | no effect | avoidance |
| | **6) Manoa: Kanewai Field Multi-Purpose Detention Basin** | | | | |
| | Manoa-Palolo Canal | Inventory No. 36 | A,C | no effect | avoidance |
| | Old Waialae Rd Bridge | Inventory No. 40 | C | no effect | avoidance |
| | Dole Street Bridge | Inventory No. 43 | C | no effect | avoidance |
| | Palolo Stream Channel | Inventory No. 63 | A,C | no effect | avoidance |
| | St. Louis High School Bridge | Inventory No. 64 | A, C | no effect | avoidance |
| | St. Louis Drive Bridge | Inventory No. 65 | A, C | no effect | avoidance |
| | **7) Palolo: Pukele D&D Basin** | | | | |
| | 10th Avenue Place Bridge | Inventory No. 74 | C | no effect | avoidance |
| | Palolo Avenue Bridge | Inventory No. 77 | C | no effect | avoidance |
| | Palolo Pipeline Tunnel | Inventory No. 78 | A,C | no effect | avoidance |
| | **8) Palolo: Waiomao D&D Basin** | | | | |
| | 10th Avenue Place Bridge | Inventory No. 74 | C | no effect | avoidance |
| | 10th Avenue Bridge | Inventory No. 75 | C | no effect | avoidance |
| | Palolo Avenue Bridge | Inventory No. 77 | C | no effect | avoidance |
| | Palolo Pipeline Tunnel | Inventory No. 78 | A,C | no effect | avoidance |

*Programmatic Agreement, Ala Wai Canal Project*

| | DESCRIPTION | SITE ID | CRITERIA | EFFECTS DETERMINATION | TREATMENT RECOMMENDATION |
|---|---|---|---|---|---|
| | **12) Watershed: Flood Warning System** | | | | |
| | Ala Wai Canal | 50-80-14-9757 | A | adverse effect | mitigation plan/ historic documentation/ consulting party design input & review |
| | Other Locations To Be Determined | | | | follow PA |
| | **13a) Aquatic Habitat Mitigation, Proposal A (Falls Repair)** | | | | |
| | East Manoa Rd Culvert | Inventory No. 48 | C | no effect | avoidance |
| | Pawaina Street Bridge | Inventory No. 50 | C | no effect | avoidance |
| | Waaloa Way Bridge 2 | Inventory No. 51 | C | adverse effect | historic documentation / mitigation plan as needed |
| | Waaloa Way Bridge 1 | no inventory number | none | no adverse effect | historic documentation |
| | Waaloa Way Bridge 4 | Inventory No. 52 | C | no effect | avoidance |
| | Waihi Gaging Station | Inventory No. 53 | A,C | no effect | avoidance |
| | Waihi Stream Stone/Mortar Dam | 50-80-14-6736/ No.54 | A | adverse effect | create more natural stream bed appearance |
| | Waiakeakua Gaging Station | Inventory No. 55 | A,C | adverse effect | create more natural stream bed appearance |
| | Manoa Tunnel Trail Steps No. 1 | Inventory No. 56 | C | no effect | avoidance |
| | **13b) Aquatic Habitat Mitigation, Proposal B (Manoa Stream)** | | | | |
| | Manoa Stream Channel | Inventory No. 41 | A,C | adverse effect | historic documentation |
| | Woodlawn Ditch | Inventory No. 42 | A,C | no effect | avoidance |
| | East Manoa Road Bridge | Inventory No. 44 | C | no effect | avoidance |
| | Lowrey Avenue Bridge | Inventory No. 45 | C | no effect | avoidance |
| | Kahaloa Drive Bridge | Inventory No. 46 | C | no effect | avoidance |
| | East Manoa Road Manoa Park Ditch Bridge | Inventory No. 47 | C | no effect | avoidance |
| | East Manoa Road Culvert | Inventory No. 48 | C | no effect | avoidance |
| | Kaamamilo Drive Driveway Bridge | Inventory No. 49 | C | no effect | avoidance |
| | | | | | |

**Table ~~27~~26. Historic Properties Potentially Affected by the Ala Wai Canal Project**

| | | | | |
|---|---|---|---|---|
| ~~Historic House (STR)~~ | ~~50-80-14-6737~~ | ~~C,D~~ | ~~no direct impact~~ | ~~no effect~~ |
| ~~Historic House (STR)~~ | ~~50-80-14-6738~~ | ~~C,D~~ | ~~no direct impact~~ | ~~no effect~~ |
| ~~Waihi Gaging Station (STR)~~ | ~~Inventory No. 53~~ | ~~A,C~~ | ~~no direct impact~~ | ~~no effect~~ |
| Waiakeakua Stream ~~(TCP)~~ | No SIHP Assigned | e | ~~reuse rocks from streambed~~adverse effect | ~~conditional no adverse effect~~micrositing to avoid significant resources |
| ~~Wa'aloa~~Waaloa Way Bridge 2 ~~(STR)~~ | Inventory No. 51 | C | ~~historic documentation~~ adverse effect | ~~conditional no adverse effect~~historic documentation / mitigation plan as needed |
| ~~Wa'aloa~~Waaloa Way Bridge 1 ~~(STR)~~ | no inventory number | none | ~~historic documentation~~ adverse effect | ~~conditional no adverse effect~~historic documentation |
| ~~Waiakeakua Gaging Station (STR)~~ | ~~Inventory No. 55~~ | ~~A,C~~ | ~~reuse rocks/improve appearance~~ | ~~conditional no adverse effect~~ |
| ~~Bridge Foundation (STR)~~ | ~~50-80-14-6744~~ | ~~C,D~~ | ~~no direct impact~~ | ~~no effect~~ |
| **4) Manoa: Woodlawn Ditch** ~~Detention Basin~~ | | | | |
| Open Space at Park ~~(N/A)~~ | No SIHP Assigned | none | not historic | not historic |
| ~~Woodlawn Ditch (STR)~~ | ~~Inventory No. 42~~ | ~~A,C~~ | ~~no direct impact~~ | ~~no effect~~ |
| ~~East Mānoa Road Mānoa Park Ditch Bridge (STR)~~ | ~~Inventory No. 47~~ | ~~C~~ | ~~no direct impact~~ | ~~no effect~~ |
| ~~East Mānoa Road Culvert (STR)~~ | ~~Inventory No. 48~~ | ~~C~~ | ~~no direct impact~~ | ~~no effect~~ |
| ~~Kaamamilo Drive Driveway Bridge (STR)~~ | ~~Inventory No. 49~~ | ~~C~~ | ~~no direct impact~~ | ~~no effect~~ |
| ~~Mānoa~~**5) Manoa: Manoa In-Stream Debris Catchment** | | | | |
| ~~Mānoa~~Manoa Stream Channel ~~(STR)~~ | Inventory No. 41 | A,C | ~~historic documentation~~ adverse effect | ~~conditional no adverse effect~~historic documentation |
| ~~Lowrey Avenue Bridge (STR)~~ | ~~Inventory No. 45~~ | ~~C~~ | ~~no direct impact~~ | ~~no effect~~ |
| ~~Kahaloa Drive Bridge (STR)~~ | ~~Inventory No. 46~~ | ~~C~~ | ~~no direct impact~~ | ~~no effect~~ |
| **6) Manoa: Kanewai Field Multi-Purpose Detention Basin** | | | | |
| Kanewai Field ~~(STR)~~ | Inventory No. 94 | C | avoid architecture/trees/seed | ~~conditional no adverse effect~~avoid architecture & trees, seed the new berm |

### 3.3 Location of Queen Ka`ahumanu's Home In Mānoa

During the April 30, 2022 Mānoa Town Hall meeting, a claim was made by a Manoa resident that a two story house on the site for the Proposed Action was the former home of Queen Ka`ahumanu's Mānoa Home. If true, the project site could be declared an important archaeological and historic site and its development potential as an affordable elderly rental project would be significantly compromised. However, an article from the April 10th, 1904 edition of the Sunday Advertiser discussed the location of the house foundation stones which were overgrown by thick lantana growth on a gently sloping hillside of Mānoa Valley's western foothills. A photo of the site was included with the 1904 article which also gave a panoramic outline view of the Ko`olau ridges in the back of Mānoa Valley, which forms the backdrop to the Lyon Arboretum. By comparing the outline of mountain peaks in the distance with a contemporary view from Google Earth taken from Mānoa Road, it was possible to approximate the location of Queen Ka`ahumanu's home as being on the western foothills and west of Manoa Road near the site of the Wai`oli Tea Room.

**FIG.3-19 1904 Photo With Outline of Mountain Ridge in Mānoa**

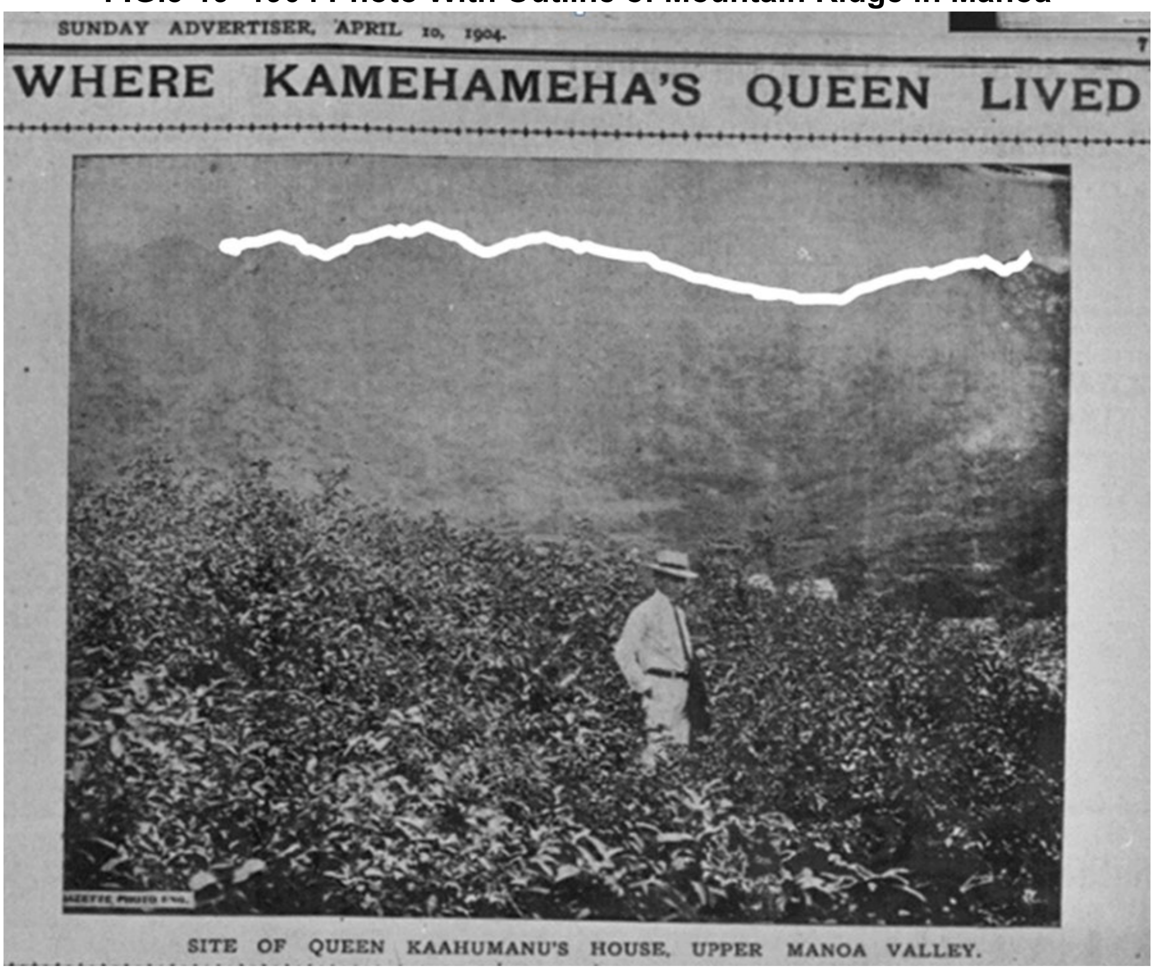


**FIG. 3-20 2019 Google Earth Photo of Mountain Ridge From Mānoa Road**

Another 1932 article gives the location of Ka'ahumanu's house as being "just beyond the junction of Manoa Road and Oahu Avenue … a green overgrown path leads off the highway to a to a tiny clearing, shaded by fine old *hau* trees and bushes in which there is a stone foundation of a former house." "The locations sited was that of the Wai`oli Tea Room at the Salvation Army Center, once the ranch of the Matano family and earlier in possession of King Kamehameha the III, and thus possibly the land of Ka`ahumanu." "It is certain that the house was on the Ali`i side of the valley, as Manoa was divided between the cool `ewa hillsides and the *taro kuliana of the maka`dinana o*f the valley floor and the eastern side."

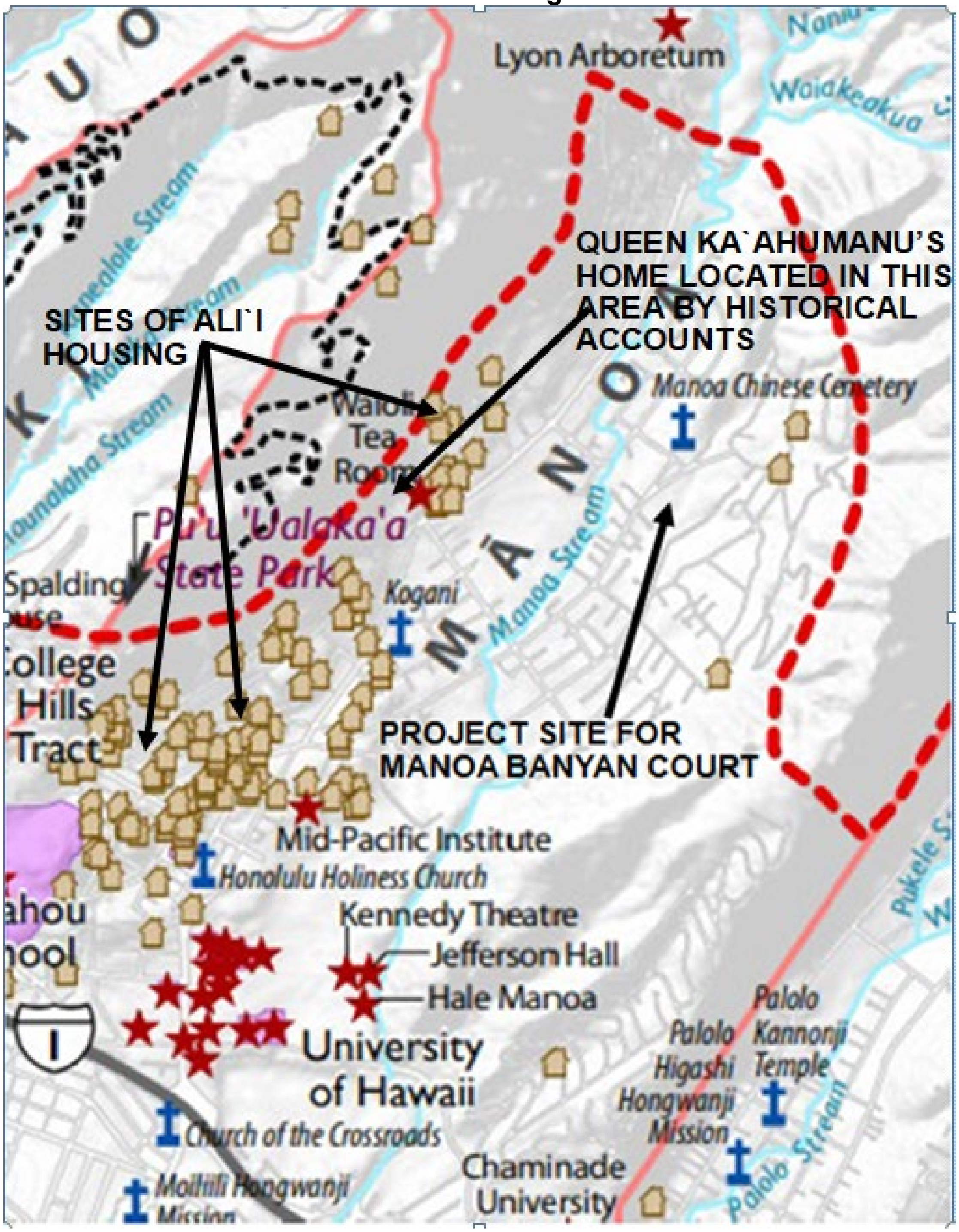
Section 3.4.1.4 on page 187 of the *Cultural Resources and Ethnographic Study for the Ala Wai Watershed Project* describes the division of Manoa Valley as follows.

*"3.4.1.4 Division of Manoa Valley*

Manoa Valley was once divided into two sections, one for the *ali 'i* and their retainers and one for the commoners. The *ali* 'i lived on the high, cooler western slopes; the commoners lived on the warmer eastern slopes and on the valley floor where they tended their irrigated taro fields (Bouslog et al. 1994 12). Mary Kawena Pukui has stated that:

In Manoa valley a low hill at the head of the valley and Rocky hill above Punahou are said by a kinswoman of mine to have marked the division between the chiefs and the commoners in that valley. The chiefs lived on the west half, the commoners on the east. The chiefs' excrement was buried secretly in the commoners' ground by the

**FIG. 3-21 Historic Homes Location Along Western Foothills of Mānoa**




keepers. (Mrs. Mary Pukui, Hawaiian Ethnological Notes, Vol. I, p 1378, cited in Sterling and Summers 1978:283)

The imaginary line from Puu-o-Manoa to Ka-pali Luahine marks the division of

Manoa; on the left called Manoa-alii, and on the right, Manoa-Kanaka. (Mrs. Mary Pukui 3/16/54, cited in Sterling and Summers 1978:283)

Pu'u Manoa is best known as Rocky Hill on the Punahou Campus. It seems that Kapaliluahine - the *mauka* reference point - is the small green hill in back of the Chinese cemetery (as illustrated by Sterling and Summers 1978).

Such a cognitive division of the va11ey suggests that the commoners - the vast majority of the populace - would have been buried on the east side of the valley. It may well be that the division of the valley into Manoa Ali'i and Manoa-Kanaka was drawn because the west side of the valley was generally higher and less swampy than the east side. It may have been drawn with regards to the experience of sunlight. The Manoa Ali'i of the valley would have the experience of the rising morning sun which was associated with values of ascendancy, tumescence, vigor and fertility, while the setting of the sun which i1luminates the Manoa-Kanaka side would have been associated with values of decay, senescence, and death.

The four known sites of pre-Contact burials in Manoa proper (Bath and Smith 1988; Smith and Kawachi 1989; the Koana Cave site; and the Dole Street site) a11 fall in Manoa-Kanaka, as defined by Pukui."

## 3.4 ETHNOGRAPHIC INTERVIEWS

Ethnographic interviews were conducted with knowledgeable persons on cultural practices in the study area. The transcripts of these interviews and more detailed study of the interviews are contained in the *Cultural Resources and Ethnographic Study for the Ala Wai Watershed Project,* ***Volume III*** *(Cultural Surveys Hawaii, 2010).* Interviewees described the extensive lo`i (irrigated agricultural terraces) that were once present within the Ala Wai watershed, noting that lo'i could serve as a valuable tool for teaching younger generations about traditional Hawaiian practices, as well as providing natural filtration and improving water quality. They described the role of agriculture within the community, explaining the value of living off natural resources as part of the traditional Hawaiian culture and protecting the land as a source of life.

Several participants recalled swimming in the streams during their childhood in areas downstream of Woodlawn Bridge and areas along Palolo stream. They also noted several areas of lo'i used to grow *kalo* (taro) including Ka Papa Lo'i o Kanewai and 'Aihualama Lo'i in Mānoa. Other plants that were gathered included Laua'e in Mānoa and Makiki Valleys. The interviewees also noted that the areas along the streams and waterways were inhabited by native Hawaiians and indicated the potential for encountering burials (especially in the Waikiki area).

Of the several interviewees, the person with the most relevance to the Proposed Action is Ms. Evelyn Giddings who has lived much of her life in the area of the Manoa Chinese Cemetery. She was interviewed on November 17, 2009.[6] Following are relevant highlights from Ms. Giddings interview.

Ms. Giddings was born in Pāʻauhau on the island of Hawaiʻi in 1925 and has lived in Manoa since 1941. Ms. Giddings was a professional artist specializing in metal sculpture and enameling and is well-known for the many Hawaiian themed murals, lithographs, paintings and public works of art created during her thirty years living in Hawaiʻi (1949–79) with most of her artwork focused on Hawaiian floral and faunal themes. A self-trained botanist and horticulturalist, for the past six decades, Ms. Giddings often volunteered her time composting gardens around Oʻahu. She developed the composting system at the organic garden at the foot of the Mānoa Chinese cemetery and is a vital part of the operations of this small, private community garden (in the project area).

For the past 15 years, Evelyn has lived in the home of (now deceased) ethnobotanist, Beatrice Krauss, behind Mid-Pacific. Before that she lived for 54 years in her family home two blocks above the Waioli Tea Room on Mānoa Road, though she spent two of those years living in a Quonset hut in Waimānalo. Evelyn has three daughters, Ann and Lynn and a *hoʻokama* daughter (adopted)—Morlee Walters—who was included in their family at the age of thirteen. Evelyn has ten grandchildren. She recalls with affection growing up in Mānoa and her many explorations of the *mauka* areas with her younger brother Don, "Of course we loved the water, we loved the stream, playing … rock-hopping … sailing boats down … the streams … I feel very close to Mānoa stream because we used to play in it." The *mauka* region of Mānoa is known for a number of cultural and historic places. Evelyn and Don found a wall she believes was a Hawaiian habitation site, "it was the remains of a house … rock walls … fairly close to a narrow stream … I don't know which stream it was, there were so many tributaries." Evelyn notes that at that time, before Mānoa School was built, from mid-Mānoa (where the school is now) it was "wilderness and farms where people were growing bananas, *ti* leaves and ginger." She believes the rock wall alignment was somewhere between Paradise Park and Puʻu Pia. In post-Contact times "*aliʻi* [chiefs] had retreats in the area above Paradise Park.… In Mānoa, one of the queens had a bath in or near the river."

"They owned the land *makai* of where the cottages are now. Beautiful big trees [like] Jacaranda. I'd drive by on Mānoa Road. I'd see that land and imagine houses on a winding road with full grown trees. When it was finally developed, they whacked it all down. They cut all the trees down [and] made a desert out of the whole thing. And they made the straight roads terrible. During a rainstorm, it washed all the topsoil off the hill. All the people that lived between Mānoa Road and Oʻahu Avenue—their yards were full of silt. How nice it would've been if the road was just meandering."

During the war years, temporary housing was built where the Mānoa Market Place and UH faculty housing is now, "they were made from canek, sugar cane—*bagasse*," When Mānoa School was built, "There was so much rain … the pylons had to be so deep … *bunkachick, bunkachick, bunkachick* [onomatopoeic imitation sound of construction] and [they found] so many artifacts from Chinese *loʻi* times." *Mauka* of the school there was a Buddhist temple on Mānoa Road. There was also a Hawaiian church. Every Sunday morning Ms. Giddings would hear the gong from the temple: Above Lowrey Avenue on East Mānoa Road, there was a big property owned by a Chinese family (possibly the Wong family home).

Pointing to the aerial map of Mānoa Valley, Ms. Giddings commented, “There are two *heiau* that I know. One is on the Cooke Estate on Mānoa Road and the other is behind a house on Ānuenue Street and you can get there through O‘ahu Avenue where the orchid grower used to be” and where the Koganji Tendai Buddhist Temple is now.

The Mānoa Chinese Cemetery has been a part of Ms. Gidding’s life since she was a girl. She remembers as early as the 1940s hearing the funeral activities. “Comes a truck full of musicians. You could hear the drums; the fire crackers, hear the funerals.” Ms. Giddings shared the inspiration for one of her murals: “When researching for a mural project for Lunalilo School, I found that at his father’s request Lunalilo had been buried, wrapped in a rare green feather cloak. I had thought of green mountains being a metaphor to express *iluna* [above, upward] with the green cloak. One day when I was in the [Chinese] cemetery, I saw on the ‘Ewa side of the valley, a form very much like a cloak draped over shoulders. When I am in the cemetery this formation reminds me of Lunalilo.”

Ms. Giddings remembers that “there was always something growing [at the foot of the cemetery].” The Filipino groundskeepers would grow bunch onions. Evelyn would visit the cemetery to collect *pilau pīkake* (unsure, *Jasminium sambac*) for lei-making with her daughters. They would sit in a circle with the lei needle and pass the string around and each would add their flowers to the string. When the lei was finished it would be uneven, “but anyway, there were beautiful lei!” Ms. Giddings has been working in the Mānoa organic garden at the base of cemetery for 12 or more years, “since Neal Soicher moved to the Big Island and handed the garden over to Elko [Evans]. I [know] about composting, and I came with the equipment [*laughs*].” Working in the garden over the years she has found shards of glass and ceramic pottery from “former civilizations”— the remnants of former workers in the area over the years. “We had a gallon jar half full of shards. But we never found any bones. The only bones are in the Bone House of the cemetery [where family remains are stored in crockery or other containers awaiting their eventual return to native China].”

**FIGURE 3-22 CULTURAL LANDSCAPE MAP OF PLACES IDENTIFIED IN CSH INTERVIEWS AND COMMUNITY CONSULTATION**

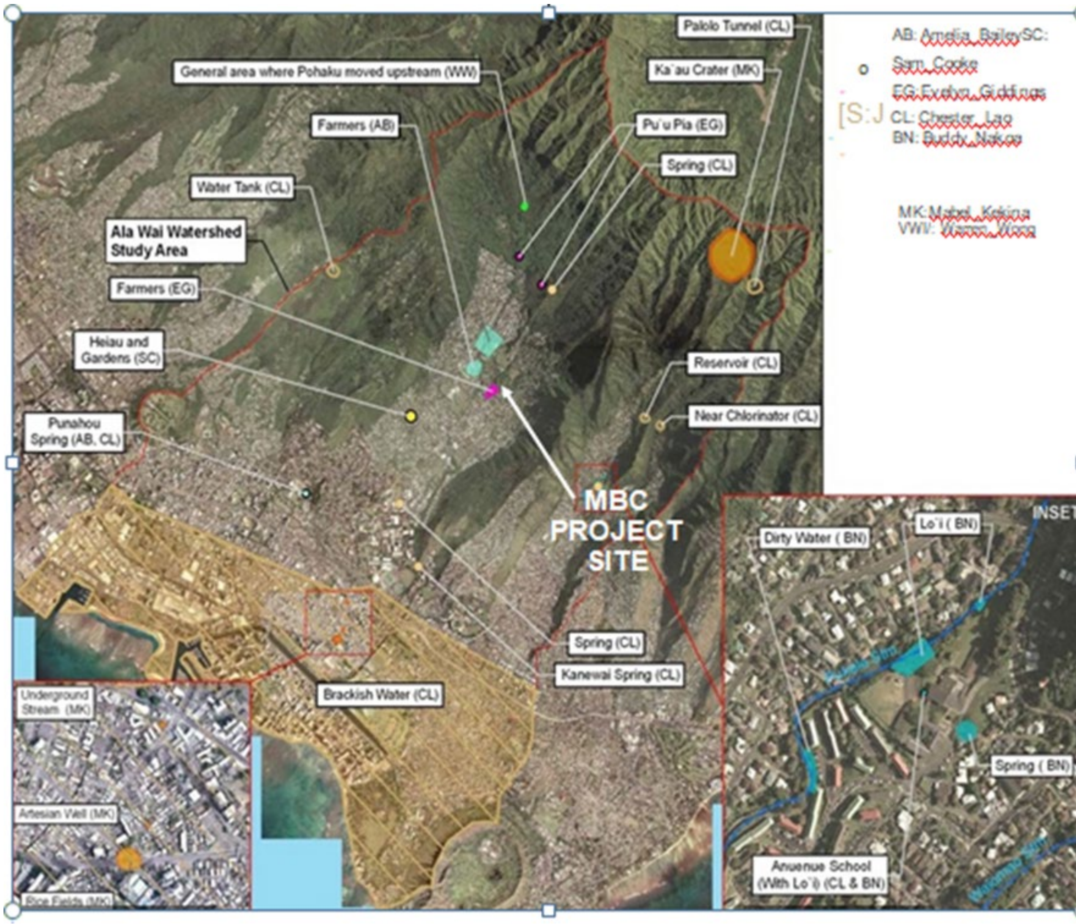



**FIG. 3-23 LUNALILO SCHOOL (copper enamel) MURAL DEPICTING LUNALILO'S GREEN CLOAK AND 21 THUNDER CLOUDS**

## 3.5 Impacts and Mitigation

**a) Existing Structures -** Existing structures on the site for Mānoa Banyan Court Phase 2 (TMK: 2-9-043:02 CPR Parcel D-3) would be demolished with debris sent to an approved facility to clear the area for new construction. These structures are not considered eligible for historic listing, are in poor condition and have no intrinsic value. Therefore, no significant impact to historic properties would occur, and no additional mitigation is required.

**b) Historical, Archaeological, Cultural and Ethnographic Surveys -** The three volumes of the historic, archeological, cultural and ethnographic surveys covering the site for the Woodlawn Ditch Detention Basin (congruent with the site for the Proposed Action), were prepared comprehensively in accordance with the National Historical Preservation Act (NHPA), Section 106, and HRS 6E, with a determination within the USACE/DLNR Ala Wai Canal Flood Risk Management Study Environmental Impact Statement, that the site for the Proposed Action is "Not Historic". Therefore, there appears no necessity to repeat these studies and no further mitigation is required.

Because the Project Site was previously used for small farms and lo'i fields, (see photos in Figs. 3-2 and 3-3) and has been unused for decades, it is unlikely that human burials are to be found. However, there is still the potential for subsurface archaeological deposits to be present. In order to minimize any potential impact on these resources, However, historic and prehistoric human remains from non-federal, non-tribal lands are subject to protection under the state's burial law(s) (Hawaiian Administrative Rules §13-300, <u>Rules of Practice and Procedure Relating to Burial Sites and Human Remains</u>, and Hawaii Revised Statutes 6E-43,6, <u>Inadvertent Discovery of Burial Sites</u>). As such, if human remains are discovered during ground disturbance and/or construction, work on that portion of the project shall stop immediately. The remains shall be covered and/or protected in place in such a way that minimizes further exposure, and damage to the remains, and the Contractor shall immediately consult with the SHPO and O`ahu Island Burial Council. A treatment plan shall be developed in accordance with Hawaiian Administrative Rules 13-300-1. The Developer shall ensure that any approved treatment and reburial plan is fully implemented.

**c) Queen Kaahumanu's Home –** Based upon the historic and photographic evidence, newspaper accounts and traditional Hawaiian sites selected for ali`i and other high ranking persons

Queen Kaahumanu's home was not a two story house on the project site as erroneously claimed. This conclusion is reinforced by the map of historic homes in Mānoa shown in Fig. 3-21. This map shows a concentration of early historic homes along the eastern slope of Mount Tantalus so as to benefit from the early rays of the morning sun. This conclusion is further reinforced in book, *"Manoa, The Story of a Valley."*[7] This book places the house in the area of the Waioli Tea Room and nowhere near the site for the Proposed Action. This false claim is therefore refuted and no further action is required.

---

[1] AMR for the Woodlawn Drive Water System Improvements (Part II) Project, Mānoa, Waikīkī, Honolulu, O`ahu TMKs: [1] 2-9-041,042, 047 through 049,059,070: Page 21
[2] Ibid
[3] Table 45. Real Estate Requirements for the Tentatively Selected Plan; Ala Wai Canal *Feasibility Study With Integrated Environmental Impact Statement*; U.S. Army Corps of Engineers; Public Review Draft Report; Aug. 2015; Page ES-7; Page 8-10.
[4] Table 45. Real Estate Requirements for the Tentatively Selected Plan; Ala Wai Canal *Feasibility Study With Integrated Environmental Impact Statement*; U.S. Army Corps of Engineers; Public Review Draft Report; Aug. 2015; Page ES-7; Page 8-10.
[5] Associated Press; Aug. 20, 2020; published in West Hawaii Today; Oct. 18, 2021
[6] Cultural Surveys Hawaiʻi Job Code: AWRP 17 Interviews
Cultural Resources and Ethnographic Study for the Ala Wai Watershed Project, Volume III: Ethnographic Study
7 "*Manoa, The Story of a Valley*"; Pgs. 198-199; Copyright © Jan 1, 1994 by Mutual Publishing, Honolulu Hawaii.

***(This page purposefully left blank)***

.

# 4 PUBLIC RESOURCES

## 4.1 EMERGENCY SERVICES

### 4.1.1 Honolulu Fire Department

Fire protection services at the Project Site would be provided by the City and County of Honolulu Fire Department (HFD). The closest fire station to the Project Site is the Mānoa Fire Station which is about 0.71 miles from the project site. Other fire stations that could access the site are the Makiki Fire Station (1.9 miles) and the McCully Fire Station (1.4 miles). The Project Site is located on East Mānoa Road and is easily accessible by public roadways wide enough to permit access by fire apparatus. Fire apparatus access could be provided via East Mānoa Road and/or from Lower Road. Two fire hydrants are located adjacent to the project site along East Mānoa Road and lie within 400 ft of the residential structures proposed for Lot D-3 and Lot D-4 (Fig. 4-1 Nearby Facilities and Services). Two fire hydrants are also located along Lower Road and would provide coverage for structures on Lots D-5 and D-6. An additional fire hydrant is located on the mauka (cemetery) side of Pakanu Street about one hundred feet from the intersection of Pakanu Street with East Mānoa Road which could serve the Community Center. An additional fire hydrant is located about midway of the triangular parcel on Old East Mānoa Road (See Fig. 4-1).

#### 4.1.1.1 Impacts and Mitigation

The Proposed Action would be constructed in accordance with the Uniform Fire Code, as amended by the City. A fire protection system would be installed, including an automatic fire sprinkler system, smoke detection system, heat detection system, carbon dioxide-based automatic fire suppression system, manual fire extinguishers, audio/visual signaling devices and fire alarm system. A dry standpipe system would be provided at the emergency exit stairwell and other areas as required by the Uniform Fire Code. No short-or long-term significant impacts to the provision of fire services are anticipated, and no additional mitigation is required.

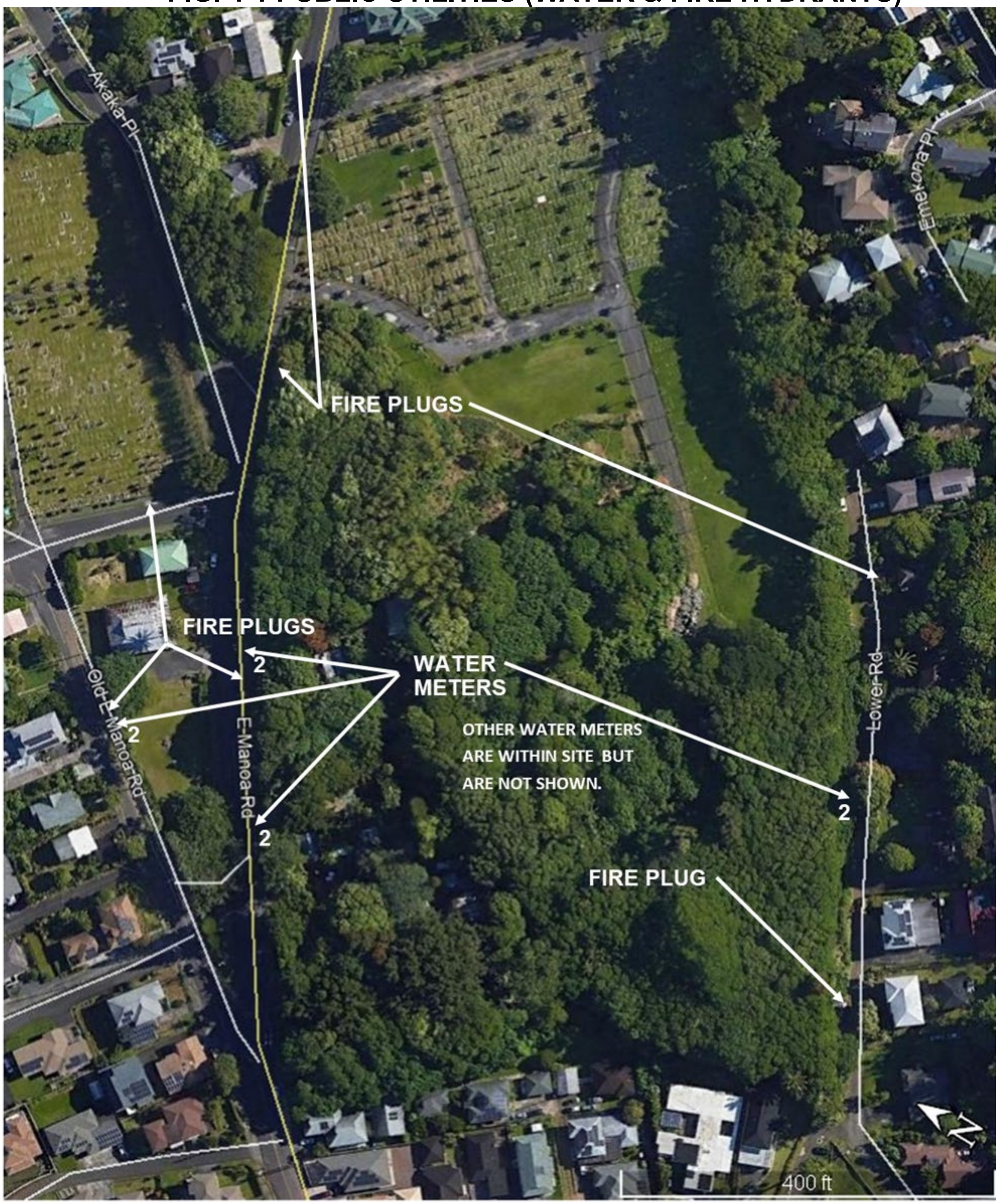
### 4.1.2 Honolulu Police Department

Police services would be provided by the City and County of Honolulu Police Department (HPD). The Project Site falls within District 7 – East Honolulu, Sector 1, which is served by the Alapaʻi Police Headquarters, located approximately three miles west of the Project Site. Other stations with proximity to the Site include the Waikīkī Substation (4.5 miles) and Downtown Substation (5 miles).

#### 4.1.2.1 Impacts and Mitigation

The Proposed Action may require the use of signalers or off-duty police officers to direct traffic and emergency vehicles to minimize any potential disturbance by construction activities to normal traffic flow. The Contractor would be responsible for communicating and arranging HPD support during scheduled construction activities, as necessary. The Contractor would also be responsible for providing and using necessary safety devices (e.g. signs, lights, barricades, etc.) during construction to ensure public safety. No short- or long-term significant impacts are anticipated, and no additional mitigation is required.

**FIG. 4-1 PUBLIC UTILITIES (WATER & FIRE HYDRANTS)**



### 4.1.3 Honolulu Emergency Services Department

Emergency medical services would be provided by the Emergency Medical Services (EMS) Division of the City and County of Honolulu Emergency Services Department. The Project Site is served by District 2, which includes the southeast region of O‘ahu. The EMS, in coordination with the HFD, would be responsible for responding to medical emergencies on the site. After-hours care, private medical facilities, and emergency response facilities are located within proximity to the project site. The closest hospital is Kapi‘olani Medical Center for Women and Children, located approximately 2.5 miles southwest of the Project Site on Punahou Street. Other facilities within close vicinity include Kaiser Permanente (Pensacola St.) and Straub Medical Center on South King Street, Kuakini Medical Center on Kuakini Street, and Queen’s Medical Center on Punchbowl Street.

#### 4.1.3.1 Impacts and Mitigation

Since the Proposed Action primarily serves elderly residents, the Proposed Action may create a slight increase in demand for emergency services that already responds to Mānoa Valley neighborhoods. No short-or long-term significant impacts are anticipated, and no additional mitigation is required.

## 4.2 PUBLIC FACILITIES

### 4.2.1 Education

The Project Site is located within the Hawai‘i State Department of Education’s (DOE) Kaimukī-McKinley-Roosevelt Complex Area, which currently includes nineteen elementary schools, five middle schools, three high schools, five charter schools, two special schools and two community schools. The nearest public-school facilities include Kaimukī High School, Voyager Public Charter School, Noelani Elementary School and Hōkūlani Elementary School all located within 3.5 miles of the Project Site. However, due to the Project serving primarily elderly residents, the number of resident school-age children, if any, is expected to be very small.

#### 4.2.1.1 Impacts and Mitigation

Educational facilities in vicinity of the Proposed Action are deemed sufficient. Owing to the small number of children likely to be residing within the elderly occupied units, no short-or-long term significant impacts on education facilities are anticipated, and no additional mitigation is required.

### 4.2.2 Recreation

The Kalaepōhaku neighborhood park (Mānoa District Park) offers a variety of recreational facilities in close proximity to the Project Site (walking distance of 0.35 miles) which is operated and managed by the City and County of Honolulu Department of Parks and Recreation (DPR). Along with general park management and maintenance, the

DPR offers various recreation and community programs to the community, including culture and arts, arts and crafts, sports, aquatics, therapeutic recreation, and senior citizen special event programs. The Mānoa District Park features a public recreation complex with softball fields, basketball, tennis courts, and an outdoor lap pool (*see* Figure 4-1 Map of Nearby Facilities and Services).

#### 4.2.2.1 Impacts and Mitigation

The Proposed Action would allow residents to enjoy a variety of recreational activities in close proximity to the Project including recreational gardening in the project's community garden area located within the Project Site. No short or long-term significant impacts are anticipated, and no additional mitigation is required.

## 4.3 UTILITIES

### 4.3.1 Water

Potable water at the Project Site is supplied by the City and County of Honolulu Board of Water Supply (BWS). There is currently one twelve-inch water main on East Mānoa Road. On Lower Road there is an eight-inch main which reduces to a four-inch main about two hundred feet before the end of the road. There are ten water meters serving the main Project Site including the existing two old houses on the site. A listing of these meters as provided by the Honolulu Board of Water Supply is shown in Table 4-2 following. There are five fire hydrants located within the vicinity of the Project Site as noted in Section 4.1.1 preceding and shown in Figure 4.1.

**TABLE 4-1 WATER SUPPLY METERS FOR TMK 29043002**

| PREMISE_ID | MTR BADGE_NUM | ADDRESS | METER SIZE |
|---|---|---|---|
| 6828344045 | 96040073 | 3349 E MĀNOA RD | 1” |
| 8706027462 | 96022782 | 3349A E MĀNOA RD | 5/8” |
| 9673283136 | 00214744 | 3459 E MĀNOA RD | 5/8” |
| 3342065537 | 00214745 | 3419A E MĀNOA RD | 5/8” |
| 5317403478 | 03060298 | 3355 E MĀNOA RD | 1-1/2” |
| 1901153923 | 00214741 | 3419 E MĀNOA RD | 5/8” |
| 3138788404 | 00214742 | 3355 E MĀNOA RD | 5/8” |
| 0944756078 | 01022657 | 3419B E MĀNOA RD | 5/8” |
| 8222291652 | 00317842 | 3355B E MĀNOA RD | 3/4” |
| 5594205504 | 96040429 | 3349B E MĀNOA RD | 1” |

**FIG. 4-2 NEARBY FACILITIES & SERVICES**


Google Earth Photo

#### 4.3.1.1 Impacts and Mitigation

A letter from the Board of Water Supply (BWS) dated March 31, 2021 stated that the existing water supply system serving the property is adequate for the proposed affordable housing development (Appendix D). If necessary to incorporate improvements to the existing water infrastructure to accommodate the anticipated water demand on-site, these improvements will be provided. The final project design would incorporate water system BMPs and mitigation measures that are consistent with LEED Silver certification status. Final design and siting of water lines and connections would be determined during the design phase and submitted to BWS for review and approval. Therefore no short or long-term significant impacts are anticipated, and no additional mitigation is required.

## 4.3.2 Wastewater

Wastewater services at the Project Site are provided by the City and County of Honolulu Department of Environmental Services (DES). In February and March 2021, Lin Yee Chung Association applied for and received approval from the Department of Environmental Services for the proposed total of 288 one-bedroom residential units that sewer capacity was adequate (Appendix D). Sewer utility access holes are located along East Mānoa Road and on Lower Road.

**4.3.2.1 Impacts and Mitigation**

The Proposed Action would incorporate a connection to the existing sewer lateral in East Mānoa Road. Final improvements would be determined by the Department of Environmental Services. The five CPR Lots would remain within the total capacity allocated for wastewater Infrastructure as per the determination of the Department of Environmental Services Wastewater Division. No short-or long-term significant impacts are anticipated, and no additional mitigation is required.

## 4.3.3 Drainage

A Preliminary Drainage Assessment was prepared by G70 in September 2022 intended to provide a preliminary assessment of the application of the City and County of Honolulu's Drainage Standards to the proposed Mānoa Banyan Court project. A brief summary of the report is presented here and the full report is available in Appendix D.

**FEMA Flood Zone**

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), community-panel number 15003C0360G, the site is located in Zone X, “areas determined to be outside of 0.2% annual choice floodplain”. Woodlawn Ditch is within Zone “X”.

**FIG. 4-3 FEMA FLOOD MAP (From Appendix in Drainage Assessment Report)**

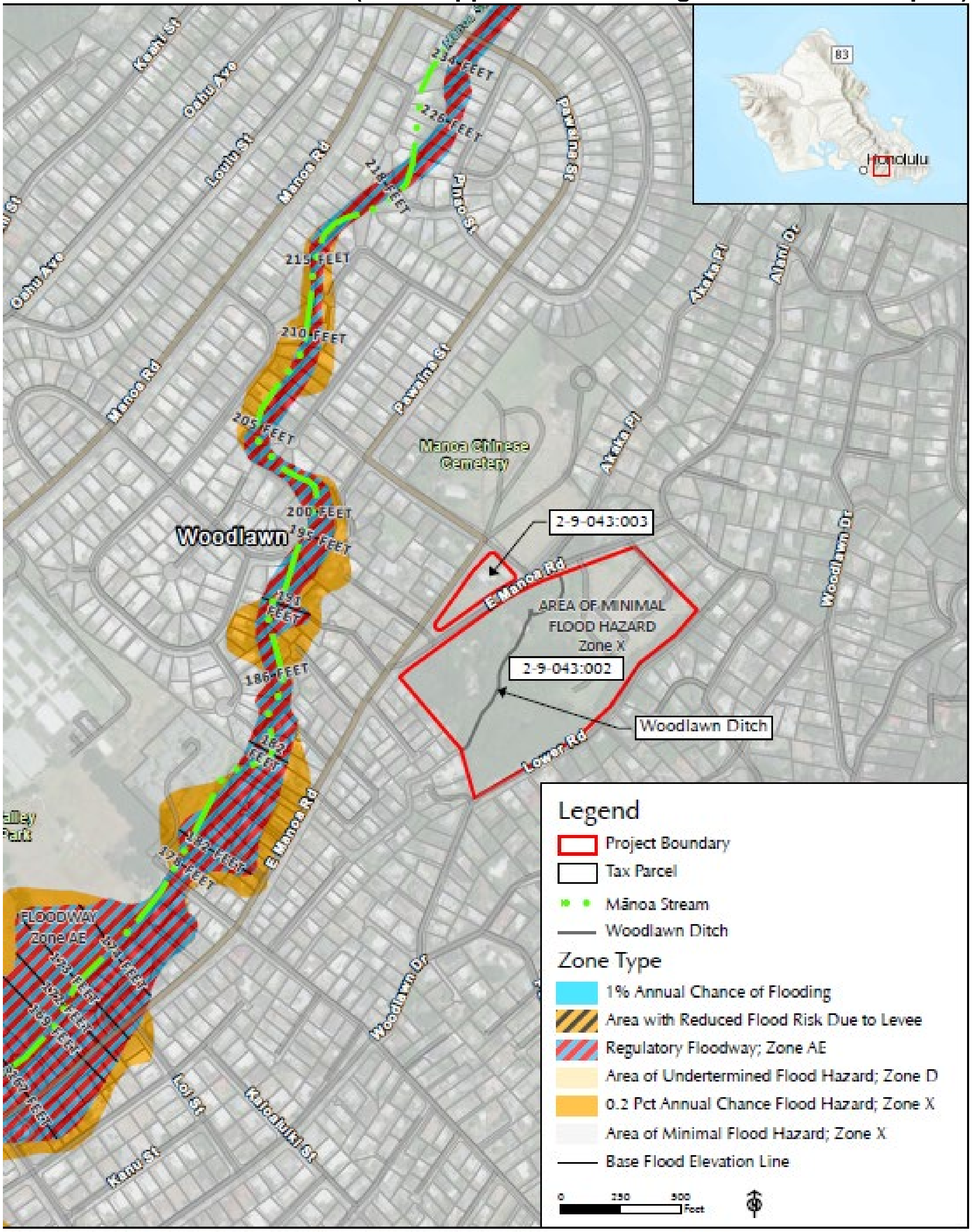



Figure 3 - FEMA Flood Map
Mānoa Banyan Court

G70

## FIG. 4-4 PROPOSED DRAINAGE MAP

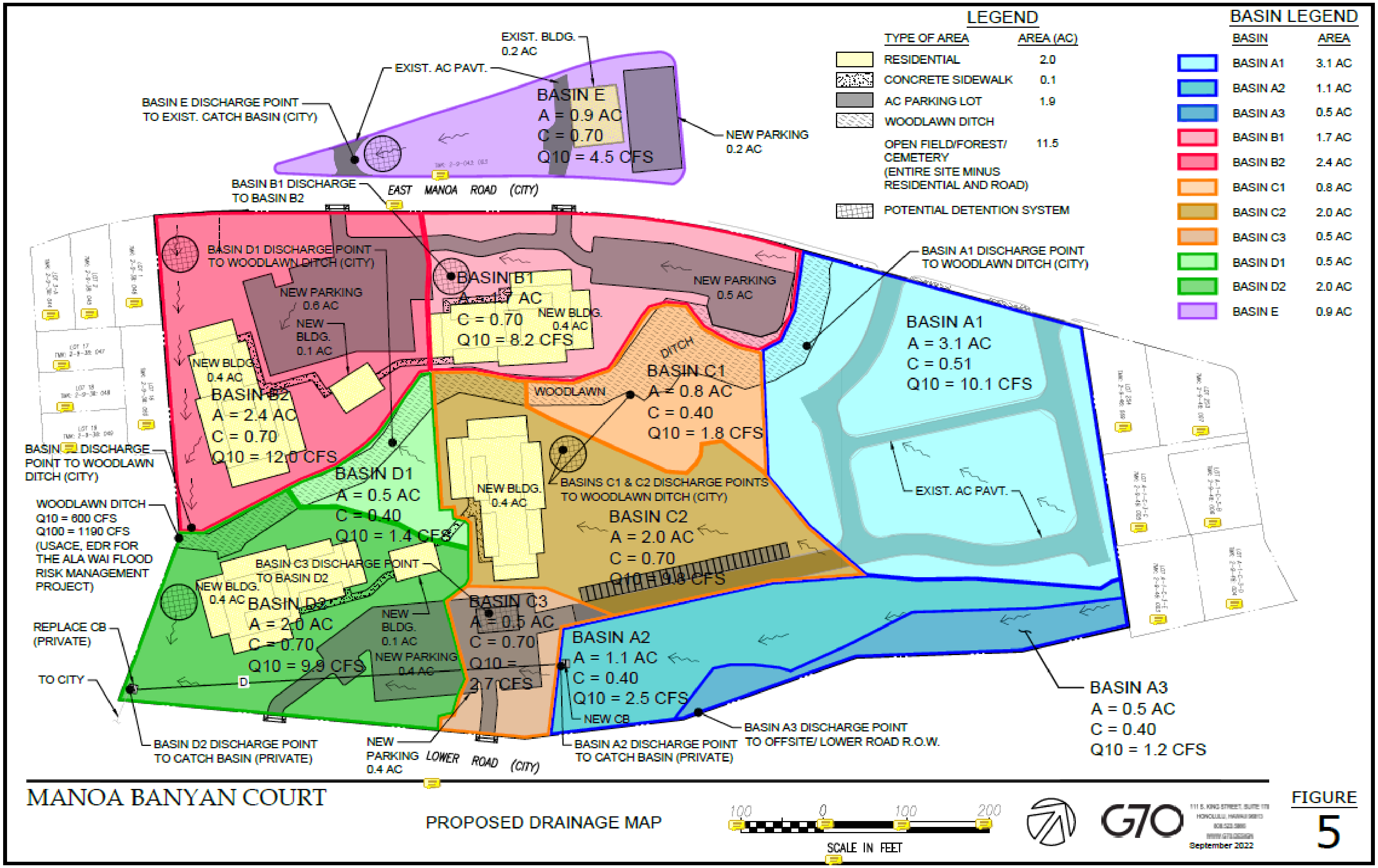


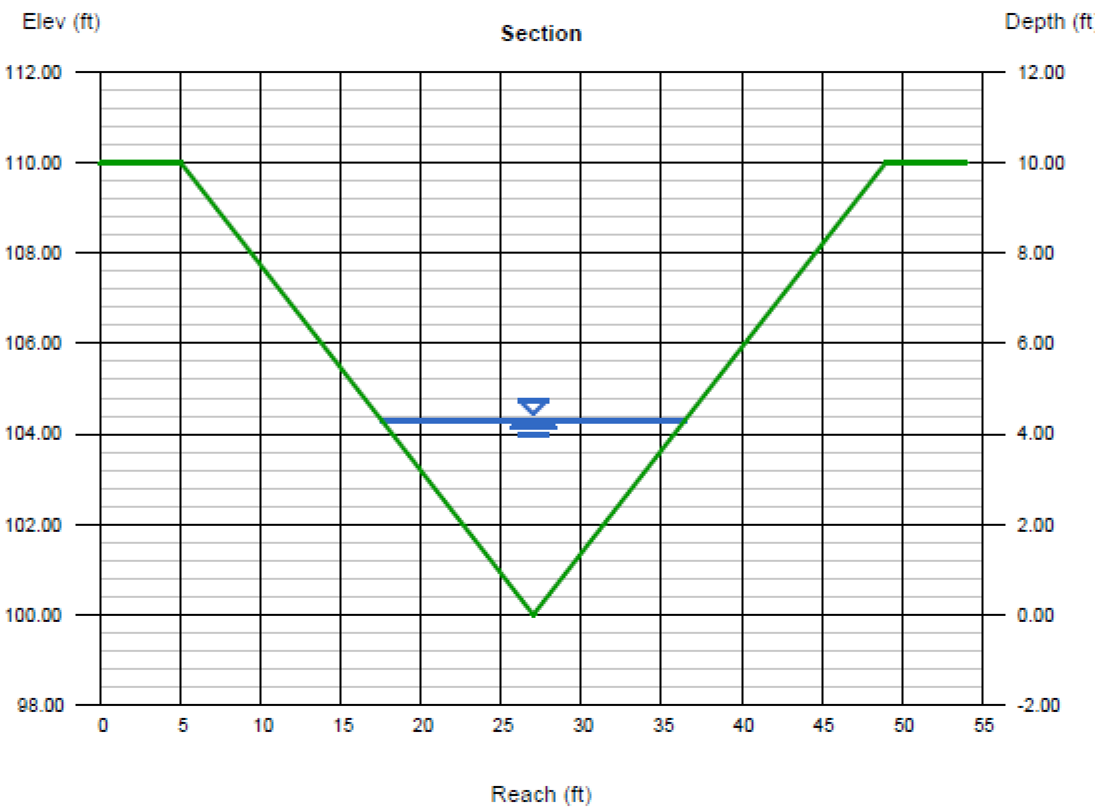
FIG. 4-5: CHANNEL REPORT Woodlawn Ditch Q10

# Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Sep 8 2022

## Woodlawn Ditch Q10

| | | | |
|---|---|---|---|
| **Triangular** | | **Highlighted** | |
| Side Slopes (z:1) | = 2.20, 2.20 | Depth (ft) | = 4.29 |
| Total Depth (ft) | = 10.00 | Q (cfs) | = 600.00 |
| | | Area (sqft) | = 40.49 |
| Invert Elev (ft) | = 100.00 | Velocity (ft/s) | = 14.82 |
| Slope (%) | = 5.00 | Wetted Perim (ft) | = 20.73 |
| N-Value | = 0.035 | Crit Depth, Yc (ft) | = 5.41 |
| | | Top Width (ft) | = 18.88 |
| **Calculations** | | EGL (ft) | = 7.70 |
| Compute by: | Known Q | | |
| Known Q (cfs) | = 600.00 | | |

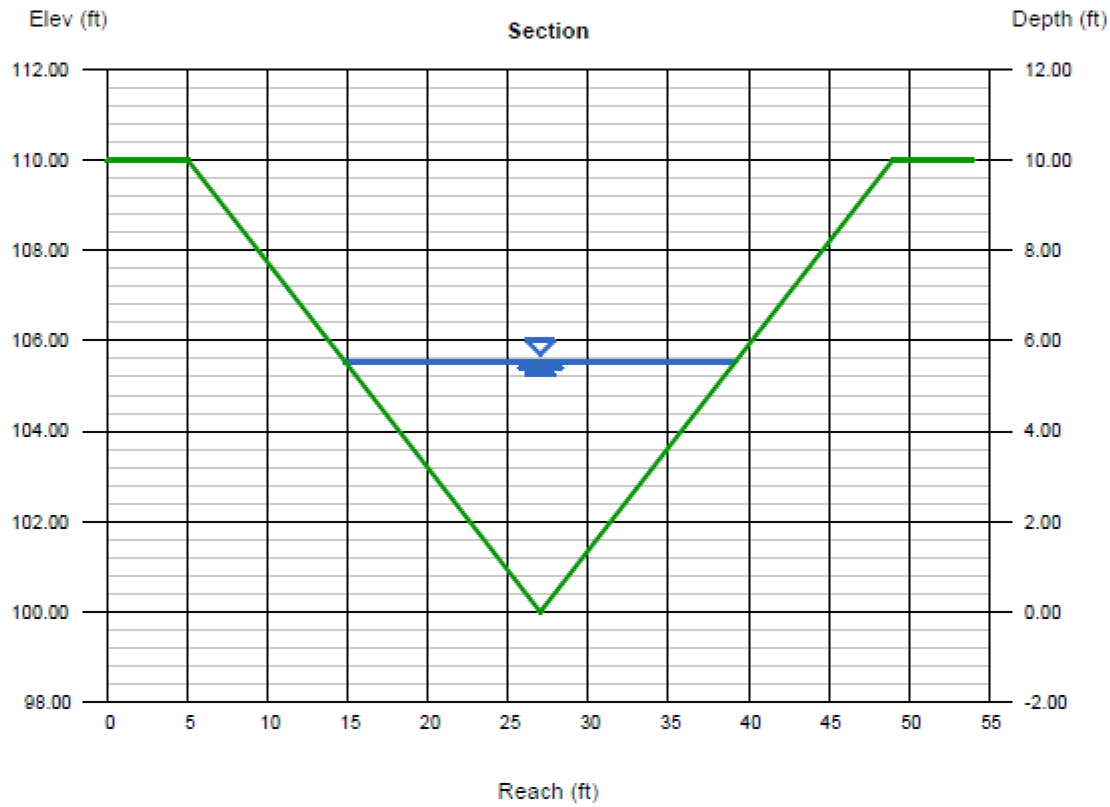


## Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Sep 8 2022

### Woodlawn Ditch Q100

| | | | |
|---|---|---|---|
| **Triangular** | | **Highlighted** | |
| Side Slopes (z:1) | = 2.20, 2.20 | Depth (ft) | = 5.55 |
| Total Depth (ft) | = 10.00 | Q (cfs) | = 1,190 |
| | | Area (sqft) | = 67.77 |
| Invert Elev (ft) | = 100.00 | Velocity (ft/s) | = 17.56 |
| Slope (%) | = 5.00 | Wetted Perim (ft) | = 26.82 |
| N-Value | = 0.035 | Crit Depth, Yc (ft) | = 7.12 |
| | | Top Width (ft) | = 24.42 |
| **Calculations** | | EGL (ft) | = 10.34 |
| Compute by: | Known Q | | |
| Known Q (cfs) | = 1190.00 | | |




**Channel Reports**

The two Channel Reports shown above are generalized cross sections of Woodlawn Ditch. The first cross section, Q10, is taken at the top of the property where Woodlawn Ditch emerges from under East Mānoa Rd. The second section, Q100, is taken where Woodlawn Ditch leaves the property at the southern property line.

**Other Studies/As-Builts**

The flood study reports used for this preliminary drainage assessment include *Engineering Documentation Report for the Ala Wai Flood Risk Management Project, by U.S. Army Corps of Engineers (July 16, 2020)*, *Technical Summary Report Mānoa Watershed Project, by Oceanit (December 2008)*, and *Ala Wai Canal Project Feasibility Study Appendix A, by Oceanit (December 2008, edited in February 2017)*. The project site is in the Mānoa Sub-Watershed which is one of the watersheds in the Ala Wai Canal flood study, by the U.S. Army Corps of Engineers. Woodlawn Ditch is a part of the drainage infrastructure in the Mānoa Sub-Watershed and thus is included in the flood study. Analysis from this study is included for reference in this report.

**Methodology and Hydrologic Calculations**

In conformance with the City and County of Honolulu's *Rules Related to Strom Drainage Standards (2017)*, the Rational Method was used to determine 10-year peak flows for the existing and proposed drainage basins located within the project area because the tributary areas are less than 100 acres. The Rational Formula, **Q = C I A**, calculates the design storm discharge for this project.
Where:
Q = Storm runoff peak flow rate, cubic feet per second (cfs)
C = Runoff coefficient, (C-value)
I = Rainfall intensity, (in/hr.) (National Oceanic and Atmospheric Administration Precipitation Frequency Data Server)
A = Drainage area, (acres)
Runoff coefficients (C-values) were based on the landcover.

**Table 2** in the Preliminary Drainage Report shows the primary C-values used.

**RUNOFF COEFFICIENTS**
**Land Cover C-Value**
Residential/Apartment area 0.70
Roof 0.90
Pavement 0.90
Landscaping and planting area, flat pervious area, cemetery area 0.40
The site is bisected by an existing dry ditch, known as Woodlawn Ditch, which is understood to not be under the jurisdiction of the U.S. Army Corps of Engineers and is not classified as a wetland or "water of the United States".

**4.3.3.1 Impacts and Mitigation**

The concluding paragraph of the Drainage Assessment Report summarizes the main findings and conclusion as quoted below.

"Other than Woodlawn Ditch, which bifurcates the Project Site, there is currently no surface drainage system for these two development parcels. Natural storm drainage via downspouts from roofs, parking areas and ground surface drainage would be retained on site to the extent possible with overflow, if any, directed to Woodlawn Ditch which connects with Mānoa Stream south of the project site. The proposed conceptual grading and drainage design for the proposed development is anticipated to be in accordance with the *City and County of Honolulu Storm Drainage Standards (2017)*. The proposed drainage system for the Mānoa Banyan Court project, as indicated conceptually in this report and on plans to be prepared, would not result in any significant increase in the peak stormwater runoff utilizing peak flow attenuation through onsite detention systems. Therefore, the proposed development of the project is not anticipated to create any adverse drainage impacts to Woodlawn Ditch and the surrounding properties. Compared to the overall Q in Woodlawn Ditch per the Engineering Documentation Report by USACE, the project's impact to flow rates are negligible to Q10 = 600 cfs / Q100 = 1190 cfs, estimated to be conveyed within Woodlawn Ditch at the downstream end of the project site. The proposed stormwater quality sizing is anticipated to meet the requirements of The City and County of Honolulu's *Rules Relating to Water Quality (August 16, 2016, as amended)*."

### 4.3.4 Solid Waste

Solid waste collection and disposal service is provided by the Environmental Services Division (ENV) for incineration at the Campbell Industrial Park's H-POWER Plant or for landfill disposal. A solid waste collection system will be provided on site for use by residents.

#### 4.3.4.1 Impacts and Mitigation

The Proposed Action would dispose of construction and demolition material at the PVT landfill in Waiʻanae. Contractors would adhere to stringent BMPs to ensure no significant impact would occur to the surrounding area. No short- or long-term significant impacts are anticipated, and no additional mitigation is required.

### 4.3.5 Power and Communications

Electrical power on the island of Oʻahu is provided by HECO. Telephone, cable TV, and internet service is provided in the area by Hawaiian Telcom, Spectrum, with cell phone service provided by several service providers. The local Community Access Television service is provided by Spectrum Enterprise.

#### 4.3.5.1 Impacts and Mitigation

A letter from HECO was received on 10/18/2022 by LYCA confirming ability to serve the Proposed Action with electric power. No significant impacts are anticipated, and no additional mitigation is required.

### 4.3.6 Piped Natural Gas Supply

Hawai`i Gas has indicated that there is no natural gas supply directly available or adjacent to the project site. However there is an underground supply line that ends at the intersection of E. Mānoa Rd. and Molulo St. which is only about 70 feet from the Southwest corner of the site. Notification was received from Hawai`i Gas that the existing line can be extended to the project site for a standard fee if Mānoa Banyan Court agrees to utilize Hawai`i Gas throughout the Proposed Project.

#### 4.3.6.1 Impacts and Mitigation

The Proposed Action would have access to existing power in the area. Natural Gas service can be extended to the project site from a nearby underground supply. The final project design would seek to implement new technologies and innovations that support Honolulu's commitment to reaching carbon neutrality by 2045. Increased storage opportunities and energy generation strategies would be incorporated into the building design to promote long-term energy efficiency on-site. Energy demand and usage per housing unit would be comparable to existing housing in the surrounding neighborhood. Residential and common area non-residential spaces at the Project Site would be metered separately. No short- or long-term significant impacts are anticipated, and no additional mitigation is required.

## 4.4 TRANSPORTATION AND CIRCULATION

### 4.4.1 Traffic Impact Analysis Report (TIAR) Summary

In June 2022, a Traffic Impact Analysis Report (TIAR) was prepared for the Lin Yee Chung Association's Proposed Project Mānoa Banyan Court by *Austin, Tsutsumi & Associates, Inc., Civil Engineers and Surveyors,* in June 2022. The purpose was to assess existing traffic conditions and anticipated traffic impacts that may be expected by the Proposed Action. Following is a summary of the TIAR's main findings, conclusions and recommendations. A copy of the full TIAR report by *Austin, Tsutsumi & Associates, Inc* is attached as Appendix C.

#### 4.4.1.1 TIAR Methodology

Assess existing traffic operating conditions at key intersections during the weekday morning (AM) and afternoon (PM) peak hours of traffic within the study area.

- Traffic projections for Year 2026 without the Project including the ambient growth rate.
- Trip generation and traffic assignment characteristics during and after construction for the proposed Project.
- Traffic projections for Year 2026 during Project construction, which includes Year 2026 without Project traffic volumes in addition to traffic volumes generated during construction.

- Traffic projections for Year 2026 with the Project, which includes Year 2026 without Project traffic volumes in addition to traffic volumes generated by the Project.
- Recommendations as needed to mitigate any impacts resulting from Year 2026 conditions during construction or at Project completion.

The TIAR assessed existing traffic operating conditions at nine intersections that could be impacted by the Proposed Action. These include:
· East Mānoa Road/Oahu Avenue (signalized)
· East Mānoa Road/Kolowalu Street (signalized)
· East Mānoa Road/Lowrey Avenue (signalized)
· East Mānoa Road/Kanaloa Drive (signalized)
· Woodlawn Drive/Kanaloa Drive (unsignalized)
· Woodlawn Drive/Lower Road (unsignalized)
· Old East Mānoa Road/East Mānoa Road (unsignalized)
· Old East Mānoa Road/Pakanu Street (unsignalized)
· East Mānoa Road/Akaka Place (unsignalized)

Traffic counts were collected at each intersection during weekdays (Mon. to Fri.) for both AM and PM peak traffic hours.

*Interpretive Note*: Level of Service (LOS) is a standard qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. Methods for calculating volume to capacity ratios, delays, and corresponding Levels of Service that were utilized in this study are based on the *Highway Capacity Manual (HCM), 6th* Edition. Analyses of study intersections used the traffic analysis software Synchro to prepare reports based on the methodologies described in the HCM.

#### 4.4.1.2 Existing Conditions

In general, the Mānoa neighborhood is fully built out and access is provided only by the University Avenue and Mānoa Road corridors. The narrow roadways and limited north-south access routes results in congestion along the Mānoa Road and University Avenue corridors, especially during the morning and afternoon peak hours as residents commute to and from schools and workplaces. The neighborhood has tightly constrained roadways, with limited potential for physical improvements due to existing trees and nearby homes.

At all study intersections with the exception of the East Mānoa Road/Kolowalu Street and East Mānoa Road/Oahu Avenue intersections, all movements operate at LOS B or better across both peak hours. At the East Mānoa Road/Kolowalu intersection, all movements operate at LOS D or better across both peak hours with the exception of the northbound approach during the PM peak hour; however, this movement operates under capacity and was observed to generally clear with each cycle.

At the East Mānoa Road/Oahu Avenue intersection, various movements are anticipated to operate at LOS E during the AM and PM peak hour. The eastbound approach operates at LOS F and overcapacity conditions. Signal timing improvements would help balance the delay across the approaches of the intersection and reduce the disproportionate eastbound delay.

#### 4.4.1.3 Base Year Traffic Conditions

Based upon projections from the Oahu Metropolitan Planning Organization (OMPO) Long Range Plan for 2040, a de facto annual growth rate of 0.08% per year was applied along East Mānoa Road and Woodlawn Drive, and a growth rate of 0.20% per year was applied along O`ahu Avenue.

The Year 2026 was selected to reflect the Project completion year. The Base Year 2026 scenario represents the traffic conditions within the study area without the Project. Traffic projections were then formulated by applying a de facto growth rate to the "Existing Conditions" traffic volumes. With no known future planned background developments or roadway improvements in the study area, no additional trips would be generated by such developments.

With Base Year conditions, it is anticipated that movement across the network may experience a slight increase in volumes and delay as a result of de facto growth; however these increases are relatively minimal and as a result, operations will remain generally similar to Existing Conditions at most intersections.

At the Oahu Avenue/East Mānoa Road intersection, the westbound left-turn movement is anticipated to lower from LOS D to LOS E with Base Year conditions. With signal timing adjustments to balance capacity, movements on the northbound, southbound, and westbound approaches are anticipated to operate at LOS E/F but will continue to operate under capacity, while the delay on the eastbound approach is reduced but is still anticipated to operate with overcapacity conditions.

#### 4.4.1.4 Future Year Conditions

In total, the Project is anticipated to generate 64 AM peak hour trips and 76 PM trips, with the residential component accounting for 56 AM peak hour trips and 49 PM trips.

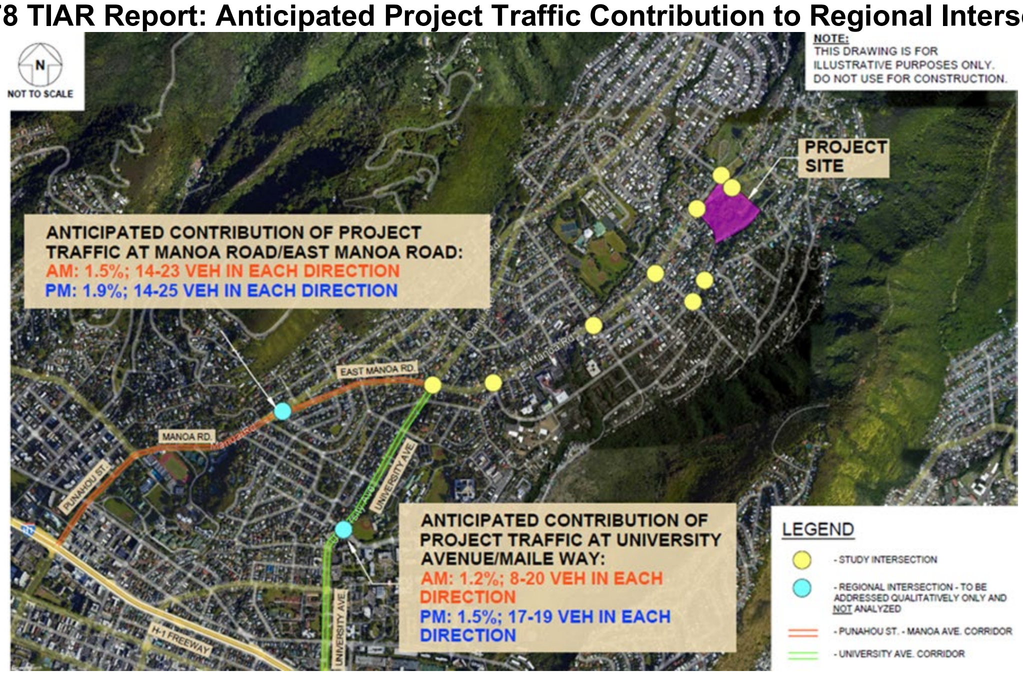
*Trip Generation* - Trip generation for the Project was performed utilizing a combination of manually collected trip rates at the nearby Mānoa Gardens Elderly Housing and trip rates published in *Trip Generation Manual, 11th Edition* by the *Institute of Transportation Engineers (ITE)*. This manual is based on empirical data compiled from a body of more than 4,250 trip generation studies that provides vehicle trip data correlated with independent variables of land use.

The Mānoa Gardens Elderly Housing project is a 79-apartment senior community a few blocks from the Project. Mānoa Gardens provides housing for applicants with all household members being age 62 years or older, with gross incomes not to exceed 60%, 80%, or 120% of Area Median Income (AMI). Traffic counts were conducted for the driveway serving Mānoa Gardens on April 27, 2022. The rates selected were based on the land use description. See Tables 5.1 and 5.2 of the TIAR in Appendix C for Trip Generation formulae and projections for the Project.

The *Trip Generation Manual, 11th Edition*, provides trip generation rates for income-limited affordable housing, which includes income-limited affordable housing that is not age-restricted. As younger residents may generate more trips during the peak hours than older residents, the ITE trip rate for non-age restricted affordable housing units was synthesized into the trip generation for the residential aspect of the Project.

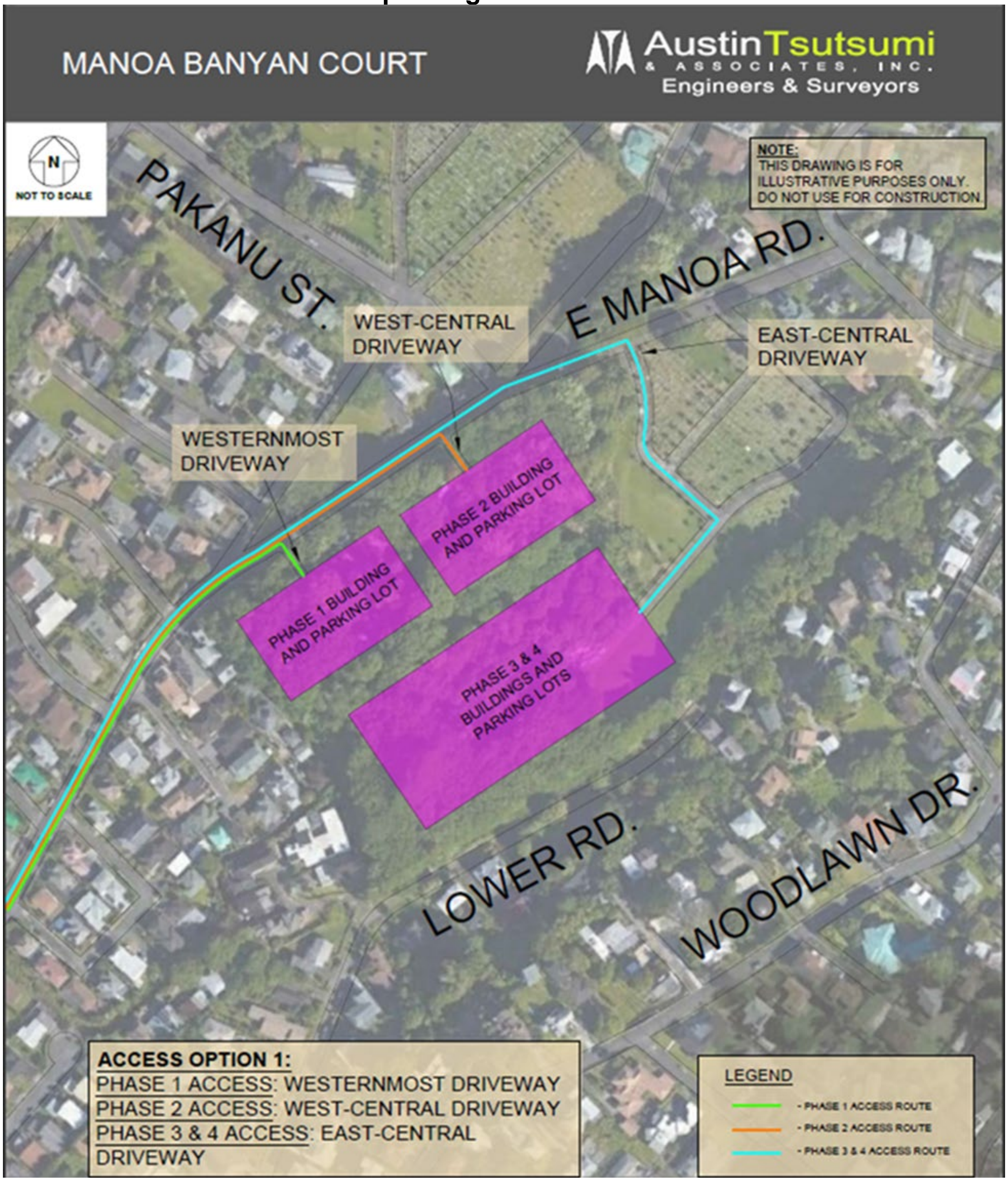
Based on analysis of state census data, of all Hawaii residents aged 55+, approximately 30% are aged 55-61, and 70% are aged 62+. This distribution was applied to the Project, and as a result, 30% of units were generated utilizing ITE trip rates for income-limited affordable housing to account for potentially higher trip generation by the age 55-61 group, and the remaining 70% of the units were generated utilizing trip rates from the Mānoa Gardens project.

**FIG. 4-78 TIAR Report: Anticipated Project Traffic Contribution to Regional Intersections**




For the residential portion of the project, two (2) Access Options were studied:

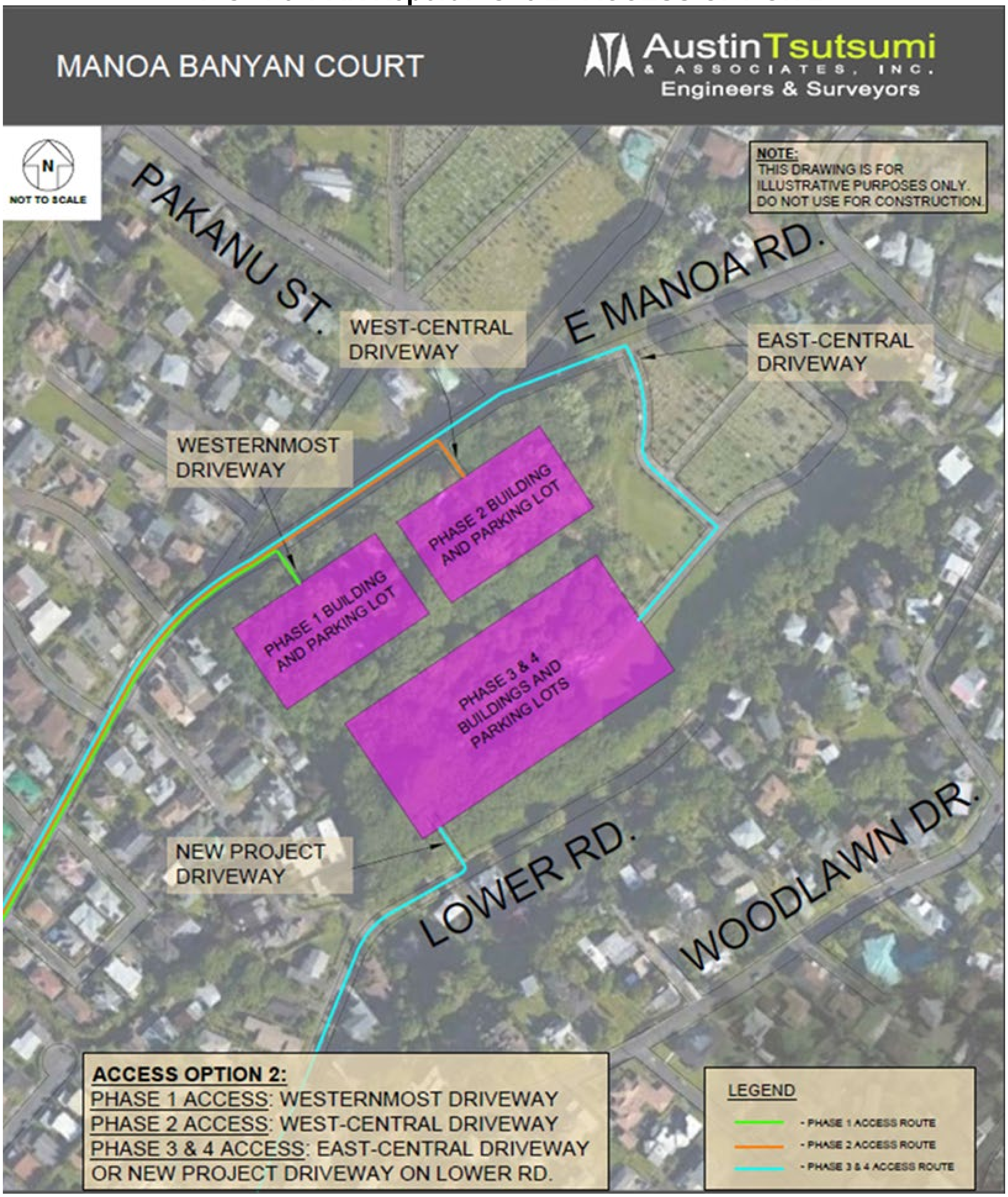
**FIG. 4-8 TIAR Report Fig. G. 5.1 - ACCESS OPTION 1**




Access Option 1: Access for Phase 1 will be from the existing westernmost driveway, with Access for Phase 2 will be from the existing west-central driveway. Access for Phases 3 & 4 will be from the existing east-central driveway which currently also serves the cemetery. Figure 5.1 illustrates Access Option 1.

Access Option 2: Access for Phase 1 will be from the existing westernmost driveway, with Phase 2 access from the existing west-central driveway. Access for Phases 3 & 4 will be from either the existing east-central driveway which currently also serves the cemetery OR a new Project driveway from Lower Road. Figure 5.2 illustrates Access Scenario 2.

**FIG. 4-9 TIAR Report FIG. 5.2 - ACCESS OPTION 2**



With both Access Options, all movements at all study intersections are anticipated to operate at *LOS B or better across both peak hours*, with the exception of the East Mānoa Road intersections with Kolowalu Road and Oahu Avenue. At the East Mānoa Road/Oahu Avenue intersection, during the AM and PM peak hours, various movements are anticipated to continue to operate at LOS E/F. During the PM peak hour, the eastbound approach is anticipated to experience an approximately 19-second increase over Base Year conditions and operate at LOS F and overcapacity conditions as it did with Existing and Base Year conditions. During the critical PM peak hour, the Project is anticipated to add approximately 25 vehicles to the eastbound approach, or about one (1) car every two (2) minutes. Project trips are anticipated to account for approximately 3.1% (3.5%) of traffic during the AM(PM) peak hours.

At the East Mānoa Road/Oahu Avenue intersection, During the AM and PM peak hours, various movements are anticipated to continue to operate at LOS E/F. During the PM peak hour, the eastbound approach is anticipated to experience an approximately 19-second increase over Base Year conditions and operate at LOS F and overcapacity conditions as it did with Existing and Base Year conditions. Houses and tree constraints at intersections make physical widening improvements likely not feasible. During the critical PM peak hour, the Project is anticipated to add approximately 25 vehicles to the eastbound approach, or about one (1) car every two (2) minutes. In total, Project trips are anticipated to account for approximately 3.1%(3.5%) of traffic during the AM(PM) peak hours.

Overall, both Access Options are anticipated to have similar operations at all study intersections, with the exception of the East Mānoa Road/Kolowalu Street intersection, where the northbound approach operates at LOS E(F) with Access Option 1 compared to LOS D(E) with Access Option 2; however the difference in delay is small – approximately 9.1 seconds during the AM(PM) peak hours – and therefore, neither Option 1 or Option 2 has a significant benefit over the other from a traffic operations standpoint.

#### 4.4.1.5 Recommendations

Coordinate with the City & County of Honolulu to determine if the two (2) bus stops fronting the Project on East Mānoa Road should be relocated.

At the East Mānoa Road/Kolowalu Street and East Mānoa Road/Oahu Avenue intersections, evaluate and optimize signal timing to maintain best-possible operations.

### 4.4.2 Multimodal Facilities

#### 4.4.2.1 Bicycle and Pedestrian Facilities

In the vicinity of the Project, sidewalks are continuous along East Mānoa Road, but are nonexistent along many neighborhood streets, including Woodlawn Drive near Lower Road, and as a result, pedestrians were observed to walk on the roadway.

#### 4.4.2.2 Public Transit Facilities

The City & County of Honolulu provides The Bus transit system which provides service throughout the island of Oahu. Effective July 1, 2022, a one-way fare will cost $3.00 with a daily cap of $7.50, and a monthly pass will cost $80.00. However, fares for seniors 65+ using the senior Holo card is capped at $3.00 per day, $20.00 per month, and $45 for the whole year. These low cost senior fares will encourage residents to use The Bus, especially for local shopping trips. In the vicinity of the Project, there are 16 existing bus stops within a ¼-mile radius (5-minute walk), all serving Route 6, which provides service throughout Mānoa, along University Avenue, portions of Beretania Street and Keeaumoku Street, with transfer at Ala Moana Center to other island routes.

#### 4.4.2.3 Impacts and Mitigation

The results of the June 2022 TIAR based on current traffic counts and analysis of anticipated traffic movement generated by the Proposed Action indicate that traffic in the vicinity of the Project Site would exhibit no significant congestion and will remain light following project full build out and occupancy. Furthermore, the Proposed Action is not likely to increase traffic beyond an occasional LOS “B” in the vicinity of the project. Impacts attributable to the Proposed Action on other more heavily trafficked intersections further from the project will also be minimal causing little additional delay. Therefore, no significant impact is anticipated, and no further mitigation is deemed necessary.

NOTE: The reader is encouraged to refer to the complete TIAR study report in Appendix C for detailed tables, intersection diagrams and the traffic analysis.

*(This page intentionally left blank)*

# 5. RELATIONSHIP AND COMPLIANCE WITH LAND USE PLANS, POLICIES AND CONTROLS

## 5.1 STATE OF HAWAIʻI

### 5.1.1 Consistency With Hawaiʻi State Plan Part I

The Hawaiʻi State Plan is a broad policy document that guides all activities, programs and decisions made by local and State agencies (DPED 1986). The purpose of the plan is to: (1) improve the planning process; (2) increase the effectiveness of government and private actions; (3) improve coordination among agencies and levels of government; (4) provide for the wise use of Hawaiʻi's resources; and (5) guide the future development of the state. Part I of the Plan references Overall Theme, Goals, Objectives and Policies while Part III references the Priority Guidelines. Because Part II relates primarily to internal government affairs it is not applicable to the Proposed Action and was not addressed. Table 5-1 assesses the Proposed Action's consistency with Part I goals, objectives, policies and guidelines. Table 5-2 assesses the consistency of the Proposed Action with Part III goals, objectives, policies and guidelines.

## Table 5-1 Consistency with Hawai`i State Plan Part 1

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **HRS § 226-4: State Goals** | | | |
| **(a) Objectives:** In order to guarantee, for the present and future generations, those elements of choice and mobility that ensure that individuals and groups may approach their desired levels of self-reliance and self-determination, it shall be the goal of the State to achieve: | | | |
| **(1)** A strong, viable economy characterized by stability, diversity and growth that enables fulfillment of the needs and expectations of Hawaiʻi's present and future generations. | X | | |
| **(2)** A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems and uniqueness that enhances the mental and physical well-being of the people. | X | | |
| **(3)** Physical, social and economic well-being, for individuals and families in Hawaiʻi, that nourishes a sense of community responsibility, of caring and of participation in community life. | X | | |
| **Discussion:** The Proposed Action supports State goals and objectives by promoting a unique and engaging residential environment in upper Mānoa Valley that is affordable, and accessible for seniors and the community. The physical environment would maintain important and viable natural vegetation features and provide a community garden area to promote open gathering spaces, connectivity and participation in community life. The Proposed Action would protect and preserve the integrity of Woodlawn Ditch, while maintaining views to surrounding scenic resources from key viewpoints in the surrounding area. | | | |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? Yes | No | N/A |
|---|---|---|---|
| **HRS § 226-5: State Goals** | | | |
| **Objective:** 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. | | | |
| **(a) Policies:** | | | |
| **(1)** Manage population growth statewide in a manner that provides increased opportunities for Hawaiʻi's people to pursue their physical, social and economic aspirations while recognizing the unique needs of each county. | | | X |
| **(2)** Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs and desires. | | | X |
| **(3)** Promote increased opportunities for Hawaiʻi's people to pursue their socioeconomic aspirations throughout the islands. | X | | |
| **(4)** Encourage research activities and public awareness programs to foster an understanding of Hawaiʻi's limited capacity to accommodate population needs and to address concerns resulting from an increase in Hawaiʻi's population. | | | X |
| **(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. | | | X |
| **(6)** Pursue an increase in federal assistance for states with a greater proportion of foreign immigrants relative to their state's population. | | | X |
| **(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. | | | X |
| **<u>Discussion</u>:** The Proposed Action would provide for population increase and mobility of the elderly population. Affordable housing developments increase opportunities for low and moderate income for elderly residents to pursue various activities without the high-cost barriers associated with market rents. | | | |
| **HRS § 226-6: Objectives and Policies for the Economy in General** | | | |
| **Objectives:** 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 Hawaiʻi'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. | | | X |
| **(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. | | | X |
| **(a) Policies** | | | |
| **(1)** Promote and encourage entrepreneurship within Hawaiʻi by residents and nonresidents of the State. | | | X |
| **(2)** Expand Hawaiʻi's national and international marketing, communication and organizational ties, to increase the State's capacity to adjust to and | | | X |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| capitalize upon economic changes and opportunities occurring outside the State. | | | |
| **(3)** Promote Hawai'i as an attractive market for environmentally and socially sound investment activities that benefit Hawai'i's people. | | | X |
| **(4)** Transform and maintain Hawai'i as a place that welcomes and facilitates innovative activity that may lead to commercial opportunities. | | | X |
| **(5)** Promote innovative activity that may pose initial risks, but ultimately contribute to the economy of Hawai'i. | | | X |
| **(6)** Seek broader outlets for new or expanded Hawai'i business investments. | | | X |
| **(7)** Expand existing markets and penetrate new markets for Hawai'i's products and services. | | | X |
| **(8)** Assure that the basic economic needs of Hawai'i's people are maintained in the event of disruptions in overseas transportation. | | | X |
| **(9)** Strive to achieve a level of construction activity responsive to and consistent with, state growth objectives. | X | | |
| **(10)** Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawai'i's small-scale producers, manufacturers and distributors. | | | X |
| **(11)** Encourage labor-intensive activities that are economically satisfying, and which offer opportunities for upward mobility. | | | X |
| **(12)** Encourage innovative activities that may not be labor-intensive but may otherwise contribute to the economy of Hawai'i. | | | X |
| **(13)** Foster greater cooperation and coordination between the government and private sectors in developing Hawai'i's employment and economic growth opportunities. | | | X |
| **(14)** Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems. | | | X |
| **(15)** Maintain acceptable working conditions and standards for Hawai'i's workers. | | | X |
| **(16)** Provide equal employment opportunities for all segments of Hawai'i's population through affirmative action and nondiscrimination measures. | | | X |
| **(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. | | | X |
| **(18)** Encourage businesses that have favorable financial multiplier effects within Hawai'i's economy, particularly with respect to emerging industries in science and technology. | | | X |
| **(19)** Promote and protect intangible resources in Hawai'i, such as scenic beauty and the aloha spirit, which are vital to a healthy economy. | X | | |
| **(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, potential growth industries in particular. | | | X |
| **(21)** Foster a business climate in Hawai'i - including attitudes, tax and regulatory policies and financial and technical assistance programs--that is | | | X |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? Yes | No | N/A |
|---|---|---|---|
| conducive to the expansion of existing enterprises and the creation and attraction of new business and industry. | | | |
| **Discussion:** The Proposed Action supports the economy by leveraging private and public expertise and investment with support from HHFDC that would not be available otherwise. Construction of the proposed housing will provide and promote job opportunities and contribute to the needs and vitality of Hawai'i. Operation of the proposed housing, and day room facility will provide some long-term job opportunities and incorporate space for community engagement, enjoyment and cooperation that promotes community well-being. The Project Site will preserve and enhance scenic beauty and healthy living by promoting a community garden area with connectivity to other community services. | | | |
| **HRS § 226-7: Objectives and Policies for the Economy–Agriculture** | | | |
| **Objectives:** Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives: | | | |
| **(1)** Viability of Hawai'i's sugar and pineapple industries. | | | X |
| **(2)** Growth and development of diversified agriculture throughout the State. | X | | |
| **(3)** An agriculture industry that continues to constitute a dynamic and essential component of Hawai'i's strategic, economic and social well-being. | | | X |
| **(a) Policies:** | | | |
| **(1)** Establish a clear direction for Hawai'i's agriculture through stakeholder commitment and advocacy. | | | X |
| **(2)** Encourage agriculture by making best use of natural resources. | X | | |
| **(3)** Provide the governor and the legislature with information and options needed for prudent decision making for the development of agriculture. | | | X |
| **(4)** Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits. | | | X |
| **(5)** Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawai'i's economy. | X | | |
| **(6)** Seek the enactment and retention of federal and state legislation that benefits Hawai'i's agricultural industries. | | | X |
| **(7)** Strengthen diversified agriculture by developing an effective promotion, marketing and distribution system between Hawai'i's food producers and consumers in the State, nation and world. | | | X |
| **(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. | | | X |
| **(9)** Enhance agricultural growth by providing public incentives and encouraging private initiatives. | X | | |
| **(10)** Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs. | | | X |
| **(11)** Increase the attractiveness and opportunities for an agricultural education and livelihood. | X | | |
| **(12)** In addition to the State's priority on food, expand Hawai'i'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. | X | | |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(13)** Promote economically competitive activities that increase Hawaiʻi's agricultural self-sufficiency, including the increased purchase and use of Hawaiʻi-grown food and food products by residents, businesses and governmental bodies as defined under HRS §103D-104. | X | | |
| **(14)** Promote and assist in the establishment of sound financial programs for diversified agriculture. | | | X |
| **(15)** Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment. | X | | |
| **(16)** Facilitate the transition of agricultural lands in economically non-feasible agricultural production to economically viable agricultural uses. | | | X |
| **<u>Discussion</u>:** The Proposed Action supports agricultural pursuits for residents by providing approximately 1 acre for a community garden accessible by both residents and the community to pursue small scale personal gardening activities. | | | |
| **HRS § 226-8: Objectives and Policies for the Economy–Visitor Industry** | | | |
| **Objective:** Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawaiʻi's economy. | | | |
| **(a) Policies:** | | | |
| **(1)** Support and assist in the promotion of Hawaiʻi's visitor attractions and facilities. | | | X |
| **(2)** Ensure that visitor industry activities are in keeping with the social, economic and physical needs and aspirations of Hawaiʻi's people. | | | X |
| **(3)** Improve the quality of existing visitor destination areas by utilizing Hawaiʻi's strengths in science and technology. | | | X |
| **(4)** Encourage cooperation and coordination between the government and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities. | | | X |
| **(5)** Develop the industry in a manner that will continue to provide new job opportunities and steady employment for Hawaiʻi's people. | | | X |
| **(6)** Provide opportunities for Hawaiʻi's people to obtain job training and education that will allow for upward mobility within the visitor industry. | | | X |
| **(7)** Foster a recognition of the contribution of the visitor industry to Hawaiʻi's economy and the need to perpetuate the aloha spirit. | | | X |
| **(8)** Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawaiʻi's cultures and values. | | | X |
| **<u>Discussion</u>:** Although the Proposed Action is not directly applicable to the Economy-Visitor Industry, nevertheless it will perform a valuable service to the community at large by providing affordable housing to a vulnerable sector of Honolulu's elderly population. | | | |
| **HRS § 226-9: Objective and Policies for the Economy–Federal Expenditures** | | | |
| **Objective:** Planning for the State's economy with regard to federal expenditures shall be directed towards achievement of the objective of a stable federal investment base as an integral component of Hawaiʻi's economy. | | | |
| **(a) Policies:** | | | |
| **(1)** Encourage the sustained flow of federal expenditures in Hawaiʻi that generates long- term government civilian employment. | | | X |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(2)** Promote Hawaiʻi's supportive role in national defense, in a manner consistent with Hawaiʻi's social, environmental and cultural goals by building upon dual-use and defense applications to develop thriving ocean engineering, aerospace research and development and related dual-use technology sectors in Hawaiʻi's economy. | | | X |
| **(3)** Promote the development of federally supported activities in Hawaiʻi that respect state-wide economic concerns, are sensitive to community needs and minimize adverse impacts on Hawaiʻi's environment. | | | X |
| **(4)** Increase opportunities for entry and advancement of Hawaiʻi's people into federal government service. | | | X |
| **(5)** Promote federal use of local commodities, services and facilities available in Hawaiʻi. | | | X |
| **(6)** Strengthen federal-state-county communication and coordination in all federal activities that affect Hawaiʻi. | | | X |
| **(7)** Pursue the return of federally controlled lands in Hawaiʻi that are not required for either the defense of the nation or for other purposes of national importance and promote the mutually beneficial exchanges of land between federal agencies, the State and the counties. | | | X |
| **<u>Discussion</u>:** While the Proposed Action does make a contribution to the overall economy, it does not directly relate to the objectives and policies of Federal Expenditures. | | | |
| **HRS § 226-10: Objectives and Policies for the Economy–Potential Growth and Innovative Activities** | | | |
| **(a) Objective:** Planning for the State's economy with regard to potential growth and innovative activities shall be directed towards achievement of the objective of development and expansion of potential growth and innovative activities that serve to increase and diversify Hawaiʻi's economic base. | | | |
| **(b) Policies:** | | | |
| **(1)** Facilitate investment and employment in economic activities that have the potential to expand and diversify Hawaiʻi's economy, including but not limited to diversified agriculture, aquaculture, renewable energy development, creative media, health care and science and technology-based sectors. | | | X |
| **(2)** Facilitate investment in innovative activity that may pose risks or be less labor intensive than other traditional business activity, but if successful, will generate revenue in Hawaiʻi through the export of services or products or substitution of imported services or products. | | | X |
| **(3)** Encourage entrepreneurship in innovative activity by academic researchers and instructors who may not have the background, skill or initial inclination to commercially exploit their discoveries or achievements. | | | X |
| **(4)** Recognize that innovative activity is not exclusively dependent upon individuals with advanced formal education, but that many self-taught, motivated individuals are able, willing, sufficiently knowledgeable and equipped with the attitude necessary to undertake innovative activity. | | | X |
| **(5)** Increase the opportunities for investors in innovative activity and talent engaged in innovative activity to personally meet and interact at cultural, art, entertainment, culinary, athletic or visitor-oriented events without a business focus. | | | X |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(6)** Expand Hawaiʻi's capacity to attract and service international programs and activities that generate employment for Hawaiʻi's people. | | | X |
| **(7)** Enhance and promote Hawaiʻi's role as a center for international relations, trade, finance, services, technology, education, culture and the arts. | | | X |
| **(8)** Accelerate research and development of new energy- related industries based on wind, solar, ocean and underground resources and solid waste. | | | X |
| **(9)** Promote Hawaiʻi's geographic, environmental, social and technological advantages to attract new economic activities into the State. | | | X |
| **(10)** Provide public incentives and encourage private initiative to attract new industries that best support Hawaiʻi's social, economic, physical and environmental objectives. | | | X |
| **(11)** Increase research and the development of ocean-related economic activities such as mining, food production and scientific research. | | | X |
| **(12)** Develop, promote and support research and educational and training programs that will enhance Hawaiʻi's ability to attract and develop economic activities of benefit to Hawaiʻi. | | | X |
| **(13)** Foster a broader public recognition and understanding of the potential benefits of new or innovative growth-oriented industry in Hawaiʻi. | | | X |
| **(14)** Encourage the development and implementation of joint federal and state initiatives to attract federal programs and projects that will support Hawaiʻi's social, economic, physical and environmental objectives. | | | X |
| **(15)** Increase research and development of businesses and services in the telecommunications and information industries. | | | X |
| **(16)** Foster the research and development of non-fossil fuel and energy efficient modes of transportation. | | | X |
| **(17)** Recognize and promote health care and health care information technology as growth industries. | | | X |
| **<u>Discussion</u>:** The Proposed Action has no direct relationship or impact on innovative activities at the Federal or State level and is not involved with research and development activities. The project design will promote and incorporate values of Hawaiʻi's unique social, economic, physical, and environmental setting and provide affordable rental housing for elderly residents and promote community diversity. | | | |
| **HRS § 226-10.5: Objectives and Policies for the Economy–Information Industry** | | | |
| **(a) Objective:** Planning for the State's economy with regard to telecommunications and information technology shall be directed toward recognizing that broadband and wireless communication capability and infrastructure are foundations for an innovative economy and positioning Hawaiʻi as a leader in broadband and wireless communications and applications in the Pacific Region. | | | |
| **(b) Policies:** | | | |
| **(1)** Promote efforts to attain the highest speeds of electronic and wireless communication within Hawaiʻi and between Hawaiʻi and the world, and make high speed communication available to all residents and businesses in Hawaiʻi. | | | X |
| **(2)** Encourage the continued development and expansion of the telecommunications infrastructure serving Hawaiʻi to accommodate future growth and innovation in Hawaiʻi's economy. | | | X |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(3)** Facilitate the development of new or innovative business and service ventures in the information industry which will provide employment opportunities for the people of Hawaiʻi. | | | X |
| **(4)** Encourage mainland- and foreign-based companies of all sizes, whether information technology-focused or not, to allow their principals, employees or contractors to live in and work from Hawaiʻi, using technology to communicate with their headquarters, offices or customers located out-of-state. | | | X |
| **(5)** Encourage greater cooperation between the public and private sectors in developing and maintaining a well-designed information industry. | | | X |
| **(6)** Ensure that the development of new businesses and services in the industry are in keeping with the social, economic and physical needs and aspirations of Hawaiʻi's people. | | | X |
| **(7)** Provide opportunities for Hawaiʻi's people to obtain job training and education that will allow for upward mobility within the information industry. | | | X |
| **(8)** Foster a recognition of the contribution of the information industry to Hawaiʻi's economy. | | | X |
| **(9)** Assist in the promotion of Hawaiʻi as a broker, creator and processor of information in the Pacific. | | | X |
| **Discussion:** The Proposed Action does not impact the economy-information industry other than by making high speed internet communication available to residents of the proposed affordable elderly rental housing facility. | | | |
| **HRS § 226-11: Objectives and Policies for the Physical Environment–Land-Based, Shoreline and Marine Resources** | | | |
| **(a) Objectives:** 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 Hawaiʻi's land-based, shoreline and marine resources. | X | | |
| **(2)** Effective protection of Hawaiʻi's unique and fragile environmental resources. | X | | |
| **(b) Policies:** | | | |
| **(1)** Exercise an overall conservation ethic in the use of Hawaiʻi's natural resources. | X | | |
| **(2)** Ensure compatibility between land-based and water-based activities and natural resources and ecological systems. | X | | |
| **(3)** Take into account the physical attributes of areas when planning and designing activities and facilities. | X | | |
| **(4)** Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage. | X | | |
| **(5)** Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions. | | | X |
| **(6)** Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaiʻi. | X | | |
| **(7)** Provide public incentives that encourage private actions to protect significant natural resources from degradation or unnecessary depletion. | | | X |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(8)** Pursue compatible relationships among activities, facilities and natural resources. | X | | |
| **(9)** Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational and scientific purposes. | X | | |
| **<u>Discussion</u>:** The Project Site is located within the State's Urban Land Use District and the design is consistent with Urban Land Use District standards. As part of the EA process, a flora and fauna survey was conducted. This survey determined that the Proposed Action may create minor short-term impacts to avian fauna found on-site during construction, however, these will only be temporary and have no long-term effects. The survey did not determine the existence of any rare or endangered plant species on the site but recognized that many species were invasive. Mitigation measures for trees recommended to be preserved are included in the EA along with measures to mitigate any long-term impacts on the Project Site's natural environment or resources. The Proposed Action is designed to preserve major trees and plant resources to the extent feasible within the scope of the project. Trees and vegetation desirable for preservation have been identified based on their size, health and location. Buildings and parking areas will be carefully sited to minimize removal of vegetation and particularly trees recommended for preservation. | | | |
| **HRS § 226-12: Objective and Policies for the Physical Environment–Scenic, Natural Beauty and Historic Resources** | | | |
| **(a) Objective:** Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawai'i's scenic assets, natural beauty and multi-cultural/historical resources. | | | |
| **(b) Policies:** | | | |
| **(1)** Promote the preservation and restoration of significant natural and historic resources. | | | X |
| **(2)** Provide incentives to maintain and enhance historic, cultural and scenic amenities. | X | | |
| **(3)** Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes and other natural features. | X | | |
| **(4)** Protect those special areas, structures and elements that are an integral and functional part of Hawai'i's ethnic and cultural heritage. | X | | |
| **(5)** Encourage the design of developments and activities that complement the natural beauty of the islands. | X | | |
| **<u>Discussion</u>:** The Proposed Action supports the objectives and policies for protecting scenic, natural, and historic beauty of the Project Site and surrounding area. The proposed design is intended to maximize the preservation of site resources, especially trees and natural features. No historic properties or archaeological resources have been identified on-site, however an Archaeological Impact Survey (AIS} will be implemented for all ground disturbing activities if needed. The timing and nature of the AIS will be based on consultation with SHPD. | | | |
| **HRS § 226-13: Objectives and Policies for the Physical Environment–Land, Air and Water Quality** | | | |
| **(a) Objectives:** 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 Hawai'i's land, air and water resources. | X | | |
| **(2)** Greater public awareness and appreciation of Hawai'i's environmental resources. | | | X |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(b) Policies:** | | | |
| **(1)** Foster educational activities that promote a better understanding of Hawaiʻi's limited environmental resources. | | | X |
| **(2)** Promote the proper management of Hawaiʻi's land and water resources. | X | | |
| **(3)** Promote effective measures to achieve desired quality in Hawaiʻi's surface, ground and coastal waters. | X | | |
| **(4)** Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaiʻi's people. | X | | |
| **(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. | X | | |
| **(6)** Encourage design and construction practices that enhance the physical qualities of Hawaiʻi's communities. | X | | |
| **(7)** Encourage urban developments in close proximity to existing services and facilities. | X | | |
| **(8)** Foster recognition of the importance and value of the land, air and water resources to Hawaiʻi's people, their cultures and visitors. | X | | |
| **<u>Discussion</u>:** Potential impacts to air quality will be minimized through project phasing over several years and by using industry BMPs. The design elements of the structures and exterior spaces will reflect the traditions, history and spiritual significance of Mānoa Valley and Hawaiian culture. A landscape plan will include shaded common areas that provide connectivity and landscaped restful areas for pedestrians and residents. | | | |
| **HRS § 226-14: Objective and Policies for Facility Systems–In General** | | | |
| **(a) Objective:** 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) Policies:** | | | |
| **(1)** Accommodate the needs of Hawaiʻi's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans. | X | | |
| **(2)** Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities. | | | X |
| **(3)** Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user. | X | | |
| **(4)** Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction and maintenance of facility systems. | X | | |
| **<u>Discussion</u>:** The location and timing of the Proposed Action will align with the availability of adequate water supply, sewage capacity, drainage, transportation and public safety facilities. The City's Wastewater Branch has approved connections for 288 housing units. The Project Site lies within a mature residential neighborhood and is adjacent to a portion of the Mānoa Chinese Cemetery. The project is designed as four courtyard structures with residential units for each phase focused onto shared courtyards. This configuration will reduce costs of providing public utilities and other public facilities. | | | |
| **HRS § 226-15: Objectives and Policies for Facility Systems–Solid and Liquid Wastes** | | | |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(a) Objectives:** 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. | X | | |
| **(2)** Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility and other areas. | X | | |
| **(b) Policies:** | | | |
| **(1)** Encourage the adequate development of sewerage facilities that complement planned growth. | X | | |
| **(2)** Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic. | X | | |
| **(3)** Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes. | | | X |
| **Discussion:** The Proposed Action for 288 affordable elderly rental units, has been approved by the City's Wastewater Branch as having sufficient wastewater capacity. | | | |
| **HRS § 226-16: Objective and Policies for Facility Systems–Water** | | | |
| **(a) Objective:** 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 accommodate domestic, agricultural, commercial, industrial, recreational and other needs within resource capacities. | | | |
| **(b) Policies:** | | | |
| **(1)** Coordinate development of land use activities with existing and potential water supply. | X | | |
| **(2)** Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs. | | | X |
| **(3)** Reclaim and encourage the productive use of runoff water and wastewater discharges. | X | | |
| **(4)** Assist in improving the quality, efficiency, service and storage capabilities of water systems for domestic and agricultural use. | | | X |
| **(5)** Support water supply services to areas experiencing critical water problems. | | | X |
| **(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. | X | | |
| **Discussion:** The location and timing of the Proposed Action will align with the availability of adequate water supply, wastewater treatment, drainage, transportation and public safety facilities. It will incorporate water conservation methods into the design using LEED silver standards as guidelines and Low Impact Development (LID) practices to ensure that the maximum amount of stormwater runoff will remain on-site. | | | |
| **HRS § 226-17: Objectives and Policies for Facility Systems–Transportation** | | | |
| **(a) Objectives:** Planning for the State's facility systems with regard to energy shall be directed toward 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. | | | X |
| **(2)** A statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the State. | X | | |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? | | |
|---|---|---|---|
| | **Yes** | **No** | **N/A** |
| **(c) Policies:** | | | |
| **(1)** Design, program and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter; | | | X |
| **(2)** Coordinate state, county, federal and private transportation activities and programs toward the achievement of statewide objectives; | | | X |
| **(3)** Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties; | | | X |
| **(4)** Provide for improved accessibility to shipping, docking and storage facilities; | | | X |
| **(5)** Promote a reasonable level and variety of mass transportation services that adequately meet statewide and community needs; | X | | |
| **(6)** Encourage transportation systems that serve to accommodate present and future development needs of communities; | X | | |
| **(7)** Encourage a variety of carriers to offer increased opportunities and advantages to interisland movement of people and goods; | | | X |
| **(8)** Increase the capacities of airport and harbor systems and support facilities to effectively accommodate transshipment and storage needs; | | | X |
| **(9)** Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification; | | | X |
| **(10)** Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawai‘i’s natural environment; | X | | |
| **(11)** Encourage safe and convenient use of low-cost, energy-efficient, non-polluting means of transportation; | X | | |
| **(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 | | | X |
| **(13)** Encourage diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency. | X | | |
| **Discussion:** The Project Site is located in the vicinity of a public transit service line. The Proposed Action will include bike storage racks. The Proposed Action would prioritize on-site parking for short-term rideshare, carshare, and loading zone to promote adequate transportation options for residents and visitors. | | | |
| **HRS § 226-18: Objectives and Policies for Facility Systems–Energy** | | | |
| **(a) Objectives:** Planning for the State’s facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all: | | | |
| **(1)** Dependable, efficient and economical statewide energy systems capable of supporting the needs of the people; | | | X |
| **(2)** Increased energy security and self-sufficiency through the reduction and ultimate elimination of Hawai‘i's dependence on imported fuels for electrical generation and ground transportation; | X | | |
| **(3)** Greater diversification of energy generation in the face of threats to Hawai‘i’s energy supplies and systems; | X | | |
| **(4)** Reduction, avoidance or sequestration of greenhouse gas emissions from energy supply and use; and | | | X |
| **(5)** Utility models that make the social and financial interests of Hawai‘i's utility customers a priority. | | | X |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(b)** To achieve the energy objectives, it shall be the policy of this State to ensure the short- and long-term provision of adequate, reasonably priced and dependable energy services to accommodate demand. | | | X |
| **(c) Other Policies:** | | | |
| **(1)** Support research and development as well as promote the use of renewable energy sources; | | | X |
| **(2)** Ensure that the combination of energy supplies and energy-saving systems is sufficient to support the demands of growth; | | | X |
| **(3)** Base decisions of least-cost supply-side and demand-side energy resource options on a comparison of their total costs and benefits when a least-cost is determined by a reasonably comprehensive, quantitative and qualitative accounting of their long-term, direct and indirect economic, environmental, social, cultural and public health costs and benefits; | | | X |
| **(4)** Promote all cost-effective conservation of power and fuel supplies through measures including: | | | |
| **(A)** Development of cost-effective demand-side management programs; | | | X |
| **(B)** Education; | | | X |
| **(C)** Adoption of energy-efficient practices and technologies; and | X | | |
| **(D)** Increasing energy efficiency and decreasing energy use in public infrastructure. | | | X |
| **(5)** Ensure, to the extent that new supply-side resources are needed, that the development or expansion of energy systems uses the least-cost energy supply option and maximizes efficient technologies; | | | X |
| **(6)** Support research, development, demonstration and use of energy efficiency, load management and other demand-side management programs, practices and technologies; | | | X |
| **(7)** Promote alternate fuels and transportation energy efficiency; | | | X |
| **(8)** Support actions that reduce, avoid or sequester greenhouse gases in utility, transportation and industrial sector applications; | | | X |
| **(9)** Support actions that reduce, avoid or sequester Hawaiʻi's greenhouse gas emissions through agriculture and forestry initiatives; | | | X |
| **(10)** Provide priority handling and processing for all state and county permits required for renewable energy projects; | | | X |
| **(11)** Ensure that liquefied natural gas is used only as a cost-effective transitional, limited- term replacement of petroleum for electricity generation and does not impede the development and use of other cost-effective renewable energy sources; and | | | X |
| **(12)** Promote the development of indigenous geothermal energy resources that are located on public trust land as an affordable and reliable source of firm power for Hawaiʻi. | | | X |
| **Discussion:** LEED silver standards will be used as guidelines during the Proposed Action's design process to integrate water and energy conservation. The Proposed Action anticipates the use of PV panels to the maximum extent feasible to reduce long term electrical energy usage and cost. | | | |
| **HRS § 226-18.5: Objectives and Policies for Facility Systems–Telecommunications** | | | |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent?<br>Yes | <br>No | <br>N/A |
|---|---|---|---|
| **(a) Objective:** Planning for the State's telecommunications facility systems shall be directed towards the achievement of dependable, efficient and economical statewide telecommunications systems capable of supporting the needs of the people. | | | |
| **(b)** To achieve the telecommunications objective, it shall be the policy of this State to ensure the provision of adequate, reasonably priced and dependable telecommunications services to accommodate demand. | | | X |
| **(c) Other Policies:** | | | |
| **(1)** Facilitate research and development of telecommunications systems and resources; | | | X |
| **(2)** Encourage public and private sector efforts to develop means for adequate, ongoing telecommunications planning; | | | X |
| **(3)** Promote efficient management and use of existing telecommunications systems and services; and | | | X |
| **(4)** Facilitate the development of education and training of telecommunications personnel. | | | X |
| **<u>Discussion</u>:** The Proposed Action does not affect or negatively impact the objectives and policies of the Facility Systems-Telecommunications. | | | |
| **HRS § 226-19: Objectives and Policies for Socio-Cultural Advancement–Housing** | | | |
| **(a) Objectives:** 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 Hawaiʻi'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 Hawaiʻi's population. | X | | |
| **(2)** The orderly development of residential areas sensitive to community needs and other land uses. | X | | |
| **(3)** The development and provision of affordable rental housing by the State to meet the housing needs of Hawaiʻi's people. | X | | |
| **(b) Policies:** | | | |
| **(1)** Effectively accommodate the housing needs of Hawaiʻi's people. | X | | |
| **(2)** Stimulate and promote feasible approaches that increase housing choices for low- income, moderate-income and gap-group households. | X | | |
| **(3)** Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style and size of housing. | X | | |
| **(4)** Promote appropriate improvement, rehabilitation and maintenance of existing housing units and residential areas. | | | X |
| **(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. | X | | |
| **(6)** Facilitate the use of available vacant, developable and underutilized urban lands for housing. | X | | |
| **(7)** Foster a variety of lifestyles traditional to Hawaiʻi through the design and maintenance of neighborhoods that reflect the culture and values of the community. | X | | |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(8)** Promote research and development of methods to reduce the cost of housing construction in Hawaiʻi. | | | X |
| **Discussion:** The Proposed Action is intended to provide affordable rental housing for the elderly age 62+ and to a limited number of residents that may require ADA compliant residential units. The Proposed Action would provide affordable housing for those elderly that are unable to afford existing market rate rental housing because they may be on fixed incomes or are otherwise unable to afford the high cost of living in the city. The Proposed Action would serve to expand the inventory of affordable housing in the Primary Urban Center (PUC) as a medium density, mixed-use, transit-accessible residential development. | | | |
| **HRS § 226-20: Objectives and Policies for Socio-Cultural Advancement–Health** | | | |
| **(a) Objectives:** 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. | | | X |
| **(2)** Maintenance of sanitary and environmentally healthful conditions in Hawaiʻi's communities. | X | | |
| **(3)** Elimination of health disparities by identifying and addressing social determinants of health. | X | | |
| **(b) Policies:** | | | |
| **(1)** Provide adequate and accessible services and facilities for prevention and treatment of physical and mental health problems, including substance abuse. | | | X |
| **(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. | | | X |
| **(3)** Encourage public and private efforts to develop and promote statewide and local strategies to reduce health care and related insurance costs. | | | X |
| **(4)** Foster an awareness of the need for personal health maintenance and preventive health care through education and other measures. | | | X |
| **(5)** Provide programs, services and activities that ensure environmentally healthful and sanitary conditions. | X | | |
| **(6)** Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring and enforcement. | | | X |
| **(7)** Prioritize programs, services, interventions and activities that address identified social determinants of health to improve native Hawaiʻian 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. | | | X |
| **Discussion:** The Proposed Action will use LEED design standards to create environmentally healthy and sanitary living conditions. | | | |
| **HRS § 226-21: Objective and Policies for Socio-Cultural Advancement–Education** | | | |
| **(a) Objective:** Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities and aspirations. | | | |
| **(b) Policies:** | | | |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(1)** Support educational programs and activities that enhance personal development, physical fitness, recreation and cultural pursuits of all groups. | X | | |
| **(2)** Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs. | | | X |
| **(3)** Provide appropriate educational opportunities for groups with special needs. | | | X |
| **(4)** Promote educational programs which enhance understanding of Hawaiʻi's cultural heritage. | | | X |
| **(5)** Provide higher educational opportunities that enable Hawaiʻi's people to adapt to changing employment demands. | | | X |
| **(6)** Assist individuals, especially those experiencing critical employment problems or barriers or undergoing employment transitions, by providing appropriate employment training programs and other related educational opportunities. | | | X |
| **(7)** Promote programs and activities that facilitate the acquisition of basic skills, such as reading, writing, computing, listening, speaking and reasoning. | | | X |
| **(8)** Emphasize quality educational programs in Hawaiʻi's institutions to promote academic excellence. | | | X |
| **(9)** Support research programs and activities that enhance the education programs of the State. | | | X |
| **Discussion:** A key purpose of the Proposed Action is to provide affordable rental housing to elderly residents that are unable to afford market rate rental housing in surrounding neighborhoods. The O`ahu General Plan, the Primary Urban Center Development Plan and the Hawai`i Housing Planning Study 2019 have identified the need for affordable elderly rental housing as a priority and in response to the projected increase in the number of O`ahu's elderly population. The Proposed Action has no specific educational components. | | | |
| **HRS § 226-22: Objective and Policies for Socio-Cultural Advancement–Social Services** | | | |
| **(a) Objective:** 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) Policies:** | | | |
| **(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. | X | | |
| **(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. | | | X |
| **(3)** Facilitate the adjustment of new residents, especially recently arrived immigrants, into Hawaiʻi's communities. | X | | |
| **(4)** Promote alternatives to institutional care in the provision of long-term care for elder and disabled populations. | X | | |
| **(5)** Support public and private efforts to prevent domestic abuse and child molestation and assist victims of abuse and neglect. | | | X |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(6)** Promote programs which assist people in need of family planning services to enable them to meet their needs. | | | X |
| **Discussion:** The Proposed Action is intended to provide affordable rental housing for the elderly and provide a limited number of ADA compliant residential units. | | | |
| **HRS § 226-23: Objective and Policies for Socio-Cultural Advancement–Leisure** | | | |
| **(a) Objective:** 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) Policies:** | | | |
| **(1)** Foster and preserve Hawai'i's multi-cultural heritage through supportive cultural, artistic, recreational and humanities-oriented programs and activities. | X | | |
| **(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. | X | | |
| **(3)** Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities and improved facility design and maintenance. | | | X |
| **(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. | X | | |
| **(5)** Ensure opportunities for everyone to use and enjoy Hawai'i's recreational resources. | | | X |
| **(6)** Assure the availability of sufficient resources to provide for future cultural, artistic and recreational needs. | | | X |
| **(7)** Provide adequate and accessible physical fitness programs to promote the physical and mental well-being of Hawai'i's people. | X | | |
| **(8)** Increase opportunities for appreciation and participation in the creative arts, including the literary, theatrical, visual, musical, folk and traditional art forms. | | | X |
| **(9)** Encourage the development of creative expression in the artistic disciplines to enable all segments of Hawai'i's population to participate in the creative arts. | | | X |
| **(10)** Assure adequate access to significant natural and cultural resources in public ownership. | X | | |
| **Discussion:** The Proposed Action would create a pleasant and convenient residential environment for elderly residents. Opportunities for recreational gardening would be available through the provision of approximately 1 acre for community garden activities where social interaction and cooperative activities can be encouraged. | | | |
| **HRS § 226-24: Objective and Policies for Socio-Cultural Advancement Individual Rights and Personal Well-being** | | | |
| **(a) Objective:** Planning for the State's socio-cultural advancement with regard to individual rights and personal well-being shall be directed towards achievement of the objective of increased opportunities and protection of individual rights to enable individuals to fulfill their socio-economic needs and aspirations. | | | |
| **(b) Policies:** | | | |

| HAWAI`I STATE PLAN<br>PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(1)** Provide effective services and activities that protect individuals from criminal acts and unfair practices and that alleviate the consequences of criminal acts in order to foster a safe and secure environment. | | | X |
| **(2)** Uphold and protect the national and state constitutional rights of every individual. | | | X |
| **(3)** Assure access to, and availability of, legal assistance, consumer protection and other public services which strive to attain social justice. | | | X |
| **(4)** Ensure equal opportunities for individual participation in society. | | | X |
| **<u>Discussion</u>:** The Proposed Action does not affect nor negatively impact the objectives and policies of the Socio-Cultural Advancement—Individual Rights or Personal Well-Being. | | | |
| **HRS § 226-25: Objective and Policies for Socio-Cultural Advancement-Culture** | | | |
| **(a) Objective:** Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs and arts of Hawai'i's people. | | | |
| **(b) Policies:** | | | |
| **(1)** Foster increased knowledge and understanding of Hawai'i's ethnic and cultural heritages and the history of Hawai'i. | X | | |
| **(2)** Support activities and conditions that promote cultural values, customs and arts that enrich the lifestyles of Hawai'i's people and which are sensitive and responsive to family and community needs. | X | | |
| **(3)** Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawai'i. | | | X |
| **(4)** Encourage the essence of the aloha spirit in people's daily activities to promote harmonious relationships among Hawai'i's people and visitors. | X | | |
| **<u>Discussion</u>:** The design elements of the space will reflect the traditions, history and spiritual significance of Mānoa Valley, Hawai'ian culture, and traditional ethnic practices. The design also incorporates shaded common areas for the residents' benefit and day room conveniently located across East Manoa Rd. from the residential units. | | | |
| **HRS § 226-27: Objectives and Policies for Socio-Cultural Advancement–Public Safety** | | | |
| **(a) Objectives:** Planning for the State's socio-cultural advancement with regard to public safety shall be directed towards the achievement of the following objectives: | | | |
| **(1)** Assurance of public safety and adequate protection of life and property for all people. | X | | |
| **(2)** Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources and social and economic wellbeing of the community in the event of civil disruptions, wars, natural disasters and other major disturbances. | | | X |
| **(3)** Promotion of a sense of community responsibility for the welfare and safety of Hawai'i's people. | | | X |
| **(b) Policies Related to Public Safety:** | | | |
| **(1)** Ensure that public safety programs are effective and responsive to community needs. | X | | |
| **(2)** Encourage increased community awareness and participation in public safety programs. | | | X |
| **(c) Policies Related to Criminal Justice:** | | | |

| HAWAI`I STATE PLAN PART 1. OVERALL THEME, GOALS, OBJECTIVES & POLICIES | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(1)** Support criminal justice programs aimed at preventing and curtailing criminal activities. | | | X |
| **(2)** Develop a coordinated, systematic approach to criminal justice administration among all criminal justice agencies. | | | X |
| **(3)** Provide a range of correctional resources which may include facilities and alternatives to traditional incarceration in order to address the varied security needs of the community and successfully reintegrate offenders into the community. | | | X |
| **(d) Policies Related to Emergency Management:** | | | |
| **(1)** Ensure that responsible organizations are in a proper state of readiness to respond to major war-related, natural or technological disasters and civil disturbances at all times. | | | X |
| **(2)** Enhance the coordination between emergency management programs throughout the State. | | | X |
| **<u>Discussion</u>:** Comments received from the HPD will be addressed in the FEA to ensure the Project Site is a safe environment for residents and visitors. | | | |
| **HRS § 226-27: Objectives and Policies for Socio-Cultural Advancement–Government** | | | |
| **(a) Objectives:** Planning the State's socio-cultural advancement with regard to government shall be directed towards the achievement of the following objectives: | | | |
| **(1)** Efficient, effective and responsive government services at all levels in the State. | | | X |
| **(2)** Fiscal integrity, responsibility and efficiency in the state government and county governments. | | | X |
| **(b) Policies:** | | | |
| **(1)** Provide for necessary public goods and services not assumed by the private sector. | | | X |
| **(2)** Pursue an openness and responsiveness in government that permits the flow of public information, interaction and response. | | | X |
| **(3)** Minimize the size of government to that necessary to be effective. | | | X |
| **(4)** Stimulate the responsibility in citizens to productively participate in government for a better Hawai'i. | | | X |
| **(5)** Assure that government attitudes, actions and services are sensitive to community needs and concerns. | | | X |
| **(6)** Provide for a balanced fiscal budget. | | | X |
| **(7)** Improve the fiscal budgeting and management system of the State. | | | X |
| **(8)** Promote the consolidation of state and county governmental functions to increase the effective and efficient delivery of government programs and services and to eliminate duplicative services wherever feasible. | | | X |
| **<u>Discussion</u>**: The Proposed Action does not affect or negatively impact the objectives and policies of the Socio-Cultural Advancement—Government. | | | |

### 5.1.2 Consistency With Hawai`i State Plan Part III

Table 5-2 outlines the Proposed Action's consistency with the Hawaiʻi State Plan Part III Priority Guidelines. Those that do not apply are not discussed.

**Table 5-2: Consistency with Hawaiʻi State Plan Part III**

| HAWAIʻI STATE PLAN PART III. PRIORITY GUIDELINES | CONSISTENT? | | |
|---|---|---|---|
| | YES | NO | N/A |
| **HRS§226-103 Economic Priority Guidelines** | | | |
| **Discussion:** The Economic Priority Guidelines are not applicable to the Proposed Action. | | | |
| **HRS §226-104 Population Growth and Land Resources Priority Guidelines** | | | |
| **(a)** Priority guidelines to effect desired statewide growth and distribution: | X | | |
| **(1)** Encourage planning and resource management to ensure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawaiʻi's people. | X | | |
| **(2)** Manage a growth rate for Hawaiʻi's economy that will parallel future employment needs for Hawaiʻi's people. | | | X |
| **(3)** Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State. | | | X |
| **(4)** Encourage major state and federal investments and services to promote economic development and private investment to the neighbor islands, as appropriate. | | | X |
| **(5)** Explore the possibility of making available urban land, low-interest loans, and housing subsidies to encourage the provision of housing to support selective economic and population growth on the neighbor islands. | | | X |
| **(6)** Seek federal funds and other funding sources outside the State for research, program development, and training to provide future employment opportunities on the neighbor islands. | | | X |
| **(7)** Support the development of high technology parks on the neighbor islands. | | | X |
| **Discussion:** The Project Site is to provide elderly affordable rental housing and is located within the Primary Urban Center. Its increase of population is estimated to be about 300 to 450 persons and as the last large site in Manoa Valley would complete the buildout of the upper Manoa community. This would contribute to the Primary Urban Center which is designated as an urban growth area and the utilization of vacant, underutilized land. | | | |
| **(b)** Priority guidelines for regional growth distribution and land resource utilization | | | |
| **(1)** Encourage urban growth primarily to existing urban areas where adequate public facilities are already available or can be provided with reasonable public expenditures and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of lifestyles. | X | | |
| **(2)** Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district. | | | X |
| **(3)** Restrict development when drafting of water would result in exceeding the sustainable yield or in significantly diminishing the recharge capacity of any groundwater area. | | | X |
| **(4)** Encourage restriction of new urban development in areas where water is insufficient from any source for both agricultural and domestic use. | | | X |
| **(5)** In order to preserve green belts, give priority to state capital improvement funds which encourage location of urban development within existing urban areas except where compelling public interest dictates development of a noncontiguous new urban core. | X | | |

| HAWAIʻI STATE PLAN PART III. PRIORITY GUIDELINES | CONSISTENT? YES | NO | N/A |
|---|---|---|---|
| **(6)** Seek participation from the private sector for the cost of building infrastructure and utilities and maintaining open spaces. | | | X |
| **(7)** Pursue rehabilitation of appropriate urban areas. | X | | |
| **(8)** Support the redevelopment of Kakaʻako into a viable residential, industrial, and commercial community. | | | X |
| **(9)** Direct future urban development away from critical environmental areas or impose mitigating measures so that negative impacts on the environment would be minimized. | X | | |
| **(10)** Identify critical environmental areas in Hawaiʻi to include but not be limited to the following: watershed and recharge areas; wildlife habitats (on land and in the ocean); areas with endangered species of plants and wildlife; natural streams and water bodies; scenic and recreational shoreline resources; open space and natural areas; historic and cultural sites; areas particularly sensitive to reduction in water and air quality; and scenic resources. | | | X |
| **(11)** Identify all areas where priority should be given to preserving rural character and lifestyle. | | | X |
| **(12)** Utilize Hawaiʻi's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations. | X | | |
| **(13)** Protect and enhance Hawaiʻi's shoreline, open spaces, and scenic resources. | | | X |
| **<u>Discussion</u>:** The Proposed Action lies within the Primary Urban Center of Honolulu and is intended to comply with the City's policy to maintain urban growth within the existing urban area and will provide affordable rental housing for elderly residents. The Project's design and the use of BMPs during construction will mitigate potential negative impacts on the surrounding environment. | | | |
| **HRS §226-105 Crime and Criminal Justice** | | | |
| **<u>Discussion</u>:** The Crime and Criminal Justice Guidelines are not applicable to the Proposed Action. | | | |
| **HRS §226-106 Affordable Housing** | | | |
| **Priority guidelines for the provision of affordable housing:** | | | |
| **(1)** Seek to use marginal or non-essential agricultural land and public land to meet housing needs of low and moderate-income and gap-group households. | | | X |
| **(2)** Encourage the use of alternative construction and development methods as a means of reducing production costs. | X | | |
| **(3)** Improve information and analysis relative to land availability and suitability for housing. | | | X |
| **(4)** Create incentives for development which would increase home ownership and rental opportunities for Hawaiʻi's low and moderate-income households, gap-group households, and residents with special needs. | X | | |
| **(5)** Encourage continued support for government or private housing programs that provide low interest mortgages to Hawaiʻi's people for the purchase of initial owner-occupied housing. | | | X |

| HAWAIʻI STATE PLAN PART III. PRIORITY GUIDELINES | CONSISTENT? | | |
|---|---|---|---|
| | YES | NO | N/A |
| **(6)** Encourage public and private sector cooperation in the development of rental housing alternatives. | X | | |
| **(7)** Encourage improved coordination between various agencies and levels of government to deal with housing policies and regulations. | | | X |
| **(8)** Give higher priority to the provision of quality housing that is affordable for Hawaiʻi 's residents and less priority to development of housing intended primarily for individuals outside of Hawaiʻi . | X | | |
| **Discussion:** The Proposed Action is a 201H project that will involve tax credits from HHFDC to provide affordable rental housing units for the elderly. | | | |
| **HRS §226-107 Quality Education** | | | |
| **Priority guidelines to promote quality education:** | | | |
| **(1)** Pursue effective programs which reflect the varied district, school, and student needs to strengthen basic skills achievement. | | | X |
| **(2)** Continue emphasis on general education "core" requirements to provide common background to students and essential support to other university programs. | | | X |
| **(3)** Initiate efforts to improve the quality of education by improving the capabilities of the education work force. | | | X |
| **(4)** Promote increased opportunities for greater autonomy and flexibility of educational institutions in their decision-making responsibilities. | | | |
| **(5)** Increase and improve the use of information technology in education by the availability of telecommunications equipment for:<br>(A) The electronic exchange of information;<br>(B) Statewide electronic mail; and<br>(C) Access to the Internet. Encourage programs that increase the public's awareness and understanding of the impact of information technologies on our lives. | | | X |
| **(6)** Pursue the establishment of Hawaiʻi's public and private universities and colleges as research and training centers of the Pacific. | | | X |
| **(7)** Develop resources and programs for early childhood education. | | | X |
| **(8)** Explore alternatives for funding and delivery of educational services to improve the overall quality of education. | | | X |
| **(9)** Strengthen and expand educational programs and services for students with special needs. | | | X |
| **Discussion:** The Proposed Action has no education component and is therefore not applicable to the priority guidelines to promote quality education. | | | |
| **HRS §226-108 Sustainability** | | | |
| **Priority guidelines and principals to promote sustainability:** | | | |
| **(1)** Encouraging balanced economic, social, community, and environmental priorities. | X | | |
| **(2)** Encouraging planning that respects and promotes living within the natural resources and limits of the State. | X | | |
| **(3)** Promoting a diversified and dynamic economy. | | | X |
| **(4)** Encouraging respect for the host culture. | X | | |
| **(5)** Promoting decisions based on meeting the needs of the present without compromising the needs of future generations. | X | | |
| **(6)** Considering the principles of the ahupuaʻa system. | X | | |

| HAWAIʻI STATE PLAN<br>PART III. PRIORITY GUIDELINES | CONSISTENT? YES | NO | N/A |
|---|---|---|---|
| **(7)** Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawaiʻi. | | | X |
| **<u>Discussion</u>:** The Proposed Action encourages balanced economic, social, community, and environmental priorities by providing affordable rental housing for the elderly, and a day room. LEED silver standards will help guide the design to respect the State's natural resources, while design elements of the space will reflect the traditions, history, and spiritual significance of Mānoa Valley, and Hawaiʻian culture. | | | |
| **HRS §226-109 Climate Change Adaption** | | | |
| Priority guidelines to prepare the State to address the impacts of climate change, including impacts to the areas of agriculture; conservation lands; coastal and nearshore marine areas; natural and cultural resources; education; energy; higher education; health; historic preservation; water resources; the built environment, such as housing, recreation, transportation; and the economy shall: | | | |
| **(1)** Ensure that Hawaiʻi 's people are educated, informed, and aware of the impacts climate change may have on their communities; | | | X |
| **(2)** Encourage community stewardship groups and local stakeholders to participate in planning and implementation of climate change policies; | X | | |
| **(3)** Invest in continued monitoring and research of Hawaiʻi 's climate and the impacts of climate change on the State; | | | X |
| **(4)** Consider native Hawaiʻian traditional knowledge and practices in planning for the impacts of climate change; | | | X |
| **(5)** Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change; | X | | |
| **(6)** Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and built environments; | | | X |
| **(7)** Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options; | | | X |
| **(8)** Foster cross-jurisdictional collaboration between county, state, and federal agencies and partnerships between government and private entities and other nongovernmental entities, including nonprofit entities; | | | X |
| **(9)** Use management and implementation approaches that encourage the continual collection, evaluation, and integration of new information and strategies into new and existing practices, policies, and plans; and | | | X |
| **(10)** Encourage planning and management of the natural and built environments that effectively integrate climate change policy. [L 2012, c 286, §2] | X | | |
| **<u>Discussion</u>:** The Proposed Action will contribute toward climate change resilience by reducing energy consumption and building disaster resistant structures. Adaptation Guidelines are not applicable to the Proposed Action. | | | |

### 5.1.3 Consistency With Hawai‘i State Functional Plans

The Hawai‘i State Plan directs appropriate State agencies to prepare Functional Plans which address statewide needs, problems and issues and recommend policies and actions to mitigate those problems. The Functional Plans are prepared to further define and implement statewide goals, objectives, policies and priority guidelines contained in the Hawai‘i State Plan. Thirteen Functional Plans were prepared to implement the State Plan provisions in the areas of agriculture, conservation lands, education, employment, energy, health, higher education, historic preservation, housing, human services, recreation, tourism and transportation. Table 5-3 outlines the Proposed Action's consistency with those objectives.

**Table 5-3: Consistency with Hawai‘i State Functional Plans**

| HAWAI`I STATE FUNCTIONAL PLAN | CONSISTENT? | | |
|---|---|---|---|
| | **YES** | **NO** | **N/A** |
| **1. Agricultural State Functional Plan (1991)** | | | |
| **Purpose:** Continued viability of agriculture throughout the State. | X | | |
| **<u>Discussion</u>:** The Proposed Action is not directly applicable to the Agricultural State Functional Plan, but the community garden will offer residents and others an opportunity to participate in hobby gardening. | | | |
| **2. Conservation Lands State Functional Plan (1991)** | | | |
| **Purpose:** Addresses issues of population and economic growth and its strain on current natural resources; broadening public use of natural resources while protecting lands and shorelines from overuse; additionally, promotes the aquaculture industry. | | | X |
| **Discussion:** The Proposed Action is not applicable to the Conservation Lands State Functional Plan. | | | |
| **3. Education State Functional Plan (1989)** | | | |
| **Purpose:** Improvements to Hawai‘i's educational curriculum, quality of educational staff and access to adequate facilities. | | | X |
| **4. Agricultural State Functional Plan (1991)** | | | |
| **Discussion:** The Proposed Action is not applicable to the Agricultural State Functional Plan. | | | |
| **5. Employment State Functional Plan (1990)** | | | |
| **Purpose:** Improve the qualifications, productivity and effectiveness of the State's workforce through better education and training of workers as well as efficient planning of economic development, employment opportunities and training activities. | | | X |
| **<u>Discussion</u>:** The Proposed Action is not applicable to the Employment State Functional Plan. | | | |
| **6. Health State Functional Plan** | | | |
| **Purpose:** Improve the health care system by providing for those who do not have access to private health care providers; increasing preventative health measures; addressing 'quality of care' elements in private and public sectors to cut increasing costs. | | | X |
| **<u>Discussion</u>:** The Proposed Action has no specific component related to health care. | | | |
| **7. Higher Education Functional Plan (1984)** | | | |
| **Purpose:** Prepare Hawai‘i's citizens for the demands of an increasingly complex world through providing technical and intellectual tools. | | | X |
| **<u>Discussion</u>:** The Proposed Action is not applicable to the Higher Education Functional Plan. | | | |
| **8. Historic Preservation State Functional Plan (1991)** | | | |

| HAWAI`I STATE FUNCTIONAL PLAN | CONSISTENT? YES | NO | N/A |
|---|---|---|---|
| **Purpose:** Preservation of historic properties, records, artifacts and oral histories; provide public with information/education on the ethnic and cultural heritages and history of Hawai'i | X | | |
| **Discussion:** The Proposed Action will support the Historic Preservation State Functional Plan. No significant impacts to historic resources are anticipated for the Proposed Action because no historic properties occur on the project site. Additionally, a large area of the project site was previously identified by the U.S. Army Corps of Engineers for use as a retention basin and a cultural/historical survey and an Archaeological Literature Review and Field Inspection report was prepared which concluded that no historic, archaeological, or cultural evidence was identified. However, recommendations from the report will be used to avoid impacts to any potential resources that may be found on-site during construction. As such, the Proposed Action, through the EA process, is consistent with the Historic Preservation State Functional Plan. | | | |
| **9. Housing State Functional Plan (1989)** | | | |
| **Purpose:** Provide affordable rental and for-sale housing; increase homeownership and amount of rental housing units; acquiring public and privately-owned lands for future residential development; maintain a statewide housing data system. | X | | |
| **Discussion:** The Proposed Action supports the Housing State Functional Plan by providing new and affordable rental housing units to seniors. | | | |
| **10. Human Services State Functional Plan (1991)** | | | |
| **Purpose:** Refining support systems for families and individuals by improving elderly care, increasing preventative measures to combat child/spousal abuse and neglect; providing means for 'self-sufficiency' | | | X |
| **Discussion:** The Proposed Action is not applicable to the Human Services State Functional Plan. | | | |
| **11. Recreation State Functional Plan (1991)** | | | |
| **Purpose:** Manage the use of recreational resources via addressing issues: (1) ocean and shoreline recreation, (2) mauka, urban and other recreation, (3) public access to shoreline and upland recreation areas, (4) resource conservation and management, (5) management of recreation programs/facilities/areas and (6) wetlands protection and management. | | | X |
| **Discussion:** The Proposed Action is not applicable to the Recreation State Functional Plan. | | | |
| **12. Tourism State Functional Plan (1991)** | | | |
| **Purpose:** Balance tourism/economic growth with environmental and community concerns; development that is cognizant of the limited land and water resources of the islands; maintaining friendly relations between tourists and community members; development of a productive workforce and enhancement of career and employment opportunities in the visitor industry. | | | X |
| **Discussion:** The Proposed Action is not applicable to the Tourism State Functional Plan. | | | |
| **13. Transportation State Functional Plan (1991)** | | | |
| **Purpose:** Development of a safer, more efficient transportation system that also is consistent with planned physical and economic growth of the state; construction of facility and infrastructure improvements; develop a transportation system balanced with new alternatives; pursue land use initiatives which help reduce travel demand. | | | X |

| HAWAI`I STATE FUNCTIONAL PLAN | CONSISTENT? | | |
|---|---|---|---|
| | YES | NO | N/A |
| **Discussion:** The Proposed Action supports the Transportation State Functional Plan by reducing travel demand on Honolulu's existing transportation systems by pursuing land use that promotes affordable elderly rental housing convenient to public transportation and community services. This would reduce the number of daily commuters and help reduce the demand for travel within the urban area. | | | |

### 5.1.4 Consistency With State Land Use Law

The State Land Use Law, HRS §205, is intended to preserve, protect and encourage the development of lands in the State for uses that are best suited to the public health and welfare of Hawaiʻi's people. Under HRS §205, all lands in the State of Hawaiʻi are classified by the State Land Use Commission (LUC) into one of four major categories of State Land Use Districts. These districts are identified as the Urban District, Agricultural District, Conservation District and Rural District. Permitted uses within the districts are prescribed under HRS §205-2 and the LUC's Administrative Rules prescribed under HAR §15-15-3.

The Project is situated entirely in the State's Urban Land Use District. The Urban District includes lands characterized by "city-like" concentrations of people, structures and services. This District also includes vacant areas for future development. Jurisdiction of Urban Districts lie primarily with the county. In general, lot sizes and uses permitted in the district area are established by the County ordinances or rules. The purpose and intent of the Proposed Action is consistent with the Urban State Land Use District.

### 5.1.5 Consistency With Hawaiʻi Coastal Zone Management Plan

The National Coastal Zone Management (CZM) Program was created through passage of the Coastal Zone Management Act of 1972. The U.S. Congress enacted the CZM Act to assist states in better managing coastal and estuarine environments. The Act provides grants to states that develop and implement federally approved CZM plans. The goal of the CZM Act is to "preserve, protect, develop and where possible, to restore or enhance the resources of the nation's coastal zone." Hawaiʻi's CZM Act, adopted as HRS §205A, provides a basis for protecting, restoring and responsibly developing coastal communities and resources. In Hawaiʻi, the "coastal zone management area" means all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the territorial sea.

The Proposed Action's conformance with the ten objectives and numerous policies of the State of Hawaiʻi CZM Plan is set forth in Table 5-4 below (OP 1990). The Proposed Action does not include the use of land that is within the Special Management Area as designated by the City (*see* Figure 1-1: Location Map). Therefore, Special Management Area permits are not required to implement the Proposed Action.

**Table 5-4: Consistency with the Hawaiʻi Coastal Zone Management Program**

| | Hawaiʻi Coastal Zone Management Program Objectives | Consistent? | | |
|---|---|---|---|---|
| | | Yes | No | N/A |
| 1 | **Recreational Resources** | | | |

| **Hawai‘i Coastal Zone Management Program Objectives** | **Consistent?** | | |
|---|---|---|---|
| | **Yes** | **No** | **N/A** |
| **Objective:** Provide coastal recreational opportunities accessible to the public. | | | |
| **Policies:** | | | |
| **(A)** Improve coordination and funding of coastal recreational planning and management; and | | | X |
| **(B)** Provide adequate, accessible and diverse recreational opportunities in the coastal zone management area by: | | | X |
| **(i)** Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas; | | | X |
| **(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; | | | X |
| **(iii)** Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value; | | | X |
| **(iv)** Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation; | | | X |
| **(v)** Ensuring public recreational uses 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; | | | X |
| **(vi)** Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters; | X | | |
| **(vii)** Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches and artificial reefs for surfing and fishing; and | | | X |
| **(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 and county authorities; and crediting such dedication against the requirements of section 46-6. | | | X |
| **Discussion:** The Proposed Action is not located on the coast and is not within the area designated as the Special Management Area (SMA). The SMA policies are therefore not applicable to the Proposed Action. However, the Proposed Action will comply with State water quality standards NPDES permit program conditions. The stormwater management system will be designed to retain stormwater on-site. No detrimental impact to coastal waters is expected. | | | |
| **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 Hawai‘i an and American history and culture. | | | |
| **Policies:** | | | |
| **(A)** Identify and analyze significant archaeological resources; | X | | |
| **(B)** Maximize information retention through preservation of remains and artifacts or salvage operations; and | X | | |
| **(C)** Support state goals for protection, restoration, interpretation and display of historic resources. | X | | |

| Hawai‘i Coastal Zone Management Program Objectives | | Consistent? Yes | No | N/A |
|---|---|---|---|---|
| **Discussion:** No historic or archaeological resources were identified on-site and therefore no significant impacts to historic resources are anticipated for the Proposed Action. The existing residential structures on the project's parcels are not considered to be historic and no preservation action is required. | | | | |
| **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; | | X | | |
| **(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; | | X | | |
| **(C)** Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and | | | | X |
| **(D)** Encourage those developments that are not coastal dependent to locate in inland areas. | | X | | |
| **Discussion:** The Proposed Action will preserve and maintain the integrity of Woodlawn Ditch that feeds into Mānoa Stream through the use of temporary and permanent best management practices. Woodlawn Ditch will also be isolated from public access with a safety barrier. | | | | |
| **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, practice stewardship in the protection, use and development of marine and coastal resources; | | | | X |
| **(B)** Improve the technical basis for natural resource management; | | | | X |
| **(C)** Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance; | | | | X |
| **(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 | | | | X |
| **(E)** Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures. | | X | | |
| **Discussion:** The Proposed Action is not in the SMA and is not located on the coastline. Most policies are not applicable to the Proposed Action. However, the Proposed Action will comply with State water quality standards, including the HDOH NPDES permit program. The stormwater management system will be designed to retain stormwater on-site. No impact to coastal waters is anticipated. | | | | |
| **5** | **Economic Uses** | | | |
| **Objective:** Provide public or private facilities and improvements important to the State's economy in suitable locations. | | | | |
| **Policies:** | | | | |
| **(A)** Concentrate coastal dependent development in appropriate areas; | | | | X |

| Hawaiʻi Coastal Zone Management Program Objectives | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(B)** Ensure that coastal dependent development such as harbors and ports, and coastal related development such as 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 | | | X |
| **(C)** Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long- term growth at such areas and permit coastal dependent development outside of presently designated areas when: | | | X |
| **(i)** Use of presently designated locations is not feasible; | | | X |
| **(ii)** Adverse environmental effects are minimized; and | | | X |
| **(iii)** The development is important to the State's economy. | | | X |
| **Discussion:** The Proposed Action is not a coastal dependent development, is not located on the coastline, and does not contain any coastal ecosystems; therefore, these policies are not applicable. | | | |
| **6 Coastal Hazards** | | | |
| **Objective:** Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution. | | | |
| **Policies:** | | | |
| **(A)** Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence and point and nonpoint source pollution hazards; | X | | |
| **(B)** Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence and point and nonpoint source pollution hazards; | | | X |
| **(C)** Ensure that developments comply with requirements of the Federal Flood Insurance Program; and | X | | |
| **(D)** Prevent coastal flooding from inland projects. | X | | |
| **Discussion:** The Proposed Action is located 1.6 miles inland from the coastline and outside of the projected storm wave, sea level rise, and tsunami zones. It is adjacent to Woodlawn Ditch and lies within FIRM Flood Zone X. However, it will comply with Federal Flood Insurance Program requirements as appropriate. Stormwater runoff will be managed on-site through LID design principals. | | | |
| **7 Managing Development** | | | |
| **Objective:** Improve the development review process, communication and public participation in the management of coastal resources and hazards. | | | |
| **Policies:** | | | |
| **(A)** Use, implement and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development; | | | X |
| **(B)** Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and | | | X |
| **(C)** Communicate the potential short and long-term impacts of proposed significant proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process. | | | X |
| **Discussion:** The Proposed Action is not a coastal development, is not located on the coastline and is not in the SMA; therefore, these policies are not applicable. | | | |

| Hawai‘i Coastal Zone Management Program Objectives | Consistent? Yes | No | N/A |
|---|---|---|---|
| **8 Public Participation** | | | |
| **Objective:** Stimulate public awareness, education and participation in coastal management. | | | |
| **Policies:** | | | |
| **(A)** Promote public involvement in coastal zone management processes; | | | X |
| **(B)** Disseminate information on coastal management issues by means of educational materials, published reports, staff contact and public workshops for persons and organizations concerned with coastal issues, developments and government activities; and | | | X |
| **(C)** Organize workshops, policy dialogues and site-specific mediations to respond to coastal issues and conflicts. | | | X |
| **Discussion:** The Proposed Action is not a coastal development and is not in the SMA; therefore, these policies are not applicable. | | | |
| **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, minimize interference with natural shoreline processes and minimize loss of improvements due to erosion; | | | X |
| **(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; and | | | X |
| **(C)** Minimize the construction of public erosion-protection structures seaward of the shoreline. | | | X |
| **(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 | | | X |
| **(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. | | | X |
| **Discussion:** The Proposed Action is not a coastal dependent development, is not located on the coastline and is not in the SMA; therefore, these policies are not applicable. | | | |
| **10 Marine Resources** | | | |
| **Objective:** Promote the protection, use and development of marine and coastal resources to assure their sustainability. | | | |
| **Policies:** | | | |
| **(A)** Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial; | | | X |
| **(B)** Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency; | | | X |
| **(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; | | | X |
| **(D)** Promote research, study and understanding of ocean processes, marine life and other ocean resources in order to acquire and inventory information | | | X |

| Hawaiʻi Coastal Zone Management Program Objectives | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| 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. | | | X |
| **Discussion:** The Proposed Action is not a coastal dependent development, is not located on the coastline and is not in the SMA; therefore, these policies are not applicable. | | | |

## 5.2 CITY AND COUNTY OF HONOLULU

### 5.2.1 Consistency With Oʻahu General Plan 2022

The *Oʻahu General Plan* is a statement of objectives and policies for the long-range social, economic, environmental and design objectives of the City planning process. The Proposed Action's consistency with objectives and policies of the Oʻahu General Plan is discussed in Table 5-5 (CCH DPP 2002). Objectives that are not applicable are noted, but do not include a discussion.

**Table 5-5: Consistency with Oʻahu General Plan**

**O`AHU GENERAL PLAN**
**APPROVED JANUARY 14, 2022**

An analysis of the Proposed Action's compatibility with the current General Plan's Objectives and Policies are detailed in the following **Table 5.5**. The current O`ahu General Plan was approved on January 14, 2022 This Draft Environmental Assessment includes an assessment of the Proposed Action's compatibility with the Objectives and Policies of the O`ahu **General Plan** 2022 in the following **Table 5.5**.

**Table 5.5: Consistency with the Oʻahu General Plan 2022**

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **I. POPULATION** | | | |
| **Objective A - To plan for anticipated population in a manner that acknowledges the limits of Oʻahu 's natural resources, protects the environment, and minimizes social, cultural, and economic disruptions.** | | | |
| **Policies** | | | |
| **(1)** Allocate efficiently the money and resources of the City in order to meet the needs of Oʻahu 's current and future population. | | | X |
| **(2)** Provide adequate support facilities to accommodate future numbers of visitors to Oʻahu while seeking to minimize disruption to residents and protect the natural environment. | | | X |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(3)** Seek a balanced pace of physical development in harmony with the City's environmental, social, cultural and economic goals by effecting and enforcing City regulations. | X | | |
| **(4)** Establish geographic growth boundaries to accommodate future population growth while at the same time protecting valuable agricultural lands, environmental resources, and open space. | | | X |
| **(5)** Support family planning and social equity. | | | X |
| **<u>Discussion</u>:** The Proposed Action would provide affordable rental housing for elderly 62+ in a phased construction program over a 4 or 5 year period with rents kept affordable in perpetuity. The Project will be built within the State's Urban District and the City's Primary Urban Center Development Plan area where City development policies indicate that such physical growth should be directed. | | | |
| **Objective B - To establish a pattern of population distribution that will allow the people of O'ahu to live, work and play in harmony.** | | | |
| **Policies** | | | |
| **(1)** Facilitate the full development of the primary urban center through higher-density redevelopment and the provision of adequate infrastructure. | X | | |
| **(2)** Encourage development within the secondary urban center at Kapolei and the `Ewa and Central O'ahu urban-fringe areas to relieve developmental pressures in the remaining urban-fringe and rural areas and to meet housing needs not readily provided in the primary urban center. | | | X |
| **(3)** Manage land use and development in the urban-fringe and rural areas so that:<br>a) Development is contained within growth boundaries; and<br>b) Population densities in all areas remain consistent with the character, culture and environmental qualities desired for each community. | | | X |
| **(4)** Direct growth according to Policies 1, 2, and 3 above by providing development capacity and needed infrastructure to support a distribution of O'ahu 's resident population that is consistent with the following table: **(Showing Primary Urban Center only)** | X | | |

*Table 1. Distribution of Residential Population*

| *Policy 1 Area:* | *% Distribution of 2040 Population** |
|---|---|
| Primary Urban Center | 43% |

- O'ahu 's population is based on DBEDT's latest population projections. The percent share for each DP area is an approximation derived through rounding.

**<u>Discussion</u>:** The Proposed Action would slightly increase the density of the Primary Urban Center and would be consistent with the population distribution goals of the General Plan.

| II. BALANCED ECONOMY | Yes | No | N/A |
|---|---|---|---|
| **Objective A - To promote diversified economic opportunities that enable all the people of O'ahu to attain meaningful employment and a decent standard of living.** | | | |
| **Policies** | | | |
| **(1)** Support a strong, diverse and dynamic economic base that protects the natural environment and is resilient to changes in global conditions. | X | | |

| O\`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(2)** Encourage the viability of businesses and industries, including support for small businesses, which contribute to the economic and social well-being of O‘ahu residents. | | | X |
| **(3)** Pursue opportunities to grow and strategically develop non-polluting industries such as healthcare, agriculture, renewable energy, and technology in appropriate locations that contribute to O‘ahu’s long-term environmental, economic, and social sustainability. | | | X |
| **(4)** Support entrepreneurship and innovation through creative efforts such as partnerships with businesses and non-profit organizations, and by encouraging complementary policies that support access to capital markets. | | | X |
| **(5)** Foster a healthy business climate by streamlining regulatory processes to be transparent, predictable, and efficient. | | | X |
| **(6)** Encourage the development of local, national, and world markets for the products of O‘ahu based industries. | | | X |
| **(7)** Explore and encourage alternate economic models that reflect traditional cultural values and improve economic resilience, i.e., subsistence, barter and a culture of reciprocity and sharing. | | | X |
| **<u>Discussion</u>:** The Proposed Action does not impact the promotion of economic opportunities or employment and therefore these policies are generally not applicable. | | | |
| **Objective B - To maintain a successful visitor industry that creates living wage employment, enhances quality of life, and actively supports our unique sense of place, natural beauty, Native Hawai‘ian culture, and multi-cultural heritage.** | | | |
| **Policies** | | | |
| **(1)** Encourage the visitor industry to support the quality of the visitor experience, the economic and social well-being of communities, the environment, and the quality of life of residents. | | | X |
| **(2)** Respect and emphasize the value that Native Hawai‘ian culture, its cultural practitioners, and other established ethnic traditions bring to enrich the visitor experience and appreciation for island heritage, culture, and values. | | | X |
| **(3)** Guide the development and operation of visitor accommodations and attractions in a manner that avoids unsustainable increases in the cost of providing public services and infrastructure, and that respects existing lifestyles, cultural practices, and natural, cultural and historic resources. | | | X |
| **(4)** Partner with the private sector to support the long-term viability of Waikiki as a world-class visitor destination and as O\`ahu’s primary resort area, and to support adequate adaptation strategies against climate change impacts. | | | X |
| **(5)** Provide related public expenditures for rural and urban-fringe areas that are highly impacted by the visitor industry. | | | X |
| **(6)** Provide for a high-quality, livable, and safe environment for visitors and residents in Waikiki, and support measures to ensure visitors’ and residents’ safety in all areas of O‘ahu . | | | X |
| **(7)** Concentrate on the quality of the visitor experience in Waikiki, rather than on development densities. | | | X |
| **(8)** Facilitate the development of the following secondary resort areas: Ko \`Olina, Turtle Bay, Hoakalei, and Mākaha Valley in a manner that respects existing lifestyles and the natural environment. | | | X |
| **(9)** Preserve scenic qualities of O‘ahu for residents and visitors alike. | X | | |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES<br>Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(10)** Encourage physical improvements, social services, and cultural programs that contribute to a high-quality visitor experience, while seeking financial support of these improvements from the visitor industry. | | | X |
| **Discussion:** The Proposed Action is intended to provide affordable rental housing and limited services to elderly residents. The Project would not support tourism development, tourism related activities, or tourism focused areas. These policies are not applicable to the Proposed Action. | | | |
| **Objective C - To ensure the long-term viability, continued productivity and sustainability of agriculture on O`ahu.** | | | |
| **Policies** | | | |
| **(1)** Foster a positive business climate for agricultural enterprises of all sizes, as well as innovative approaches to farming as a business, to ensure the continuation of agriculture as an important component of O'ahu 's economy. | | | X |
| **(2)** Support agricultural diversification to strengthen the agricultural industry and to make more locally grown food available for local consumption. | | | X |
| **(3)** Foster market opportunities and increased consumer demand for safe, locally grown, fresh, processed, and value-added agricultural products. | | | X |
| **(4)** Streamline the implementation of regulations to enhance a producer's ability to develop, market, and distribute locally grown food and products. | | | X |
| **(5)** Identify the economic benefits of local food production for local markets. Provide economic incentives to encourage local food production and sustainability and encourage agricultural and aquaculture occupations. | | | X |
| **(6)** Promote small-scale farming activities and other operations, such as truck farming, flower growing, aquaculture, livestock production, taro growing, subsistence farms, and community gardens. | X | | |
| **(7)** Encourage landowners to actively use agricultural lands for agricultural purposes, and to pursue the long-term preservation of agricultural land with high productivity potential for agricultural production. | | | X |
| **(8)** Encourage sustainable agricultural production to coexist on lands with renewable energy generation. | | | X |
| **(9)** Prohibit the urbanization of agricultural land located outside the City's growth boundaries. | | | X |
| **(10)** Support and encourage technologies and agricultural practices that conserve and protect water, soil, air quality, and drainage areas, reduce carbon emissions, and promote public health and safety. | | | X |
| **(11)** Support and encourage the availability and use of non-potable water for irrigation, where feasible. | | | X |
| **(12)** Provide plans, incentives, and strategies to ensure the affordability of agricultural land for farmers. | | | X |
| **(13)** Encourage both public and private investments to improve and expand agricultural infrastructure, such as irrigation systems, agricultural processing centers, and distribution networks. | | | X |
| **(14)** Promote farming as a desirable and fulfilling occupation by encouraging agricultural education and training programs and by raising public awareness and appreciation for agriculture. | | | X |
| **(15)** Protect the right to farm by enforcing right-to-farm laws, enacting policies to protect agricultural operations, and imposing meaningful buffer zones. | | | X |
| **(16)** Seek ways to discourage agricultural theft and vandalism. | | | X |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(17)** Recognize the scenic value of agricultural lands as an open-space resource and amenity. | | | **X** |
| **Discussion**: With the exception of the site area reserved for dedication as a community garden within the project area, the Proposed Action does not impact agricultural activities on O`ahu. | | | |
| **Objective D - To use the economic resources of the sea in a sustainable manner.** | | | |
| **Policies** | | | |
| **(1)** Encourage the fishing industry to maintain its viability at a level that does not degrade or damage marine ecosystems. | | | **X** |
| **(2)** Encourage the ongoing development of aquaculture, ocean research, and other ocean related industries. | | | X |
| **(3)** Encourage the expansion of ocean recreation activities for residents and visitors that are operated in a sustainable manner. | | | X |
| **Discussion**: The Proposed Action has no impact on the use of the economic resources of the sea and the Objective and supporting policies are therefore not applicable. | | | |
| **Objective E - To ensure meaningful employment and economic equity.** | | | |
| **Policies** | | | |
| **(1)** Support public and private training and employment programs to prepare residents for existing and future job, including those for historically marginalized communities. | | | X |
| **(2)** Make full use of State and federal employment and training programs. | | | X |
| **(3)** Encourage the provision of retraining programs for workers in industries with planned reductions in their labor force. | | | X |
| **(4)** Identify emerging industries, encourage investments needed to support the industries, and develop a skilled workforce in these fields. | | | **X** |
| **Discussion**: The Proposed Action will provide meaningful employment for an apartment manager and maintenance personnel but has no additional relationship with employment training programs. | | | |
| **Objective F - To maintain federal programs and economic activity on O`ahu consistent with the City's infrastructure and environmental goals.** | | | |
| **Policies** | | | |
| **(1)** Take full advantage of Federal programs and grants that contribute to the economic, social, cultural, and environmental well-being of O`ahu's residents. | | | X |
| **(2)** Encourage the federal government to pay for the cost of public services used by federal agencies. | | | X |
| **(3)** Encourage the federal government to lease new facilities rather than construct them on tax-exempt public land. | | | X |
| **(4)** Encourage the federal government to purchase locally all needed services and supplies which are available on O`ahu. | | | X |
| **(5)** Encourage the continuation of a high level of military-related employment both on and off base in the Hickam-Pearl Harbor, Wahiawa, Kailua-Kaneohe, and `Ewa Areas. | | | X |
| **Discussion**: The Proposed Action has no relationship with federal spending and therefore these policies are not applicable. | | | |
| **Objective G - To bring about orderly economic growth on O`ahu.** | | | |
| **Policies** | | | |
| **(1)** Concentrate economic activity and government services in the primary urban center and in the secondary urban center at Kapolei | **X** | | |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(2)** Advance the equitable distribution of City capital spending, employment opportunities, infrastructure investments, and other benefits throughout communities based on need and regardless of income level. Allow infrastructure and business activity in urban fringe areas appropriate to population needs.. | | | X |
| **(3)** Maintain sufficient land in appropriately located commercial and industrial areas to ensure a favorable business climate on O`ahu. | | | X |
| **Discussion:** The Proposed Action is located in the Primary Urban Center but has no impact on economic growth and these policies are therefore not applicable. | | | |
| **III NATURAL ENVIRONMENT AND RESOURCE STEWARDSHIP** | | | |
| **Objective A - To protect and preserve the natural environment.** | | | |
| **Policies** | | | |
| **(1)** Protect O'ahu's natural environment, especially the shoreline, valleys, ridges, watershed areas, and wetlands from incompatible development. | X | | |
| **(2)** Seek the restoration of environmentally damaged areas and natural resources. | | | X |
| **(3)** Preserve**, p**rotect, and restore stream flows and stream habitats to support aquatic and environmental processes and riparian, scenic, recreational, and Native Hawai'ian cultural resources. | | | X |
| **(4)** Require development projects to give due consideration to natural features and hazards such as slope, inland and coastal erosion flood hazards, water-recharge areas, and existing vegetation, as well as to plan for coastal hazards that threaten life and property. | X | | |
| **(5)** Require sufficient setbacks from O'ahu 's shorelines to protect life and property, preserve natural shoreline areas and sandy beaches, and minimize the future need for protective structures or relocation of structures. | | | X |
| **(6)** Design and maintain surface drainage and flood-control systems in a manner which will help preserve natural and cultural resources. | X | | |
| **(7)** Protect the natural environment from damaging levels of air, water, carbon and noise pollution. | X | | |
| **(8)** Protect plants, birds, and other animals that are unique to the State of Hawai'i and O'ahu and protect their habitats. | X | | |
| **(9)** Increase tree canopy and ensure its integration into new developments and **p**rotect significant trees on public and private lands. | X | | |
| **(10)** Increase public awareness, appreciation, and protection of O'ahu 's land, air and water resources. | | | X |
| **(11)** Support the State and federal governments in the protection of the unique environmental, marine, cultural and wildlife assets of the Northwestern Hawai'i an Islands. | | | X |
| **(12)** Plan and prepare for the impacts of climate change on the natural environment, including strategies of adaption. | X | | |
| **Discussion:** The Proposed Action would utilize BMP for site drainage and intends to preserve to the extent possible the wooded nature of the site by preserving those trees that are healthy and provide benefits such as shade, visual privacy, and wildlife habitat. Access to hazardous areas of steeply sloping land and the Woodlawn Ditch will be deterred. The property is within FIRM flood Zone X and is not prone to flooding. (See full Preliminary Drainage Report in Appendix D) | | | |

| O\`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **Objective B - To preserve and enhance natural landmarks and scenic views of O‘ahu for the benefit of both residents and visitors as well as future generations.** | | | |
| **Policies** | | | |
| **(1)** Protect the island's significant natural resources: its mountains and craters; forests and watershed areas, wetlands, rivers, and streams; shorelines, fishponds, and bays; and reefs and offshore islands. | X | | |
| **Discussion:** The purposefully low-rise configuration of buildings will not significantly impinge on views of Mānoa Valley's natural scenic features. | | | |
| **IV. HOUSING AND COMMUNITIES** | | | |
| **Objective A - To ensure a balanced mix of housing opportunities and choices for all residents at prices they can afford.** | | | |
| **Policies** | | | |
| **(1)** Support programs, policies, and strategies which will provide decent and affordable homes for local residents, especially those in the lowest income brackets.. | X | | |
| **(2)** Streamline approval and permit procedures in a transparent manner, for housing and other development projects. | | | X |
| **(3)** Encourage innovative residential developments that result in lower costs, sustainable use of resources, more efficient use of land and infrastructure, greater convenience and privacy, and a distinct community identity. | X | | |
| **(4)** Support and encourage programs to maintain and improve the conditions of existing housing. | | | X |
| **(5)** Make full use of government programs that provide assistance for low-and moderate income renters and homebuyers. | X | | |
| **(6)** Maximize local funding programs available for affordable housing. | X | | |
| **(7)** Provide financial and other incentives to encourage the private sector to build homes for low-and moderate-income residents. | X | | |
| **(8)** Encourage and participate in joint public-private development of low-and moderate-income housing. | X | | |
| **(9)** Encourage the replacement of low-and moderate-income housing in areas which are being redeveloped at higher densities. | | | X |
| **(10)** Promote the design and construction of dwellings which take advantage of O\`ahu's year round moderate climate and use other sustainable design techniques. | X | | |
| **(11)** Encourage the construction of affordable homes within established low-density and rural communities by such means as \`ohana units, duplex dwellings, and cluster development that embraces the \`ohana concept by maintaining multi-generational proximity for local families. | X | | |
| **(12)** Promote higher-density, mixed-use development where appropriate, including rail transit-oriented development, to increase the supply of affordable and market housing in convenient proximity to jobs, shops and public transit. | X | | |
| **(13)** Encourage the production and maintenance of affordable rental housing. | X | | |
| **(14)** Encourage the provision of affordable housing designed for the elderly and people with disabilities in locations convenient to critical services and to public transit. | X | | |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(15)** Encourage equitable relationships between landowners and leaseholders, between landlords and tenants, and between condominium developers and owners. | **X** | | |
| **(16)** Support collaborative partnerships that work toward immediate solutions to house and service homeless populations and also toward long-term strategies to prevent and eliminate homelessness. | **X** | | |
| **(17)** Support programs to address all facets of homelessness, so that every homeless person has a place to stay along with the infrastructure and support services that are needed. | | | **X** |
| **Discussion:** The Proposed Action is especially consistent with and focused on achieving these objectives and implementing policies. It will provide 288 rental housing units that are affordable and developed specifically for O`ahu's increasing elderly population. The Proposed Action is a Public – Private development which uses a variety of funding sources including the contribution of about eleven acres of private land, public housing tax credits through the State's HHFDC, and Federal funding assistance from the Community Block Grant Program, A portion of the housing units will be designed to be ADA compliant for those residents with disabilities. Development costs will be reduced through an innovative planning and design approach. A one acre community garden area will be dedicated to the City for use by community residents. The project site is convenient to public transportation (The Bus) and to neighborhood services, shopping, and recreational activities. | | | |
| **Objective B - To minimize speculation in land and housing.** | | | |
| **Policies** | | | |
| **(1)** Encourage the State government to coordinate its urban-area designations with the developmental policies of the City and County. | | | **X** |
| **(2)** Discourage speculation in lands outside of areas planned for urban use, reduce the prevalence of vacant dwelling units, and reduce the use of residential dwelling units for short-term vacation rentals. | | | **X** |
| **(3)** Seek public benefits from increases in the value of land owing to City and State developmental policies and decisions. | X | | |
| **(4)** Require government-assisted housing to be delivered to qualified purchasers and renters. | **X** | | |
| **(5)** Ensure that owners of housing properties, including government-subsidized housing, maintain housing affordability over the long term. | **X** | | |
| **Discussion:** The Proposed Action will be kept affordable for 65 years and prospective residents will be screened to ensure they meet the affordable housing qualification criteria established by Federal, State, and City subsidized housing programs. | | | |
| **Objective C - To provide residents with a choice of living environments that are reasonably close to employment, schools, recreation, and commercial centers and that are adequately served by transportation networks and public utilities.** | | | |
| **Policies** | | | |
| **(1)** Ensure that residential developments offer affordable housing to people of different income levels and to families of various sizes to alleviate the existing condition of overcrowding. | **X** | | |
| **(2)** Encourage the fair distribution of low-and moderate-income housing throughout the island. | **X** | | |
| **(3)** Encourage the co-location of residential development and employment centers with commercial, educational, social and recreational amenities in the development of desirable communities. | **X** | | |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(4)** Encourage residential development in suburban areas where existing roads, utilities, and other community facilities are not being used to capacity, and in urban areas where higher densities can be readily accommodated. | X | | |
| **(5)** Support mixed-use development and higher-density redevelopment in areas surrounding rail transit stations. | | | X |
| **(6)** Discourage residential development in areas where the topography makes construction difficult or hazardous and where providing and maintaining roads, utilities, and other facilities would be extremely costly or environmentally damaging. | | | X |
| **(7)** Encourage public and private investments in older communities as needed to keep the communities vibrant and livable. | X | | |
| **(8)** Encourage the military to provide housing for active duty personnel and their families on military bases and in areas turned over to military housing contractors. | | | X |
| **Discussion:** The Proposed Action is located on The Bus route #6 with a short trip to Mānoa Marketplace where a variety of commercial services and shops are available. The project site is also within walking distance of Mānoa Regional Park. | | | |
| **V. TRANSPORTATION AND UTILITIES** | | | |
| **Objective A: To create a multi-mode transportation system that moves people and goods safely, efficiently and at a reasonable cost; and minimizes fossil fuel consumption and greenhouse gas emissions; serves all users, including limited income, elderly, and disabled populations; and is integrated with existing and planned development.** | | | |
| **Policies** | | | |
| **(1)** Develop a comprehensive, well-connected and integrated ground-transportation system that reduces carbon emissions and enables safe, comfortable and convenient travel for all users, including motorists, pedestrians, bicyclists, and public transportation users of all ages and abilities. | X | | |
| **(2)** Provide multi-modal transportation services to people living within `Ewa, Central O‘ahu and Pearl City-Hawai‘i Kai corridors primarily through a mass transit system including exclusive right-of-way rail transit and feeder bus components as well as through the existing highway system. | | | X |
| **(3)** Provide multi-modal transportation services outside the `Ewa, Central O‘ahu and Pearl City-Hawai‘i Kai corridors primarily through` a system of express-and feeder-buses as well as through the highway system with limited to moderate improvements sufficient to meet the needs of the communities being served. | | | X |
| (4) Work with the State to ensure adequate and safe access for communities served by O`ahu’s coastal highway system, and to plan for the relocation of highways and roads subject to sea level rise away from coastlines. | | | X |
| (5) Support the rail transit system as the transportation spine for the urban core, with links to the airport and maritime terminals, which will work together with other alternative modes of transit and transit-oriented development to reduce automobile dependency and increase multi-modal travel. | | | X |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(6)** Support the development of transportation plans, programs, and facilities that are based on Complete Streets features. Maintain and improve road, bicycle, pedestrian, and micro-mobility facilities in existing communities to eliminate unsafe conditions. | | | X |
| **(7)** Design street networks to incorporate greater roadway and pathway connectivity. | X | | |
| **(8)** Make transportation services safe and accessible to people with limited mobility; the young, elderly, disabled, and those with limited incomes. | | | X |
| **(9)** Consider environmental, social, cultural, and climate change and natural hazard impacts, as well as construction and operating costs, as important factors in planning transportation system improvements. . | | | X |
| **(10)** Reduce traffic congestion and maximize the efficient use of transportation resources by pursuing transportation demand management strategies such as carpooling, telecommuting, flexible work schedules, and incentives to use alternative travel modes. | X | | |
| **(11)** Enhance pedestrian-friendly and bicycle-friendly travel via public and private programs and improvements. | X | | |
| **(12)** Maintain separate aviation facilities for general aviation operations to supplement the capacity of Daniel K. Inouye International Airport. | | | X |
| **(13)** Support improvements to Kalaeloa Barbers Point Harbor as O`ahu's second deep-water harbor. | | | X |
| **(14)** Support the operation, maintenance and improvement of Honolulu Harbor as O`ahu's primary cargo and ocean transportation hub. | | | |
| **(15)** Advance the transition to electric and alternative fuel infrastructure to provide adequate and accessible charging spaces and renewal fueling stations for ground transportation on O`ahu. | | | |
| **Discussion:** The Proposed Action will provide 185 parking spaces which exceeds the minimum (one space per 1000 sq. ft. of floor area) required by Ordinance 20-4. Parking provision is based on the following assumptions: (a) car ownership would be less for elderly residents on fixed or low incomes; (b) some residents may choose to use Uber, Lyft, carpool, taxi, or The Bus as their preferred transportation mode. To support the objective of promoting multi-modal transportation, the Proposed Action would encourage the use of these alternate transportation modes rather than personal cars and long-term parking on-site. The Project Site is located along The Bus Route #6 which provides convenient public transportation to community shops and services (Mānoa Marketplace and Mānoa Regional Park). This would also tend to reduce site generated traffic on East Mānoa Road. The site would provide bike parking, loading, and unloading areas, handicapped parking, and parking for service vehicles. It will incorporate paving and landscaping that supports walking and promotes connectivity throughout the Project Site. | | | |
| **Objective B: Provide an adequate supply of water and environmentally sound systems of waste disposal for O`ahu's existing population and for future generations and support a one water approach that uses and manages freshwater, wastewater, and stormwater resources in an integrated manner.** | | | |
| **Policies** | | | |
| **(1)** Develop and maintain an adequate, safe, and reliable supply of fresh water in a cost-effective way that supports the long-term sustainability of the resource and considers the impacts of climate change. | X | | |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(2)** Help to develop and maintain an adequate, safe, and reliable supply of water for agricultural and industrial needs in a resource-integrated and cost-effective way that supports the long-term health of the resource. | X | | |
| **(3)** Use technologies that provide water, waste disposal, and recycling services at a reasonable cost and in a manner that addresses environmental and community impacts. | | | X |
| **(4)** Encourage the increased availability and use of recycled or brackish water to meet non-potable demands. | X | | |
| **(5)** Pursue strategies and programs to reduce the per capita consumption of water and the per capita production of waste. | X | | |
| **(6)** Provide safe, reliable, efficient, and environmentally sound waste-collection, waste disposal, and recycling services that consider the near- and long term impacts of climate change during the siting and construction of new facilities. | X | | |
| **(7)** Pursue programs to expand on-island recycling and resource recovery from O`ahu's solid-waste and wastewater streams. | | | X |
| **(8)** Support initiatives that educate the community about the importance of conserving resources and reducing waste streams through reduction, reuse, and recycling. | | | |
| **(9)** Require the safe use and disposal of hazardous materials. | | | |
| **Discussion:** The Board of Water Supply has indicated that adequate water supply is available for the project. Water saving efforts will be made to minimize water use by the project. Residents will be encouraged to sort their solid waste to facilitate recycling. | | | |
| **Objective C: To Ensure reliable, cost-effective, and responsive service for all utilities with equitable access for residents.** | | | |
| **Policies** | | | |
| **(1)** Maintain and upgrade utility systems in order to avoid major breakdowns. and service interruptions. | | | X |
| **(2)** Provide improvements to utilities in existing neighborhoods to reduce substandard conditions., and increase resilience to use fluctuations, natural hazards, extreme weather, and other climate impacts. | | | X |
| **(3)** Facilitate timely and orderly upgrades and expansions of utility systems. | | | X |
| **(4)** Increase the efficiency of public-serving utilities by encouraging a mixture of uses with peak periods of demand aligning with the availability of resources. | | | X |
| **Discussion**: The Proposed Action is not expected to negatively impact the existing utility systems. | | | |
| **Objective D: To maintain transportation and utility systems which support O'ahu as a desirable place to live and visit.** | | | |
| Policies | | | |
| **(1)** Provide adequate resources to ensure the maintenance and improvement of transportation systems and utilities. | | | X |
| **(2)** Evaluate the social, cultural, economic, and environment impact of additions to the transportation and utility systems before they are constructed. | | | X |
| **(3)** Require the installation of underground utility lines wherever feasible. | X | | |
| **(4)** Seek improved taxing powers for the City in order to provide a more equitable means of financing transportation and utility services. | | | X |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(5)** Evaluate impacts of sea level rise on existing public infrastructure, especially sewage treatment plants, roads, and other public and private utilities located along or near O`ahu's coastal areas and avoid the placement of future public infrastructure in threatened areas. | | | **X** |
| **Discussion:** The Proposed Action intends to locate all on-site utilities underground to the extent possible and compatible with existing natural site conditions. | | | |
| **VI. ENERGY SYSTEMS** | | | |
| **Objective A: To increase energy self-sufficiency through renewable energy and maintain an efficient, reliable, resilient, and cost-efficient energy system.** | | | |
| **Policies** | | | |
| **(1)** Encourage the implementation of a comprehensive plan to guide and coordinate energy conservation and renewable energy development and utilization programs. | | | X |
| **(2)** Support and encourage programs and projects, including economic incentives, regulatory measures, and educational efforts, and seek to eliminate O`ahu's dependence on fossil fuels. | **X** | | |
| **(3)** Ensure access to an adequate reserve of fuel and energy supplies to aid disaster response and recovery. | | | **X** |
| **(4)** Support the increased use of solid waste energy recovery and other biomass energy conversion systems. | | | **X** |
| **(5)** Support and participate in research, development, demonstration, commercialization, and optimization programs aimed at developing cost-effective and environmentally sound renewable energy supplies. | | | **X** |
| **(6)** Support State and federal initiatives to utilize renewable energy sources. | | | **X** |
| **(7)** Manage resources and development of communities in line with long-term efficiency and sustainability goals and targets in the areas of energy, carbon emissions, waste streams, all utilities and food security. | **X** | | |
| **(8)** Encourage and equitably incentivize the use of commercially available renewable energy systems in public facilities, institutions, residences, and business developments**.** | **X** | | |
| **(9)** Consider health, safety, environmental, cultural, and aesthetic impacts, as well as resource limitations, land use patterns, and relative costs | **X** | | |
| **(10)** Work closely with the State and federal governments in the formulation and implementation of all City energy-related programs and regulations, including updating building energy codes. | | | **X** |
| **Discussion:** The Proposed Action intends to install PV panels on roofs and parking areas to utilize renewable energy and reduce energy consumption. The project will also install several charging stations for electric vehicles. | | | |
| **Objective B: To conserve energy through the more efficient management of its use**. | | | |
| **Policies** | | | |
| **(1)** Ensure that the efficient use of energy is a primary factor in the preparation and administration of land use plans and regulations. | | | **X** |
| **(2)** Provide incentives and, where appropriate, mandatory controls to achieve energy-efficient siting and design of new developments. | | | **X** |
| **(3)** Carry out public, and promote private, programs to more efficiently use energy in existing buildings and outdoor facilities. | **X** | | |
| **(4)** Promote the development of an energy-efficient transportation system. | | | **X** |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **Discussion:** In addition to installing solar PV panels and solar water heating, the project will save energy through its architectural design which allows flow-through natural ventilation of each apartment unit which will also save energy. Its proximity to neighborhood services and public transportation will reduce the need for private vehicle ownership and use. | | | |
| **Objective C: To fully utilize proven alternative sources of energy.** | | | |
| **Policies** | | | |
| **(1)** Encourage the use of commercially available solar energy systems in public facilities, institutions, residences and business developments. | X | | |
| **(2)** Support the increased use of operational solid waste energy recovery and other biomass energy conversion systems. | | | X |
| **Discussion:** The Proposed Action intends to install PV panels on roofs and parking areas as well as solar hot water systems to reduce overall energy consumption to the fullest extent possible. | | | |
| **Objective D: To develop and apply new, locally available energy resources**. | | | |
| **Policies** | | | |
| **(1)** Support and participate in research, development, demonstration and commercialization programs aimed at producing new, economical and environmentally sound energy supplies from: | | | X |
| **(a)** solar insolation; | | | X |
| **(b)** biomass energy conversion; | | | X |
| **(c)** wind energy conversion; | | | X |
| **(d)** geothermal energy; and | | | X |
| **(e)** ocean thermal energy conversion. | | | X |
| **(2)** Secure State and Federal support of City and County efforts to develop new sources of energy. | | | X |
| **Discussion:** The Proposed Action is not involved in the development of new energy resources; and therefore these policies are not applicable. | | | |
| Objective E: To establish a continuing energy information program. | | | |
| **Policies** | | | |
| **(1)** Supply citizens with the information they need to fully understand the potential supply, cost and other problems associated with O‘ahu’s dependence on imported petroleum. | | | X |
| **(2)** Foster the development of an energy conservation ethic among O‘ahu residents. | | | X |
| **(3)** Keep consumers informed about available alternative energy sources and their costs and benefits. | | | X |
| **(4)** Provide information concerning the impact of public and private decisions on future energy use. | | | X |
| **Discussion:** The Proposed Action will have no impact on the establishment of a continuing energy information program, and therefore these policies are not applicable. | | | |
| **VII. PHYSICAL DEVELOPMENT AND URBAN DESIGN** | | | |
| **Objective A - To coordinate changes in the physical environment of O‘ahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located.** | | | |
| **Policies** | | | |
| **(1)** Provide infrastructure improvements to serve new growth areas, redevelopment areas, and areas with badly deteriorating infrastructure. | | | X |

| O\`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(2)** Coordinate the location and timing of new development with the availability of adequate water supply, sewage treatment, drainage, transportation, and other public facilities and services. | X | | |
| **(3)** Require new developments to provide or pay the cost of all essential community services, including roads, utilities, schools, parks, and emergency facilities that are intended to directly serve the development. | X | | |
| **(4)** Facilitate and encourage compact, higher-density development in urban areas designated for such uses. | X | | |
| **(5)** Encourage the establishment of mixed-use town centers that are compatible with the physical and social character of their community. | X | | |
| **(6)** Facilitate transit-oriented development in rail transit station areas to create live/work/play multi-modal communities that reduce travel and traffic congestion. | | | X |
| **(7)** Encourage the clustering of development to reduce the cost of providing utilities and other public services. | X | | |
| **(8)** Locate new industries and new commercial areas so that they will be well-related to their markets and suppliers, and to residential areas and transportation facilities. | | | X |
| **(9)** Locate community facilities on sites that will be convenient to the people they are intended to serve. | X | | |
| **(10)** Discourage uses which are major sources of noise, air, and light pollution. | | | X |
| **(11)** Encourage siting and design solutions that seek to reduce exposure to natural hazards, including those related to climate change, flooding, and sea level rise. | X | | |
| **(12)** Prohibit new airfields, high-powered electromagnetic-radiation sources, and storage places for fuel and explosives from locating on sites where they will endanger or disrupt nearby communities. | | | X |
| **(13)** Promote opportunities for the community to participate meaningfully in planning and development processes, including new forms of communication and social media. | X | | |
| **<u>Discussion</u>:** The Proposed Action would provide affordable elderly rental housing in a compact clustered low-rise development that is convenient to community markets, services, and recreational opportunities. To meet essential site access, it is understood that the development may require minor widening of Lower Road. The community will have an opportunity to participate through meetings with the Mānoa Neighborhood Board and during the EA review process. | | | |
| **Objective B: To plan and prepare for the long-term impacts of climate change.** | | | |
| **Policies** | | | |
| **(1)** Integrate climate change adaptation into the planning, design and construction of all significant improvements to and development of the built environment. | X | | |
| **(2)** Coordinate plans in the private and public sectors that support research, monitoring and educational programs on climate change. | | | X |
| **(3)** Prepare for the anticipated impacts of climate change and sea level rise on existing communities and facilities through mitigation adaptation, managed retreat, or other measures in exposed areas. | | | X |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **Discussion**: The Proposed Action is not located near the coastline and will not be affected by sea level rise. Project structures will meet building code requirements to protect from natural hazards such as strong winds. | | | |
| **Objective C: To Develop the urban corridor stretching from Wai`alae-Kāhala to Pearl City as the island's primary urban center.** | | | |
| **Policies** | | | |
| **(1)** Provide downtown Honolulu and other major business centers with a well-balance mixture of uses. | | | X |
| **(2)** Encourage the development of attractive residential communities in downtown and other business centers. | | | X |
| **(3)** Maintain and improve downtown as the financial and office center of the island, and as a major retail center. | | | X |
| **(4)** Provide for the continued viability of the Hawai'i Capital District as a center of government activities and as an attractive park-like setting in the heart of the city. | | | X |
| **(5)** Foster the development of Honolulu's waterfront as the State's major port and maritime center, as a people-oriented mixed-use area, and as a major recreation area with accommodation for sea level rise. | | | X |
| **Discussion**: The Proposed Action is located within the Primary Urban Center, but not within the Hawai'i Capital District or in Downtown Honolulu. These policies are therefore not applicable to the project. | | | |
| **Objective D: To develop a secondary urban center in `Ewa with its nucleus in the Kapolei area.** | | | |
| **Policies:** | | | |
| **(1)** Support public projects that are needed to facilitate development of the secondary urban center at Kapolei. | | | X |
| **(2)** Encourage the development of a major residential, commercial, and employment center within the secondary urban center at Kapolei. | | | X |
| **(3)** Encourage the continuing development of the area encompassing Campbell Industrial Park, Kalaeloa Barbers Point Harbor, and West Kapolei as a major industrial center. | | | X |
| **(4)** Coordinate plans for the development of the secondary urban center at Kapolei with the State and federal governments, major landowners and developers, and the community. | | | X |
| **(5)** Cooperate with the State and federal governments in the improvements to the deep water harbor at Kalaeloa Barbers Point. | | | X |
| **(6)** Encourage the development of the Ocean Pointe/Hoakalei Communities as a major residential and recreation area emphasizing recreational activities and a waterfront commercial center containing light-industrial, commercial, and visitor accommodation uses. | | | X |
| **Discussion**: The Proposed Action lies within the Primary Urban Center of Honolulu and is not applicable to policies for `Ewa and/or Kapolei. | | | |
| **Objective E: To maintain those development characteristics in the urban-fringe and rural areas which make them desirable places to live.** | | | |
| **Policies:** | | | |
| **(1)** Develop and maintain urban-fringe areas as predominantly residential areas characterized by generally lower-rise, lower-density development which | | | X |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| may include significant levels of retail and service commercial users as well as satellite institutional and public uses geared to serving the needs of households. | | | |
| **(2)** Coordinate plans for developments within the `Ewa and Central O`ahu urban-fringe areas with the State and federal governments, major landowners and developers, agricultural industries, and the community. | | | X |
| **(3)** Maintain a "green-belt" of open space and agricultural land around developed communities in the 'Ewa and Central O1ahu areas of O`ahu. | | | X |
| **(4)** Maintain rural areas that reflect an open and scenic setting, dominated by small to moderate size agricultural pursuits, with small towns of low-density and low-rise character, and which allows modest growth opportunities tailored to address area residents' future needs. | | | X |
| **(5)** Encourage the development of a variety of housing choices including affordable housing in rural communities, to give people the choice to continue to live in the community that they were raised in. | | | X |
| **(6)** Ensure the social and economic vitality of rural communities by supporting infill development and modest increases in heights and densities around existing rural town areas where feasible to maintain an adequate supply of housing for future generations. | | | X |
| **<u>Discussion</u>:** The Proposed Action lies within the Primary Urban Center of Honolulu and policies for the urban-fringe and rural areas of O`ahu are therefore not applicable. | | | |
| **Objective F: To create and maintain attractive, meaningful, and stimulating environments throughout O`ahu.** | | | |
| **Polices** | | | |
| **(1)** Encourage distinctive community identities for both new and existing communities and neighborhoods. | X | | |
| **(2)** Require the consideration of urban design principles in all development projects. | X | | |
| **(3)** Require developments in stable, established communities and rural areas to be compatible with the existing communities and areas. | X | | |
| **(4)** Provide design guidelines and controls that will allow more compact development and intensive use of lands in the primary urban center, and along the rail transit corridor. | X | | |
| **(5)** Seek to protect resident's quality of life and to maintain the integrity of neighborhoods by strengthening regulatory and enforcement strategies that address the presence of inappropriate non-residential activities. | | | X |
| **(6)** Promote public and private programs to beautify the urban and rural environments. | X | | |
| **(7)** Design public structures to meet high aesthetic and functional standards and to complement the physical character of the communities they will serve. | | | X |
| **(8)** Design public street networks to be safe and accessible for users of all ages and abilities, to accommodate multiple modes of travel to be visually attractive and to support sustainable ecological processes such as stormwater infiltration. | | | X |
| **(9)** Recognize the importance of using Native Hawaiian plants in landscaping to further the traditional Hawaiian concept of *mālama `āina* and to create a more Hawaiian sense of place. | X | | |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **Discussion:** The Proposed Action will apply design guidelines to produce an environment that is compatible with the neighborhood character. Existing trees in healthy condition that are identified in the arborists' report will be preserved since they contribute to the overall project design. Native plants will be used in landscaping to the extent they are appropriate. Perimeter vegetation will also be retained or replaced to provide a visual barrier and privacy. | | | |
| **Objective G: To promote and enhance the social and physical character of O`ahu's older towns and neighborhoods.** | | | |
| **Policies** | | | |
| **(1)** Encourage new construction in established areas to be compatible with the character and cultural values of the surrounding community. | X | | |
| **(2)** Encourage, wherever desirable, the rehabilitation of existing substandard structures. | | | X |
| **(3)** Provide and maintain roads, public facilities, and utilities without damaging the character of older communities. | X | | |
| **(4)** Seek the satisfactory relocation of residents before permitting their displacement by new development, redevelopment, or neighborhood rehabilitation. | | | X |
| **(5)** Acknowledge the cultural and historical significance of *kuleana* lands, the ancestral ownership of *kuleana* lands and promote policies that preserve and protect *kuleana* lands. | | | X |
| **(6)** Support and encourage cohesive neighborhoods which foster interactions among neighbors, promote vibrant community life, and enhance livability. | X | | |
| **Discussion:** The Proposed Action is designed to be a low rise medium-density residential development in order to be compatible with the general character of the neighborhood. The project is expected to be about 30 ft. which is only 5 ft. above the height limit of 25 ft. for single family residences in Manoa (if on a slope, the allowed height is 30 feet). The development of a community center (day room) is required for a 201H affordable housing project and would be allowed on the R 7.5 zoned property with a conditional use permit. | | | |
| **VIII. PUBLIC SAFETY AND COMMUNITY RESILIENCE** | | | |
| **Objective A – To prevent and control crime and maintain public order.** | | | |
| **Policies:** | | | |
| **(1)** Provide a safe environment for residents and visitors on O`ahu. | | | |
| **(2)** Provide adequate, safe and secure criminal justice facilities. | | | X |
| **(3)** Provide adequate, training, staffing, and support for City public safety agencies. | | | X |
| **(4)** Emphasize improvements to police and prosecution operations which will result in a higher proportion of wrongdoers who are arrested, convicted, and punished for their crimes. | | | X |
| **(5)** Support policies and programs that expand access to treatment, rehabilitation, and re-entry programs for adult and juvenile offenders. | | | X |
| (6) Keep the public informed of the nature and extent of criminal activity. | | | X |
| **(7)** Establish and maintain programs to encourage public cooperation in the prevention and solution of crimes and promote strong community-police relationships. | | | X |
| **(8)** Seek the help of State and federal law-enforcement agencies to curtail the activities of organized crime syndicates on O`ahu. | | | X |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(9)** Conduct periodic reviews of criminal laws to ensure their relevance to the community's needs and values. | | | X |
| **(10)** Cooperate with other law-enforcement agencies to develop new methods of addressing crime. Support communication and coordination across federal, State, and City law enforcement and corrections agencies. | | | X |
| **(11)** Encourage the improvement of rehabilitation programs and facilities for criminals and juvenile offenders. | | | X |
| **Discussion:** The proposed Action is not directly related to the effectiveness and operations of law enforcement agencies and therefore these policies are not applicable. | | | |
| **Objective B – To protect residents and visitors and their property against natural disasters and other emergencies, traffic and fire hazards, and unsafe conditions.** | | | |
| **Policies** | | | |
| **(1)** Keep up-to-date and enforce all City and County safety regulations. | X | | |
| **(2)** Require all developments in areas subject to floods and tsunamis, and coastal erosion to be located and constructed in a manner that will not create any health or safety hazards or cause harm to natural and public resources. | | | X |
| **(3)** Participate with State and Federal agencies in the funding and construction of flood-control projects and prioritize the use of ecologically sensitive flood-control strategies whenever feasible. | | | X |
| **(4)** Collaborate with State and Federal agencies to provide emergency warnings, protection, mitigation, response, and recovery, during and after major emergencies such as tsunamis, hurricanes, and other high-hazard events. | X | | |
| **(5)** Cooperate with State and federal agencies to provide protection from war, civil disruptions, pandemics, and other major disturbances. | X | | |
| **(6)** Reduce hazardous traffic conditions. | X | | |
| **(7)** Provide adequate resources to effectively prepare for and respond to natural and manmade threats to public safety, property, and the environment. | X | | |
| **(8)** Foster disaster-ready communities and households through implementation of resilience hubs and other resiliency strategies. | | | X |
| **(9)** Plan for the impacts of climate change and sea level rise on public safety, in order to minimize potential future hazards. | | | X |
| **(10)** Develop emergency management plans, policies, programs, and procedures to protect and promote public health, safety, and welfare of the people. | X | | |
| **(11)** Provide educational materials on emergency management preparedness, fire protection, traffic hazards, and other unsafe conditions. | X | | |
| **Discussion:** The Proposed Action will comply with all City and County safety regulations and cooperate with State and Federal agencies in case of emergencies affecting the project site or its residents. The courtyard type design of the Proposed Action will help create a safe and secure environment for the residents by providing clear points of access control, thereby discouraging criminal activity. | | | |
| **IX. HEALTH AND EDUCATION** | | | |
| **Objective A – To protect the health and well-being of residents and visitors.** | | | |
| **Policies** | | | |
| **(1)** Encourage the provision of health-care facilities that are accessible to both employment and residential centers. | X | | |

| O\`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(2)** Provide prompt and adequate ambulance and first-aid services in all areas of O\`ahu. | | | X |
| **(3)** Coordinate City health codes and other regulations with State and federal health codes to facilitate the enforcement of air, water, and noise-pollution controls. | | | X |
| **(4)** Integrate public health concerns such as air and water pollution as a consideration in land use planning decisions. | X | | |
| **(5)** Encourage healthy lifestyles by supporting opportunities that increase access to and promote consumption of fresh, locally grown foods. | X | | |
| **(6)** Encourage healthy lifestyles through walkable communities, safe street crossings, safe routes to schools, and parks and pathways for pedestrians and bicyclists. | X | | |
| **(7)** Support efforts to make health-care more accessible and affordable for everyone. | X | | |
| **(8)** Support efforts to improve and expand access to mental health, drug treatment, community-based programs and other similar programs for those requiring such services. | X | | |
| **(9)** Support becoming an age-friendly city that provides people of all ages with user-friendly parks and other public gathering places, that offers safe streets and multi-modal transportation options that provides an adequate supply of affordable housing that encourages growth in needed and desirable jobs that provides quality health-care and support services, and that encourages civic participation, social inclusion, and respect between interest groups. | X | | |
| **(10)** Plan for our aging population's growing health-care, personal service, and diverse daily activity needs and encourage these services to be provided in a timely manner, including age-specific social activities. | X | | |
| **<u>Discussion</u>:** The Proposed Action would strongly support these policies by provided 288 affordable rental units specifically targeted to O'ahu 's elderly population including some units that are ADA compliant. | | | |
| **Objective B – To provide a wide range of educational opportunities for the people of O\`ahu.** | | | |
| **Policies** | | | |
| **(1)** Support education programs that encourage the development of employable skills. | | | X |
| **(2)** Encourage the provision of informal educational programs for people of all age groups. | | | X |
| **(3)** Encourage the after-hours use of school building, grounds and facilities. | | | X |
| **(4)** Encourage the construction of school facilities that are designed for flexibility and high levels of use. | | | X |
| **(5)** Facilitate the appropriate location of learning institutions from the preschool through the university levels. | | | X |
| **(6)** Encourage outdoor learning opportunities and venues that reflect our unique natural environment and Native Hawaiian culture. | X | | |
| **<u>Discussion</u>:** The Proposed Action has no specific educational component, but educational benefits and appreciation for the site's natural environment and Native Hawaiian culture could be gained informally through community gardening and other activities. | | | |
| **Objective C – To make Honolulu the center of higher education in the Pacific.** | | | |
| **Policies:** | | | |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(1)** Encourage continuing improvement in the quality of higher education in Hawai`i as well as ways to make higher education more affordable. | | | X |
| **(2)** Encourage the development of diverse opportunities in higher education. | | | X |
| **(3)** Encourage research institutions to establish branches on O`ahu. | | | X |
| **(4)** Establish Honolulu as a knowledge center and international Pacific crossroads hub. | | | X |
| **Discussion**: The Proposed Action has no direct higher education component. | | | |
| **X. CULTURE AND RECREATION** | | | |
| **Objective A – To foster the multiethnic culture of Hawai`i and respect the host culture of the Native Hawaiian people.** | | | |
| **Policies** | | | |
| **(1)** Recognize the Native Hawaiian host culture, including its customs, language, history, and close connection to the natural environment, as a dynamic, living culture and as an integral part of O`ahu's way of life. | X | | |
| **(2)** Promote the preservation and enhancement of local cultures, values and traditions. | X | | |
| **(3)** Encourage greater public awareness, understanding, and appreciation of the cultural heritage and contributions to Hawaiʻi made by Oʻahu 's various ethnic groups. | X | | |
| **(4)** Foster equity and increased opportunities for positive interaction among people with different ethnic, social, and cultural backgrounds. | X | | |
| **(5)** Preserve the identities of the historical communities of O`ahu. | X | | |
| **Discussion**: The Proposed Action is being initiated by the Lin Yee Chung Association (LYCA) which is the oldest Chinese benevolent association in Hawaiʻi having been established in 1852. One of LYCA's major responsibilities is the management and maintenance of the historic Mānoa Chinese Cemetery. LYCA recognizes and has respect for all the ethnic cultures of Hawaiʻi, therefore it is important to emphasize that the cemetery is open to all persons and is not restricted in any way to any specific ethnic group. | | | |
| **Objective B – To protect, preserve and enhance Oʻahu 's cultural, historic, architectural, and archaeological resources.** | | | |
| **Policies** | | | |
| **(1)** Promote the restoration and preservation of early Hawaiian structures, artifacts, and landmarks. | | | X |
| **(2)** Identify and, to the extent possible, preserve and restore buildings, sites, and areas of social, cultural, historic, architectural, and archaeological significance. | | | X |
| **(3)** Cooperate with the State and federal governments in developing and implementing a comprehensive preservation program for social, cultural, historic, architectural and archaeological resources. | X | | |
| **(4)** Promote the interpretive and educational use of cultural, historic, architectural, and archaeological sites, buildings, and artifacts. | X | | |
| **(5)** Seek public and private funds, and encourage public participation and support, to protect preserve and enhance social, cultural, historic, architectural, and archaeological resources. | X | | |

| O\`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? Yes | No | N/A |
|---|---|---|---|
| **(6)** Provide incentives for the restoration, preservation, maintenance, and enhancement of social, cultural, historic, architectural, and archaeological resources. | X | | |
| **(7)** Encourage the protection of areas that are historically important to Native Hawaiʻian cultural practices and to the cultural practices of other ethnicities, in order to further preserve and continue these practices for future generations. | X | | |
| **<u>Discussion</u>**: It is important to note that one of the dual purposes of the proposed action is to generate an income stream that will support, restore, maintain, and preserve the historic Mānoa Chinese Cemetery as a major historical and cultural site in Manoa. According to the cultural survey of the site, no Hawaiʻian structures, artifacts or landmarks have been identified on the property. However, during construction SHPD will be notified if any suspicious cultural artifacts or structures are encountered. | | | |
| **Objective C – To foster the visual and performing arts.** | | | |
| **Policies:** | | | |
| **(1)** Encourage and support programs and activities for the visual and performing arts. | | | X |
| **(2)** Encourage creative expression and access to the arts by all segments of the population. | | | X |
| **(3)** Provide permanent art in appropriate City public buildings and places. | | | X |
| **<u>Discussion</u>**: The Proposed Action has no specific relationship with the visual and performing arts. | | | |
| **Objective D – To provide a wide range of recreational facilities and services that are readily available to residents and visitors alike, and to balance access to natural areas with the protection of those areas.** | | | |
| **Policies:** | | | |
| **(1)** Develop, maintain, and expand a community-based park system to meet the needs of the diverse communities on O\`ahu. | | | X |
| **(2)** Develop, maintain and expand a system of regional parks and specialized recreation facilities, based on the cumulative demand of residents and visitors. | | | X |
| **(3)** Develop, maintain and improve urban parks, squares, and beautification areas in high density urban places. | | | X |
| **(4)** Encourage public and private natural reserves and botanical and zoological parks to foster greater awareness and appreciation of the natural environment. | | | X |
| **(5)** Encourage the State to develop, improve and maintain a system of natural resource-based parks, such as beach, shoreline, and mountain parks. | | | X |
| **(6)** Ensure that public recreational facilities balance the demand for facilities against capital and operating cost constraints so that they are adequately sized and properly maintained. | | | X |
| **(7)** Ensure and maintain convenient and safe access to beaches, ocean environments and mauka recreation areas in a manner that protects natural and cultural resources. | | | X |
| **(8)** Encourage ocean and water-oriented recreation activities that do not adversely impact the natural environment and cultural assets, or result in overcrowding or overuse of beaches, shoreline areas and the ocean. | | | X |
| **(9)** Require all new developments to provide their residents with adequate recreation space. | X | | |
| **(10)** Utilize our unique natural environment in a responsible way to promote cultural events and activities and maintain cultural practices. | | | X |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **(11)** Encourage the after-hours, weekend, and summertime use of public school facilities for recreation. | | | X |
| **(12)** Provide for safe and secure use of public parks, beaches, and recreation facilities. | | | X |
| **(13)** Create and promote recreational venues for kūpuna and keiki and for kama`āina and malihini. | X | | |
| **(14)** Encourage the State and Federal governments to transfer excess and underutilized land to the City for public recreation use. | | | X |
| **<u>Discussion</u>:** The Proposed Action will include a 1.5 acre area dedicated as a community garden which would be available to both project and neighborhood residents for recreational gardening. | | | |
| **XI GOVERNMENT OPERATIONS AND FISCAL MANAGEMENT** | | | |
| **Objective A – To promote increased efficiency, effectiveness, and responsiveness in the provision of government services by the City and County of Honolulu.** | | | |
| **Policies:** | | | |
| **(1)** Maintain and adequately fund City government services at the level necessary to be effective. | | | X |
| **(2)** Promote alignment and consolidation of State and City functions whenever more efficient and effective delivery of government programs and services may be achieved. | | | X |
| **(3)** Ensure that government attitudes, actions, and services are sensitive to community needs and concerns, and held accountable to the public trust. | | | X |
| **(4)** Sufficiently fund and staff the timely preparation, maintenance, and update of public policies and plans to guide and coordinate City programs and regulatory responsibilities. | | | X |
| **(5)** Expand the adoption of technology across all City agencies to achieve greater transparency, efficiency, and accountability to the general public throughout government operations. | | | X |
| **Objective B – To ensure fiscal integrity, responsibility, and efficiency by the City government in carrying out its responsibilities.** | | | |
| **Policies:** | | | |
| **(1)** Provide for a balanced budget. | | | X |
| **(2)** Allocate fiscal resources of the City to efficiently implement the policies of the General Plan and the DP5 and SCPs. | | | X |
| **(3)** Ensure accountability and transparency in government operations. | | | X |
| **<u>Discussion</u>:** The Proposed Action is unrelated to government operations and fiscal management and these objectives are therefore not applicable. | | | |
| **Objective C – To achieve equitable outcomes for City programs, policies, and allocation of resources throughout the O`ahu community.** | | | |
| **Policies:** | | | |
| **(1)** Promote policies that actively address and eliminate disparate outcomes for historically underserved communities. | | | X |
| **(2)** Seek equitable distribution of City investments towards promoting employment opportunities, infrastructure, and other community benefits appropriate to the community needs and proportionate to the population size. | | | X |

| O`AHU GENERAL PLAN OBJECTIVES AND POLICIES Approved January 14, 2022 (21-23 CD1) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| (3) Promote adherence to processes that advance procedural, distributional, structural, intergenerational, and cultural equity within the City. | | | X |
| (4) Provide resources for City employees to understand and actively advance equity solutions within all agencies of City government. | | | X |
| **Discussion:** Allocation of City Resources is not applicable to the Proposed Action. | | | |

### 5.2.2 Primary Urban Center Development Plan (PUCDP)

The Project Site is located within the PUCDP area, which extends from downtown Honolulu to Pearl City in the west and to Waiʻalae-Kāhala in the east. The PUCDP is home to almost half of Oʻahu's population and three quarters of all jobs. The PUC DP (June 2004) provides a vision for the PUC in the areas of land use, transportation, infrastructure and public facilities. It also provides policies and guidelines for achieving that vision. Table 5-6 provides a summary of the Proposed Action's consistency with the guidelines, policies, and principles established in the PUCDP. (CCH DPP 2004).

**TABLE 5-6: CONSISTENCY WITH PRIMARY URBAN CENTER DEVELOPMENT PLAN**

| PRIMARY URBAN CENTER DEVELOPMENT PLAN GUIDELINES, POLICIES AND PRINCIPLES (2004) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **CHAPTER 3: LAND USE AND TRANSPORTATION** | | | |
| **Protecting and Enhancing Natural, Cultural and Scenic Resources** | | | |
| **Preserve historic and cultural sites:** Special emphasis should be placed on-sites and associated settings that are unique, of special significance or are in good condition. | X | | |
| **Preserve and protect natural resource and constraint areas:** Establish an urban community boundary to define urban development and protect areas outside the boundary for their open space, scenic and resource values. | | | X |
| **Preserve panoramic views of natural landmarks and the urban skyline:** This includes important vistas and focused views of significant natural and urban features and skyline profiles that make up or frame the PUC from publicly accessible places. | X | | |
| **Develop stream greenbelts:** Keep or create mauka-makai connections and views up and down important streams and create public walkways where possible and appropriate. | X | | |
| **Provide parks and active recreation areas:** Create or strengthen parks, plazas and other conveniences throughout the PUC, especially in more populated areas as a balance to the built environment, for recreation, social interaction and leisure interludes. | | | X |
| **Discussion:** The Project Site is located within the State's Urban Land Use district in Mānoa. It supports the PUC DP goal of developing within existing urban boundaries. The Proposed Action would create a centralized "live-work-play-relax" development within a park-like environment and encourage social interaction and connectivity both within and external to the project. The Proposed Action is low-rise apartments compatible with the neighborhood and | | | |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN GUIDELINES, POLICIES AND PRINCIPLES (2004) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| would not inhibit views of the urban skyline or valley ridges. Natural resources occurring within the Project Site will be protected from any impacts by the proposed mitigation measures. | | | |
| **Cultivating Livable Neighborhoods** | | | |
| **Develop a system for collaborative neighborhood planning:** Refine and further develop a stakeholder-based process for continuing community-based neighborhood planning for areas requiring this attention. | | | X |
| **Cultivate existing and new "neighborhood centers":** Develop neighborhood centers as the principal places for people in a neighborhood to gather, shop, dine or play and to provide a source of community identity. | X | | |
| **Promote mixed land uses:** Encourage compatible mixtures of land uses for intown PUC neighborhoods and districts to support a variety of urban lifestyle choices and to create vibrant and convenient neighborhoods. | X | | |
| **Create parks that draw people and activity:** Develop parks that invite people and promote positive social interaction and activity. | | | X |
| **Make streets "pedestrian-friendly":** Create inviting and attractive street side environments that support and enhance convenient and safe pedestrian use. | X | | |
| **<u>Discussion</u>:** The Proposed Action aims to create a cohesive environment by creating a residential community gathering facility for residents and a community garden. The design elements of the space will reflect the traditions, history, and spiritual significance of Mānoa Valley and Hawaiʻian culture by incorporating shaded common areas that connect pedestrians with the site's environment . | | | |
| **In-Town Housing Choices** | | | |
| **Promote people-scaled apartment and townhouse dwellings in low- or midrise buildings oriented to the street:** This policy encourages residential buildings that are modest in height and have ground-floor shopping and dining opportunities to create pedestrian-oriented neighborhoods that satisfy a range of lifestyle needs conveniently. | X | | |
| **Improve the feasibility of redeveloping small lots:** Encourage housing variety and affordability by removing barriers for small-scale townhouse and low-rise apartment development on smaller apartment-zoned lots. | | | X |
| **Reduce costs for apartment homes:** Promote affordable housing choices consistent with creating livable communities by reducing certain construction and development-related costs. | X | | |
| **Provide adequate schools and parks for in-town neighborhoods:** Conveniently located schools and parks that can be reached safely are needed to meet the needs of young, active families. | | | X |
| **Expand the capacity of infrastructure, including water supply, sewers and storm drains:** This policy calls for government action and leadership in creating adequate infrastructure to meet present and future demands in order to support the strengthening or creation of livable in-town communities. | | | X |
| **Preserve and expand the current inventory of affordable rental housing units:** The City should assure that the current inventory of affordable rental units, whether owned by the City or not, is preserved and | X | | |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN GUIDELINES, POLICIES AND PRINCIPLES (2004) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| retained as affordable and that the inventory of affordable rental units is expanded as needed by the community. | | | |
| **Support the retention, rehabilitation and improvement of older, low-rent apartment buildings:** Maintain, rehabilitate and improve older apartment buildings to retain existing housing stock as viable in-town housing choices. | | | X |
| **Provide for special needs housing:** Allow housing for people with special needs and promote their integration into the larger PUC community. | X | | |
| **Provide incentives and cost savings for affordable housing:** This policy promotes exemptions from regulations, on a case-by-case basis, to make "affordable" housing available to those needing it. | X | | |
| **Provide for high-density housing options in mixed-use developments around transit stations.** This type of "transit-oriented development" facilitates transit use and allows for increased densities without generating increased vehicular congestion. | | | X |
| **<u>Discussion</u>:** The Proposed Action is intended to provide affordable senior rental housing to elderly persons 62+ with lower incomes. The Proposed Action would serve to expand the inventory of affordable senior rental housing within the PUC DP. The Project Site is on "The Bus'" route #6 with a direct connection to Mānoa Marketplace, UH Campus, and urban Honolulu. | | | |
| **The Pacific's Leading City** | | | |
| **Create public open space along the Pearl Harbor waterfront and strengthen the physical and visual connections between the urban center and the water:** This recognizes the waterfront as a principal element in the PUC's setting and as an organizing reference point for the city and supports development of an economic and social asset for the surrounding community. | | | X |
| **Redevelop the Downtown/Iwilei waterfront:** This policy proposes to increase visual and physical access to the waterfront by re-routing traffic away from Nimitz Highway and introducing commercial activities such as restaurants, shops, offices and entertainment, low to medium-rise residences and areas capable of hosting recreational activities. | | | X |
| **Stimulate the development of high technology and knowledge-based industries:** Attract high-technology businesses to Hawai'i and provide in-town locations for them. Encourage investment in infrastructure within commercial buildings that will accommodate and attract high-technology and biotechnology businesses. | | | X |
| **Develop and implement a plan for a vibrant and livable Waikīkī:** This plan should address resident and visitor experiences, the street environment, the design of new buildings and relationships with adjacent districts. | | | X |
| **Support attractions that are of interest to both residents and visitors in the Ala Moana/Kaka'ako/Downtown corridor.** Develop commercial and cultural attractions and improvements to serve residents and visitor interests. | | | X |
| **Provide opportunities for the development of visitor units in the Ala Moana/Kaka'ako/Downtown corridor:** Provide accommodation options | | | X |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN GUIDELINES, POLICIES AND PRINCIPLES (2004) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| for convention and business travelers conveniently located near downtown and the Hawaiʻi Convention Center. | | | |
| **Provide opportunities for the development of village inns in existing commercial centers and allow bed and breakfast establishments in residential neighborhoods:** This policy encourages development of alternative visitor accommodations in contrast to the traditional resort enclaves of Waikīkī. | | | X |
| **Support continuation of military uses:** Support and coordinate with the military's long-range land planning activities to realize common employment, housing and recreation goals. | | | X |
| **Enhance Honolulu Harbor and harbor-related uses:** Reserve lands adjacent to the harbor for harbor-related uses. | | | X |
| **Support industrial uses in Kalihi-Pālama industrial districts:** Support existing mixed-usages in the industrial districts of Kalihi-Kai and Kapālama, as well as existing commercial uses along the Nimitz, Dillingham, King, Kalihi and Waiakamilo corridors. | | | X |
| **Define the role of town centers and promote a mixture of land uses in ʻAiea-Pearl City:** Strengthen the functions and latent identities of town centers in Pearl City, ʻAiea, Waimalu and Hālawa and establish the Pearlridge area as a Pearl Harbor Regional Town Center. | | | X |
| **Encourage the full use of existing private and public parking garages:** Encourage private parking garage owners to rent underused parking stalls within commercial buildings and large-scale residential projects. | | | X |
| **Discussion:** The Proposed Action has no direct relationship to these polices. | | | |
| **Develop a Balanced Transportation System** | | | |
| **Implement land use strategies to achieve a balanced transportation system:** To achieve community livability and enable transportation choices, land use strategies that support alternative travel modes such as walking, bicycling and transit should be adopted and implemented. | X | | |
| **Improve the public transit system, including development of a rapid transit component:** A convenient and efficient public transit system aids in maintaining traffic flows at an acceptable level for an attractive and successful urban setting. An effective public transit system for the PUC could be created with an east-west rapid transit route supplemented by effective links to the PUC's valley communities. | | | X |
| **Implement Transportation Demand Management (TDM) strategies:** Employ management strategies that encourage alternative travel models. | | | X |
| **Review existing plans and establish priorities for roads and road improvements:** Conduct a comprehensive classification of roadways to identify prospective improvements (e.g., automobile, transit, bikeways, pedestrian routes) and prioritize the implementation of such improvements. | | | X |
| **Implement the Honolulu Bicycle Master Plan:** Institutionalize a policy that all streets designated for bicycle travel should be maintained to accommodate shared bicycle and automobile use. | X | | |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN GUIDELINES, POLICIES AND PRINCIPLES (2004) | Consistent? | | |
|---|---|---|---|
| | Yes | No | N/A |
| **Enhance and improve pedestrian mobility:** Create pedestrian districts, route and a regional pedestrian network and address pedestrian safety concerns. | | | X |
| **Encourage the full use of existing private and public parking garages:** Encourage private parking garage owners to rent underused parking stalls with commercial buildings and large-scale residential projects. | | | X |
| **<u>Discussion</u>:** The Proposed Action incorporates shaded common areas that encourage walkability within the project site and with connections to neighborhood facilities. The Proposed Action would provide on-site parking for residents and short term rideshare, carshare, and loading/unloading zones to promote multi-modal transportation. | | | |
| **CHAPTER 4: INFRASTRUCTURE AND PUBLIC FACILITIES** | | | |
| **Water Allocation and System Development** | | | |
| **Integrate** resource management of all potable and non-potable water sources, including groundwater, stream water, storm water and wastewater effluent. | X | | |
| **Adapt** water conservation practices in the design of new developments and modification of existing uses, including landscaped areas. | X | | |
| Implement upgrades and capacity improvements to serve projected population increases. | | | X |
| **Protect** and maintain watersheds to ensure an adequate supply of high-quality water with sufficient infiltration recharge into groundwater aquifers | X | | |
| **<u>Discussion</u>:** LEED Silver standards will be used as guidelines during the Proposed Action's design process to integrate water conservation. LID practices and temporary and permanent BMPs will be used to prevent construction related runoff from exiting the work area and entering any surface or groundwater resources. These actions serve to integrate water resource management into the Project Design by protecting stream water quality and encouraging on-site groundwater recharge. | | | |
| **Wastewater System** | | | |
| **Implement** wastewater collection system improvements to provide adequate service and sound facilities to existing neighborhoods and timely increases in system capacity to areas planned to undergo improvement or change in use. | | | X |
| **Implement** adequate and timely upgrades/expansion of wastewater treatment facilities to meet the growth demands of the PUC. | | | X |
| **<u>Discussion</u>:** The Proposed Action has received approval for connection to the Wastewater System provided by the City's Department of Environmental Services in accordance with the requirements of the PUCDP. | | | |
| **Electrical Power** | | | |
| Support retention and upgrade of the Waiau and Honolulu Power Plants as part of a strategic plan to improve the reliability of the PUC's electrical power system. | | | X |
| Promote and implement energy conservation measures and integrated resource planning. | X | | |
| Planning and building of new or relocated transmission lines should take into consideration system and cost concerns and the impacts on the environment. | | | X |

<table>
<tr><th rowspan="2">PRIMARY URBAN CENTER DEVELOPMENT PLAN GUIDELINES, POLICIES AND PRINCIPLES (2004)</th><th colspan="3">Consistent?</th></tr>
<tr><th>Yes</th><th>No</th><th>N/A</th></tr>
<tr><td>Options to place utility lines underground should be considered, and priorities should be established.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="4"><u>Discussion</u>: LEED Silver certification standards will be used as guidelines during the Proposed Action’s design process to implement energy conservation measures. The Proposed Action also intends to install PV solar panel on the roof of all structures to provide clean energy at reduced long term costs.</td></tr>
<tr><td colspan="4">Telecommunications Facilities</td></tr>
<tr><td>Minimize the visual impacts and potential health hazard of new facilities.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="4"><u>Discussion</u>: The Proposed Action is not applicable to the telecommunications Facilities requirements of the PUC DP.</td></tr>
<tr><td colspan="4">Solid Waste</td></tr>
<tr><td>Reduce the solid waste stream by encouraging recycling and reuse.</td><td>X</td><td></td><td></td></tr>
<tr><td>Reduce dependence on landfills by encouraging alternative waste disposal technologies.</td><td></td><td></td><td>X</td></tr>
<tr><td colspan="4"><u>Discussion</u>: Residents will be encouraged to participate in a waste recycling program compatible with the City’s efforts to minimize the waste stream.</td></tr>
<tr><td colspan="4">Stormwater Systems</td></tr>
<tr><td>Require methods of retaining or detaining stormwater for gradual release into the ground as the preferred strategy for the management of stormwater. Where feasible, utilize open spaces including parking lots, landscaped areas, parks and golf courses to detain or infiltrate stormwater flows to reduce their volume and runoff rates. (City Council Resolution No. 94-296).</td><td>X</td><td></td><td></td></tr>
<tr><td>Manage stormwater flows through best management practices to minimize stormwater runoff and peak discharge rates.</td><td>X</td><td></td><td></td></tr>
<tr><td>Preserve stream and estuarine habitats.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="4"><u>Discussion</u>: LID practices and temporary and permanent BMPs will be used to prevent construction related stormwater runoff from exiting the work area and entering any surface or groundwater resources. This will serve to protect stream water quality and encourage on-site groundwater recharge. The specific type and location of these LID practices and BMPs will be determined during the Proposed Action's design process. (See Preliminary Drainage Report in Appendix D.)</td></tr>
<tr><td colspan="4">School and Library Facilities</td></tr>
<tr><td>Support the development of a high-quality educational system of schools and postsecondary institutions that increase the attractiveness of the PUC as a place to live and work.</td><td></td><td></td><td>X</td></tr>
<tr><td>Work with the DOE to develop innovative shared-use facilities, particularly on City owned school properties.</td><td></td><td></td><td>X</td></tr>
<tr><td colspan="4"><u>Discussion</u>: The Proposed Action is not applicable to the School and Library Facilities requirements of the PUCDP.</td></tr>
<tr><td colspan="4">Civic and Public Safety Facilities</td></tr>
<tr><td>Provide adequate staffing and facilities to ensure effective and efficient delivery of basic governmental service and protection of public safety.</td><td></td><td></td><td>X</td></tr>
<tr><td colspan="4"><u>Discussion</u>: The Proposed Action is not applicable to the Civic and Public Safety Facilities requirements of the PUC DP.</td></tr>
</table>

### 5.2.3 Land Use Ordinance

The Land Use Ordinance (LUO) establishes zoning regulations to regulate and manage land uses and development standards in accordance with the City's land use policies, such as the O'ahu General Plan and the PUCDP. The LUO has not been comprehensively revised since 1986. A comprehensive revision, Bill 10 (2022), is now being considered by the City Council and its Planning and Zoning Committee. The Bill has passed second reading and has the possibility of passage by the end of 2022 or early 2023.

The Project Site is currently zoned Preservation (P-2) but is surrounded by an R-7.5 Residential zoned community. However approval of a 201H Resolution by the City Council under the 201H planning process will allow use of the site as apartment zoning (A-2) and will also allow other exemptions from the LUO regulations providing they are essential and can be justified to the satisfaction of the City Council. A 201H Resolution for the Proposed Action will be submitted to the City Council following acceptance of the DEA and FEA with issuance of a Finding of No Significant Impact (FONSI). Passage of the 201H Resolution will require public hearings before the City Council to allow comment and input from the Honolulu community at large.

### 5.2.4 ADDENDUM A - Consistency With Primary Urban Center Development Plan ***Proposed Revised*** Goals and Policies (Pending Approval by City Council)

The currently adopted Primary Urban Center Development Plan (PUCDP) was passed in June 2004 which, like the City's General Plan, makes it out of date to the tune of eighteen years. Many issues and factors have changed since 2004. To address these changes, the PUCDP is in the process of revision. This plan review process started in 2018 and involves several steps. The review and revision process relies extensively on the input and views from policy makers, organizations, administrators and the public at large. Early in the process was a visioning effort to identify community views, principles and topics of concern which the plan should address within the planning process. Community workshops were held in all the neighborhoods of the PUC to solicit community input. Additionally, community input was continuously encouraged and solicited through the project's website www.pucdp.com which provided considerable technical and supporting information. During 2019 the Plan's policy framework was prepared and alternatives were evaluated. In 2020 drafting of the revised plan was undertaken. The current status is that a ***DRAFT PROPOSED REVISED PUCDP GOALS AND POLICIES*** covering the following eleven topic areas were prepared by the Department of Planning and Permitting and published on the project website for public review and comment.

1. Growth and Placemaking
2. Growth Management
3. Focus Areas
4. Housing
5. Parks and Open Space
6. Mobility + Connectivity
7. Healthy Communities
8. Sea Level Rise Adaptation and Planning
9. Water Resources
10. Economic Development
11. Civic Facilities and Services

Public comments were due by July 8, 2022. Upon receipt of all comments, revisions to the PUCDP's Goals and Policies will be finalized and the Final Draft will be forwarded to the City Council for further review and public testimony. It is currently understood that the draft Bill anticipates that the revised plan may be approved by the City Council by the end of 2022 or early 2023.

The Proposed Action (Mānoa Banyan Court) will not likely receive a Finding of No Significant Impact (FONSI) till perhaps early 2023. It is therefore reasonably assumed that by then, it is likely that the Proposed Revised Primary Urban Center Development Plan will be adopted by the City Council. Given the reviews, consultations, and public input already received during the planning process, it is also reasonably assumed that the *PROPOSED REVISED GOALS AND POLICIES* for the Primary Urban Center Development Plan will not likely encounter significant changes prior to adoption by the Honolulu City Council.

For these reasons, it was considered appropriate that, as part of this Draft Environmental Assessment, that the Proposed Action be assessed against the Proposed Revised Goals and Policies identified in the Draft Primary Urban Center Development Plan. This assessment follows in Table 5-7.

**Table 5-7 Consistency with the *PROPOSED REVISED* Primary Urban Center Development Plan – Dec. 2020**

| PRIMARY URBAN CENTER DEVELOPMENT PLAN *PROPOSED REVISED* GOALS AND POLICIES - DEC. 2020 | CONSISTENT? | | |
|---|---|---|---|
| | YES | NO | N/A |
| **1. GROWTH and PLACEMAKING** | | | |
| **GOAL PL-1: Enhance the PUC's Unique Places.** | | | |
| Policy PL-1.1: Encourage development projects and a public realm that reflects Hawai'i's culture, arts, and climate. | X | | |
| Policy PL-1.2: Enhance the sense of entry at key gateways within the PUC by aligning major public improvements and private development. | | | X |
| Policy PL-1.3: Protect, preserve, and care for historical, cultural, and archaeologically significant resources in the PUC. | X | | |
| Policy PL-1.4: Continue to preserve significant panoramic public views of natural landmarks through Special District provisions. | | | X |
| Policy PL-1.5: Protect and enhance key mauka-makai public view corridors. | X | | |
| **Discussion**: Although no specific historical, cultural, or archaeologically significant resources have been identified on the site, the developer will notify SHPD if any suspect sites are uncovered or found and treated as required. | | | |
| **GOAL PL-2. Direct Higher-Density Growth to Mixed-Use Transit Oriented Development (TOD) Areas.** | | | |
| Policy PL-2.1: Focus higher intensity mixed use development and supporting public infrastructure around HART rail stations. | | | X |
| Policy PL-2.2: Create mixed-use neighborhoods with meaningful character and a sense of place. | X | | |
| Policy PL-2.3: Facilitate conversion/ evolution of malls and big box retail near rail from isolated single-use centers into true gathering places and neighborhoods | | | X |

| **PRIMARY URBAN CENTER DEVELOPMENT PLAN** <br> ***PROPOSED REVISED*** **GOALS AND POLICIES - DEC. 2020** | **CONSISTENT?** | | |
|---|---|---|---|
| | **YES** | **NO** | **N/A** |
| **Discussion:** The Proposed Action is not within a HART rail station or other mixed use neighborhood; therefore these policies are not applicable. | | | |
| **GOAL PL-3: Support Vibrant Commercial Corridors and Neighborhood Centers in the PUC.** | | | |
| Policy PL-3.1: Create and maintain civic spaces and neighborhood “main streets” that serve as gathering places and expressions of community identity. | | | X |
| Policy PL-3.2: Support an attractive and pedestrian-friendly public realm along well-used corridors with improvements to façades, pedestrian amenities, and landscaping. | | | X |
| Policy PL-3.3: Support mixed-use infill development and increased bus service along key commercial corridors. | | | X |
| **Discussion:** The Proposed Action is not located along a commercial corridor and these policies are not directly applicable to the project. | | | |
| **GOAL PL-4: Invest in Mixed-Density In-town Neighborhoods Farther from Rail.** | | | |
| Policy PL-4.1: Promote mid-rise and moderate density residential infill development while preserving affordability. | X | | |
| Policy PL-4.2: Provide green space/ landscaping improvements in mixed-density in-town neighborhoods, especially those lacking in parks. | X | | |
| Policy PL-4.3. Invest in long-term growth in active commercial corridors and mixed-density neighborhoods outside of the sea level rise exposure area (SLR-XA). | X | | |
| **Discussion:** The Proposed Action’s low-rise and moderate-density character will fit well with the Manoa community and provide affordable elderly rental units within a pleasant and landscaped environment. | | | |
| **Goal PL-5: Plan for Appropriate Infill and Redevelopment in Lower- Density Places.** | | | |
| Policy PL-5.1. Allow gradual addition of house-form multiunit dwellings and small apartment buildings close to lower-intensity commercial corridors. | X | | |
| Policy PL-5.2. Continue to improve transportation access and connections for lower-density neighborhoods. | | | X |
| Policy PL-5.3. Maintain the lower-intensity character of valley/ridge and near-town neighborhoods. | X | | |
| **Discussion:** The Proposed Action will comprise infill development of affordable elderly rental housing within an existing low-density (R7.5) residential neighborhood. However, as a low-rise residential development, it will be compatible and fit well with the general residential character of the neighborhood. | | | |
| **GOAL PL-6: Create a Walkable, Bikeable, and Well-Connected PUC.** | | | |
| Policy PL-6.1. Ensure pedestrian-oriented design for corridors and activity centers, especially in Town Corridor, Urban Corridor, Downtown, and Resort place types. | | | X |
| Policy PL-6.2. Align public realm improvements for corridors and activity centers across projects. | | | X |
| Policy PL-6.2:[sic] (6.3) Improve multimodal connections and pedestrian pathways within and between PUC neighborhoods, parks, mixed-use areas, and institutions. | | | X |
| **Discussion:** These goals and policies indicate actions implemented by government at the City or State level and are not applicable to the Proposed Action. | | | |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN *PROPOSED REVISED* GOALS AND POLICIES - DEC. 2020 | CONSISTENT? | | |
|---|---|---|---|
| | YES | NO | N/A |
| **2. GROWTH MANAGEMENT** | | | |
| **GOAL PL-7. Avoid Development in Sensitive/Protected Natural Areas and on Overly Steep Slopes.** | | | |
| Policy PL-7.1: Continue to prevent new development beyond the Community Growth Boundary and on very steep slopes. | | | X |
| Policy PL-7.2: Decrease building and structure encroachments on streams and wetlands except for those essential to flooding control. | | | X |
| **Discussion:** The Proposed Action lies within the Community Growth Boundary. These goals and policies indicate actions implemented by government at the City or State level and are not applicable to the Proposed Action. | | | |
| **GOAL PL-8: Promote Excellent Building and Site Design that Responds to Honolulu's Climate and Environment** | | | |
| Policy PL-8.1: Promote a regulatory framework that encourages the construction of green, sustainable buildings. | X | | |
| Policy PL-8.2: Encourage building and site design best practices that respond to our tropical climate. | X | | |
| Policy PL-8.3: Integrate LID/green infrastructure in new developments and implement stormwater best practices. | X | | |
| Policy PL-8.4: Increase the urban tree canopy to reduce Urban Heat Island effect, especially in interior neighborhoods lacking trees. | X | | |
| **Discussion:** The site for the Proposed Action is completely wooded with a variety of trees, Some of which are invasive species. The project site plan has been designed with the intent to preserve as many large non-invasive trees as feasible. Vegetation along the site perimeter will also likely be preserved to function as visual and sound buffers. These trees, combined with the low-rise medium density character of the project would tend to reduce the visual impact of the new buildings. | | | |
| **GOAL PL-9. Manage Directed Growth Policies and Public Investment for the Benefit of all PUC Residents.** | | | |
| Policy PL-9.1. Refine the discretionary TOD permitting process to balance higher-density entitlements with commensurate community benefits. | | | X |
| Policy PL-9.2: Make equitable public investment a priority in all functional planning through ongoing evaluation of areas with basic service and amenities deficiencies. | | | X |
| Policy PL-9.3: Manage the broader, indirect impacts of high-density development and growth on adjacent communities through sustained attention and community participation. | | | X |
| Policy PL-9.4: Support and maximize high-quality affordable housing in redevelopments on public land. | | | X |
| **GOAL PL-10: Coordinate Infrastructure Planning closely with New Development** | | | |
| Policy PL-10.1: Align near-term infrastructure upgrades and capacity expansion with designated growth areas. | | | X |
| Policy PL-10.2: Improve capacity planning for areas of low to moderate growth to unlock demand for ADUs, small commercial, and other modest infill development. | | | X |
| Policy PL-10.3: Formalize inter-agency coordination for long-term infrastructure planning processes and proper siting. | | | X |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN *PROPOSED REVISED* GOALS AND POLICIES - DEC. 2020 | CONSISTENT? | | |
|---|---|---|---|
| | YES | NO | N/A |
| **Discussion:** These Goals and Policies are not the direct responsibility of the Proposed Action and therefore are not applicable. | | | |
| **3. FOCUS AREAS – EAST PUC** | | | |
| **Discussion:** Mānoa is not identified in the ***Preview Draft PUC*** update as a focus area. | | | |
| **4. HOUSING** | | | |
| **GOAL H-1: Encourage Development of a Wide Range of Housing Types** | | | |
| Policy H-1.1: Enable or incentivize residential infill development in transit-accessible planned growth areas. | | | X |
| Policy H-1.2: Encourage a greater variety of housing options and types, including middle density housing, expansion of ADUs and ‘Ohana units, shared housing models, and mid-rise apartment buildings. | X | | |
| Policy H-1.3: Support accessible housing options and a broad range of housing types for kūpuna. | X | | |
| Policy H-1.4: Expand homeless services and supportive housing in the PUC. | | | X |
| **GOAL H-2: Expand the Availability of Quality Affordable Housing for PUC** | | | |
| Policy H-2.1: Expand the supply of income restricted affordable housing through affordable housing requirements and infrastructure investment. | X | | |
| Policy H-2.2: Produce new income-restricted units through non-profit, public, and private sector development partnerships. | X | | |
| Policy H-2.3: Preserve existing affordable housing options and improve conditions by encouraging reinvestment/redevelopment of aging multi-family housing. | | | X |
| **Discussion:** The Proposed Action will add 288 affordable rental apartment units for the elderly 62+ with a limited number that will meet ADA requirements. These will be income restricted units and will be developed using the 201H process with support financing provided through HHFDC with possible additional financial assistance using a portion of Community Development Block Grant funds. The Developer, LYCA is a non-profit association categorized as a 501c(3) association. The affordability of the rental units will be maintained in perpetuity. In short, these housing Goals and Policies will be achieved by this development. | | | |
| **5. PARKS AND OPEN SPACE** | | | |
| **GOAL POS-1: Provide Adequate Parks Coverage to meet Resident Needs.** | | | |
| Policy POS-1.1: Pursue a long-term vision and strategy for the PUC parks and open space network. | | | X |
| Policy POS-1.2: Implement a “10-minute walk” standard for park accessibility in the PUC. | | | X |
| Policy POS-1.3: Seek opportunities to create new parks in high-density and growing areas of the PUC. | | | X |
| Policy POS-1.4: Find creative opportunities in the urban context for a greater variety of park and open space types. | | | X |
| Policy POS-1.5: Improve the ecological function of parks. | | | X |
| **Discussion:** The Proposed Action’s provision of a community garden provides recreational opportunities. Additionally, the Project Site is within walking distance of the Mānoa Regional Park. | | | |
| **GOAL POS-2: Increase Connectivity and Access to and between parks, beaches and trails.** | | | |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN *PROPOSED REVISED* GOALS AND POLICIES - DEC. 2020 | CONSISTENT? | | |
|---|---|---|---|
| | YES | NO | N/A |
| Policy POS-2.1: Create safe park-to-park connections through continuous and dedicated pedestrian/bicycle ways. | | | X |
| Policy POS-2.2: Use Green Streets to connect major recreation and public areas, provide missing green space, and beautify viewshed corridors. | | | X |
| Policy POS-2.3: Better connect residents to the beaches and trails in the PUC, such as through an enhanced beach access program. | | | X |
| **Discussion:** The location of the Proposed Action is within walking distance of the Mānoa Regional Park which provides a variety of recreational opportunities for project residents. Also, the site would be designed to provide a pleasant and enjoyable outdoor environment. | | | |
| **GOAL POS-3: Provide High-Quality Parks for all PUC Residents.** | | | |
| Policy POS-3.1: Invest in park facilities, equipment, and programs that serve all ages. | | | X |
| Policy POS-3.2: Support park revitalization with additional park maintenance funding, partnerships, and staff. | | | X |
| Policy POS-3.3: Promote parks that are safe for the community through environmental design strategies and after-hours activity. | | | X |
| Policy POS-3.4: Expand existing programs that advance shared use and park stewardship efforts. | | | X |
| POS-3.5: Ensure long-term maintenance and preservation of open spaces in subdivisions and cluster developments. | X | | |
| **Discussion:** The Proposed Action's provision of a community garden provides recreational on-site opportunities. Income from the project ensures a long-term ability for maintenance. | | | |
| **6. MOBILITY AND CONNECTIVITY** | | | |
| **GOAL MC-1: Provide Safe, Accessible, & Affordable Multimodal Transportation Options.** | | | |
| Policy MC-1.1: Implement Complete Streets to enhance the safety and utility of the transportation system for all users. | | | X |
| Policy MC-1.2: Continually improve the efficiency and connectivity of public transit in PUC neighborhoods. | | | X |
| Policy MC-1.3: Continue to expand facilities and comfort in the bicycle network. | | | X |
| Policy MC-1.4: Improve pedestrian connectivity and safety throughout the PUC. | | | X |
| **GOAL MC-2: Create an Adaptable and Flexible Transportation System.** | | | |
| Policy MC-2.1: Reduce dependency on single-occupancy vehicle trips. | X | | |
| Policy MC-2.2: Safely integrate emerging technologies into the transportation system. | | | X |
| Policy MC-2.3: Improve the efficiency and operations of existing transportation facilities. | | | X |
| Policy MC-2.4: Maximize interagency and regional coordination when making transportation system improvements. | | | X |
| **Discussion:** The Proposed Action is located on The Bus Route #6 and the elderly residents may occasionally use Handivan services. However is it anticipated that Uber, and Lyft transport services and taxi services will also be available which may reduce the need for private personal transportation. | | | |
| **7. HEALTHY COMMUNITIES** | | | |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN<br>***PROPOSED REVISED*** **GOALS AND POLICIES - DEC. 2020** | CONSISTENT? YES | NO | N/A |
|---|---|---|---|
| **GOAL HC-1: Foster a healthy built environment in the PUC.** | | | |
| Policy HC-1.1: Encourage exemplary healthy building standards and accessible design in developments and public spaces. | X | | |
| Policy HC-1.2: Create a safe and active mobility network in the PUC. | | | X |
| Policy HC-1.3: Expand access to healthy foods from local growers and expand the community gardens program. | X | | |
| Policy HC-1.4: Promote strategies to increase energy efficiency in buildings. | X | | |
| **Discussion:** The Proposed Action would install energy efficiency technology such as PV panels along with solar water heating equipment. The project will also utilize other energy efficient methods such as energy efficient appliances to the extent feasible. The one acre community garden will provide a unique opportunity not usually available to low-income renters. | | | |
| **GOAL HC-2: Shape an Age-Friendly community that responds to the needs of all PUC residents** | | | |
| Policy HC-2.1: Support housing developments in the PUC that are accessible, affordable, and designed for kūpuna and a range of household and family sizes. | X | | |
| Policy HC-2.2: Facilitate home modifications to increase home safety for kūpuna by providing permitting guidance, connections to informational resources, or incentives. | | | X |
| Policy HC-2.3 Design parks and open space to provide increased physical activity for all ages. | X | | |
| **Discussion:** The project is specifically designed as affordable rental units for the elderly and will also designate a limited number of the affordable rental units to be developed as ADA compliant. | | | |
| **GOAL HC-3: Encourage initiatives that improve community engagement, health, and equity.** | | | |
| Policy HC-3.1: Collaborate across county agencies, with state agencies and partner organizations to improve services for neighborhoods with disproportionately poor health outcomes. | | | X |
| Policy HC-3.2: Improve civic engagement in the planning process through increased community-focused initiatives. | | | X |
| Policy HC-3.3: Address potential impacts to existing residents and businesses in rapidly changing rail station areas through improved project vetting processes. | | | X |
| Policy HC-3.4: Prioritize completion of sidewalk and bicycle networks near transit stops and schools. | | | X |
| **Discussion:** The Proposed Action is not applicable to this Goal or its four objectives. | | | |
| **8. SEA LEVEL RISE ADAPTATION + PLANNING** | | | |
| **GOAL SLR-1: Adapt Regulatory Standards to Improve Resilience to Climate Change and Sea Level Rise Hazards.** | | | |
| Policy SLR 1.1: Formalize a sea level rise hazard overlay for development project review in the 3.2’ SLR-XA and for long-lived and critical infrastructure projects in the 6’ SLR. | | | X |
| Policy SLR 1.2: Develop a framework and tools to introduce and advance evidence-based sea level rise and resilience requirements into City ordinances and permitting practices. | | | X |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN *PROPOSED REVISED* GOALS AND POLICIES - DEC. 2020 | CONSISTENT? | | |
|---|---|---|---|
| | YES | NO | N/A |
| Policy SLR 1.3: Allow voluntary adaptation measures in proposed development in the 3.2’ SLR-XA that exceed given requirements. | | | X |
| Policy SLR 1.4: Consider the SLR-XA compound hazards (passive flooding, annual high wave flooding, and erosion) separately and together in individual site decisions to determine appropriate adaptation measures. | | | X |
| Policy SLR 1.5: Revise existing shoreline regulatory and development policy to reflect sea level rise impacts (Shoreline Management Area and Shoreline Setbacks). | | | X |
| Policy SLR 1.6: Support state agencies in applying appropriate interventions and environmental measures for adapting / preserving beaches and shoreline impacted by sea level rise. | | | X |
| **Discussion:** The Project Site is several miles from the shoreline and is not subject to direct impacts from sea level rise. The site also lies outside the special management area boundary. Therefore Goals and Policies related to sea level rise are not applicable. | | | |
| **GOAL SLR-2: Conduct Long-Range Planning to Increase Area-Wide Resilience and Adaptation Efforts.** | | | |
| Policy SLR 2.1: Plan for long-term solutions such as priority growth areas and redevelopment opportunity sites outside of the 3.2’ SLR-XA and 6’ SLR, and vet other long-term solutions in highly impacted areas through rigorous community based processes. | | | X |
| Policy SLR 2.2: Address potential impacts to surrounding sites for project-level adaptation measures whether requirements or voluntary best practices. | | | X |
| Policy SLR 2.3: Develop and implement a County level Climate Adaptation Strategy (CAS) and regional-scale climate adaptation preparedness strategies and identify key decision points (benchmarks) for choosing/implementing major adaptation options. | | | X |
| Policy SLR 2.4: Implement sea level rise adaption efforts and pilot projects identified in the O'ahu Climate Adaptation Strategy. | | | X |
| **GOAL SLR-3: Coordinate Infrastructure Planning for Sea Level Rise Across Agencies.** | | | |
| Policy SLR 3.1: Include sea level rise considerations into the planning, design, and maintenance of City facilities and infrastructure. | | | X |
| Policy SLR 3.2: Support One Water collaboration efforts and resilience planning for new and existing infrastructure. | | | X |
| Policy SLR 3.3: Pursue a district-scale fee structure or other dedicated funding mechanisms for sea level rise and flooding adaptation. | | | X |
| Policy SLR 3.4: Monitor ongoing impacts within the SLR-XA for ongoing updates to development regulations that implement adaptation. | | | X |
| **Discussion:** The Project Site is several miles from the shoreline and is not subject to direct impacts from sea level rise. The site also lies outside the special management area boundary. Therefore, Goals and Policies related to sea level rise are not applicable. | | | |
| **9. WATER RESOURCES** | | | |
| **GOAL WR-1: Take a Comprehensive and Collaborative Approach to Water Management in the PUC.** | | | |
| Policy WR-1.1: Collaborate across water quality and water infrastructure management departments and agencies. | | | X |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN *PROPOSED REVISED* GOALS AND POLICIES - DEC. 2020 | CONSISTENT? | | |
|---|---|---|---|
| | YES | NO | N/A |
| Policy WR-1.2: Work with state water and environmental agencies to protect and manage upper watersheds. | X | | |
| Policy WR-1.3: Address chronic storm flooding issues through multiple solutions. | | | X |
| **GOAL WR-2: Protect Ground and Surface Water Quality from Polluting Land Uses.** | | | |
| Policy WR-2.1: Protect drinking water aquifers, and surface and nearshore waters from contamination by developed land uses, urban runoff, and illegal dumping. | X | | |
| Policy WR-2.2: Enhance the ecological function of streams. | | | X |
| Policy WR-.2.3: Effectively manage stormwater flows with appropriate on-site and city-system best practices. | X | | |
| **GOAL WR-3: Maintain Resilient Water Infrastructure Systems.** | | | |
| Policy WR-3.1: Reduce vulnerability of the water infrastructure system to the effects of climate change. | | | X |
| Policy WR-3.2: Support water conservation projects and programs to manage demand. | X | | |
| Policy WR-3.3: Improve coordination of wastewater infrastructure and land use planning. | | | X |
| **Discussion:** The Proposed Action will follow BMP in the management of the site's storm water and support water conservation efforts. | | | |
| **10. ECONOMIC DEVELOPMENT** | | | |
| **GOAL ED-1: Support Employment and Business Growth in the PUC's Jobs-Rich Areas.** | | | |
| Policy ED-1.1: Accommodate commercial job growth in dense, transit-rich locations. | | | X |
| Policy ED-1.2: Enhance efforts to retain and attract small businesses in rapidly developing areas. | | | X |
| Policy ED-1.3: Maintain industrial as the primary land use in key PUC locations with easy access to the port and airport. | | | X |
| Policy ED-1.4: Support new, non-traditional configurations of employment use in light industrial and mixed-use areas. | | | X |
| **GOAL ED -2: Create a Balanced and Diversified PUC Economy** | | | |
| Policy ED-2.1: Encourage growth of new industries, especially in information tech, green tech, and creative media and other key industries identified by County and State Economic Development initiatives. | | | X |
| Policy ED-2.2: Grow resident workforce skills by supporting State investments in higher education and K-12 facilities. | | | X |
| Policy ED-2.3: Continue to invest in the success of Waikīkī as Honolulu's primary visitor destination/resort area and a livable neighborhood. | | | X |
| Policy ED-2.4: Maintain a productive relationship with the military to broaden its contributions to the PUC. | | | X |
| **Discussion:** The Proposed Action has no direct impact on creating business growth or a balanced and diversified PUC economy. These Goals and Policies are not applicable. | | | |
| **GOAL ED-3: Ensure City Services & Infrastructure Support Broad Economic Growth Prosperity.** | | | |

| PRIMARY URBAN CENTER DEVELOPMENT PLAN *PROPOSED REVISED* GOALS AND POLICIES - DEC. 2020 | CONSISTENT? | | |
|---|---|---|---|
| | YES | NO | N/A |
| Policy ED-3.1: Support small property owners and their redevelopment, infrastructure, and funding needs through process streamlining and enhancements. | | | X |
| Policy ED-3.2: Ensure major public infrastructure needs are funded equitably, including contributions from new developments. | X | | |
| **Discussion**: The Proposed Action would utilize existing infrastructure services but will contribute equitably its contribution for utility improvements. | | | |
| **11. CIVIC FACILITIES + SERVICES** | | | |
| **GOAL CIV-1: Support Civic and Public Institutions in the PUC.** | | | |
| Policy CIV-1.1: Provide for adequate civic and public safety facilities and essential services in the PUC. | X | | |
| Policy CIV-1.2: Assist the State in providing a high-quality environment for public schools and educational institutions in the PUC. | | | X |
| **GOAL CIV-2: Plan for Emergency Management and Hazard Mitigation in the PUC.** | | | |
| Policy CIV-2.1: Strengthen Disaster Preparedness in the PUC. | | | X |
| Policy CIV-2.2: Increase Overall Community Resilience to Disruptive Hazards. | X | | |
| **GOAL CIV 3: Maintain Efficient Energy and Telecommunications Systems in the PUC.** | | | |
| Policy CIV-3.1: Carefully site energy and telecommunications systems. | | | X |
| Policy CIV-3.2: Increase production of renewable energy at the building and community scale. | X | | |
| **GOAL CIV 4: Provide Efficient Solid Waste Services for PUC Residents.** | | | |
| Policy CIV-4.1: Efficiently manage the region's solid waste system. | | | X |
| **Discussion**: The Proposed Action has no direct impact on the provision of civic facilities and services and therefore these Goals and Policies are not applicable with the exception of providing resilience to disruptive hazards. However, the project's intended use of PV panels will reduce energy consumption. | | | |

## 5.3 PERMITS AND APPROVALS

The Proposed Action will be subject to the following list of permits and approvals:

**Table 5-8: Permits and Approvals**

| | |
|---|---|
| **State** | |
| Department of Health | National Pollutant Discharge Elimination System |
| Department of Land and Natural Resources – Historic Preservation Division | HRS §6E Consultation, State Historic Preservation Law |
| **City and County** | |
| Department of Planning and Permitting | 201H Resolution |
| | Demolition Permit |
| | Grubbing Permit |
| | Grading Permit |
| | Building Permits |
| | Certificate of Occupancy |

*(This page intentionally left blank)*

# 6. ALTERNATIVES CONSIDERED

As a requirement of HAR §11-200.1-18 (2019), an environmental assessment must identify and consider Alternative Actions that would achieve the Purpose and Need of the Proposed Action. Alternative Actions eliminated from consideration are those that do not meet the Purpose and Need. They are described in Sections 6.1, 6.2 and 6.3 following, and include the No Action Alternative, alternative sites and alternative actions.

## 6.1 No Action Alternative

Under the No Action Alternative, the Project Site's existing conditions would remain largely undisturbed since the Proposed Action and related site improvements would not occur. The forested area would remain but continue to propagate seeds of invasive species throughout the area. No affordable rental units for the elderly would be built and no area would be available for community gardening. In continuing the No Action alternative, LYCA would attempt to continue regular maintenance of the Mānoa Chinese Cemetery with the limited funds available, and declining income, till exhaustion and eventual bankruptcy. This would leave the cemetery without proper maintenance and its function as a community asset and important historic site would be compromised and seriously diminished while likely falling into further disrepair. The two old existing dwellings and storage buildings on the Project Site are deteriorated beyond affordable or practical renovation. The exterior areas would continue to function as temporary storage for cemetery maintenance equipment and related miscellaneous outdoor storage. The No Action Alternative would have no short-or long-term impacts on the existing resources found on the Project Site.

Furthermore, the No Action Alternative would fail to meet the equally important Purpose and Need of the Proposed Action, which is to provide affordable elderly rental housing in support of the well documented urgent need for such housing and LYCA's eleemosynary responsibility as a registered non-profit association. The No Action Alternative would fail to tribute toward achieving the housing objectives of the Hawai`i State Plan, the 2022 O`ahu General Plan, the PUC Development Plan and the Proposed Revised PUC Development Plan, as well as the recommendations of the Special Action Team on Affordable Rental Housing prepared by the State Office of Planning and Sustainable Development. Because of its failure to meet both objectives of the Purpose and Need and the objectives of the State and County housing policies, it is not a feasible alternative and was dismissed.

## 6.2 Alternative Project Site

It has also been suggested the project be relocated to another site rather than on the Mānoa Valley property of LYCA. The problem with this suggestion is that there are few, if any, other available sites in the Primary Urban Center (PUC) with the locational advantages of the LYCA property. Those advantages include, inter alia; (a) availability of an adequately sized site for use as senior affordable rental housing under the 201H housing program which was designed and passed by the Hawai`i State Legislature

specifically to facilitate and support the creation of affordable housing where it can be provided; (b) proximity to daily needs shopping and convenient public transit; walking distance to recreational opportunities at Mānoa Regional Park. The underused project site therefore is an appropriate and suitable location for an affordable elderly rental housing project in the PUC that also has sufficient area available for a community garden. There are no other available sites of comparable size in Mānoa Valley (or perhaps even in the PUC) that would be suitable and have the distinct advantages as the LYCA site for the Proposed Action. Over one hundred years of free and clear fee simple ownership by LYCA was viewed as a unique advantage and would include a sizable cost free contribution in kind toward the cooperative use of Hawai`i Housing Finance and Development Corporation's (HHFDC) affordable housing tax credits. Although the project site is zoned P2 (Preservation), the 201H-38 affordable housing development process allows for a multi-family residential (low to medium density apartments with A-2 zoning) and exemptions from some sections of the Land Use Ordinance when granted through a 201H resolution passed by the City Council. Any exemptions requested must provide sufficient justification. Additionally, the Project Site has convenient road access and confirmed availability of water supply and waste water capacity. Therefore, LYCA has determined that an affordable senior rental housing project financed with assistance from HHFDC would be the highest and best use of their
9.5 acre undeveloped parcel.

LYCA also proposes that the small triangular parcel (TMK 29043003 of 22,542 sq. ft., which lies across East Mānoa Road from the affordable housing site) be renovated as a Day Room for project residents. The availability of this parcel in close and easily accessible proximity to the 288 affordable elderly rental housing units provides a unique locational advantage that would be very difficult to duplicate elsewhere. There are no other known combinations of alternative sites in the PUC with the same synergistic advantages available at this location. The two structures on the site include the dilapidated Chinese Memorial Hall built in 1958 and a small single family residence. Although the old section of the Mānoa Chinese Cemetery is on the State register of historical places, the Memorial Hall is not and is not considered a historical building.

### 6.3 Alternative Project Design

The LYCA Development Committee invited five architectural firms to submit alternative design concepts for the Proposed Action. The invitation requested that proposals should give consideration to:

- Standardize building design that could be replicated to enable phased development of the 288 units over several years to reduce cost;
- Align buildings to capture trade winds for natural ventilation to reduce the need for whole building air conditioning;
- Design a service core to accommodate a lobby, elevators and other service areas for common use that can serve two or more structures;
- Ground floor units that could be designed to comply with ADA handicap requirements;

- Preserve and incorporate the three large banyans into the site plan along with other trees and site vegetation suitable for shade and as visual buffers.
- Design roofs to allow installation of PV panels to offset energy costs throughout the project's lifetime.
- A project design that would create a desirable residential project and would be compatible with the community.
- Proposals should also give appropriate consideration to building configuration, height, bulk and visual impact.

From the five firms, eight concept proposals were presented to the LYCA Development Committee over a two week period in June 2021 and were comprehensively evaluated against the design criteria and with consideration of the requirements for the Low- Income Housing Tax Credit (LIHTC) Program administered by HHFDC, as well as State and County housing policies. Based on the comprehensive evaluation of the eight design concepts, the Development Committee was unanimous in selecting the concept design prepared by Group 70 as having best met the design criteria including the Purpose and Need of the Proposed Action. The LYCA Development Committee's recommendation was later accepted and subsequently approved by the LYCA Board of Directors. Several of the comments and views expressed during the evaluation by the LYCA Development Committee members were as follows.

- Expressed a preference for a residential courtyard design because it would encourage a sense of community among residents and group identity.
- Expressed a preference for single loaded units with exterior corridor access which would enable cross flow ventilation and minimize the need for continuous air conditioning with consequent reductions of energy cost.
- Favorable toward a courtyard grouping that can be replicated for all four phases.
- Favorable toward distribution of parking throughout the site rather than concentrating parking in one large area.
- Favorable toward the innovative proposal to the occasional use of East Mānoa Rd. for special events, with the sparse East Mānoa Rd. traffic temporarily re- routed around the Memorial Hall day room via Pakanu St. and Old E. Mānoa Rd. Such events would require a permit for temporary road closure from the City and County of Honolulu.
- The enclosed courtyard design enables security for residential units to be easily provided via control of access into courtyards, stairways and elevators.
- Placement of parking for Community Center / Wellness Center on mauka portion behind Community Center building makes parking less visually prominent and would also allow entrance from less traveled Pokanu St rather than E. Mānoa Road.
- Pedestrian bridges are proposed for crossing Woodlawn Ditch and linking Phases 1 and 2 with Phases 3 and 4. The cemetery access road connecting with East Mānoa Rd. could be used for emergency access to Phases 3 and 4.
- Favorable toward the proposed Central Garden area straddling Woodlawn Ditch, but appropriate safety measures would be required.

The Day Room on the adjacent triangular parcel, although a part of the overall finished project, will be addressed later as a separate facility of the project and not as a part of the first phase housing development.

### 6.4 Other Alternative Uses and Sites Considered

Several members of the Mānoa community, especially those residing in proximity to the Proposed Action, have suggested various alternative uses for the site that they consider could potentially generate income for maintenance of the cemetery without building three story affordable elderly rental apartment units. Four of these alternative approaches are described below with reasons for their rejection as being inadequate to achieve the dual Purpose and Need for the Proposed Action.

**a) Expand Cemetery Area–** It has been the understanding by LYCA for many years that the cemetery could not be expanded into the 9.5 acre wooded site due to a Department of Health regulation that prohibited full body burials within 200 feet of any stream, due to concerns of possible ground water contamination from embalming fluids. due to the relatively high water table level. LYCA does not have sufficient funding to finance the expansion of the cemetery or to construct a columbarium. There are also geotechnical issues related to the relatively high water table and the presence of large underground boulders. The cemetery has only about 200 plots remaining and does not have a pre-need sales license and cannot, therefore, pre-sell niches or burial plots.

Although no specific setback regulation has been identified, any expansion of the cemetery would still depend upon authorization from the State Department of Health. Even if expansion of the cemetery is technically feasible, such expansion would only enable a temporary extension of LYCA's income stream from the sale of burial plots. Perhaps of more concern to the Mānoa community, however, cemetery expansion would mean significant ground clearance, grading and landscaping for new cemetery burial areas and access roads and could require removal of site vegetation including some of the large trees which the proposed Project Action seeks to preserve and integrate into the overall landscape and site plan for the affordable housing units. Additionally, given the strongly identified need and demand for affordable elderly rental housing on O`ahu, it would appear that housing for living kupuna is currently a higher priority than space for those who have passed on. The increased preference for less expensive cremation, has also slowed the demand for full body burial plots. While this alternative may add new burial plots, this alternative was rejected because it would not fulfill the Proposed Action's purpose and need to provide affordable elderly rental housing as well as funding for cemetery improvement and maintenance .

**b) P-2 Zoning Allows a Golf Course –** A golf course has also been suggested. Although golf courses are allowed on P-2 zoned parcels, an 18 hole golf course requires an area of 130 to 150 acres. Considering that the site's largest parcel is only 9.5 acres this is not feasible. The only type of golf course that might potentially fit on the parcel would be a commercial type mini-putt-putt course with parking and lighting to allow nighttime family play. This too would require removal of most of the vegetation and the long term financial feasibility is doubtful. Additionally, golf courses of any size are expensive to maintain and operate. This idea would very likely be even more strenuously opposed than the Proposed Action by the greater Mānoa community for traffic, parking, noise, light pollution or other reasons, and would not be economically feasible. Additionally, this alternative use would not produce any affordable elderly rental apartments and therefore would not satisfy State and County goals, objectives and policies to provide affordable rental housing in the PUC. It would also not help achieve LYCA's eleemosynary mandate. For these reasons this proposed alternative was rejected.

**c) Taro Fields –** It was also suggested that the area be converted back into taro fields (l`oi). This use would also require grading and terracing into taro ponds, and again would require wholesale removal of the majority of the site's vegetation (see historic site air photos 1945 to 2019 in Part 2). It is also doubtful if sufficient water supply would be available unless pumped from groundwater or diverted from Mānoa Stream. Given the cost of labor for commercial farming of taro, the income stream would likely not be sufficient to maintain and improve the cemetery. This option would therefore not achieve the Purpose and Needs of the project and was dismissed. Income stream would likely not be sufficient, and this proposal would not produce affordable elderly rental apartments which is a key objective of the Proposed Action. It was rejected accordingly.

**d) "Preserve Mānoa" Flyer -** A group of Mānoa residents opposed to the project prepared a list of alternative approaches for funding long term cemetery maintenance without resorting to the Proposed Action to develop 288 affordable elderly rental housing units. This printed flyer, entitled "*Preserve Mānoa*" was distributed as a handout to attendees at the April 30, 2022 "Town Hall Meeting" (see Appendix E). Each of the alternative approaches described in the flyer are stated below followed by a response as to why they are: (i) not acceptable to LYCA; (ii) not appropriate; (iii) inadequate; or (iv) impractical.

- *"Sell and/or borrow against the multiple properties owned by the Cemetery that are not being used for burials, such as 3476 East Mānoa Road (estimated value $1.6 million)."*

**LYCA Response:** This alternative is not acceptable to LYCA because the property in Mānoa has been under the association's ownership for over 150 years and LYCA considers it imperative to continue its ownership, control and management of the property in perpetuity without selling it as separate parcels. Mortgaging a portion of the property to finance maintenance would not provide an income stream with which to repay borrowed funds. The smaller triangular parcel (TMK 2-9-043:001) produces reliable rental income to assist with cemetery maintenance costs. Selling this parcel, with the loss of rental income, so as to replace it with income from dubious investments is not considered prudent and is not acceptable to LYCA.

- *"Reorganize itself to become a functioning non-profit organization.*

- *Use funds generated from property sales or transactions to (1) create an endowment that is professionally managed and (2) hire an Executive Director with fund-raising experience.*
- *Change its bylaws to allow anyone to become a trustee, such as people with relevant management or fund-raising experience."*

**LYCA Response:** The Lin Yee Chung Association is already a 501(c)13 non-profit eleemosynary association. Funds generated from burial plot sales are a major source of income to fund cemetery property maintenance and to make necessary improvements. It has already been established that this income stream is insufficient in the long term to continue adequate finance of cemetery maintenance and improvements. Furthermore, funding cemetery maintenance only will not fulfil the other key objective to create affordable rental elderly housing for which the urgent need is well documented and established as an objective, goal, and/or policy at both State and County level. Interference in the internal affairs, organization, and management of LYCA, their procedures for appointment of Trustees, or requesting the Association to change its by-laws to accommodate the preferences of some Mānoa residents who oppose the Proposed Action is really a stretch and is categorically rejected by LYCA.

- *"Task the new Executive Director and Officers to raise funds through:*
  - *Reviving and expanding the annual Ching Ming Festival*
  - *Actively seeking donations on a yearly basis from:*
    - *Chinese societies in Hawaii and elsewhere.*
    - *Families with loved ones / ancestors buried at the cemetery*
    - *Mānoa residents.*
  - *Actively applying for federal, state and private grants each year.*
  - *Creating a social media presence and on-going fund-raising campaign."*

**LYCA Response:** Previous response applies here as well. Funding and managing perpetual maintenance and improvement of the cemetery solely on donations is not considered sustainable. The availability and adequacy of donations and grants would be highly variable over time, require continuous solicitations and management, and would not produce a stable adequate income source for long term funding of cemetery expenses. Expanding the Ching Ming Festival could possibly irritate nearby residents with what they may consider to be excessive noise, traffic congestion, or some other perceived annoyance. Additionally, Ching Ming Festival is a religious rite intended to honor one's ancestors and is not intended to be an income generating enterprise. This is considered by LYCA to be an inadequate and inappropriate approach toward long term stable financing for cemetery maintenance and improvement. As stated previously, alternative proposals to fund cemetery maintenance only will not fulfil the equally important objective to create affordable rental elderly housing for which the urgent need is well documented and established as goals, objectives and policies at both State and County level.

- *"Change the Cemetery's business model into that of on-going, active business.*
  - *Request a license change to allow sales of lots before death.*

  - *Build a columbarium/niche wall and actively sell spaces.”*

**LYCA Response:** While construction of a columbarium/niche wall may eventually become a necessity for future burials, it would require clearing of a sizable portion of the vegetated area to accommodate columbarium structures with roadway access and parking for funerals. If the columbarium structures are two stories, elevators would also be required to satisfy access requirements for disabled visitors under the Americans with Disabilities Act. LYCA could continue to sell burial vaults on an as need basis rather than in advance of need. Storage of maintenance equipment would also still be required. Construction costs would require commercially borrowed funds since HHFDC only assists with the construction of affordable rental housing. While this alternative may extend the cemetery’s ability to accommodate new burials for a time, it would not fulfil the equally important dual objective to create affordable rental elderly housing for which the urgent need is well documented and legislatively established as goals, objectives and policies at both State and County plans. Currently, the urgent need is for affordable rental housing for O`ahu’s living kupuna, not just for those who have passed on.

- *“Restore Memorial Hall and work with the community to find acceptable revenue-generating activities for it.*
  - *Create a historical tour, which ends at a gift shop at Memorial Hall.”*

**LYCA Response:** LYCA is currently considering a restoration with some enlargement of the Memorial Hall to upgrade its use as a day room. It is extremely unlikely that a historical tour and gift shop could generate sufficient revenue to finance perpetual maintenance and/or improvement of the cemetery. Additionally, members of the Mānoa Community have already registered their strong opposition to any type of retail intrusion into the Mānoa community. Furthermore, this proposal would not fulfil the equally important objective to create affordable rental elderly housing for which the urgent need is well documented and legislatively established as goals, objectives and policies at both State and County levels. This alternative would not meet the purpose and need to provide affordable elderly rental housing.

- *Rent preservation land to commercial and/or community farmers, restoring it to its historical use.*

**LYCA Response:** Assuming that this alternative would even generate sufficient income to maintain the cemetery, it would require almost total clearance of the “forest” to make the area available for farming. However, many residents of Mānoa have voiced their opinion as being strongly against any removal or clearance of a sizable portion of the forested area. Again, this alternative would not provide affordable elderly rental housing and therefore must be rejected as not meeting the stated Purpose and Need.

- *“Request community help with physical maintenance of the Cemetery.*
  - *Seek volunteers from Malama Mānoa, The Outdoor Circle-Mānoa, Mānoa Heritage Center, Historic Hawaii Foundation, Mānoa Lions Club, Chinese*

*Societies, Mānoa residents and families with ancestors buried at the Cemetery to help with groundskeeping work."*

**LYCA Response:** Organizing and scheduling volunteers from the Mānoa community, even by working through established community organizations, to undertake cemetery maintenance on a voluntary basis would be very difficult and is not a viable long term solution. Expecting volunteers to carry out cemetery maintenance which requires use of various types of grounds maintenance equipment, could raise liability issues for LYCA. Again, this alternative would not achieve the parallel and equally important purpose to provide affordable rental elderly housing. This proposal was rejected as being impractical and would not fulfill the Purpose and Need of the Proposed Action.

**6.5 Community Alternatives and Criticisms**

The "Preserve Mānoa" flyer which suggested the above "*alternatives*" to development of the Proposed Action also expressed community objections and concerns by posing several statements and questions supported with short descriptive elaborations. Because these questions form the basis of community objections, they are repeated here with a response to each from the applicant.

***"What's wrong with the Development in its current form?"***

"PRESERVATION FOREST WILL BE LOST [*Upper case used in original*.]

- *One of the few remaining preservation forests within the interior of Mānoa valley will be almost entirely razed to make way for parking lots and buildings."*

**LYCA Response:** The *Flora and Fauna Report* provides a detailed description of the trees and other plants found on the site. The aerial photos in Part 2 provide a timeline from 1940 to 2019 of the progressive changes in the site's vegetative cover. These photos indicate that the "preservation forest" is actually a derelict piece of land previously used for farming and now taken over largely by invasive plant species. This conclusion was echoed by the Flora Report which noted that many of the trees and plants on the site are non-native invasive species and some are simply overgrown weeds. This assessment is further supported in that the *Hawaii Invasive Species Council* has rated Macaranga tanarius, which covers much of the site, as a high risk weed with a Hawaii-Pacific Weed Risk Assessment Score of 12, with plants exceeding a score of 6 or higher being classified as high risk invasive species.

With the exception of the 35 trees identified by the *Flora Report* as worthy of possible preservation, much of the vegetation as shown in the air photos has occurred over only the last 20 years and does not represent a historical, pristine virgin native forest as has been characterized by several Mānoa residents. The project site has undergone visibly significant changes in use and vegetation cover since 1945 when it was largely vacant land with small farm plots. Other than the 35 trees identified for possible preservation, much of the vegetation is either scrub or invasive species that should be removed and the site properly landscaped with native Hawaiian species including shade trees such as Monkeypod (Samanea Saman - Ohai) imported to Hawaii in 1847 and widely cherished as a valuable shade tree. The Kauʻiokahaloa Nui Apartments at 3029 Lowrey Ave. (See Figs' 2-12 to 2-16) are an excellent example of a medium density apartment complex shaded by Monkeypod trees and landscaped to provide privacy, comfort and a pleasant environment. It is intended that Mānoa Banyan Court will be similarly landscaped to create a pleasant environment for residents, visitors, and the community.

"IT'S NOT RIGHT FOR MĀNOA [*Upper case used in original*.]

- *"The Development is a high-density, 3 story apartment project in a neighborhood of nearly all single, family homes; it's not a good fit with the character of the neighborhood."*

**LYCA Response:** It needs to be stated clearly up front that the Proposed Action is not a high density development as has been wrongly characterized. High density housing in Mānoa is exemplified by the proposed multi-family mixed-use housing for UHM students and junior faculty which will have 400 units in two towers of 12 and 18 stories respectively. Comparatively, at only three stories and 288 units in four separate courtyard buildings, the proposed Mānoa Banyan Court is low-rise medium density and does not meet criteria as high density housing. As shown in FIGs 2-18, 2-19 and 2-20, three story apartment buildings already exist as a precedent in lower Mānoa. These were built several decades ago and are not an aberration in Mānoa. The project density is about 30 units per acre (288 units / 9.5 acres = 30) which is considered medium density.

To understand high density housing a valid comparison can be made with the Kuilei Place in Moiliili being developed by Kobayashi Group. The proposed tower would be 400 feet high (250 feet above the currently allowed zoning), contain 1,005 residential units on 3.2 acres of land, which yields a density of 314 units per acre (1,005 / 3.2 acres = 314). That is 4.5 times the density allowed by current zoning. The developer intends to make 60% of the units (603) available to residents with moderate and high-moderate incomes. The remaining 402 units would be sold at market rates. This development will also utilize tax credits from HHFDC and must be approved by the Honolulu City Council.[1]

With regard to "*not a good fit with the character of the neighborhood*" it seems appropriate to call attention to the pertinent housing policies stated in the *Proposed Revised* PUCDP.

Draft Housing Policies for the *Proposed Revised* Primary Urban Center Development Plan (PUCDP)
Housing Policy H-1.3: *Encourage a greater variety of housing types, including low or middle-density multi-family housing, ADUs and ʻohana units, mid-rise apartment buildings, and shared housing models*.
Housing Policy H-2.1: *Expand the supply of income-restricted affordable housing through requirements, incentives and public-private partnerships*.
Policy H-2.2: *Produce new income restricted units through public sector development and non-profit partnerships.*

Note: These policies for the revised PUCDP are still in draft form and were recently published for public comment. According to the time schedule, the *Proposed Revised* PUCDP is likely to be adopted by the end of 2022.

- *"The Development will be a bustling focal point – filled with people, cars and activity next to a cemetery of ancestors at rest, and in a quiet, residential part of Mānoa."*

**LYCA Response:** This exaggerated subjective opinion fails to recognize that the prospective tenants are at least 62 years old and are not likely to create a "bustling focal point filled with people, cars, and activity…".

"IT MAY CAUSE FLOODS IN MĀNOA AND ELSEWHERE [*Upper case used in original*.]

- *During the construction phase of the Development, after the forest is removed and the site is being developed, neighbors and those downstream will be at increased risk for soil erosion, dirt runoff and floods.*
- *Because of the lack of planning for the Development's impact on Woodlawn Ditch and Mānoa Stream, the completed Development may increase the risk of floods to those downstream in Mānoa, Moiliili, and Waikiki."*

**LYCA Response:** A drainage assessment report was prepared by the project's design consultants, G70. The drainage assessment report indicates that flood risk from the site will be minimal. The project site is classified as Zone X which defines flood risk as being very low (refer to the full Drainage Assessment Report in Appendix D).

"IT WILL HURT MĀNOA'S RESIDENTS [*Upper case used in original*.]

- *"The development will bring potentially 576 new residents into Mānoa Valley, increasing congestion within the Valley and at the two access points in and out of the Valley."*

**LYCA Response:** This assumes that every unit will be occupied by two tenants which is unlikely due to the income restrictions for eligibility. It is anticipated that many of the units will be occupied by a single tenant and total project occupancy is expected to be between 350 and 400 persons. If the "congestion" referred to relates to auto traffic, the TIAR has concluded that traffic impact generated by the project will be minimal and will not create traffic over what is currently experienced. Given the tenant income restrictions, cost of car ownership, maintenance, insurance and fuel (reasonably estimated at about $9,000 a year), coupled with the availability of public transit adjacent to the project, it is also unlikely that all tenants will own a car.

- *"The Development will add traffic to East Mānoa Road, Woodlawn and Lower Road, and the parking provided on site may be inadequate and cause spillover into the neighboring streets."*

**LYCA Response:** The Traffic Impact Assessment Report (TIAR) was prepared by Austin Tsutsumi Associates, a registered traffic engineering firm, who examined the project's potential impacts on Mānoa traffic conditions. This TIAR concluded that traffic impacts from the Project on local traffic would be minimal. A community claim was made that parking was inadequate and would "spillover into the neighboring streets". This situation was exemplified on Saturday March 26, 2022 when an estimated 150 community demonstrators gathered at the intersection of East Mānoa Rd. and Old East Mānoa Rd. to demonstrate against the Proposed Action. The photo below (Figure 6-1) shows about twelve of their cars parked on both sides of East Mānoa Road directly adjacent to the project site. During this demonstration there was no observable evidence that these parked cars caused any delay, hindrance or inconvenience to normal mauka or makai traffic flow on East Mānoa Rd. However, given this objection the Proposed Action has increased on- site parking provision from 185 up to 245 spaces.

**FIG. 6-1 Demonstration With Cars Parked on Both Sides of E. Mānoa Rd.**


- *"The quiet rural character of the single-lane Lower Road will be forever changed."*

**LYCA Response:** The TIAR offered two options for site entry and exit. Option 2 indicated the use of a short section of Lower Road for access to the Project's Phases 3 and 4. A decision to use Lower Road as an access point is still under consideration.

- *"Cars entering and existing* [sic] *the Development off East Mānoa Road and Lower Road will impede the flow of traffic for Mānoa residents travelling deeper into the Valley, particularly for those living on Lower Road, Puhala Rise, Waipuna Rise, Seaview Rise, Alani, Paty, Beaumont Place, Anoai Place, Melemele Place, Woodlawn Terrace, and Anela Place."*

**LYCA Response:** The TIAR analysis of intersections near the site made no mention of project sourced traffic impeding local traffic in the area or on the streets mentioned.

"THIS DEVELOPMENT IS BEING FAST-TRACKED FOR CONSTRUCTION APPROVAL, UNDER-THE-RADAR OF THE MĀNOA COMMUNITY" [*Upper case used* *in original*.]

- *"The Developer is seeking to take advantage of a statute (Haw. Rev. Stat. §201H-38) that allows for a development to be exempted from statutes, ordinances and rules relating to planning, zoning and construction standards; in other words, the Developer is trying to fast-track the Development, limit customary review by governmental agencies and curtail input from Mānoa residents."*

**LYCA Response:** HRS §201H-38 was passed by the Hawaii State Legislature to specifically encourage, facilitate and enable affordable housing on parcels where they would not normally be allowed under existing zoning. There is no opportunity within required procedures that a 201H project can be "fast-tracked" to curtail input from Mānoa residents. To the contrary, because it is a public private non-profit development with LYCA providing the land and with financial assistance from State funds through HHFDC, more procedures and more time is required. Exceptions to zoning and construction may be allowed, but only upon approval by the City Council. There are no exemptions for required government agency reviews. The Environmental Assessment process does not enable "curtailed input" from community residents.

At the Mānoa Neighborhood Board (virtual) Meeting of April 6, 2022 Mr. Tom Eisen, State Office of Planning and Sustainable Development presented the procedure for the Environmental Review Program. He outlined the procedural steps as follows. When a Draft Environmental Assessment (DEA) is accepted by the determining agency (often DPP), the DEA is published on the Environmental Notice website for 30 calendar days to receive public comment, including up to 15 Federal, State and City agencies. Following this, the DEA must respond to all agency and public comments received and the DEA resubmitted to the determining agency. If satisfactory and approved, the determining agency issues a Finding Of No Significant Impact (FONSI) and a Final Environmental Assessment (FEA) is published. The Proposed Action then requires passage of a 201H Council Resolution for approval of a project. A Draft Resolution is prepared for submission to the City Council for approval. Public hearings are required before the Council's Planning and Zoning Committee and also before the full Council. Following Council's passage of the 201H Resolution, the developer can initiate architectural drawings for submission to DPP for a building permit and other permits as required. As specifically related to the Mānoa Banyan Court Project:

- The project is still in the planning and design stage;
- If accepted by DPP, this DEA will likely be published in November, 2022 for a 30 day public comment period in conformance with Chapter 343;
- A Final EA **has not** been prepared or published and a FONSI **has not** been issued by the accepting agency;

**No 201H** application has been submitted to the Department of Planning and Permitting;

- **No** City Council public hearings on this proposal have been scheduled or held;
- The City Council **has not** approved a 201H Resolution for the Proposed Action;
- A 201H application **has not been submitted** to HHFDC for tax credit financing;

- **No** detailed architectural construction drawings have been prepared or submitted to DPP for **any** required permit; and
- **No** demolition, grubbing, grading, drainage or building permit has been issued by DPP for the Mānoa Banyan Court project.

Therefore, there is **no** "FAST TRACKING" of this project for construction approval as claimed. There has been **no** "UNDER-THE-RADAR" action to bypass the Mānoa Community or the Mānoa Neighborhood Board as claimed.

- *"The Developer did not meaningfully engage those living in the immediate vicinity of the proposed development – such as those on East Mānoa Road, Alani Drive, and Lower Road – during the conceptual phase of the Development. – In other words this is not being undertaken in a pono way."*

**LYCA Response:** The conceptual design phase of the Proposed Action is ongoing along with continued engagement in the planning process with the neighborhood. Residents living closest to the project, along with others, expressed their views at the "Town Hall" public meeting on April 30, 2022 attended by several members of the LYCA Board of Directors and project design staff. The entirety of Mānoa Valley is represented by the Mānoa Neighborhood Board and residents who have property closest to the project site have an equal and adequate opportunity, like all other residents of Mānoa Valley, to express their views through the Mānoa Neighborhood Board and at the public hearings to be held by the City Council.

In response to the expressed community concerns, the Proposed Action has made the following modifications to the project.

Increased the minimum age requirement of residents from 55 to 62 years. This should reduce the number of tenants who own and use cars regularly.

Reduced the unit sizes from 576 sq. ft. to 480 sq. ft. This will reduce the overall footprint for each of the four courtyard buildings and related area of ground disturbance and allow increased area for additional parking and landscaping, particular along the site boundary to provide additional visual privacy.

Parking area has been increased by one half acre. However, this additional parking area may not be activated until construction of Manoa Banyan Court Phase 4. This provides an opportunity to closely monitor actual parking use over a suitable period of time, perhaps two or three years, following completion of Phases 1, 2, and 3. If it is determined that actual parking demand is less than originally provided or anticipated, the additional parking area may not be required. This will allow a larger area to be used for the community garden area or other common area use.

Redevelopment of the small triangular parcel (TMK: 2-9-043:003) across from the residential parcel will be limited to renovation and possible minor enlargement of the existing Memorial Hall as a day room for project residents. However this renovation is not expected to occur till after Phases 1 and 2 are completed.

[1] As reported by Andrew Gomes of the Star-Advertiser on October 14, 2022

## 7. FINDINGS AND DETERMINATIONS

### 7.1 PRELIMINARY DETERMINATION

A Finding of No Significant Impact (FONSI) determination is recommended for the Proposed Action. No short-or long-term significant impacts have been anticipated or identified, and therefore, an Environmental Impact Statement (EIS) would not be required.

### 7.2 FINDINGS AND REASONS SUPPORTING DETERMINATION

The following findings and reasoning indicate that the Proposed Action will have no significant adverse impacts on the environment based on the thirteen significance criteria, pursuant to HAR §11-200.1-13:

1) **Irrevocably commit a natural, cultural, or historic resource;** The Proposed Action would not irrevocably commit any natural, cultural or historic resources at the Project Site. The Proposed Action's design was selected to remain consistent with the existing conditions and surrounding environment. One of the Project's priority site development objectives is to preserve as many of the viable trees as feasible. The arborist's survey report has noted that no endangered tree or plant species were found on the site. Additionally, the survey report noted that much of the site's vegetation could be classified as invasive, especially the extensive area of Macaranga trees which are considered an invasive weed tree, and even including several of the larger trees. This determination is supported by the air photos from 1945, 1959, 1978, 2001, 2011, and 2019 which clearly show a progressive history of the site's vegetative cover (or historical lack thereof). Based on the flora survey, 35 trees (or tree clusters) were identified for potential preservation. All trees will require mitigation actions to improve their condition and appearance and to reduce their risk of failure. A portion of the site is proposed for use as a community garden. Existing vegetation along the site perimeter adjacent to East Mānoa Road and Lower Road will be maintained as visual and sound buffers between the project's residential structures, and neighboring residences. While it will be necessary to remove some vegetation to create areas for structures and parking, including some large trees, vegetation removal will be minimized to what is necessary and will not comprise the wholesale destruction or disregard for a mature, but unmaintained forested area.

   Best Management Practices (BMPs) and mitigation measures would be applied to avoid and/or minimize potential impacts that would result in significant losses or destruction to natural or cultural resources. Contractors will adhere to specific protocol for monitoring and preserving significant habitat of Federal or State listed protected species if they are found at the Project Site during construction. The historical literature review has indicated that the most likely use of the site in historical periods, if used at all, would have been for small lo'i (taro fields) or vegetable plots. Since lo`i were not used as traditional burial sites, it is therefore very unlikely that Hawaiian iwi kupuna (ancestral remains) would be found on the site. However, subsurface testing will occur during demolition of the dilapidated existing structures and during other soil disturbing activities to monitor for potential subsurface archaeological deposits in order to minimize any potential impact on cultural resources. SHPD will be consulted prior to initiating subsurface testing, and, if SHPD determines testing must be done prior to demolition, the Developer will comply.

2) **Curtail the range of beneficial uses of the environment;** The Proposed Action, to develop the site for elderly affordable rental housing, is in full compliance with State and County Housing Objectives, Goals and Policies as clearly stated in the Hawai`i State Plan, the O`ahu General Plan (2022), and the current and proposed revisions to the PUC Development Plan. Additionally, the Proposed Action, at three stories, is compatible with the existing Mānoa community character since there are several mid-rise multi-family developments of two and three stories throughout Mānoa which have existed for decades. The urban-residential uses and character surrounding the Project Site would not curtail future beneficial uses of the environment within the context of an existing single-family residential area. A range of alternative uses for the site were considered and determined not to achieve the purpose and need for the project. The project location and site is perhaps the only large, viable, and fully serviced undeveloped site in the PUC.

3) **Conflict with the State's environmental policies or long-term environmental goals established by law;** The Proposed Action would not conflict with the State's environmental policies and objectives or long-term environmental goals, as discussed in Section 5, *Relationship to Land Use Policies, Plans and Controls*. BMPs and mitigation measures would be applied as necessary to avoid or minimize potential impacts associated with construction or operation activities at the Project Site.

4) **Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State;** The Proposed Action would provide affordable rental housing for elderly residents who qualify under the income restrictive affordable housing rules for subsidized rental housing. The Proposed Action is also consistent with the needs identified in the Hawai`i Housing Planning Study, 2019 which stated *"Of the 50,156 units needed for households between 2020 and 2025, 13 percent were for elderly households statewide (6,714 units; Table 34). This is up from 9 percent in 2016. Considering just the units needed for elderly households, about 29 percent (1,967 units) are needed for low and moderate-income households (80% average median income (AMI) or less)."* [page 45] The Proposed Action is intended to directly contribute toward this identified and increasing demand for elderly affordable housing in urban Honolulu and create a "live-work-relax" environment that fosters inclusivity and connectivity

with the Mānoa community. The Proposed Action will therefore create a long-term positive effect on the economic and social welfare of the Mānoa community, the City, and the State. The Project Site is located in close proximity to shopping and community services, and the Mānoa Regional Park. Combined with convenient public transportation makes the site an ideal location for an affordable elderly rental housing development. Construction would create short-term employment opportunities while full-time operational activities would also create several new employment opportunities for project management and maintenance personnel. Tax revenues would increase for both the State and County. The Proposed Action would not impact traditional and cultural practices. According to the archaeological literature review and field inspection report there are no known sacred sites or cultural objects, or resources known to occur on-site. BMPs and mitigation measures would be implemented to protect the existing conditions of Woodlawn Ditch and avoid impacts to Mānoa Stream and Ka Papa Lo‘i O Kānewai downstream. The project design aims to incorporate cultural and environmental motifs to honor the tradition, history, and spiritual significance of Mānoa Valley.

5) **Have a substantial adverse effect on public health;** The Proposed Action would not contribute any adverse effects to public health. The Project will incorporate natural and native landscaping, pedestrian walkways, and a community garden area. Multi-modal transportation use would be encouraged to reduce traffic impacts on the surrounding community and environment. Short-term impacts to noise and air quality will be implemented throughout the construction phasing over several years using BMPs in compliance with existing City and State policies and regulations.

6) **Involve adverse secondary impacts, such as population changes or effects on public facilities;** The total current population of Mānoa Valley to be about 25,000. The Proposed Action would increase the Mānoa Valley population by an estimated 300 to 450 persons (about 1.2% to 1.8%) based on a mix of both single person and two person occupancy. This relatively small population increase would not cause substantial adverse secondary impacts to the social environment or drain on public resources. The elderly, affordable rental housing facility would create a “live-work-relax” environment for its elderly residents. The use of public services and infrastructure would be consistent with existing functional plans of the current PUC Development Plan and the Proposed Revised PUC Development Plan. Public facilities such as water supply, sewerage, and electric power have been determined adequate by the governmental and private agencies responsible for providing these services. Additionally, because this site is the last large undeveloped site in Mānoa, and perhaps in the PUC, suitable for affordable multi-family housing, there would be little opportunity after its development to increase the population of Mānoa further.

7) **Involve a substantial degradation of environmental quality;** The Proposed Action would not degrade environmental quality at the Project Site or surrounding area. The project location and design would be consistent and compatible with existing land uses in Mānoa. The removal of invasive species with replacement landscaping of appropriate new plantings including native Hawaiian plants will be beneficial to the overall environment of Mānoa.

8) **Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions;** The Proposed Action, including its phased development, would not have a substantial adverse effect upon the environment and does not involve future commitments beyond the current project scope and phasing. This is the last site of this size suitable for housing development in mauka Mānoa. Development of the Proposed Action and its ancillary support structures will therefore substantially complete the buildout of Mānoa Valley as a residential area. The Proposed Action very likely represents an important opportunity to make a substantial contribution toward fulfilling the thoroughly documented need for affordable elderly rental housing in the PUC.

9) **Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat;** The Proposed Action would not cause a substantial impact to rare, threatened, or endangered species or habitats on the Project Site. The flora and fauna survey report has noted that no endangered tree or plant or animal species were found on the site. Suitable nesting habitat identified for species protected under the MBTA was limited to the State-listed white tern. Although suitable roosting and foraging habitat was identified for two (2) Federal and State-listed species, the Hawaiian Hoary Bat and Hawaiian Duck, neither species was observed on-site during the project survey. BMPs in monitoring and mitigation would be implemented during construction to avoid and protect potential impacts to these species and suitable habitats. The preservation of trees along with planting of new vegetation, including native Hawaiian species and shade trees, would also retain and provide new habitat for birds.

10) **Have a substantial adverse effect on air or water quality or ambient noise levels;** The Proposed Action would not create adverse effects on air, water or noise conditions at the Project Site or surrounding area. BMPs such as project phasing over four to six years, erosion control and dust mitigation would be implemented to avoid or minimize short-term impacts of construction activities, especially on neighboring properties. Long-term impacts to ambient noise levels would be consistent with the existing uses and activities in the surrounding area, namely single family residential uses. It is very unlikely that the residential units, occupied by elderly residents 62 years and older, would cause or emit anything that would have a substantial negative impact on air or water quality, ambient noise levels, or any other impact that would be substantially different than that originating from the surrounding single-family homes. Building emissions would be negligible

and potential impacts from construction and operation activities would be short-term and remain in compliance with all applicable City and State regulations. Preservation of perimeter vegetation would minimize sound from within the project and also minimize sound penetration into the project from adjacent local road traffic.

11) **Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;** The Proposed Action is not located in or near any recognized environmentally sensitive area and is not susceptible to substantial adverse effects or risk of damage from natural hazards at the Project Site. Although Woodlawn Ditch bifurcates the main development area, no development or operations would occur immediately adjacent to Woodlawn Ditch with the possible exception of a pedestrian walkway or safety barrier along the rim of the ditch. All project parcels are designated as being in FIRM Zone X and not considered to be within a Flood Zone. It should be noted that the closest point of the project site (Southwest corner) is 480 feet away from the closest point of Mānoa Stream and is also elevated 20 feet above Mānoa Stream. Built-in flood protections will be used to safeguard the built areas from potential flood damage. The Project Site is located several miles inland from the tsunami evacuation zone and will also not be subject to impacts from sea level rise. The apartment structures and ancillary buildings will be constructed to local building codes and required wind design criteria to minimize the potential impacts of natural hazards, such as earthquakes and hurricanes.

12) **Have a substantial adverse effect on scenic vistas and view planes, during day or night, identified in county or state plans or studies; or,** The Proposed Action would not have a substantial adverse effect or significant impact on scenic vistas and view planes, during day or night that have been identified in county or state plans or studies of surrounding scenic resources, such as Waʻahila Ridge and Mānoa Stream or the mauka-makai view planes identified in the City's PUC DP. The project location and design is consistent with existing urban residential uses in the surrounding area. The low-rise three story design of the proposed residential buildings, including the visual barrier formed by the existing vegetation supplemented with added landscaping, will minimize any impact on views from neighboring residences. The Proposed Action will also adhere to development guidelines of the City and State.

13) **Requires substantial energy consumption or emit substantial greenhouse gases.** The Proposed Action would incorporate energy saving technology by installing PV panels on all suitable roof surfaces to receive maximum available solar radiation. A partially solar powered hot water system will also be used to further reduce energy consumption. Additionally, buildings would be designed

with adequate cross ventilation to capture trade winds and thereby minimize the need for air conditioning.  The buildings will also be designed to be consistent with LEED Silver certification to minimize long-term energy consumption.

(This Page Intentionally Left Blank)

Tree Solutions & Environmental Consulting Services, Inc.
P.O. Box 10026
Honolulu, Hawaii 96816
808-734-5963

23 August 2021

Charles Wong
Lin Yee Chung Association

The following report was requested by Charles Wong of the Lin Yee Chung Association regarding a tree survey of the undeveloped property adjacent to the Lin Yee Chung Manoa Chinese Cemetery. Specifically, Tree Solutions Hawaii was retained to identify significant trees in the future site of Manoa Banyan Court, and comment on the species composition of non-significant trees on the property.

Ilana Nimz, arborist with Tree Solutions Hawaii met with Charles Wong, President of the Lin Yee Chung Association and the site designers from G70 regarding plans for Manoa Banyan Court. Maps were provided identifying locations of most of the trees currently on site, and the planned locations of buildings.

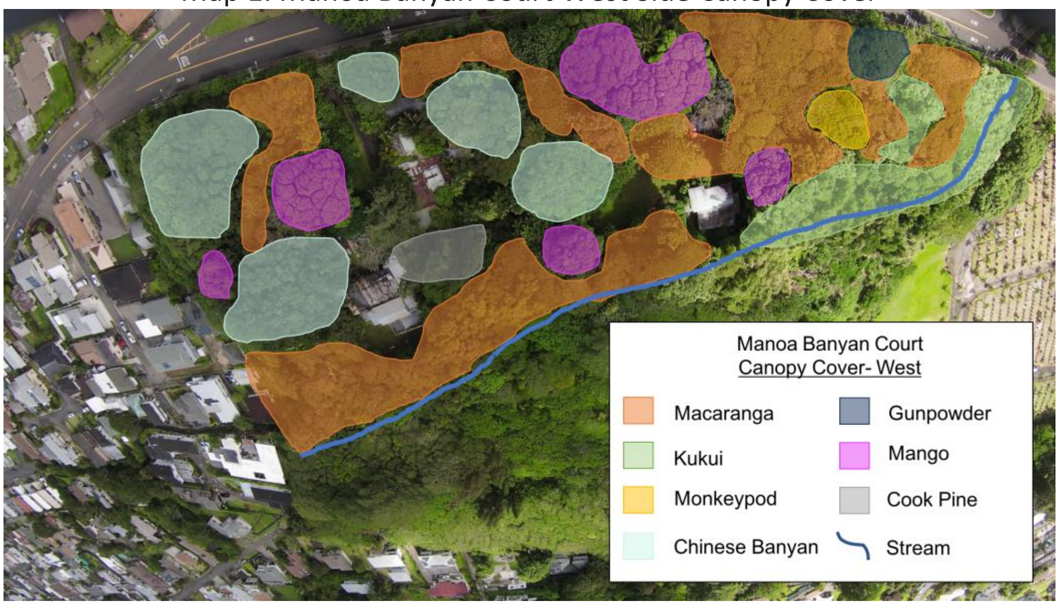
A site visit was conducted on August 13, 2021 by Ilana Nimz to identify significant trees to consider for preservation in the Manoa Banyan Court site plans. The survey was conducted by walking through the site and by using a drone to survey the tree canopy cover. Significant trees were marked in the field with yellow or orange flagging tape. The approximate location of significant trees is indicated on the provided map (at the end of the report), and corresponds to a spreadsheet which details the following:

- -Tree Number
- -Species
- -Attributes (Diameter, Height, Crown Spread)
- -Condition Rating
- -Mitigation (Crown Prune)
- -Tree Protection Zone (for both construction activity and minimum distance from buildings/infrastructure)
- -Comments

Drone imaging of the property:

The property is bisected by a stream, and comprised of unmaintained forest with several dwelling units amongst the trees on the west side. Using drone imagery, we approximated the canopy cover by species (map 1 and 2, below). The dominant species is *Macaranga tanarius*, a fast-growing invasive tree with weak branch structure (see orange). Other invasive species on site are Albizia (see purple) and Gunpowder trees (see dark blue). Kukui trees (see light green), a Polynesian introduced species, were observed predominantly along the stream, but individuals were also found scattered throughout the property. On the west side of the property, several large Chinese Banyan (*Ficus microcarpa*, see light blue) and mango trees (magenta) were distributed throughout the site. Pockets of specimen trees were identified within the groves of *Macaranga*, including Ironwood (see red), Cook Pines (see gray), and Monkeypods (see yellow).

Map 1: Manoa Banyan Court West Side Canopy Cover




Map 2: Manoa Banyan Court East Side Canopy Cover

Overall, the trees on the site have grown quite tall, averaging 60-ft high with some species up to 90-ft high. Since trees have not been maintained, most trees are covered in pothos vines, and have dead branches and overextended branches. To preserve these trees, major pruning will be required to include crown cleaning, crown reduction, vine removal and select restructure pruning. Trees have grown tall within a grove, which protects interior trees from extreme wind events. When the area is cleared and select trees are chosen, they will be exposed to more wind, which can lead to failures. This factor was considered during our assessment.

Tall trees overgrown with vines

Significant trees to consider for preservation were determined by the following criteria: species profile (i.e. desirability, invasive status), condition (health & structure), location, and potential for restructure pruning to improve condition. Species considered for preservation have higher-quality characteristics such as aesthetics, fruit, strong branch attachment, cultural value, and non-invasive qualities. The condition ratings on some trees are in the fair-poor categories, but mitigation in the form of pruning and insect treatment will increase their ratings. Location was considered in terms of the current site and impacts to neighbors, utilities and the stream bed. Trees that had a low potential of health and structural improvement with pruning and insect treatment were not considered “significant.”

Based on the criteria described above, 35 trees (or tree clusters) were identified for potential preservation. All trees will require mitigation actions to improve their condition and aesthetics, and to reduce their risk of failure. Details for each tree or tree cluster are provided on the attached spreadsheet.

**Kukui**

Kukui trees were found throughout the property, but primarily along the stream bank. Trees have grown tall and are about 60-ft high. Select trees (#1-4) were identified as significant based on their structure and aesthetic contribution to the site. While other kukui are present on site, these trees are mediocre specimens based on their tall size and poor structures, and may not be the most appropriate trees for the complex. Trees on the edge of the stream bank are recommended for removal because they are undermined and have a high potential to fail when water rushes through the stream bed during major weather events.

Several Kukui trees had interesting branch structure

Undermined streambank trees

**Monkeypod**

Two monkeypods were identified at the site, one on the west side (#5) and a pair of trees on the east side (#32). Monkeypod #5 has a tall and lanky structure with few lower branches and a high and compact canopy. It could be an interesting specimen tree if the site plans can accommodate its structure. Otherwise, this tree is a removal candidate. The two monkeypod trees (cluster #32) on the east side of the stream border the cemetery's open grass. One tree is leaning towards the cemetery, likely due to phototropism (i.e. more light availability). The second tree has good structure and would be an ideal candidate for preservation. Both trees could be preserved together, or the leaning tree could be removed while the upright tree could remain alone.

Monkeypod #32 in the orange box

**Mango**

Mango trees are found throughout the property on the west side of the stream. The mango trees (#6, 7, 9, 12, 19, 23, 26) are all tall (upwards of 90-ft) and are being smothered by pothos vines. Crown reduction, crown cleaning and vine removal are required for all trees. Not all mango trees were designated as significant, as several trees have poor structure that would not be fully corrected to create an aesthetically pleasing and healthy tree.

Mango # 19

Mango #26

**False Kamani**

False Kamani trees (#13, 14) along the road and sidewalk are beautiful specimens that require vine removal and crown pruning to improve their structures. These trees provide a visual barrier between the road and the property. The three false kamani trees (#29 cluster of 3 trees) in the triangle are incredible specimen trees with beautiful branching and buttress root structures. These trees should be preserved, with pruning to crown raise and reduce the branch end weight. The plans indicate a structure will be beneath the canopies. There is ample space, but root pruning may be required to accommodate the building.

False Kamani #13 and 14 visual barrier

Beautiful False Kamani cluster #29

**Ficus Trees**

One large Bodhi tree (#10) was designated for preservation due to cultural significance and the potential for the tree to be a nice specimen. The tree was previously topped so the canopy is comprised of excessive mature water sprouts. To improve the tree's structure and to reduce the potential for branch failure, the crown should be selectively thinned and reduced by 25%. The adjacent lychee tree (#11) is being suppressed by the Bodhi tree's canopy and half of the tree has died. To preserve the lychee tree, the Bodhi tree will need to be significantly directionally pruned to allow more sunlight to reach the lychee. The lychee will need to have the dead limbs removed, which will make it asymmetrical. The lychee also has several trunk wounds. Overall, the Bodhi tree is a better specimen than the lychee, so prioritizing improving and preserving the Bodhi tree is recommended.

Bodhi tree (left) suppressing half dead lychee tree (right)

Several large Chinese Banyan trees are on the property. Mr. Wong expressed interest in preserving the Chinese Banyans due to their cultural significance. All of the trees are infested with an insect called the stem gall wasp. The wasp burrows into the stems and damages the new growth, which negatively impacts the health and structure of the trees. A systemic insecticide has positive results of suppressing the insect population when on an annual treatment plan, but the chemical does not eradicate the insect from the tree or environment. Based on the level of infestation, as well as the health and structure of the trees, we provided recommendations to preserve trees that will both survive longer-term and will benefit from the wasp treatment. Trees #15, 24, 25 and 27 have moderate wasp infestations and are candidates for treatment. These trees will require vine removal and crown cleaning, pruning, and crown reduction. Tree #27 has several low limbs that should be removed to raise the canopy for building clearance. Trees #16 and 20 are severely impacted by the wasp and will likely not gain significant health or structural benefits from the insecticide treatment. Tree #16 is a large specimen that would be a high risk of branch failure due to health and structural issues if preserved, and is recommended for removal. Tree #20 is also in poor condition, but it can be preserved as an edge tree if the jungle aesthetic is incorporated into the design. Otherwise, #20 should be removed.

Chinese Banyan #16

Chinese Banyans #25 (front) and 24 (back)

Chinese Banyan #27

*Ficus triangularis*

Three small *F*icus trees were observed when walking around the dwelling units. These appear to have been planted by the resident. One tree, a *Ficus triangularis* (#18), is in the ground adjacent to the row of Cook pines (#17). This is a compact tree and fairly uncommon *Ficus* species that is a transplant candidate, and will make a great accent specimen tree. Two *Ficus benjamina* trees (#22, 2 trees) are containerized, but have outgrown the containers and have rooted. These are also transplant candidates and would be accent specimen trees. The *Ficus benjamina* have a similar growth form to the Chinese banyans, and can grow just as large as them as well, but are not impacted by the stem gall wasp. Or they can be maintained as a small compact size. A discussion should be had with the tenant about keeping these trees on the property. Additionally, planning ahead for the locations for these trees should be part of the design process. The trees can be transplanted to their permanent location to get established while still small.

**Pines**

Juniper/Pine sp. and Cook Pine #33 with coconuts

Adjacent to one of the dwelling units is a row of four unknown juniper or pine species (#21 group of 4 trees). These are not common trees in Hawaii, and are interesting specimens in good health. Minor crown pruning and cleaning to reshape and improve the aesthetics is required. If they can fit into the design plans, preserving them would provide uncommon and interesting mature specimen trees to the complex.

Several Cook Pines are present on both the east and west sides of the property. Four large cook pines (#26 set of trees) are in a row on the property's west side, and appear to be in good health. A couple of Cook pines (#31, 2 trees) are amongst the ironwoods (#30) on the east side of the property. An additional Cook Pine (#33) on the east side was near coconut trees (#34). The coconuts are transplant candidates, but the Cook pine is not. Before incorporating into the design plans, all Cook Pines should be structurally tested with a Resistograph drill test to ensure they are not decayed.

A small cluster of ironwood trees (#30) and saplings are on the east side of the property. The ironwoods are fair specimen trees that require some crown shaping and reduction. One or more of the trees would be nice accent specimens in the complex.

**Bamboo**

A large clump of green bamboo (#35) is along the stream bank. This bamboo looks appealing and could be incorporated into the design. Dead stalks should be removed, and select leaning and declining stalks should be thinned out.

**General Recommendations**

Overall, the property should be cleared of the low-quality invasive macaranga trees. As these trees have weak structure and are prone to branch breaking, they are not a worthwhile species to incorporate into the design of a new complex.

Monoculture grove of Macaranga

Trees directly along the streambed should be cleared to 10-ft from the bank edge due to undermining and high potential for whole tree failure during extreme weather or flash flood events. The design plan should consider stream stabilization measures to ensure safety of the residents and property when the stream bank fills.

The tree protection zone radius provided in the spreadsheet is to be followed during construction activities to protect the trunk and critical root zone of these significant trees. These are also guidelines for a minimum distance of buildings, parking or other infrastructure from the tree to help guide edits to the complex's design. The crowns of the trees often extend beyond the tree protection zone, meaning infrastructure can usually be implemented beneath the tree canopy. Depending on the design, directional crown pruning may be required to accommodate the infrastructure and the tree. Root pruning will likely be required for many trees within this complex to put in parking and buildings. We recommend that the root pruning be evaluated on a tree-by-tree basis once designs are nearly finalized.

Trees and shrubs along the edge of the property's west side creates a visual barrier of the property from the fairly busy roadway. The looking-glass trees have been side pruned to be maintained as a shrub, and have provided a thick and high-quality visual barrier. Additionally, hibiscus hedge has created a thick barrier as well. We recommend preserving these edge plantings, and implementing similar ones now in areas with visual gaps to start establishing a visual barrier. Aside from the looking glass, most of the other tree species along the Manoa Road road side are low-quality or invasive, like macaranga or gunpowder trees. Removal and replanting with a higher quality species would be recommended if the area is planned to be landscaped. Otherwise, the jungle aesthetic provides the appropriate visual barrier. Because the Lower Rd. side of the property does not have any high-quality plants that would create an appropriate visual barrier, this side will require landscaping to reach that desired aesthetic.

Looking Glass and Hibiscus Hedge

Barrier of gunpowder and macaranga

Please contact our office with any questions at 808-734-5963.

Respectfully,

Steve Nimz
ASCA Consulting Arborist
ISA Certified Arborist # WE- 0314AM
ISA Tree Risk Assessment Qualified

Ilana Nimz, MSc.
Arborist, Wildlife Biologist
ISA Certified Arborist # WE- 11029AT
ISA Tree Risk Assessment Qualified

Tree Solutions & Environmental
Consulting Services, Inc.
P.O. Box 10026
Honolulu, Hawaii 96816
808-734-5963

12 October 2021
Charles Wong
Lin Yee Chung Association

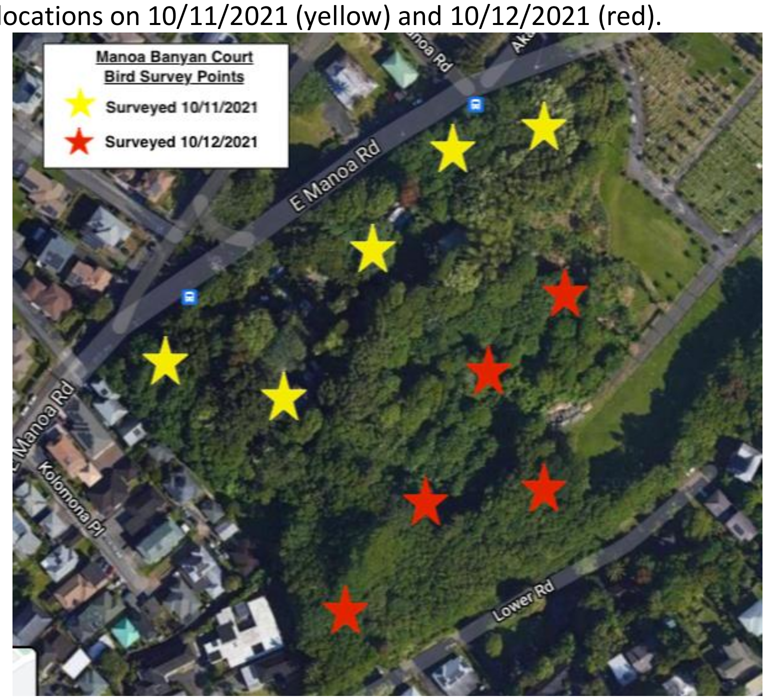
Re: Fauna assessment at Manoa Banyan Court

The following report was requested by Charles Wong of the Lin Yee Chung Association regarding a fauna assessment at Manoa Banyan Court. The fauna assessment will be integrated into the Environmental Assessment for the senior housing project.

Tree Solutions Hawaii wildlife biologist Ilana Nimz conducted the biological survey for avifauna and mammals on October 11 and 12, 2021. Fauna in the western side of the property was assessed on October 11, 2021 from 0630-0745. Weather was overcast, with 10-15 mph wind gusts and dry. The eastern side of the property was assessed on October 12, 2021 from 0630-0745. Weather was overcast and drizzling, with 10-15 mph wind gusts. The site was evaluated using avian point count stations distributed throughout the property (see map below). Ten-minute point counts were made at 10 stations between 0630 and 0745 hours on both days, with 5 counts occurring each day. Visual and auditory detections of birds were recorded. Visual detections were made using binoculars (Eagle Optics 10 x 50). Casual observations of mammal presence were recorded outside of the point count durations.

An avian species list was compiled, which includes common and scientific names of the individual species, the legal regulatory status, average number of individuals per station, and how many count stations were occupied. The last two metrics to provide a qualitative relative abundance. The mammal species list documents the incidental observations of mammals and mammal indicators during the survey.

Map of bird survey locations on 10/11/2021 (yellow) and 10/12/2021 (red).



**Avifauna**
Avian point count surveys identified 227 individual birds from 13 Species (Table 1). Of the birds observed, only the White tern (Manu O Ku) is native to Hawaii. White terns were observed flying above the property in pairs, as well as roosting and calling from kukui trees. No chicks or breeding white terns were noted during the survey, though the habitat is appropriate for breeding to occur.

All of the other avian species are alien to Hawaii, and several are considered to be “Injurious wildlife” by the State of Hawaii. The most abundant species was the Warbling White-eye (*Zosterops japonicus),* which was observed in the macaranga-dominated forest and in kukui, mango and ficus trees. Commonly observed in the parcel were zebra doves, rose-ringed parakeets and red-vented bulbuls. Zebra doves were on communication wires, calling from high in trees, and foraging on open ground (driveways, low grass). The Rose-ringed parakeets were observed roosting in mango trees and flying above the parcel. Bulbuls were the most common species in the macaranga-dominated forest. All abundant and common species observed in the site are considered to be Injurious Wildlife in the State of Hawaii due to threats they pose to agriculture and native wildlife. Uncommon and rare species were observed occasionally, either roosting or transiting in trees. Red jungle-fowl males and females foraging with chicks were only noted on the western side of the property.

**Mammals**
All mammalian observations of mammalian species at Manoa Banyan Court were made incidentally. These were based on visual and auditory detection, coupled with visual observation of scat, tracks, and other animal signs. An inventory was kept of all vertebrate species observed and heard during the survey. As Hawaiian hoary bats have been documented to occur in Manoa Valley (US Fish and Wildlife document: Recovery Plant for the Hawaiian Hoary Bat *Lasiurus cinereus semotus,* 1998), we did not conduct surveys to identify the presence of this species.

Four feral mammal species were observed in the Manoa Banyan Court site (Table 2). One black rat was observed on a ficus tree limb. A feral pig wallow and rooting signs were observed on the eastern side of the project site, but individual pigs were not observed. Likely, the pigs occasionally access the forested site. Three mongoose were observed on both the eastern and western sides of the property, with two observed in the vicinity of a driveway. Cat scat was observed on the western side of the property. I did not incidentally observe any Hawaiian Hoary Bats. All observed mammal species are invasive to Hawaii.

**Conclusions**
Faunal observed in the Manoa Banyan Court parcel were predominantly introduced, injurious wildlife. The only observed native species of concern is the white tern. A survey to identify if white terns are breeding in trees designated for removal is recommended prior to tree removal. Tree removal should be scheduled from September 16 to May 30, to avoid the summer pupping season of the Hawaiian Hoary Bat.

If you have any questions, please contact our office at 808-734-5963.

Ilana Nimz, MSc.
Wildlife Biologist, Avian specialist
ISA Certified Arborist and Tree Worker # WE-11029AT

**Table 1: Avian Species observed on October 11 and 12, 2021, Manoa Banyan Court**

| Scientific Name | Common Name | Status | Average birds per Point Count Station (n=10) | Number of Stations Occupied (n = 10) | Qualitative Relative Abundance |
|---|---|---|---|---|---|
| *Acridotheres tristis* | Common myna | X | 1.4 | 6 | Uncommon |
| *Cardinalis cardinalis* | Northern cardinal | X, M | 1.0 | 5 | Uncommon |
| *Carpodacus mexicanus* | House finch | X, M | 0.6 | 4 | Rare |
| *Copsychus malabaricus* | White-rumped shama | X, IW | 0.3 | 3 | Rare |
| *Gallus gallus* | Red jungle fowl | X | 1.2 | 4 | Uncommon |
| *Geopelia striata* | Zebra dove | X, IW | 3.7 | 9 | Common |
| *Gygis alba* | White tern | I, M | 0.5 | 3 | Rare |
| *Leiothrix lutea* | Red Billed Leiothrix | X | 1.5 | 7 | Uncommon |
| *Paroaria coronata* | Red-crested cardinal | X, M | 1.8 | 7 | Uncommon |
| *Psittacula krameri* | Rose-ringed Parakeet | X | 2.0 | 7 | Common |
| *Pycnonotus cafer* | Red-vented bulbul | X, IW | 3.2 | 9 | Common |
| *Streptopelia chinensis* | Spotted Dove | X, IW | 1.1 | 4 | Uncommon |
| *Zosterops japonicus* | Warbling White-eye | X, IW | 4.4 | 10 | Abundant |

Abundance based on the average number of individuals observed per count station, averaged across all point count stations, as follows:

Abundant – average $\geq$ 4 individuals observed per station

Common –3.9 – 2.0 individuals observed per station

Uncommon – average 1.9 – 1.0 individuals observed per station

Rare – average < 1.0 individual observed per station

ES = state or federally listed as endangered

I = indigenous (native to the Hawaiian Islands and elsewhere)

IW = State (HAR 12-124, Exhibit 5) or Federal (18 U.S.C. 42) injurious wildlife species

X = introduced or alien (non-native species)

M= Listed as a Migratory Bird Treaty Act Protected Species (10.13 List)

**Table 2: Mammal species observed on October 11 and 12, 2021, Manoa Banyan Court**

| Scientific Name | Common Name | Status | Qualitative Relative Abundance |
|---|---|---|---|
| *Felis catus* | Feral cat | X | Rare |
| *Herpestes javanicus* | Small Indian mongoose | X, IW | Common |
| *Rattus rattus* | Black rat | X | Common |
| *Sus scrofa* | Feral pig | X | Rare |

# TRAFFIC IMPACT ANALYSIS REPORT
# MANOA BANYAN COURT

MANOA, OAHU, HAWAII

## DRAFT FINAL

July 8, 2022

Prepared for:

Lin Yee Chung Association
3430 East Manoa Road
Honolulu, Hawaii 96822

*Austin, Tsutsumi & Associates, Inc.*
Civil Engineers • Surveyors
501 Sumner Street, Suite 521
Honolulu, Hawaii 96817-5031
Telephone: (808) 533-3646
Facsimile: (808) 526-1267
E-mail: atahnl@atahawaii.com
Honolulu • Wailuku, Hawaii

# TRAFFIC IMPACT ANALYSIS REPORT
# MANOA BANYAN COURT
Manoa, Oahu, Hawaii

## DRAFT FINAL

Prepared for

**Lin Yee Chung Association**
**3430 East Manoa Road**
**Honolulu, Hawaii 96822**


Prepared by
**Austin, Tsutsumi & Associates, Inc.**
Civil Engineers • Surveyors
Honolulu • Wailuku, Hawaii


July 8, 2022

## TABLE OF CONTENTS

**Page**

**TABLE OF CONTENTS**
**Cont'd**

**TABLE OF CONTENTS**
**Cont'd**

**TABLES**



**FIGURES**

**TABLE OF CONTENTS**
**Cont'd**

## APPENDICES

AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS
CONTINUING THE ENGINEERING PRACTICE FOUNDED BY H. A. R. AUSTIN IN 1934

TERRANCE S. ARASHIRO, P.E.
ADRIENNE W.L.H. WONG, P.E., LEED AP
DEANNA M.R. HAYASHI, P.E.
PAUL K. ARITA, P.E.
ERIK S. KANESHIRO, L.P.L.S., LEED AP
MATT K. NAKAMOTO, P.E.
GARRETT K. TOKUOKA, P.E.

# TRAFFIC IMPACT ANALYSIS REPORT

## Manoa Banyan Court

## Manoa, Oahu, Hawaii

## 1. INTRODUCTION

This report documents the findings of a traffic study conducted by Austin, Tsutsumi, and Associates, Inc. (ATA) to evaluate the traffic impacts resulting from the proposed Manoa Banyan Court Project (hereinafter referred to as the "Project") located in Manoa, Oahu, Hawaii.

### 1.1 Project Location

The proposed Project includes a residential component, which will be bound by East Manoa Road to the north, the existing Manoa Chinese Cemetery to the east, and Lower Road to the south. The Project also proposes a community center to be located upon the triangular parcel to the north of the residential component bound by Old East Manoa Road to the north and east, and East Manoa Road to the south.

See Figure 1.1 for the Project location.

### 1.2 Project Description

The Project is ultimately envisioned to be a senior affordable rental housing project and community center. The site plan consists of four (4) residential courtyard buildings with a total of 288 residential units and complementary land uses such as garden areas upon a currently undeveloped portion of the existing Manoa Chinese Cemetery property situated between East Manoa Road and Lower Road. About 1.5 acres of the property is planned to be dedicated to the City & County of Honolulu for use by both residents and community members as a community garden area.

The Project also includes an approximately 4,000 square-foot (SF) community center which will be served by a 20-stall parking lot with one (1) entry-only driveway and one (1) exit-only driveway from Old East Manoa Road.

It is anticipated that the residential component of the Project will be built out in four (4) phases, with the community center being built after the third and fourth phases of the residential units and ancillary common facilities are completed and occupied. Full buildout of the Project is anticipated by Year 2029. The site plan can be found in Figure 1.2.

MANOA BANYAN COURT

Austin Tsutsumi & Associates, Inc.
Engineers & Surveyors

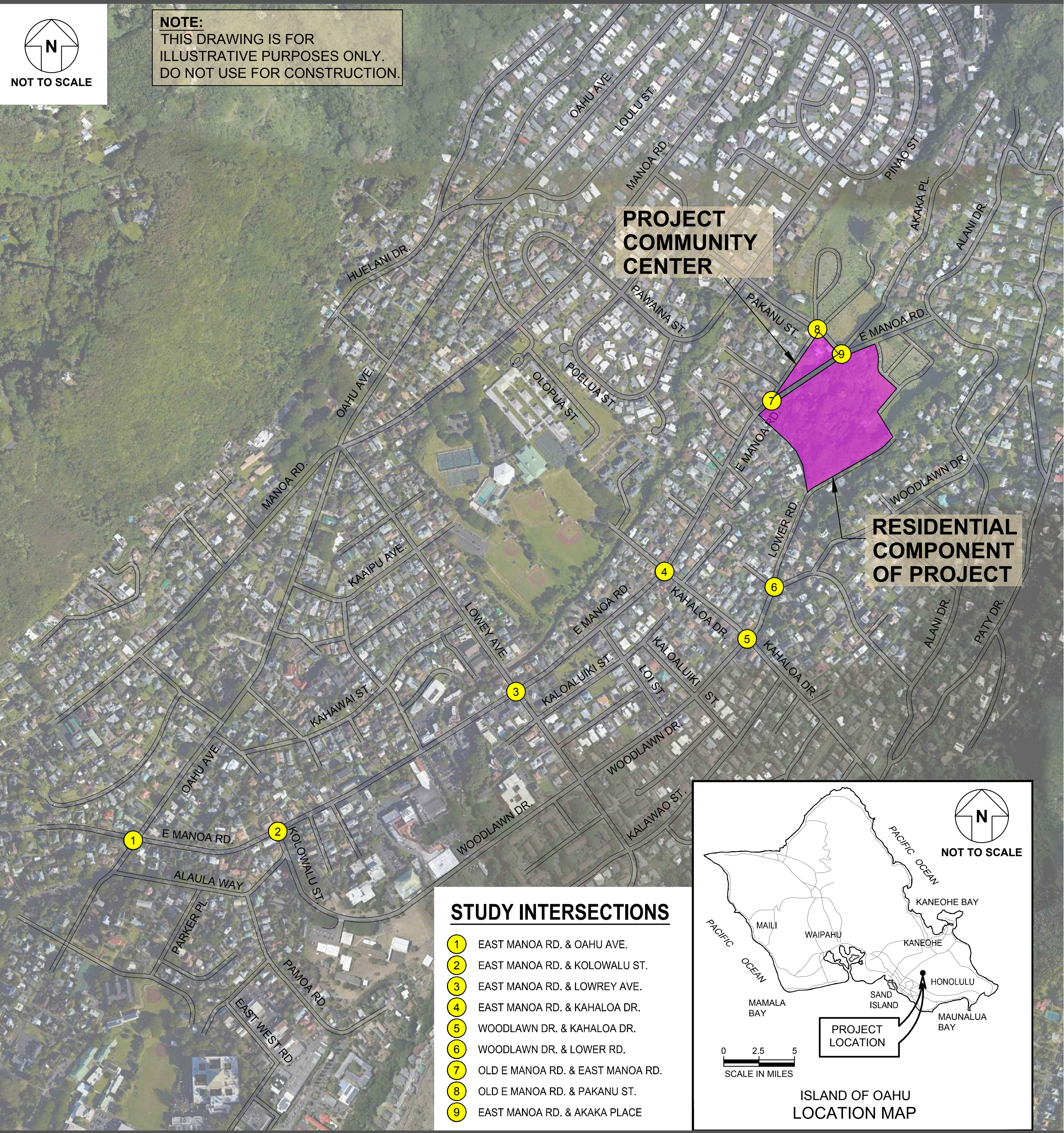



FIGURE 1.1

LOCATION MAP

Austin Tsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

**NOTE:**
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.


## program

1 **(4) Residential Courtyard Buildings**
55,296 sf total
- 72 dwelling units each
- 288 dwelling units total
- single-loaded 3-story courtyard design

2 **(2) Residents' Commons**
2,000 sf
- function room/classroom, restroom
- mgt office
- maintenance room
- mail area

3 **Parking**
185 spaces
~60 spaces (Ewa)
~60 spaces (DH)
~45 spaces (Ewa Mauka)
~20 spaces (Comm. Center)

A **Central Garden**
A large outdoor gathering for all residents and guests.

B **Chinese Pagoda**
A cultural icon for the community.

C **Festival Block**
This stretch of East Manoa could be closed for festivals like Ching Ming and Chinese New Year. Vehicular traffic could be temporarily re-routed around the community center.

NEW GREEN SPACE
NEW TREES
EXISTING DITCH

FIGURE 1.2

SITE PLAN

# 2. METHODOLOGY

## 2.1 Study Methodology

This study will address the following:

- Assess existing traffic operating conditions at key intersections during the weekday morning (AM) and afternoon (PM) peak hours of traffic within the study area.
- Traffic projections for Year 2029 without the Project including traffic generated by other known developments in the vicinity of the Project in addition to an ambient growth rate. These other known developments are projects that are currently under construction or known new/future developments that are anticipated to affect traffic demand and operations within the study area.
- Trip generation and traffic assignment characteristics during and after construction for the proposed Project.
- Traffic projections for Year 2029 during Project construction, which includes Year 2029 without Project traffic volumes in addition to traffic volumes generated during construction.
- Traffic projections for Year 2029 with the Project, which includes Year 2029 without Project traffic volumes in addition to traffic volumes generated by the Project.
- Recommendations as needed to mitigate any impacts resulting from Year 2029 conditions during construction or at Project completion.

## 2.2 Intersection Analysis

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6th Edition, includes methods for calculating volume to capacity ratios, delays, and corresponding Levels of Service that were utilized in this study. LOS definitions for signalized and unsignalized intersections are provided in Appendix A.

Analyses for the study intersections were performed using the traffic analysis software Synchro, which is able to prepare reports based on the methodologies described in the HCM. These reports contain control delay results as based on intersection lane geometry, signal timing, and hourly traffic volumes. Based on the vehicular delay at each intersection, a LOS is assigned to each approach and intersection movement as a qualitative measure of performance. These results, as confirmed or refined by field observations, constitute the technical analysis that will form the basis of the recommendations outlined in this report.

## 2.3 Study Area Intersection Analysis

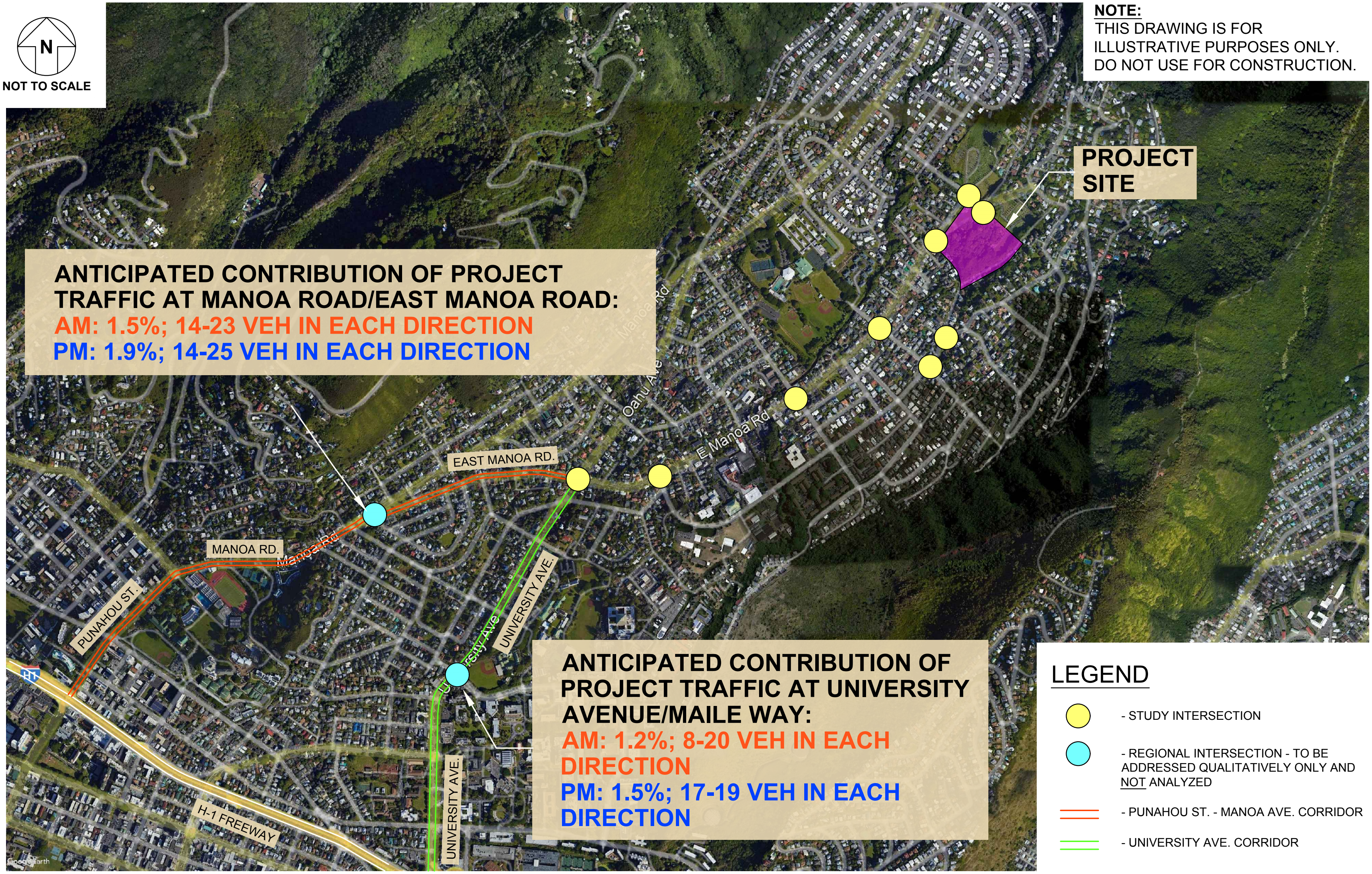
The study intersection scope was developed based upon proximity to the Project, the anticipated impact of Project traffic to the study intersections, and ongoing conversation with reviewing agencies. Based on calculations which are detailed in Section 5, Project traffic is anticipated to minimally make up less than 2.0% of traffic volumes at major regional intersections along the East Manoa Road and University Avenue corridor, and these intersections are qualitatively addressed in the report based upon field observations but not explicitly studied and included in the study intersection scope. The percentages conservatively assumed that all trips to/from the Project site will travel through the respective intersections and would not be lost to destinations along the way, though generally, trips would naturally be lost further from the project. To provide general context for the study intersection scoping, Figure 2.1 shows the percentage of project traffic at select regional intersections to show the minimal impact that Project traffic is anticipated to have on these regional intersections. Further details on methodology, trip generation, trip distribution, and analysis of the impacts of Project traffic on the study intersections can be found in Section 5.

The following intersections listed below were selected for analysis:

- East Manoa Road/Oahu Avenue (signalized)
- East Manoa Road/Kolowalu Street (signalized)
- East Manoa Road/Lowrey Avenue (signalized)
- East Manoa Road/Kanaloa Drive (signalized)
- Woodlawn Drive/Kanaloa Drive (unsignalized)
- Woodlawn Drive/Lower Road (unsignalized)
- Old East Manoa Road/East Manoa Road (unsignalized)
- Old East Manoa Road/Pakanu Street (unsignalized)
- East Manoa Road/Akaka Place (unsignalized)

# MANOA BANYAN COURT

Austin Tsutsumi & ASSOCIATES, INC.
Engineers & Surveyors




# FIGURE 2.1

ANTICIPATED PROJECT TRAFFIC CONTRIBUTION TO REGIONAL INTERSECTIONS

# 3. EXISTING TRAFFIC CONDITIONS

The existing conditions scenario represents the traffic conditions within the Project area as it currently stands, with no build-out of the Project.

## 3.1 Roadway System

The following are brief descriptions of the studied roadways within the vicinity of the Project:

Akaka Place is generally a north-south roadway which extends approximately 0.4 miles north from its intersection with Old Manoa Road and east Manoa Road and ends in a cul-de-sac. Akaka Place provides access to a number of homes along its stretch. The posted speed limit along Akaka Place is 25 miles per hour (mph).

East Manoa Road is generally an east-west roadway which begins to the west at its intersection with Manoa Road and extends eastward until it terminates at a T-intersection with Alani Drive. East Manoa Road is one of the main thoroughfares through the neighborhood and serves residential and commercial uses along its stretch. In the vicinity of the Project, the posted speed limit is 25 mph.

Kahaloa Drive is generally a north-south roadway which begins to the north at the Manoa Valley District Park and extends southward until it ends in a cul-de-sac near its intersection with Kahaloa Place. The posted speed limit along Kahaloa Drive is 25 mph.

Kolowalu Street begins to the north at its T-intersection with East Manoa Road and extends southward and curves eastward until its termination at the exit-only driveway at Momilani Elementary School, where the roadway continues eastward as Woodlawn Drive. The posted speed limit along Kolowalu Street is 25 mph.

Lower Road begins at its intersection with Woodlawn Drive and runs northeast and then east for a total of approximately 0.25 miles until it terminates in a cul-de-sac. Lower Road provides access to a number of homes along its stretch. The majority of the roadway is only wide enough for one car to fit comfortably, and therefore generally operates as a two-way, one-lane roadway. The posted speed limit along Lower Road is 15 mph.

Lowrey Avenue is generally a north-south roadway which begins to the north at the 5-way intersection with Manoa Road, Oahu Avenue and extends southward until its intersection with Kalawao Street, and continues as Kalawao Place further south. The posted speed limit along Lowrey Avenue is 25 mph.

Oahu Avenue is generally a north-south roadway which begins to the south at its intersection with University Avenue and East Manoa Road and extends in the northeast direction until it terminates at its intersection with Manoa Road and Pawaina Street. The posted speed limit along Oahu Avenue is 25 mph.

Old East Manoa Road begins to the southwest at its intersection with East Manoa Road and extends to the northeast, where it ends in a cul-de-sac within the Manoa Chinese Cemetery.

Pakanu Street begins to the south at its intersection with Old East Manoa Road near the entrance of the Manoa Chinese Cemetery and extends to the northwest, then turns to the northeast, and then to the southeast where it terminates at a T-intersection with Pawaina Street.

The posted speed limit along Pakanu Street near the Manoa Chinese Cemetery entrance is 25 mph.

Woodlawn Drive begins to the west at the exit driveway at Noelani Elementary School, where it transitions from Kolowalu Street into Woodlawn Drive. Woodlawn Drive generally runs parallel to East Manoa Road and serves as a secondary arterial serving homes in the area. The posted speed limit along Woodlawn Drive is 25 mph.

## 3.2 Multimodal Facilities

### 3.2.1 Bicycle and Pedestrian Facilities

In the vicinity of the Project, sidewalks are continuous along East Manoa Road, but are nonexistent along many neighborhood streets, including Woodlawn Drive near Lower Road, and as a result, pedestrians were observed to walk on the roadway.

Sharrows (shared lane markings) are present along East Manoa Road for cyclists in the vicinity of the Project.

### 3.2.2 Transit Facilities

The City & County of Honolulu provides TheBus transit system which provides service throughout the island of Oahu. Effective July 1, 2022, a one-way fare will cost $3.00 with a daily cap of $7.50, and a monthly pass will cost $80.00. An annual pass will cost $880.00.

In the vicinity of the Project, there are 16 existing bus stops within a ¼-mile radius (5-minute walk), all serving Route 6, which provides service throughout Manoa, along University, and portions of Beretania Street and Keeaumoku Street, and the Ala Moana Center for transfer to other regional routes.

## 3.3 Existing Traffic Volumes

Turning movement counts for the weekday AM and PM peak hours were collected on Wednesday, April 27, 2022, while State of Hawaii Department of Education and the University of Hawaii at Manoa were in session. Based on historical traffic data, the volumes collected in April 2022 appear to be slightly lower than in previous years, possibly due to lingering effects of COVID-19 and ongoing reduced travel and social distancing recommendations. As a result, traffic counts at intersections across the study network were increased based upon historical data and projected growth to constitute “Existing 2022” conditions.

Based on the traffic count data, the weekday AM peak hour of traffic was determined to begin generally between 7:15 AM and 8:15 AM and the PM peak hour of traffic was determined to begin between 4:00 PM to 5:00 PM, respectively.

## 3.4 Existing Observations and Intersection Analysis

### 3.4.1 Regional Observations

In general, access to the Manoa neighborhood is provided only by the University Avenue and Manoa Road corridors – the two main arteries which provide connection to the H-1 Freeway, Beretania Street, and King Street for regional travel. While University Avenue provides six (6) lanes of travel near UH Manoa with three (3) lanes in each direction, University Avenue narrows to a two (2) lane roadway north of Maile Way, with one (1) lane in each direction. On the Manoa Road corridor, four (4) lanes accommodate all inbound and outbound Manoa traffic along the corridor until the intersection of Manoa Road and East Manoa Road, where the roadway split ultimately results in the East Manoa Road corridor becoming two (2) lanes, with one (1) lane in each direction. The limited north-south access routes results in intermittent congestion along the Manoa Road and University Avenue corridors during the busiest commuter times.

In general, the Manoa neighborhood is fully built out and has tightly constrained roadways, with homes or shops on both sides of the roadway. As a result, the potential for physical widening improvements is limited. However, as discussed in Section 5, the Project impacts to regional commuter traffic are minimal.

Manoa Road Corridor

As previously mentioned, the Manoa Road Corridor is one of the two major routes providing regional access to and from the Manoa neighborhood. Residents of the area travelling regionally are able to use the Punahou Street on- and off-ramps to access the H-1 Freeway or continue further south along Punahou Street to Beretania Street and King Street. Nehoa Street is another commonly used route at times of congestion on the H-1 Freeway.

During the AM peak hour, commuter traffic bound for the H-1 Freeway, Beretania Street, and King Street and trips related to multiple major traffic generators within a few blocks – two Maryknoll School campuses, Punahou Schools, and Kapiolani Hospital – results in congestion along Punahou Street. This congestion is generally contained to the area of Punahou Schools campus and to the south, but there appears to be some congestion related to the Punahou Street/Nehoa Street intersection as drivers maneuver to get into the appropriate lanes. To the north, the Manoa Road/East Manoa Road intersection appears to generally operate acceptably as southbound through volumes along Manoa Road are able to proceed through the intersection unimpeded, and the westbound East Manoa Road traffic yields only to the eastbound left-turn volumes.

Similarly in the PM peak hour, the area can get congested due to residents returning home and afternoon school pickups. Again, congestion is generally contained to the area of Punahou Schools campus and to the south, further from the Project. To the north, the Manoa Road/East Manoa Road intersection generally appears to operate acceptably, as the westbound approach yields to the higher-volume northbound approach which is able to proceed unimpeded through the intersection.

As shown in Figure 2.1, Project traffic is anticipated to account for less than 2.0% of traffic across both peak hours along this corridor.

University Avenue Corridor

To the south of Maile Way, University Avenue provides two (2) to three (3) lanes in each direction, with curbside metered parking offered during the daytime hours. During the AM and PM peak hours, there is generally minimal congestion along University Avenue between Maile Way and Dole Street.

To the north of the signal at Maile Way, University Avenue necks down to two (2) lanes, one (1) in each direction. During the AM peak hour, there is congestion in both directions along University Avenue that appears to be due primarily to pedestrian volumes and student drop-offs to the Mid-Pacific Institute near the intersection of University Avenue and Kaala Street. Due to the single-lane approaches, turning traffic sometimes blocks all progression through the intersection resulting in queueing. In the northbound direction, queues sometimes spilled back from Kaala Street to Maile Way, and in the southbound direction, queues could extend from Kaala Street approximately 0.3 miles to Alaula Way. Sometimes, southbound queues from the University Avenue/Maile Way intersection extended to Kaala Street, resulting in queueing that extends 0.45 miles between Maile Way to Alaula Way. This queue appears to be generally caused by slow progression in the single southbound lane up the hill to the University Avenue/Maile Way intersection, rather than spillback as a result of traffic signal timing or blocking.

As shown in Figure 2.1, Project traffic is anticipated to account for approximately 1.5% or less of traffic across both peak hours along this corridor.

### 3.4.2 Study Intersection Analysis and Observations

At all study intersections to the east of the East Manoa Road/Kolowalu Street intersection, operations were generally smooth across both peak hours and all movements operate at LOS B or better across both peak hours. Traffic volumes were generally low across these intersections and queueing was minimal to nonexistent throughout both peak hours. Sporadic slow-downs occurred along East Manoa Road near Manoa Marketplace as drivers yielded to pedestrians crossing at the Huapala Street crosswalk; though these slow-downs were temporary and cleared quickly upon the completion of the pedestrian crossing.

At the East Manoa Road/Kolowalu Street intersection, progression along East Manoa Road is generally smooth across both peak hours. On the westbound approach, westbound left-turn vehicles occasionally block westbound through vehicles; though most times, through vehicles are able to bypass the left-turn vehicles as the left-turn vehicle pulls into the intersection. As a result, no persistent queueing was observed during either peak hour; even through the AM peak hour with the nearby Noelani Elementary School. Synchro analysis shows that all movements at this intersection operate at LOS D or better across both peak hours during the AM and PM peak hours with the exception of the northbound approach, which operates at LOS E during the PM peak hour. Overall, the intersection is anticipated to operate at LOS C(C) during the AM(PM) peak hours.

At the Oahu Avenue/East Manoa Road intersection during the AM peak hour, queues on all approaches are generally able to clear with each cycle. However, due to relatively long cycle lengths, the eastbound and southbound approaches, and the westbound shared through/right-turn approach operate at LOS E. During the PM peak hour, queues on the single-lane eastbound approach was observed to extend over 0.25 miles along East Manoa Road, and took several cycles to clear. Queue time from the back of the eastbound queue can be 3-5 minutes during the PM peak hour. Analysis shows that all movements operate at LOS D or better during the PM peak hour, with the exception of the eastbound approach, which operates at LOS F and overcapacity conditions. Due to the large trees and homes on all four corners of this intersection, physical widening improvements are likely not feasible. Signal timing improvements would help balance the delay across the approaches of the intersection and reduce the disproportionate eastbound delay.

MANOA BANYAN COURT

Austin Tsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

DATE OF COUNTS:
WEDNESDAY, APRIL 27, 2022

AM PEAK HOUR:
7:15 AM - 8:15 AM

PM PEAK HOUR:
4:00 PM - 5:00 PM

**NOTE:**
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

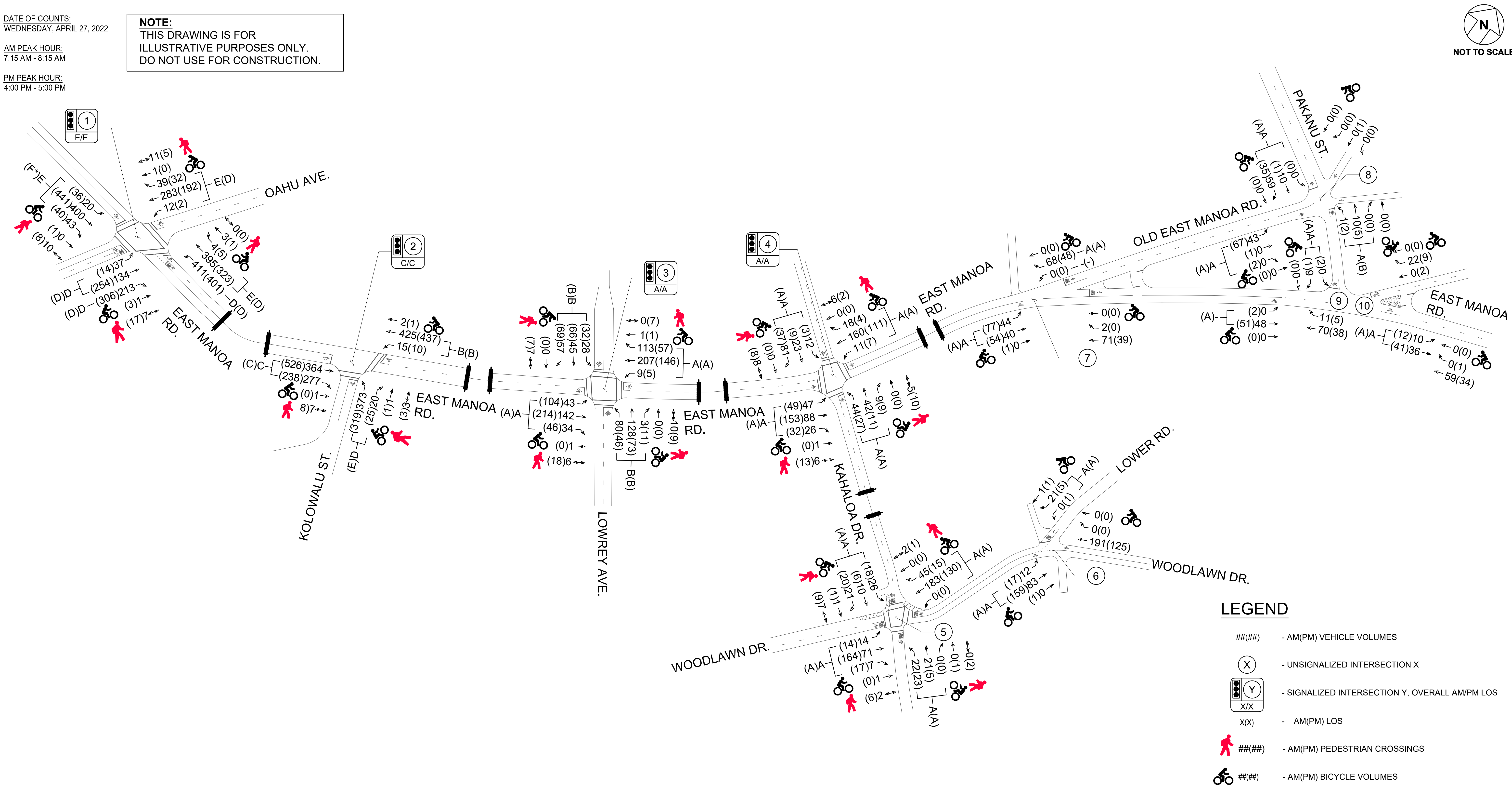



FIGURE 3.1

EXISTING CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES, AND LOS

Table 3.1 : Existing Conditions Level of Service Summary

| Intersection | Existing Conditions | | | | | |
|---|---|---|---|---|---|---|
| | AM | | | PM | | |
| | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS |
| **1: Oahu Ave & E Manoa Rd** | | | | | | |
| NB LT/TH | 47.9 | 0.66 | D | 54.9 | 0.80 | D |
| NB RT | 36.7 | 0.07 | D | 39.8 | 0.21 | D |
| EB LT/TH/RT | 68.2 | 0.94 | E | 134.4 | 1.16 | F* |
| WB LT | 53.2 | 0.81 | D | 54.1 | 0.84 | D |
| WB TH/RT | 58.7 | 0.86 | E | 48.2 | 0.77 | D |
| SB LT/TH/RT | 62.8 | 0.87 | E | 44.8 | 0.57 | D |
| *Overall* | 59.3 | - | E | 74.7 | - | E |
| **2: Kolowalu St & E Manoa Rd** | | | | | | |
| NB LT/RT | 43.2 | 0.92 | D | 64.8 | 0.93 | E |
| EB TH/RT | 23.6 | 0.89 | C | 27.2 | 0.91 | C |
| WB LT/TH | 12.5 | 0.63 | B | 13.8 | 0.55 | B |
| *Overall* | 26.0 | - | C | 32.2 | - | C |
| **3: Lowrey Ave & E Manoa Rd** | | | | | | |
| NB LT/TH/RT | 14.2 | 0.51 | B | 12.9 | 0.30 | B |
| EB LT/TH/RT | 6.0 | 0.26 | A | 6.9 | 0.45 | A |
| WB LT/TH/RT | 6.6 | 0.35 | A | 5.8 | 0.21 | A |
| SB LT/TH/RT | 12.7 | 0.26 | B | 13.3 | 0.38 | B |
| *Overall* | 9.4 | - | A | 8.9 | - | A |
| **4: Kahaloa Dr & E Manoa Rd** | | | | | | |
| NB LT/TH/RT | 5.2 | 0.15 | A | 5.7 | 0.07 | A |
| EB LT/TH/RT | 4.1 | 0.21 | A | 3.8 | 0.28 | A |
| WB LT/TH/RT | 4.3 | 0.27 | A | 3.5 | 0.15 | A |
| SB LT/TH/RT | 5.0 | 0.09 | A | 5.6 | 0.03 | A |
| *Overall* | 4.5 | - | A | 3.9 | - | A |
| **5: Woodlawn Drive & Kahaloa Dr** | | | | | | |
| NB LT/TH/RT | 8.2 | 0.06 | A | 8.2 | 0.04 | A |
| EB LT/TH/RT | 8.1 | 0.12 | A | 8.7 | 0.25 | A |
| WB LT/TH/RT | 8.9 | 0.29 | A | 8.3 | 0.19 | A |
| SB LT/TH/RT | 8.1 | 0.08 | A | 7.9 | 0.06 | A |
| *Overall* | 8.5 | - | A | 8.4 | - | A |
| **6: Woodlawn Drive & Lower Rd** | | | | | | |
| EB LT | 7.7 | 0.01 | A | 7.6 | 0.01 | A |
| SB LT/RT | 9.5 | 0.03 | A | 9.3 | 0.01 | A |
| *Overall* | 1.0 | - | - | 0.6 | - | - |
| **7: E Manoa Rd & Old E Manoa Rd** | | | | | | |
| EB LT | 7.4 | 0.03 | A | 7.4 | 0.05 | A |
| SB LT | - | - | - | - | - | - |
| SB RT | 9.0 | 0.08 | A | 8.7 | 0.05 | A |
| *Overall* | 4.2 | - | - | 4.6 | - | - |
| **8: Old E Manoa Rd & Pakanu St** | | | | | | |
| NB LT/TH/RT | 9.8 | 0.02 | A | 10.1 | 0.01 | B |
| EB LT | 7.3 | 0.03 | A | 7.3 | 0.05 | A |
| SB LT/TH/RT | 8.8 | 0.07 | A | 8.5 | 0.04 | A |
| *Overall* | 8.3 | - | - | 7.6 | - | - |
| **9: E Manoa Rd & Old E Manoa Rd** | | | | | | |
| EB LT | - | - | - | 7.3 | 0.00 | A |
| SB LT/RT | 8.7 | 0.01 | A | 8.9 | 0.00 | A |
| *Overall* | 0.6 | - | - | 0.4 | - | - |
| **10: E Manoa Rd & Akaka Pl** | | | | | | |
| EB LT | 7.4 | 0.01 | A | 7.3 | 0.01 | A |
| SB LT/RT | 8.7 | 0.02 | A | 8.7 | 0.01 | A |
| *Overall* | 2.1 | - | - | 1.9 | - | - |

* Denotes overcapacity condition, v/c ≥ 1.

# 4. BASE YEAR TRAFFIC CONDITIONS

The Year 2029 was selected to reflect the Project completion year. The Base Year 2029 scenario represents the traffic conditions within the study area without the Project. Traffic projections were formulated by applying a defacto growth rate to the "Existing Conditions" traffic volumes as well as trips generated by known future developments in the vicinity of the Project.

## 4.1 Defacto Growth Rate

Projections for Year 2029 traffic were based upon the Oahu Metropolitan Organization (OMPO) Long Range Plan. Typical forecasting models take into account both existing and future land uses and distribute the associated vehicular trips across predetermined Traffic Analysis Zones (TAZ) based upon various factors specific to the region. Based on the model, projected growth was very limited in the study area, and annual growth rate of 0.80% per year was applied along East Manoa Road and Woodlawn Drive, and an annual growth rate of 0.20% was applied along Oahu Avenue.

## 4.2 Background Projects

By Year 2029 without the Project, no other background projects are planned to be constructed in the area.

## 4.3 Planned Roadway Improvements

By Year 2029 without the Project, no major roadway improvements are planned to be constructed in the area.

## 4.4 Base Year Analysis

With Base Year conditions, it is anticipated that movements across the network may experience slight increases volumes and delay as a result of defacto growth; however these increases are relatively minimal and as a result, operations will remain generally similar to Existing Conditions at most intersections.

At the Oahu Avenue/East Manoa Road intersection, with signal timing adjustments to balance capacity, movements on the northbound, southbound, and westbound approaches are anticipated to operate at LOS E/F but will continue to operate under capacity, while the delay on the eastbound approach is reduced but is still anticipated to operate with overcapacity conditions. As previously described, due to large trees and homes on all four corners of the intersection, physical widening improvements are likely not feasible.

See Figure 4.1 for base year lane configuration, traffic volumes, and LOS for the study intersections. See Table 4.1 for a LOS comparison between Existing Conditions and Base Year conditions.

NOTE:
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

NOT TO SCALE

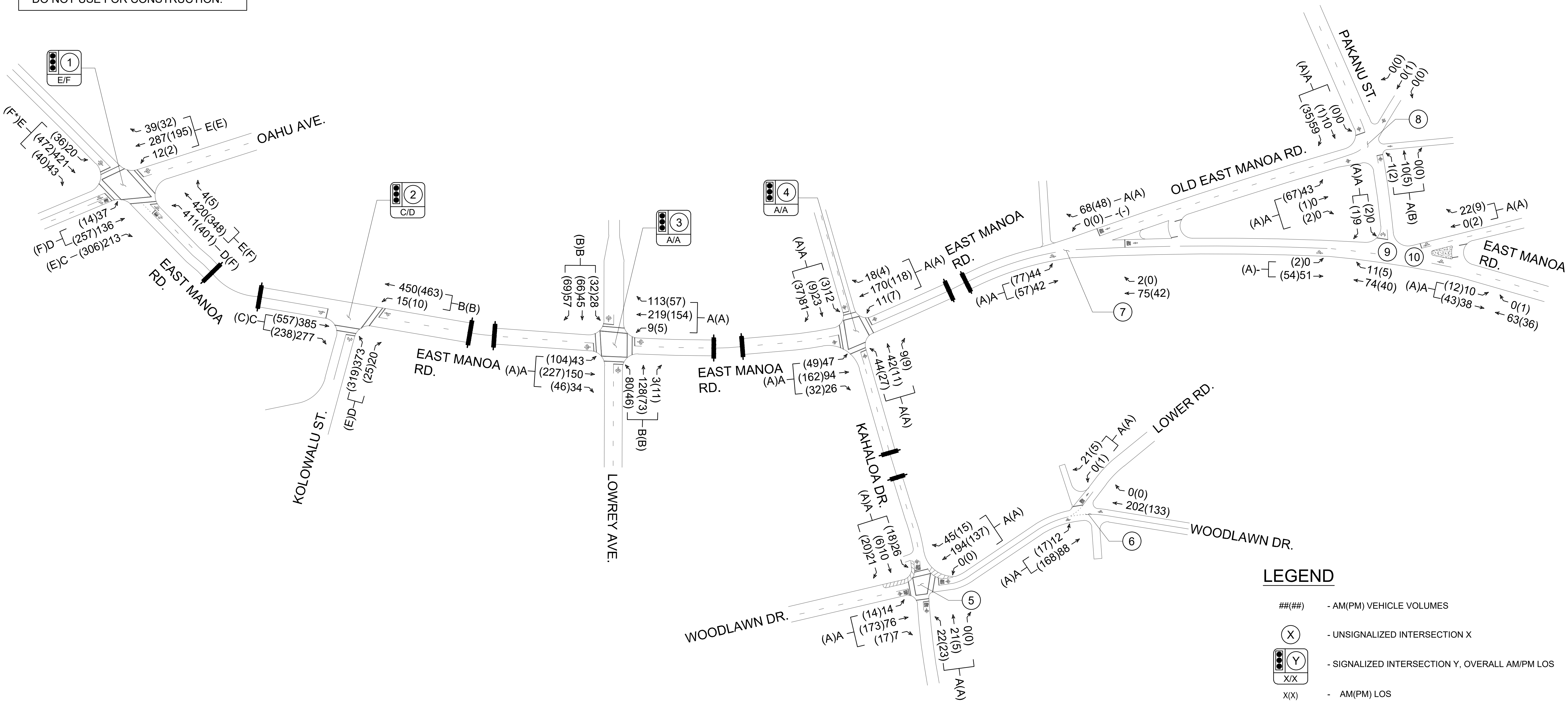


Table 4.2: Existing and Base Year Level of Service Summary

| Intersection | Existing Conditions | | | | | | Base Year Conditions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM | | | PM | | | AM | | | PM | | |
| | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS |
| **1: Oahu Ave & E Manoa Rd** | | | | | | | | | | | | |
| NB LT/TH | 47.9 | 0.66 | D | 54.9 | 0.80 | D | 44.5 | 0.66 | D | 98.0 | 0.94 | F |
| NB RT | 36.7 | 0.07 | D | 39.8 | 0.21 | D | 33.5 | 0.07 | C | 59.9 | 0.40 | E |
| EB LT/TH/RT | 68.2 | 0.94 | E | 134.4 | 1.16 | F* | 65.8 | 0.95 | E | 94.3 | 1.03 | F* |
| WB LT | 53.2 | 0.81 | D | 54.1 | 0.84 | D | 51.1 | 0.83 | D | 90.5 | 0.93 | F |
| WB TH/RT | 58.7 | 0.86 | E | 48.2 | 0.77 | D | 67.5 | 0.94 | E | 86.2 | 0.91 | F |
| SB LT/TH/RT | 62.8 | 0.87 | E | 44.8 | 0.57 | D | 64.5 | 0.90 | E | 72.6 | 0.77 | E |
| *Overall* | 59.3 | - | E | 74.7 | - | E | 60.3 | - | E | 88.1 | - | F |
| **2: Kolowalu St & E Manoa Rd** | | | | | | | | | | | | |
| NB LT/RT | 43.2 | 0.92 | D | 64.8 | 0.93 | E | 48.2 | 0.93 | D | 77.9 | 0.95 | E |
| EB TH/RT | 23.6 | 0.89 | C | 27.2 | 0.91 | C | 26.2 | 0.90 | C | 32.9 | 0.92 | C |
| WB LT/TH | 12.5 | 0.63 | B | 13.8 | 0.55 | B | 14.1 | 0.67 | B | 16.9 | 0.61 | B |
| *Overall* | 26.0 | - | C | 32.2 | - | C | 28.7 | - | C | 38.5 | - | D |
| **3: Lowrey Ave & E Manoa Rd** | | | | | | | | | | | | |
| NB LT/TH/RT | 14.2 | 0.51 | B | 12.9 | 0.30 | B | 14.2 | 0.51 | B | 12.9 | 0.30 | B |
| EB LT/TH/RT | 6.0 | 0.26 | A | 6.9 | 0.45 | A | 6.1 | 0.27 | A | 7.0 | 0.46 | A |
| WB LT/TH/RT | 6.6 | 0.35 | A | 5.8 | 0.21 | A | 6.6 | 0.37 | A | 5.8 | 0.22 | A |
| SB LT/TH/RT | 12.7 | 0.26 | B | 13.3 | 0.38 | B | 12.7 | 0.26 | B | 13.3 | 0.38 | B |
| *Overall* | 9.4 | - | A | 8.9 | - | A | 9.4 | - | A | 8.9 | - | A |
| **4: Kahaloa Dr & E Manoa Rd** | | | | | | | | | | | | |
| NB LT/TH/RT | 5.2 | 0.15 | A | 5.7 | 0.07 | A | 5.3 | 0.15 | A | 5.8 | 0.07 | A |
| EB LT/TH/RT | 4.1 | 0.21 | A | 3.8 | 0.28 | A | 4.1 | 0.21 | A | 3.8 | 0.29 | A |
| WB LT/TH/RT | 4.3 | 0.27 | A | 3.5 | 0.15 | A | 4.2 | 0.28 | A | 3.4 | 0.16 | A |
| SB LT/TH/RT | 5.0 | 0.09 | A | 5.6 | 0.03 | A | 5.1 | 0.09 | A | 5.7 | 0.03 | A |
| *Overall* | 4.5 | - | A | 3.9 | - | A | 4.5 | - | A | 3.9 | - | A |
| **5: Woodlawn Drive & Kahaloa Dr** | | | | | | | | | | | | |
| NB LT/TH/RT | 8.2 | 0.06 | A | 8.2 | 0.04 | A | 8.3 | 0.06 | A | 8.3 | 0.04 | A |
| EB LT/TH/RT | 8.1 | 0.12 | A | 8.7 | 0.25 | A | 8.1 | 0.13 | A | 8.8 | 0.26 | A |
| WB LT/TH/RT | 8.9 | 0.29 | A | 8.3 | 0.19 | A | 9.0 | 0.30 | A | 8.4 | 0.20 | A |
| SB LT/TH/RT | 8.1 | 0.08 | A | 7.9 | 0.06 | A | 8.1 | 0.08 | A | 8.0 | 0.06 | A |
| *Overall* | 8.5 | - | A | 8.4 | - | A | 8.6 | - | A | 8.5 | - | A |

* Denotes overcapacity condition, v/c ≥ 1.

Table 4.2: Existing and Base Year Level of Service Summary

| Intersection | Existing Conditions | | | | | | Base Year Conditions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM | | | PM | | | AM | | | PM | | |
| | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS |
| **6: Woodlawn Drive & Lower Rd** | | | | | | | | | | | | |
| EB LT | 7.7 | 0.01 | A | 7.6 | 0.01 | A | 7.7 | 0.01 | A | 7.6 | 0.01 | A |
| SB LT/RT | 9.5 | 0.03 | A | 9.3 | 0.01 | A | 9.5 | 0.03 | A | 9.4 | 0.01 | A |
| *Overall* | 1.0 | - | - | 0.6 | - | - | 0.9 | - | - | 0.6 | - | - |
| **7: E Manoa Rd & Old E Manoa Rd** | | | | | | | | | | | | |
| EB LT | 7.4 | 0.03 | A | 7.4 | 0.05 | A | 7.5 | 0.03 | A | 7.4 | 0.05 | A |
| SB LT | - | - | - | - | - | - | - | - | - | - | - | - |
| SB RT | 9.0 | 0.08 | A | 8.7 | 0.05 | A | 9.0 | 0.08 | A | 8.7 | 0.05 | A |
| *Overall* | 4.2 | - | - | 4.6 | - | - | 4.1 | - | - | 4.4 | - | - |
| **8: Old E Manoa Rd & Pakanu St** | | | | | | | | | | | | |
| NB LT/TH/RT | 9.8 | 0.02 | A | 10.1 | 0.01 | B | 9.8 | 0.02 | A | 10.1 | 0.01 | B |
| EB LT | 7.3 | 0.03 | A | 7.3 | 0.05 | A | 7.3 | 0.03 | A | 7.3 | 0.05 | A |
| SB LT/TH/RT | 8.8 | 0.07 | A | 8.5 | 0.04 | A | 8.8 | 0.07 | A | 8.5 | 0.04 | A |
| *Overall* | 8.3 | - | - | 7.6 | - | - | 8.3 | - | - | 7.6 | - | - |
| **9: E Manoa Rd & Old E Manoa Rd** | | | | | | | | | | | | |
| EB LT | - | - | - | 7.3 | 0.00 | A | - | - | - | 7.3 | 0.00 | A |
| SB LT/RT | 8.7 | 0.01 | A | 8.9 | 0.00 | A | 8.7 | 0.01 | A | 8.9 | 0.00 | A |
| *Overall* | 0.6 | - | - | 0.4 | - | - | 0.5 | - | - | 0.4 | - | - |
| **10: E Manoa Rd & Akaka Pl** | | | | | | | | | | | | |
| EB LT | 7.4 | 0.01 | A | 7.3 | 0.01 | A | 7.4 | 0.01 | A | 7.3 | 0.01 | A |
| SB LT/RT | 8.7 | 0.02 | A | 8.7 | 0.01 | A | 8.7 | 0.02 | A | 8.7 | 0.01 | A |
| *Overall* | 2.1 | - | - | 1.9 | - | - | 2.0 | - | - | 1.8 | - | - |

* Denotes overcapacity condition, v/c ≥ 1.

# 5. FUTURE YEAR TRAFFIC CONDITIONS

The Future Year scenario represents the traffic conditions within the Project study area with the full build-out of the Project.

## 5.1 Background

The Project is ultimately envisioned to be a senior affordable rental housing project consisting of a total of 288 residential units with complementary land uses such as garden areas and a courtyard for residents, and an approximately 4,000 SF community center to be located across East Manoa Road from the residential units.

## 5.2 Travel Demand Estimations

### 5.2.1 Trip Generation

Trip generation for the Project was performed utilizing a combination of manually-collected trip rates at the nearby Manoa Gardens Elderly Housing and trip rates published in Trip Generation Manual, 11th Edition by the Institute of Transportation Engineers (ITE). This book, based on empirical data compiled from a body of more than 4,250 trip generation studies submitted by public agencies, developers, consulting firms, and associations, provides trip rates and/or formulae based on graphs that correlate vehicular traffic with independent variables. The independent variables can range from Dwelling Units (DU) for single and multi-family attached homes to Square-Foot Gross Leasable Area (SF GLA) for commercial development.

The Manoa Gardens Elderly Housing project is a 79-apartment senior community located at 2790 Kahaloa Drive, a few blocks away from the Project. Manoa Gardens provides housing for applicants with all household members being age 62 years or older, with gross incomes not to exceed 60%, 80%, or 120% of Area Median Income (AMI). Traffic counts were collected at the singular driveway serving Manoa Gardens on April 27, 2022. Calculated trip rates for Manoa Gardens can be found in Table 5.1.

The Trip Generation Manual, 11th Edition, provides trip generation rates for income-limited affordable housing, which includes income-limited affordable housing that is not age-restricted. As younger residents may generate more trips during the peak hours than older residents, the ITE trip rate for non-age restricted affordable housing units was synthesized into the trip generation for the residential aspect of the Project.

Based on analysis of state census data, of all Hawaii residents aged 55+, approximately 30% are aged 55-61, and 70% are aged 62+[1]. This distribution was applied to the Project, and as a result, 30% of units were generated utilizing ITE trip rates for income-limited affordable housing to account for potentially higher trip generation by the age 55-61 group, and the remaining 70% of the units were generated utilizing trip rates from the Manoa Gardens project. As a result, the trip generation technique was assumed to account for car ownership and trip generation variabilities due to age and income limitations.

[1] Department of Business, Economic Development & Tourism. *Resident Population of Hawaii 1985-1990 by Single Year of Age (to 85+) and Sex*. http://census.hawaii.gov/home/population-estimate/

The rates selected were based on the land use description. See Tables 5.1 and 5.2 for Trip Generation formulae and projections for the Project.

Table 5.1: Trip Generation Rates

| Land Use (ITE Code/Source) | Independent Variable | AM | | PM | |
|---|---|---|---|---|---|
| | | Enter % | Rate | Enter % | Rate |
| Affordable Housing - Income Limits (ITE 223) | Dwelling Units | 29% | [a] | 59% | [b] |
| Senior Affordable Housing - 62 years + (Manoa Gardens) [1] | Dwelling Units | 31% | 0.16 | 67% | 0.08 |
| Recreational Community Center (ITE 495) | 1000 SF | 66% | 1.91 | 47% | [c] |

[1]Trip Rates calculated by peak hour traffic counts taken by ATA on April 27, 2022 at Manoa Gardens

[a] T = 0.21X + 17.21
[b] Ln(T) = 0.72*Ln(X) + 0.64
[c] Ln(T) = 0.71*Ln(X) + 2.31

Table 5.2: Project Trip Generation

| Land Use (Source/ITE Code) | Quantity | Independent Variable | AM | | | PM | | |
|---|---|---|---|---|---|---|---|---|
| | | | Enter | Exit | Total | Enter | Exit | Total |
| Affordable Housing - Income Limits (ITE 223)[1] | 86 | Dwelling Units | 7 | 17 | 23 | 20 | 14 | 34 |
| Senior Affordable Housing - 62 years + (Manoa Gardens) | 202 | Dwelling Units | 10 | 23 | 33 | 10 | 5 | 15 |
| *Residential Subtotal* | *288* | *Dwelling Units* | *17* | *40* | *56* | *30* | *19* | *49* |
| Recreational Community Center (ITE 495) | 4 | 1000 SF | 5 | 3 | 8 | 13 | 14 | 27 |
| **TOTAL PROJECT** | | | **22** | **43** | **64** | **43** | **33** | **76** |

[1]As described in Section 5.2.1, 30% of units were generated utilizing ITE trip rates for income-limited affordable housing. Therefore, these trips were calculated as (Tripgen for 288 Units)*30%

### 5.2.2 Trip Distribution

For the residential portion of the project, two (2) Access Options were studied:

- Access Option 1: Access for Phase 1 will be from the existing westernmost driveway. Access for Phase 2 will be from the existing west-central driveway. Access for Phases 3 & 4 will be from the existing east-central driveway which currently also serves the cemetery. Figure 5.1 illustrates Access Option 1.

- Access Option 2: Access for Phase 1 will be from the existing westernmost driveway. Access for Phase 2 will be from the existing west-central driveway. Access for Phases 3 & 4 will be from either the existing east-central driveway which currently also serves the cemetery OR a new Project driveway from Lower Road. Figure 5.2 illustrates Access Scenario 2.

  For Access Option 2, ALL trips for Phases 3 and 4 (50% of total Project trips) were distributed to the Lower Road driveway. This scenario represents the most conservative scenario for operations at the Lower Road driveway and along Woodlawn Drive. Iterations of trip distributions for Phases 3 & 4 between the two driveways (ex. 50% of trips utilizing the East Manoa Road driveway and 50% utilizing the Lower Road driveway) will result in operations that are intermediate between Access Option 1 and Access Option 2, and were assumed to be addressed by these two scenarios.

Beyond the specific access driveways, trips generated by the proposed project were assigned throughout the study area generally based upon existing travel pattens. The traffic generated by the proposed project was added to the forecast Base Year volumes within the vicinity of the proposed project to constitute traffic volumes for Future Year conditions. Since there are multiple routes to access the Project, trips may not take the exact route they are assigned on a consistent basis; however, trips were distributed along heavily-trafficked routes which were observed to experience congestion, and therefore the trip distribution is expected to result in the most conservative scenario. Figure 5.1 illustrates the distribution for trips generated by the proposed Project.

## 5.3 Future Year Analysis

In total, the Project is anticipated to generate 64(76) trips during the AM(PM) peak hours, with the residential component accounting for 56(49) of these trips.

Both Access Options are anticipated to have similar operations at all study intersections, with the exception of the East Manoa Road/Kolowalu Street intersection. At the East Manoa Road/Kolowalu Street intersection, with Access Option 1, all movements are anticipated to operate with the same LOS as with Base Year conditions, with the exception of the eastbound through movement, which is anticipated to lower from LOS C to LOS D during the PM peak hour. With Access Option 2, the increased left-turn movements from Kolowalu Street results in the northbound approach operating at LOS E(F) with Future Year conditions, compared to LOS D(E) with Base Year conditions and Option 1 conditions; though all movements are anticipated to continue operating under capacity. Project trips are anticipated to account for 4.8%(2.7%) of vehicles on the northbound approach during the AM(PM) peak hours.

At the East Manoa Road/Oahu Avenue intersection, both Access Scenarios are expected to have identical operations, and are anticipated to operate similarly to Base Year conditions. During the AM and PM peak hours, various movements are anticipated to continue to operate at LOS E/F. During the PM peak hour, the eastbound approach is anticipated to experience an approximately 16-second increase over Base Year conditions and operate at LOS F and overcapacity conditions as it did with Existing and Base Year conditions. As previously described, the large trees and houses on all four corners of the intersection approach make physical widening improvements likely not feasible. During the critical PM peak hour, the Project is anticipated to add approximately 25 vehicles to the eastbound approach, or about one (1) car every two (2) minutes. In total, Project trips are anticipated to account for approximately 2.8%(4.4%) of traffic during the AM(PM) peak hours.

All other movements at all other study intersections are anticipated to operate at LOS B or better across both peak hours. Project traffic is anticipated to have little to no impact to travel time through these intersections.

## 5.4 Recommendations

Between Options 1 and 2, operations at most intersections are generally the same, with the exception of the East Manoa Road/Kolowalu intersection, which will experience only a slightly greater delay on the northbound approach with Option 2 compared to Option 1 – a difference of about 9(1) second during the AM(PM) peak hours. Given this, neither Option 1 or Option 2 has a significant benefit over the other from a traffic operation standpoint and the Access Option choice should be based upon other factors, including feasibility of construction of the new Project access from Lower Road for Access Option 2.

At the East Manoa Road/Kolowalu Street and East Manoa Road/Oahu Avenue intersections, it is recommended that signal timing be evaluated and optimized to maintain best-possible operations.

MANOA BANYAN COURT

Austin Tsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

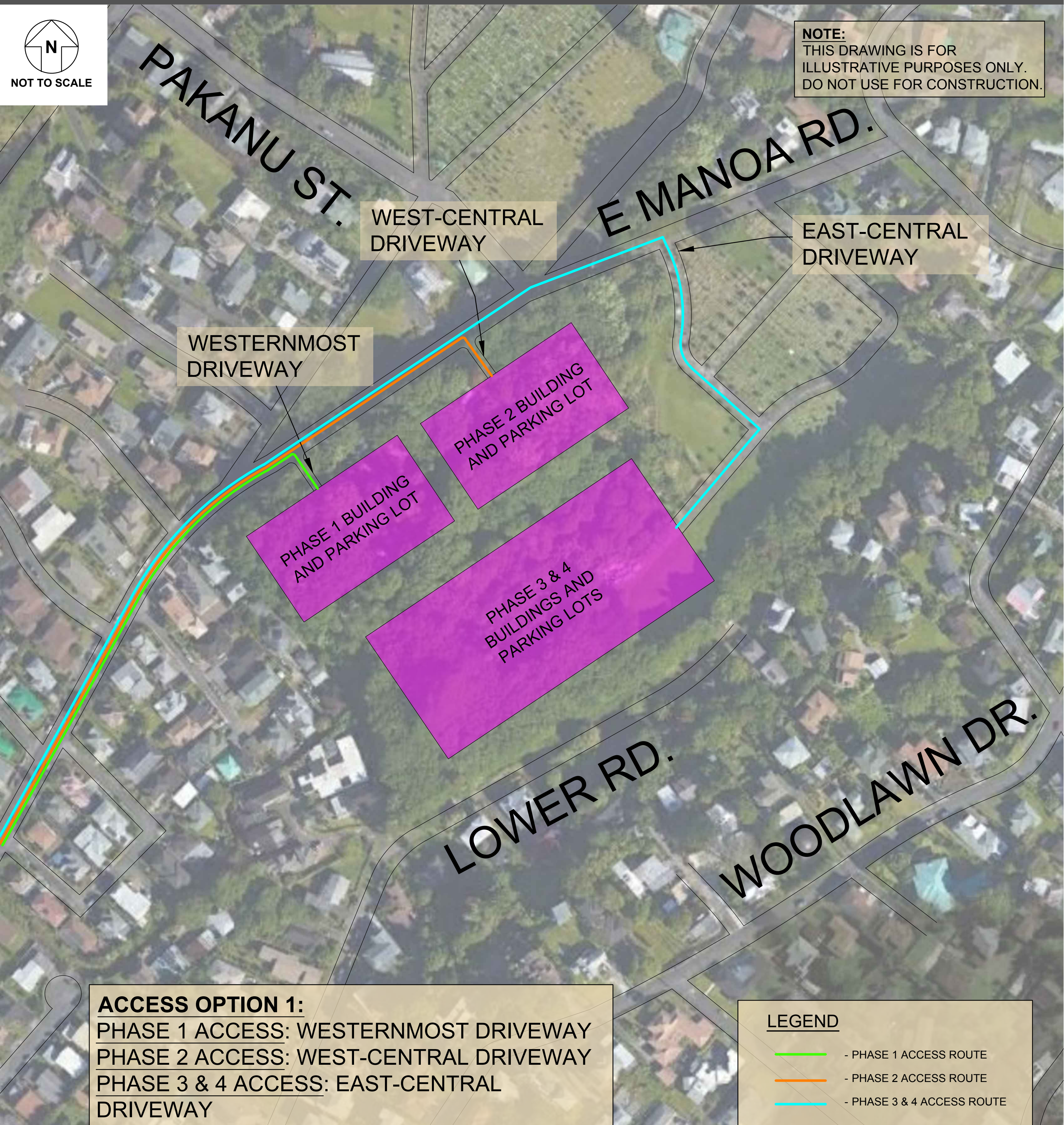



FIGURE 5.1

ACCESS OPTION 1

MANOA BANYAN COURT

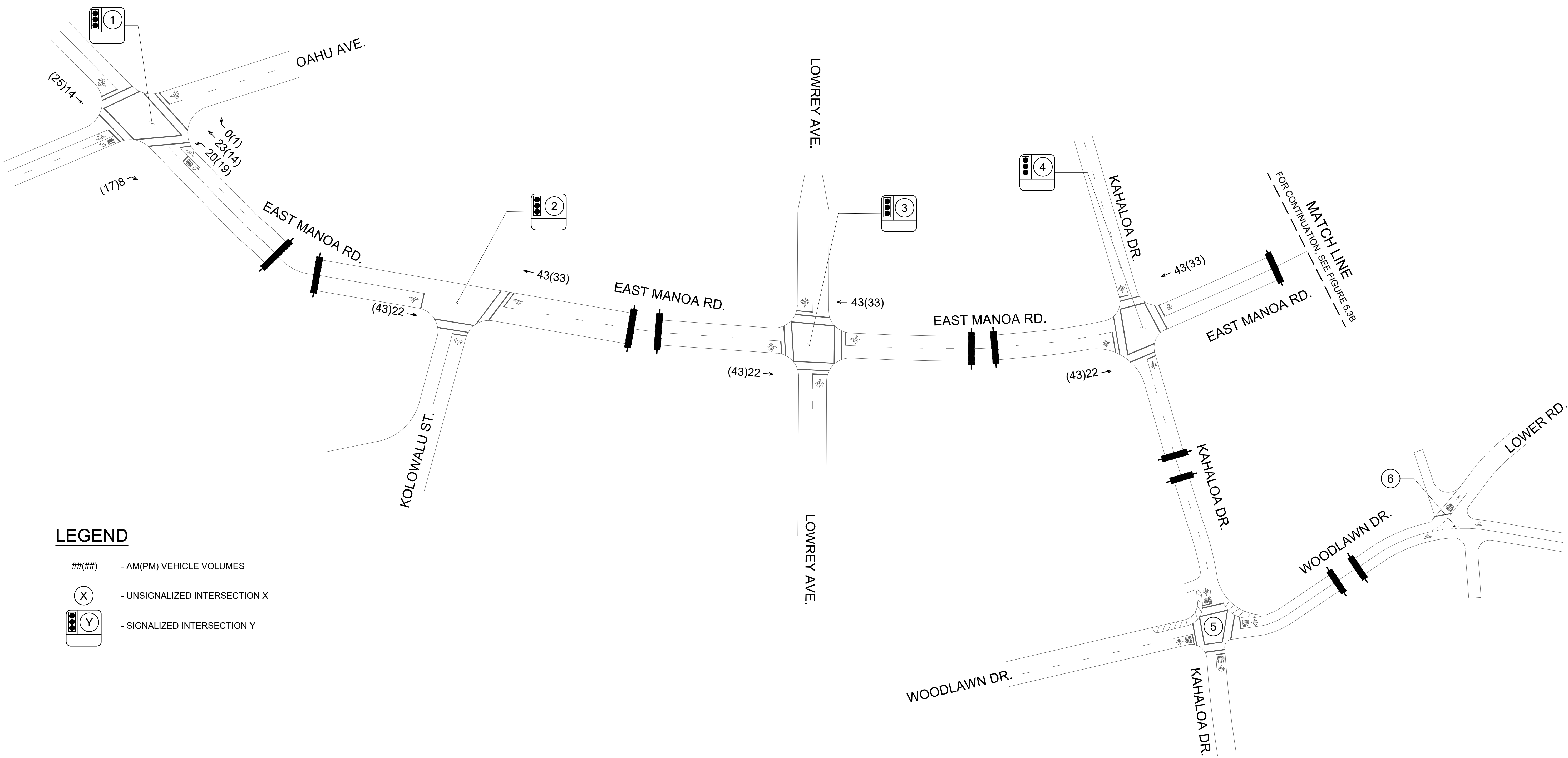
Austin Tsutsumi & ASSOCIATES, INC.
Engineers & Surveyors


FIGURE 5.2

ACCESS OPTION 2

Austin Tsutsumi & Associates, Inc.
Engineers & Surveyors

**NOTE:**
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.




LEGEND

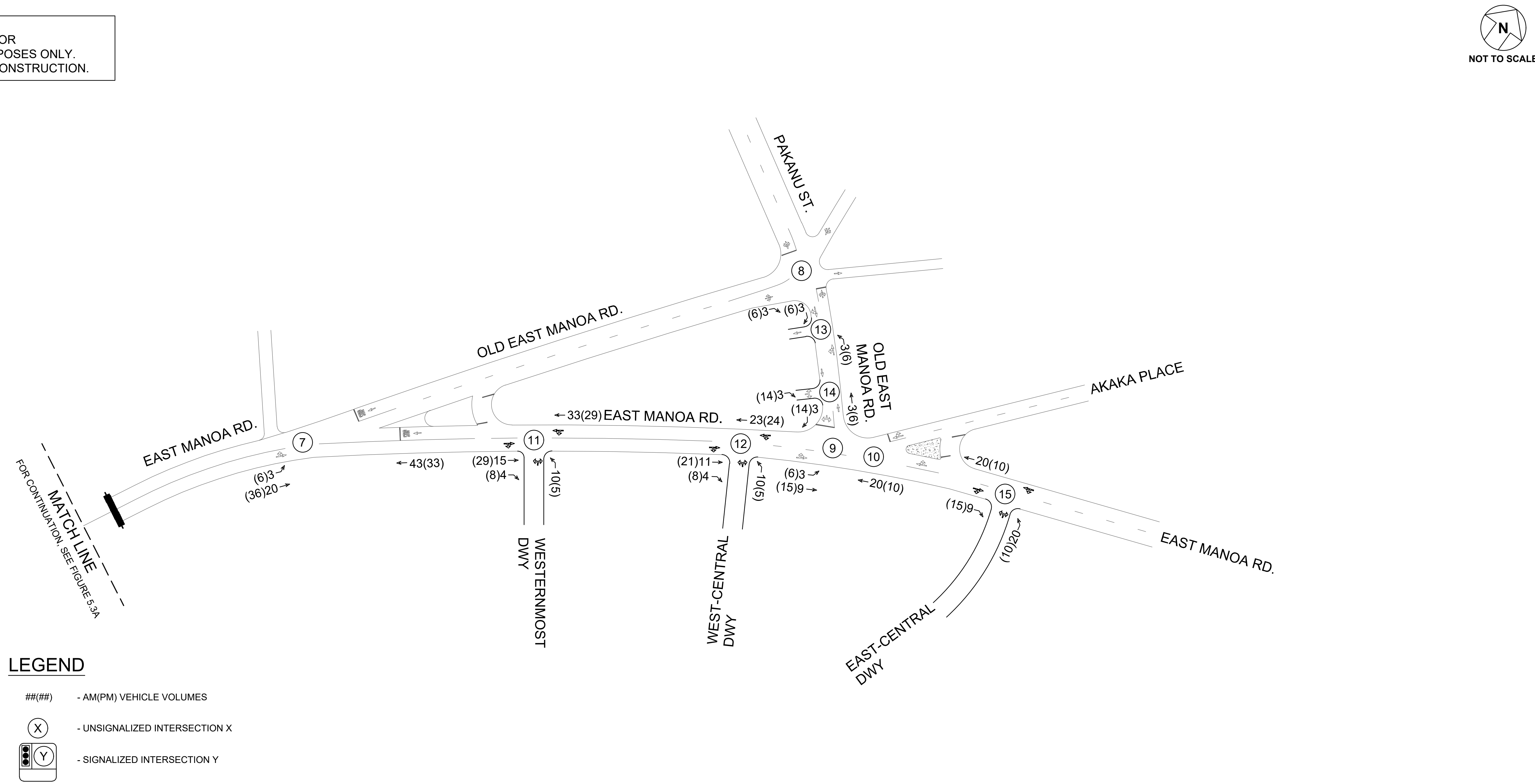
- ##(##) - AM(PM) VEHICLE VOLUMES
- X - UNSIGNALIZED INTERSECTION X
- Y - SIGNALIZED INTERSECTION Y

# FIGURE 5.3A

OPTION 1 PROJECT TRIPS

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

**NOTE:**
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

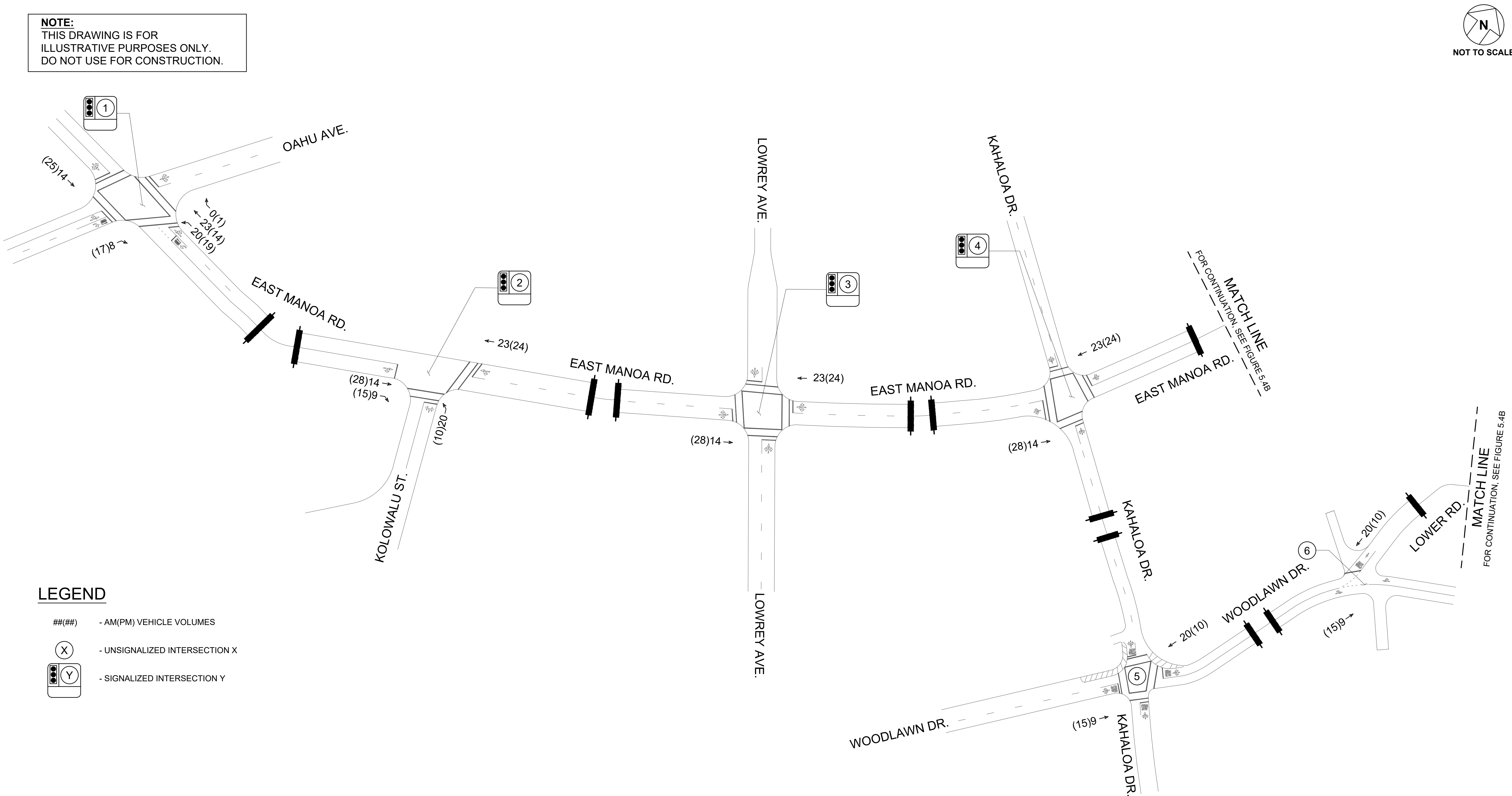



# FIGURE 5.3B

OPTION 1 PROJECT TRIPS

AustinTsutsumi & ASSOCIATES, INC. Engineers & Surveyors

**NOTE:**
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.




LEGEND

##(##) - AM(PM) VEHICLE VOLUMES

X - UNSIGNALIZED INTERSECTION X

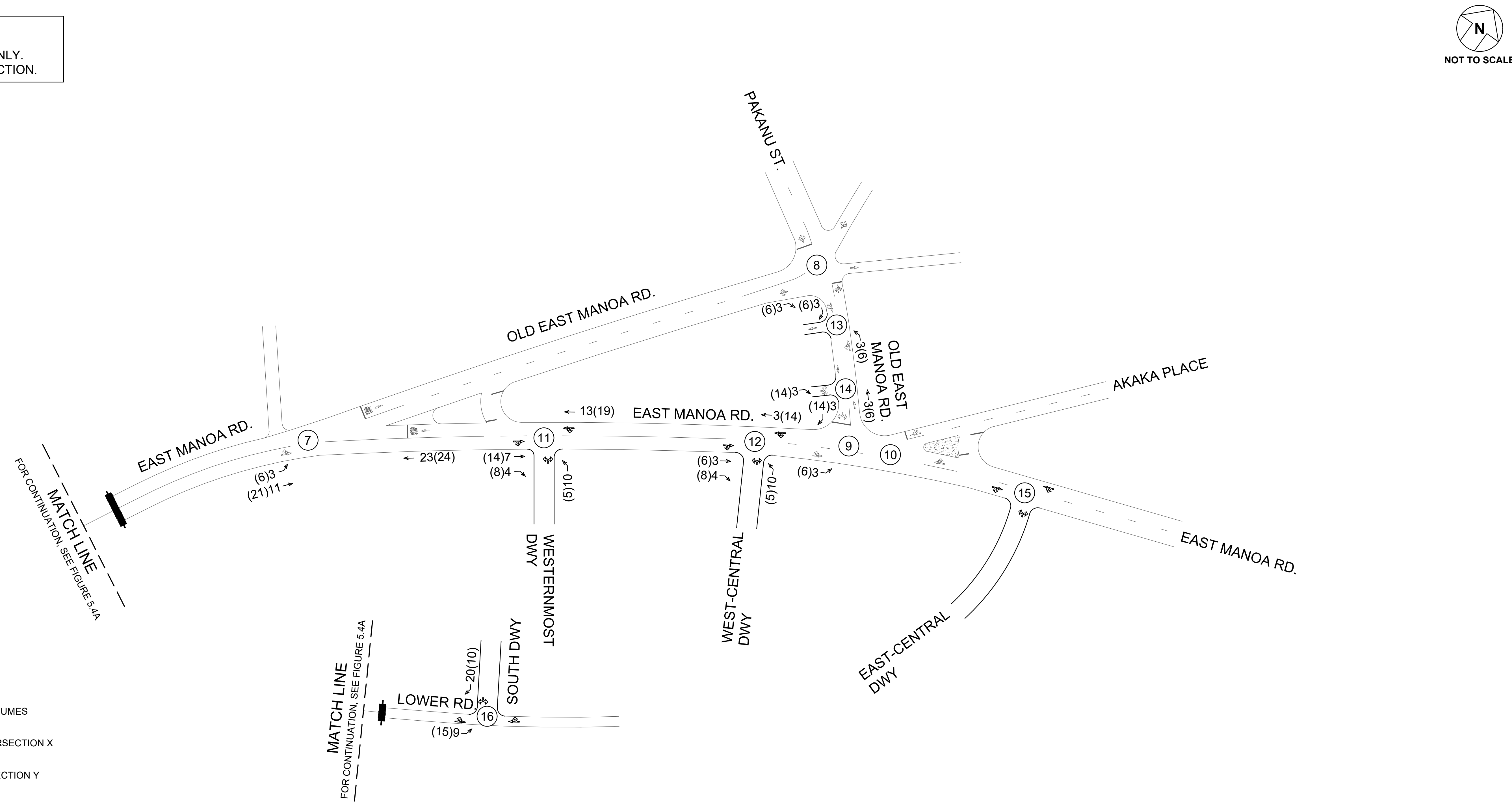
Y - SIGNALIZED INTERSECTION Y

# FIGURE 5.4A

OPTION 2 PROJECT TRIPS

Austin Tsutsumi & Associates, Inc.
Engineers & Surveyors

**NOTE:**
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.




## LEGEND

| | |
|---|---|
| ##(##) | - AM(PM) VEHICLE VOLUMES |
| X | - UNSIGNALIZED INTERSECTION X |
| Y | - SIGNALIZED INTERSECTION Y |

FIGURE 5.4B

OPTION 2 PROJECT TRIPS

MANOA BANYAN COURT

Austin Tsutsumi & Associates, Inc.
Engineers & Surveyors

**NOTE:**
THIS DRAWING IS FOR
ILLUSTRATIVE PURPOSES ONLY.
DO NOT USE FOR CONSTRUCTION.

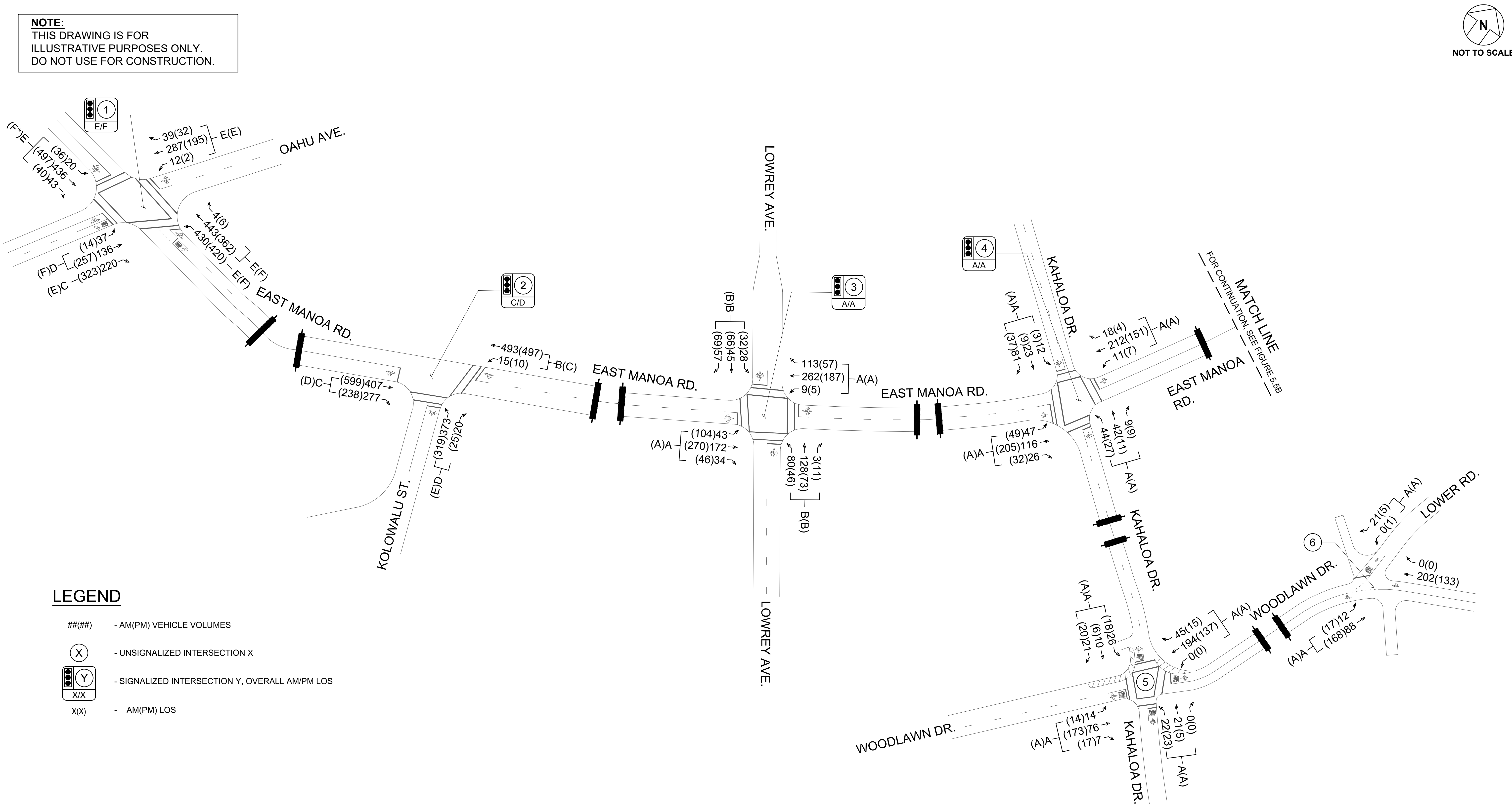
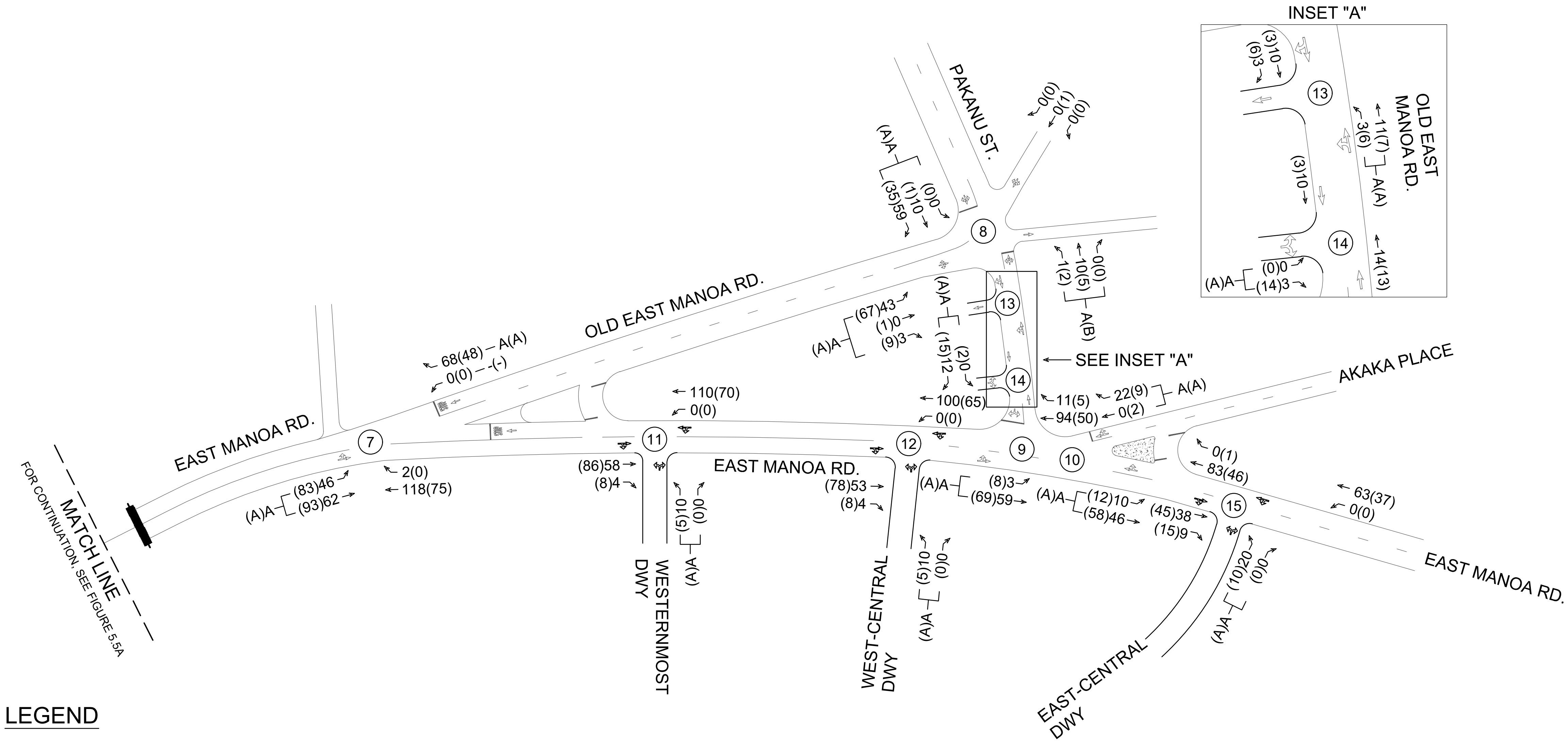



FIGURE 5.5A

OPTION 1 FUTURE YEAR LANE CONFIGURATION,
TRAFFIC VOLUME AND LOS

**NOTE:**
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

NOT TO SCALE



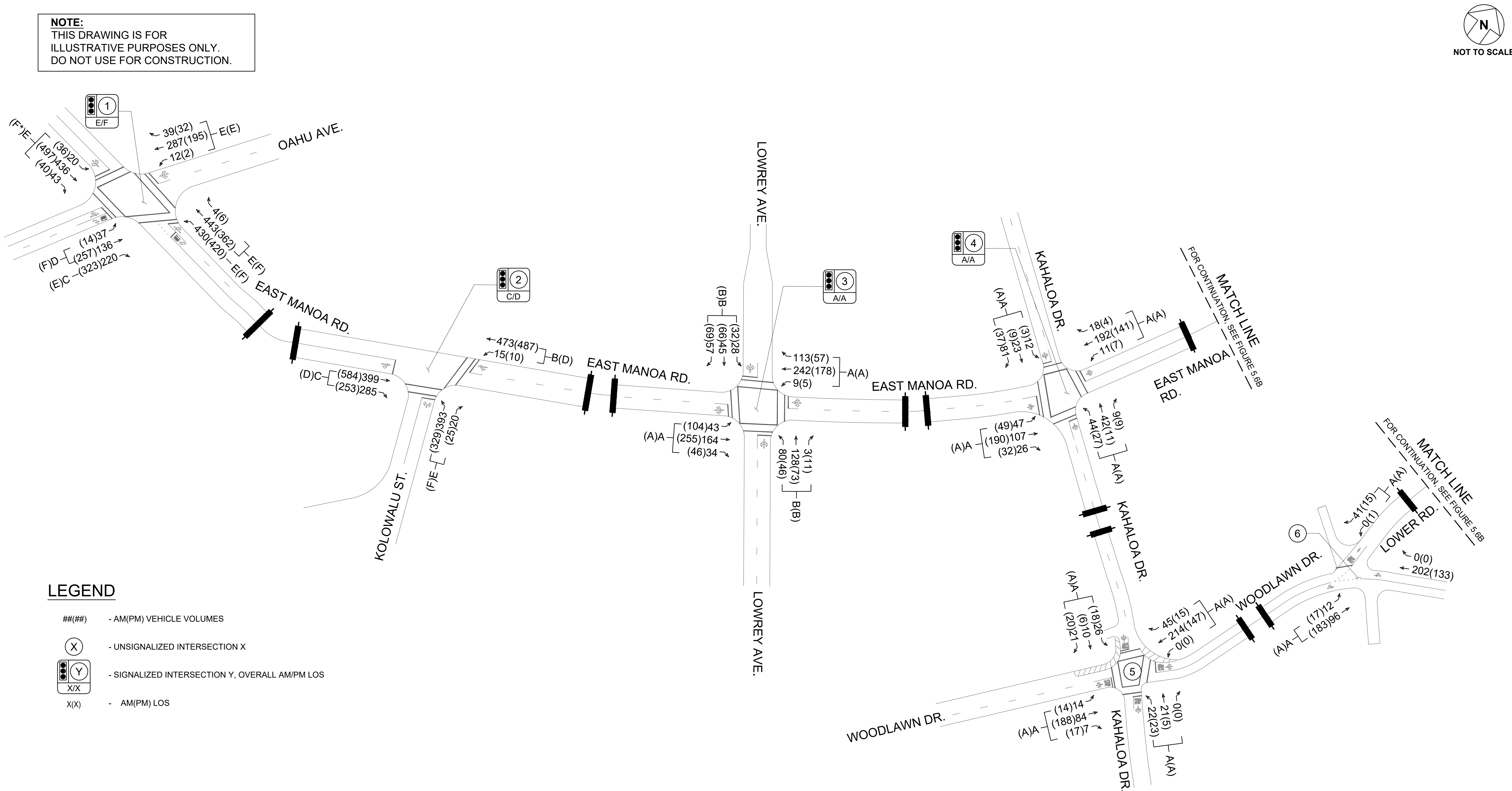

## LEGEND

| | |
|---|---|
| ##(##) | - AM(PM) VEHICLE VOLUMES |
| (X) | - UNSIGNALIZED INTERSECTION X |
| (Y) X/X | - SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS |
| X(X) | - AM(PM) LOS |

FIGURE 5.5B

OPTION 1 FUTURE YEAR LANE CONFIGURATION, TRAFFIC VOLUME AND LOS

**NOTE:**
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.



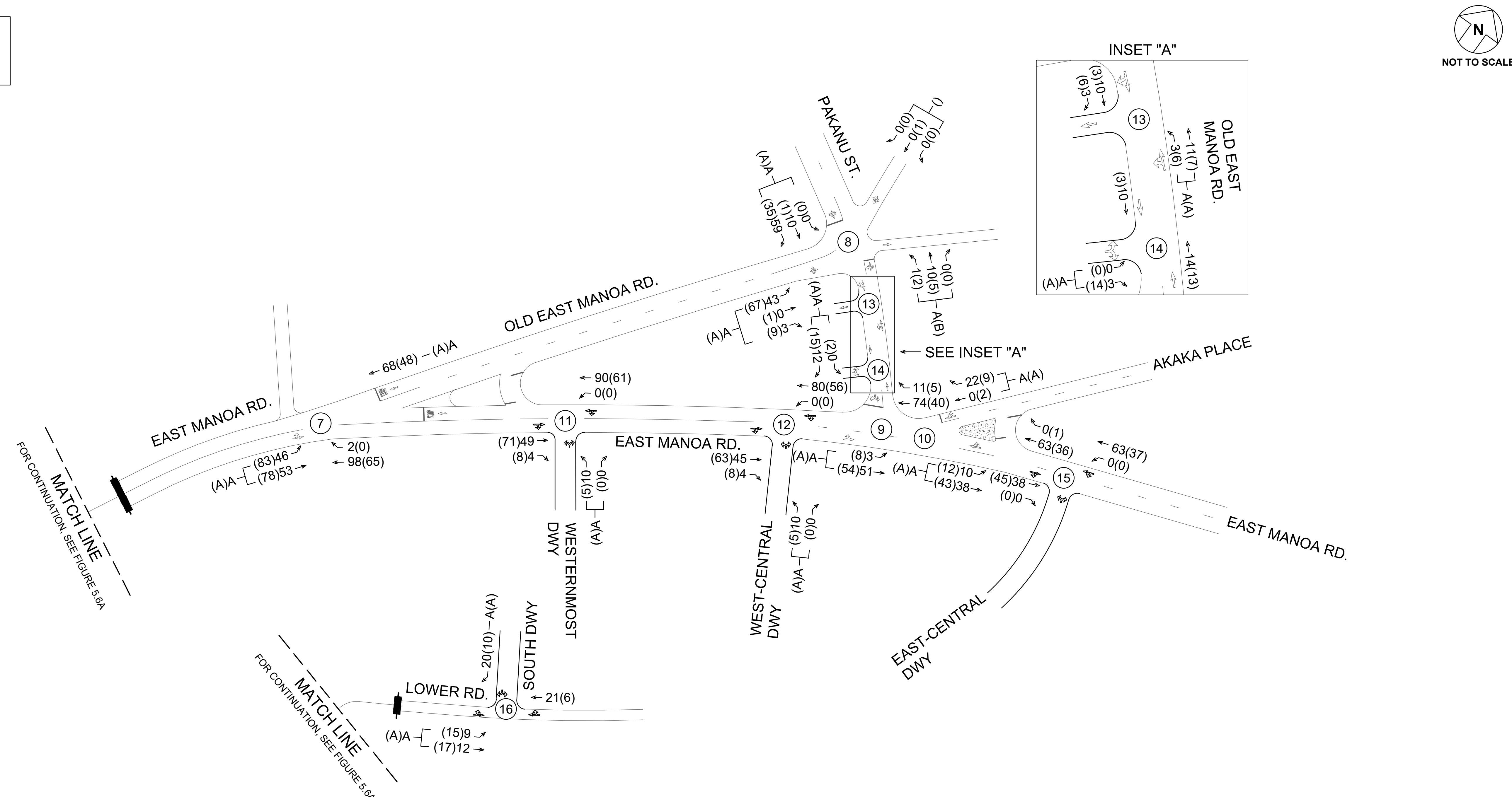

## LEGEND

- ##(##) - AM(PM) VEHICLE VOLUMES
- X - UNSIGNALIZED INTERSECTION X
- Y, X/X - SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS
- X(X) - AM(PM) LOS

# FIGURE 5.6A

OPTION 2 FUTURE YEAR LANE CONFIGURATION, TRAFFIC VOLUME AND LOS

**NOTE:**
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.




## LEGEND

- ##(##) - AM(PM) VEHICLE VOLUMES
- X - UNSIGNALIZED INTERSECTION X
- Y X/X - SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS
- X(X) - AM(PM) LOS

# FIGURE 5.6B

OPTION 2 FUTURE YEAR LANE CONFIGURATION, TRAFFIC VOLUME AND LOS

Table 5.3: Existing, Base Year, and Future Year Level of Service Summary

| Intersection | Existing Conditions | | | | | | Base Year Conditions | | | | | | Future Year Conditions Option 1 | | | | | | Future Year Conditions Option 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM | | | PM | | | AM | | | PM | | | AM | | | PM | | | AM | | | PM | | |
| | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS |
| **1: Oahu Ave & E Manoa Rd** | | | | | | | | | | | | | | | | | | | | | | | | |
| NB LT/TH | 47.9 | 0.66 | D | 54.9 | 0.80 | D | 44.5 | 0.66 | D | 98.0 | 0.94 | F | 46.2 | 0.69 | D | 100.3 | 0.94 | F | 46.2 | 0.69 | D | 100.3 | 0.94 | F |
| NB RT | 36.7 | 0.07 | D | 39.8 | 0.21 | D | 33.5 | 0.07 | C | 59.9 | 0.40 | E | 33.8 | 0.07 | C | 61.0 | 0.42 | E | 33.8 | 0.07 | C | 61.0 | 0.42 | E |
| EB LT/TH/RT | 68.2 | 0.94 | E | 134.4 | 1.16 | F* | 65.8 | 0.95 | E | 94.3 | 1.03 | F* | 72.1 | 0.98 | E | 110.5 | 1.08 | F* | 72.1 | 0.98 | E | 110.5 | 1.08 | F* |
| WB LT | 53.2 | 0.81 | D | 54.1 | 0.84 | D | 51.1 | 0.83 | D | 90.5 | 0.93 | F | 55.1 | 0.86 | E | 96.7 | 0.96 | F | 55.1 | 0.86 | E | 96.7 | 0.96 | F |
| WB TH/RT | 58.7 | 0.86 | E | 48.2 | 0.77 | D | 67.5 | 0.94 | E | 86.2 | 0.91 | F | 79.0 | 0.99 | E | 91.0 | 0.93 | F | 79.0 | 0.99 | E | 91.0 | 0.93 | F |
| SB LT/TH/RT | 62.8 | 0.87 | E | 44.8 | 0.57 | D | 64.5 | 0.90 | E | 72.6 | 0.77 | E | 70.5 | 0.93 | E | 74.8 | 0.78 | E | 70.5 | 0.93 | E | 74.8 | 0.78 | E |
| *Overall* | 59.3 | - | E | 74.7 | - | E | 60.3 | - | E | 88.1 | - | F | 66.7 | - | E | 95.5 | - | F | 66.7 | - | E | 95.5 | - | F |
| **2: Kolowalu St & E Manoa Rd** | | | | | | | | | | | | | | | | | | | | | | | | |
| NB LT/RT | 43.2 | 0.92 | D | 64.8 | 0.93 | E | 48.2 | 0.93 | D | 77.9 | 0.95 | E | 51.9 | 0.94 | D | 79.2 | 0.95 | E | 60.6 | 0.98 | E | 80.3 | 0.95 | F |
| EB TH/RT | 23.6 | 0.89 | C | 27.2 | 0.91 | C | 26.2 | 0.90 | C | 32.9 | 0.92 | C | 29.5 | 0.92 | C | 43.9 | 0.96 | D | 30.5 | 0.92 | C | 47.9 | 0.97 | D |
| WB LT/TH | 12.5 | 0.63 | B | 13.8 | 0.55 | B | 14.1 | 0.67 | B | 16.9 | 0.61 | B | 17.6 | 0.76 | B | 33.3 | 0.77 | C | 17.3 | 0.74 | B | 42.4 | 0.80 | D |
| *Overall* | 26.0 | - | C | 32.2 | - | C | 28.7 | - | C | 38.5 | - | D | 31.8 | - | C | 48.4 | - | D | 34.9 | - | C | 53.4 | - | D |
| **3: Lowrey Ave & E Manoa Rd** | | | | | | | | | | | | | | | | | | | | | | | | |
| NB LT/TH/RT | 14.2 | 0.51 | B | 12.9 | 0.30 | B | 14.2 | 0.51 | B | 12.9 | 0.30 | B | 14.2 | 0.51 | B | 12.9 | 0.30 | B | 14.2 | 0.51 | B | 12.9 | 0.30 | B |
| EB LT/TH/RT | 6.0 | 0.26 | A | 6.9 | 0.45 | A | 6.1 | 0.27 | A | 7.0 | 0.46 | A | 6.2 | 0.29 | A | 7.4 | 0.51 | A | 6.1 | 0.28 | A | 7.2 | 0.50 | A |
| WB LT/TH/RT | 6.6 | 0.35 | A | 5.8 | 0.21 | A | 6.6 | 0.37 | A | 5.8 | 0.22 | A | 6.9 | 0.41 | A | 6.0 | 0.26 | A | 6.8 | 0.39 | A | 5.9 | 0.25 | A |
| SB LT/TH/RT | 12.7 | 0.26 | B | 13.3 | 0.38 | B | 12.7 | 0.26 | B | 13.3 | 0.38 | B | 12.7 | 0.26 | B | 13.3 | 0.38 | B | 12.7 | 0.26 | B | 13.3 | 0.38 | B |
| *Overall* | 9.4 | - | A | 8.9 | - | A | 9.4 | - | A | 8.9 | - | A | 9.3 | - | A | 8.9 | - | A | 9.3 | - | A | 8.9 | - | A |
| **4: Kahaloa Dr & E Manoa Rd** | | | | | | | | | | | | | | | | | | | | | | | | |
| NB LT/TH/RT | 5.2 | 0.15 | A | 5.7 | 0.07 | A | 5.3 | 0.15 | A | 5.8 | 0.07 | A | 5.8 | 0.16 | A | 6.3 | 0.08 | A | 5.6 | 0.16 | A | 6.1 | 0.07 | A |
| EB LT/TH/RT | 4.1 | 0.21 | A | 3.8 | 0.28 | A | 4.1 | 0.21 | A | 3.8 | 0.29 | A | 3.9 | 0.23 | A | 3.7 | 0.33 | A | 4.0 | 0.23 | A | 3.7 | 0.31 | A |
| WB LT/TH/RT | 4.3 | 0.27 | A | 3.5 | 0.15 | A | 4.2 | 0.28 | A | 3.4 | 0.16 | A | 4.1 | 0.31 | A | 3.3 | 0.19 | A | 4.2 | 0.29 | A | 3.4 | 0.18 | A |
| SB LT/TH/RT | 5.0 | 0.09 | A | 5.6 | 0.03 | A | 5.1 | 0.09 | A | 5.7 | 0.03 | A | 5.6 | 0.09 | A | 6.1 | 0.04 | A | 5.4 | 0.09 | A | 6.0 | 0.04 | A |
| *Overall* | 4.5 | - | A | 3.9 | - | A | 4.5 | - | A | 3.9 | - | A | 4.5 | - | A | 3.9 | - | A | 4.5 | - | A | 3.9 | - | A |
| **5: Woodlawn Drive & Kahaloa Dr** | | | | | | | | | | | | | | | | | | | | | | | | |
| NB LT/TH/RT | 8.2 | 0.06 | A | 8.2 | 0.04 | A | 8.3 | 0.06 | A | 8.3 | 0.04 | A | 8.3 | 0.06 | A | 8.3 | 0.04 | A | 8.4 | 0.07 | A | 8.3 | 0.04 | A |
| EB LT/TH/RT | 8.1 | 0.12 | A | 8.7 | 0.25 | A | 8.1 | 0.13 | A | 8.8 | 0.26 | A | 8.1 | 0.13 | A | 8.8 | 0.26 | A | 8.2 | 0.14 | A | 9.0 | 0.28 | A |
| WB LT/TH/RT | 8.9 | 0.29 | A | 8.3 | 0.19 | A | 9.0 | 0.30 | A | 8.4 | 0.20 | A | 9.0 | 0.30 | A | 8.4 | 0.20 | A | 9.3 | 0.33 | A | 8.5 | 0.21 | A |
| SB LT/TH/RT | 8.1 | 0.08 | A | 7.9 | 0.06 | A | 8.1 | 0.08 | A | 8.0 | 0.06 | A | 8.1 | 0.08 | A | 8.0 | 0.06 | A | 8.2 | 0.08 | A | 8.0 | 0.06 | A |
| *Overall* | 8.5 | - | A | 8.4 | - | A | 8.6 | - | A | 8.5 | - | A | 8.6 | - | A | 8.5 | - | A | 8.8 | - | A | 8.7 | - | A |
| **6: Woodlawn Drive & Lower Rd** | | | | | | | | | | | | | | | | | | | | | | | | |
| EB LT | 7.7 | 0.01 | A | 7.6 | 0.01 | A | 7.7 | 0.01 | A | 7.6 | 0.01 | A | 7.7 | 0.01 | A | 7.6 | 0.01 | A | 7.7 | 0.01 | A | 7.6 | 0.01 | A |
| SB LT/RT | 9.5 | 0.03 | A | 9.3 | 0.01 | A | 9.5 | 0.03 | A | 9.4 | 0.01 | A | 9.5 | 0.03 | A | 9.4 | 0.01 | A | 9.7 | 0.06 | A | 9.3 | 0.02 | A |
| *Overall* | 1.0 | - | - | 0.6 | - | - | 0.9 | - | - | 0.6 | - | - | 0.9 | - | - | 0.6 | - | - | 1.4 | - | - | 0.8 | - | - |
| **7: E Manoa Rd & Old E Manoa Rd** | | | | | | | | | | | | | | | | | | | | | | | | |
| EB LT | 7.4 | 0.03 | A | 7.4 | 0.05 | A | 7.5 | 0.03 | A | 7.4 | 0.05 | A | 7.6 | 0.03 | A | 7.5 | 0.06 | A | 7.5 | 0.03 | A | 7.5 | 0.06 | A |
| SB LT | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| SB RT | 9.0 | 0.08 | A | 8.7 | 0.05 | A | 9.0 | 0.08 | A | 8.7 | 0.05 | A | 9.3 | 0.08 | A | 8.9 | 0.05 | A | 9.1 | 0.08 | A | 8.8 | 0.05 | A |
| *Overall* | 4.2 | - | - | 4.6 | - | - | 4.1 | - | - | 4.4 | - | - | 3.3 | - | - | 3.5 | - | - | 3.6 | - | - | 3.8 | - | - |
| **8: Old E Manoa Rd & Pakanu St** | | | | | | | | | | | | | | | | | | | | | | | | |
| NB LT/TH/RT | 9.8 | 0.02 | A | 10.1 | 0.01 | B | 9.8 | 0.02 | A | 10.1 | 0.01 | B | 9.8 | 0.02 | A | 10.1 | 0.01 | B | 9.8 | 0.02 | A | 10.1 | 0.01 | B |
| EB LT | 7.3 | 0.03 | A | 7.3 | 0.05 | A | 7.3 | 0.03 | A | 7.3 | 0.05 | A | 7.3 | 0.03 | A | 7.3 | 0.05 | A | 7.3 | 0.03 | A | 7.3 | 0.05 | A |
| SB LT/TH/RT | 8.8 | 0.07 | A | 8.5 | 0.04 | A | 8.8 | 0.07 | A | 8.5 | 0.04 | A | 8.8 | 0.07 | A | 8.5 | 0.04 | A | 8.8 | 0.07 | A | 8.5 | 0.04 | A |
| *Overall* | 8.3 | - | - | 7.6 | - | - | 8.3 | - | - | 7.6 | - | - | 8.1 | - | - | 7.2 | - | - | 8.1 | - | - | 7.2 | - | - |
| **9: E Manoa Rd & Old E Manoa Rd** | | | | | | | | | | | | | | | | | | | | | | | | |
| EB LT | - | - | - | 7.3 | 0.00 | A | - | - | - | 7.3 | 0.00 | A | 7.4 | 0.00 | A | 7.3 | 0.01 | A | 7.4 | 0.00 | A | 7.3 | 0.01 | A |
| SB LT/RT | 8.7 | 0.01 | A | 8.9 | 0.00 | A | 8.7 | 0.01 | A | 8.9 | 0.00 | A | 8.9 | 0.01 | A | 8.7 | 0.02 | A | 8.8 | 0.01 | A | 8.7 | 0.02 | A |
| *Overall* | 0.6 | - | - | 0.4 | - | - | 0.5 | - | - | 0.4 | - | - | 0.7 | - | - | 1.4 | - | - | 0.8 | - | - | 1.6 | - | - |
| **10: E Manoa Rd & Akaka Pl** | | | | | | | | | | | | | | | | | | | | | | | | |
| EB LT | 7.4 | 0.01 | A | 7.3 | 0.01 | A | 7.4 | 0.01 | A | 7.3 | 0.01 | A | 7.4 | 0.01 | A | 7.3 | 0.01 | A | 7.4 | 0.01 | A | 7.3 | 0.01 | A |
| SB LT/RT | 8.7 | 0.02 | A | 8.7 | 0.01 | A | 8.7 | 0.02 | A | 8.7 | 0.01 | A | 8.8 | 0.03 | A | 8.7 | 0.01 | A | 8.7 | 0.02 | A | 8.7 | 0.01 | A |
| *Overall* | 2.1 | - | - | 1.9 | - | - | 2.0 | - | - | 1.8 | - | - | 1.7 | - | - | 1.5 | - | - | 2.0 | - | - | 1.8 | - | - |

* Denotes overcapacity condition, v/c≥ 1.

Table 5.3: Existing, Base Year, and Future Year LOS Summary

| Intersection | Existing Conditions | | | | | | Base Year Conditions | | | | | | Future Year Conditions Option 1 | | | | | | Future Year Conditions Option 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM | | | PM | | | AM | | | PM | | | AM | | | PM | | | AM | | | PM | | |
| | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS | HCM Delay | v/c Ratio | LOS |
| **11: Westernmost Dwy & E Manoa Rd** | | | | | | | | | | | | | | | | | | | | | | | | |
| NB LT/RT | - | - | - | - | - | - | - | - | - | - | - | - | 9.5 | 0.01 | A | 9.4 | 0.01 | A | 9.3 | 0.01 | A | 9.3 | 0.01 | A |
| WB LT | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Overall* | - | - | - | - | - | - | - | - | - | - | - | - | 0.5 | - | - | 0.3 | - | - | 0.6 | - | - | 0.3 | - | - |
| **12: West-Central Dwy & E Manoa Rd** | | | | | | | | | | | | | | | | | | | | | | | | |
| NB LT/RT | - | - | - | - | - | - | - | - | - | - | - | - | 9.4 | 0.01 | A | 9.4 | 0.01 | A | 9.3 | 0.01 | A | 9.2 | 0.01 | A |
| WB LT | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Overall* | - | - | - | - | - | - | - | - | - | - | - | - | 0.6 | - | - | 0.3 | - | - | 0.7 | - | - | 0.3 | - | - |
| **13: Old E Manoa Rd & Community Center Dwy Enter-Only** | | | | | | | | | | | | | | | | | | | | | | | | |
| NB LT | - | - | - | - | - | - | - | - | - | - | - | - | 7.2 | 0.00 | A | 7.2 | 0.00 | A | 7.2 | 0.00 | A | 7.2 | 0.00 | A |
| *Overall* | - | - | - | - | - | - | - | - | - | - | - | - | 0.8 | - | - | 2.0 | - | - | 0.8 | - | - | 2.0 | - | - |
| **14: Old E Manoa Rd & Community Center Dwy Exit-Only** | | | | | | | | | | | | | | | | | | | | | | | | |
| EB LT/RT | - | - | - | - | - | - | - | - | - | - | - | - | 8.4 | 0.00 | A | 8.4 | 0.01 | A | 8.4 | 0.00 | A | 8.4 | 0.01 | A |
| *Overall* | - | - | - | - | - | - | - | - | - | - | - | - | 0.9 | - | - | 3.9 | - | - | 0.9 | - | - | 3.9 | - | - |
| **15: East-Central Dwy & E Manoa Rd** | | | | | | | | | | | | | | | | | | | | | | | | |
| NB LT/RT | - | - | - | - | - | - | - | - | - | - | - | - | 9.2 | 0.03 | A | 9.0 | 0.01 | A | - | - | - | - | - | - |
| WB LT | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Overall* | - | - | - | - | - | - | - | - | - | - | - | - | 1.4 | - | - | 0.8 | - | - | 0.0 | - | - | 0.0 | - | - |
| **16: Lower Rd & South Dwy** | | | | | | | | | | | | | | | | | | | | | | | | |
| EB LT | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7.3 | 0.01 | A | 7.3 | 0.01 | A |
| SB LT/RT | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8.5 | 0.02 | A | 8.4 | 0.01 | A |
| *Overall* | - | - | - | - | - | - | - | - | - | - | - | - | 0.0 | - | - | 0.0 | - | - | 3.8 | - | - | 4.0 | - | - |

* Denotes overcapacity condition, v/c≥ 1.

# 6. CONCLUSIONS

The Project is envisioned to include a total of 288 senior affordable rental housing units with complimentary uses for residents, and an approximately 4,000 square-foot community center.

## 6.1 Existing Conditions

In general, access to the Manoa neighborhood is provided only by the University Avenue and Manoa Road corridors. The narrow roadways and limited north-south access routes results in congestion along the Manoa Road and University Avenue corridors, especially during the morning and afternoon peak hours as residents commute to and from schools and workplaces.

In general, the Manoa neighborhood is fully built out and has tightly constrained roadways, with homes or shops on both sides of the roadway. As a result, the potential for physical improvements is limited.

At all study intersections with the exception of the East Manoa Road/Kolowalu Street and East Manoa Road/Oahu Avenue intersections, all movements operate at LOS B or better across both peak hours.

At the East Manoa Road/Kolowalu intersection, all movements operate at LOS D or better across both peak hours with the exception of the northbound approach during the PM peak hour; however, this movement operates under capacity and was observed to generally clear with each cycle.

At the East Manoa Road/Oahu Avenue intersection, various movements are anticipated to operate at LOS E during the AM peak hour, and during the PM peak hour, the eastbound approach operates at LOS F and overcapacity conditions; however physical obstructions such as large trees and homes at all four corners of the intersection makes widening improvements likely not feasible. Signal timing improvements would help balance the delay across the approaches of the intersection and reduce the disproportionate eastbound delay.

## 6.2 Base Year Conditions

Based upon projections from the Oahu Metropolitan Organization Long Range Plan for 2040, a defacto annual growth rate of 0.08% per year was applied along East Manoa Road and Woodlawn Drive, and a growth rate of 0.20% per year was applied along Oahu Avenue. There are no known planned background developments or roadway improvements in the study area.

With the inclusion of defacto growth, it is anticipated that most movements across the study network will operate similarly to Existing conditions. With signal timing modifications at the East Manoa Road/Oahu Avenue intersection to balance capacity, the eastbound approach can operate with at-capacity conditions, though other movements are anticipated to operate at LOS E/F but will continue to operate under capacity. As previously described, due to large trees and homes on all four corners of the intersection, physical widening improvements are likely not feasible.

## 6.3 Future Year Conditions

In total, the Project is anticipated to generate 64(76) trips during the AM(PM) peak hours, with the residential component accounting for 56(49) of these trips.

For the residential portion of the project, two (2) Access Options were studied:

- Access Option 1: Access for Phase 1 will be from the existing westernmost driveway. Access for Phase 2 will be from the existing west-central driveway. Access for Phases 3 & 4 will be from the existing east-central driveway which currently also serves the cemetery. Figure 5.1 illustrates Access Option 1.
- Access Option 2: Access for Phase 1 will be from the existing westernmost driveway. Access for Phase 2 will be from the existing west-central driveway. Access for Phases 3 & 4 will be from either the existing east-central driveway which currently also serves the cemetery OR a new Project driveway from Lower Road. Figure 5.2 illustrates Access Scenario 2.

With both Access Options, all movements at all study intersections are anticipated to operate at LOS B or better across both peak hours, with the exception of the East Manoa Road intersections with Kolowalu Road and Oahu Avenue.

At the East Manoa Road/Oahu Avenue intersection, During the AM and PM peak hours, various movements are anticipated to continue to operate at LOS E/F. During the PM peak hour, the eastbound approach is anticipated to experience an approximately 16-second increase over Base Year conditions and operate at LOS F and overcapacity conditions as it did with Existing and Base Year conditions. As previously described, the large trees and houses on all four corners of the intersection approach make physical widening improvements likely not feasible. During the critical PM peak hour, the Project is anticipated to add approximately 25 vehicles to the eastbound approach, or about one (1) car every two (2) minutes. In total, Project trips are anticipated to account for approximately 2.8%(4.4%) of traffic during the AM(PM) peak hours.

Overall, both Access Options are anticipated to have similar operations at all study intersections, with the exception of the East Manoa Road/Kolowalu Street intersection, where the northbound approach operates at LOS E(F) with Access Option 1 compared to LOS D(E) with Access Option 1; however the difference in delay is small – approximately 9(1) seconds during the AM(PM) peak hours – and therefore, neither Option 1 or Option 2 has a significant benefit over the other from a traffic operations standpoint.

# 7. RECOMMENDATIONS

- Coordinate with the City & County of Honolulu to determine if the two (2) bus stops fronting the Project on East Manoa Road should be relocated.
- At the East Manoa Road/Kolowalu Street and East Manoa Road/Oahu Avenue intersections, evaluate and optimize signal timing to maintain best-possible operations.

# 8. REFERENCES

1. City and County of Honolulu, TheBus Fares, *http://www.thebus.org/Fare/TheBusFares.asp*.

2. Department of Business, Economic Development & Tourism. Resident Population of Hawaii 1985-1900 by Single Year of Age (to 85+) and Sex. *http://census.hawaii.gov/home/population-estimate/*

3. Institute of Transportation Engineers, Trip Generation, 11th Edition, 2021.

4. Locations Hawaii. "Manoa Gardens Elderly Housing". *https://images.locationshawaii.com/Rentals/ManoaGardensBrochure.pdf*

5. OahuMPO, Oahu Regional Transportation Plan 2040, 2016.

6. Parsons Brinckerhoff Quade & Douglas, Inc., Traffic Impact Analysis for Manoa Valley District Park Improvement, 1999.

7. Transportation Research Board, Highway Capacity Manual, 6th Edition, 2016.

# APPENDICES

# APPENDIX A

## LOS CRITERIA

**LEVEL OF SERVICE (LOS) CRITERIA**

**VEHICULAR LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 6th Edition)**

Level of service for vehicles at signalized intersections is directly related to delay values and is assigned on that basis. Level of Service is a measure of the acceptability of delay values to motorists at a given intersection. The criteria are given in the table below.

Level-of Service Criteria for Signalized Intersections

| Level of Service | Control Delay per Vehicle (sec./veh.) |
|---|---|
| A | < 10.0 |
| B | >10.0 and ≤ 20.0 |
| C | >20.0 and ≤ 35.0 |
| D | >35.0 and ≤ 55.0 |
| E | >55.0 and ≤ 80.0 |
| F | > 80.0 |

Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group or approach in question.

**VEHICULAR LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS (HCM 6th Edition)**

The level of service criteria for vehicles at unsignalized intersections is defined as the average control delay, in seconds per vehicle.

LOS delay threshold values are lower for two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections than those of signalized intersections. This is because more vehicles pass through signalized intersections, and therefore, drivers expect and tolerate greater delays. While the criteria for level of service for TWSC and AWSC intersections are the same, procedures to calculate the average total delay may differ.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

| Level of Service | Average Control Delay (sec/veh) |
|---|---|
| A | ≤ 10 |
| B | >10 and ≤15 |
| C | >15 and ≤25 |
| D | >25 and ≤35 |
| E | >35 and ≤50 |
| F | > 50 |

# APPENDIX B

## TRAFFIC COUNT DATA

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : Oahu Ave - East Manoa Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

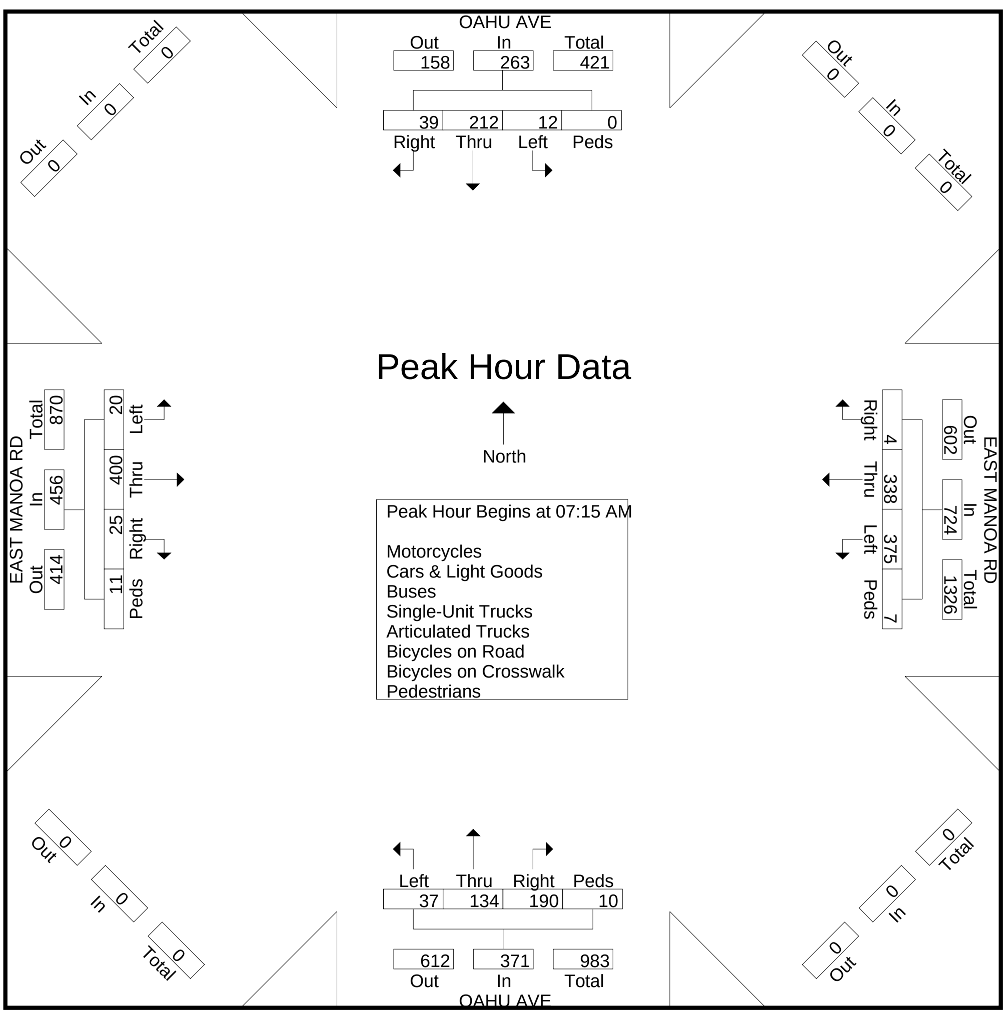
| | OAHU AVE Southbound | | | | EAST MANOA RD Westbound | | | | OAHU AVE Northbound | | | | EAST MANOA RD Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 06:30 AM | 0 | 24 | 10 | 0 | 45 | 48 | 0 | 1 | 1 | 8 | 27 | 2 | 1 | 37 | 1 | 2 | 207 |
| 06:45 AM | 1 | 33 | 3 | 0 | 61 | 53 | 0 | 0 | 2 | 16 | 22 | 0 | 3 | 59 | 3 | 2 | 258 |
| Total | 1 | 57 | 13 | 0 | 106 | 101 | 0 | 1 | 3 | 24 | 49 | 2 | 4 | 96 | 4 | 4 | 465 |
| 07:00 AM | 2 | 66 | 7 | 0 | 55 | 48 | 0 | 0 | 4 | 22 | 51 | 1 | 4 | 70 | 4 | 3 | 337 |
| 07:15 AM | 3 | 59 | 9 | 0 | 97 | 71 | 1 | 1 | 12 | 12 | 40 | 2 | 3 | 76 | 2 | 4 | 392 |
| 07:30 AM | 4 | 70 | 17 | 0 | 99 | 86 | 0 | 3 | 10 | 21 | 34 | 3 | 4 | 109 | 9 | 4 | 473 |
| 07:45 AM | 3 | 47 | 6 | 0 | 98 | 102 | 3 | 1 | 9 | 49 | 60 | 4 | 8 | 107 | 4 | 1 | 502 |
| Total | 12 | 242 | 39 | 0 | 349 | 307 | 4 | 5 | 35 | 104 | 185 | 10 | 19 | 362 | 19 | 12 | 1704 |
| 08:00 AM | 2 | 36 | 7 | 0 | 81 | 79 | 0 | 2 | 6 | 52 | 56 | 1 | 5 | 108 | 10 | 2 | 447 |
| 08:15 AM | 1 | 38 | 9 | 0 | 79 | 61 | 2 | 0 | 5 | 42 | 53 | 0 | 5 | 88 | 3 | 0 | 386 |
| Grand Total | 16 | 373 | 68 | 0 | 615 | 548 | 6 | 8 | 49 | 222 | 343 | 13 | 33 | 654 | 36 | 18 | 3002 |
| Apprch % | 3.5 | 81.6 | 14.9 | 0 | 52.3 | 46.6 | 0.5 | 0.7 | 7.8 | 35.4 | 54.7 | 2.1 | 4.5 | 88.3 | 4.9 | 2.4 | |
| Total % | 0.5 | 12.4 | 2.3 | 0 | 20.5 | 18.3 | 0.2 | 0.3 | 1.6 | 7.4 | 11.4 | 0.4 | 1.1 | 21.8 | 1.2 | 0.6 | |
| Motorcycles | 0 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 5 | 0 | 0 | 13 |
| % Motorcycles | 0 | 0.5 | 0 | 0 | 0.2 | 0.2 | 0 | 0 | 2 | 0.5 | 0.6 | 0 | 0 | 0.8 | 0 | 0 | 0.4 |
| Cars & Light Goods | 16 | 368 | 62 | 0 | 602 | 539 | 6 | 0 | 48 | 216 | 327 | 0 | 31 | 644 | 36 | 0 | 2895 |
| % Cars & Light Goods | 100 | 98.7 | 91.2 | 0 | 97.9 | 98.4 | 100 | 0 | 98 | 97.3 | 95.3 | 0 | 93.9 | 98.5 | 100 | 0 | 96.4 |
| Buses | 0 | 0 | 4 | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 2 | 2 | 0 | 0 | 19 |
| % Buses | 0 | 0 | 5.9 | 0 | 0.8 | 0 | 0 | 0 | 0 | 0.5 | 1.5 | 0 | 6.1 | 0.3 | 0 | 0 | 0.6 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 5 | 5 | 0 | 0 | 0 | 2 | 8 | 0 | 0 | 3 | 0 | 0 | 23 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0.8 | 0.9 | 0 | 0 | 0 | 0.9 | 2.3 | 0 | 0 | 0.5 | 0 | 0 | 0.8 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| Bicycles on Road | 0 | 3 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| % Bicycles on Road | 0 | 0.8 | 2.9 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 18 | 39 |
| % Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 1.3 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : Oahu Ave - East Manoa Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 2

| | OAHU AVE Southbound | | | | | EAST MANOA RD Westbound | | | | | OAHU AVE Northbound | | | | | EAST MANOA RD Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:15 AM | | | | | | | | | | | | | | | | | | | | | |
| 07:15 AM | 3 | 59 | 9 | 0 | 71 | 97 | 71 | 1 | 1 | 170 | **12** | 12 | 40 | 2 | 66 | 3 | 76 | 2 | **4** | 85 | 392 |
| 07:30 AM | **4** | **70** | **17** | 0 | **91** | **99** | 86 | 0 | **3** | 188 | 10 | 21 | 34 | 3 | 68 | 4 | **109** | 9 | 4 | **126** | 473 |
| 07:45 AM | 3 | 47 | 6 | 0 | 56 | 98 | **102** | **3** | 1 | **204** | 9 | 49 | **60** | **4** | **122** | **8** | 107 | 4 | 1 | 120 | **502** |
| 08:00 AM | 2 | 36 | 7 | 0 | 45 | 81 | 79 | 0 | 2 | 162 | 6 | **52** | 56 | 1 | 115 | 5 | 108 | **10** | 2 | 125 | 447 |
| Total Volume | 12 | 212 | 39 | 0 | 263 | 375 | 338 | 4 | 7 | 724 | 37 | 134 | 190 | 10 | 371 | 20 | 400 | 25 | 11 | 456 | 1814 |
| % App. Total | 4.6 | 80.6 | 14.8 | 0 | | 51.8 | 46.7 | 0.6 | 1 | | 10 | 36.1 | 51.2 | 2.7 | | 4.4 | 87.7 | 5.5 | 2.4 | | |
| PHF | .750 | .757 | .574 | .000 | .723 | .947 | .828 | .333 | .583 | .887 | .771 | .644 | .792 | .625 | .760 | .625 | .917 | .625 | .688 | .905 | .903 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : Oahu Ave - East Manoa Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

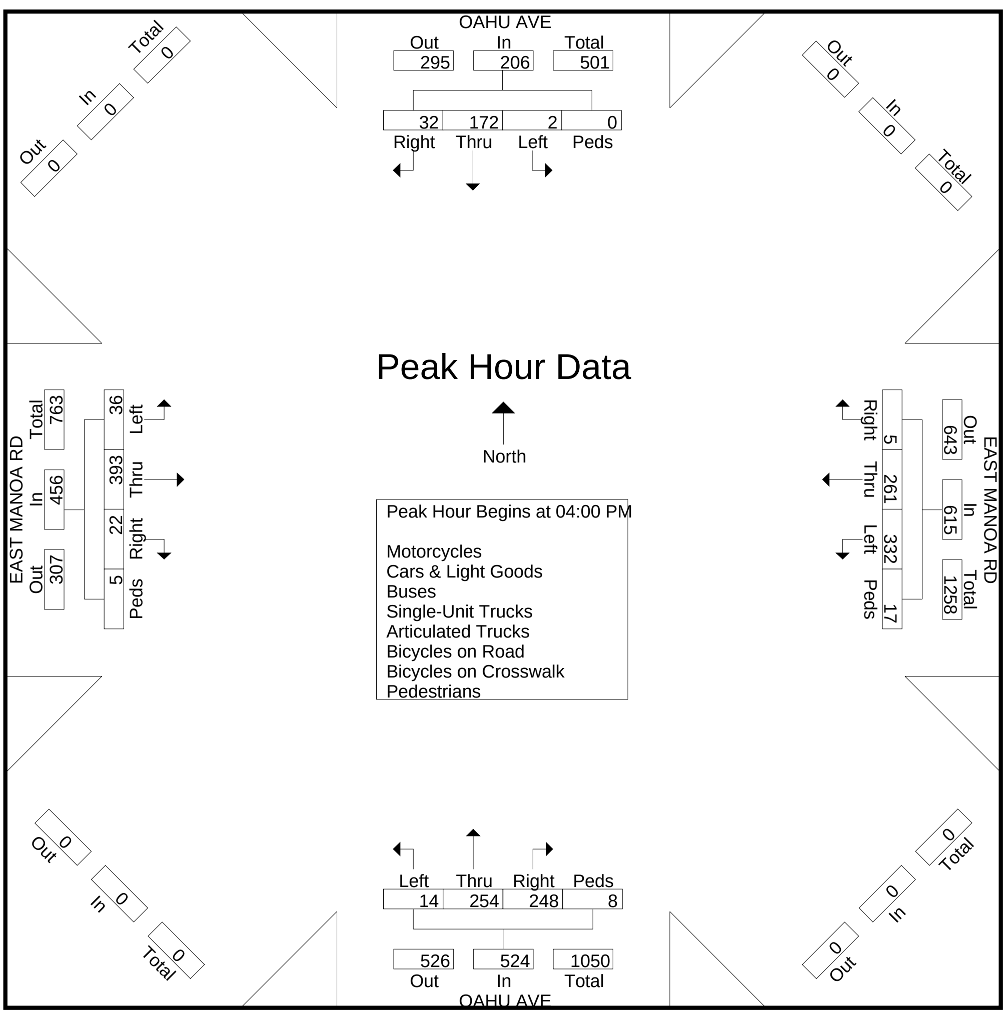
| | OAHU AVE Southbound | | | | EAST MANOA RD Westbound | | | | OAHU AVE Northbound | | | | EAST MANOA RD Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 03:30 PM | 1 | 50 | 7 | 0 | 77 | 89 | 1 | 1 | 6 | 44 | 72 | 0 | 7 | 97 | 2 | 0 | 454 |
| 03:45 PM | 0 | 38 | 7 | 0 | 92 | 70 | 4 | 2 | 4 | 44 | 66 | 1 | 6 | 126 | 5 | 0 | 465 |
| Total | 1 | 88 | 14 | 0 | 169 | 159 | 5 | 3 | 10 | 88 | 138 | 1 | 13 | 223 | 7 | 0 | 919 |
| | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 48 | 6 | 0 | 85 | 72 | 4 | 2 | 4 | 51 | 51 | 0 | 9 | 102 | 7 | 0 | 441 |
| 04:15 PM | 1 | 38 | 11 | 0 | 96 | 68 | 1 | 1 | 5 | 68 | 70 | 2 | 13 | 95 | 4 | 2 | 475 |
| 04:30 PM | 1 | 46 | 9 | 0 | 82 | 68 | 0 | 6 | 1 | 59 | 60 | 5 | 8 | 93 | 6 | 3 | 447 |
| 04:45 PM | 0 | 40 | 6 | 0 | 69 | 53 | 0 | 8 | 4 | 76 | 67 | 1 | 6 | 103 | 5 | 0 | 438 |
| Total | 2 | 172 | 32 | 0 | 332 | 261 | 5 | 17 | 14 | 254 | 248 | 8 | 36 | 393 | 22 | 5 | 1801 |
| | | | | | | | | | | | | | | | | | |
| 05:00 PM | 0 | 59 | 4 | 0 | 103 | 80 | 4 | 8 | 5 | 54 | 65 | 0 | 8 | 126 | 3 | 2 | 521 |
| 05:15 PM | 0 | 52 | 4 | 0 | 77 | 69 | 0 | 3 | 3 | 47 | 54 | 5 | 16 | 123 | 4 | 4 | 461 |
| Grand Total | 3 | 371 | 54 | 0 | 681 | 569 | 14 | 31 | 32 | 443 | 505 | 14 | 73 | 865 | 36 | 11 | 3702 |
| Apprch % | 0.7 | 86.7 | 12.6 | 0 | 52.6 | 43.9 | 1.1 | 2.4 | 3.2 | 44.6 | 50.8 | 1.4 | 7.4 | 87.8 | 3.7 | 1.1 | |
| Total % | 0.1 | 10 | 1.5 | 0 | 18.4 | 15.4 | 0.4 | 0.8 | 0.9 | 12 | 13.6 | 0.4 | 2 | 23.4 | 1 | 0.3 | |
| Motorcycles | 0 | 6 | 1 | 0 | 6 | 5 | 0 | 0 | 1 | 8 | 2 | 0 | 0 | 6 | 0 | 0 | 35 |
| % Motorcycles | 0 | 1.6 | 1.9 | 0 | 0.9 | 0.9 | 0 | 0 | 3.1 | 1.8 | 0.4 | 0 | 0 | 0.7 | 0 | 0 | 0.9 |
| Cars & Light Goods | 3 | 362 | 51 | 0 | 664 | 555 | 14 | 0 | 30 | 430 | 488 | 0 | 69 | 855 | 36 | 0 | 3557 |
| % Cars & Light Goods | 100 | 97.6 | 94.4 | 0 | 97.5 | 97.5 | 100 | 0 | 93.8 | 97.1 | 96.6 | 0 | 94.5 | 98.8 | 100 | 0 | 96.1 |
| Buses | 0 | 1 | 2 | 0 | 5 | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 3 | 0 | 0 | 0 | 19 |
| % Buses | 0 | 0.3 | 3.7 | 0 | 0.7 | 0.7 | 0 | 0 | 0 | 0 | 0.8 | 0 | 4.1 | 0 | 0 | 0 | 0.5 |
| Single-Unit Trucks | 0 | 2 | 0 | 0 | 5 | 4 | 0 | 0 | 1 | 1 | 6 | 0 | 0 | 1 | 0 | 0 | 20 |
| % Single-Unit Trucks | 0 | 0.5 | 0 | 0 | 0.7 | 0.7 | 0 | 0 | 3.1 | 0.2 | 1.2 | 0 | 0 | 0.1 | 0 | 0 | 0.5 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 3 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 | 0 | 0.1 | 0 | 0 | 0.1 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 4 | 4 | 0 | 1 | 2 | 0 | 0 | 12 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 | 0 | 0 | 0.9 | 0.8 | 0 | 1.4 | 0.2 | 0 | 0 | 0.3 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9.1 | 0.1 |
| Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 10 | 54 |
| % Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96.8 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 90.9 | 1.5 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : Oahu Ave - East Manoa Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | OAHU AVE Southbound | | | | | EAST MANOA RD Westbound | | | | | OAHU AVE Northbound | | | | | EAST MANOA RD Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:00 PM | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | **48** | 6 | 0 | 54 | 85 | **72** | **4** | 2 | 163 | 4 | 51 | 51 | 0 | 106 | 9 | 102 | **7** | 0 | **118** | 441 |
| 04:15 PM | **1** | 38 | **11** | 0 | 50 | **96** | 68 | 1 | 1 | **166** | **5** | 68 | **70** | 2 | 145 | **13** | 95 | 4 | 2 | 114 | **475** |
| 04:30 PM | 1 | 46 | 9 | 0 | **56** | 82 | 68 | 0 | 6 | 156 | 1 | 59 | 60 | **5** | 125 | 8 | 93 | 6 | **3** | 110 | 447 |
| 04:45 PM | 0 | 40 | 6 | 0 | 46 | 69 | 53 | 0 | **8** | 130 | 4 | **76** | 67 | 1 | **148** | 6 | **103** | 5 | 0 | 114 | 438 |
| Total Volume | 2 | 172 | 32 | 0 | 206 | 332 | 261 | 5 | 17 | 615 | 14 | 254 | 248 | 8 | 524 | 36 | 393 | 22 | 5 | 456 | 1801 |
| % App. Total | 1 | 83.5 | 15.5 | 0 | | 54 | 42.4 | 0.8 | 2.8 | | 2.7 | 48.5 | 47.3 | 1.5 | | 7.9 | 86.2 | 4.8 | 1.1 | | |
| PHF | .500 | .896 | .727 | .000 | .920 | .865 | .906 | .313 | .531 | .926 | .700 | .836 | .886 | .400 | .885 | .692 | .954 | .786 | .417 | .966 | .948 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : East Manoa Rd - Kolowalu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

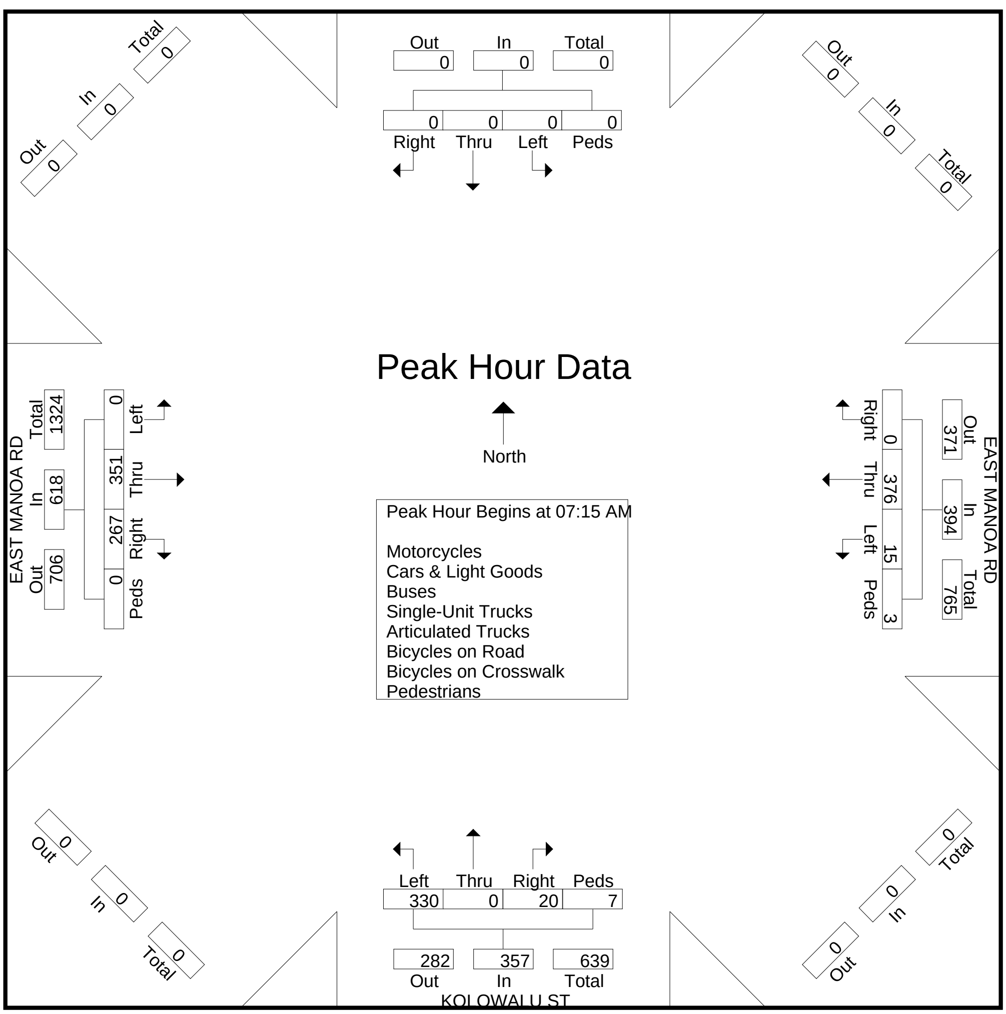
| | Southbound | | | | EAST MANOA RD Westbound | | | | KOLOWALU ST Northbound | | | | EAST MANOA RD Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 06:30 AM | 0 | 0 | 0 | 0 | 1 | 56 | 0 | 0 | 35 | 0 | 2 | 3 | 0 | 59 | 12 | 0 | 168 |
| 06:45 AM | 0 | 0 | 0 | 0 | 1 | 78 | 0 | 0 | 35 | 0 | 2 | 1 | 0 | 64 | 24 | 0 | 205 |
| Total | 0 | 0 | 0 | 0 | 2 | 134 | 0 | 0 | 70 | 0 | 4 | 4 | 0 | 123 | 36 | 0 | 373 |
| | | | | | | | | | | | | | | | | | |
| 07:00 AM | 0 | 0 | 0 | 0 | 1 | 68 | 0 | 0 | 43 | 0 | 1 | 1 | 0 | 77 | 42 | 0 | 233 |
| 07:15 AM | 0 | 0 | 0 | 0 | 4 | 85 | 0 | 0 | 78 | 0 | 4 | 0 | 0 | 78 | 53 | 0 | 302 |
| 07:30 AM | 0 | 0 | 0 | 0 | 5 | 96 | 0 | 0 | 93 | 0 | 5 | 3 | 0 | 63 | 82 | 0 | 347 |
| 07:45 AM | 0 | 0 | 0 | 0 | 3 | 92 | 0 | 3 | 96 | 0 | 6 | 3 | 0 | 97 | 79 | 0 | 379 |
| Total | 0 | 0 | 0 | 0 | 13 | 341 | 0 | 3 | 310 | 0 | 16 | 7 | 0 | 315 | 256 | 0 | 1261 |
| | | | | | | | | | | | | | | | | | |
| 08:00 AM | 0 | 0 | 0 | 0 | 3 | 103 | 0 | 0 | 63 | 0 | 5 | 1 | 0 | 113 | 53 | 0 | 341 |
| 08:15 AM | 0 | 0 | 0 | 0 | 4 | 83 | 0 | 0 | 55 | 0 | 2 | 2 | 0 | 100 | 34 | 0 | 280 |
| Grand Total | 0 | 0 | 0 | 0 | 22 | 661 | 0 | 3 | 498 | 0 | 27 | 14 | 0 | 651 | 379 | 0 | 2255 |
| Apprch % | 0 | 0 | 0 | 0 | 3.2 | 96.4 | 0 | 0.4 | 92.4 | 0 | 5 | 2.6 | 0 | 63.2 | 36.8 | 0 | |
| Total % | 0 | 0 | 0 | 0 | 1 | 29.3 | 0 | 0.1 | 22.1 | 0 | 1.2 | 0.6 | 0 | 28.9 | 16.8 | 0 | |
| Motorcycles | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 2 | 0 | 11 |
| % Motorcycles | 0 | 0 | 0 | 0 | 4.5 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.9 | 0.5 | 0 | 0.5 |
| Cars & Light Goods | 0 | 0 | 0 | 0 | 21 | 650 | 0 | 0 | 486 | 0 | 26 | 0 | 0 | 636 | 367 | 0 | 2186 |
| % Cars & Light Goods | 0 | 0 | 0 | 0 | 95.5 | 98.3 | 0 | 0 | 97.6 | 0 | 96.3 | 0 | 0 | 97.7 | 96.8 | 0 | 96.9 |
| Buses | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 5 | 1 | 0 | 12 |
| % Buses | 0 | 0 | 0 | 0 | 0 | 0.8 | 0 | 0 | 0 | 0 | 3.7 | 0 | 0 | 0.8 | 0.3 | 0 | 0.5 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 3 | 8 | 0 | 21 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 1.6 | 0 | 0 | 0 | 0 | 0.5 | 2.1 | 0 | 0.9 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0.2 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 0.2 | 0 | 0 | 0 | 0 | 0.2 | 0 | 0 | 0.2 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7.1 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 16 |
| % Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 92.9 | 0 | 0 | 0 | 0 | 0.7 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : East Manoa Rd - Kolowalu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | Southbound | | | | | EAST MANOA RD Westbound | | | | | KOLOWALU ST Northbound | | | | | EAST MANOA RD Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:15 AM | | | | | | | | | | | | | | | | | | | | | |
| 07:15 AM | 0 | 0 | 0 | 0 | 0 | 4 | 85 | 0 | 0 | 89 | 78 | 0 | 4 | 0 | 82 | 0 | 78 | 53 | 0 | 131 | 302 |
| 07:30 AM | 0 | 0 | 0 | 0 | 0 | **5** | 96 | 0 | 0 | 101 | 93 | 0 | 5 | **3** | 101 | 0 | 63 | **82** | 0 | 145 | 347 |
| 07:45 AM | 0 | 0 | 0 | 0 | 0 | 3 | 92 | 0 | **3** | 98 | **96** | 0 | **6** | 3 | **105** | 0 | 97 | 79 | 0 | **176** | **379** |
| 08:00 AM | 0 | 0 | 0 | 0 | 0 | 3 | **103** | 0 | 0 | **106** | 63 | 0 | 5 | 1 | 69 | 0 | **113** | 53 | 0 | 166 | 341 |
| Total Volume | 0 | 0 | 0 | 0 | 0 | 15 | 376 | 0 | 3 | 394 | 330 | 0 | 20 | 7 | 357 | 0 | 351 | 267 | 0 | 618 | 1369 |
| % App. Total | 0 | 0 | 0 | 0 | | 3.8 | 95.4 | 0 | 0.8 | | 92.4 | 0 | 5.6 | 2 | | 0 | 56.8 | 43.2 | 0 | | |
| PHF | .000 | .000 | .000 | .000 | .000 | .750 | .913 | .000 | .250 | .929 | .859 | .000 | .833 | .583 | .850 | .000 | .777 | .814 | .000 | .878 | .903 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : East Manoa Rd - Kolowalu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

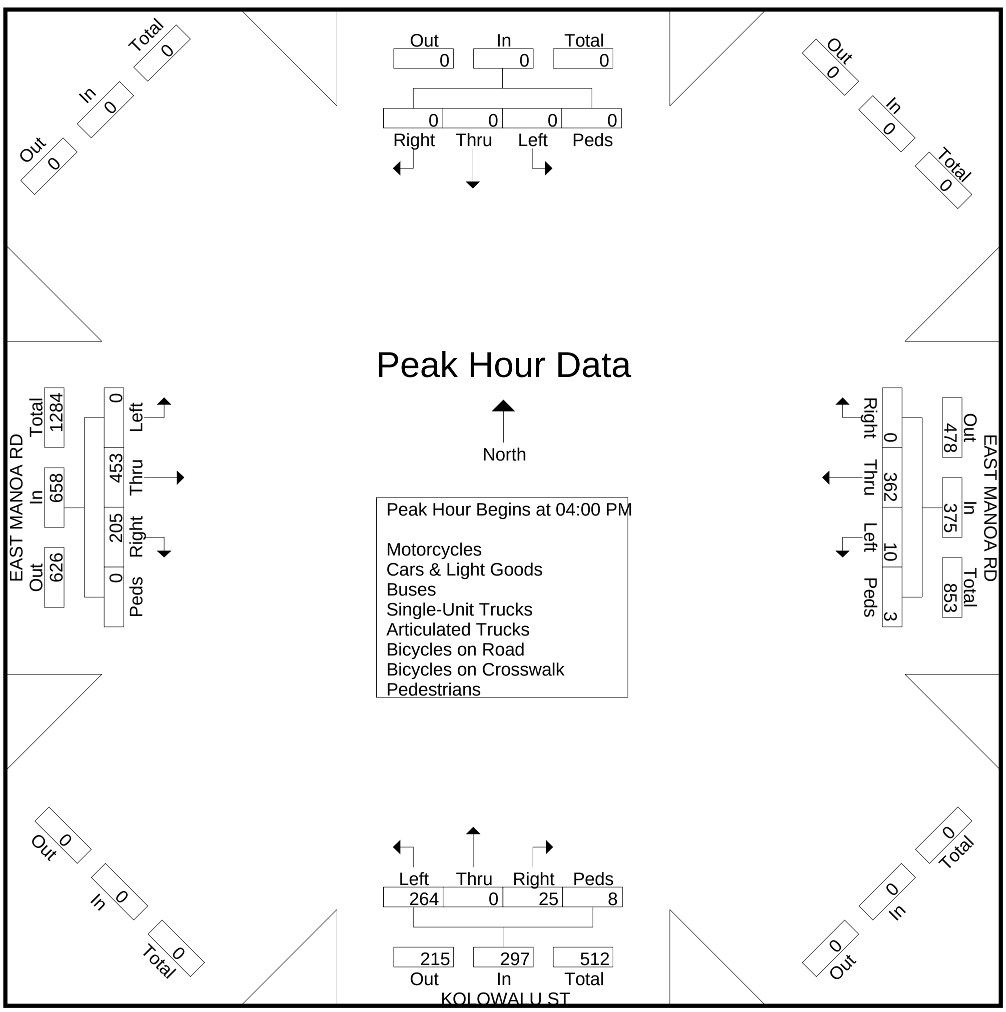
| | Southbound | | | | EAST MANOA RD Westbound | | | | KOLOWALU ST Northbound | | | | EAST MANOA RD Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 03:30 PM | 0 | 0 | 0 | 0 | 0 | 101 | 0 | 1 | 78 | 0 | 6 | 8 | 0 | 113 | 49 | 0 | 356 |
| 03:45 PM | 0 | 0 | 0 | 0 | 7 | 98 | 0 | 0 | 54 | 0 | 7 | 1 | 0 | 137 | 59 | 0 | 363 |
| Total | 0 | 0 | 0 | 0 | 7 | 199 | 0 | 1 | 132 | 0 | 13 | 9 | 0 | 250 | 108 | 0 | 719 |
| | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 0 | 0 | 0 | 1 | 97 | 0 | 0 | 78 | 0 | 6 | 1 | 0 | 100 | 44 | 0 | 327 |
| 04:15 PM | 0 | 0 | 0 | 0 | 1 | 99 | 0 | 1 | 67 | 0 | 8 | 3 | 0 | 114 | 55 | 0 | 348 |
| 04:30 PM | 0 | 0 | 0 | 0 | 3 | 85 | 0 | 2 | 54 | 0 | 4 | 2 | 0 | 111 | 49 | 0 | 310 |
| 04:45 PM | 0 | 0 | 0 | 0 | 5 | 81 | 0 | 0 | 65 | 0 | 7 | 2 | 0 | 128 | 57 | 0 | 345 |
| Total | 0 | 0 | 0 | 0 | 10 | 362 | 0 | 3 | 264 | 0 | 25 | 8 | 0 | 453 | 205 | 0 | 1330 |
| | | | | | | | | | | | | | | | | | |
| 05:00 PM | 0 | 0 | 0 | 0 | 0 | 104 | 0 | 1 | 68 | 0 | 7 | 2 | 0 | 139 | 63 | 0 | 384 |
| 05:15 PM | 0 | 0 | 0 | 0 | 4 | 93 | 0 | 0 | 62 | 0 | 2 | 8 | 0 | 113 | 69 | 0 | 351 |
| Grand Total | 0 | 0 | 0 | 0 | 21 | 758 | 0 | 5 | 526 | 0 | 47 | 27 | 0 | 955 | 445 | 0 | 2784 |
| Apprch % | 0 | 0 | 0 | 0 | 2.7 | 96.7 | 0 | 0.6 | 87.7 | 0 | 7.8 | 4.5 | 0 | 68.2 | 31.8 | 0 | |
| Total % | 0 | 0 | 0 | 0 | 0.8 | 27.2 | 0 | 0.2 | 18.9 | 0 | 1.7 | 1 | 0 | 34.3 | 16 | 0 | |
| Motorcycles | 0 | 0 | 0 | 0 | 1 | 9 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 14 | 2 | 0 | 30 |
| % Motorcycles | 0 | 0 | 0 | 0 | 4.8 | 1.2 | 0 | 0 | 0.6 | 0 | 2.1 | 0 | 0 | 1.5 | 0.4 | 0 | 1.1 |
| Cars & Light Goods | 0 | 0 | 0 | 0 | 20 | 735 | 0 | 0 | 515 | 0 | 44 | 0 | 0 | 930 | 441 | 0 | 2685 |
| % Cars & Light Goods | 0 | 0 | 0 | 0 | 95.2 | 97 | 0 | 0 | 97.9 | 0 | 93.6 | 0 | 0 | 97.4 | 99.1 | 0 | 96.4 |
| Buses | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 13 |
| % Buses | 0 | 0 | 0 | 0 | 0 | 0.9 | 0 | 0 | 0.2 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0.5 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 13 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0.3 | 0.2 | 0 | 0.5 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 4 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 0.1 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 7 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 0.4 | 0 | 4.3 | 0 | 0 | 0 | 0.2 | 0 | 0.3 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 27 | 0 | 0 | 0 | 0 | 32 |
| % Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 1.1 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : East Manoa Rd - Kolowalu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 2

| | Southbound | | | | | EAST MANOA RD Westbound | | | | | KOLOWALU ST Northbound | | | | | EAST MANOA RD Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:00 PM | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 0 | 0 | 0 | 0 | 1 | 97 | 0 | 0 | 98 | **78** | 0 | 6 | 1 | **85** | 0 | 100 | 44 | 0 | 144 | 327 |
| 04:15 PM | 0 | 0 | 0 | 0 | 0 | 1 | **99** | 0 | 1 | **101** | 67 | 0 | **8** | **3** | 78 | 0 | 114 | 55 | 0 | 169 | **348** |
| 04:30 PM | 0 | 0 | 0 | 0 | 0 | 3 | 85 | 0 | **2** | 90 | 54 | 0 | 4 | 2 | 60 | 0 | 111 | 49 | 0 | 160 | 310 |
| 04:45 PM | 0 | 0 | 0 | 0 | 0 | **5** | 81 | 0 | 0 | 86 | 65 | 0 | 7 | 2 | 74 | 0 | **128** | **57** | 0 | **185** | 345 |
| Total Volume | 0 | 0 | 0 | 0 | 0 | 10 | 362 | 0 | 3 | 375 | 264 | 0 | 25 | 8 | 297 | 0 | 453 | 205 | 0 | 658 | 1330 |
| % App. Total | 0 | 0 | 0 | 0 | | 2.7 | 96.5 | 0 | 0.8 | | 88.9 | 0 | 8.4 | 2.7 | | 0 | 68.8 | 31.2 | 0 | | |
| PHF | .000 | .000 | .000 | .000 | .000 | .500 | .914 | .000 | .375 | .928 | .846 | .000 | .781 | .667 | .874 | .000 | .885 | .899 | .000 | .889 | .955 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : East Manoa Rd - Lowrey Ave
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

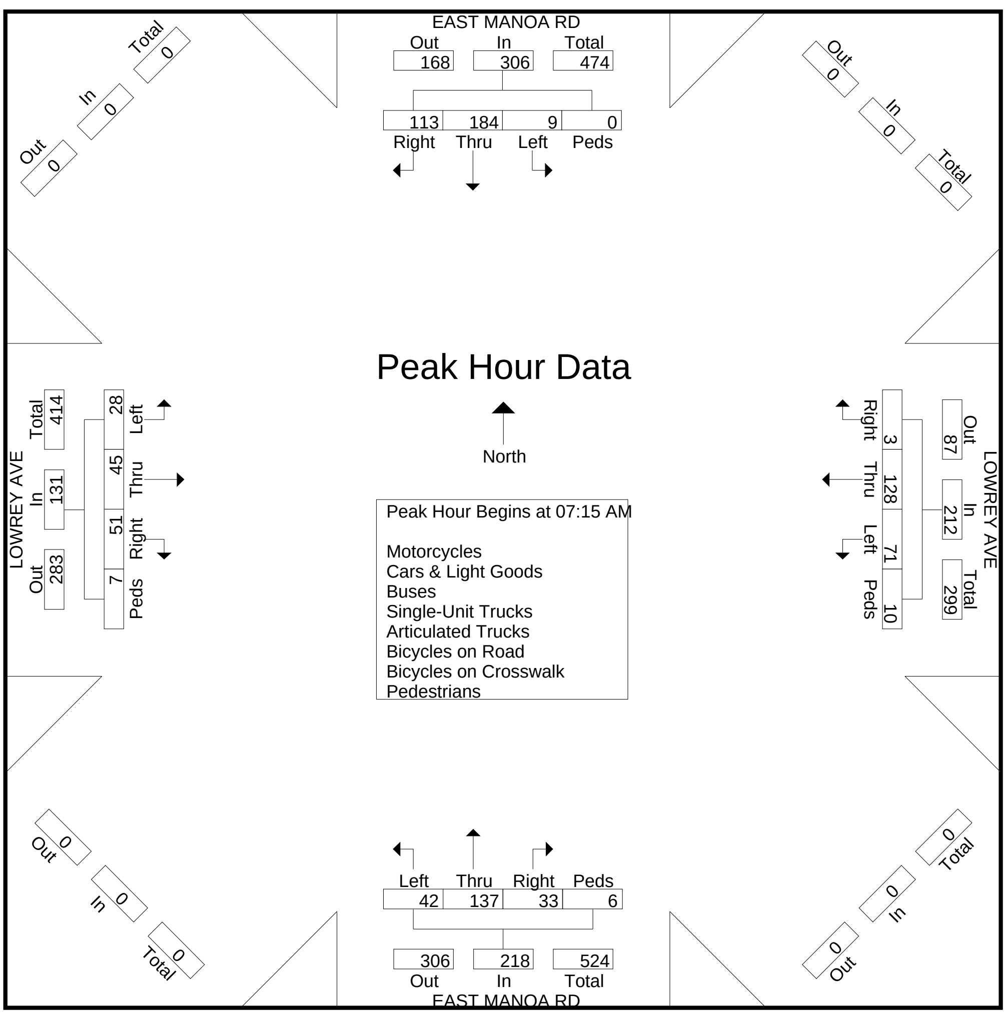
| | EAST MANOA RD Southbound | | | | LOWREY AVE Westbound | | | | EAST MANOA RD Northbound | | | | LOWREY AVE Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 06:30 AM | 0 | 27 | 13 | 0 | 7 | 14 | 0 | 6 | 5 | 16 | 8 | 0 | 2 | 3 | 6 | 0 | 107 |
| 06:45 AM | 0 | 36 | 22 | 0 | 8 | 21 | 1 | 5 | 10 | 21 | 3 | 1 | 1 | 2 | 11 | 0 | 142 |
| Total | 0 | 63 | 35 | 0 | 15 | 35 | 1 | 11 | 15 | 37 | 11 | 1 | 3 | 5 | 17 | 0 | 249 |
| | | | | | | | | | | | | | | | | | |
| 07:00 AM | 2 | 38 | 22 | 0 | 7 | 30 | 3 | 2 | 10 | 24 | 12 | 1 | 2 | 2 | 4 | 0 | 159 |
| 07:15 AM | 2 | 46 | 39 | 0 | 13 | 28 | 1 | 1 | 7 | 28 | 4 | 0 | 4 | 5 | 5 | 2 | 185 |
| 07:30 AM | 2 | 46 | 28 | 0 | 22 | 44 | 1 | 3 | 13 | 21 | 8 | 3 | 4 | 12 | 11 | 1 | 219 |
| 07:45 AM | 3 | 43 | 27 | 0 | 20 | 31 | 1 | 1 | 9 | 41 | 9 | 2 | 8 | 10 | 19 | 3 | 227 |
| Total | 9 | 173 | 116 | 0 | 62 | 133 | 6 | 7 | 39 | 114 | 33 | 6 | 18 | 29 | 39 | 6 | 790 |
| | | | | | | | | | | | | | | | | | |
| 08:00 AM | 2 | 49 | 19 | 0 | 16 | 25 | 0 | 5 | 13 | 47 | 12 | 1 | 12 | 18 | 16 | 1 | 236 |
| 08:15 AM | 2 | 35 | 10 | 1 | 7 | 13 | 0 | 2 | 20 | 33 | 12 | 2 | 5 | 7 | 16 | 1 | 166 |
| Grand Total | 13 | 320 | 180 | 1 | 100 | 206 | 7 | 25 | 87 | 231 | 68 | 10 | 38 | 59 | 88 | 8 | 1441 |
| Apprch % | 2.5 | 62.3 | 35 | 0.2 | 29.6 | 60.9 | 2.1 | 7.4 | 22 | 58.3 | 17.2 | 2.5 | 19.7 | 30.6 | 45.6 | 4.1 | |
| Total % | 0.9 | 22.2 | 12.5 | 0.1 | 6.9 | 14.3 | 0.5 | 1.7 | 6 | 16 | 4.7 | 0.7 | 2.6 | 4.1 | 6.1 | 0.6 | |
| Motorcycles | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 7 |
| % Motorcycles | 0 | 0.3 | 0.6 | 0 | 1 | 0.5 | 0 | 0 | 0 | 0.9 | 1.5 | 0 | 0 | 0 | 0 | 0 | 0.5 |
| Cars & Light Goods | 13 | 313 | 179 | 0 | 98 | 204 | 6 | 0 | 87 | 221 | 67 | 0 | 38 | 58 | 87 | 0 | 1371 |
| % Cars & Light Goods | 100 | 97.8 | 99.4 | 0 | 98 | 99 | 85.7 | 0 | 100 | 95.7 | 98.5 | 0 | 100 | 98.3 | 98.9 | 0 | 95.1 |
| Buses | 0 | 6 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 1 | 0 | 15 |
| % Buses | 0 | 1.9 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 1.1 | 0 | 1 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 14.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.7 | 0 | 0 | 0.1 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| Pedestrians | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 8 | 43 |
| % Pedestrians | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 96 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 3 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : East Manoa Rd - Lowrey Ave
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | EAST MANOA RD Southbound | | | | | LOWREY AVE Westbound | | | | | EAST MANOA RD Northbound | | | | | LOWREY AVE Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:15 AM | | | | | | | | | | | | | | | | | | | | | |
| 07:15 AM | 2 | 46 | **39** | 0 | **87** | 13 | 28 | **1** | 1 | 43 | 7 | 28 | 4 | 0 | 39 | 4 | 5 | 5 | 2 | 16 | 185 |
| 07:30 AM | 2 | 46 | 28 | 0 | 76 | **22** | **44** | 1 | 3 | **70** | **13** | 21 | 8 | **3** | 45 | 4 | 12 | 11 | 1 | 28 | 219 |
| 07:45 AM | **3** | 43 | 27 | 0 | 73 | 20 | 31 | 1 | 1 | 53 | 9 | 41 | 9 | 2 | 61 | 8 | 10 | **19** | **3** | 40 | 227 |
| 08:00 AM | 2 | **49** | 19 | 0 | 70 | 16 | 25 | 0 | **5** | 46 | 13 | **47** | **12** | 1 | **73** | **12** | **18** | 16 | 1 | **47** | **236** |
| Total Volume | 9 | 184 | 113 | 0 | 306 | 71 | 128 | 3 | 10 | 212 | 42 | 137 | 33 | 6 | 218 | 28 | 45 | 51 | 7 | 131 | 867 |
| % App. Total | 2.9 | 60.1 | 36.9 | 0 | | 33.5 | 60.4 | 1.4 | 4.7 | | 19.3 | 62.8 | 15.1 | 2.8 | | 21.4 | 34.4 | 38.9 | 5.3 | | |
| PHF | .750 | .939 | .724 | .000 | .879 | .807 | .727 | .750 | .500 | .757 | .808 | .729 | .688 | .500 | .747 | .583 | .625 | .671 | .583 | .697 | .918 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : East Manoa Rd - Lowrey Ave
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

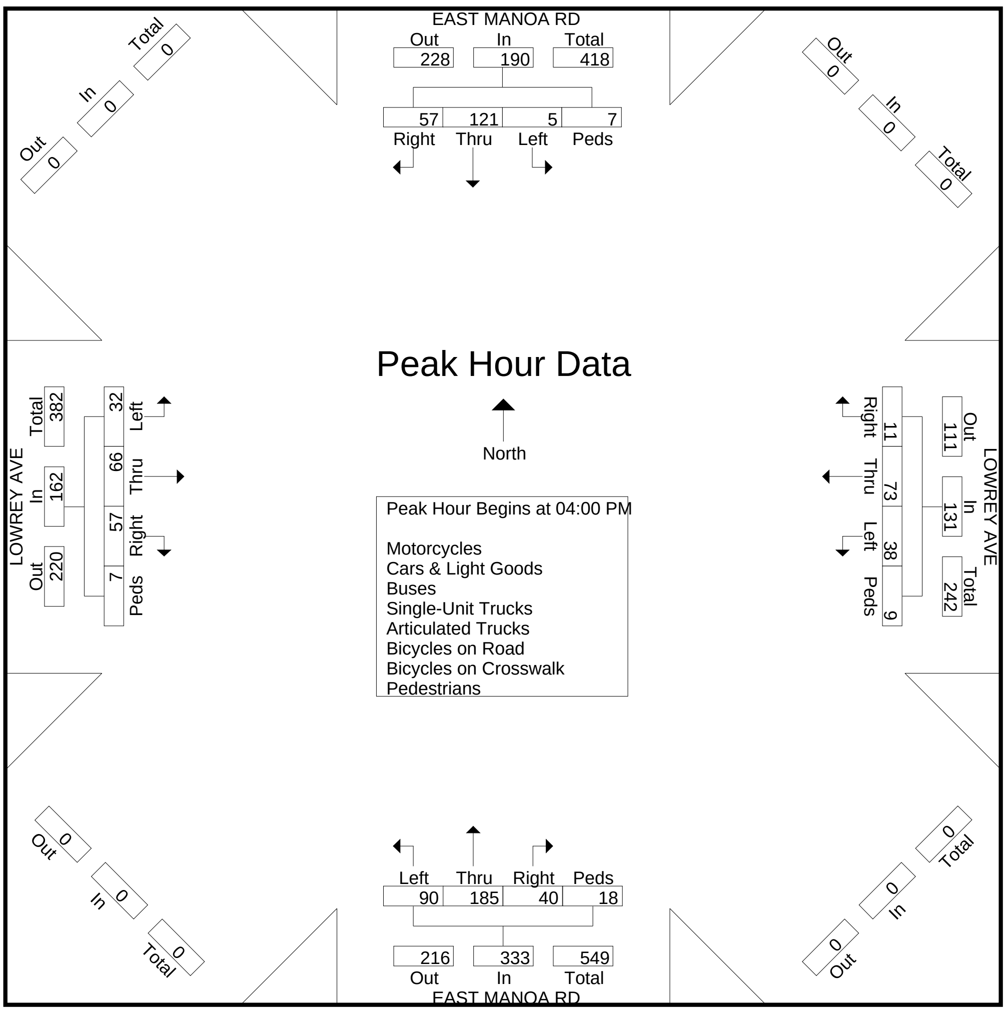
| | EAST MANOA RD Southbound | | | | LOWREY AVE Westbound | | | | EAST MANOA RD Northbound | | | | LOWREY AVE Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 03:30 PM | 2 | 36 | 13 | 0 | 17 | 17 | 0 | 0 | 17 | 50 | 16 | 1 | 8 | 19 | 11 | 0 | 207 |
| 03:45 PM | 4 | 30 | 13 | 1 | 6 | 18 | 1 | 1 | 17 | 61 | 11 | 1 | 11 | 14 | 23 | 0 | 212 |
| Total | 6 | 66 | 26 | 1 | 23 | 35 | 1 | 1 | 34 | 111 | 27 | 2 | 19 | 33 | 34 | 0 | 419 |
| | | | | | | | | | | | | | | | | | |
| 04:00 PM | 1 | 40 | 23 | 3 | 10 | 17 | 0 | 6 | 21 | 45 | 6 | 0 | 8 | 9 | 16 | 2 | 207 |
| 04:15 PM | 1 | 27 | 11 | 1 | 10 | 15 | 4 | 1 | 17 | 56 | 9 | 5 | 5 | 22 | 15 | 0 | 199 |
| 04:30 PM | 0 | 30 | 13 | 0 | 10 | 19 | 4 | 2 | 26 | 45 | 16 | 5 | 8 | 17 | 13 | 3 | 211 |
| 04:45 PM | 3 | 24 | 10 | 3 | 8 | 22 | 3 | 0 | 26 | 39 | 9 | 8 | 11 | 18 | 13 | 2 | 199 |
| Total | 5 | 121 | 57 | 7 | 38 | 73 | 11 | 9 | 90 | 185 | 40 | 18 | 32 | 66 | 57 | 7 | 816 |
| | | | | | | | | | | | | | | | | | |
| 05:00 PM | 2 | 34 | 10 | 10 | 12 | 26 | 2 | 7 | 25 | 64 | 13 | 2 | 10 | 13 | 21 | 4 | 255 |
| 05:15 PM | 0 | 36 | 7 | 1 | 9 | 20 | 2 | 0 | 19 | 60 | 17 | 5 | 14 | 10 | 15 | 3 | 218 |
| Grand Total | 13 | 257 | 100 | 19 | 82 | 154 | 16 | 17 | 168 | 420 | 97 | 27 | 75 | 122 | 127 | 14 | 1708 |
| Apprch % | 3.3 | 66.1 | 25.7 | 4.9 | 30.5 | 57.2 | 5.9 | 6.3 | 23.6 | 59 | 13.6 | 3.8 | 22.2 | 36.1 | 37.6 | 4.1 | |
| Total % | 0.8 | 15 | 5.9 | 1.1 | 4.8 | 9 | 0.9 | 1 | 9.8 | 24.6 | 5.7 | 1.6 | 4.4 | 7.1 | 7.4 | 0.8 | |
| Motorcycles | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 3 | 2 | 2 | 0 | 0 | 2 | 0 | 0 | 12 |
| % Motorcycles | 0 | 0 | 1 | 0 | 0 | 0.6 | 6.2 | 0 | 1.8 | 0.5 | 2.1 | 0 | 0 | 1.6 | 0 | 0 | 0.7 |
| Cars & Light Goods | 11 | 246 | 97 | 0 | 81 | 152 | 15 | 0 | 164 | 408 | 94 | 0 | 74 | 119 | 127 | 0 | 1588 |
| % Cars & Light Goods | 84.6 | 95.7 | 97 | 0 | 98.8 | 98.7 | 93.8 | 0 | 97.6 | 97.1 | 96.9 | 0 | 98.7 | 97.5 | 100 | 0 | 93 |
| Buses | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 1 | 0 | 0 | 0 | 14 |
| % Buses | 0 | 2.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.4 | 0 | 0 | 1.3 | 0 | 0 | 0 | 0.8 |
| Single-Unit Trucks | 0 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 9 |
| % Single-Unit Trucks | 0 | 1.2 | 1 | 0 | 1.2 | 0 | 0 | 0 | 0.6 | 0.5 | 0 | 0 | 0 | 0.8 | 0 | 0 | 0.5 |
| Articulated Trucks | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| % Articulated Trucks | 7.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | 1 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| Bicycles on Road | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| % Bicycles on Road | 7.7 | 0.4 | 1 | 0 | 0 | 0.6 | 0 | 0 | 0 | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 15.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| Pedestrians | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 27 | 0 | 0 | 0 | 14 | 74 |
| % Pedestrians | 0 | 0 | 0 | 84.2 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 4.3 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*




| | EAST MANOA RD Southbound | | | | | LOWREY AVE Westbound | | | | | EAST MANOA RD Northbound | | | | | LOWREY AVE Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:00 PM | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 1 | **40** | **23** | **3** | **67** | **10** | 17 | 0 | **6** | 33 | 21 | 45 | 6 | 0 | 72 | 8 | 9 | **16** | 2 | 35 | 207 |
| 04:15 PM | 1 | 27 | 11 | 1 | 40 | 10 | 15 | **4** | 1 | 30 | 17 | **56** | 9 | 5 | 87 | 5 | **22** | 15 | 0 | 42 | 199 |
| 04:30 PM | 0 | 30 | 13 | 0 | 43 | 10 | 19 | 4 | 2 | **35** | **26** | 45 | **16** | 5 | **92** | 8 | 17 | 13 | **3** | 41 | **211** |
| 04:45 PM | **3** | 24 | 10 | 3 | 40 | 8 | **22** | 3 | 0 | 33 | 26 | 39 | 9 | **8** | 82 | **11** | 18 | 13 | 2 | **44** | 199 |
| Total Volume | 5 | 121 | 57 | 7 | 190 | 38 | 73 | 11 | 9 | 131 | 90 | 185 | 40 | 18 | 333 | 32 | 66 | 57 | 7 | 162 | 816 |
| % App. Total | 2.6 | 63.7 | 30 | 3.7 | | 29 | 55.7 | 8.4 | 6.9 | | 27 | 55.6 | 12 | 5.4 | | 19.8 | 40.7 | 35.2 | 4.3 | | |
| PHF | .417 | .756 | .620 | .583 | .709 | .950 | .830 | .688 | .375 | .936 | .865 | .826 | .625 | .563 | .905 | .727 | .750 | .891 | .583 | .920 | .967 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : East Manoa Rd - Kahaloa Dr
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

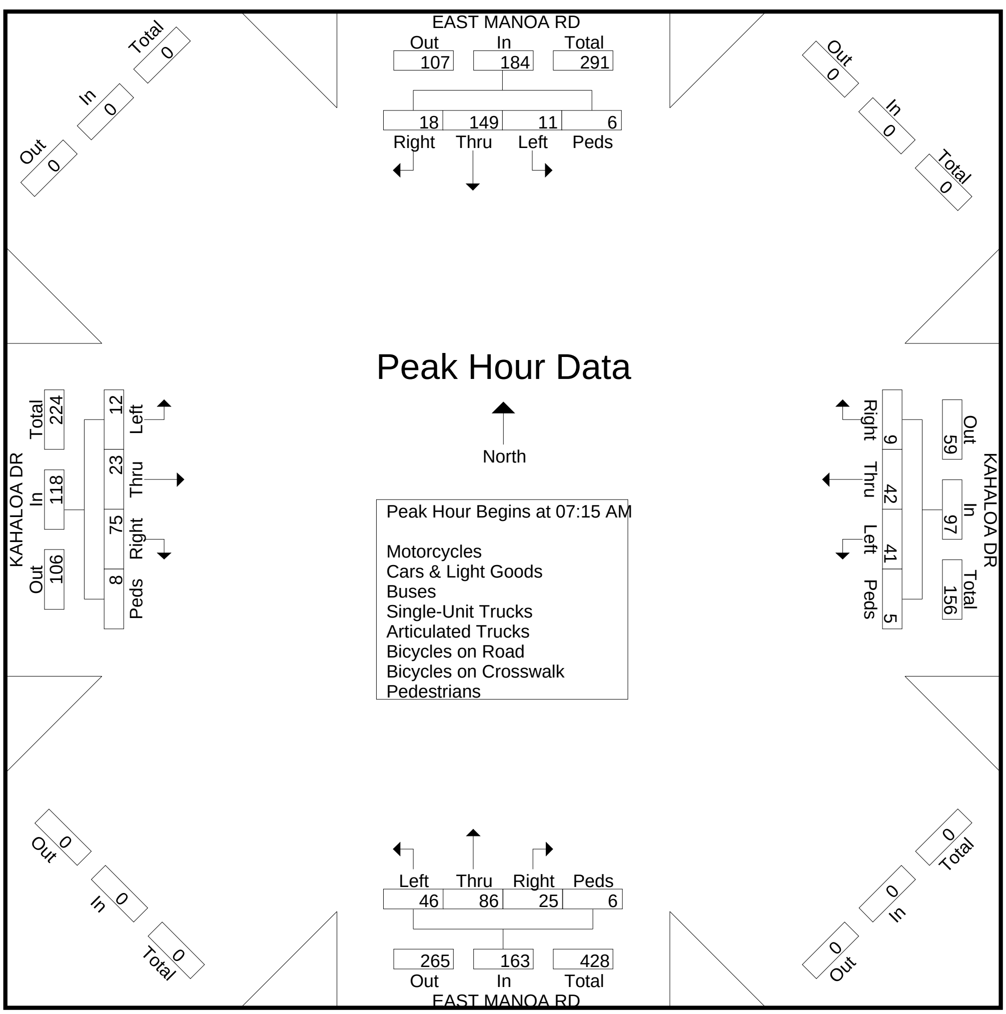
| | EAST MANOA RD Southbound | | | | KAHALOA DR Westbound | | | | EAST MANOA RD Northbound | | | | KAHALOA DR Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 06:30 AM | 0 | 28 | 1 | 1 | 5 | 1 | 1 | 5 | 3 | 14 | 0 | 0 | 1 | 1 | 5 | 1 | 67 |
| 06:45 AM | 0 | 34 | 3 | 1 | 9 | 0 | 0 | 1 | 4 | 10 | 4 | 0 | 0 | 1 | 4 | 0 | 71 |
| Total | 0 | 62 | 4 | 2 | 14 | 1 | 1 | 6 | 7 | 24 | 4 | 0 | 1 | 2 | 9 | 1 | 138 |
| 07:00 AM | 6 | 36 | 1 | 0 | 6 | 2 | 0 | 1 | 13 | 14 | 4 | 1 | 0 | 1 | 10 | 0 | 95 |
| 07:15 AM | 2 | 48 | 3 | 2 | 18 | 9 | 0 | 1 | 13 | 16 | 2 | 3 | 2 | 3 | 12 | 3 | 137 |
| 07:30 AM | 1 | 46 | 2 | 1 | 11 | 6 | 3 | 0 | 2 | 15 | 3 | 1 | 2 | 0 | 7 | 2 | 102 |
| 07:45 AM | 5 | 26 | 9 | 3 | 5 | 17 | 4 | 1 | 22 | 23 | 9 | 2 | 6 | 8 | 33 | 3 | 176 |
| Total | 14 | 156 | 15 | 6 | 40 | 34 | 7 | 3 | 50 | 68 | 18 | 7 | 10 | 12 | 62 | 8 | 510 |
| 08:00 AM | 3 | 29 | 4 | 0 | 7 | 10 | 2 | 3 | 9 | 32 | 11 | 0 | 2 | 12 | 23 | 0 | 147 |
| 08:15 AM | 2 | 27 | 1 | 0 | 7 | 1 | 2 | 0 | 5 | 17 | 8 | 2 | 4 | 2 | 7 | 0 | 85 |
| Grand Total | 19 | 274 | 24 | 8 | 68 | 46 | 12 | 12 | 71 | 141 | 41 | 9 | 17 | 28 | 101 | 9 | 880 |
| Apprch % | 5.8 | 84.3 | 7.4 | 2.5 | 49.3 | 33.3 | 8.7 | 8.7 | 27.1 | 53.8 | 15.6 | 3.4 | 11 | 18.1 | 65.2 | 5.8 | |
| Total % | 2.2 | 31.1 | 2.7 | 0.9 | 7.7 | 5.2 | 1.4 | 1.4 | 8.1 | 16 | 4.7 | 1 | 1.9 | 3.2 | 11.5 | 1 | |
| Motorcycles | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 5 |
| % Motorcycles | 10.5 | 0.4 | 0 | 0 | 0 | 0 | 8.3 | 0 | 0 | 0 | 2.4 | 0 | 0 | 0 | 0 | 0 | 0.6 |
| Cars & Light Goods | 17 | 271 | 24 | 0 | 64 | 45 | 11 | 0 | 69 | 134 | 39 | 0 | 16 | 27 | 100 | 0 | 817 |
| % Cars & Light Goods | 89.5 | 98.9 | 100 | 0 | 94.1 | 97.8 | 91.7 | 0 | 97.2 | 95 | 95.1 | 0 | 94.1 | 96.4 | 99 | 0 | 92.8 |
| Buses | 0 | 1 | 0 | 0 | 4 | 1 | 0 | 0 | 2 | 5 | 0 | 0 | 1 | 0 | 1 | 0 | 15 |
| % Buses | 0 | 0.4 | 0 | 0 | 5.9 | 2.2 | 0 | 0 | 2.8 | 3.5 | 0 | 0 | 5.9 | 0 | 1 | 0 | 1.7 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| Articulated Trucks | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 |
| % Articulated Trucks | 0 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.4 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.7 | 0 | 0 | 0 | 3.6 | 0 | 0 | 0.2 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 9 | 38 |
| % Pedestrians | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 4.3 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646 Fax: (808)526-1267*


File Name : East Manoa Rd - Kahaloa Dr
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | EAST MANOA RD Southbound | | | | | KAHALOA DR Westbound | | | | | EAST MANOA RD Northbound | | | | | KAHALOA DR Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:15 AM | | | | | | | | | | | | | | | | | | | | | |
| 07:15 AM | 2 | **48** | 3 | 2 | **55** | **18** | 9 | 0 | 1 | **28** | 13 | 16 | 2 | **3** | 34 | 2 | 3 | 12 | **3** | 20 | 137 |
| 07:30 AM | 1 | 46 | 2 | 1 | 50 | 11 | 6 | 3 | 0 | 20 | 2 | 15 | 3 | 1 | 21 | 2 | 0 | 7 | 2 | 11 | 102 |
| 07:45 AM | **5** | 26 | **9** | **3** | 43 | 5 | **17** | **4** | 1 | 27 | **22** | 23 | 9 | 2 | **56** | **6** | 8 | **33** | 3 | **50** | **176** |
| 08:00 AM | 3 | 29 | 4 | 0 | 36 | 7 | 10 | 2 | **3** | 22 | 9 | **32** | **11** | 0 | 52 | 2 | **12** | 23 | 0 | 37 | 147 |
| Total Volume | 11 | 149 | 18 | 6 | 184 | 41 | 42 | 9 | 5 | 97 | 46 | 86 | 25 | 6 | 163 | 12 | 23 | 75 | 8 | 118 | 562 |
| % App. Total | 6 | 81 | 9.8 | 3.3 | | 42.3 | 43.3 | 9.3 | 5.2 | | 28.2 | 52.8 | 15.3 | 3.7 | | 10.2 | 19.5 | 63.6 | 6.8 | | |
| PHF | .550 | .776 | .500 | .500 | .836 | .569 | .618 | .563 | .417 | .866 | .523 | .672 | .568 | .500 | .728 | .500 | .479 | .568 | .667 | .590 | .798 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646 Fax: (808)526-1267*

File Name : East Manoa Rd - Kahaloa Dr
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

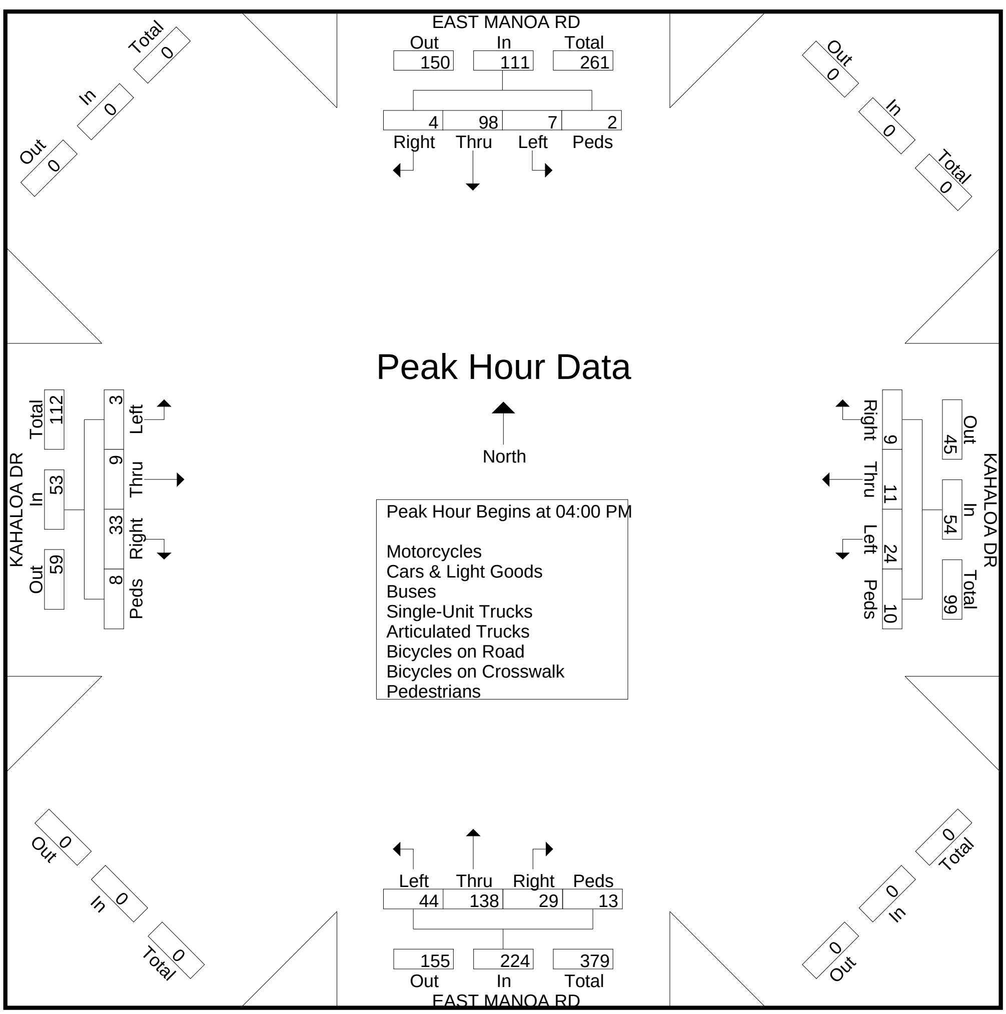
| | EAST MANOA RD Southbound | | | | KAHALOA DR Westbound | | | | EAST MANOA RD Northbound | | | | KAHALOA DR Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 03:30 PM | 2 | 26 | 1 | 0 | 7 | 2 | 5 | 0 | 7 | 33 | 8 | 2 | 2 | 1 | 8 | 0 | 104 |
| 03:45 PM | 2 | 32 | 2 | 1 | 6 | 2 | 5 | 1 | 14 | 51 | 8 | 4 | 0 | 3 | 2 | 1 | 134 |
| Total | 4 | 58 | 3 | 1 | 13 | 4 | 10 | 1 | 21 | 84 | 16 | 6 | 2 | 4 | 10 | 1 | 238 |
| | | | | | | | | | | | | | | | | | |
| 04:00 PM | 2 | 33 | 1 | 0 | 8 | 3 | 2 | 6 | 9 | 37 | 7 | 6 | 0 | 1 | 16 | 2 | 133 |
| 04:15 PM | 1 | 25 | 1 | 2 | 4 | 0 | 3 | 2 | 13 | 33 | 10 | 5 | 1 | 3 | 5 | 2 | 110 |
| 04:30 PM | 3 | 19 | 1 | 0 | 7 | 3 | 2 | 0 | 9 | 37 | 8 | 0 | 0 | 3 | 7 | 4 | 103 |
| 04:45 PM | 1 | 21 | 1 | 0 | 5 | 5 | 2 | 2 | 13 | 31 | 4 | 2 | 2 | 2 | 5 | 0 | 96 |
| Total | 7 | 98 | 4 | 2 | 24 | 11 | 9 | 10 | 44 | 138 | 29 | 13 | 3 | 9 | 33 | 8 | 442 |
| | | | | | | | | | | | | | | | | | |
| 05:00 PM | 2 | 22 | 1 | 1 | 8 | 2 | 3 | 0 | 13 | 46 | 7 | 4 | 3 | 4 | 12 | 2 | 130 |
| 05:15 PM | 0 | 24 | 1 | 1 | 3 | 2 | 1 | 2 | 13 | 47 | 7 | 2 | 0 | 2 | 4 | 2 | 111 |
| Grand Total | 13 | 202 | 9 | 5 | 48 | 19 | 23 | 13 | 91 | 315 | 59 | 25 | 8 | 19 | 59 | 13 | 921 |
| Apprch % | 5.7 | 88.2 | 3.9 | 2.2 | 46.6 | 18.4 | 22.3 | 12.6 | 18.6 | 64.3 | 12 | 5.1 | 8.1 | 19.2 | 59.6 | 13.1 | |
| Total % | 1.4 | 21.9 | 1 | 0.5 | 5.2 | 2.1 | 2.5 | 1.4 | 9.9 | 34.2 | 6.4 | 2.7 | 0.9 | 2.1 | 6.4 | 1.4 | |
| Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| % Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.6 | 1.7 | 0 | 0 | 0 | 0 | 0 | 0.3 |
| Cars & Light Goods | 13 | 193 | 8 | 0 | 42 | 18 | 22 | 0 | 90 | 304 | 57 | 0 | 5 | 18 | 58 | 0 | 828 |
| % Cars & Light Goods | 100 | 95.5 | 88.9 | 0 | 87.5 | 94.7 | 95.7 | 0 | 98.9 | 96.5 | 96.6 | 0 | 62.5 | 94.7 | 98.3 | 0 | 89.9 |
| Buses | 0 | 1 | 0 | 0 | 5 | 0 | 0 | 0 | 1 | 6 | 0 | 0 | 0 | 0 | 1 | 0 | 14 |
| % Buses | 0 | 0.5 | 0 | 0 | 10.4 | 0 | 0 | 0 | 1.1 | 1.9 | 0 | 0 | 0 | 0 | 1.7 | 0 | 1.5 |
| Single-Unit Trucks | 0 | 3 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 9 |
| % Single-Unit Trucks | 0 | 1.5 | 0 | 0 | 2.1 | 5.3 | 4.3 | 0 | 0 | 0.6 | 0 | 0 | 0 | 5.3 | 0 | 0 | 1 |
| Articulated Trucks | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 |
| % Articulated Trucks | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.7 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| Bicycles on Road | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 9 |
| % Bicycles on Road | 0 | 2 | 11.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 37.5 | 0 | 0 | 0 | 1 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 4 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0.4 |
| Pedestrians | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 13 | 52 |
| % Pedestrians | 0 | 0 | 0 | 80 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 88 | 0 | 0 | 0 | 100 | 5.6 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : East Manoa Rd - Kahaloa Dr
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 2

| | EAST MANOA RD Southbound | | | | | KAHALOA DR Westbound | | | | | EAST MANOA RD Northbound | | | | | KAHALOA DR Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:00 PM | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 2 | **33** | **1** | 0 | **36** | **8** | 3 | 2 | **6** | **19** | 9 | **37** | 7 | **6** | 59 | 0 | 1 | **16** | 2 | **19** | **133** |
| 04:15 PM | 1 | 25 | 1 | **2** | 29 | 4 | 0 | **3** | 2 | 9 | **13** | 33 | **10** | 5 | **61** | 1 | **3** | 5 | 2 | 11 | 110 |
| 04:30 PM | **3** | 19 | 1 | 0 | 23 | 7 | 3 | 2 | 0 | 12 | 9 | 37 | 8 | 0 | 54 | 0 | 3 | 7 | **4** | 14 | 103 |
| 04:45 PM | 1 | 21 | 1 | 0 | 23 | 5 | **5** | 2 | 2 | 14 | 13 | 31 | 4 | 2 | 50 | **2** | 2 | 5 | 0 | 9 | 96 |
| Total Volume | 7 | 98 | 4 | 2 | 111 | 24 | 11 | 9 | 10 | 54 | 44 | 138 | 29 | 13 | 224 | 3 | 9 | 33 | 8 | 53 | 442 |
| % App. Total | 6.3 | 88.3 | 3.6 | 1.8 | | 44.4 | 20.4 | 16.7 | 18.5 | | 19.6 | 61.6 | 12.9 | 5.8 | | 5.7 | 17 | 62.3 | 15.1 | | |
| PHF | .583 | .742 | 1.00 | .250 | .771 | .750 | .550 | .750 | .417 | .711 | .846 | .932 | .725 | .542 | .918 | .375 | .750 | .516 | .500 | .697 | .831 |



# Austin Tsutsumi & Associates
501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : Woodlawn Dr - Kahaloa Dr
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

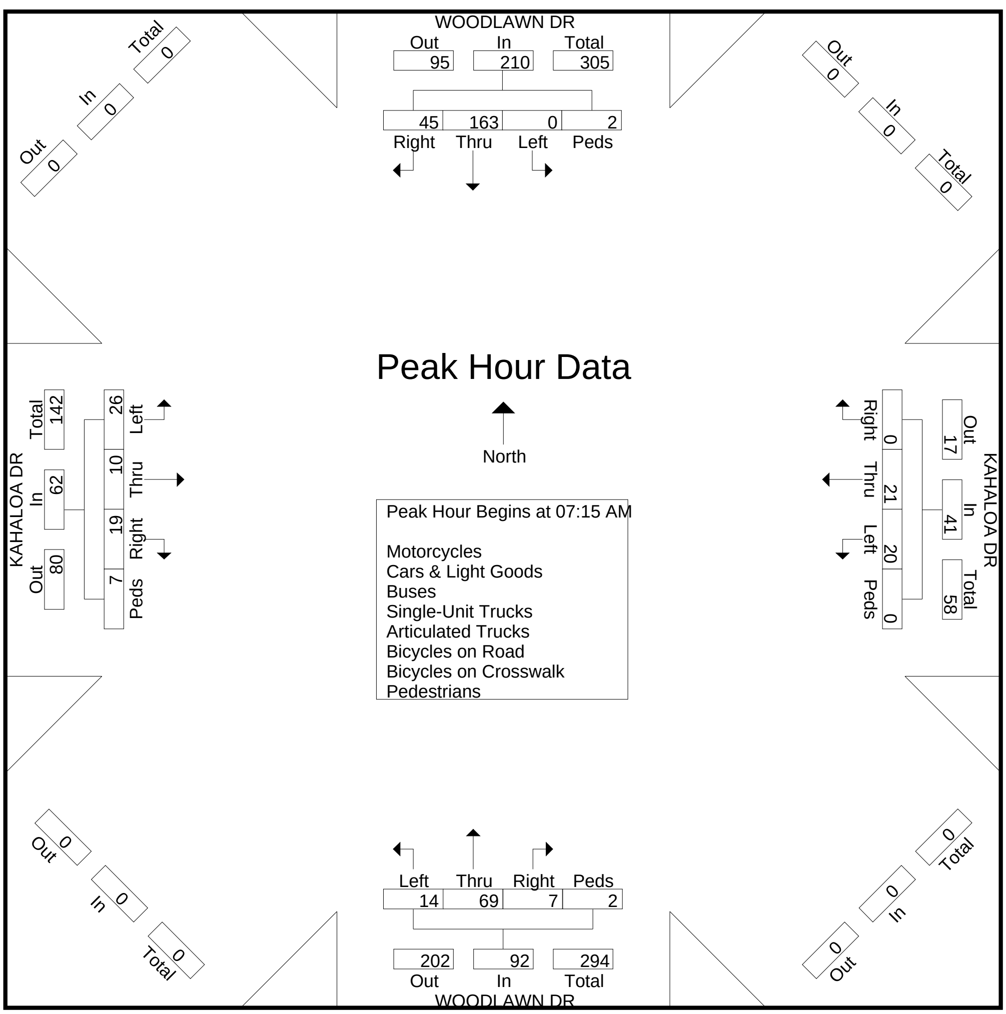
| | WOODLAWN DR Southbound | | | | KAHALOA DR Westbound | | | | WOODLAWN DR Northbound | | | | KAHALOA DR Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 06:30 AM | 0 | 24 | 3 | 0 | 5 | 1 | 0 | 0 | 0 | 5 | 0 | 1 | 1 | 0 | 0 | 0 | 40 |
| 06:45 AM | 0 | 40 | 2 | 0 | 5 | 1 | 0 | 1 | 0 | 7 | 2 | 1 | 3 | 3 | 0 | 0 | 65 |
| Total | 0 | 64 | 5 | 0 | 10 | 2 | 0 | 1 | 0 | 12 | 2 | 2 | 4 | 3 | 0 | 0 | 105 |
| 07:00 AM | 0 | 38 | 6 | 2 | 3 | 2 | 0 | 0 | 0 | 12 | 0 | 2 | 4 | 1 | 6 | 0 | 76 |
| 07:15 AM | 0 | 39 | 12 | 0 | 5 | 12 | 0 | 0 | 2 | 13 | 0 | 0 | 4 | 3 | 2 | 1 | 93 |
| 07:30 AM | 0 | 55 | 9 | 1 | 7 | 2 | 0 | 0 | 4 | 9 | 2 | 1 | 1 | 1 | 2 | 4 | 98 |
| 07:45 AM | 0 | 33 | 17 | 0 | 3 | 3 | 0 | 0 | 4 | 20 | 4 | 1 | 10 | 3 | 4 | 2 | 104 |
| Total | 0 | 165 | 44 | 3 | 18 | 19 | 0 | 0 | 10 | 54 | 6 | 4 | 19 | 8 | 14 | 7 | 371 |
| 08:00 AM | 0 | 36 | 7 | 1 | 5 | 4 | 0 | 0 | 4 | 27 | 1 | 0 | 11 | 3 | 11 | 0 | 110 |
| 08:15 AM | 0 | 35 | 3 | 0 | 1 | 2 | 0 | 0 | 3 | 20 | 4 | 2 | 4 | 3 | 2 | 0 | 79 |
| Grand Total | 0 | 300 | 59 | 4 | 34 | 27 | 0 | 1 | 17 | 113 | 13 | 8 | 38 | 17 | 27 | 7 | 665 |
| Apprch % | 0 | 82.6 | 16.3 | 1.1 | 54.8 | 43.5 | 0 | 1.6 | 11.3 | 74.8 | 8.6 | 5.3 | 42.7 | 19.1 | 30.3 | 7.9 | |
| Total % | 0 | 45.1 | 8.9 | 0.6 | 5.1 | 4.1 | 0 | 0.2 | 2.6 | 17 | 2 | 1.2 | 5.7 | 2.6 | 4.1 | 1.1 | |
| Motorcycles | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 7 |
| % Motorcycles | 0 | 0.7 | 0 | 0 | 0 | 3.7 | 0 | 0 | 0 | 0.9 | 0 | 0 | 2.6 | 5.9 | 3.7 | 0 | 1.1 |
| Cars & Light Goods | 0 | 295 | 55 | 0 | 34 | 25 | 0 | 0 | 17 | 112 | 12 | 0 | 36 | 15 | 25 | 0 | 626 |
| % Cars & Light Goods | 0 | 98.3 | 93.2 | 0 | 100 | 92.6 | 0 | 0 | 100 | 99.1 | 92.3 | 0 | 94.7 | 88.2 | 92.6 | 0 | 94.1 |
| Buses | 0 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 6 |
| % Buses | 0 | 0 | 6.8 | 0 | 0 | 3.7 | 0 | 0 | 0 | 0 | 7.7 | 0 | 0 | 0 | 0 | 0 | 0.9 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.6 | 0 | 0 | 0 | 0.2 |
| Bicycles on Road | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 5 |
| % Bicycles on Road | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5.9 | 3.7 | 0 | 0.8 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 7 | 20 |
| % Pedestrians | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 3 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : Woodlawn Dr - Kahaloa Dr
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | WOODLAWN DR Southbound | | | | | KAHALOA DR Westbound | | | | | WOODLAWN DR Northbound | | | | | KAHALOA DR Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:15 AM | | | | | | | | | | | | | | | | | | | | | |
| 07:15 AM | 0 | 39 | 12 | 0 | 51 | 5 | **12** | 0 | 0 | **17** | 2 | 13 | 0 | 0 | 15 | 4 | **3** | 2 | 1 | 10 | 93 |
| 07:30 AM | 0 | **55** | 9 | **1** | **65** | **7** | 2 | 0 | 0 | 9 | **4** | 9 | 2 | **1** | 16 | 1 | 1 | 2 | **4** | 8 | 98 |
| 07:45 AM | 0 | 33 | **17** | 0 | 50 | 3 | 3 | 0 | 0 | 6 | 4 | 20 | **4** | 1 | 29 | 10 | 3 | 4 | 2 | 19 | 104 |
| 08:00 AM | 0 | 36 | 7 | 1 | 44 | 5 | 4 | 0 | 0 | 9 | 4 | **27** | 1 | 0 | **32** | **11** | 3 | **11** | 0 | **25** | **110** |
| Total Volume | 0 | 163 | 45 | 2 | 210 | 20 | 21 | 0 | 0 | 41 | 14 | 69 | 7 | 2 | 92 | 26 | 10 | 19 | 7 | 62 | 405 |
| % App. Total | 0 | 77.6 | 21.4 | 1 | | 48.8 | 51.2 | 0 | 0 | | 15.2 | 75 | 7.6 | 2.2 | | 41.9 | 16.1 | 30.6 | 11.3 | | |
| PHF | .000 | .741 | .662 | .500 | .808 | .714 | .438 | .000 | .000 | .603 | .875 | .639 | .438 | .500 | .719 | .591 | .833 | .432 | .438 | .620 | .920 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : Woodlawn Dr - Kahaloa Dr
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

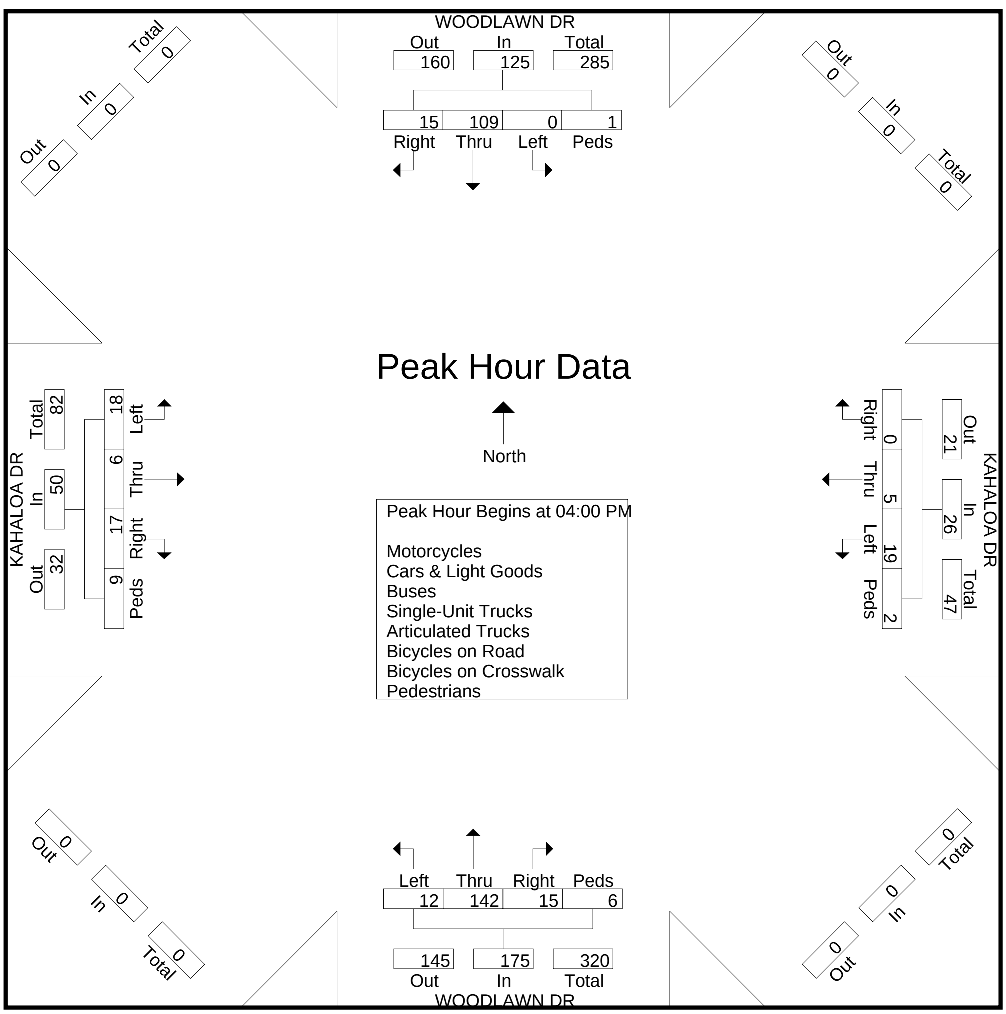
| | WOODLAWN DR Southbound | | | | KAHALOA DR Westbound | | | | WOODLAWN DR Northbound | | | | KAHALOA DR Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 03:30 PM | 0 | 20 | 4 | 0 | 2 | 1 | 0 | 0 | 4 | 23 | 7 | 1 | 7 | 0 | 0 | 1 | 70 |
| 03:45 PM | 0 | 27 | 4 | 4 | 4 | 2 | 0 | 2 | 6 | 38 | 10 | 0 | 5 | 2 | 4 | 0 | 108 |
| Total | 0 | 47 | 8 | 4 | 6 | 3 | 0 | 2 | 10 | 61 | 17 | 1 | 12 | 2 | 4 | 1 | 178 |
| | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 22 | 6 | 0 | 10 | 0 | 0 | 0 | 2 | 29 | 2 | 0 | 3 | 0 | 5 | 3 | 82 |
| 04:15 PM | 0 | 26 | 2 | 1 | 2 | 2 | 0 | 1 | 2 | 41 | 4 | 1 | 4 | 4 | 3 | 3 | 96 |
| 04:30 PM | 0 | 30 | 2 | 0 | 2 | 2 | 0 | 0 | 4 | 24 | 4 | 2 | 7 | 0 | 7 | 2 | 86 |
| 04:45 PM | 0 | 31 | 5 | 0 | 5 | 1 | 0 | 1 | 4 | 48 | 5 | 3 | 4 | 2 | 2 | 1 | 112 |
| Total | 0 | 109 | 15 | 1 | 19 | 5 | 0 | 2 | 12 | 142 | 15 | 6 | 18 | 6 | 17 | 9 | 376 |
| | | | | | | | | | | | | | | | | | |
| 05:00 PM | 1 | 33 | 9 | 0 | 2 | 2 | 0 | 2 | 8 | 35 | 4 | 4 | 6 | 5 | 2 | 1 | 114 |
| 05:15 PM | 0 | 17 | 2 | 2 | 5 | 1 | 0 | 2 | 5 | 40 | 6 | 2 | 6 | 0 | 0 | 2 | 90 |
| Grand Total | 1 | 206 | 34 | 7 | 32 | 11 | 0 | 8 | 35 | 278 | 42 | 13 | 42 | 13 | 23 | 13 | 758 |
| Apprch % | 0.4 | 83.1 | 13.7 | 2.8 | 62.7 | 21.6 | 0 | 15.7 | 9.5 | 75.5 | 11.4 | 3.5 | 46.2 | 14.3 | 25.3 | 14.3 | |
| Total % | 0.1 | 27.2 | 4.5 | 0.9 | 4.2 | 1.5 | 0 | 1.1 | 4.6 | 36.7 | 5.5 | 1.7 | 5.5 | 1.7 | 3 | 1.7 | |
| Motorcycles | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 1 | 0 | 0 | 0 | 8 |
| % Motorcycles | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.8 | 0 | 0 | 2.4 | 0 | 0 | 0 | 1.1 |
| Cars & Light Goods | 0 | 202 | 29 | 0 | 32 | 11 | 0 | 0 | 33 | 266 | 42 | 0 | 41 | 13 | 23 | 0 | 692 |
| % Cars & Light Goods | 0 | 98.1 | 85.3 | 0 | 100 | 100 | 0 | 0 | 94.3 | 95.7 | 100 | 0 | 97.6 | 100 | 100 | 0 | 91.3 |
| Buses | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| % Buses | 0 | 0 | 14.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.7 |
| Single-Unit Trucks | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| % Single-Unit Trucks | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 2.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| Bicycles on Road | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| % Bicycles on Road | 100 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 2.9 | 2.2 | 0 | 0 | 0 | 0 | 0 | 0 | 1.2 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 13 | 41 |
| % Pedestrians | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 5.4 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : Woodlawn Dr - Kahaloa Dr
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | WOODLAWN DR Southbound | | | | | KAHALOA DR Westbound | | | | | WOODLAWN DR Northbound | | | | | KAHALOA DR Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:00 PM | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 22 | **6** | 0 | 28 | **10** | 0 | 0 | 0 | **10** | 2 | 29 | 2 | 0 | 33 | 3 | 0 | 5 | **3** | 11 | 82 |
| 04:15 PM | 0 | 26 | 2 | **1** | 29 | 2 | **2** | 0 | **1** | 5 | 2 | 41 | 4 | 1 | 48 | 4 | **4** | 3 | 3 | 14 | 96 |
| 04:30 PM | 0 | 30 | 2 | 0 | 32 | 2 | 2 | 0 | 0 | 4 | **4** | 24 | 4 | 2 | 34 | **7** | 0 | **7** | 2 | **16** | 86 |
| 04:45 PM | 0 | **31** | 5 | 0 | **36** | 5 | 1 | 0 | 1 | 7 | 4 | **48** | **5** | **3** | **60** | 4 | 2 | 2 | 1 | 9 | **112** |
| Total Volume | 0 | 109 | 15 | 1 | 125 | 19 | 5 | 0 | 2 | 26 | 12 | 142 | 15 | 6 | 175 | 18 | 6 | 17 | 9 | 50 | 376 |
| % App. Total | 0 | 87.2 | 12 | 0.8 | | 73.1 | 19.2 | 0 | 7.7 | | 6.9 | 81.1 | 8.6 | 3.4 | | 36 | 12 | 34 | 18 | | |
| PHF | .000 | .879 | .625 | .250 | .868 | .475 | .625 | .000 | .500 | .650 | .750 | .740 | .750 | .500 | .729 | .643 | .375 | .607 | .750 | .781 | .839 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : Woodlawn Dr - Lower Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

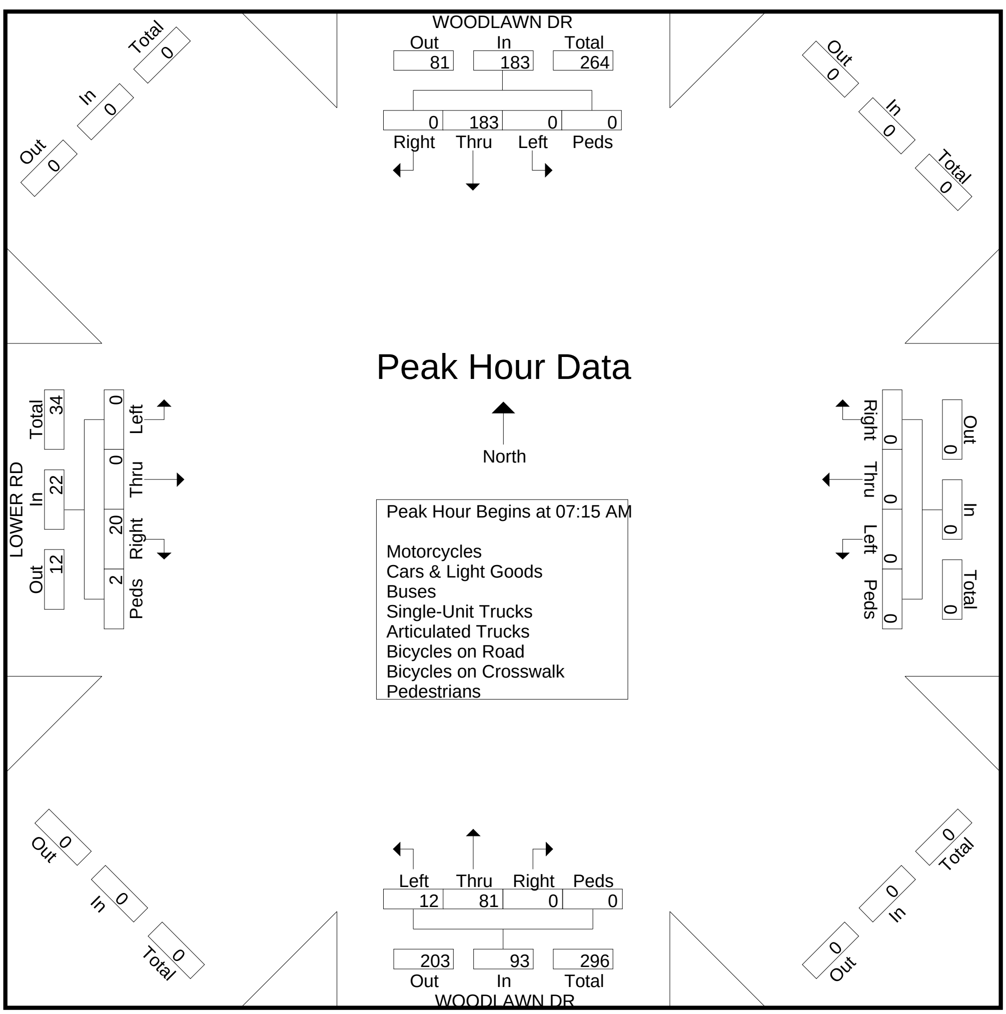
| | WOODLAWN DR Southbound | | | | Westbound | | | | WOODLAWN DR Northbound | | | | LOWER RD Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 06:30 AM | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 9 | 0 | 0 | 0 | 0 | 3 | 0 | 37 |
| 06:45 AM | 0 | 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 1 | 0 | 0 | 4 | 3 | 54 |
| Total | 0 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 19 | 0 | 1 | 0 | 0 | 7 | 3 | 91 |
| | | | | | | | | | | | | | | | | | |
| 07:00 AM | 0 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 12 | 0 | 0 | 0 | 0 | 2 | 1 | 64 |
| 07:15 AM | 0 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 12 | 0 | 0 | 0 | 0 | 9 | 0 | 65 |
| 07:30 AM | 0 | 57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 6 | 2 | 75 |
| 07:45 AM | 0 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 25 | 0 | 0 | 0 | 0 | 4 | 0 | 79 |
| Total | 0 | 188 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 59 | 0 | 0 | 0 | 0 | 21 | 3 | 283 |
| | | | | | | | | | | | | | | | | | |
| 08:00 AM | 0 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 34 | 0 | 0 | 0 | 0 | 1 | 0 | 79 |
| 08:15 AM | 0 | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 19 | 0 | 0 | 0 | 0 | 5 | 0 | 61 |
| Grand Total | 0 | 321 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 131 | 0 | 1 | 0 | 0 | 34 | 6 | 514 |
| Apprch % | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 13.7 | 85.6 | 0 | 0.7 | 0 | 0 | 85 | 15 | |
| Total % | 0 | 62.5 | 0 | 0 | 0 | 0 | 0 | 0 | 4.1 | 25.5 | 0 | 0.2 | 0 | 0 | 6.6 | 1.2 | |
| Motorcycles | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| % Motorcycles | 0 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0.8 |
| Cars & Light Goods | 0 | 313 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 128 | 0 | 0 | 0 | 0 | 34 | 0 | 496 |
| % Cars & Light Goods | 0 | 97.5 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 97.7 | 0 | 0 | 0 | 0 | 100 | 0 | 96.5 |
| Buses | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| % Buses | 0 | 1.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.8 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| Bicycles on Road | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| % Bicycles on Road | 0 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 6 | 7 |
| % Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 1.4 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646 Fax: (808)526-1267*

File Name : Woodlawn Dr - Lower Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 2

| | WOODLAWN DR Southbound | | | | | Westbound | | | | | WOODLAWN DR Northbound | | | | | LOWER RD Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:15 AM | | | | | | | | | | | | | | | | | | | | | |
| 07:15 AM | 0 | 41 | 0 | 0 | 41 | 0 | 0 | 0 | 0 | 0 | 3 | 12 | 0 | 0 | 15 | 0 | 0 | **9** | 0 | **9** | 65 |
| 07:30 AM | 0 | **57** | 0 | 0 | **57** | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 6 | **2** | 8 | 75 |
| 07:45 AM | 0 | 45 | 0 | 0 | 45 | 0 | 0 | 0 | 0 | 0 | **5** | 25 | 0 | 0 | 30 | 0 | 0 | 4 | 0 | 4 | **79** |
| 08:00 AM | 0 | 40 | 0 | 0 | 40 | 0 | 0 | 0 | 0 | 0 | 4 | **34** | 0 | 0 | **38** | 0 | 0 | 1 | 0 | 1 | 79 |
| Total Volume | 0 | 183 | 0 | 0 | 183 | 0 | 0 | 0 | 0 | 0 | 12 | 81 | 0 | 0 | 93 | 0 | 0 | 20 | 2 | 22 | 298 |
| % App. Total | 0 | 100 | 0 | 0 | | 0 | 0 | 0 | 0 | | 12.9 | 87.1 | 0 | 0 | | 0 | 0 | 90.9 | 9.1 | | |
| PHF | .000 | .803 | .000 | .000 | .803 | .000 | .000 | .000 | .000 | .000 | .600 | .596 | .000 | .000 | .612 | .000 | .000 | .556 | .250 | .611 | .943 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : Woodlawn Dr - Lower Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

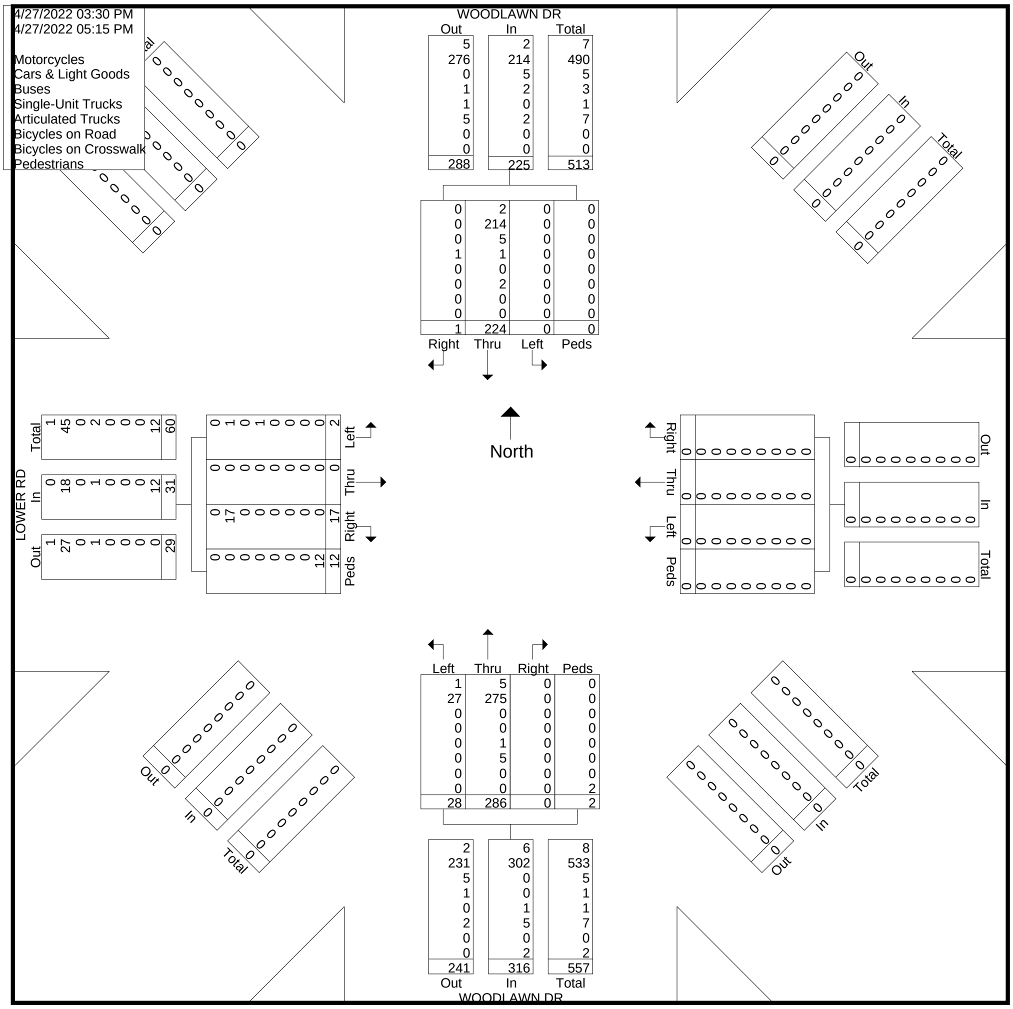
Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

| | WOODLAWN DR Southbound | | | | Westbound | | | | WOODLAWN DR Northbound | | | | LOWER RD Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 03:30 PM | 0 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 28 | 0 | 0 | 0 | 0 | 2 | 0 | 53 |
| 03:45 PM | 0 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 38 | 0 | 0 | 0 | 0 | 4 | 2 | 75 |
| Total | 0 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 66 | 0 | 0 | 0 | 0 | 6 | 2 | 128 |
| | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 30 | 0 | 0 | 1 | 0 | 1 | 3 | 63 |
| 04:15 PM | 0 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 70 |
| 04:30 PM | 0 | 29 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 28 | 0 | 0 | 0 | 0 | 2 | 4 | 68 |
| 04:45 PM | 0 | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 46 | 0 | 0 | 0 | 0 | 2 | 1 | 88 |
| Total | 0 | 118 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 142 | 0 | 0 | 1 | 0 | 5 | 8 | 289 |
| | | | | | | | | | | | | | | | | | |
| 05:00 PM | 0 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 38 | 0 | 2 | 0 | 0 | 4 | 0 | 87 |
| 05:15 PM | 0 | 18 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 40 | 0 | 0 | 1 | 0 | 2 | 2 | 68 |
| Grand Total | 0 | 224 | 1 | 0 | 0 | 0 | 0 | 0 | 28 | 286 | 0 | 2 | 2 | 0 | 17 | 12 | 572 |
| Apprch % | 0 | 99.6 | 0.4 | 0 | 0 | 0 | 0 | 0 | 8.9 | 90.5 | 0 | 0.6 | 6.5 | 0 | 54.8 | 38.7 | |
| Total % | 0 | 39.2 | 0.2 | 0 | 0 | 0 | 0 | 0 | 4.9 | 50 | 0 | 0.3 | 0.3 | 0 | 3 | 2.1 | |
| Motorcycles | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| % Motorcycles | 0 | 0.9 | 0 | 0 | 0 | 0 | 0 | 0 | 3.6 | 1.7 | 0 | 0 | 0 | 0 | 0 | 0 | 1.4 |
| Cars & Light Goods | 0 | 214 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 275 | 0 | 0 | 1 | 0 | 17 | 0 | 534 |
| % Cars & Light Goods | 0 | 95.5 | 0 | 0 | 0 | 0 | 0 | 0 | 96.4 | 96.2 | 0 | 0 | 50 | 0 | 100 | 0 | 93.4 |
| Buses | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| % Buses | 0 | 2.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.9 |
| Single-Unit Trucks | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 |
| % Single-Unit Trucks | 0 | 0.4 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0.5 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| Bicycles on Road | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| % Bicycles on Road | 0 | 0.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.7 | 0 | 0 | 0 | 0 | 0 | 0 | 1.2 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 12 | 14 |
| % Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 2.4 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : Woodlawn Dr - Lower Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 2

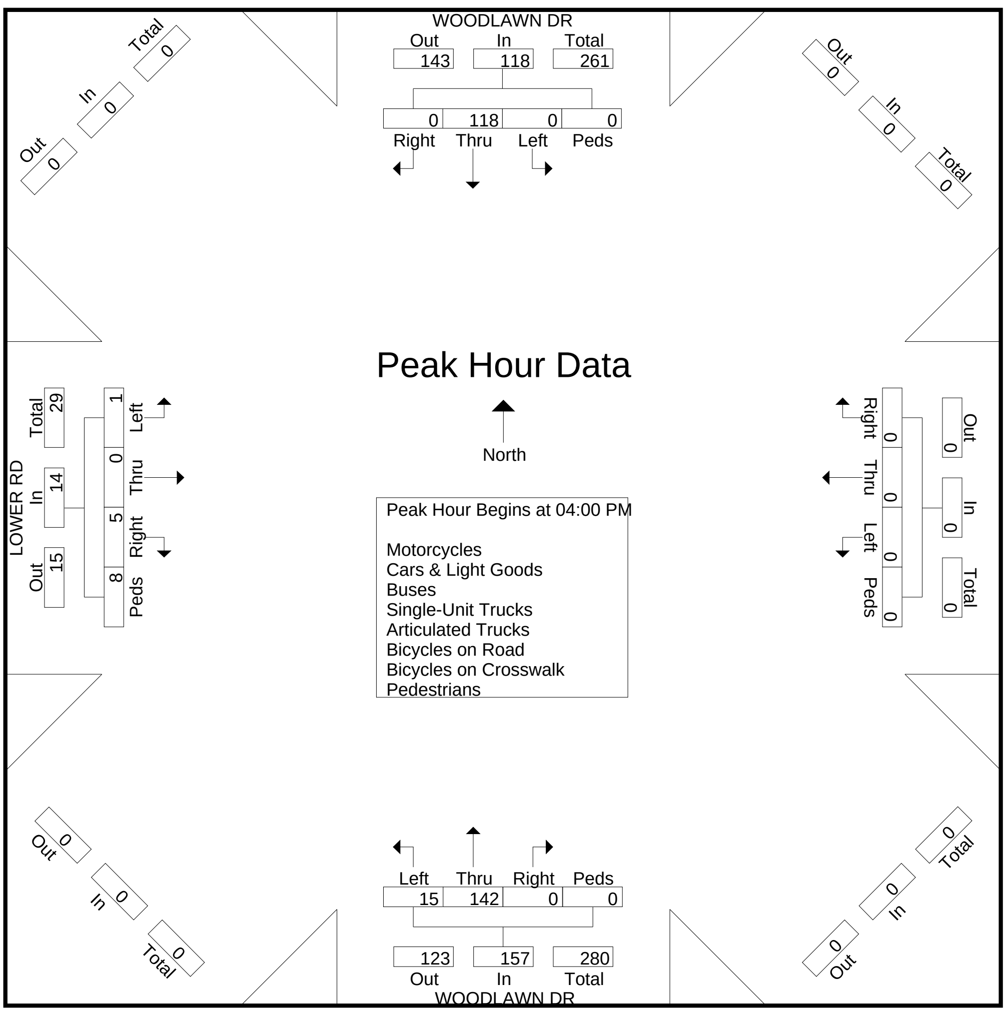


# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : Woodlawn Dr - Lower Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 3

| | WOODLAWN DR Southbound | | | | | Westbound | | | | | WOODLAWN DR Northbound | | | | | LOWER RD Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:00 PM | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 26 | 0 | 0 | 26 | 0 | 0 | 0 | 0 | 0 | 2 | 30 | 0 | 0 | 32 | **1** | 0 | 1 | 3 | 5 | 63 |
| 04:15 PM | 0 | 28 | 0 | 0 | 28 | 0 | 0 | 0 | 0 | 0 | 4 | 38 | 0 | 0 | 42 | 0 | 0 | 0 | 0 | 0 | 70 |
| 04:30 PM | 0 | 29 | 0 | 0 | 29 | 0 | 0 | 0 | 0 | 0 | **5** | 28 | 0 | 0 | 33 | 0 | 0 | **2** | **4** | **6** | 68 |
| 04:45 PM | 0 | **35** | 0 | 0 | **35** | 0 | 0 | 0 | 0 | 0 | 4 | **46** | 0 | 0 | **50** | 0 | 0 | 2 | 1 | 3 | **88** |
| Total Volume | 0 | 118 | 0 | 0 | 118 | 0 | 0 | 0 | 0 | 0 | 15 | 142 | 0 | 0 | 157 | 1 | 0 | 5 | 8 | 14 | 289 |
| % App. Total | 0 | 100 | 0 | 0 | | 0 | 0 | 0 | 0 | | 9.6 | 90.4 | 0 | 0 | | 7.1 | 0 | 35.7 | 57.1 | | |
| PHF | .000 | .843 | .000 | .000 | .843 | .000 | .000 | .000 | .000 | .000 | .750 | .772 | .000 | .000 | .785 | .250 | .000 | .625 | .500 | .583 | .821 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : East Manoa Rd - Old East Manoa Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

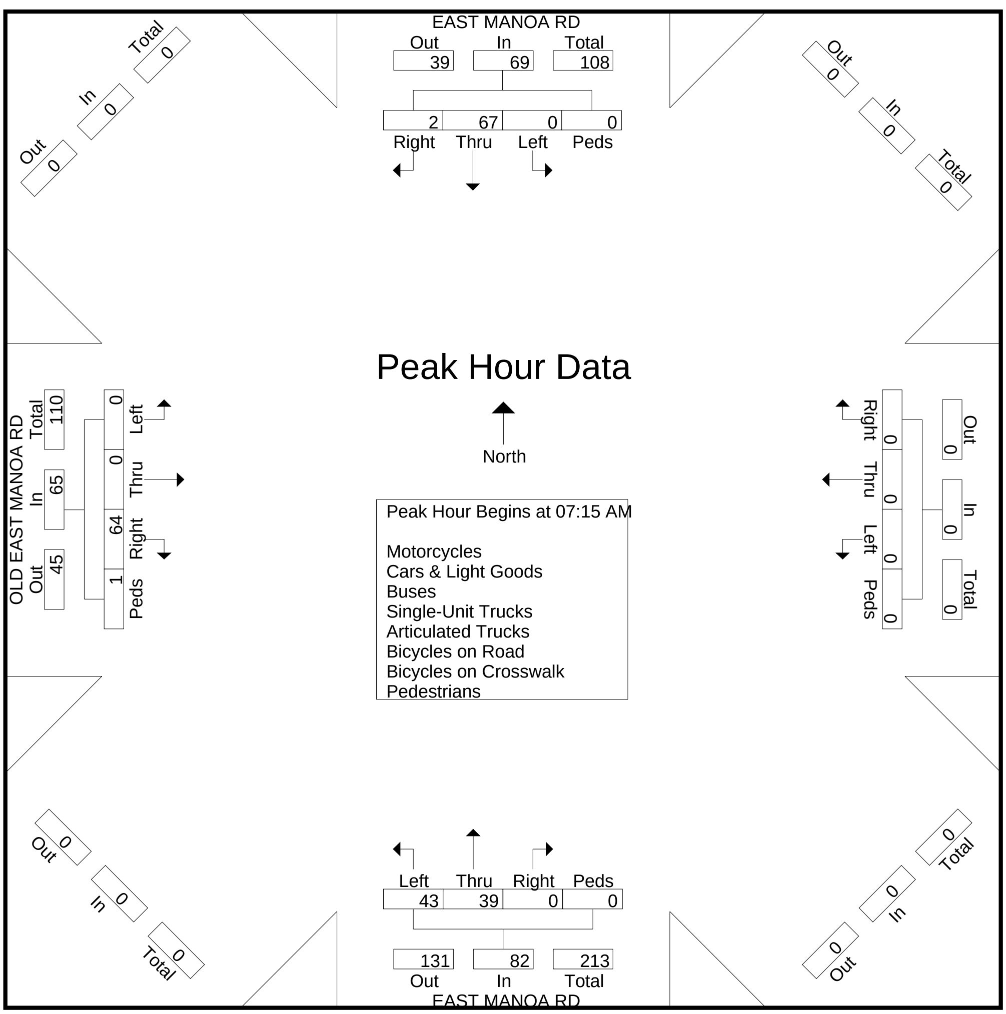
| | EAST MANOA RD Southbound | | | | Westbound | | | | EAST MANOA RD Northbound | | | | OLD EAST MANOA RD Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 06:30 AM | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 7 | 0 | 0 | 0 | 0 | 8 | 0 | 34 |
| 06:45 AM | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 16 | 0 | 34 |
| Total | 0 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 10 | 0 | 0 | 0 | 0 | 24 | 0 | 68 |
| | | | | | | | | | | | | | | | | | |
| 07:00 AM | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 5 | 0 | 0 | 1 | 0 | 16 | 0 | 45 |
| 07:15 AM | 0 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 5 | 0 | 0 | 0 | 0 | 18 | 0 | 57 |
| 07:30 AM | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 11 | 0 | 0 | 0 | 0 | 19 | 0 | 51 |
| 07:45 AM | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 11 | 0 | 0 | 0 | 0 | 16 | 0 | 53 |
| Total | 0 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 32 | 0 | 0 | 1 | 0 | 69 | 0 | 206 |
| | | | | | | | | | | | | | | | | | |
| 08:00 AM | 0 | 16 | 2 | 0 | 0 | 0 | 0 | 0 | 13 | 12 | 0 | 0 | 0 | 0 | 11 | 1 | 55 |
| 08:15 AM | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 11 | 0 | 0 | 0 | 0 | 10 | 0 | 44 |
| Grand Total | 0 | 117 | 2 | 0 | 0 | 0 | 0 | 0 | 73 | 65 | 0 | 0 | 1 | 0 | 114 | 1 | 373 |
| Apprch % | 0 | 98.3 | 1.7 | 0 | 0 | 0 | 0 | 0 | 52.9 | 47.1 | 0 | 0 | 0.9 | 0 | 98.3 | 0.9 | |
| Total % | 0 | 31.4 | 0.5 | 0 | 0 | 0 | 0 | 0 | 19.6 | 17.4 | 0 | 0 | 0.3 | 0 | 30.6 | 0.3 | |
| Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| % Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.8 | 0 | 0.5 |
| Cars & Light Goods | 0 | 117 | 2 | 0 | 0 | 0 | 0 | 0 | 71 | 60 | 0 | 0 | 1 | 0 | 111 | 0 | 362 |
| % Cars & Light Goods | 0 | 100 | 100 | 0 | 0 | 0 | 0 | 0 | 97.3 | 92.3 | 0 | 0 | 100 | 0 | 97.4 | 0 | 97.1 |
| Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| % Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.4 | 6.2 | 0 | 0 | 0 | 0 | 0 | 0 | 1.3 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.9 | 0 | 0.3 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| % Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0.3 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : East Manoa Rd - Old East Manoa Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 2

| | EAST MANOA RD Southbound | | | | | Westbound | | | | | EAST MANOA RD Northbound | | | | | OLD EAST MANOA RD Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:15 AM | | | | | | | | | | | | | | | | | | | | | |
| 07:15 AM | 0 | **23** | 0 | 0 | **23** | 0 | 0 | 0 | 0 | 0 | 11 | 5 | 0 | 0 | 16 | 0 | 0 | 18 | 0 | 18 | **57** |
| 07:30 AM | 0 | 14 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 7 | 11 | 0 | 0 | 18 | 0 | 0 | **19** | 0 | **19** | 51 |
| 07:45 AM | 0 | 14 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 12 | 11 | 0 | 0 | 23 | 0 | 0 | 16 | 0 | 16 | 53 |
| 08:00 AM | 0 | 16 | **2** | 0 | 18 | 0 | 0 | 0 | 0 | 0 | **13** | **12** | 0 | 0 | **25** | 0 | 0 | 11 | **1** | 12 | 55 |
| Total Volume | 0 | 67 | 2 | 0 | 69 | 0 | 0 | 0 | 0 | 0 | 43 | 39 | 0 | 0 | 82 | 0 | 0 | 64 | 1 | 65 | 216 |
| % App. Total | 0 | 97.1 | 2.9 | 0 | | 0 | 0 | 0 | 0 | | 52.4 | 47.6 | 0 | 0 | | 0 | 0 | 98.5 | 1.5 | | |
| PHF | .000 | .728 | .250 | .000 | .750 | .000 | .000 | .000 | .000 | .000 | .827 | .813 | .000 | .000 | .820 | .000 | .000 | .842 | .250 | .855 | .947 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : East Manoa Rd - Old East Manoa Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022

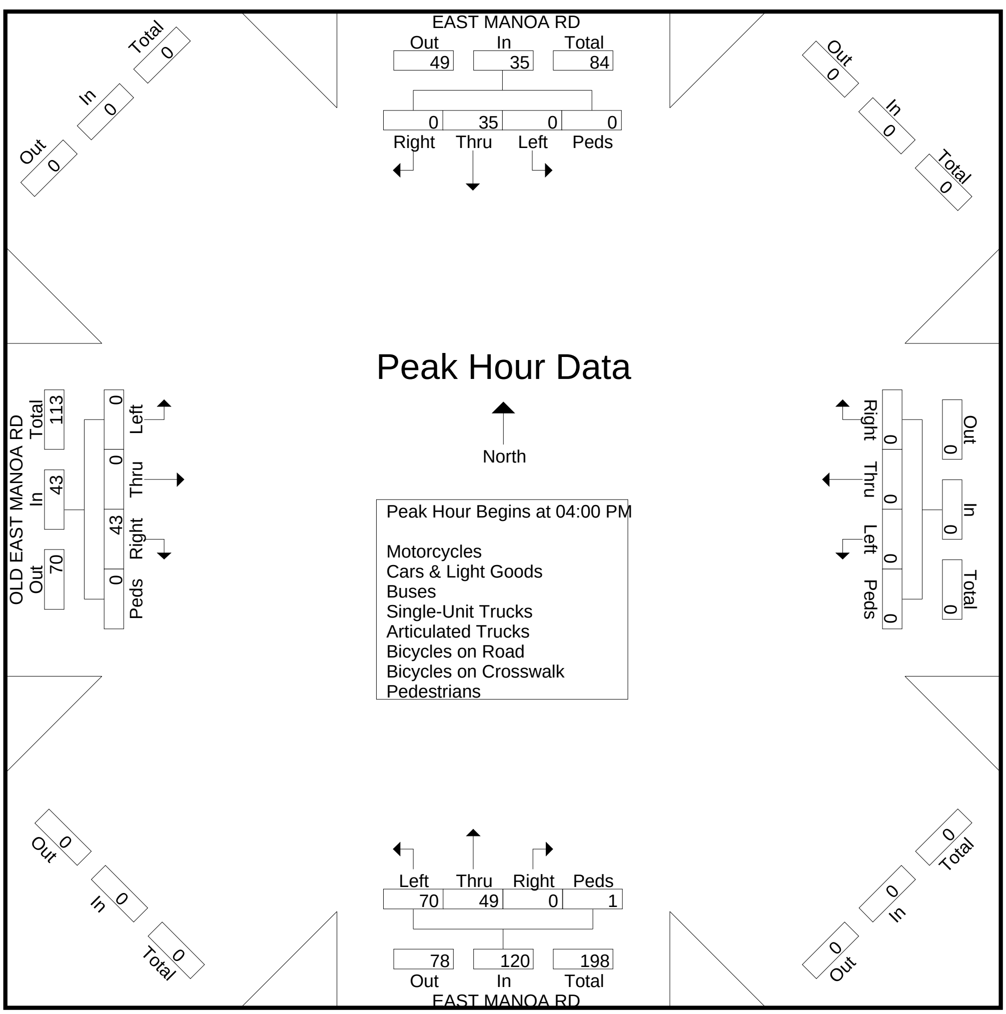

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

| | EAST MANOA RD Southbound | | | | Westbound | | | | EAST MANOA RD Northbound | | | | OLD EAST MANOA RD Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 03:30 PM | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 11 | 0 | 0 | 0 | 0 | 15 | 0 | 54 |
| 03:45 PM | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 18 | 0 | 0 | 0 | 0 | 21 | 0 | 70 |
| Total | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 29 | 0 | 0 | 0 | 0 | 36 | 0 | 124 |
| | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 12 | 0 | 0 | 0 | 0 | 12 | 0 | 56 |
| 04:15 PM | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 9 | 0 | 0 | 0 | 0 | 10 | 0 | 46 |
| 04:30 PM | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 17 | 0 | 1 | 0 | 0 | 11 | 0 | 53 |
| 04:45 PM | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 11 | 0 | 0 | 0 | 0 | 10 | 0 | 43 |
| Total | 0 | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 49 | 0 | 1 | 0 | 0 | 43 | 0 | 198 |
| | | | | | | | | | | | | | | | | | |
| 05:00 PM | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 30 | 0 | 0 | 2 | 0 | 9 | 0 | 67 |
| 05:15 PM | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 17 | 0 | 0 | 1 | 0 | 17 | 1 | 57 |
| Grand Total | 0 | 68 | 0 | 0 | 0 | 0 | 0 | 0 | 143 | 125 | 0 | 1 | 3 | 0 | 105 | 1 | 446 |
| Apprch % | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 53.2 | 46.5 | 0 | 0.4 | 2.8 | 0 | 96.3 | 0.9 | |
| Total % | 0 | 15.2 | 0 | 0 | 0 | 0 | 0 | 0 | 32.1 | 28 | 0 | 0.2 | 0.7 | 0 | 23.5 | 0.2 | |
| Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| Cars & Light Goods | 0 | 63 | 0 | 0 | 0 | 0 | 0 | 0 | 142 | 114 | 0 | 0 | 1 | 0 | 103 | 0 | 423 |
| % Cars & Light Goods | 0 | 92.6 | 0 | 0 | 0 | 0 | 0 | 0 | 99.3 | 91.2 | 0 | 0 | 33.3 | 0 | 98.1 | 0 | 94.8 |
| Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 1 | 0 | 7 |
| % Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4.8 | 0 | 0 | 0 | 0 | 1 | 0 | 1.6 |
| Single-Unit Trucks | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 3 |
| % Single-Unit Trucks | 0 | 1.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.8 | 0 | 0 | 33.3 | 0 | 0 | 0 | 0.7 |
| Articulated Trucks | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Articulated Trucks | 0 | 1.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| Bicycles on Road | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 1 | 0 | 1 | 0 | 9 |
| % Bicycles on Road | 0 | 4.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.2 | 0 | 0 | 33.3 | 0 | 1 | 0 | 2 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0.2 |
| Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| % Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 0.2 |

# Austin Tsutsumi & Associates
501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : East Manoa Rd - Old East Manoa Rd
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | EAST MANOA RD Southbound | | | | | Westbound | | | | | EAST MANOA RD Northbound | | | | | OLD EAST MANOA RD Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:00 PM | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | **13** | 0 | 0 | **13** | 0 | 0 | 0 | 0 | 0 | 19 | 12 | 0 | 0 | 31 | 0 | 0 | **12** | 0 | **12** | **56** |
| 04:15 PM | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | **20** | 9 | 0 | 0 | 29 | 0 | 0 | 10 | 0 | 10 | 46 |
| 04:30 PM | 0 | 9 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 15 | **17** | 0 | **1** | **33** | 0 | 0 | 11 | 0 | 11 | 53 |
| 04:45 PM | 0 | 6 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 16 | 11 | 0 | 0 | 27 | 0 | 0 | 10 | 0 | 10 | 43 |
| Total Volume | 0 | 35 | 0 | 0 | 35 | 0 | 0 | 0 | 0 | 0 | 70 | 49 | 0 | 1 | 120 | 0 | 0 | 43 | 0 | 43 | 198 |
| % App. Total | 0 | 100 | 0 | 0 | | 0 | 0 | 0 | 0 | | 58.3 | 40.8 | 0 | 0.8 | | 0 | 0 | 100 | 0 | | |
| PHF | .000 | .673 | .000 | .000 | .673 | .000 | .000 | .000 | .000 | .000 | .875 | .721 | .000 | .250 | .909 | .000 | .000 | .896 | .000 | .896 | .884 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : Old East Manoa St - Pakanu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

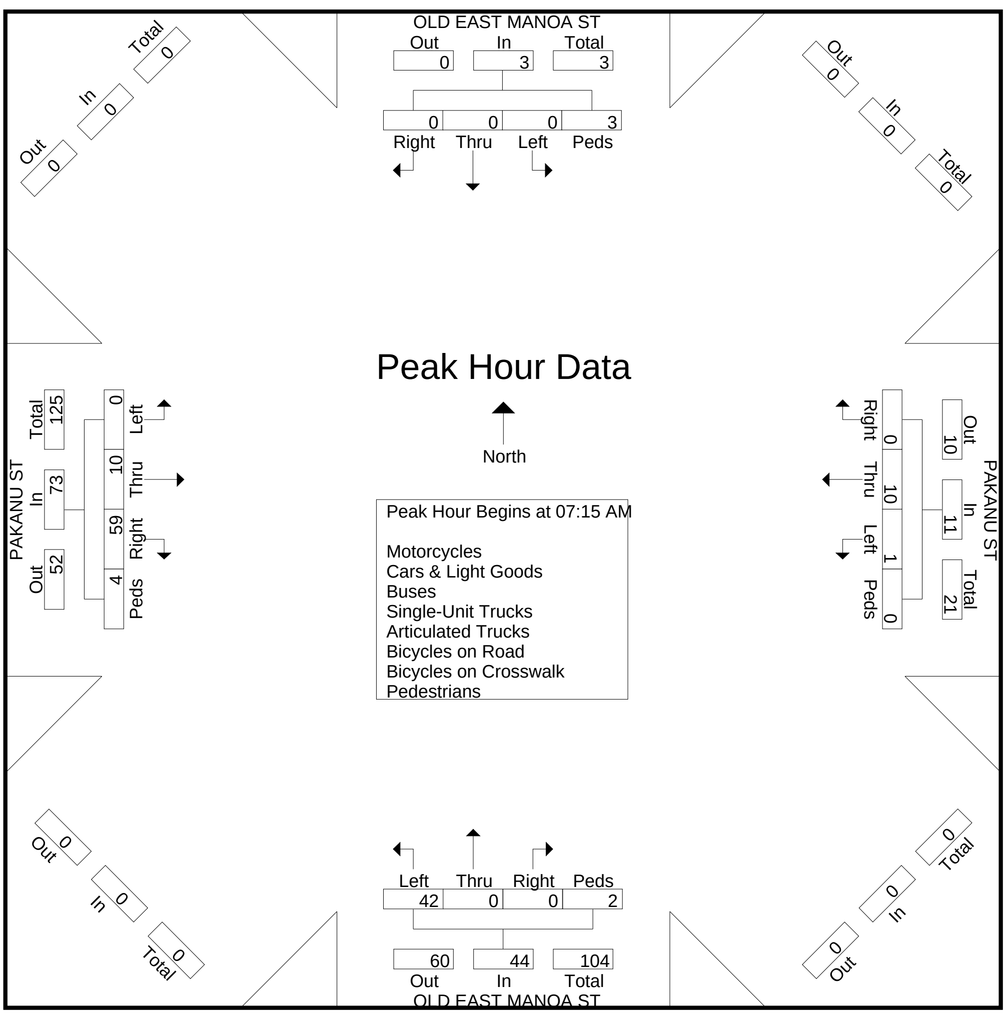
| | OLD EAST MANOA ST Southbound | | | | PAKANU ST Westbound | | | | OLD EAST MANOA ST Northbound | | | | PAKANU ST Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 06:30 AM | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 1 | 7 | 0 | 19 |
| 06:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 18 |
| Total | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 1 | 22 | 0 | 37 |
| | | | | | | | | | | | | | | | | | |
| 07:00 AM | 0 | 0 | 0 | 3 | 2 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 24 |
| 07:15 AM | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 16 | 1 | 29 |
| 07:30 AM | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 6 | 0 | 0 | 1 | 0 | 0 | 18 | 3 | 30 |
| 07:45 AM | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 2 | 15 | 0 | 35 |
| Total | 0 | 0 | 0 | 5 | 3 | 7 | 0 | 0 | 36 | 0 | 0 | 1 | 0 | 2 | 60 | 4 | 118 |
| | | | | | | | | | | | | | | | | | |
| 08:00 AM | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 0 | 14 | 0 | 0 | 1 | 0 | 8 | 10 | 0 | 37 |
| 08:15 AM | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 7 | 1 | 1 | 0 | 0 | 1 | 10 | 0 | 22 |
| Grand Total | 0 | 0 | 0 | 8 | 3 | 13 | 0 | 0 | 68 | 1 | 1 | 2 | 0 | 12 | 102 | 4 | 214 |
| Apprch % | 0 | 0 | 0 | 100 | 18.8 | 81.2 | 0 | 0 | 94.4 | 1.4 | 1.4 | 2.8 | 0 | 10.2 | 86.4 | 3.4 | |
| Total % | 0 | 0 | 0 | 3.7 | 1.4 | 6.1 | 0 | 0 | 31.8 | 0.5 | 0.5 | 0.9 | 0 | 5.6 | 47.7 | 1.9 | |
| Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| % Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0.5 |
| Cars & Light Goods | 0 | 0 | 0 | 0 | 3 | 13 | 0 | 0 | 66 | 1 | 1 | 0 | 0 | 11 | 101 | 0 | 196 |
| % Cars & Light Goods | 0 | 0 | 0 | 0 | 100 | 100 | 0 | 0 | 97.1 | 100 | 100 | 0 | 0 | 91.7 | 99 | 0 | 91.6 |
| Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8.3 | 0 | 0 | 0.5 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 4 | 14 |
| % Pedestrians | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 6.5 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : Old East Manoa St - Pakanu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | OLD EAST MANOA ST Southbound | | | | | PAKANU ST Westbound | | | | | OLD EAST MANOA ST Northbound | | | | | PAKANU ST Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:15 AM | | | | | | | | | | | | | | | | | | | | | |
| 07:15 AM | 0 | 0 | 0 | **1** | **1** | **1** | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 0 | 10 | 0 | 0 | 16 | 1 | 17 | 29 |
| 07:30 AM | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 6 | 0 | 0 | **1** | 7 | 0 | 0 | **18** | **3** | **21** | 30 |
| 07:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | **6** | 0 | 0 | **6** | 12 | 0 | 0 | 0 | 12 | 0 | 2 | 15 | 0 | 17 | 35 |
| 08:00 AM | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 0 | 3 | **14** | 0 | 0 | 1 | **15** | 0 | **8** | 10 | 0 | 18 | **37** |
| Total Volume | 0 | 0 | 0 | 3 | 3 | 1 | 10 | 0 | 0 | 11 | 42 | 0 | 0 | 2 | 44 | 0 | 10 | 59 | 4 | 73 | 131 |
| % App. Total | 0 | 0 | 0 | 100 | | 9.1 | 90.9 | 0 | 0 | | 95.5 | 0 | 0 | 4.5 | | 0 | 13.7 | 80.8 | 5.5 | | |
| PHF | .000 | .000 | .000 | .750 | .750 | .250 | .417 | .000 | .000 | .458 | .750 | .000 | .000 | .500 | .733 | .000 | .313 | .819 | .333 | .869 | .885 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : Old East Manoa St - Pakanu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

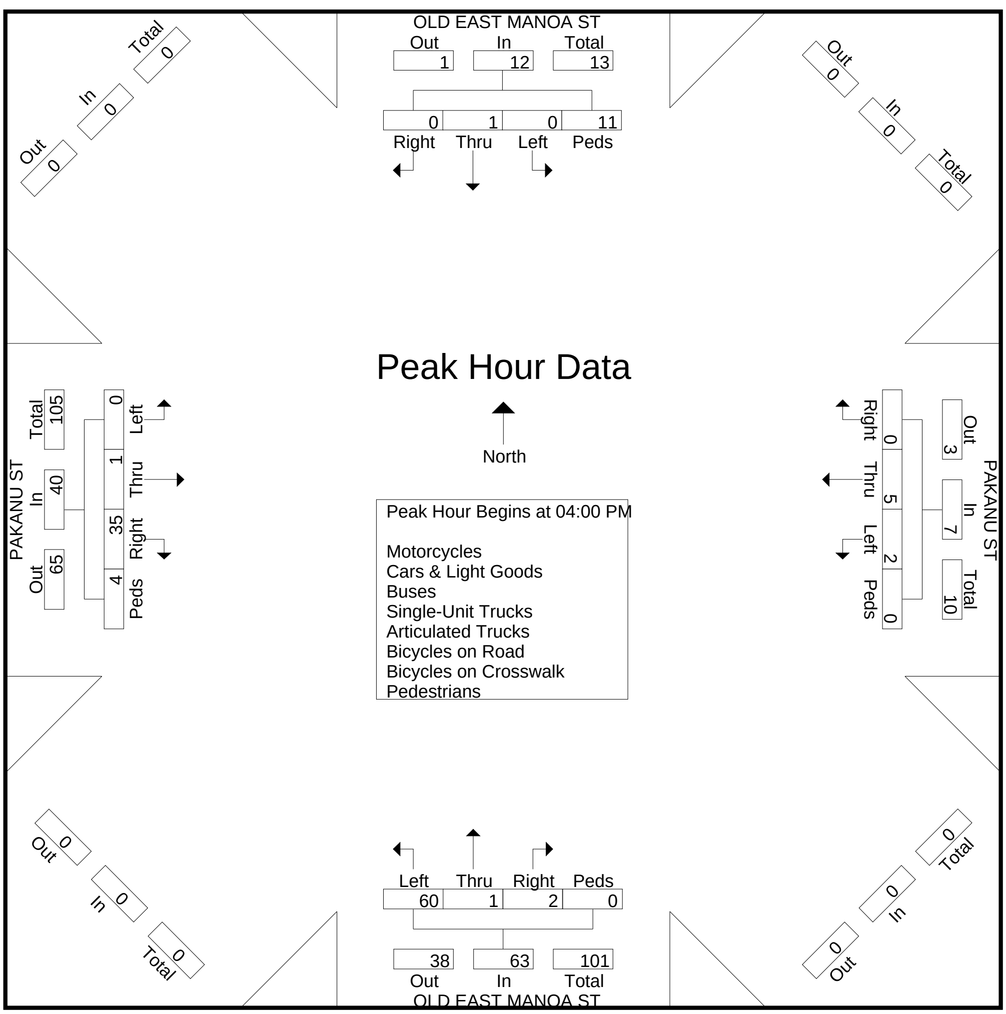
| | OLD EAST MANOA ST Southbound | | | | PAKANU ST Westbound | | | | OLD EAST MANOA ST Northbound | | | | PAKANU ST Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 03:30 PM | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 16 | 0 | 1 | 0 | 0 | 0 | 11 | 0 | 31 |
| 03:45 PM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 0 | 2 | 0 | 21 | 0 | 44 |
| Total | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 35 | 0 | 1 | 0 | 2 | 0 | 32 | 0 | 75 |
| | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 18 | 0 | 1 | 0 | 0 | 0 | 9 | 2 | 34 |
| 04:15 PM | 0 | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 30 |
| 04:30 PM | 0 | 0 | 0 | 4 | 0 | 1 | 0 | 0 | 13 | 0 | 1 | 0 | 0 | 0 | 10 | 1 | 30 |
| 04:45 PM | 0 | 0 | 0 | 2 | 1 | 2 | 0 | 0 | 12 | 1 | 0 | 0 | 0 | 1 | 8 | 1 | 28 |
| Total | 0 | 1 | 0 | 11 | 2 | 5 | 0 | 0 | 60 | 1 | 2 | 0 | 0 | 1 | 35 | 4 | 122 |
| | | | | | | | | | | | | | | | | | |
| 05:00 PM | 0 | 0 | 0 | 4 | 1 | 4 | 1 | 0 | 17 | 0 | 0 | 0 | 0 | 1 | 8 | 2 | 38 |
| 05:15 PM | 0 | 0 | 0 | 4 | 0 | 2 | 0 | 1 | 15 | 0 | 0 | 1 | 0 | 2 | 14 | 1 | 40 |
| Grand Total | 2 | 1 | 0 | 21 | 4 | 11 | 1 | 1 | 127 | 1 | 3 | 1 | 2 | 4 | 89 | 7 | 275 |
| Apprch % | 8.3 | 4.2 | 0 | 87.5 | 23.5 | 64.7 | 5.9 | 5.9 | 96.2 | 0.8 | 2.3 | 0.8 | 2 | 3.9 | 87.3 | 6.9 | |
| Total % | 0.7 | 0.4 | 0 | 7.6 | 1.5 | 4 | 0.4 | 0.4 | 46.2 | 0.4 | 1.1 | 0.4 | 0.7 | 1.5 | 32.4 | 2.5 | |
| Motorcycles | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 5 |
| % Motorcycles | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.8 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 1.8 |
| Cars & Light Goods | 0 | 1 | 0 | 0 | 3 | 11 | 1 | 0 | 126 | 1 | 3 | 0 | 0 | 4 | 88 | 0 | 238 |
| % Cars & Light Goods | 0 | 100 | 0 | 0 | 75 | 100 | 100 | 0 | 99.2 | 100 | 100 | 0 | 0 | 100 | 98.9 | 0 | 86.5 |
| Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| % Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.1 | 0 | 0.4 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 21 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 7 | 30 |
| % Pedestrians | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 10.9 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : Old East Manoa St - Pakanu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 2

| | OLD EAST MANOA ST Southbound | | | | | PAKANU ST Westbound | | | | | OLD EAST MANOA ST Northbound | | | | | PAKANU ST Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:00 PM | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 0 | 0 | 3 | 3 | 0 | 1 | 0 | 0 | 1 | **18** | 0 | **1** | 0 | **19** | 0 | 0 | 9 | **2** | **11** | **34** |
| 04:15 PM | 0 | **1** | 0 | 2 | 3 | **1** | 1 | 0 | 0 | 2 | 17 | 0 | 0 | 0 | 17 | 0 | 0 | 8 | 0 | 8 | 30 |
| 04:30 PM | 0 | 0 | 0 | **4** | **4** | 0 | 1 | 0 | 0 | 1 | 13 | 0 | 1 | 0 | 14 | 0 | 0 | **10** | 1 | 11 | 30 |
| 04:45 PM | 0 | 0 | 0 | 2 | 2 | 1 | **2** | 0 | 0 | **3** | 12 | **1** | 0 | 0 | 13 | 0 | **1** | 8 | 1 | 10 | 28 |
| Total Volume | 0 | 1 | 0 | 11 | 12 | 2 | 5 | 0 | 0 | 7 | 60 | 1 | 2 | 0 | 63 | 0 | 1 | 35 | 4 | 40 | 122 |
| % App. Total | 0 | 8.3 | 0 | 91.7 | | 28.6 | 71.4 | 0 | 0 | | 95.2 | 1.6 | 3.2 | 0 | | 0 | 2.5 | 87.5 | 10 | | |
| PHF | .000 | .250 | .000 | .688 | .750 | .500 | .625 | .000 | .000 | .583 | .833 | .250 | .500 | .000 | .829 | .000 | .250 | .875 | .500 | .909 | .897 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : East Manoa Rd - Pakanu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022

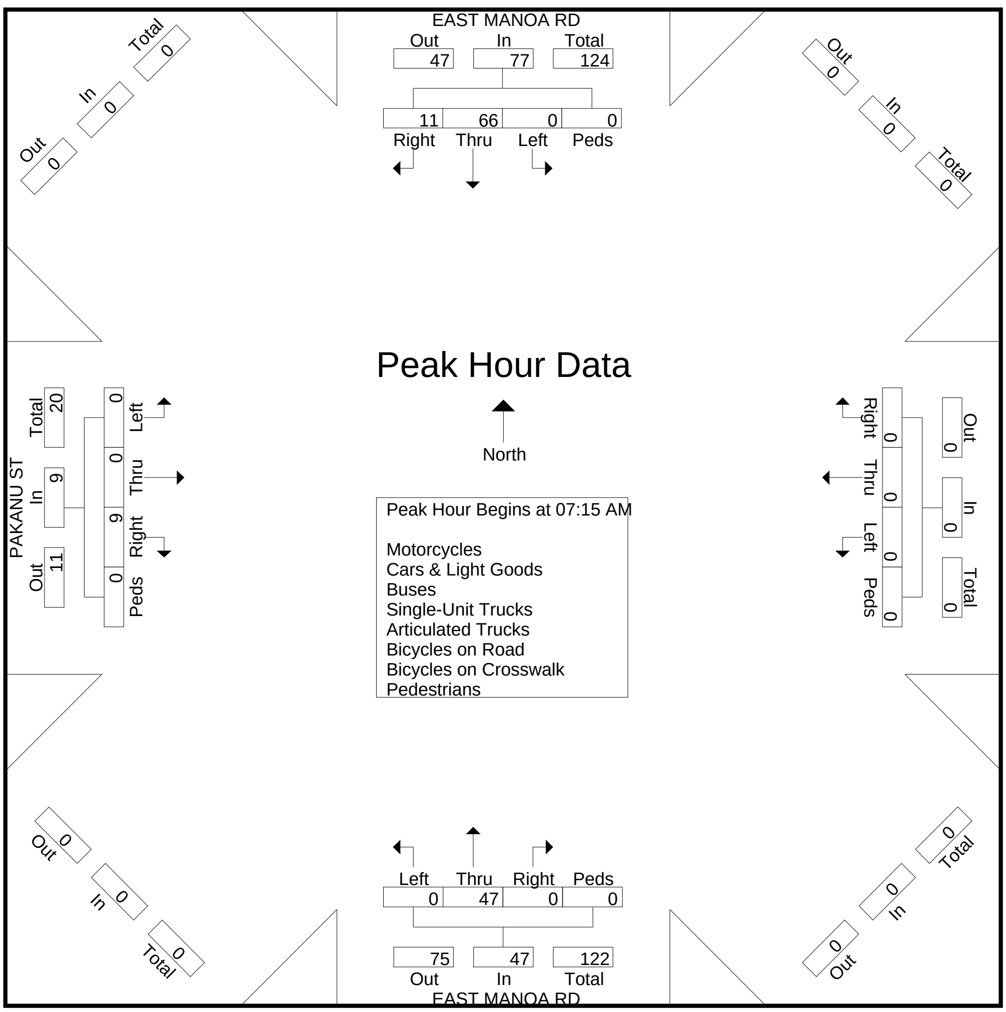

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

| | EAST MANOA RD Southbound | | | | Westbound | | | | EAST MANOA RD Northbound | | | | PAKANU ST Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 06:30 AM | 0 | 12 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 1 | 0 | 23 |
| 06:45 AM | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| Total | 0 | 25 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 1 | 0 | 39 |
| | | | | | | | | | | | | | | | | | |
| 07:00 AM | 0 | 14 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 21 |
| 07:15 AM | 0 | 21 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 27 |
| 07:30 AM | 0 | 15 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 27 |
| 07:45 AM | 0 | 13 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 2 | 0 | 34 |
| Total | 0 | 63 | 9 | 0 | 0 | 0 | 0 | 0 | 1 | 34 | 0 | 0 | 0 | 0 | 2 | 0 | 109 |
| | | | | | | | | | | | | | | | | | |
| 08:00 AM | 0 | 17 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 7 | 0 | 45 |
| 08:15 AM | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 13 | 0 | 0 | 1 | 0 | 2 | 0 | 29 |
| Grand Total | 0 | 117 | 13 | 0 | 0 | 0 | 0 | 0 | 2 | 77 | 0 | 0 | 1 | 0 | 12 | 0 | 222 |
| Apprch % | 0 | 90 | 10 | 0 | 0 | 0 | 0 | 0 | 2.5 | 97.5 | 0 | 0 | 7.7 | 0 | 92.3 | 0 | |
| Total % | 0 | 52.7 | 5.9 | 0 | 0 | 0 | 0 | 0 | 0.9 | 34.7 | 0 | 0 | 0.5 | 0 | 5.4 | 0 | |
| Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cars & Light Goods | 0 | 117 | 13 | 0 | 0 | 0 | 0 | 0 | 2 | 77 | 0 | 0 | 1 | 0 | 12 | 0 | 222 |
| % Cars & Light Goods | 0 | 100 | 100 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 0 | 0 | 100 | 0 | 100 | 0 | 100 |
| Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Austin Tsutsumi & Associates
501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646 Fax: (808)526-1267*

File Name : East Manoa Rd - Pakanu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 2

| | EAST MANOA RD Southbound | | | | | Westbound | | | | | EAST MANOA RD Northbound | | | | | PAKANU ST Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 07:15 AM to 08:00 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:15 AM | | | | | | | | | | | | | | | | | | | | | |
| 07:15 AM | 0 | **21** | 1 | 0 | **22** | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 27 |
| 07:30 AM | 0 | 15 | 1 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 27 |
| 07:45 AM | 0 | 13 | **6** | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 13 | 0 | 0 | 2 | 0 | 2 | 34 |
| 08:00 AM | 0 | 17 | 3 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | **18** | 0 | 0 | **18** | 0 | 0 | **7** | 0 | **7** | **45** |
| Total Volume | 0 | 66 | 11 | 0 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 47 | 0 | 0 | 47 | 0 | 0 | 9 | 0 | 9 | 133 |
| % App. Total | 0 | 85.7 | 14.3 | 0 | | 0 | 0 | 0 | 0 | | 0 | 100 | 0 | 0 | | 0 | 0 | 100 | 0 | | |
| PHF | .000 | .786 | .458 | .000 | .875 | .000 | .000 | .000 | .000 | .000 | .000 | .653 | .000 | .000 | .653 | .000 | .000 | .321 | .000 | .321 | .739 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : East Manoa Rd - Pakanu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

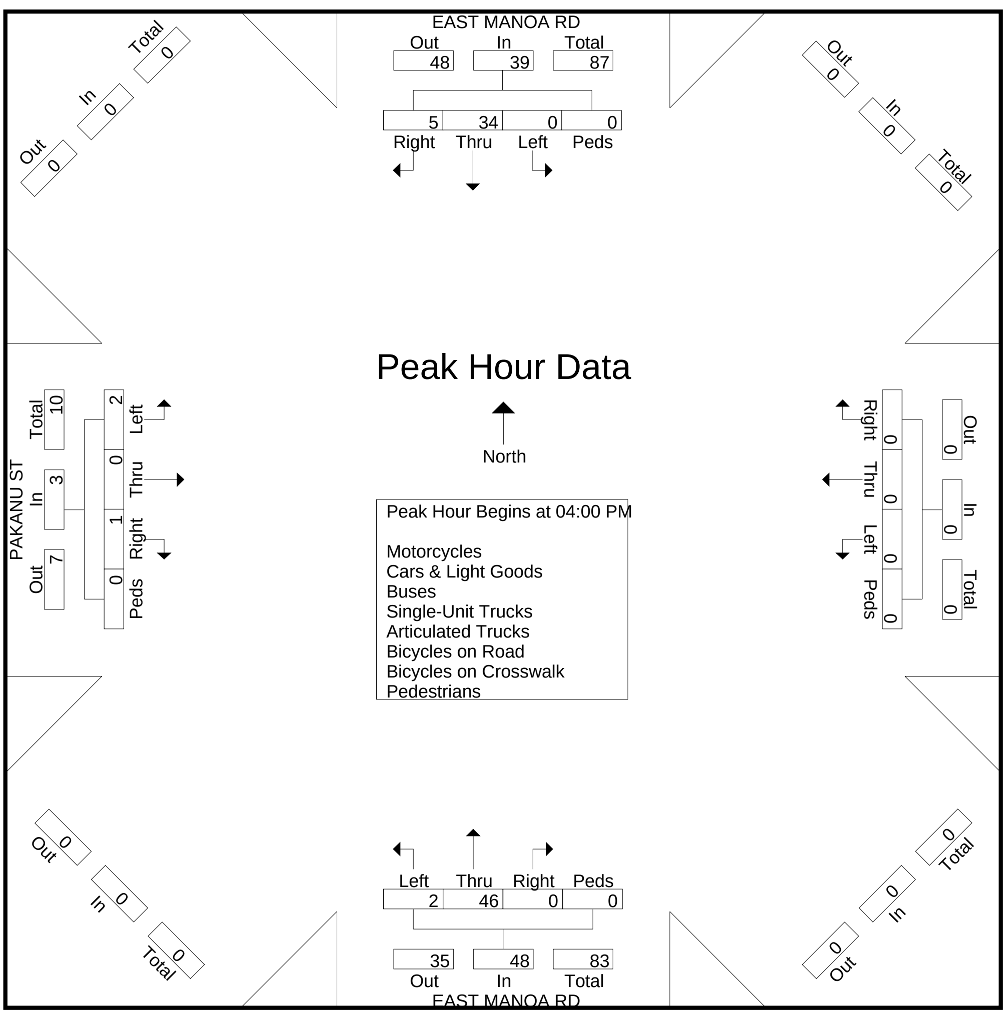
| | EAST MANOA RD Southbound | | | | Westbound | | | | EAST MANOA RD Northbound | | | | PAKANU ST Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 03:30 PM | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 1 | 0 | 0 | 0 | 20 |
| 03:45 PM | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 29 |
| Total | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 29 | 0 | 0 | 1 | 0 | 0 | 0 | 49 |
| | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 13 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 1 | 0 | 0 | 0 | 25 |
| 04:15 PM | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| 04:30 PM | 0 | 8 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 1 | 0 | 0 | 0 | 27 |
| 04:45 PM | 0 | 7 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 1 | 0 | 23 |
| Total | 0 | 34 | 5 | 0 | 0 | 0 | 0 | 0 | 2 | 46 | 0 | 0 | 2 | 0 | 1 | 0 | 90 |
| | | | | | | | | | | | | | | | | | |
| 05:00 PM | 0 | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 26 | 0 | 0 | 1 | 0 | 0 | 0 | 37 |
| 05:15 PM | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 1 | 0 | 25 |
| Grand Total | 0 | 61 | 10 | 0 | 0 | 0 | 0 | 0 | 4 | 120 | 0 | 0 | 4 | 0 | 2 | 0 | 201 |
| Apprch % | 0 | 85.9 | 14.1 | 0 | 0 | 0 | 0 | 0 | 3.2 | 96.8 | 0 | 0 | 66.7 | 0 | 33.3 | 0 | |
| Total % | 0 | 30.3 | 5 | 0 | 0 | 0 | 0 | 0 | 2 | 59.7 | 0 | 0 | 2 | 0 | 1 | 0 | |
| Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cars & Light Goods | 0 | 61 | 10 | 0 | 0 | 0 | 0 | 0 | 4 | 120 | 0 | 0 | 4 | 0 | 2 | 0 | 201 |
| % Cars & Light Goods | 0 | 100 | 100 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 0 | 0 | 100 | 0 | 100 | 0 | 100 |
| Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Single-Unit Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Pedestrians | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646 Fax: (808)526-1267*

File Name : East Manoa Rd - Pakanu St
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | EAST MANOA RD Southbound | | | | | Westbound | | | | | EAST MANOA RD Northbound | | | | | PAKANU ST Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:00 PM | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | **13** | 1 | 0 | **14** | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 10 | **1** | 0 | 0 | 0 | **1** | 25 |
| 04:15 PM | 0 | 6 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | **2** | 7 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 15 |
| 04:30 PM | 0 | 8 | 1 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | **17** | 0 | 0 | **17** | 1 | 0 | 0 | 0 | 1 | **27** |
| 04:45 PM | 0 | 7 | **3** | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 12 | 0 | 0 | **1** | 0 | 1 | 23 |
| Total Volume | 0 | 34 | 5 | 0 | 39 | 0 | 0 | 0 | 0 | 0 | 2 | 46 | 0 | 0 | 48 | 2 | 0 | 1 | 0 | 3 | 90 |
| % App. Total | 0 | 87.2 | 12.8 | 0 | | 0 | 0 | 0 | 0 | | 4.2 | 95.8 | 0 | 0 | | 66.7 | 0 | 33.3 | 0 | | |
| PHF | .000 | .654 | .417 | .000 | .696 | .000 | .000 | .000 | .000 | .000 | .250 | .676 | .000 | .000 | .706 | .500 | .000 | .250 | .000 | .750 | .833 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646 Fax: (808)526-1267*

File Name : East Manoa Rd - Akaka Pl
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

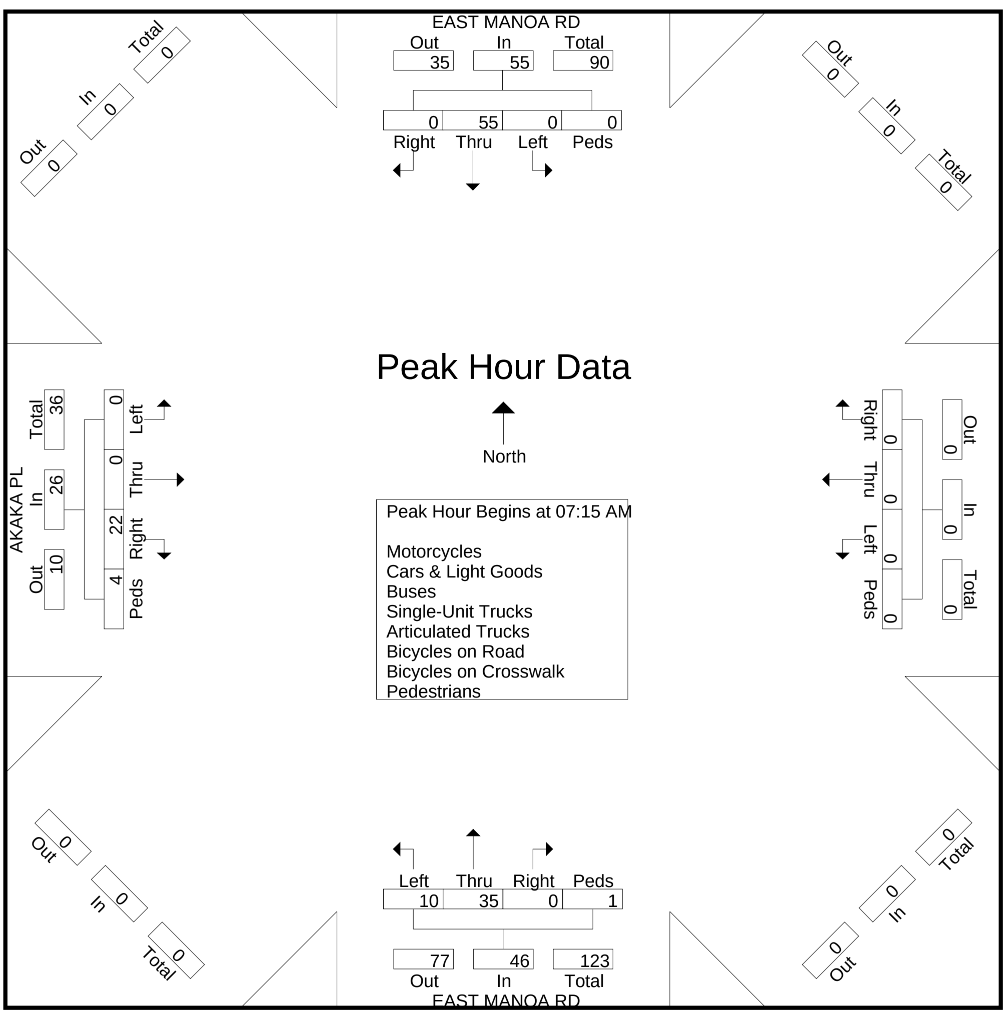
| | EAST MANOA RD Southbound | | | | Westbound | | | | EAST MANOA RD Northbound | | | | AKAKA PL Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 06:30 AM | 0 | 9 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 3 | 0 | 0 | 4 | 4 | 30 |
| 06:45 AM | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 5 | 0 | 16 |
| Total | 0 | 17 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 3 | 0 | 0 | 9 | 4 | 46 |
| | | | | | | | | | | | | | | | | | |
| 07:00 AM | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 0 | 1 | 0 | 0 | 4 | 0 | 21 |
| 07:15 AM | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 6 | 0 | 26 |
| 07:30 AM | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 8 | 0 | 1 | 0 | 0 | 6 | 2 | 29 |
| 07:45 AM | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 11 | 0 | 0 | 0 | 0 | 4 | 0 | 32 |
| Total | 0 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 24 | 0 | 2 | 0 | 0 | 20 | 2 | 108 |
| | | | | | | | | | | | | | | | | | |
| 08:00 AM | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 13 | 0 | 0 | 0 | 0 | 6 | 2 | 40 |
| 08:15 AM | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 12 | 0 | 0 | 0 | 0 | 3 | 0 | 26 |
| Grand Total | 0 | 92 | 0 | 1 | 0 | 0 | 0 | 0 | 15 | 61 | 0 | 5 | 0 | 0 | 38 | 8 | 220 |
| Apprch % | 0 | 98.9 | 0 | 1.1 | 0 | 0 | 0 | 0 | 18.5 | 75.3 | 0 | 6.2 | 0 | 0 | 82.6 | 17.4 | |
| Total % | 0 | 41.8 | 0 | 0.5 | 0 | 0 | 0 | 0 | 6.8 | 27.7 | 0 | 2.3 | 0 | 0 | 17.3 | 3.6 | |
| Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cars & Light Goods | 0 | 91 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 55 | 0 | 0 | 0 | 0 | 38 | 0 | 199 |
| % Cars & Light Goods | 0 | 98.9 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 90.2 | 0 | 0 | 0 | 0 | 100 | 0 | 90.5 |
| Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| % Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6.6 | 0 | 0 | 0 | 0 | 0 | 0 | 1.8 |
| Single-Unit Trucks | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| % Single-Unit Trucks | 0 | 1.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.3 | 0 | 0 | 0 | 0 | 0 | 0 | 1.4 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 8 | 14 |
| % Pedestrians | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 6.4 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*

File Name : East Manoa Rd - Akaka Pl
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | EAST MANOA RD Southbound | | | | | Westbound | | | | | EAST MANOA RD Northbound | | | | | AKAKA PL Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:15 AM | | | | | | | | | | | | | | | | | | | | | |
| 07:15 AM | 0 | **16** | 0 | 0 | **16** | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 4 | 0 | 0 | **6** | 0 | 6 | 26 |
| 07:30 AM | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 2 | 8 | 0 | **1** | 11 | 0 | 0 | 6 | **2** | **8** | 29 |
| 07:45 AM | 0 | 15 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 2 | 11 | 0 | 0 | 13 | 0 | 0 | 4 | 0 | 4 | 32 |
| 08:00 AM | 0 | 14 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | **5** | **13** | 0 | 0 | **18** | 0 | 0 | 6 | 2 | 8 | **40** |
| Total Volume | 0 | 55 | 0 | 0 | 55 | 0 | 0 | 0 | 0 | 0 | 10 | 35 | 0 | 1 | 46 | 0 | 0 | 22 | 4 | 26 | 127 |
| % App. Total | 0 | 100 | 0 | 0 | | 0 | 0 | 0 | 0 | | 21.7 | 76.1 | 0 | 2.2 | | 0 | 0 | 84.6 | 15.4 | | |
| PHF | .000 | .859 | .000 | .000 | .859 | .000 | .000 | .000 | .000 | .000 | .500 | .673 | .000 | .250 | .639 | .000 | .000 | .917 | .500 | .813 | .794 |



# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : East Manoa Rd - Akaka Pl
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

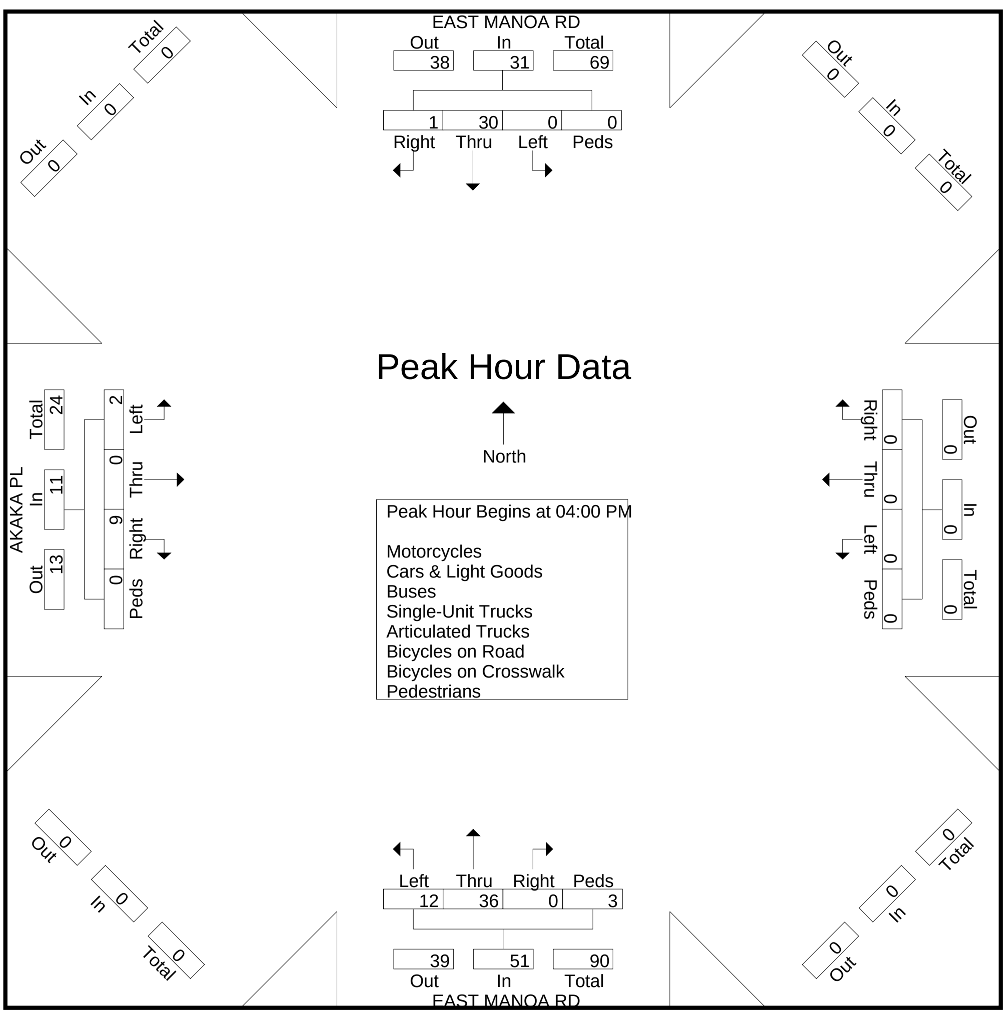
| | EAST MANOA RD Southbound | | | | Westbound | | | | EAST MANOA RD Northbound | | | | AKAKA PL Eastbound | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Left | Thru | Right | Peds | Int. Total |
| 03:30 PM | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 9 | 0 | 0 | 0 | 0 | 0 | 2 | 21 |
| 03:45 PM | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 14 | 0 | 0 | 0 | 0 | 2 | 0 | 29 |
| Total | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 23 | 0 | 0 | 0 | 0 | 2 | 2 | 50 |
| | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 9 | 0 | 2 | 0 | 0 | 5 | 0 | 27 |
| 04:15 PM | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| 04:30 PM | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 13 | 0 | 1 | 1 | 0 | 1 | 0 | 29 |
| 04:45 PM | 0 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 8 | 0 | 0 | 1 | 0 | 3 | 0 | 24 |
| Total | 0 | 30 | 1 | 0 | 0 | 0 | 0 | 0 | 12 | 36 | 0 | 3 | 2 | 0 | 9 | 0 | 93 |
| | | | | | | | | | | | | | | | | | |
| 05:00 PM | 0 | 4 | 0 | 3 | 0 | 0 | 0 | 0 | 6 | 21 | 0 | 0 | 0 | 0 | 5 | 4 | 43 |
| 05:15 PM | 0 | 5 | 0 | 2 | 0 | 0 | 0 | 0 | 5 | 14 | 0 | 0 | 0 | 0 | 0 | 2 | 28 |
| Grand Total | 0 | 55 | 1 | 5 | 0 | 0 | 0 | 0 | 30 | 94 | 0 | 3 | 2 | 0 | 16 | 8 | 214 |
| Apprch % | 0 | 90.2 | 1.6 | 8.2 | 0 | 0 | 0 | 0 | 23.6 | 74 | 0 | 2.4 | 7.7 | 0 | 61.5 | 30.8 | |
| Total % | 0 | 25.7 | 0.5 | 2.3 | 0 | 0 | 0 | 0 | 14 | 43.9 | 0 | 1.4 | 0.9 | 0 | 7.5 | 3.7 | |
| Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| % Motorcycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 |
| Cars & Light Goods | 0 | 53 | 1 | 0 | 0 | 0 | 0 | 0 | 29 | 84 | 0 | 0 | 2 | 0 | 14 | 0 | 183 |
| % Cars & Light Goods | 0 | 96.4 | 100 | 0 | 0 | 0 | 0 | 0 | 96.7 | 89.4 | 0 | 0 | 100 | 0 | 87.5 | 0 | 85.5 |
| Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| % Buses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6.4 | 0 | 0 | 0 | 0 | 0 | 0 | 2.8 |
| Single-Unit Trucks | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 5 |
| % Single-Unit Trucks | 0 | 3.6 | 0 | 0 | 0 | 0 | 0 | 0 | 3.3 | 1.1 | 0 | 0 | 0 | 0 | 6.2 | 0 | 2.3 |
| Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Articulated Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 3 |
| % Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.1 | 0 | 0 | 0 | 0 | 6.2 | 0 | 1.4 |
| Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Bicycles on Crosswalk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 8 | 16 |
| % Pedestrians | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 100 | 7.5 |

# Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
*Phone: (808)533-3646   Fax: (808)526-1267*


File Name : East Manoa Rd - Akaka Pl
Site Code : 22-206 Manoa Banyan Court
Start Date : 4/27/2022


| | EAST MANOA RD Southbound | | | | | Westbound | | | | | EAST MANOA RD Northbound | | | | | AKAKA PL Eastbound | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Left | Thru | Right | Peds | App. Total | Int. Total |
| Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:00 PM | | | | | | | | | | | | | | | | | | | | | |
| 04:00 PM | 0 | **9** | 0 | 0 | **9** | 0 | 0 | 0 | 0 | 0 | 2 | 9 | 0 | **2** | 13 | 0 | 0 | **5** | 0 | **5** | 27 |
| 04:15 PM | 0 | 6 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 13 |
| 04:30 PM | 0 | 8 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | **5** | **13** | 0 | 1 | **19** | **1** | 0 | 1 | 0 | 2 | **29** |
| 04:45 PM | 0 | 7 | **1** | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 4 | 8 | 0 | 0 | 12 | 1 | 0 | 3 | 0 | 4 | 24 |
| Total Volume | 0 | 30 | 1 | 0 | 31 | 0 | 0 | 0 | 0 | 0 | 12 | 36 | 0 | 3 | 51 | 2 | 0 | 9 | 0 | 11 | 93 |
| % App. Total | 0 | 96.8 | 3.2 | 0 | | 0 | 0 | 0 | 0 | | 23.5 | 70.6 | 0 | 5.9 | | 18.2 | 0 | 81.8 | 0 | | |
| PHF | .000 | .833 | .250 | .000 | .861 | .000 | .000 | .000 | .000 | .000 | .600 | .692 | .000 | .375 | .671 | .500 | .000 | .450 | .000 | .550 | .802 |



# APPENDIX C

LOS WORKSHEETS

# APPENDIX C

## LOS WORKSHEETS

### Existing Conditions – AM Peak Hour

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 364 | 277 | 15 | 425 | 373 | 20 |
| Future Volume (veh/h) | 364 | 277 | 15 | 425 | 373 | 20 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 0.99 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1751 | 1683 | 1678 | 1745 | 1745 | 1678 |
| Adj Flow Rate, veh/h | 449 | 335 | 23 | 452 | 455 | 24 |
| Peak Hour Factor | 0.81 | 0.71 | 0.65 | 0.94 | 0.82 | 0.71 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 506 | 378 | 62 | 697 | 494 | 26 |
| Arrive On Green | 0.55 | 0.55 | 0.55 | 0.55 | 0.32 | 0.32 |
| Sat Flow, veh/h | 928 | 693 | 17 | 1278 | 1566 | 83 |
| Grp Volume(v), veh/h | 0 | 784 | 475 | 0 | 480 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1621 | 1295 | 0 | 1652 | 0 |
| Q Serve(g_s), s | 0.0 | 30.6 | 4.0 | 0.0 | 20.2 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 30.6 | 34.6 | 0.0 | 20.2 | 0.0 |
| Prop In Lane | | 0.43 | 0.05 | | 0.95 | 0.05 |
| Lane Grp Cap(c), veh/h | 0 | 884 | 759 | 0 | 521 | 0 |
| V/C Ratio(X) | 0.00 | 0.89 | 0.63 | 0.00 | 0.92 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 1013 | 887 | 0 | 573 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 14.4 | 11.1 | 0.0 | 23.8 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 9.2 | 1.4 | 0.0 | 19.5 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 12.0 | 4.5 | 0.0 | 10.3 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 23.6 | 12.5 | 0.0 | 43.2 | 0.0 |
| LnGrp LOS | A | C | B | A | D | A |
| Approach Vol, veh/h | 784 | | | 475 | 480 | |
| Approach Delay, s/veh | 23.6 | | | 12.5 | 43.2 | |
| Approach LOS | C | | | B | D | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 44.3 | | 27.7 | | 44.3 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 45.0 | | 25.0 | | 45.0 |
| Max Q Clear Time (g_c+I1), s | | 32.6 | | 22.2 | | 36.6 |
| Green Ext Time (p_c), s | | 6.3 | | 0.5 | | 2.7 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 26.0 |
| HCM 6th LOS | | | C |

Notes

User approved volume balancing among the lanes for turning movement.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 43 | 142 | 34 | 9 | 207 | 113 | 80 | 128 | 3 | 28 | 45 | 57 |
| Future Volume (veh/h) | 43 | 142 | 34 | 9 | 207 | 113 | 80 | 128 | 3 | 28 | 45 | 57 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.99 | | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 53 | 161 | 34 | 22 | 230 | 102 | 93 | 186 | 4 | 40 | 76 | 29 |
| Peak Hour Factor | 0.81 | 0.88 | 0.62 | 0.40 | 0.90 | 0.85 | 0.86 | 0.69 | 0.50 | 0.70 | 0.59 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 224 | 627 | 118 | 116 | 630 | 264 | 227 | 325 | 6 | 183 | 286 | 89 |
| Arrive On Green | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Sat Flow, veh/h | 234 | 1245 | 235 | 44 | 1250 | 524 | 436 | 1286 | 25 | 282 | 1132 | 354 |
| Grp Volume(v), veh/h | 248 | 0 | 0 | 354 | 0 | 0 | 283 | 0 | 0 | 145 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1714 | 0 | 0 | 1819 | 0 | 0 | 1746 | 0 | 0 | 1768 | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 3.1 | 0.0 | 0.0 | 4.8 | 0.0 | 0.0 | 5.7 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 |
| Prop In Lane | 0.21 | | 0.14 | 0.06 | | 0.29 | 0.33 | | 0.01 | 0.28 | | 0.20 |
| Lane Grp Cap(c), veh/h | 970 | 0 | 0 | 1009 | 0 | 0 | 558 | 0 | 0 | 559 | 0 | 0 |
| V/C Ratio(X) | 0.26 | 0.00 | 0.00 | 0.35 | 0.00 | 0.00 | 0.51 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 1500 | 0 | 0 | 1590 | 0 | 0 | 1282 | 0 | 0 | 1257 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 5.8 | 0.0 | 0.0 | 6.3 | 0.0 | 0.0 | 13.5 | 0.0 | 0.0 | 12.4 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.2 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.9 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 | 2.1 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 6.0 | 0.0 | 0.0 | 6.6 | 0.0 | 0.0 | 14.2 | 0.0 | 0.0 | 12.7 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | B | A | A | B | A | A |
| Approach Vol, veh/h | | 248 | | | 354 | | | 283 | | | 145 | |
| Approach Delay, s/veh | | 6.0 | | | 6.6 | | | 14.2 | | | 12.7 | |
| Approach LOS | | A | | | A | | | B | | | B | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 25.6 | | 15.4 | | 25.6 | | 15.4 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 34.0 | | 28.0 | | 34.0 | | 28.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 5.1 | | 7.7 | | 6.8 | | 4.6 | | | | |
| Green Ext Time (p_c), s | | 2.4 | | 1.7 | | 3.5 | | 0.8 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 9.4 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 47 | 88 | 26 | 11 | 160 | 18 | 44 | 42 | 9 | 12 | 23 | 81 |
| Future Volume (veh/h) | 47 | 88 | 26 | 11 | 160 | 18 | 44 | 42 | 9 | 12 | 23 | 81 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 51 | 96 | 14 | 12 | 174 | 12 | 48 | 46 | 1 | 13 | 25 | 12 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 488 | 256 | 35 | 321 | 394 | 27 | 531 | 99 | 2 | 414 | 109 | 52 |
| Arrive On Green | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| Sat Flow, veh/h | 472 | 1053 | 145 | 83 | 1623 | 110 | 821 | 787 | 17 | 448 | 862 | 414 |
| Grp Volume(v), veh/h | 161 | 0 | 0 | 198 | 0 | 0 | 95 | 0 | 0 | 50 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1670 | 0 | 0 | 1816 | 0 | 0 | 1625 | 0 | 0 | 1724 | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.9 | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 |
| Prop In Lane | 0.32 | | 0.09 | 0.06 | | 0.06 | 0.51 | | 0.01 | 0.26 | | 0.24 |
| Lane Grp Cap(c), veh/h | 780 | 0 | 0 | 742 | 0 | 0 | 632 | 0 | 0 | 575 | 0 | 0 |
| V/C Ratio(X) | 0.21 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 3612 | 0 | 0 | 3997 | 0 | 0 | 3667 | 0 | 0 | 3729 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 4.0 | 0.0 | 0.0 | 4.1 | 0.0 | 0.0 | 5.1 | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 4.1 | 0.0 | 0.0 | 4.3 | 0.0 | 0.0 | 5.2 | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | A | A | A | A | A | A |
| Approach Vol, veh/h | | 161 | | | 198 | | | 95 | | | 50 | |
| Approach Delay, s/veh | | 4.1 | | | 4.3 | | | 5.2 | | | 5.0 | |
| Approach LOS | | A | | | A | | | A | | | A | |

| Timer - Assigned Phs | 2 | 4 | 6 | 8 |
|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 7.1 | 5.6 | 7.1 | 5.6 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 26.0 | 26.0 | 26.0 |
| Max Q Clear Time (g_c+I1), s | 2.9 | 2.7 | 3.2 | 2.3 |
| Green Ext Time (p_c), s | 0.9 | 0.4 | 1.1 | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 4.5 |
| HCM 6th LOS | A |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.5 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 14 | 71 | 7 | 0 | 183 | 45 | 22 | 21 | 0 | 26 | 10 | 21 |
| Future Vol, veh/h | 14 | 71 | 7 | 0 | 183 | 45 | 22 | 21 | 0 | 26 | 10 | 21 |
| 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 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 77 | 8 | 0 | 199 | 49 | 24 | 23 | 0 | 28 | 11 | 23 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.1 | 8.9 | 8.2 | 8.1 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 51% | 15% | 0% | 46% |
| Vol Thru, % | 49% | 77% | 80% | 18% |
| Vol Right, % | 0% | 8% | 20% | 37% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 43 | 92 | 228 | 57 |
| LT Vol | 22 | 14 | 0 | 26 |
| Through Vol | 21 | 71 | 183 | 10 |
| RT Vol | 0 | 7 | 45 | 21 |
| Lane Flow Rate | 47 | 100 | 248 | 62 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.063 | 0.123 | 0.288 | 0.08 |
| Departure Headway (Hd) | 4.877 | 4.436 | 4.187 | 4.628 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 735 | 810 | 860 | 775 |
| Service Time | 2.902 | 2.455 | 2.203 | 2.65 |
| HCM Lane V/C Ratio | 0.064 | 0.123 | 0.288 | 0.08 |
| HCM Control Delay | 8.2 | 8.1 | 8.9 | 8.1 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.2 | 0.4 | 1.2 | 0.3 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 83 | 191 | 0 | 0 | 21 |
| Future Vol, veh/h | 12 | 83 | 191 | 0 | 0 | 21 |
| Conflicting Peds, #/hr | 2 | 0 | 0 | 2 | 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 | 13 | 90 | 208 | 0 | 0 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 210 | 0 | - | 0 | 326 | 210 |
| Stage 1 | - | - | - | - | 210 | - |
| Stage 2 | - | - | - | - | 116 | - |
| 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 | 1361 | - | - | - | 668 | 830 |
| Stage 1 | - | - | - | - | 825 | - |
| Stage 2 | - | - | - | - | 909 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1359 | - | - | - | 659 | 829 |
| Mov Cap-2 Maneuver | - | - | - | - | 659 | - |
| Stage 1 | - | - | - | - | 815 | - |
| Stage 2 | - | - | - | - | 907 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1 | 0 | 9.5 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1359 | - | - | - | 829 |
| HCM Lane V/C Ratio | 0.01 | - | - | - | 0.028 |
| HCM Control Delay (s) | 7.7 | 0 | - | - | 9.5 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.2 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 44 | 40 | 71 | 2 | 0 | 68 |
| Future Vol, veh/h | 44 | 40 | 71 | 2 | 0 | 68 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 20 | 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 | 48 | 43 | 77 | 2 | 0 | 74 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 79 | 0 | - | 0 | 217 | 78 |
| Stage 1 | - | - | - | - | 78 | - |
| Stage 2 | - | - | - | - | 139 | - |
| 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 | 1519 | - | - | - | 771 | 983 |
| Stage 1 | - | - | - | - | 945 | - |
| Stage 2 | - | - | - | - | 888 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1519 | - | - | - | 746 | 983 |
| Mov Cap-2 Maneuver | - | - | - | - | 746 | - |
| Stage 1 | - | - | - | - | 915 | - |
| Stage 2 | - | - | - | - | 888 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 3.9 | 0 | 9 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1519 | - | - | - | - | 983 |
| HCM Lane V/C Ratio | 0.031 | - | - | - | - | 0.075 |
| HCM Control Delay (s) | 7.4 | 0 | - | - | 0 | 9 |
| HCM Lane LOS | A | A | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | - | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 8.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 43 | 0 | 0 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 10 | 59 |
| Future Vol, veh/h | 43 | 0 | 0 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 10 | 59 |
| Conflicting Peds, #/hr | 4 | 0 | 0 | 0 | 0 | 4 | 2 | 0 | 3 | 3 | 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 | 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 | 47 | 0 | 0 | 0 | 0 | 0 | 1 | 11 | 0 | 0 | 11 | 64 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 5 | 0 | 0 | 0 | 0 | 0 | 135 | 99 | 3 | 108 | 99 | 7 |
| Stage 1 | - | - | - | - | - | - | 94 | 94 | - | 5 | 5 | - |
| Stage 2 | - | - | - | - | - | - | 41 | 5 | - | 103 | 94 | - |
| 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 | 1616 | - | - | - | - | - | 836 | 791 | 1081 | 871 | 791 | 1075 |
| Stage 1 | - | - | - | - | - | - | 913 | 817 | - | 1017 | 892 | - |
| Stage 2 | - | - | - | - | - | - | 974 | 892 | - | 903 | 817 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1611 | - | - | - | - | - | 759 | 766 | 1078 | 838 | 766 | 1070 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 759 | 766 | - | 838 | 766 | - |
| Stage 1 | - | - | - | - | - | - | 887 | 793 | - | 984 | 889 | - |
| Stage 2 | - | - | - | - | - | - | 903 | 889 | - | 863 | 793 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 7.3 | 0 | 9.8 | 8.8 |
| HCM LOS | | | A | A |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 765 | 1611 | - | - | - | - | - | 1012 |
| HCM Lane V/C Ratio | 0.016 | 0.029 | - | - | - | - | - | 0.074 |
| HCM Control Delay (s) | 9.8 | 7.3 | 0 | - | 0 | - | - | 8.8 |
| HCM Lane LOS | A | A | A | - | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | 0.1 | - | - | - | - | - | 0.2 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.6 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 48 | 70 | 11 | 0 | 9 |
| Future Vol, veh/h | 0 | 48 | 70 | 11 | 0 | 9 |
| 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 | 0 | 52 | 76 | 12 | 0 | 10 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 88 | 0 | - | 0 | 134 | 82 |
| Stage 1 | - | - | - | - | 82 | - |
| Stage 2 | - | - | - | - | 52 | - |
| 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 | 1508 | - | - | - | 860 | 978 |
| Stage 1 | - | - | - | - | 941 | - |
| Stage 2 | - | - | - | - | 970 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1508 | - | - | - | 860 | 978 |
| Mov Cap-2 Maneuver | - | - | - | - | 860 | - |
| Stage 1 | - | - | - | - | 941 | - |
| Stage 2 | - | - | - | - | 970 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1508 | - | - | - | 978 |
| HCM Lane V/C Ratio | - | - | - | - | 0.01 |
| HCM Control Delay (s) | 0 | - | - | - | 8.7 |
| HCM Lane LOS | A | - | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 2.1 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 10 | 36 | 59 | 0 | 0 | 22 |
| Future Vol, veh/h | 10 | 36 | 59 | 0 | 0 | 22 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 1 |
| 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 | 11 | 39 | 64 | 0 | 0 | 24 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 64 | 0 | - | 0 | 125 | 65 |
| Stage 1 | - | - | - | - | 64 | - |
| Stage 2 | - | - | - | - | 61 | - |
| 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 | 1538 | - | - | - | 870 | 999 |
| Stage 1 | - | - | - | - | 959 | - |
| Stage 2 | - | - | - | - | 962 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1538 | - | - | - | 864 | 998 |
| Mov Cap-2 Maneuver | - | - | - | - | 864 | - |
| Stage 1 | - | - | - | - | 952 | - |
| Stage 2 | - | - | - | - | 962 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.6 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1538 | - | - | - | 998 |
| HCM Lane V/C Ratio | 0.007 | - | - | - | 0.024 |
| HCM Control Delay (s) | 7.4 | 0 | - | - | 8.7 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 36 | 0 | 0 | 59 | 0 | 0 |
| Future Vol, veh/h | 36 | 0 | 0 | 59 | 0 | 0 |
| 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 | 39 | 0 | 0 | 64 | 0 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 39 | 0 | 103 | 39 |
| Stage 1 | - | - | - | - | 39 | - |
| Stage 2 | - | - | - | - | 64 | - |
| 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 | - | - | 1571 | - | 895 | 1033 |
| Stage 1 | - | - | - | - | 983 | - |
| Stage 2 | - | - | - | - | 959 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1571 | - | 895 | 1033 |
| Mov Cap-2 Maneuver | - | - | - | - | 895 | - |
| Stage 1 | - | - | - | - | 983 | - |
| Stage 2 | - | - | - | - | 959 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 0 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 1571 | - |
| HCM Lane V/C Ratio | - | - | - | - | - |
| HCM Control Delay (s) | 0 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | - | - | - | 0 | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 20 | 400 | 43 | 411 | 395 | 4 | 37 | 134 | 213 | 12 | 283 | 39 |
| Future Volume (veh/h) | 20 | 400 | 43 | 411 | 395 | 4 | 37 | 134 | 213 | 12 | 283 | 39 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.98 | 1.00 | | 0.98 | 1.00 | | 0.98 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1796 | 1870 | 1870 | 1870 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 29 | 457 | 56 | 428 | 456 | 6 | 47 | 184 | 29 | 21 | 325 | 41 |
| Peak Hour Factor | 0.69 | 0.92 | 0.72 | 0.96 | 0.91 | 0.50 | 0.79 | 0.73 | 0.86 | 0.58 | 0.87 | 0.85 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 31 | 488 | 60 | 531 | 527 | 7 | 75 | 275 | 421 | 39 | 364 | 44 |
| Arrive On Green | 0.32 | 0.32 | 0.32 | 0.30 | 0.30 | 0.30 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 |
| Sat Flow, veh/h | 98 | 1541 | 189 | 1781 | 1768 | 23 | 157 | 1001 | 1529 | 39 | 1323 | 161 |
| Grp Volume(v), veh/h | 542 | 0 | 0 | 428 | 0 | 462 | 231 | 0 | 29 | 387 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1827 | 0 | 0 | 1781 | 0 | 1791 | 1158 | 0 | 1529 | 1524 | 0 | 0 |
| Q Serve(g_s), s | 39.3 | 0.0 | 0.0 | 30.3 | 0.0 | 33.3 | 0.0 | 0.0 | 1.9 | 11.6 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 39.3 | 0.0 | 0.0 | 30.3 | 0.0 | 33.3 | 22.9 | 0.0 | 1.9 | 34.5 | 0.0 | 0.0 |
| Prop In Lane | 0.05 | | 0.10 | 1.00 | | 0.01 | 0.20 | | 1.00 | 0.05 | | 0.11 |
| Lane Grp Cap(c), veh/h | 578 | 0 | 0 | 531 | 0 | 534 | 351 | 0 | 421 | 447 | 0 | 0 |
| V/C Ratio(X) | 0.94 | 0.00 | 0.00 | 0.81 | 0.00 | 0.86 | 0.66 | 0.00 | 0.07 | 0.87 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 603 | 0 | 0 | 588 | 0 | 591 | 379 | 0 | 448 | 481 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 45.3 | 0.0 | 0.0 | 44.2 | 0.0 | 45.2 | 42.3 | 0.0 | 36.5 | 47.7 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 22.9 | 0.0 | 0.0 | 9.0 | 0.0 | 13.5 | 5.6 | 0.0 | 0.1 | 15.1 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 21.6 | 0.0 | 0.0 | 14.8 | 0.0 | 16.9 | 7.5 | 0.0 | 0.8 | 14.9 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 68.2 | 0.0 | 0.0 | 53.2 | 0.0 | 58.7 | 47.9 | 0.0 | 36.7 | 62.8 | 0.0 | 0.0 |
| LnGrp LOS | E | A | A | D | A | E | D | A | D | E | A | A |
| Approach Vol, veh/h | | 542 | | | 890 | | | 260 | | | 387 | |
| Approach Delay, s/veh | | 68.2 | | | 56.1 | | | 46.6 | | | 62.8 | |
| Approach LOS | | E | | | E | | | D | | | E | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 42.5 | | 48.2 | | 42.5 | | 45.7 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 40.0 | | 45.0 | | 40.0 | | 45.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 36.5 | | 41.3 | | 24.9 | | 35.3 | | | | |
| Green Ext Time (p_c), s | | 1.0 | | 1.9 | | 2.3 | | 5.4 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 59.3 | | | | | | | | | |
| HCM 6th LOS | | | E | | | | | | | | | |

# APPENDIX C

## LOS WORKSHEETS

## Existing Conditions – PM Peak Hour

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 526 | 238 | 10 | 437 | 319 | 25 |
| Future Volume (veh/h) | 526 | 238 | 10 | 437 | 319 | 25 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 0.99 | 1.00 | | 1.00 | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1751 | 1683 | 1678 | 1745 | 1745 | 1678 |
| Adj Flow Rate, veh/h | 649 | 318 | 15 | 465 | 389 | 32 |
| Peak Hour Factor | 0.81 | 0.71 | 0.65 | 0.94 | 0.82 | 0.71 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 716 | 351 | 37 | 838 | 416 | 34 |
| Arrive On Green | 0.65 | 0.65 | 0.65 | 0.65 | 0.27 | 0.27 |
| Sat Flow, veh/h | 1107 | 542 | 11 | 1295 | 1517 | 125 |
| Grp Volume(v), veh/h | 0 | 967 | 480 | 0 | 422 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1649 | 1307 | 0 | 1646 | 0 |
| Q Serve(g_s), s | 0.0 | 63.4 | 8.1 | 0.0 | 31.7 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 63.4 | 71.5 | 0.0 | 31.7 | 0.0 |
| Prop In Lane | | 0.33 | 0.03 | | 0.92 | 0.08 |
| Lane Grp Cap(c), veh/h | 0 | 1066 | 874 | 0 | 452 | 0 |
| V/C Ratio(X) | 0.00 | 0.91 | 0.55 | 0.00 | 0.93 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 1380 | 1185 | 0 | 572 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 19.1 | 13.0 | 0.0 | 44.8 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 8.1 | 0.8 | 0.0 | 20.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 25.2 | 6.7 | 0.0 | 15.5 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 27.2 | 13.8 | 0.0 | 64.8 | 0.0 |
| LnGrp LOS | A | C | B | A | E | A |
| Approach Vol, veh/h | 967 | | | 480 | 422 | |
| Approach Delay, s/veh | 27.2 | | | 13.8 | 64.8 | |
| Approach LOS | C | | | B | E | |

| Timer - Assigned Phs | 2 | 4 | 6 |
|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 86.9 | 39.7 | 86.9 |
| Change Period (Y+Rc), s | 5.0 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | 106.0 | 44.0 | 106.0 |
| Max Q Clear Time (g_c+I1), s | 65.4 | 33.7 | 73.5 |
| Green Ext Time (p_c), s | 16.5 | 1.1 | 5.3 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 32.2 |
| HCM 6th LOS | C |

Notes

User approved volume balancing among the lanes for turning movement.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 104 | 214 | 46 | 5 | 146 | 57 | 46 | 73 | 11 | 32 | 66 | 69 |
| Future Volume (veh/h) | 104 | 214 | 46 | 5 | 146 | 57 | 46 | 73 | 11 | 32 | 66 | 69 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 1.00 | | 0.99 | 0.98 | | 0.96 | 0.97 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 128 | 243 | 59 | 12 | 162 | 46 | 53 | 106 | 6 | 46 | 112 | 45 |
| Peak Hour Factor | 0.81 | 0.88 | 0.62 | 0.40 | 0.90 | 0.85 | 0.86 | 0.69 | 0.50 | 0.70 | 0.59 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 304 | 543 | 116 | 109 | 724 | 196 | 204 | 330 | 16 | 168 | 276 | 96 |
| Arrive On Green | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Sat Flow, veh/h | 373 | 1073 | 230 | 31 | 1431 | 387 | 351 | 1331 | 63 | 240 | 1114 | 385 |
| Grp Volume(v), veh/h | 430 | 0 | 0 | 220 | 0 | 0 | 165 | 0 | 0 | 203 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1676 | 0 | 0 | 1849 | 0 | 0 | 1746 | 0 | 0 | 1739 | 0 | 0 |
| Q Serve(g_s), s | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 6.2 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 2.9 | 0.0 | 0.0 | 3.8 | 0.0 | 0.0 |
| Prop In Lane | 0.30 | | 0.14 | 0.05 | | 0.21 | 0.32 | | 0.04 | 0.23 | | 0.22 |
| Lane Grp Cap(c), veh/h | 963 | 0 | 0 | 1029 | 0 | 0 | 550 | 0 | 0 | 540 | 0 | 0 |
| V/C Ratio(X) | 0.45 | 0.00 | 0.00 | 0.21 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.38 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 1496 | 0 | 0 | 1623 | 0 | 0 | 1272 | 0 | 0 | 1277 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 6.4 | 0.0 | 0.0 | 5.6 | 0.0 | 0.0 | 12.6 | 0.0 | 0.0 | 12.9 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.5 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.7 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 6.9 | 0.0 | 0.0 | 5.8 | 0.0 | 0.0 | 12.9 | 0.0 | 0.0 | 13.3 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | B | A | A | B | A | A |
| Approach Vol, veh/h | | 430 | | | 220 | | | 165 | | | 203 | |
| Approach Delay, s/veh | | 6.9 | | | 5.8 | | | 12.9 | | | 13.3 | |
| Approach LOS | | A | | | A | | | B | | | B | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 25.6 | | 15.1 | | 25.6 | | 15.1 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 34.0 | | 28.0 | | 34.0 | | 28.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 8.2 | | 4.9 | | 4.7 | | 5.8 | | | | |
| Green Ext Time (p_c), s | | 4.5 | | 1.0 | | 2.0 | | 1.2 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 8.9 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 49 | 153 | 32 | 7 | 111 | 4 | 27 | 11 | 9 | 3 | 9 | 37 |
| Future Volume (veh/h) | 49 | 153 | 32 | 7 | 111 | 4 | 27 | 11 | 9 | 3 | 9 | 37 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.97 | | 0.99 | 0.97 | | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 53 | 166 | 22 | 8 | 121 | 2 | 29 | 12 | 1 | 3 | 10 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 422 | 387 | 47 | 312 | 530 | 9 | 551 | 35 | 3 | 366 | 102 | 10 |
| Arrive On Green | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Sat Flow, veh/h | 279 | 1268 | 155 | 65 | 1735 | 28 | 1036 | 429 | 36 | 375 | 1249 | 125 |
| Grp Volume(v), veh/h | 241 | 0 | 0 | 131 | 0 | 0 | 42 | 0 | 0 | 14 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1703 | 0 | 0 | 1827 | 0 | 0 | 1501 | 0 | 0 | 1749 | 0 | 0 |
| Q Serve(g_s), s | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.4 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Prop In Lane | 0.22 | | 0.09 | 0.06 | | 0.02 | 0.69 | | 0.02 | 0.21 | | 0.07 |
| Lane Grp Cap(c), veh/h | 856 | 0 | 0 | 851 | 0 | 0 | 589 | 0 | 0 | 478 | 0 | 0 |
| V/C Ratio(X) | 0.28 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 3658 | 0 | 0 | 3888 | 0 | 0 | 3407 | 0 | 0 | 3741 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 3.6 | 0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 5.6 | 0.0 | 0.0 | 5.5 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 3.8 | 0.0 | 0.0 | 3.5 | 0.0 | 0.0 | 5.7 | 0.0 | 0.0 | 5.6 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | A | A | A | A | A | A |
| Approach Vol, veh/h | | 241 | | | 131 | | | 42 | | | 14 | |
| Approach Delay, s/veh | | 3.8 | | | 3.5 | | | 5.7 | | | 5.6 | |
| Approach LOS | | A | | | A | | | A | | | A | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 8.0 | | 5.1 | | 8.0 | | 5.1 | | | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | | 4.0 | | 4.0 | | | | |
| Max Green Setting (Gmax), s | | 26.0 | | 26.0 | | 26.0 | | 26.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 3.4 | | 2.3 | | 2.7 | | 2.1 | | | | |
| Green Ext Time (p_c), s | | 1.5 | | 0.1 | | 0.7 | | 0.0 | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 3.9 |
| HCM 6th LOS | | | A |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.4 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 14 | 164 | 17 | 0 | 130 | 15 | 23 | 5 | 0 | 18 | 6 | 20 |
| Future Vol, veh/h | 14 | 164 | 17 | 0 | 130 | 15 | 23 | 5 | 0 | 18 | 6 | 20 |
| 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 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 178 | 18 | 0 | 141 | 16 | 25 | 5 | 0 | 20 | 7 | 22 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.7 | 8.3 | 8.2 | 7.9 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 82% | 7% | 0% | 41% |
| Vol Thru, % | 18% | 84% | 90% | 14% |
| Vol Right, % | 0% | 9% | 10% | 45% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 28 | 195 | 145 | 44 |
| LT Vol | 23 | 14 | 0 | 18 |
| Through Vol | 5 | 164 | 130 | 6 |
| RT Vol | 0 | 17 | 15 | 20 |
| Lane Flow Rate | 30 | 212 | 158 | 48 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.042 | 0.251 | 0.187 | 0.061 |
| Departure Headway (Hd) | 4.969 | 4.261 | 4.277 | 4.592 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 722 | 848 | 842 | 781 |
| Service Time | 2.991 | 2.261 | 2.293 | 2.613 |
| HCM Lane V/C Ratio | 0.042 | 0.25 | 0.188 | 0.061 |
| HCM Control Delay | 8.2 | 8.7 | 8.3 | 7.9 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.1 | 1 | 0.7 | 0.2 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.6 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 17 | 159 | 125 | 0 | 1 | 5 |
| Future Vol, veh/h | 17 | 159 | 125 | 0 | 1 | 5 |
| Conflicting Peds, #/hr | 8 | 0 | 0 | 8 | 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 | 18 | 173 | 136 | 0 | 1 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 144 | 0 | - | 0 | 353 | 144 |
| Stage 1 | - | - | - | - | 144 | - |
| Stage 2 | - | - | - | - | 209 | - |
| 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 | 1438 | - | - | - | 645 | 903 |
| Stage 1 | - | - | - | - | 883 | - |
| Stage 2 | - | - | - | - | 826 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1428 | - | - | - | 627 | 897 |
| Mov Cap-2 Maneuver | - | - | - | - | 627 | - |
| Stage 1 | - | - | - | - | 864 | - |
| Stage 2 | - | - | - | - | 820 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.7 | 0 | 9.3 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1428 | - | - | - | 837 |
| HCM Lane V/C Ratio | 0.013 | - | - | - | 0.008 |
| HCM Control Delay (s) | 7.6 | 0 | - | - | 9.3 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.6 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 77 | 54 | 39 | 0 | 0 | 48 |
| Future Vol, veh/h | 77 | 54 | 39 | 0 | 0 | 48 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 20 | 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 | 84 | 59 | 42 | 0 | 0 | 52 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 43 | 0 | - | 0 | 270 | 43 |
| Stage 1 | - | - | - | - | 43 | - |
| Stage 2 | - | - | - | - | 227 | - |
| 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 | 1566 | - | - | - | 719 | 1027 |
| Stage 1 | - | - | - | - | 979 | - |
| Stage 2 | - | - | - | - | 811 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1565 | - | - | - | 678 | 1026 |
| Mov Cap-2 Maneuver | - | - | - | - | 678 | - |
| Stage 1 | - | - | - | - | 924 | - |
| Stage 2 | - | - | - | - | 810 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 4.4 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1565 | - | - | - | - | 1026 |
| HCM Lane V/C Ratio | 0.053 | - | - | - | - | 0.051 |
| HCM Control Delay (s) | 7.4 | 0 | - | - | 0 | 8.7 |
| HCM Lane LOS | A | A | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | - | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 7.6 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 67 | 1 | 2 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 35 |
| Future Vol, veh/h | 67 | 1 | 2 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 35 |
| Conflicting Peds, #/hr | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 11 | 11 | 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, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 73 | 1 | 2 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 38 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 5 | 0 | 0 | 3 | 0 | 0 | 169 | 153 | 13 | 167 | 154 | 5 |
| Stage 1 | - | - | - | - | - | - | 148 | 148 | - | 5 | 5 | - |
| Stage 2 | - | - | - | - | - | - | 21 | 5 | - | 162 | 149 | - |
| 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 | 1616 | - | - | 1619 | - | - | 795 | 739 | 1067 | 797 | 738 | 1078 |
| Stage 1 | - | - | - | - | - | - | 855 | 775 | - | 1017 | 892 | - |
| Stage 2 | - | - | - | - | - | - | 998 | 892 | - | 840 | 774 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1611 | - | - | 1619 | - | - | 739 | 704 | 1057 | 756 | 703 | 1074 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 739 | 704 | - | 756 | 703 | - |
| Stage 1 | - | - | - | - | - | - | 817 | 740 | - | 968 | 889 | - |
| Stage 2 | - | - | - | - | - | - | 961 | 889 | - | 789 | 739 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 7 | 0 | 10.1 | 8.5 |
| HCM LOS | | | B | A |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 714 | 1611 | - | - | 1619 | - | - | 1058 |
| HCM Lane V/C Ratio | 0.011 | 0.045 | - | - | - | - | - | 0.037 |
| HCM Control Delay (s) | 10.1 | 7.3 | 0 | - | 0 | - | - | 8.5 |
| HCM Lane LOS | B | A | A | - | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | 0.1 | - | - | 0 | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.4 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 2 | 51 | 38 | 5 | 2 | 1 |
| Future Vol, veh/h | 2 | 51 | 38 | 5 | 2 | 1 |
| 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 | 2 | 55 | 41 | 5 | 2 | 1 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 46 | 0 | - | 0 | 103 | 44 |
| Stage 1 | - | - | - | - | 44 | - |
| Stage 2 | - | - | - | - | 59 | - |
| 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 | 1562 | - | - | - | 895 | 1026 |
| Stage 1 | - | - | - | - | 978 | - |
| Stage 2 | - | - | - | - | 964 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1562 | - | - | - | 894 | 1026 |
| Mov Cap-2 Maneuver | - | - | - | - | 894 | - |
| Stage 1 | - | - | - | - | 977 | - |
| Stage 2 | - | - | - | - | 964 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.3 | 0 | 8.9 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1562 | - | - | - | 934 |
| HCM Lane V/C Ratio | 0.001 | - | - | - | 0.003 |
| HCM Control Delay (s) | 7.3 | 0 | - | - | 8.9 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 1.9 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 41 | 34 | 1 | 2 | 9 |
| Future Vol, veh/h | 12 | 41 | 34 | 1 | 2 | 9 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 3 |
| 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 | 13 | 45 | 37 | 1 | 2 | 10 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 38 | 0 | - | 0 | 109 | 41 |
| Stage 1 | - | - | - | - | 38 | - |
| Stage 2 | - | - | - | - | 71 | - |
| 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 | 1572 | - | - | - | 888 | 1030 |
| Stage 1 | - | - | - | - | 984 | - |
| Stage 2 | - | - | - | - | 952 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1572 | - | - | - | 881 | 1027 |
| Mov Cap-2 Maneuver | - | - | - | - | 881 | - |
| Stage 1 | - | - | - | - | 976 | - |
| Stage 2 | - | - | - | - | 952 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.7 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1572 | - | - | - | 997 |
| HCM Lane V/C Ratio | 0.008 | - | - | - | 0.012 |
| HCM Control Delay (s) | 7.3 | 0 | - | - | 8.7 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 43 | 0 | 0 | 35 | 0 | 0 |
| Future Vol, veh/h | 43 | 0 | 0 | 35 | 0 | 0 |
| 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 | 47 | 0 | 0 | 38 | 0 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 47 | 0 | 85 | 47 |
| Stage 1 | - | - | - | - | 47 | - |
| Stage 2 | - | - | - | - | 38 | - |
| 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 | - | - | 1560 | - | 916 | 1022 |
| Stage 1 | - | - | - | - | 975 | - |
| Stage 2 | - | - | - | - | 984 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1560 | - | 916 | 1022 |
| Mov Cap-2 Maneuver | - | - | - | - | 916 | - |
| Stage 1 | - | - | - | - | 975 | - |
| Stage 2 | - | - | - | - | 984 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 0 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 1560 | - |
| HCM Lane V/C Ratio | - | - | - | - | - |
| HCM Control Delay (s) | 0 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | - | - | - | 0 | - |

# HCM 6th Signalized Intersection Summary
16: Oahu Ave & E Manoa Rd

07/07/2022

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 36 | 441 | 40 | 401 | 323 | 5 | 14 | 254 | 306 | 2 | 192 | 32 |
| Future Volume (veh/h) | 36 | 441 | 40 | 401 | 323 | 5 | 14 | 254 | 306 | 2 | 192 | 32 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 0.96 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1525 | 1525 | 1525 | 1768 | 1697 | 1768 | 1870 | 1870 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 52 | 503 | 52 | 418 | 373 | 8 | 18 | 348 | 76 | 3 | 221 | 33 |
| Peak Hour Factor | 0.69 | 0.92 | 0.72 | 0.96 | 0.91 | 0.50 | 0.79 | 0.73 | 0.86 | 0.58 | 0.87 | 0.85 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 45 | 433 | 45 | 496 | 487 | 10 | 40 | 419 | 360 | 29 | 365 | 54 |
| Arrive On Green | 0.35 | 0.35 | 0.35 | 0.29 | 0.29 | 0.29 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| Sat Flow, veh/h | 128 | 1238 | 128 | 1684 | 1655 | 35 | 46 | 1751 | 1504 | 4 | 1526 | 225 |
| Grp Volume(v), veh/h | 607 | 0 | 0 | 418 | 0 | 381 | 366 | 0 | 76 | 257 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1494 | 0 | 0 | 1684 | 0 | 1690 | 1797 | 0 | 1504 | 1755 | 0 | 0 |
| Q Serve(g_s), s | 45.0 | 0.0 | 0.0 | 30.0 | 0.0 | 26.4 | 0.0 | 0.0 | 5.2 | 0.3 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 45.0 | 0.0 | 0.0 | 30.0 | 0.0 | 26.4 | 25.1 | 0.0 | 5.2 | 25.4 | 0.0 | 0.0 |
| Prop In Lane | 0.09 | | 0.09 | 1.00 | | 0.02 | 0.05 | | 1.00 | 0.01 | | 0.13 |
| Lane Grp Cap(c), veh/h | 522 | 0 | 0 | 496 | 0 | 498 | 459 | 0 | 360 | 448 | 0 | 0 |
| V/C Ratio(X) | 1.16 | 0.00 | 0.00 | 0.84 | 0.00 | 0.77 | 0.80 | 0.00 | 0.21 | 0.57 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 522 | 0 | 0 | 589 | 0 | 591 | 589 | 0 | 468 | 582 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 41.8 | 0.0 | 0.0 | 42.6 | 0.0 | 41.3 | 46.5 | 0.0 | 39.2 | 43.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 92.5 | 0.0 | 0.0 | 11.5 | 0.0 | 6.8 | 8.4 | 0.0 | 0.6 | 1.6 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 29.9 | 0.0 | 0.0 | 14.1 | 0.0 | 12.0 | 12.3 | 0.0 | 2.0 | 7.5 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 134.4 | 0.0 | 0.0 | 54.1 | 0.0 | 48.2 | 54.9 | 0.0 | 39.8 | 44.8 | 0.0 | 0.0 |
| LnGrp LOS | F | A | A | D | A | D | D | A | D | D | A | A |
| Approach Vol, veh/h | | 607 | | | 799 | | | 442 | | | 257 | |
| Approach Delay, s/veh | | 134.4 | | | 51.3 | | | 52.3 | | | 44.8 | |
| Approach LOS | | F | | | D | | | D | | | D | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 35.8 | | 50.0 | | 35.8 | | 42.9 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 40.0 | | 45.0 | | 40.0 | | 45.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 27.4 | | 47.0 | | 27.1 | | 32.0 | | | | |
| Green Ext Time (p_c), s | | 1.6 | | 0.0 | | 3.7 | | 5.9 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 74.7 | | | | | | | | | |
| HCM 6th LOS | | | E | | | | | | | | | |

# APPENDIX C

## LOS WORKSHEETS

Base Year Conditions – AM Peak Hour

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 385 | 277 | 15 | 450 | 373 | 20 |
| Future Volume (veh/h) | 385 | 277 | 15 | 450 | 373 | 20 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 0.99 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1751 | 1683 | 1678 | 1745 | 1745 | 1678 |
| Adj Flow Rate, veh/h | 475 | 338 | 23 | 479 | 455 | 24 |
| Peak Hour Factor | 0.81 | 0.71 | 0.65 | 0.94 | 0.82 | 0.71 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 529 | 376 | 58 | 691 | 488 | 26 |
| Arrive On Green | 0.56 | 0.56 | 0.56 | 0.56 | 0.31 | 0.31 |
| Sat Flow, veh/h | 949 | 675 | 15 | 1240 | 1566 | 83 |
| Grp Volume(v), veh/h | 0 | 813 | 502 | 0 | 480 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1624 | 1256 | 0 | 1652 | 0 |
| Q Serve(g_s), s | 0.0 | 33.9 | 5.1 | 0.0 | 21.5 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 33.9 | 39.0 | 0.0 | 21.5 | 0.0 |
| Prop In Lane | | 0.42 | 0.05 | | 0.95 | 0.05 |
| Lane Grp Cap(c), veh/h | 0 | 905 | 749 | 0 | 515 | 0 |
| V/C Ratio(X) | 0.00 | 0.90 | 0.67 | 0.00 | 0.93 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 956 | 800 | 0 | 540 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 15.0 | 11.7 | 0.0 | 25.5 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 11.2 | 2.3 | 0.0 | 22.7 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 13.8 | 5.2 | 0.0 | 11.3 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 26.2 | 14.1 | 0.0 | 48.2 | 0.0 |
| LnGrp LOS | A | C | B | A | D | A |
| Approach Vol, veh/h | 813 | | | 502 | 480 | |
| Approach Delay, s/veh | 26.2 | | | 14.1 | 48.2 | |
| Approach LOS | C | | | B | D | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 47.6 | | 28.8 | | 47.6 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 45.0 | | 25.0 | | 45.0 |
| Max Q Clear Time (g_c+I1), s | | 35.9 | | 23.5 | | 41.0 |
| Green Ext Time (p_c), s | | 5.2 | | 0.3 | | 1.6 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 28.7 |
| HCM 6th LOS | | | C |

Notes

User approved volume balancing among the lanes for turning movement.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 43 | 150 | 34 | 9 | 219 | 113 | 80 | 128 | 3 | 28 | 45 | 57 |
| Future Volume (veh/h) | 43 | 150 | 34 | 9 | 219 | 113 | 80 | 128 | 3 | 28 | 45 | 57 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.99 | | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 53 | 170 | 36 | 22 | 243 | 104 | 93 | 186 | 4 | 40 | 76 | 29 |
| Peak Hour Factor | 0.81 | 0.88 | 0.62 | 0.40 | 0.90 | 0.85 | 0.86 | 0.69 | 0.50 | 0.70 | 0.59 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 216 | 635 | 120 | 114 | 637 | 258 | 227 | 325 | 6 | 183 | 286 | 89 |
| Arrive On Green | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Sat Flow, veh/h | 220 | 1261 | 239 | 42 | 1265 | 513 | 436 | 1286 | 25 | 282 | 1132 | 354 |
| Grp Volume(v), veh/h | 259 | 0 | 0 | 369 | 0 | 0 | 283 | 0 | 0 | 145 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1719 | 0 | 0 | 1821 | 0 | 0 | 1746 | 0 | 0 | 1768 | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 3.2 | 0.0 | 0.0 | 5.1 | 0.0 | 0.0 | 5.7 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 |
| Prop In Lane | 0.20 | | 0.14 | 0.06 | | 0.28 | 0.33 | | 0.01 | 0.28 | | 0.20 |
| Lane Grp Cap(c), veh/h | 971 | 0 | 0 | 1010 | 0 | 0 | 558 | 0 | 0 | 559 | 0 | 0 |
| V/C Ratio(X) | 0.27 | 0.00 | 0.00 | 0.37 | 0.00 | 0.00 | 0.51 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 1502 | 0 | 0 | 1591 | 0 | 0 | 1282 | 0 | 0 | 1257 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 5.9 | 0.0 | 0.0 | 6.3 | 0.0 | 0.0 | 13.5 | 0.0 | 0.0 | 12.4 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.2 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.0 | 0.0 | 0.0 | 1.5 | 0.0 | 0.0 | 2.1 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 6.1 | 0.0 | 0.0 | 6.6 | 0.0 | 0.0 | 14.2 | 0.0 | 0.0 | 12.7 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | B | A | A | B | A | A |
| Approach Vol, veh/h | | 259 | | | 369 | | | 283 | | | 145 | |
| Approach Delay, s/veh | | 6.1 | | | 6.6 | | | 14.2 | | | 12.7 | |
| Approach LOS | | A | | | A | | | B | | | B | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 25.6 | | 15.4 | | 25.6 | | 15.4 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 34.0 | | 28.0 | | 34.0 | | 28.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 5.2 | | 7.7 | | 7.1 | | 4.6 | | | | |
| Green Ext Time (p_c), s | | 2.5 | | 1.7 | | 3.7 | | 0.8 | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 9.4 |
| HCM 6th LOS | | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 47 | 94 | 26 | 11 | 170 | 18 | 44 | 42 | 9 | 12 | 23 | 81 |
| Future Volume (veh/h) | 47 | 94 | 26 | 11 | 170 | 18 | 44 | 42 | 9 | 12 | 23 | 81 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 51 | 102 | 15 | 12 | 185 | 12 | 48 | 46 | 1 | 13 | 25 | 12 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 473 | 279 | 38 | 314 | 418 | 27 | 523 | 99 | 2 | 407 | 108 | 52 |
| Arrive On Green | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| Sat Flow, veh/h | 431 | 1092 | 149 | 74 | 1639 | 104 | 821 | 787 | 17 | 448 | 862 | 414 |
| Grp Volume(v), veh/h | 168 | 0 | 0 | 209 | 0 | 0 | 95 | 0 | 0 | 50 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1672 | 0 | 0 | 1818 | 0 | 0 | 1625 | 0 | 0 | 1725 | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.0 | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 |
| Prop In Lane | 0.30 | | 0.09 | 0.06 | | 0.06 | 0.51 | | 0.01 | 0.26 | | 0.24 |
| Lane Grp Cap(c), veh/h | 790 | 0 | 0 | 758 | 0 | 0 | 624 | 0 | 0 | 568 | 0 | 0 |
| V/C Ratio(X) | 0.21 | 0.00 | 0.00 | 0.28 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 3549 | 0 | 0 | 3928 | 0 | 0 | 3599 | 0 | 0 | 3661 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 3.9 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 5.2 | 0.0 | 0.0 | 5.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 4.1 | 0.0 | 0.0 | 4.2 | 0.0 | 0.0 | 5.3 | 0.0 | 0.0 | 5.1 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | A | A | A | A | A | A |
| Approach Vol, veh/h | | 168 | | | 209 | | | 95 | | | 50 | |
| Approach Delay, s/veh | | 4.1 | | | 4.2 | | | 5.3 | | | 5.1 | |
| Approach LOS | | A | | | A | | | A | | | A | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 7.3 | | 5.6 | | 7.3 | | 5.6 | | | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | | 4.0 | | 4.0 | | | | |
| Max Green Setting (Gmax), s | | 26.0 | | 26.0 | | 26.0 | | 26.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 3.0 | | 2.7 | | 3.2 | | 2.3 | | | | |
| Green Ext Time (p_c), s | | 1.0 | | 0.4 | | 1.2 | | 0.2 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 4.5 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.6 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ✥ | | | ✥ | | | ✥ | | | ✥ | |
| Traffic Vol, veh/h | 14 | 76 | 7 | 0 | 194 | 45 | 22 | 21 | 0 | 26 | 10 | 21 |
| Future Vol, veh/h | 14 | 76 | 7 | 0 | 194 | 45 | 22 | 21 | 0 | 26 | 10 | 21 |
| 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 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 83 | 8 | 0 | 211 | 49 | 24 | 23 | 0 | 28 | 11 | 23 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.1 | 9 | 8.3 | 8.1 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 51% | 14% | 0% | 46% |
| Vol Thru, % | 49% | 78% | 81% | 18% |
| Vol Right, % | 0% | 7% | 19% | 37% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 43 | 97 | 239 | 57 |
| LT Vol | 22 | 14 | 0 | 26 |
| Through Vol | 21 | 76 | 194 | 10 |
| RT Vol | 0 | 7 | 45 | 21 |
| Lane Flow Rate | 47 | 105 | 260 | 62 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.064 | 0.13 | 0.303 | 0.08 |
| Departure Headway (Hd) | 4.918 | 4.452 | 4.201 | 4.667 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 729 | 807 | 857 | 768 |
| Service Time | 2.944 | 2.471 | 2.216 | 2.693 |
| HCM Lane V/C Ratio | 0.064 | 0.13 | 0.303 | 0.081 |
| HCM Control Delay | 8.3 | 8.1 | 9 | 8.1 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.2 | 0.4 | 1.3 | 0.3 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.9 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 88 | 202 | 0 | 0 | 21 |
| Future Vol, veh/h | 12 | 88 | 202 | 0 | 0 | 21 |
| Conflicting Peds, #/hr | 2 | 0 | 0 | 2 | 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 | 13 | 96 | 220 | 0 | 0 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 222 | 0 | - | 0 | 344 | 222 |
| Stage 1 | - | - | - | - | 222 | - |
| Stage 2 | - | - | - | - | 122 | - |
| 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 | 1347 | - | - | - | 652 | 818 |
| Stage 1 | - | - | - | - | 815 | - |
| Stage 2 | - | - | - | - | 903 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1345 | - | - | - | 643 | 817 |
| Mov Cap-2 Maneuver | - | - | - | - | 643 | - |
| Stage 1 | - | - | - | - | 805 | - |
| Stage 2 | - | - | - | - | 901 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.9 | 0 | 9.5 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1345 | - | - | - | 817 |
| HCM Lane V/C Ratio | 0.01 | - | - | - | 0.028 |
| HCM Control Delay (s) | 7.7 | 0 | - | - | 9.5 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.1 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 44 | 42 | 75 | 2 | 0 | 68 |
| Future Vol, veh/h | 44 | 42 | 75 | 2 | 0 | 68 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 20 | 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 | 48 | 46 | 82 | 2 | 0 | 74 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 84 | 0 | - | 0 | 225 | 83 |
| Stage 1 | - | - | - | - | 83 | - |
| Stage 2 | - | - | - | - | 142 | - |
| 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 | 1513 | - | - | - | 763 | 976 |
| Stage 1 | - | - | - | - | 940 | - |
| Stage 2 | - | - | - | - | 885 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1513 | - | - | - | 738 | 976 |
| Mov Cap-2 Maneuver | - | - | - | - | 738 | - |
| Stage 1 | - | - | - | - | 909 | - |
| Stage 2 | - | - | - | - | 885 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 3.8 | 0 | 9 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1513 | - | - | - | - | 976 |
| HCM Lane V/C Ratio | 0.032 | - | - | - | - | 0.076 |
| HCM Control Delay (s) | 7.5 | 0 | - | - | 0 | 9 |
| HCM Lane LOS | A | A | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | - | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 8.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 43 | 0 | 0 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 10 | 59 |
| Future Vol, veh/h | 43 | 0 | 0 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 10 | 59 |
| Conflicting Peds, #/hr | 4 | 0 | 0 | 0 | 0 | 4 | 2 | 0 | 3 | 3 | 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 | 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 | 47 | 0 | 0 | 0 | 0 | 0 | 1 | 11 | 0 | 0 | 11 | 64 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 5 | 0 | 0 | 0 | 0 | 0 | 135 | 99 | 3 | 108 | 99 | 7 |
| Stage 1 | - | - | - | - | - | - | 94 | 94 | - | 5 | 5 | - |
| Stage 2 | - | - | - | - | - | - | 41 | 5 | - | 103 | 94 | - |
| 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 | 1616 | - | - | - | - | - | 836 | 791 | 1081 | 871 | 791 | 1075 |
| Stage 1 | - | - | - | - | - | - | 913 | 817 | - | 1017 | 892 | - |
| Stage 2 | - | - | - | - | - | - | 974 | 892 | - | 903 | 817 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1611 | - | - | - | - | - | 759 | 766 | 1078 | 838 | 766 | 1070 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 759 | 766 | - | 838 | 766 | - |
| Stage 1 | - | - | - | - | - | - | 887 | 793 | - | 984 | 889 | - |
| Stage 2 | - | - | - | - | - | - | 903 | 889 | - | 863 | 793 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 7.3 | 0 | 9.8 | 8.8 |
| HCM LOS | | | A | A |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 765 | 1611 | - | - | - | - | - | 1012 |
| HCM Lane V/C Ratio | 0.016 | 0.029 | - | - | - | - | - | 0.074 |
| HCM Control Delay (s) | 9.8 | 7.3 | 0 | - | 0 | - | - | 8.8 |
| HCM Lane LOS | A | A | A | - | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | 0.1 | - | - | - | - | - | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.5 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | ↰ | ↱ | | Y | |
| Traffic Vol, veh/h | 0 | 51 | 74 | 11 | 0 | 9 |
| Future Vol, veh/h | 0 | 51 | 74 | 11 | 0 | 9 |
| 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 | 0 | 55 | 80 | 12 | 0 | 10 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 92 | 0 | - | 0 | 141 | 86 |
| Stage 1 | - | - | - | - | 86 | - |
| Stage 2 | - | - | - | - | 55 | - |
| 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 | 1503 | - | - | - | 852 | 973 |
| Stage 1 | - | - | - | - | 937 | - |
| Stage 2 | - | - | - | - | 968 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1503 | - | - | - | 852 | 973 |
| Mov Cap-2 Maneuver | - | - | - | - | 852 | - |
| Stage 1 | - | - | - | - | 937 | - |
| Stage 2 | - | - | - | - | 968 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1503 | - | - | - | 973 |
| HCM Lane V/C Ratio | - | - | - | - | 0.01 |
| HCM Control Delay (s) | 0 | - | - | - | 8.7 |
| HCM Lane LOS | A | - | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 2 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 10 | 38 | 63 | 0 | 0 | 22 |
| Future Vol, veh/h | 10 | 38 | 63 | 0 | 0 | 22 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 1 |
| 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 | 11 | 41 | 68 | 0 | 0 | 24 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 68 | 0 | - | 0 | 131 | 69 |
| Stage 1 | - | - | - | - | 68 | - |
| Stage 2 | - | - | - | - | 63 | - |
| 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 | 1533 | - | - | - | 863 | 994 |
| Stage 1 | - | - | - | - | 955 | - |
| Stage 2 | - | - | - | - | 960 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1533 | - | - | - | 857 | 993 |
| Mov Cap-2 Maneuver | - | - | - | - | 857 | - |
| Stage 1 | - | - | - | - | 948 | - |
| Stage 2 | - | - | - | - | 960 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.5 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1533 | - | - | - | 993 |
| HCM Lane V/C Ratio | 0.007 | - | - | - | 0.024 |
| HCM Control Delay (s) | 7.4 | 0 | - | - | 8.7 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 38 | 0 | 0 | 63 | 0 | 0 |
| Future Vol, veh/h | 38 | 0 | 0 | 63 | 0 | 0 |
| 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 | 41 | 0 | 0 | 68 | 0 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 41 | 0 | 109 | 41 |
| Stage 1 | - | - | - | - | 41 | - |
| Stage 2 | - | - | - | - | 68 | - |
| 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 | - | - | 1568 | - | 888 | 1030 |
| Stage 1 | - | - | - | - | 981 | - |
| Stage 2 | - | - | - | - | 955 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1568 | - | 888 | 1030 |
| Mov Cap-2 Maneuver | - | - | - | - | 888 | - |
| Stage 1 | - | - | - | - | 981 | - |
| Stage 2 | - | - | - | - | 955 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 0 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 1568 | - |
| HCM Lane V/C Ratio | - | - | - | - | - |
| HCM Control Delay (s) | 0 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | - | - | - | 0 | - |

HCM 6th Signalized Intersection Summary
16: Oahu Ave & E Manoa Rd 07/07/2022

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 20 | 421 | 43 | 411 | 420 | 4 | 37 | 136 | 213 | 12 | 287 | 39 |
| Future Volume (veh/h) | 20 | 421 | 43 | 411 | 420 | 4 | 37 | 136 | 213 | 12 | 287 | 39 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.98 | 1.00 | | 0.98 | 0.99 | | 0.98 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1796 | 1870 | 1870 | 1870 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 29 | 480 | 56 | 428 | 485 | 6 | 47 | 186 | 29 | 21 | 330 | 41 |
| Peak Hour Factor | 0.69 | 0.92 | 0.72 | 0.96 | 0.91 | 0.50 | 0.79 | 0.73 | 0.86 | 0.58 | 0.87 | 0.85 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 30 | 503 | 59 | 518 | 515 | 6 | 77 | 274 | 397 | 42 | 353 | 42 |
| Arrive On Green | 0.32 | 0.32 | 0.32 | 0.29 | 0.29 | 0.29 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 |
| Sat Flow, veh/h | 94 | 1554 | 181 | 1781 | 1769 | 22 | 156 | 1055 | 1527 | 39 | 1357 | 163 |
| Grp Volume(v), veh/h | 565 | 0 | 0 | 428 | 0 | 491 | 233 | 0 | 29 | 392 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1829 | 0 | 0 | 1781 | 0 | 1791 | 1211 | 0 | 1527 | 1559 | 0 | 0 |
| Q Serve(g_s), s | 36.1 | 0.0 | 0.0 | 26.8 | 0.0 | 31.9 | 0.0 | 0.0 | 1.7 | 11.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 36.1 | 0.0 | 0.0 | 26.8 | 0.0 | 31.9 | 18.9 | 0.0 | 1.7 | 29.9 | 0.0 | 0.0 |
| Prop In Lane | 0.05 | | 0.10 | 1.00 | | 0.01 | 0.20 | | 1.00 | 0.05 | | 0.10 |
| Lane Grp Cap(c), veh/h | 592 | 0 | 0 | 518 | 0 | 521 | 351 | 0 | 397 | 437 | 0 | 0 |
| V/C Ratio(X) | 0.95 | 0.00 | 0.00 | 0.83 | 0.00 | 0.94 | 0.66 | 0.00 | 0.07 | 0.90 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 598 | 0 | 0 | 523 | 0 | 525 | 351 | 0 | 397 | 437 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 39.5 | 0.0 | 0.0 | 39.5 | 0.0 | 41.3 | 38.3 | 0.0 | 33.3 | 43.3 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 26.3 | 0.0 | 0.0 | 11.6 | 0.0 | 26.2 | 6.2 | 0.0 | 0.2 | 21.2 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 20.5 | 0.0 | 0.0 | 13.4 | 0.0 | 17.9 | 6.7 | 0.0 | 0.7 | 14.1 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 65.8 | 0.0 | 0.0 | 51.1 | 0.0 | 67.5 | 44.5 | 0.0 | 33.5 | 64.5 | 0.0 | 0.0 |
| LnGrp LOS | E | A | A | D | A | E | D | A | C | E | A | A |
| Approach Vol, veh/h | | 565 | | | 919 | | | 262 | | | 392 | |
| Approach Delay, s/veh | | 65.8 | | | 59.8 | | | 43.3 | | | 64.5 | |
| Approach LOS | | E | | | E | | | D | | | E | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 36.0 | | 43.6 | | 36.0 | | 39.7 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 31.0 | | 39.0 | | 31.0 | | 35.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 31.9 | | 38.1 | | 20.9 | | 33.9 | | | | |
| Green Ext Time (p_c), s | | 0.0 | | 0.5 | | 1.8 | | 0.8 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 60.3 | | | | | | | | | |
| HCM 6th LOS | | | E | | | | | | | | | |

# APPENDIX C

## LOS WORKSHEETS

## Base Year Conditions – PM Peak Hour

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 557 | 238 | 10 | 463 | 319 | 25 |
| Future Volume (veh/h) | 557 | 238 | 10 | 463 | 319 | 25 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 0.99 | 1.00 | | 1.00 | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1751 | 1683 | 1678 | 1745 | 1745 | 1678 |
| Adj Flow Rate, veh/h | 688 | 320 | 15 | 493 | 389 | 32 |
| Peak Hour Factor | 0.81 | 0.71 | 0.65 | 0.94 | 0.82 | 0.71 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 745 | 346 | 32 | 797 | 410 | 34 |
| Arrive On Green | 0.66 | 0.66 | 0.66 | 0.66 | 0.27 | 0.27 |
| Sat Flow, veh/h | 1128 | 525 | 9 | 1207 | 1517 | 125 |
| Grp Volume(v), veh/h | 0 | 1008 | 508 | 0 | 422 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1652 | 1216 | 0 | 1646 | 0 |
| Q Serve(g_s), s | 0.0 | 76.9 | 12.5 | 0.0 | 36.4 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 76.9 | 89.4 | 0.0 | 36.4 | 0.0 |
| Prop In Lane | | 0.32 | 0.03 | | 0.92 | 0.08 |
| Lane Grp Cap(c), veh/h | 0 | 1091 | 829 | 0 | 445 | 0 |
| V/C Ratio(X) | 0.00 | 0.92 | 0.61 | 0.00 | 0.95 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 1211 | 947 | 0 | 501 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 21.4 | 15.6 | 0.0 | 51.8 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 11.5 | 1.2 | 0.0 | 26.2 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 31.9 | 8.2 | 0.0 | 18.4 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 32.9 | 16.9 | 0.0 | 77.9 | 0.0 |
| LnGrp LOS | A | C | B | A | E | A |
| Approach Vol, veh/h | 1008 | | | 508 | 422 | |
| Approach Delay, s/veh | 32.9 | | | 16.9 | 77.9 | |
| Approach LOS | C | | | B | E | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 100.5 | | 44.1 | | 100.5 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 106.0 | | 44.0 | | 106.0 |
| Max Q Clear Time (g_c+I1), s | | 78.9 | | 38.4 | | 91.4 |
| Green Ext Time (p_c), s | | 14.4 | | 0.7 | | 4.1 |

| Intersection Summary | | | | | | |
|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 38.5 | | | |
| HCM 6th LOS | | | D | | | |

**Notes**

User approved volume balancing among the lanes for turning movement.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 104 | 227 | 46 | 5 | 154 | 57 | 46 | 73 | 11 | 32 | 66 | 69 |
| Future Volume (veh/h) | 104 | 227 | 46 | 5 | 154 | 57 | 46 | 73 | 11 | 32 | 66 | 69 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 1.00 | | 0.99 | 0.98 | | 0.96 | 0.97 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 128 | 258 | 59 | 12 | 171 | 47 | 53 | 106 | 6 | 46 | 112 | 45 |
| Peak Hour Factor | 0.81 | 0.88 | 0.62 | 0.40 | 0.90 | 0.85 | 0.86 | 0.69 | 0.50 | 0.70 | 0.59 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 294 | 558 | 113 | 108 | 730 | 191 | 204 | 330 | 16 | 168 | 276 | 96 |
| Arrive On Green | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Sat Flow, veh/h | 357 | 1103 | 223 | 30 | 1443 | 378 | 351 | 1331 | 63 | 240 | 1114 | 385 |
| Grp Volume(v), veh/h | 445 | 0 | 0 | 230 | 0 | 0 | 165 | 0 | 0 | 203 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1682 | 0 | 0 | 1850 | 0 | 0 | 1746 | 0 | 0 | 1739 | 0 | 0 |
| Q Serve(g_s), s | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 6.5 | 0.0 | 0.0 | 2.8 | 0.0 | 0.0 | 2.9 | 0.0 | 0.0 | 3.8 | 0.0 | 0.0 |
| Prop In Lane | 0.29 | | 0.13 | 0.05 | | 0.20 | 0.32 | | 0.04 | 0.23 | | 0.22 |
| Lane Grp Cap(c), veh/h | 965 | 0 | 0 | 1030 | 0 | 0 | 550 | 0 | 0 | 540 | 0 | 0 |
| V/C Ratio(X) | 0.46 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.38 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 1499 | 0 | 0 | 1624 | 0 | 0 | 1271 | 0 | 0 | 1276 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 6.5 | 0.0 | 0.0 | 5.7 | 0.0 | 0.0 | 12.6 | 0.0 | 0.0 | 12.9 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.5 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.8 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 7.0 | 0.0 | 0.0 | 5.8 | 0.0 | 0.0 | 12.9 | 0.0 | 0.0 | 13.3 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | B | A | A | B | A | A |
| Approach Vol, veh/h | | 445 | | | 230 | | | 165 | | | 203 | |
| Approach Delay, s/veh | | 7.0 | | | 5.8 | | | 12.9 | | | 13.3 | |
| Approach LOS | | A | | | A | | | B | | | B | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 25.6 | | 15.1 | | 25.6 | | 15.1 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 34.0 | | 28.0 | | 34.0 | | 28.0 |
| Max Q Clear Time (g_c+I1), s | | 8.5 | | 4.9 | | 4.8 | | 5.8 |
| Green Ext Time (p_c), s | | 4.7 | | 1.0 | | 2.1 | | 1.2 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 8.9 |
| HCM 6th LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 49 | 162 | 32 | 7 | 118 | 4 | 27 | 11 | 9 | 3 | 9 | 37 |
| Future Volume (veh/h) | 49 | 162 | 32 | 7 | 118 | 4 | 27 | 11 | 9 | 3 | 9 | 37 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.97 | | 0.99 | 0.97 | | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 53 | 176 | 23 | 8 | 128 | 2 | 29 | 12 | 1 | 3 | 10 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 410 | 410 | 49 | 305 | 552 | 8 | 543 | 35 | 3 | 359 | 102 | 10 |
| Arrive On Green | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Sat Flow, veh/h | 259 | 1295 | 156 | 59 | 1745 | 27 | 1036 | 429 | 36 | 375 | 1249 | 125 |
| Grp Volume(v), veh/h | 252 | 0 | 0 | 138 | 0 | 0 | 42 | 0 | 0 | 14 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1710 | 0 | 0 | 1830 | 0 | 0 | 1501 | 0 | 0 | 1749 | 0 | 0 |
| Q Serve(g_s), s | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.5 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Prop In Lane | 0.21 | | 0.09 | 0.06 | | 0.01 | 0.69 | | 0.02 | 0.21 | | 0.07 |
| Lane Grp Cap(c), veh/h | 869 | 0 | 0 | 866 | 0 | 0 | 581 | 0 | 0 | 472 | 0 | 0 |
| V/C Ratio(X) | 0.29 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 3599 | 0 | 0 | 3821 | 0 | 0 | 3346 | 0 | 0 | 3674 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 3.6 | 0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 5.8 | 0.0 | 0.0 | 5.6 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 3.8 | 0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 5.8 | 0.0 | 0.0 | 5.7 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | A | A | A | A | A | A |
| Approach Vol, veh/h | | 252 | | | 138 | | | 42 | | | 14 | |
| Approach Delay, s/veh | | 3.8 | | | 3.4 | | | 5.8 | | | 5.7 | |
| Approach LOS | | A | | | A | | | A | | | A | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 8.2 | | 5.1 | | 8.2 | | 5.1 | | | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | | 4.0 | | 4.0 | | | | |
| Max Green Setting (Gmax), s | | 26.0 | | 26.0 | | 26.0 | | 26.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 3.5 | | 2.3 | | 2.7 | | 2.1 | | | | |
| Green Ext Time (p_c), s | | 1.6 | | 0.1 | | 0.7 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 3.9 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.5 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 14 | 173 | 17 | 0 | 137 | 15 | 23 | 5 | 0 | 18 | 6 | 20 |
| Future Vol, veh/h | 14 | 173 | 17 | 0 | 137 | 15 | 23 | 5 | 0 | 18 | 6 | 20 |
| 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 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 188 | 18 | 0 | 149 | 16 | 25 | 5 | 0 | 20 | 7 | 22 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.8 | 8.4 | 8.3 | 8 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 82% | 7% | 0% | 41% |
| Vol Thru, % | 18% | 85% | 90% | 14% |
| Vol Right, % | 0% | 8% | 10% | 45% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 28 | 204 | 152 | 44 |
| LT Vol | 23 | 14 | 0 | 18 |
| Through Vol | 5 | 173 | 137 | 6 |
| RT Vol | 0 | 17 | 15 | 20 |
| Lane Flow Rate | 30 | 222 | 165 | 48 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.042 | 0.262 | 0.197 | 0.062 |
| Departure Headway (Hd) | 5.007 | 4.261 | 4.294 | 4.63 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 716 | 845 | 838 | 775 |
| Service Time | 3.031 | 2.273 | 2.307 | 2.651 |
| HCM Lane V/C Ratio | 0.042 | 0.263 | 0.197 | 0.062 |
| HCM Control Delay | 8.3 | 8.8 | 8.4 | 8 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.1 | 1.1 | 0.7 | 0.2 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.6 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 17 | 168 | 133 | 0 | 1 | 5 |
| Future Vol, veh/h | 17 | 168 | 133 | 0 | 1 | 5 |
| Conflicting Peds, #/hr | 8 | 0 | 0 | 8 | 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 | 18 | 183 | 145 | 0 | 1 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 153 | 0 | - | 0 | 372 | 153 |
| Stage 1 | - | - | - | - | 153 | - |
| Stage 2 | - | - | - | - | 219 | - |
| 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 | 1428 | - | - | - | 629 | 893 |
| Stage 1 | - | - | - | - | 875 | - |
| Stage 2 | - | - | - | - | 817 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1418 | - | - | - | 611 | 887 |
| Mov Cap-2 Maneuver | - | - | - | - | 611 | - |
| Stage 1 | - | - | - | - | 857 | - |
| Stage 2 | - | - | - | - | 811 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.7 | 0 | 9.4 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1418 | - | - | - | 825 |
| HCM Lane V/C Ratio | 0.013 | - | - | - | 0.008 |
| HCM Control Delay (s) | 7.6 | 0 | - | - | 9.4 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 4.4 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 77 | 57 | 42 | 0 | 0 | 48 |
| Future Vol, veh/h | 77 | 57 | 42 | 0 | 0 | 48 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 20 | 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 | 84 | 62 | 46 | 0 | 0 | 52 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 47 | 0 | - | 0 | 277 | 47 |
| Stage 1 | - | - | - | - | 47 | - |
| Stage 2 | - | - | - | - | 230 | - |
| 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 | 1560 | - | - | - | 713 | 1022 |
| Stage 1 | - | - | - | - | 975 | - |
| Stage 2 | - | - | - | - | 808 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1559 | - | - | - | 672 | 1021 |
| Mov Cap-2 Maneuver | - | - | - | - | 672 | - |
| Stage 1 | - | - | - | - | 919 | - |
| Stage 2 | - | - | - | - | 807 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 4.3 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1559 | - | - | - | - | 1021 |
| HCM Lane V/C Ratio | 0.054 | - | - | - | - | 0.051 |
| HCM Control Delay (s) | 7.4 | 0 | - | - | 0 | 8.7 |
| HCM Lane LOS | A | A | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | - | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 7.6 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 67 | 1 | 2 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 35 |
| Future Vol, veh/h | 67 | 1 | 2 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 35 |
| Conflicting Peds, #/hr | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 11 | 11 | 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, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 73 | 1 | 2 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 38 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 5 | 0 | 0 | 3 | 0 | 0 | 169 | 153 | 13 | 167 | 154 | 5 |
| Stage 1 | - | - | - | - | - | - | 148 | 148 | - | 5 | 5 | - |
| Stage 2 | - | - | - | - | - | - | 21 | 5 | - | 162 | 149 | - |
| 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 | 1616 | - | - | 1619 | - | - | 795 | 739 | 1067 | 797 | 738 | 1078 |
| Stage 1 | - | - | - | - | - | - | 855 | 775 | - | 1017 | 892 | - |
| Stage 2 | - | - | - | - | - | - | 998 | 892 | - | 840 | 774 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1611 | - | - | 1619 | - | - | 739 | 704 | 1057 | 756 | 703 | 1074 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 739 | 704 | - | 756 | 703 | - |
| Stage 1 | - | - | - | - | - | - | 817 | 740 | - | 968 | 889 | - |
| Stage 2 | - | - | - | - | - | - | 961 | 889 | - | 789 | 739 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 7 | 0 | 10.1 | 8.5 |
| HCM LOS | | | B | A |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 714 | 1611 | - | - | 1619 | - | - | 1058 |
| HCM Lane V/C Ratio | 0.011 | 0.045 | - | - | - | - | - | 0.037 |
| HCM Control Delay (s) | 10.1 | 7.3 | 0 | - | 0 | - | - | 8.5 |
| HCM Lane LOS | B | A | A | - | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | 0.1 | - | - | 0 | - | - | 0.1 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.4 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 2 | 54 | 40 | 5 | 2 | 1 |
| Future Vol, veh/h | 2 | 54 | 40 | 5 | 2 | 1 |
| 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 | 2 | 59 | 43 | 5 | 2 | 1 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 48 | 0 | - | 0 | 109 | 46 |
| Stage 1 | - | - | - | - | 46 | - |
| Stage 2 | - | - | - | - | 63 | - |
| 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 | 1559 | - | - | - | 888 | 1023 |
| Stage 1 | - | - | - | - | 976 | - |
| Stage 2 | - | - | - | - | 960 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1559 | - | - | - | 887 | 1023 |
| Mov Cap-2 Maneuver | - | - | - | - | 887 | - |
| Stage 1 | - | - | - | - | 975 | - |
| Stage 2 | - | - | - | - | 960 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.3 | 0 | 8.9 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1559 | - | - | - | 928 |
| HCM Lane V/C Ratio | 0.001 | - | - | - | 0.004 |
| HCM Control Delay (s) | 7.3 | 0 | - | - | 8.9 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 1.8 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 43 | 36 | 1 | 2 | 9 |
| Future Vol, veh/h | 12 | 43 | 36 | 1 | 2 | 9 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 3 |
| 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 | 13 | 47 | 39 | 1 | 2 | 10 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 40 | 0 | - | 0 | 113 | 43 |
| Stage 1 | - | - | - | - | 40 | - |
| Stage 2 | - | - | - | - | 73 | - |
| 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 | 1570 | - | - | - | 884 | 1027 |
| Stage 1 | - | - | - | - | 982 | - |
| Stage 2 | - | - | - | - | 950 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1570 | - | - | - | 876 | 1024 |
| Mov Cap-2 Maneuver | - | - | - | - | 876 | - |
| Stage 1 | - | - | - | - | 973 | - |
| Stage 2 | - | - | - | - | 950 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.6 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1570 | - | - | - | 993 |
| HCM Lane V/C Ratio | 0.008 | - | - | - | 0.012 |
| HCM Control Delay (s) | 7.3 | 0 | - | - | 8.7 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 45 | 0 | 0 | 37 | 0 | 0 |
| Future Vol, veh/h | 45 | 0 | 0 | 37 | 0 | 0 |
| 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 | 49 | 0 | 0 | 40 | 0 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 49 | 0 | 89 | 49 |
| Stage 1 | - | - | - | - | 49 | - |
| Stage 2 | - | - | - | - | 40 | - |
| 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 | - | - | 1558 | - | 912 | 1020 |
| Stage 1 | - | - | - | - | 973 | - |
| Stage 2 | - | - | - | - | 982 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1558 | - | 912 | 1020 |
| Mov Cap-2 Maneuver | - | - | - | - | 912 | - |
| Stage 1 | - | - | - | - | 973 | - |
| Stage 2 | - | - | - | - | 982 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 0 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 1558 | - |
| HCM Lane V/C Ratio | - | - | - | - | - |
| HCM Control Delay (s) | 0 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | - | - | - | 0 | - |

# HCM 6th Signalized Intersection Summary
## 16: Oahu Ave & E Manoa Rd

07/07/2022

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 36 | 472 | 40 | 401 | 348 | 5 | 14 | 257 | 306 | 2 | 195 | 32 |
| Future Volume (veh/h) | 36 | 472 | 40 | 401 | 348 | 5 | 14 | 257 | 306 | 2 | 195 | 32 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 0.98 | 1.00 | | 0.96 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1525 | 1525 | 1525 | 1768 | 1697 | 1768 | 1870 | 1870 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 52 | 539 | 53 | 418 | 402 | 8 | 18 | 352 | 137 | 3 | 224 | 34 |
| Peak Hour Factor | 0.69 | 0.92 | 0.72 | 0.96 | 0.91 | 0.50 | 0.79 | 0.73 | 0.86 | 0.58 | 0.87 | 0.85 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 51 | 526 | 52 | 448 | 441 | 9 | 31 | 363 | 345 | 20 | 278 | 42 |
| Arrive On Green | 0.42 | 0.42 | 0.42 | 0.27 | 0.27 | 0.27 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |
| Sat Flow, veh/h | 121 | 1251 | 123 | 1684 | 1658 | 33 | 43 | 1583 | 1502 | 0 | 1209 | 181 |
| Grp Volume(v), veh/h | 644 | 0 | 0 | 418 | 0 | 410 | 370 | 0 | 137 | 261 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1495 | 0 | 0 | 1684 | 0 | 1691 | 1626 | 0 | 1502 | 1391 | 0 | 0 |
| Q Serve(g_s), s | 75.0 | 0.0 | 0.0 | 43.3 | 0.0 | 41.9 | 0.0 | 0.0 | 13.8 | 0.5 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 75.0 | 0.0 | 0.0 | 43.3 | 0.0 | 41.9 | 40.5 | 0.0 | 13.8 | 41.0 | 0.0 | 0.0 |
| Prop In Lane | 0.08 | | 0.08 | 1.00 | | 0.02 | 0.05 | | 1.00 | 0.01 | | 0.13 |
| Lane Grp Cap(c), veh/h | 628 | 0 | 0 | 448 | 0 | 450 | 394 | 0 | 345 | 340 | 0 | 0 |
| V/C Ratio(X) | 1.03 | 0.00 | 0.00 | 0.93 | 0.00 | 0.91 | 0.94 | 0.00 | 0.40 | 0.77 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 628 | 0 | 0 | 462 | 0 | 464 | 394 | 0 | 345 | 340 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 51.8 | 0.0 | 0.0 | 63.9 | 0.0 | 63.4 | 67.4 | 0.0 | 58.3 | 61.8 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 42.5 | 0.0 | 0.0 | 26.5 | 0.0 | 22.8 | 30.7 | 0.0 | 1.6 | 10.8 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 35.7 | 0.0 | 0.0 | 22.0 | 0.0 | 21.1 | 20.3 | 0.0 | 5.5 | 11.8 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 94.3 | 0.0 | 0.0 | 90.5 | 0.0 | 86.2 | 98.0 | 0.0 | 59.9 | 72.6 | 0.0 | 0.0 |
| LnGrp LOS | F | A | A | F | A | F | F | A | E | E | A | A |
| Approach Vol, veh/h | | 644 | | | 828 | | | 507 | | | 261 | |
| Approach Delay, s/veh | | 94.3 | | | 88.4 | | | 87.7 | | | 72.6 | |
| Approach LOS | | F | | | F | | | F | | | E | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 46.0 | | 80.0 | | 46.0 | | 52.5 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 41.0 | | 75.0 | | 41.0 | | 49.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 43.0 | | 77.0 | | 42.5 | | 45.3 | | | | |
| Green Ext Time (p_c), s | | 0.0 | | 0.0 | | 0.0 | | 2.3 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 88.1 | | | | | | | | | |
| HCM 6th LOS | | | F | | | | | | | | | |

# APPENDIX C

## LOS WORKSHEETS

## Future Year Conditions Access Option 1 – AM Peak Hour

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 407 | 277 | 15 | 493 | 373 | 20 |
| Future Volume (veh/h) | 407 | 277 | 15 | 493 | 373 | 20 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 0.99 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1751 | 1683 | 1678 | 1745 | 1745 | 1678 |
| Adj Flow Rate, veh/h | 502 | 341 | 23 | 524 | 455 | 24 |
| Peak Hour Factor | 0.81 | 0.71 | 0.65 | 0.94 | 0.82 | 0.71 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 548 | 372 | 54 | 670 | 484 | 26 |
| Arrive On Green | 0.57 | 0.57 | 0.57 | 0.57 | 0.31 | 0.31 |
| Sat Flow, veh/h | 969 | 658 | 12 | 1185 | 1566 | 83 |
| Grp Volume(v), veh/h | 0 | 843 | 547 | 0 | 480 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1627 | 1197 | 0 | 1652 | 0 |
| Q Serve(g_s), s | 0.0 | 37.2 | 6.9 | 0.0 | 22.5 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 37.2 | 44.2 | 0.0 | 22.5 | 0.0 |
| Prop In Lane | | 0.40 | 0.04 | | 0.95 | 0.05 |
| Lane Grp Cap(c), veh/h | 0 | 920 | 723 | 0 | 511 | 0 |
| V/C Ratio(X) | 0.00 | 0.92 | 0.76 | 0.00 | 0.94 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 920 | 723 | 0 | 518 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 15.6 | 12.7 | 0.0 | 26.8 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 13.9 | 4.9 | 0.0 | 25.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 15.7 | 6.5 | 0.0 | 12.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 29.5 | 17.6 | 0.0 | 51.9 | 0.0 |
| LnGrp LOS | A | C | B | A | D | A |
| Approach Vol, veh/h | 843 | | | 547 | 480 | |
| Approach Delay, s/veh | 29.5 | | | 17.6 | 51.9 | |
| Approach LOS | C | | | B | D | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 50.0 | | 29.6 | | 50.0 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 45.0 | | 25.0 | | 45.0 |
| Max Q Clear Time (g_c+I1), s | | 39.2 | | 24.5 | | 46.2 |
| Green Ext Time (p_c), s | | 3.7 | | 0.1 | | 0.0 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 31.8 |
| HCM 6th LOS | | | C |

Notes

User approved volume balancing among the lanes for turning movement.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 43 | 172 | 34 | 9 | 262 | 113 | 80 | 128 | 3 | 28 | 45 | 57 |
| Future Volume (veh/h) | 43 | 172 | 34 | 9 | 262 | 113 | 80 | 128 | 3 | 28 | 45 | 57 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.99 | | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 53 | 195 | 37 | 22 | 291 | 107 | 93 | 186 | 4 | 40 | 76 | 29 |
| Peak Hour Factor | 0.81 | 0.88 | 0.62 | 0.40 | 0.90 | 0.85 | 0.86 | 0.69 | 0.50 | 0.70 | 0.59 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 200 | 662 | 113 | 111 | 668 | 235 | 227 | 325 | 6 | 183 | 286 | 89 |
| Arrive On Green | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Sat Flow, veh/h | 190 | 1315 | 225 | 38 | 1327 | 467 | 436 | 1286 | 25 | 282 | 1132 | 354 |
| Grp Volume(v), veh/h | 285 | 0 | 0 | 420 | 0 | 0 | 283 | 0 | 0 | 145 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1730 | 0 | 0 | 1832 | 0 | 0 | 1746 | 0 | 0 | 1768 | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 3.6 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 | 5.7 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 |
| Prop In Lane | 0.19 | | 0.13 | 0.05 | | 0.25 | 0.33 | | 0.01 | 0.28 | | 0.20 |
| Lane Grp Cap(c), veh/h | 975 | 0 | 0 | 1015 | 0 | 0 | 558 | 0 | 0 | 559 | 0 | 0 |
| V/C Ratio(X) | 0.29 | 0.00 | 0.00 | 0.41 | 0.00 | 0.00 | 0.51 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 1506 | 0 | 0 | 1600 | 0 | 0 | 1282 | 0 | 0 | 1257 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 5.9 | 0.0 | 0.0 | 6.5 | 0.0 | 0.0 | 13.5 | 0.0 | 0.0 | 12.4 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.2 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.1 | 0.0 | 0.0 | 1.7 | 0.0 | 0.0 | 2.1 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 6.2 | 0.0 | 0.0 | 6.9 | 0.0 | 0.0 | 14.2 | 0.0 | 0.0 | 12.7 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | B | A | A | B | A | A |
| Approach Vol, veh/h | | 285 | | | 420 | | | 283 | | | 145 | |
| Approach Delay, s/veh | | 6.2 | | | 6.9 | | | 14.2 | | | 12.7 | |
| Approach LOS | | A | | | A | | | B | | | B | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 25.7 | | 15.4 | | 25.7 | | 15.4 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 34.0 | | 28.0 | | 34.0 | | 28.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 5.6 | | 7.7 | | 8.0 | | 4.6 | | | | |
| Green Ext Time (p_c), s | | 2.8 | | 1.7 | | 4.2 | | 0.8 | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 9.3 |
| HCM 6th LOS | | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 47 | 116 | 26 | 11 | 212 | 18 | 44 | 42 | 9 | 12 | 23 | 81 |
| Future Volume (veh/h) | 47 | 116 | 26 | 11 | 212 | 18 | 44 | 42 | 9 | 12 | 23 | 81 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 51 | 126 | 17 | 12 | 230 | 13 | 48 | 46 | 1 | 13 | 25 | 11 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 423 | 365 | 44 | 287 | 507 | 28 | 491 | 97 | 2 | 384 | 108 | 48 |
| Arrive On Green | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| Sat Flow, veh/h | 317 | 1212 | 147 | 51 | 1684 | 93 | 822 | 787 | 17 | 458 | 881 | 388 |
| Grp Volume(v), veh/h | 194 | 0 | 0 | 255 | 0 | 0 | 95 | 0 | 0 | 49 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1676 | 0 | 0 | 1828 | 0 | 0 | 1626 | 0 | 0 | 1728 | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.1 | 0.0 | 0.0 | 1.5 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 |
| Prop In Lane | 0.26 | | 0.09 | 0.05 | | 0.05 | 0.51 | | 0.01 | 0.27 | | 0.22 |
| Lane Grp Cap(c), veh/h | 832 | 0 | 0 | 822 | 0 | 0 | 590 | 0 | 0 | 540 | 0 | 0 |
| V/C Ratio(X) | 0.23 | 0.00 | 0.00 | 0.31 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 3311 | 0 | 0 | 3667 | 0 | 0 | 3350 | 0 | 0 | 3409 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 3.8 | 0.0 | 0.0 | 3.9 | 0.0 | 0.0 | 5.6 | 0.0 | 0.0 | 5.5 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 3.9 | 0.0 | 0.0 | 4.1 | 0.0 | 0.0 | 5.8 | 0.0 | 0.0 | 5.6 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | A | A | A | A | A | A |
| Approach Vol, veh/h | | 194 | | | 255 | | | 95 | | | 49 | |
| Approach Delay, s/veh | | 3.9 | | | 4.1 | | | 5.8 | | | 5.6 | |
| Approach LOS | | A | | | A | | | A | | | A | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 8.2 | | 5.7 | | 8.2 | | 5.7 | | | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | | 4.0 | | 4.0 | | | | |
| Max Green Setting (Gmax), s | | 26.0 | | 26.0 | | 26.0 | | 26.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 3.1 | | 2.7 | | 3.5 | | 2.3 | | | | |
| Green Ext Time (p_c), s | | 1.2 | | 0.4 | | 1.5 | | 0.2 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 4.5 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.6 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 14 | 76 | 7 | 0 | 194 | 45 | 22 | 21 | 0 | 26 | 10 | 21 |
| Future Vol, veh/h | 14 | 76 | 7 | 0 | 194 | 45 | 22 | 21 | 0 | 26 | 10 | 21 |
| 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 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 83 | 8 | 0 | 211 | 49 | 24 | 23 | 0 | 28 | 11 | 23 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.1 | 9 | 8.3 | 8.1 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 51% | 14% | 0% | 46% |
| Vol Thru, % | 49% | 78% | 81% | 18% |
| Vol Right, % | 0% | 7% | 19% | 37% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 43 | 97 | 239 | 57 |
| LT Vol | 22 | 14 | 0 | 26 |
| Through Vol | 21 | 76 | 194 | 10 |
| RT Vol | 0 | 7 | 45 | 21 |
| Lane Flow Rate | 47 | 105 | 260 | 62 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.064 | 0.13 | 0.303 | 0.08 |
| Departure Headway (Hd) | 4.918 | 4.452 | 4.201 | 4.667 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 729 | 807 | 857 | 768 |
| Service Time | 2.944 | 2.471 | 2.216 | 2.693 |
| HCM Lane V/C Ratio | 0.064 | 0.13 | 0.303 | 0.081 |
| HCM Control Delay | 8.3 | 8.1 | 9 | 8.1 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.2 | 0.4 | 1.3 | 0.3 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.9 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 88 | 202 | 0 | 0 | 21 |
| Future Vol, veh/h | 12 | 88 | 202 | 0 | 0 | 21 |
| Conflicting Peds, #/hr | 2 | 0 | 0 | 2 | 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 | 13 | 96 | 220 | 0 | 0 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 222 | 0 | - | 0 | 344 | 222 |
| Stage 1 | - | - | - | - | 222 | - |
| Stage 2 | - | - | - | - | 122 | - |
| 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 | 1347 | - | - | - | 652 | 818 |
| Stage 1 | - | - | - | - | 815 | - |
| Stage 2 | - | - | - | - | 903 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1345 | - | - | - | 643 | 817 |
| Mov Cap-2 Maneuver | - | - | - | - | 643 | - |
| Stage 1 | - | - | - | - | 805 | - |
| Stage 2 | - | - | - | - | 901 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.9 | 0 | 9.5 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1345 | - | - | - | 817 |
| HCM Lane V/C Ratio | 0.01 | - | - | - | 0.028 |
| HCM Control Delay (s) | 7.7 | 0 | - | - | 9.5 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.3 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 46 | 62 | 118 | 2 | 0 | 68 |
| Future Vol, veh/h | 46 | 62 | 118 | 2 | 0 | 68 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 20 | 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 | 50 | 67 | 128 | 2 | 0 | 74 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 130 | 0 | - | 0 | 296 | 129 |
| Stage 1 | - | - | - | - | 129 | - |
| Stage 2 | - | - | - | - | 167 | - |
| 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 | 1455 | - | - | - | 695 | 921 |
| Stage 1 | - | - | - | - | 897 | - |
| Stage 2 | - | - | - | - | 863 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1455 | - | - | - | 670 | 921 |
| Mov Cap-2 Maneuver | - | - | - | - | 670 | - |
| Stage 1 | - | - | - | - | 865 | - |
| Stage 2 | - | - | - | - | 863 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 3.2 | 0 | 9.3 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1455 | - | - | - | - | 921 |
| HCM Lane V/C Ratio | 0.034 | - | - | - | - | 0.08 |
| HCM Control Delay (s) | 7.6 | 0 | - | - | 0 | 9.3 |
| HCM Lane LOS | A | A | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | - | 0.3 |

| Intersection | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Int Delay, s/veh | 8.1 | | | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 43 | 0 | 3 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 10 | 59 |
| Future Vol, veh/h | 43 | 0 | 3 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 10 | 59 |
| Conflicting Peds, #/hr | 4 | 0 | 0 | 0 | 0 | 4 | 2 | 0 | 3 | 3 | 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 | 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 | 47 | 0 | 3 | 0 | 0 | 0 | 1 | 11 | 0 | 0 | 11 | 64 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 5 | 0 | 0 | 3 | 0 | 0 | 137 | 101 | 5 | 109 | 102 | 7 |
| Stage 1 | - | - | - | - | - | - | 96 | 96 | - | 5 | 5 | - |
| Stage 2 | - | - | - | - | - | - | 41 | 5 | - | 104 | 97 | - |
| 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 | 1616 | - | - | 1619 | - | - | 834 | 789 | 1078 | 870 | 788 | 1075 |
| Stage 1 | - | - | - | - | - | - | 911 | 815 | - | 1017 | 892 | - |
| Stage 2 | - | - | - | - | - | - | 974 | 892 | - | 902 | 815 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1611 | - | - | 1619 | - | - | 757 | 764 | 1075 | 837 | 763 | 1070 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 757 | 764 | - | 837 | 763 | - |
| Stage 1 | - | - | - | - | - | - | 885 | 791 | - | 984 | 889 | - |
| Stage 2 | - | - | - | - | - | - | 903 | 889 | - | 862 | 791 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 6.8 | 0 | 9.8 | 8.8 |
| HCM LOS | | | A | A |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 763 | 1611 | - | - | 1619 | - | - | 1011 |
| HCM Lane V/C Ratio | 0.016 | 0.029 | - | - | - | - | - | 0.074 |
| HCM Control Delay (s) | 9.8 | 7.3 | 0 | - | 0 | - | - | 8.8 |
| HCM Lane LOS | A | A | A | - | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | 0.1 | - | - | 0 | - | - | 0.2 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.7 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 3 | 59 | 94 | 11 | 0 | 12 |
| Future Vol, veh/h | 3 | 59 | 94 | 11 | 0 | 12 |
| 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 | 3 | 64 | 102 | 12 | 0 | 13 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 114 | 0 | - | 0 | 178 | 108 |
| Stage 1 | - | - | - | - | 108 | - |
| Stage 2 | - | - | - | - | 70 | - |
| 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 | 1475 | - | - | - | 812 | 946 |
| Stage 1 | - | - | - | - | 916 | - |
| Stage 2 | - | - | - | - | 953 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1475 | - | - | - | 810 | 946 |
| Mov Cap-2 Maneuver | - | - | - | - | 810 | - |
| Stage 1 | - | - | - | - | 914 | - |
| Stage 2 | - | - | - | - | 953 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.4 | 0 | 8.9 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1475 | - | - | - | 946 |
| HCM Lane V/C Ratio | 0.002 | - | - | - | 0.014 |
| HCM Control Delay (s) | 7.4 | 0 | - | - | 8.9 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 1.7 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 10 | 46 | 83 | 0 | 0 | 22 |
| Future Vol, veh/h | 10 | 46 | 83 | 0 | 0 | 22 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 1 |
| 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 | 11 | 50 | 90 | 0 | 0 | 24 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 90 | 0 | - | 0 | 162 | 91 |
| Stage 1 | - | - | - | - | 90 | - |
| Stage 2 | - | - | - | - | 72 | - |
| 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 | 1505 | - | - | - | 829 | 967 |
| Stage 1 | - | - | - | - | 934 | - |
| Stage 2 | - | - | - | - | 951 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1505 | - | - | - | 822 | 966 |
| Mov Cap-2 Maneuver | - | - | - | - | 822 | - |
| Stage 1 | - | - | - | - | 927 | - |
| Stage 2 | - | - | - | - | 951 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.3 | 0 | 8.8 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1505 | - | - | - | 966 |
| HCM Lane V/C Ratio | 0.007 | - | - | - | 0.025 |
| HCM Control Delay (s) | 7.4 | 0 | - | - | 8.8 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.5 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 58 | 4 | 0 | 110 | 10 | 0 |
| Future Vol, veh/h | 58 | 4 | 0 | 110 | 10 | 0 |
| 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 | 63 | 4 | 0 | 120 | 11 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 67 | 0 | 185 | 65 |
| Stage 1 | - | - | - | - | 65 | - |
| Stage 2 | - | - | - | - | 120 | - |
| 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 | - | - | 1535 | - | 804 | 999 |
| Stage 1 | - | - | - | - | 958 | - |
| Stage 2 | - | - | - | - | 905 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1535 | - | 804 | 999 |
| Mov Cap-2 Maneuver | - | - | - | - | 804 | - |
| Stage 1 | - | - | - | - | 958 | - |
| Stage 2 | - | - | - | - | 905 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 9.5 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 804 | - | - | 1535 | - |
| HCM Lane V/C Ratio | 0.014 | - | - | - | - |
| HCM Control Delay (s) | 9.5 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.6 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 53 | 4 | 0 | 100 | 10 | 0 |
| Future Vol, veh/h | 53 | 4 | 0 | 100 | 10 | 0 |
| 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 | 58 | 4 | 0 | 109 | 11 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 62 | 0 | 169 | 60 |
| Stage 1 | - | - | - | - | 60 | - |
| Stage 2 | - | - | - | - | 109 | - |
| 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 | - | - | 1541 | - | 821 | 1005 |
| Stage 1 | - | - | - | - | 963 | - |
| Stage 2 | - | - | - | - | 916 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1541 | - | 821 | 1005 |
| Mov Cap-2 Maneuver | - | - | - | - | 821 | - |
| Stage 1 | - | - | - | - | 963 | - |
| Stage 2 | - | - | - | - | 916 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 9.4 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 821 | - | - | 1541 | - |
| HCM Lane V/C Ratio | 0.013 | - | - | - | - |
| HCM Control Delay (s) | 9.4 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.8 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 0 | 3 | 11 | 10 | 3 |
| Future Vol, veh/h | 0 | 0 | 3 | 11 | 10 | 3 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| 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 | 0 | 0 | 3 | 12 | 11 | 3 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 31 | - | 14 | 0 | - | 0 |
| Stage 1 | 13 | - | - | - | - | - |
| Stage 2 | 18 | - | - | - | - | - |
| Critical Hdwy | 6.42 | - | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | - | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | 983 | 0 | 1604 | - | - | - |
| Stage 1 | 1010 | 0 | - | - | - | - |
| Stage 2 | 1005 | 0 | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 981 | - | 1604 | - | - | - |
| Mov Cap-2 Maneuver | 981 | - | - | - | - | - |
| Stage 1 | 1008 | - | - | - | - | - |
| Stage 2 | 1005 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 1.6 | 0 |
| HCM LOS | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1604 | - | - | - | - |
| HCM Lane V/C Ratio | 0.002 | - | - | - | - |
| HCM Control Delay (s) | 7.2 | 0 | 0 | - | - |
| HCM Lane LOS | A | A | A | - | - |
| HCM 95th %tile Q(veh) | 0 | - | - | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.9 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 3 | 0 | 14 | 10 | 0 |
| Future Vol, veh/h | 0 | 3 | 0 | 14 | 10 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| 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 | 0 | 3 | 0 | 15 | 11 | 0 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 26 | 11 | - | 0 | - | 0 |
| Stage 1 | 11 | - | - | - | - | - |
| Stage 2 | 15 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | - | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | - | - | - | - |
| Pot Cap-1 Maneuver | 989 | 1070 | 0 | - | - | 0 |
| Stage 1 | 1012 | - | 0 | - | - | 0 |
| Stage 2 | 1008 | - | 0 | - | - | 0 |
| Platoon blocked, % | | | | - | - | |
| Mov Cap-1 Maneuver | 989 | 1070 | - | - | - | - |
| Mov Cap-2 Maneuver | 989 | - | - | - | - | - |
| Stage 1 | 1012 | - | - | - | - | - |
| Stage 2 | 1008 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 8.4 | 0 | 0 |
| HCM LOS | A | | |

| Minor Lane/Major Mvmt | NBT | EBLn1 | SBT |
|---|---|---|---|
| Capacity (veh/h) | - | 1070 | - |
| HCM Lane V/C Ratio | - | 0.003 | - |
| HCM Control Delay (s) | - | 8.4 | - |
| HCM Lane LOS | - | A | - |
| HCM 95th %tile Q(veh) | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.4 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 38 | 9 | 0 | 63 | 20 | 0 |
| Future Vol, veh/h | 38 | 9 | 0 | 63 | 20 | 0 |
| 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 | 41 | 10 | 0 | 68 | 22 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 51 | 0 | 114 | 46 |
| Stage 1 | - | - | - | - | 46 | - |
| Stage 2 | - | - | - | - | 68 | - |
| 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 | - | - | 1555 | - | 882 | 1023 |
| Stage 1 | - | - | - | - | 976 | - |
| Stage 2 | - | - | - | - | 955 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1555 | - | 882 | 1023 |
| Mov Cap-2 Maneuver | - | - | - | - | 882 | - |
| Stage 1 | - | - | - | - | 976 | - |
| Stage 2 | - | - | - | - | 955 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 9.2 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 882 | - | - | 1555 | - |
| HCM Lane V/C Ratio | 0.025 | - | - | - | - |
| HCM Control Delay (s) | 9.2 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 12 | 21 | 0 | 0 | 0 |
| Future Vol, veh/h | 0 | 12 | 21 | 0 | 0 | 0 |
| 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 | 0 | 13 | 23 | 0 | 0 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 23 | 0 | - | 0 | 36 | 23 |
| Stage 1 | - | - | - | - | 23 | - |
| Stage 2 | - | - | - | - | 13 | - |
| 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 | 1592 | - | - | - | 977 | 1054 |
| Stage 1 | - | - | - | - | 1000 | - |
| Stage 2 | - | - | - | - | 1010 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1592 | - | - | - | 977 | 1054 |
| Mov Cap-2 Maneuver | - | - | - | - | 977 | - |
| Stage 1 | - | - | - | - | 1000 | - |
| Stage 2 | - | - | - | - | 1010 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 0 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1592 | - | - | - | - |
| HCM Lane V/C Ratio | - | - | - | - | - |
| HCM Control Delay (s) | 0 | - | - | - | 0 |
| HCM Lane LOS | A | - | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 20 | 436 | 43 | 430 | 443 | 4 | 37 | 136 | 220 | 12 | 287 | 39 |
| Future Volume (veh/h) | 20 | 436 | 43 | 430 | 443 | 4 | 37 | 136 | 220 | 12 | 287 | 39 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.98 | 1.00 | | 0.98 | 1.00 | | 0.98 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1796 | 1870 | 1870 | 1870 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 29 | 498 | 56 | 448 | 511 | 6 | 47 | 186 | 29 | 21 | 330 | 41 |
| Peak Hour Factor | 0.69 | 0.92 | 0.72 | 0.96 | 0.91 | 0.50 | 0.79 | 0.73 | 0.86 | 0.58 | 0.87 | 0.85 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 30 | 508 | 57 | 520 | 516 | 6 | 75 | 264 | 394 | 41 | 342 | 41 |
| Arrive On Green | 0.32 | 0.32 | 0.32 | 0.29 | 0.29 | 0.29 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 |
| Sat Flow, veh/h | 91 | 1563 | 176 | 1781 | 1771 | 21 | 149 | 1023 | 1526 | 37 | 1323 | 159 |
| Grp Volume(v), veh/h | 583 | 0 | 0 | 448 | 0 | 517 | 233 | 0 | 29 | 392 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1830 | 0 | 0 | 1781 | 0 | 1791 | 1171 | 0 | 1526 | 1518 | 0 | 0 |
| Q Serve(g_s), s | 37.9 | 0.0 | 0.0 | 28.6 | 0.0 | 34.5 | 0.0 | 0.0 | 1.7 | 11.5 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 37.9 | 0.0 | 0.0 | 28.6 | 0.0 | 34.5 | 19.5 | 0.0 | 1.7 | 31.0 | 0.0 | 0.0 |
| Prop In Lane | 0.05 | | 0.10 | 1.00 | | 0.01 | 0.20 | | 1.00 | 0.05 | | 0.10 |
| Lane Grp Cap(c), veh/h | 595 | 0 | 0 | 520 | 0 | 522 | 339 | 0 | 394 | 424 | 0 | 0 |
| V/C Ratio(X) | 0.98 | 0.00 | 0.00 | 0.86 | 0.00 | 0.99 | 0.69 | 0.00 | 0.07 | 0.93 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 595 | 0 | 0 | 520 | 0 | 522 | 339 | 0 | 394 | 424 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 40.1 | 0.0 | 0.0 | 40.2 | 0.0 | 42.3 | 38.8 | 0.0 | 33.6 | 44.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 31.9 | 0.0 | 0.0 | 14.9 | 0.0 | 36.7 | 7.4 | 0.0 | 0.2 | 26.4 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 22.2 | 0.0 | 0.0 | 14.7 | 0.0 | 20.5 | 6.9 | 0.0 | 0.7 | 14.8 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 72.1 | 0.0 | 0.0 | 55.1 | 0.0 | 79.0 | 46.2 | 0.0 | 33.8 | 70.5 | 0.0 | 0.0 |
| LnGrp LOS | E | A | A | E | A | E | D | A | C | E | A | A |
| Approach Vol, veh/h | | 583 | | | 965 | | | 262 | | | 392 | |
| Approach Delay, s/veh | | 72.1 | | | 67.9 | | | 44.8 | | | 70.5 | |
| Approach LOS | | E | | | E | | | D | | | E | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 36.0 | | 44.0 | | 36.0 | | 40.0 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 31.0 | | 39.0 | | 31.0 | | 35.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 33.0 | | 39.9 | | 21.5 | | 36.5 | | | | |
| Green Ext Time (p_c), s | | 0.0 | | 0.0 | | 1.7 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 66.7 | | | | | | | | | |
| HCM 6th LOS | | | E | | | | | | | | | |

# APPENDIX C

LOS WORKSHEETS

Future Year Conditions Access Option 1 – PM Peak Hour

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 599 | 238 | 10 | 497 | 319 | 25 |
| Future Volume (veh/h) | 599 | 238 | 10 | 497 | 319 | 25 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 0.99 | 1.00 | | 1.00 | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1751 | 1683 | 1678 | 1745 | 1745 | 1678 |
| Adj Flow Rate, veh/h | 740 | 324 | 15 | 529 | 389 | 32 |
| Peak Hour Factor | 0.81 | 0.71 | 0.65 | 0.94 | 0.82 | 0.71 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 770 | 337 | 26 | 684 | 411 | 34 |
| Arrive On Green | 0.67 | 0.67 | 0.67 | 0.67 | 0.27 | 0.27 |
| Sat Flow, veh/h | 1152 | 504 | 5 | 1024 | 1517 | 125 |
| Grp Volume(v), veh/h | 0 | 1064 | 544 | 0 | 422 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1656 | 1029 | 0 | 1646 | 0 |
| Q Serve(g_s), s | 0.0 | 98.2 | 11.8 | 0.0 | 41.4 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 98.2 | 110.0 | 0.0 | 41.4 | 0.0 |
| Prop In Lane | | 0.30 | 0.03 | | 0.92 | 0.08 |
| Lane Grp Cap(c), veh/h | 0 | 1107 | 710 | 0 | 446 | 0 |
| V/C Ratio(X) | 0.00 | 0.96 | 0.77 | 0.00 | 0.95 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 1107 | 710 | 0 | 600 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 25.4 | 28.0 | 0.0 | 58.8 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 18.6 | 5.3 | 0.0 | 20.4 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 43.0 | 14.0 | 0.0 | 19.9 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 43.9 | 33.3 | 0.0 | 79.2 | 0.0 |
| LnGrp LOS | A | D | C | A | E | A |
| Approach Vol, veh/h | 1064 | | | 544 | 422 | |
| Approach Delay, s/veh | 43.9 | | | 33.3 | 79.2 | |
| Approach LOS | D | | | C | E | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 115.0 | | 49.6 | | 115.0 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 110.0 | | 60.0 | | 110.0 |
| Max Q Clear Time (g_c+I1), s | | 100.2 | | 43.4 | | 112.0 |
| Green Ext Time (p_c), s | | 7.2 | | 1.3 | | 0.0 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 48.4 |
| HCM 6th LOS | | | D |

Notes

User approved volume balancing among the lanes for turning movement.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 104 | 270 | 46 | 5 | 187 | 57 | 46 | 73 | 11 | 32 | 66 | 69 |
| Future Volume (veh/h) | 104 | 270 | 46 | 5 | 187 | 57 | 46 | 73 | 11 | 32 | 66 | 69 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 1.00 | | 0.99 | 0.98 | | 0.96 | 0.97 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 128 | 307 | 61 | 12 | 208 | 51 | 53 | 106 | 6 | 46 | 112 | 45 |
| Peak Hour Factor | 0.81 | 0.88 | 0.62 | 0.40 | 0.90 | 0.85 | 0.86 | 0.69 | 0.50 | 0.70 | 0.59 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 272 | 589 | 105 | 105 | 750 | 177 | 204 | 330 | 16 | 168 | 276 | 96 |
| Arrive On Green | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Sat Flow, veh/h | 318 | 1164 | 208 | 25 | 1482 | 349 | 351 | 1331 | 63 | 240 | 1114 | 385 |
| Grp Volume(v), veh/h | 496 | 0 | 0 | 271 | 0 | 0 | 165 | 0 | 0 | 203 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1690 | 0 | 0 | 1857 | 0 | 0 | 1746 | 0 | 0 | 1739 | 0 | 0 |
| Q Serve(g_s), s | 2.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 7.6 | 0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 2.9 | 0.0 | 0.0 | 3.8 | 0.0 | 0.0 |
| Prop In Lane | 0.26 | | 0.12 | 0.04 | | 0.19 | 0.32 | | 0.04 | 0.23 | | 0.22 |
| Lane Grp Cap(c), veh/h | 967 | 0 | 0 | 1032 | 0 | 0 | 550 | 0 | 0 | 540 | 0 | 0 |
| V/C Ratio(X) | 0.51 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.38 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 1502 | 0 | 0 | 1630 | 0 | 0 | 1271 | 0 | 0 | 1276 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 6.8 | 0.0 | 0.0 | 5.8 | 0.0 | 0.0 | 12.6 | 0.0 | 0.0 | 12.9 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.6 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.1 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 7.4 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 | 12.9 | 0.0 | 0.0 | 13.3 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | B | A | A | B | A | A |
| Approach Vol, veh/h | | 496 | | | 271 | | | 165 | | | 203 | |
| Approach Delay, s/veh | | 7.4 | | | 6.0 | | | 12.9 | | | 13.3 | |
| Approach LOS | | A | | | A | | | B | | | B | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 25.6 | | 15.1 | | 25.6 | | 15.1 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 34.0 | | 28.0 | | 34.0 | | 28.0 |
| Max Q Clear Time (g_c+I1), s | | 9.6 | | 4.9 | | 5.4 | | 5.8 |
| Green Ext Time (p_c), s | | 5.3 | | 1.0 | | 2.6 | | 1.2 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 8.9 |
| HCM 6th LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 49 | 205 | 32 | 7 | 151 | 4 | 27 | 11 | 9 | 3 | 9 | 37 |
| Future Volume (veh/h) | 49 | 205 | 32 | 7 | 151 | 4 | 27 | 11 | 9 | 3 | 9 | 37 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.97 | | 0.99 | 0.97 | | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 53 | 223 | 24 | 8 | 164 | 2 | 29 | 12 | 1 | 3 | 10 | 5 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 364 | 506 | 50 | 275 | 642 | 8 | 510 | 36 | 3 | 315 | 81 | 41 |
| Arrive On Green | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Sat Flow, veh/h | 196 | 1401 | 139 | 40 | 1779 | 21 | 1039 | 430 | 36 | 288 | 959 | 479 |
| Grp Volume(v), veh/h | 300 | 0 | 0 | 174 | 0 | 0 | 42 | 0 | 0 | 18 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1736 | 0 | 0 | 1840 | 0 | 0 | 1505 | 0 | 0 | 1726 | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.8 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Prop In Lane | 0.18 | | 0.08 | 0.05 | | 0.01 | 0.69 | | 0.02 | 0.17 | | 0.28 |
| Lane Grp Cap(c), veh/h | 920 | 0 | 0 | 925 | 0 | 0 | 549 | 0 | 0 | 437 | 0 | 0 |
| V/C Ratio(X) | 0.33 | 0.00 | 0.00 | 0.19 | 0.00 | 0.00 | 0.08 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 3343 | 0 | 0 | 3534 | 0 | 0 | 3079 | 0 | 0 | 3313 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 3.5 | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 6.2 | 0.0 | 0.0 | 6.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 3.7 | 0.0 | 0.0 | 3.3 | 0.0 | 0.0 | 6.3 | 0.0 | 0.0 | 6.1 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | A | A | A | A | A | A |
| Approach Vol, veh/h | | 300 | | | 174 | | | 42 | | | 18 | |
| Approach Delay, s/veh | | 3.7 | | | 3.3 | | | 6.3 | | | 6.1 | |
| Approach LOS | | A | | | A | | | A | | | A | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 9.2 | | 5.2 | | 9.2 | | 5.2 | | | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | | 4.0 | | 4.0 | | | | |
| Max Green Setting (Gmax), s | | 26.0 | | 26.0 | | 26.0 | | 26.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 3.8 | | 2.4 | | 2.9 | | 2.1 | | | | |
| Green Ext Time (p_c), s | | 1.9 | | 0.1 | | 1.0 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 3.9 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.5 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ✥ | | | ✥ | | | ✥ | | | ✥ | |
| Traffic Vol, veh/h | 14 | 173 | 17 | 0 | 137 | 15 | 23 | 5 | 0 | 18 | 6 | 20 |
| Future Vol, veh/h | 14 | 173 | 17 | 0 | 137 | 15 | 23 | 5 | 0 | 18 | 6 | 20 |
| 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 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 188 | 18 | 0 | 149 | 16 | 25 | 5 | 0 | 20 | 7 | 22 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.8 | 8.4 | 8.3 | 8 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 82% | 7% | 0% | 41% |
| Vol Thru, % | 18% | 85% | 90% | 14% |
| Vol Right, % | 0% | 8% | 10% | 45% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 28 | 204 | 152 | 44 |
| LT Vol | 23 | 14 | 0 | 18 |
| Through Vol | 5 | 173 | 137 | 6 |
| RT Vol | 0 | 17 | 15 | 20 |
| Lane Flow Rate | 30 | 222 | 165 | 48 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.042 | 0.262 | 0.197 | 0.062 |
| Departure Headway (Hd) | 5.007 | 4.261 | 4.294 | 4.63 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 716 | 845 | 838 | 775 |
| Service Time | 3.031 | 2.273 | 2.307 | 2.651 |
| HCM Lane V/C Ratio | 0.042 | 0.263 | 0.197 | 0.062 |
| HCM Control Delay | 8.3 | 8.8 | 8.4 | 8 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.1 | 1.1 | 0.7 | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.6 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 17 | 168 | 133 | 0 | 1 | 5 |
| Future Vol, veh/h | 17 | 168 | 133 | 0 | 1 | 5 |
| Conflicting Peds, #/hr | 8 | 0 | 0 | 8 | 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 | 18 | 183 | 145 | 0 | 1 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 153 | 0 | - | 0 | 372 | 153 |
| Stage 1 | - | - | - | - | 153 | - |
| Stage 2 | - | - | - | - | 219 | - |
| 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 | 1428 | - | - | - | 629 | 893 |
| Stage 1 | - | - | - | - | 875 | - |
| Stage 2 | - | - | - | - | 817 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1418 | - | - | - | 611 | 887 |
| Mov Cap-2 Maneuver | - | - | - | - | 611 | - |
| Stage 1 | - | - | - | - | 857 | - |
| Stage 2 | - | - | - | - | 811 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.7 | 0 | 9.4 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1418 | - | - | - | 825 |
| HCM Lane V/C Ratio | 0.013 | - | - | - | 0.008 |
| HCM Control Delay (s) | 7.6 | 0 | - | - | 9.4 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 3.5 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 83 | 93 | 75 | 0 | 0 | 48 |
| Future Vol, veh/h | 83 | 93 | 75 | 0 | 0 | 48 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 20 | 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 | 90 | 101 | 82 | 0 | 0 | 52 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 83 | 0 | - | 0 | 364 | 83 |
| Stage 1 | - | - | - | - | 83 | - |
| Stage 2 | - | - | - | - | 281 | - |
| 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 | 1514 | - | - | - | 635 | 976 |
| Stage 1 | - | - | - | - | 940 | - |
| Stage 2 | - | - | - | - | 767 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1513 | - | - | - | 594 | 975 |
| Mov Cap-2 Maneuver | - | - | - | - | 594 | - |
| Stage 1 | - | - | - | - | 880 | - |
| Stage 2 | - | - | - | - | 766 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 3.6 | 0 | 8.9 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1513 | - | - | - | - | 975 |
| HCM Lane V/C Ratio | 0.06 | - | - | - | - | 0.054 |
| HCM Control Delay (s) | 7.5 | 0 | - | - | 0 | 8.9 |
| HCM Lane LOS | A | A | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | - | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 7.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 67 | 1 | 9 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 35 |
| Future Vol, veh/h | 67 | 1 | 9 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 35 |
| Conflicting Peds, #/hr | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 11 | 11 | 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, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 73 | 1 | 10 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 38 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 5 | 0 | 0 | 11 | 0 | 0 | 173 | 157 | 17 | 171 | 162 | 5 |
| Stage 1 | - | - | - | - | - | - | 152 | 152 | - | 5 | 5 | - |
| Stage 2 | - | - | - | - | - | - | 21 | 5 | - | 166 | 157 | - |
| 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 | 1616 | - | - | 1608 | - | - | 790 | 735 | 1062 | 792 | 730 | 1078 |
| Stage 1 | - | - | - | - | - | - | 850 | 772 | - | 1017 | 892 | - |
| Stage 2 | - | - | - | - | - | - | 998 | 892 | - | 836 | 768 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1611 | - | - | 1608 | - | - | 735 | 699 | 1052 | 750 | 694 | 1074 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 735 | 699 | - | 750 | 694 | - |
| Stage 1 | - | - | - | - | - | - | 811 | 736 | - | 967 | 889 | - |
| Stage 2 | - | - | - | - | - | - | 961 | 889 | - | 784 | 733 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 6.4 | 0 | 10.1 | 8.5 |
| HCM LOS | | | B | A |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 709 | 1611 | - | - | 1608 | - | - | 1058 |
| HCM Lane V/C Ratio | 0.011 | 0.045 | - | - | - | - | - | 0.037 |
| HCM Control Delay (s) | 10.1 | 7.3 | 0 | - | 0 | - | - | 8.5 |
| HCM Lane LOS | B | A | A | - | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | 0.1 | - | - | 0 | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.4 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 8 | 69 | 50 | 5 | 2 | 15 |
| Future Vol, veh/h | 8 | 69 | 50 | 5 | 2 | 15 |
| 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 | 9 | 75 | 54 | 5 | 2 | 16 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 59 | 0 | - | 0 | 150 | 57 |
| Stage 1 | - | - | - | - | 57 | - |
| Stage 2 | - | - | - | - | 93 | - |
| 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 | 1545 | - | - | - | 842 | 1009 |
| Stage 1 | - | - | - | - | 966 | - |
| Stage 2 | - | - | - | - | 931 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1545 | - | - | - | 837 | 1009 |
| Mov Cap-2 Maneuver | - | - | - | - | 837 | - |
| Stage 1 | - | - | - | - | 960 | - |
| Stage 2 | - | - | - | - | 931 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.8 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1545 | - | - | - | 985 |
| HCM Lane V/C Ratio | 0.006 | - | - | - | 0.019 |
| HCM Control Delay (s) | 7.3 | 0 | - | - | 8.7 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 1.5 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 58 | 46 | 1 | 2 | 9 |
| Future Vol, veh/h | 12 | 58 | 46 | 1 | 2 | 9 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 3 |
| 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 | 13 | 63 | 50 | 1 | 2 | 10 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 51 | 0 | - | 0 | 140 | 54 |
| Stage 1 | - | - | - | - | 51 | - |
| Stage 2 | - | - | - | - | 89 | - |
| 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 | 1555 | - | - | - | 853 | 1013 |
| Stage 1 | - | - | - | - | 971 | - |
| Stage 2 | - | - | - | - | 934 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1555 | - | - | - | 845 | 1010 |
| Mov Cap-2 Maneuver | - | - | - | - | 845 | - |
| Stage 1 | - | - | - | - | 962 | - |
| Stage 2 | - | - | - | - | 934 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.3 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1555 | - | - | - | 975 |
| HCM Lane V/C Ratio | 0.008 | - | - | - | 0.012 |
| HCM Control Delay (s) | 7.3 | 0 | - | - | 8.7 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.3 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 86 | 8 | 0 | 70 | 5 | 0 |
| Future Vol, veh/h | 86 | 8 | 0 | 70 | 5 | 0 |
| 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 | 93 | 9 | 0 | 76 | 5 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 102 | 0 | 174 | 98 |
| Stage 1 | - | - | - | - | 98 | - |
| Stage 2 | - | - | - | - | 76 | - |
| 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 | - | - | 1490 | - | 816 | 958 |
| Stage 1 | - | - | - | - | 926 | - |
| Stage 2 | - | - | - | - | 947 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1490 | - | 816 | 958 |
| Mov Cap-2 Maneuver | - | - | - | - | 816 | - |
| Stage 1 | - | - | - | - | 926 | - |
| Stage 2 | - | - | - | - | 947 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 9.4 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 816 | - | - | 1490 | - |
| HCM Lane V/C Ratio | 0.007 | - | - | - | - |
| HCM Control Delay (s) | 9.4 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.3 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 78 | 8 | 0 | 65 | 5 | 0 |
| Future Vol, veh/h | 78 | 8 | 0 | 65 | 5 | 0 |
| 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 | 85 | 9 | 0 | 71 | 5 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 94 | 0 | 161 | 90 |
| Stage 1 | - | - | - | - | 90 | - |
| Stage 2 | - | - | - | - | 71 | - |
| 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 | - | - | 1500 | - | 830 | 968 |
| Stage 1 | - | - | - | - | 934 | - |
| Stage 2 | - | - | - | - | 952 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1500 | - | 830 | 968 |
| Mov Cap-2 Maneuver | - | - | - | - | 830 | - |
| Stage 1 | - | - | - | - | 934 | - |
| Stage 2 | - | - | - | - | 952 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 9.4 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 830 | - | - | 1500 | - |
| HCM Lane V/C Ratio | 0.007 | - | - | - | - |
| HCM Control Delay (s) | 9.4 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 2 | | | | | |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 0 | 6 | 7 | 3 | 6 |
| Future Vol, veh/h | 0 | 0 | 6 | 7 | 3 | 6 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| 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 | 0 | 0 | 7 | 8 | 3 | 7 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 29 | - | 10 | 0 | - | 0 |
| Stage 1 | 7 | - | - | - | - | - |
| Stage 2 | 22 | - | - | - | - | - |
| Critical Hdwy | 6.42 | - | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | - | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | 986 | 0 | 1610 | - | - | - |
| Stage 1 | 1016 | 0 | - | - | - | - |
| Stage 2 | 1001 | 0 | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 982 | - | 1610 | - | - | - |
| Mov Cap-2 Maneuver | 982 | - | - | - | - | - |
| Stage 1 | 1012 | - | - | - | - | - |
| Stage 2 | 1001 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 3.3 | 0 |
| HCM LOS | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1610 | - | - | - | - |
| HCM Lane V/C Ratio | 0.004 | - | - | - | - |
| HCM Control Delay (s) | 7.2 | 0 | 0 | - | - |
| HCM Lane LOS | A | A | A | - | - |
| HCM 95th %tile Q(veh) | 0 | - | - | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.9 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 14 | 0 | 13 | 3 | 0 |
| Future Vol, veh/h | 0 | 14 | 0 | 13 | 3 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| 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 | 0 | 15 | 0 | 14 | 3 | 0 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 17 | 3 | - | 0 | - | 0 |
| Stage 1 | 3 | - | - | - | - | - |
| Stage 2 | 14 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | - | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | - | - | - | - |
| Pot Cap-1 Maneuver | 1001 | 1081 | 0 | - | - | 0 |
| Stage 1 | 1020 | - | 0 | - | - | 0 |
| Stage 2 | 1009 | - | 0 | - | - | 0 |
| Platoon blocked, % | | | | - | - | |
| Mov Cap-1 Maneuver | 1001 | 1081 | - | - | - | - |
| Mov Cap-2 Maneuver | 1001 | - | - | - | - | - |
| Stage 1 | 1020 | - | - | - | - | - |
| Stage 2 | 1009 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 8.4 | 0 | 0 |
| HCM LOS | A | | |

| Minor Lane/Major Mvmt | NBT | EBLn1 | SBT |
|---|---|---|---|
| Capacity (veh/h) | - | 1081 | - |
| HCM Lane V/C Ratio | - | 0.014 | - |
| HCM Control Delay (s) | - | 8.4 | - |
| HCM Lane LOS | - | A | - |
| HCM 95th %tile Q(veh) | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.8 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 45 | 15 | 0 | 37 | 10 | 0 |
| Future Vol, veh/h | 45 | 15 | 0 | 37 | 10 | 0 |
| 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 | 49 | 16 | 0 | 40 | 11 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 65 | 0 | 97 | 57 |
| Stage 1 | - | - | - | - | 57 | - |
| Stage 2 | - | - | - | - | 40 | - |
| 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 | - | - | 1537 | - | 902 | 1009 |
| Stage 1 | - | - | - | - | 966 | - |
| Stage 2 | - | - | - | - | 982 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1537 | - | 902 | 1009 |
| Mov Cap-2 Maneuver | - | - | - | - | 902 | - |
| Stage 1 | - | - | - | - | 966 | - |
| Stage 2 | - | - | - | - | 982 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 9 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 902 | - | - | 1537 | - |
| HCM Lane V/C Ratio | 0.012 | - | - | - | - |
| HCM Control Delay (s) | 9 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 17 | 6 | 0 | 0 | 0 |
| Future Vol, veh/h | 0 | 17 | 6 | 0 | 0 | 0 |
| 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 | 0 | 18 | 7 | 0 | 0 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 7 | 0 | - | 0 | 25 | 7 |
| Stage 1 | - | - | - | - | 7 | - |
| Stage 2 | - | - | - | - | 18 | - |
| 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 | 1614 | - | - | - | 991 | 1075 |
| Stage 1 | - | - | - | - | 1016 | - |
| Stage 2 | - | - | - | - | 1005 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1614 | - | - | - | 991 | 1075 |
| Mov Cap-2 Maneuver | - | - | - | - | 991 | - |
| Stage 1 | - | - | - | - | 1016 | - |
| Stage 2 | - | - | - | - | 1005 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 0 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1614 | - | - | - | - |
| HCM Lane V/C Ratio | - | - | - | - | - |
| HCM Control Delay (s) | 0 | - | - | - | 0 |
| HCM Lane LOS | A | - | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 36 | 497 | 40 | 420 | 362 | 6 | 14 | 257 | 323 | 2 | 195 | 32 |
| Future Volume (veh/h) | 36 | 497 | 40 | 420 | 362 | 6 | 14 | 257 | 323 | 2 | 195 | 32 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 0.96 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1525 | 1525 | 1525 | 1768 | 1697 | 1768 | 1870 | 1870 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 52 | 567 | 53 | 438 | 418 | 10 | 18 | 352 | 145 | 3 | 224 | 34 |
| Peak Hour Factor | 0.69 | 0.92 | 0.72 | 0.96 | 0.91 | 0.50 | 0.79 | 0.73 | 0.86 | 0.58 | 0.87 | 0.85 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 48 | 527 | 49 | 456 | 447 | 11 | 31 | 361 | 343 | 20 | 272 | 41 |
| Arrive On Green | 0.42 | 0.42 | 0.42 | 0.27 | 0.27 | 0.27 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |
| Sat Flow, veh/h | 116 | 1263 | 118 | 1684 | 1650 | 39 | 43 | 1581 | 1502 | 0 | 1191 | 178 |
| Grp Volume(v), veh/h | 672 | 0 | 0 | 438 | 0 | 428 | 370 | 0 | 145 | 261 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1496 | 0 | 0 | 1684 | 0 | 1689 | 1625 | 0 | 1502 | 1369 | 0 | 0 |
| Q Serve(g_s), s | 75.0 | 0.0 | 0.0 | 46.1 | 0.0 | 44.4 | 0.0 | 0.0 | 14.8 | 0.1 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 75.0 | 0.0 | 0.0 | 46.1 | 0.0 | 44.4 | 40.9 | 0.0 | 14.8 | 41.0 | 0.0 | 0.0 |
| Prop In Lane | 0.08 | | 0.08 | 1.00 | | 0.02 | 0.05 | | 1.00 | 0.01 | | 0.13 |
| Lane Grp Cap(c), veh/h | 625 | 0 | 0 | 456 | 0 | 458 | 392 | 0 | 343 | 333 | 0 | 0 |
| V/C Ratio(X) | 1.08 | 0.00 | 0.00 | 0.96 | 0.00 | 0.93 | 0.94 | 0.00 | 0.42 | 0.78 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 625 | 0 | 0 | 459 | 0 | 461 | 392 | 0 | 343 | 333 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 52.4 | 0.0 | 0.0 | 64.5 | 0.0 | 63.9 | 68.1 | 0.0 | 59.2 | 62.5 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 58.2 | 0.0 | 0.0 | 32.2 | 0.0 | 27.1 | 32.2 | 0.0 | 1.8 | 12.3 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 38.4 | 0.0 | 0.0 | 24.0 | 0.0 | 22.8 | 20.6 | 0.0 | 5.9 | 12.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 110.5 | 0.0 | 0.0 | 96.7 | 0.0 | 91.0 | 100.3 | 0.0 | 61.0 | 74.8 | 0.0 | 0.0 |
| LnGrp LOS | F | A | A | F | A | F | F | A | E | E | A | A |
| Approach Vol, veh/h | | 672 | | | 866 | | | 515 | | | 261 | |
| Approach Delay, s/veh | | 110.5 | | | 93.9 | | | 89.2 | | | 74.8 | |
| Approach LOS | | F | | | F | | | F | | | E | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 46.0 | | 80.0 | | 46.0 | | 53.7 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 41.0 | | 75.0 | | 41.0 | | 49.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 43.0 | | 77.0 | | 42.9 | | 48.1 | | | | |
| Green Ext Time (p_c), s | | 0.0 | | 0.0 | | 0.0 | | 0.6 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 95.5 |
| HCM 6th LOS | | F |

Notes

User approved pedestrian interval to be less than phase max green.

# APPENDIX C

LOS WORKSHEETS

Future Year Conditions Option 2 – AM Peak Hour

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 399 | 285 | 15 | 473 | 393 | 20 |
| Future Volume (veh/h) | 399 | 285 | 15 | 473 | 393 | 20 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 0.99 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1751 | 1683 | 1678 | 1745 | 1745 | 1678 |
| Adj Flow Rate, veh/h | 493 | 349 | 23 | 503 | 479 | 24 |
| Peak Hour Factor | 0.81 | 0.71 | 0.65 | 0.94 | 0.82 | 0.71 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 535 | 379 | 53 | 656 | 491 | 25 |
| Arrive On Green | 0.56 | 0.56 | 0.56 | 0.56 | 0.31 | 0.31 |
| Sat Flow, veh/h | 951 | 673 | 12 | 1167 | 1570 | 79 |
| Grp Volume(v), veh/h | 0 | 842 | 526 | 0 | 504 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1624 | 1179 | 0 | 1652 | 0 |
| Q Serve(g_s), s | 0.0 | 37.7 | 6.8 | 0.0 | 24.1 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 37.7 | 44.5 | 0.0 | 24.1 | 0.0 |
| Prop In Lane | | 0.41 | 0.04 | | 0.95 | 0.05 |
| Lane Grp Cap(c), veh/h | 0 | 914 | 710 | 0 | 516 | 0 |
| V/C Ratio(X) | 0.00 | 0.92 | 0.74 | 0.00 | 0.98 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 914 | 710 | 0 | 516 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 15.9 | 12.8 | 0.0 | 27.2 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 14.6 | 4.5 | 0.0 | 33.4 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 16.0 | 6.2 | 0.0 | 13.9 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 30.5 | 17.3 | 0.0 | 60.6 | 0.0 |
| LnGrp LOS | A | C | B | A | E | A |
| Approach Vol, veh/h | 842 | | | 526 | 504 | |
| Approach Delay, s/veh | 30.5 | | | 17.3 | 60.6 | |
| Approach LOS | C | | | B | E | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 50.0 | | 30.0 | | 50.0 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 45.0 | | 25.0 | | 45.0 |
| Max Q Clear Time (g_c+I1), s | | 39.7 | | 26.1 | | 46.5 |
| Green Ext Time (p_c), s | | 3.4 | | 0.0 | | 0.0 |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 34.9 |
| HCM 6th LOS | | C |

Notes

User approved volume balancing among the lanes for turning movement.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 43 | 164 | 34 | 9 | 242 | 113 | 80 | 128 | 3 | 28 | 45 | 57 |
| Future Volume (veh/h) | 43 | 164 | 34 | 9 | 242 | 113 | 80 | 128 | 3 | 28 | 45 | 57 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.99 | | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 53 | 186 | 36 | 22 | 269 | 106 | 93 | 186 | 4 | 40 | 76 | 29 |
| Peak Hour Factor | 0.81 | 0.88 | 0.62 | 0.40 | 0.90 | 0.85 | 0.86 | 0.69 | 0.50 | 0.70 | 0.59 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 206 | 655 | 114 | 113 | 654 | 246 | 227 | 325 | 6 | 183 | 286 | 89 |
| Arrive On Green | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Sat Flow, veh/h | 201 | 1301 | 226 | 40 | 1299 | 488 | 436 | 1286 | 25 | 282 | 1132 | 354 |
| Grp Volume(v), veh/h | 275 | 0 | 0 | 397 | 0 | 0 | 283 | 0 | 0 | 145 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1728 | 0 | 0 | 1827 | 0 | 0 | 1746 | 0 | 0 | 1768 | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 3.5 | 0.0 | 0.0 | 5.6 | 0.0 | 0.0 | 5.7 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 |
| Prop In Lane | 0.19 | | 0.13 | 0.06 | | 0.27 | 0.33 | | 0.01 | 0.28 | | 0.20 |
| Lane Grp Cap(c), veh/h | 975 | 0 | 0 | 1013 | 0 | 0 | 558 | 0 | 0 | 559 | 0 | 0 |
| V/C Ratio(X) | 0.28 | 0.00 | 0.00 | 0.39 | 0.00 | 0.00 | 0.51 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 1506 | 0 | 0 | 1596 | 0 | 0 | 1282 | 0 | 0 | 1257 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 5.9 | 0.0 | 0.0 | 6.4 | 0.0 | 0.0 | 13.5 | 0.0 | 0.0 | 12.4 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.2 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.0 | 0.0 | 0.0 | 1.6 | 0.0 | 0.0 | 2.1 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 6.1 | 0.0 | 0.0 | 6.8 | 0.0 | 0.0 | 14.2 | 0.0 | 0.0 | 12.7 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | B | A | A | B | A | A |
| Approach Vol, veh/h | | 275 | | | 397 | | | 283 | | | 145 | |
| Approach Delay, s/veh | | 6.1 | | | 6.8 | | | 14.2 | | | 12.7 | |
| Approach LOS | | A | | | A | | | B | | | B | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 25.6 | | 15.4 | | 25.6 | | 15.4 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 34.0 | | 28.0 | | 34.0 | | 28.0 |
| Max Q Clear Time (g_c+I1), s | | 5.5 | | 7.7 | | 7.6 | | 4.6 |
| Green Ext Time (p_c), s | | 2.7 | | 1.7 | | 4.0 | | 0.8 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 9.3 |
| HCM 6th LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 47 | 107 | 26 | 11 | 192 | 18 | 44 | 42 | 9 | 12 | 23 | 81 |
| Future Volume (veh/h) | 47 | 107 | 26 | 11 | 192 | 18 | 44 | 42 | 9 | 12 | 23 | 81 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 51 | 116 | 16 | 12 | 209 | 13 | 48 | 46 | 1 | 13 | 25 | 12 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 443 | 328 | 41 | 298 | 467 | 28 | 505 | 98 | 2 | 393 | 107 | 52 |
| Arrive On Green | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| Sat Flow, veh/h | 359 | 1169 | 146 | 60 | 1662 | 101 | 821 | 787 | 17 | 449 | 863 | 414 |
| Grp Volume(v), veh/h | 183 | 0 | 0 | 234 | 0 | 0 | 95 | 0 | 0 | 50 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1675 | 0 | 0 | 1823 | 0 | 0 | 1626 | 0 | 0 | 1726 | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.1 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 |
| Prop In Lane | 0.28 | | 0.09 | 0.05 | | 0.06 | 0.51 | | 0.01 | 0.26 | | 0.24 |
| Lane Grp Cap(c), veh/h | 813 | 0 | 0 | 794 | 0 | 0 | 605 | 0 | 0 | 552 | 0 | 0 |
| V/C Ratio(X) | 0.23 | 0.00 | 0.00 | 0.29 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 3416 | 0 | 0 | 3778 | 0 | 0 | 3457 | 0 | 0 | 3516 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 3.9 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 5.5 | 0.0 | 0.0 | 5.3 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 4.0 | 0.0 | 0.0 | 4.2 | 0.0 | 0.0 | 5.6 | 0.0 | 0.0 | 5.4 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | A | A | A | A | A | A |
| Approach Vol, veh/h | | 183 | | | 234 | | | 95 | | | 50 | |
| Approach Delay, s/veh | | 4.0 | | | 4.2 | | | 5.6 | | | 5.4 | |
| Approach LOS | | A | | | A | | | A | | | A | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 7.8 | | 5.7 | | 7.8 | | 5.7 | | | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | | 4.0 | | 4.0 | | | | |
| Max Green Setting (Gmax), s | | 26.0 | | 26.0 | | 26.0 | | 26.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 3.1 | | 2.7 | | 3.4 | | 2.3 | | | | |
| Green Ext Time (p_c), s | | 1.1 | | 0.4 | | 1.4 | | 0.2 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 4.5 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.8 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 14 | 84 | 7 | 0 | 214 | 45 | 22 | 21 | 0 | 26 | 10 | 21 |
| Future Vol, veh/h | 14 | 84 | 7 | 0 | 214 | 45 | 22 | 21 | 0 | 26 | 10 | 21 |
| 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 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 91 | 8 | 0 | 233 | 49 | 24 | 23 | 0 | 28 | 11 | 23 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.2 | 9.3 | 8.4 | 8.2 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 51% | 13% | 0% | 46% |
| Vol Thru, % | 49% | 80% | 83% | 18% |
| Vol Right, % | 0% | 7% | 17% | 37% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 43 | 105 | 259 | 57 |
| LT Vol | 22 | 14 | 0 | 26 |
| Through Vol | 21 | 84 | 214 | 10 |
| RT Vol | 0 | 7 | 45 | 21 |
| Lane Flow Rate | 47 | 114 | 282 | 62 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.065 | 0.142 | 0.33 | 0.082 |
| Departure Headway (Hd) | 4.989 | 4.48 | 4.224 | 4.737 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 718 | 801 | 853 | 756 |
| Service Time | 3.019 | 2.503 | 2.242 | 2.767 |
| HCM Lane V/C Ratio | 0.065 | 0.142 | 0.331 | 0.082 |
| HCM Control Delay | 8.4 | 8.2 | 9.3 | 8.2 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.2 | 0.5 | 1.4 | 0.3 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.4 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 96 | 202 | 0 | 0 | 41 |
| Future Vol, veh/h | 12 | 96 | 202 | 0 | 0 | 41 |
| Conflicting Peds, #/hr | 2 | 0 | 0 | 2 | 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 | 13 | 104 | 220 | 0 | 0 | 45 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 222 | 0 | - | 0 | 352 | 222 |
| Stage 1 | - | - | - | - | 222 | - |
| Stage 2 | - | - | - | - | 130 | - |
| 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 | 1347 | - | - | - | 646 | 818 |
| Stage 1 | - | - | - | - | 815 | - |
| Stage 2 | - | - | - | - | 896 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1345 | - | - | - | 637 | 817 |
| Mov Cap-2 Maneuver | - | - | - | - | 637 | - |
| Stage 1 | - | - | - | - | 805 | - |
| Stage 2 | - | - | - | - | 894 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.9 | 0 | 9.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1345 | - | - | - | 817 |
| HCM Lane V/C Ratio | 0.01 | - | - | - | 0.055 |
| HCM Control Delay (s) | 7.7 | 0 | - | - | 9.7 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.6 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 46 | 53 | 98 | 2 | 0 | 68 |
| Future Vol, veh/h | 46 | 53 | 98 | 2 | 0 | 68 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 20 | 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 | 50 | 58 | 107 | 2 | 0 | 74 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 109 | 0 | - | 0 | 266 | 108 |
| Stage 1 | - | - | - | - | 108 | - |
| Stage 2 | - | - | - | - | 158 | - |
| 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 | 1481 | - | - | - | 723 | 946 |
| Stage 1 | - | - | - | - | 916 | - |
| Stage 2 | - | - | - | - | 871 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1481 | - | - | - | 698 | 946 |
| Mov Cap-2 Maneuver | - | - | - | - | 698 | - |
| Stage 1 | - | - | - | - | 884 | - |
| Stage 2 | - | - | - | - | 871 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 3.5 | 0 | 9.1 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1481 | - | - | - | - | 946 |
| HCM Lane V/C Ratio | 0.034 | - | - | - | - | 0.078 |
| HCM Control Delay (s) | 7.5 | 0 | - | - | 0 | 9.1 |
| HCM Lane LOS | A | A | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | - | 0.3 |

| Intersection | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Int Delay, s/veh | 8.1 | | | | | | | | | | | |
| **Movement** | **EBL** | **EBT** | **EBR** | **WBL** | **WBT** | **WBR** | **NBL** | **NBT** | **NBR** | **SBL** | **SBT** | **SBR** |
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 43 | 0 | 3 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 10 | 59 |
| Future Vol, veh/h | 43 | 0 | 3 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 10 | 59 |
| Conflicting Peds, #/hr | 4 | 0 | 0 | 0 | 0 | 4 | 2 | 0 | 3 | 3 | 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 | 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 | 47 | 0 | 3 | 0 | 0 | 0 | 1 | 11 | 0 | 0 | 11 | 64 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 5 | 0 | 0 | 3 | 0 | 0 | 137 | 101 | 5 | 109 | 102 | 7 |
| Stage 1 | - | - | - | - | - | - | 96 | 96 | - | 5 | 5 | - |
| Stage 2 | - | - | - | - | - | - | 41 | 5 | - | 104 | 97 | - |
| 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 | 1616 | - | - | 1619 | - | - | 834 | 789 | 1078 | 870 | 788 | 1075 |
| Stage 1 | - | - | - | - | - | - | 911 | 815 | - | 1017 | 892 | - |
| Stage 2 | - | - | - | - | - | - | 974 | 892 | - | 902 | 815 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1611 | - | - | 1619 | - | - | 757 | 764 | 1075 | 837 | 763 | 1070 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 757 | 764 | - | 837 | 763 | - |
| Stage 1 | - | - | - | - | - | - | 885 | 791 | - | 984 | 889 | - |
| Stage 2 | - | - | - | - | - | - | 903 | 889 | - | 862 | 791 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 6.8 | 0 | 9.8 | 8.8 |
| HCM LOS | | | A | A |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 763 | 1611 | - | - | 1619 | - | - | 1011 |
| HCM Lane V/C Ratio | 0.016 | 0.029 | - | - | - | - | - | 0.074 |
| HCM Control Delay (s) | 9.8 | 7.3 | 0 | - | 0 | - | - | 8.8 |
| HCM Lane LOS | A | A | A | - | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | 0.1 | - | - | 0 | - | - | 0.2 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.8 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 3 | 51 | 74 | 11 | 0 | 12 |
| Future Vol, veh/h | 3 | 51 | 74 | 11 | 0 | 12 |
| 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 | 3 | 55 | 80 | 12 | 0 | 13 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 92 | 0 | - | 0 | 147 | 86 |
| Stage 1 | - | - | - | - | 86 | - |
| Stage 2 | - | - | - | - | 61 | - |
| 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 | 1503 | - | - | - | 845 | 973 |
| Stage 1 | - | - | - | - | 937 | - |
| Stage 2 | - | - | - | - | 962 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1503 | - | - | - | 843 | 973 |
| Mov Cap-2 Maneuver | - | - | - | - | 843 | - |
| Stage 1 | - | - | - | - | 935 | - |
| Stage 2 | - | - | - | - | 962 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.4 | 0 | 8.8 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1503 | - | - | - | 973 |
| HCM Lane V/C Ratio | 0.002 | - | - | - | 0.013 |
| HCM Control Delay (s) | 7.4 | 0 | - | - | 8.8 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 2 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 10 | 38 | 63 | 0 | 0 | 22 |
| Future Vol, veh/h | 10 | 38 | 63 | 0 | 0 | 22 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 1 |
| 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 | 11 | 41 | 68 | 0 | 0 | 24 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 68 | 0 | - | 0 | 131 | 69 |
| Stage 1 | - | - | - | - | 68 | - |
| Stage 2 | - | - | - | - | 63 | - |
| 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 | 1533 | - | - | - | 863 | 994 |
| Stage 1 | - | - | - | - | 955 | - |
| Stage 2 | - | - | - | - | 960 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1533 | - | - | - | 857 | 993 |
| Mov Cap-2 Maneuver | - | - | - | - | 857 | - |
| Stage 1 | - | - | - | - | 948 | - |
| Stage 2 | - | - | - | - | 960 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.5 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1533 | - | - | - | 993 |
| HCM Lane V/C Ratio | 0.007 | - | - | - | 0.024 |
| HCM Control Delay (s) | 7.4 | 0 | - | - | 8.7 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.6 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 49 | 4 | 0 | 90 | 10 | 0 |
| Future Vol, veh/h | 49 | 4 | 0 | 90 | 10 | 0 |
| 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 | 53 | 4 | 0 | 98 | 11 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 57 | 0 | 153 | 55 |
| Stage 1 | - | - | - | - | 55 | - |
| Stage 2 | - | - | - | - | 98 | - |
| 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 | - | - | 1547 | - | 839 | 1012 |
| Stage 1 | - | - | - | - | 968 | - |
| Stage 2 | - | - | - | - | 926 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1547 | - | 839 | 1012 |
| Mov Cap-2 Maneuver | - | - | - | - | 839 | - |
| Stage 1 | - | - | - | - | 968 | - |
| Stage 2 | - | - | - | - | 926 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 9.3 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 839 | - | - | 1547 | - |
| HCM Lane V/C Ratio | 0.013 | - | - | - | - |
| HCM Control Delay (s) | 9.3 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.7 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 45 | 4 | 0 | 80 | 10 | 0 |
| Future Vol, veh/h | 45 | 4 | 0 | 80 | 10 | 0 |
| 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 | 49 | 4 | 0 | 87 | 11 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 53 | 0 | 138 | 51 |
| Stage 1 | - | - | - | - | 51 | - |
| Stage 2 | - | - | - | - | 87 | - |
| 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 | - | - | 1553 | - | 855 | 1017 |
| Stage 1 | - | - | - | - | 971 | - |
| Stage 2 | - | - | - | - | 936 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1553 | - | 855 | 1017 |
| Mov Cap-2 Maneuver | - | - | - | - | 855 | - |
| Stage 1 | - | - | - | - | 971 | - |
| Stage 2 | - | - | - | - | 936 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 9.3 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 855 | - | - | 1553 | - |
| HCM Lane V/C Ratio | 0.013 | - | - | - | - |
| HCM Control Delay (s) | 9.3 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.8 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 0 | 3 | 11 | 10 | 3 |
| Future Vol, veh/h | 0 | 0 | 3 | 11 | 10 | 3 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| 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 | 0 | 0 | 3 | 12 | 11 | 3 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 31 | - | 14 | 0 | - | 0 |
| Stage 1 | 13 | - | - | - | - | - |
| Stage 2 | 18 | - | - | - | - | - |
| Critical Hdwy | 6.42 | - | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | - | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | 983 | 0 | 1604 | - | - | - |
| Stage 1 | 1010 | 0 | - | - | - | - |
| Stage 2 | 1005 | 0 | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 981 | - | 1604 | - | - | - |
| Mov Cap-2 Maneuver | 981 | - | - | - | - | - |
| Stage 1 | 1008 | - | - | - | - | - |
| Stage 2 | 1005 | - | - | - | - | - |

| Approach | EB | | NB | | SB | |
|---|---|---|---|---|---|---|
| HCM Control Delay, s | 0 | | 1.6 | | 0 | |
| HCM LOS | A | | | | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1604 | - | - | - | - |
| HCM Lane V/C Ratio | 0.002 | - | - | - | - |
| HCM Control Delay (s) | 7.2 | 0 | 0 | - | - |
| HCM Lane LOS | A | A | A | - | - |
| HCM 95th %tile Q(veh) | 0 | - | - | - | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.9 | | | | | |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 3 | 0 | 14 | 10 | 0 |
| Future Vol, veh/h | 0 | 3 | 0 | 14 | 10 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| 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 | 0 | 3 | 0 | 15 | 11 | 0 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 26 | 11 | - | 0 | - | 0 |
| Stage 1 | 11 | - | - | - | - | - |
| Stage 2 | 15 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | - | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | - | - | - | - |
| Pot Cap-1 Maneuver | 989 | 1070 | 0 | - | - | 0 |
| Stage 1 | 1012 | - | 0 | - | - | 0 |
| Stage 2 | 1008 | - | 0 | - | - | 0 |
| Platoon blocked, % | | | | - | - | |
| Mov Cap-1 Maneuver | 989 | 1070 | - | - | - | - |
| Mov Cap-2 Maneuver | 989 | - | - | - | - | - |
| Stage 1 | 1012 | - | - | - | - | - |
| Stage 2 | 1008 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 8.4 | 0 | 0 |
| HCM LOS | A | | |

| Minor Lane/Major Mvmt | NBT | EBLn1 | SBT |
|---|---|---|---|
| Capacity (veh/h) | - | 1070 | - |
| HCM Lane V/C Ratio | - | 0.003 | - |
| HCM Control Delay (s) | - | 8.4 | - |
| HCM Lane LOS | - | A | - |
| HCM 95th %tile Q(veh) | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 38 | 0 | 0 | 63 | 0 | 0 |
| Future Vol, veh/h | 38 | 0 | 0 | 63 | 0 | 0 |
| 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 | 41 | 0 | 0 | 68 | 0 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 41 | 0 | 109 | 41 |
| Stage 1 | - | - | - | - | 41 | - |
| Stage 2 | - | - | - | - | 68 | - |
| 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 | - | - | 1568 | - | 888 | 1030 |
| Stage 1 | - | - | - | - | 981 | - |
| Stage 2 | - | - | - | - | 955 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1568 | - | 888 | 1030 |
| Mov Cap-2 Maneuver | - | - | - | - | 888 | - |
| Stage 1 | - | - | - | - | 981 | - |
| Stage 2 | - | - | - | - | 955 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 0 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 1568 | - |
| HCM Lane V/C Ratio | - | - | - | - | - |
| HCM Control Delay (s) | 0 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | - | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.8 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 9 | 12 | 21 | 0 | 0 | 20 |
| Future Vol, veh/h | 9 | 12 | 21 | 0 | 0 | 20 |
| 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 | 10 | 13 | 23 | 0 | 0 | 22 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 23 | 0 | - | 0 | 56 | 23 |
| Stage 1 | - | - | - | - | 23 | - |
| Stage 2 | - | - | - | - | 33 | - |
| 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 | 1592 | - | - | - | 952 | 1054 |
| Stage 1 | - | - | - | - | 1000 | - |
| Stage 2 | - | - | - | - | 989 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1592 | - | - | - | 946 | 1054 |
| Mov Cap-2 Maneuver | - | - | - | - | 946 | - |
| Stage 1 | - | - | - | - | 994 | - |
| Stage 2 | - | - | - | - | 989 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 3.1 | 0 | 8.5 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1592 | - | - | - | 1054 |
| HCM Lane V/C Ratio | 0.006 | - | - | - | 0.021 |
| HCM Control Delay (s) | 7.3 | 0 | - | - | 8.5 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

# HCM 6th Signalized Intersection Summary
## 16: Oahu Ave & E Manoa Rd

07/07/2022

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 20 | 436 | 43 | 430 | 443 | 4 | 37 | 136 | 220 | 12 | 287 | 39 |
| Future Volume (veh/h) | 20 | 436 | 43 | 430 | 443 | 4 | 37 | 136 | 220 | 12 | 287 | 39 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.98 | 1.00 | | 0.98 | 1.00 | | 0.98 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1796 | 1870 | 1870 | 1870 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 29 | 498 | 56 | 448 | 511 | 6 | 47 | 186 | 29 | 21 | 330 | 41 |
| Peak Hour Factor | 0.69 | 0.92 | 0.72 | 0.96 | 0.91 | 0.50 | 0.79 | 0.73 | 0.86 | 0.58 | 0.87 | 0.85 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 30 | 508 | 57 | 520 | 516 | 6 | 75 | 264 | 394 | 41 | 342 | 41 |
| Arrive On Green | 0.32 | 0.32 | 0.32 | 0.29 | 0.29 | 0.29 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 |
| Sat Flow, veh/h | 91 | 1563 | 176 | 1781 | 1771 | 21 | 149 | 1023 | 1526 | 37 | 1323 | 159 |
| Grp Volume(v), veh/h | 583 | 0 | 0 | 448 | 0 | 517 | 233 | 0 | 29 | 392 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1830 | 0 | 0 | 1781 | 0 | 1791 | 1171 | 0 | 1526 | 1518 | 0 | 0 |
| Q Serve(g_s), s | 37.9 | 0.0 | 0.0 | 28.6 | 0.0 | 34.5 | 0.0 | 0.0 | 1.7 | 11.5 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 37.9 | 0.0 | 0.0 | 28.6 | 0.0 | 34.5 | 19.5 | 0.0 | 1.7 | 31.0 | 0.0 | 0.0 |
| Prop In Lane | 0.05 | | 0.10 | 1.00 | | 0.01 | 0.20 | | 1.00 | 0.05 | | 0.10 |
| Lane Grp Cap(c), veh/h | 595 | 0 | 0 | 520 | 0 | 522 | 339 | 0 | 394 | 424 | 0 | 0 |
| V/C Ratio(X) | 0.98 | 0.00 | 0.00 | 0.86 | 0.00 | 0.99 | 0.69 | 0.00 | 0.07 | 0.93 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 595 | 0 | 0 | 520 | 0 | 522 | 339 | 0 | 394 | 424 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 40.1 | 0.0 | 0.0 | 40.2 | 0.0 | 42.3 | 38.8 | 0.0 | 33.6 | 44.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 31.9 | 0.0 | 0.0 | 14.9 | 0.0 | 36.7 | 7.4 | 0.0 | 0.2 | 26.4 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 22.2 | 0.0 | 0.0 | 14.7 | 0.0 | 20.5 | 6.9 | 0.0 | 0.7 | 14.8 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 72.1 | 0.0 | 0.0 | 55.1 | 0.0 | 79.0 | 46.2 | 0.0 | 33.8 | 70.5 | 0.0 | 0.0 |
| LnGrp LOS | E | A | A | E | A | E | D | A | C | E | A | A |
| Approach Vol, veh/h | | 583 | | | 965 | | | 262 | | | 392 | |
| Approach Delay, s/veh | | 72.1 | | | 67.9 | | | 44.8 | | | 70.5 | |
| Approach LOS | | E | | | E | | | D | | | E | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 36.0 | | 44.0 | | 36.0 | | 40.0 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 31.0 | | 39.0 | | 31.0 | | 35.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 33.0 | | 39.9 | | 21.5 | | 36.5 | | | | |
| Green Ext Time (p_c), s | | 0.0 | | 0.0 | | 1.7 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 66.7 | | | | | | | | | |
| HCM 6th LOS | | | E | | | | | | | | | |

# APPENDIX C

## LOS WORKSHEETS

## Future Year Conditions Option 2 – PM Peak Hour

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 584 | 253 | 10 | 487 | 329 | 25 |
| Future Volume (veh/h) | 584 | 253 | 10 | 487 | 329 | 25 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 0.99 | 1.00 | | 1.00 | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1751 | 1683 | 1678 | 1745 | 1745 | 1678 |
| Adj Flow Rate, veh/h | 721 | 343 | 15 | 518 | 401 | 32 |
| Peak Hour Factor | 0.81 | 0.71 | 0.65 | 0.94 | 0.82 | 0.71 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 740 | 352 | 24 | 639 | 423 | 34 |
| Arrive On Green | 0.66 | 0.66 | 0.66 | 0.66 | 0.28 | 0.28 |
| Sat Flow, veh/h | 1119 | 532 | 3 | 966 | 1521 | 121 |
| Grp Volume(v), veh/h | 0 | 1064 | 533 | 0 | 434 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1651 | 970 | 0 | 1646 | 0 |
| Q Serve(g_s), s | 0.0 | 101.9 | 8.1 | 0.0 | 43.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 101.9 | 110.0 | 0.0 | 43.0 | 0.0 |
| Prop In Lane | | 0.32 | 0.03 | | 0.92 | 0.07 |
| Lane Grp Cap(c), veh/h | 0 | 1093 | 664 | 0 | 458 | 0 |
| V/C Ratio(X) | 0.00 | 0.97 | 0.80 | 0.00 | 0.95 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 1093 | 664 | 0 | 594 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 26.8 | 35.0 | 0.0 | 58.8 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 21.2 | 7.4 | 0.0 | 21.5 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 45.2 | 16.6 | 0.0 | 20.8 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 47.9 | 42.4 | 0.0 | 80.3 | 0.0 |
| LnGrp LOS | A | D | D | A | F | A |
| Approach Vol, veh/h | 1064 | | | 533 | 434 | |
| Approach Delay, s/veh | 47.9 | | | 42.4 | 80.3 | |
| Approach LOS | D | | | D | F | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 115.0 | | 51.2 | | 115.0 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 110.0 | | 60.0 | | 110.0 |
| Max Q Clear Time (g_c+I1), s | | 103.9 | | 45.0 | | 112.0 |
| Green Ext Time (p_c), s | | 4.7 | | 1.3 | | 0.0 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 53.4 |
| HCM 6th LOS | | | D |

## Notes

User approved volume balancing among the lanes for turning movement.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 104 | 255 | 46 | 5 | 178 | 57 | 46 | 73 | 11 | 32 | 66 | 69 |
| Future Volume (veh/h) | 104 | 255 | 46 | 5 | 178 | 57 | 46 | 73 | 11 | 32 | 66 | 69 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 1.00 | | 0.99 | 0.98 | | 0.96 | 0.97 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 128 | 290 | 61 | 12 | 198 | 49 | 53 | 106 | 6 | 46 | 112 | 45 |
| Peak Hour Factor | 0.81 | 0.88 | 0.62 | 0.40 | 0.90 | 0.85 | 0.86 | 0.69 | 0.50 | 0.70 | 0.59 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 278 | 579 | 109 | 106 | 749 | 178 | 204 | 330 | 16 | 168 | 276 | 96 |
| Arrive On Green | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Sat Flow, veh/h | 329 | 1144 | 215 | 26 | 1479 | 351 | 351 | 1331 | 63 | 240 | 1114 | 385 |
| Grp Volume(v), veh/h | 479 | 0 | 0 | 259 | 0 | 0 | 165 | 0 | 0 | 203 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1687 | 0 | 0 | 1857 | 0 | 0 | 1746 | 0 | 0 | 1739 | 0 | 0 |
| Q Serve(g_s), s | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 7.2 | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 2.9 | 0.0 | 0.0 | 3.8 | 0.0 | 0.0 |
| Prop In Lane | 0.27 | | 0.13 | 0.05 | | 0.19 | 0.32 | | 0.04 | 0.23 | | 0.22 |
| Lane Grp Cap(c), veh/h | 966 | 0 | 0 | 1032 | 0 | 0 | 550 | 0 | 0 | 540 | 0 | 0 |
| V/C Ratio(X) | 0.50 | 0.00 | 0.00 | 0.25 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.38 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 1500 | 0 | 0 | 1629 | 0 | 0 | 1271 | 0 | 0 | 1276 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 6.7 | 0.0 | 0.0 | 5.8 | 0.0 | 0.0 | 12.6 | 0.0 | 0.0 | 12.9 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.6 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.0 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 7.2 | 0.0 | 0.0 | 5.9 | 0.0 | 0.0 | 12.9 | 0.0 | 0.0 | 13.3 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | B | A | A | B | A | A |
| Approach Vol, veh/h | | 479 | | | 259 | | | 165 | | | 203 | |
| Approach Delay, s/veh | | 7.2 | | | 5.9 | | | 12.9 | | | 13.3 | |
| Approach LOS | | A | | | A | | | B | | | B | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 25.6 | | 15.1 | | 25.6 | | 15.1 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 34.0 | | 28.0 | | 34.0 | | 28.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 9.2 | | 4.9 | | 5.2 | | 5.8 | | | | |
| Green Ext Time (p_c), s | | 5.1 | | 1.0 | | 2.4 | | 1.2 | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 8.9 |
| HCM 6th LOS | | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 49 | 190 | 32 | 7 | 141 | 4 | 27 | 11 | 9 | 3 | 9 | 37 |
| Future Volume (veh/h) | 49 | 190 | 32 | 7 | 141 | 4 | 27 | 11 | 9 | 3 | 9 | 37 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 0.99 | 0.99 | | 0.99 | 0.97 | | 0.99 | 0.97 | | 0.99 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 53 | 207 | 23 | 8 | 153 | 2 | 29 | 12 | 1 | 3 | 10 | 5 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 378 | 476 | 49 | 284 | 613 | 8 | 521 | 37 | 3 | 323 | 81 | 41 |
| Arrive On Green | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Sat Flow, veh/h | 215 | 1374 | 141 | 45 | 1770 | 23 | 1039 | 430 | 36 | 288 | 959 | 479 |
| Grp Volume(v), veh/h | 283 | 0 | 0 | 163 | 0 | 0 | 42 | 0 | 0 | 18 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1729 | 0 | 0 | 1838 | 0 | 0 | 1505 | 0 | 0 | 1726 | 0 | 0 |
| Q Serve(g_s), s | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.7 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Prop In Lane | 0.19 | | 0.08 | 0.05 | | 0.01 | 0.69 | | 0.02 | 0.17 | | 0.28 |
| Lane Grp Cap(c), veh/h | 903 | 0 | 0 | 905 | 0 | 0 | 560 | 0 | 0 | 445 | 0 | 0 |
| V/C Ratio(X) | 0.31 | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 3422 | 0 | 0 | 3623 | 0 | 0 | 3160 | 0 | 0 | 3401 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 3.6 | 0.0 | 0.0 | 3.3 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 | 5.9 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 3.7 | 0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 6.1 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 |
| LnGrp LOS | A | A | A | A | A | A | A | A | A | A | A | A |
| Approach Vol, veh/h | | 283 | | | 163 | | | 42 | | | 18 | |
| Approach Delay, s/veh | | 3.7 | | | 3.4 | | | 6.1 | | | 6.0 | |
| Approach LOS | | A | | | A | | | A | | | A | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 8.9 | | 5.2 | | 8.9 | | 5.2 | | | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | | 4.0 | | 4.0 | | | | |
| Max Green Setting (Gmax), s | | 26.0 | | 26.0 | | 26.0 | | 26.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 3.7 | | 2.4 | | 2.9 | | 2.1 | | | | |
| Green Ext Time (p_c), s | | 1.8 | | 0.1 | | 0.9 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 3.9 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.7 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 14 | 188 | 17 | 0 | 147 | 15 | 23 | 5 | 0 | 18 | 6 | 20 |
| Future Vol, veh/h | 14 | 188 | 17 | 0 | 147 | 15 | 23 | 5 | 0 | 18 | 6 | 20 |
| 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 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 204 | 18 | 0 | 160 | 16 | 25 | 5 | 0 | 20 | 7 | 22 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 9 | 8.5 | 8.3 | 8 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 82% | 6% | 0% | 41% |
| Vol Thru, % | 18% | 86% | 91% | 14% |
| Vol Right, % | 0% | 8% | 9% | 45% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 28 | 219 | 162 | 44 |
| LT Vol | 23 | 14 | 0 | 18 |
| Through Vol | 5 | 188 | 147 | 6 |
| RT Vol | 0 | 17 | 15 | 20 |
| Lane Flow Rate | 30 | 238 | 176 | 48 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.043 | 0.283 | 0.211 | 0.062 |
| Departure Headway (Hd) | 5.068 | 4.275 | 4.315 | 4.69 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 707 | 843 | 833 | 764 |
| Service Time | 3.096 | 2.29 | 2.332 | 2.716 |
| HCM Lane V/C Ratio | 0.042 | 0.282 | 0.211 | 0.063 |
| HCM Control Delay | 8.3 | 9 | 8.5 | 8 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.1 | 1.2 | 0.8 | 0.2 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.8 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 17 | 183 | 133 | 0 | 1 | 15 |
| Future Vol, veh/h | 17 | 183 | 133 | 0 | 1 | 15 |
| Conflicting Peds, #/hr | 8 | 0 | 0 | 8 | 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 | 18 | 199 | 145 | 0 | 1 | 16 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 153 | 0 | - | 0 | 388 | 153 |
| Stage 1 | - | - | - | - | 153 | - |
| Stage 2 | - | - | - | - | 235 | - |
| 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 | 1428 | - | - | - | 616 | 893 |
| Stage 1 | - | - | - | - | 875 | - |
| Stage 2 | - | - | - | - | 804 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1418 | - | - | - | 599 | 887 |
| Mov Cap-2 Maneuver | - | - | - | - | 599 | - |
| Stage 1 | - | - | - | - | 857 | - |
| Stage 2 | - | - | - | - | 798 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.6 | 0 | 9.3 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1418 | - | - | - | 861 |
| HCM Lane V/C Ratio | 0.013 | - | - | - | 0.02 |
| HCM Control Delay (s) | 7.6 | 0 | - | - | 9.3 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 3.8 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 83 | 78 | 65 | 0 | 0 | 48 |
| Future Vol, veh/h | 83 | 78 | 65 | 0 | 0 | 48 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 20 | 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 | 90 | 85 | 71 | 0 | 0 | 52 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 72 | 0 | - | 0 | 337 | 72 |
| Stage 1 | - | - | - | - | 72 | - |
| Stage 2 | - | - | - | - | 265 | - |
| 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 | 1528 | - | - | - | 658 | 990 |
| Stage 1 | - | - | - | - | 951 | - |
| Stage 2 | - | - | - | - | 779 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1527 | - | - | - | 616 | 989 |
| Mov Cap-2 Maneuver | - | - | - | - | 616 | - |
| Stage 1 | - | - | - | - | 891 | - |
| Stage 2 | - | - | - | - | 778 | - |

| Approach | EB | | WB | | SB | |
|---|---|---|---|---|---|---|
| HCM Control Delay, s | 3.9 | | 0 | | 8.8 | |
| HCM LOS | | | | | A | |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1527 | - | - | - | - | 989 |
| HCM Lane V/C Ratio | 0.059 | - | - | - | - | 0.053 |
| HCM Control Delay (s) | 7.5 | 0 | - | - | 0 | 8.8 |
| HCM Lane LOS | A | A | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | - | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 7.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 67 | 1 | 9 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 35 |
| Future Vol, veh/h | 67 | 1 | 9 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 35 |
| Conflicting Peds, #/hr | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 11 | 11 | 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, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 73 | 1 | 10 | 0 | 1 | 0 | 2 | 5 | 0 | 0 | 1 | 38 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 5 | 0 | 0 | 11 | 0 | 0 | 173 | 157 | 17 | 171 | 162 | 5 |
| Stage 1 | - | - | - | - | - | - | 152 | 152 | - | 5 | 5 | - |
| Stage 2 | - | - | - | - | - | - | 21 | 5 | - | 166 | 157 | - |
| 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 | 1616 | - | - | 1608 | - | - | 790 | 735 | 1062 | 792 | 730 | 1078 |
| Stage 1 | - | - | - | - | - | - | 850 | 772 | - | 1017 | 892 | - |
| Stage 2 | - | - | - | - | - | - | 998 | 892 | - | 836 | 768 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1611 | - | - | 1608 | - | - | 735 | 699 | 1052 | 750 | 694 | 1074 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 735 | 699 | - | 750 | 694 | - |
| Stage 1 | - | - | - | - | - | - | 811 | 736 | - | 967 | 889 | - |
| Stage 2 | - | - | - | - | - | - | 961 | 889 | - | 784 | 733 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 6.4 | 0 | 10.1 | 8.5 |
| HCM LOS | | | B | A |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 709 | 1611 | - | - | 1608 | - | - | 1058 |
| HCM Lane V/C Ratio | 0.011 | 0.045 | - | - | - | - | - | 0.037 |
| HCM Control Delay (s) | 10.1 | 7.3 | 0 | - | 0 | - | - | 8.5 |
| HCM Lane LOS | B | A | A | - | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | 0.1 | - | - | 0 | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.6 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 8 | 54 | 40 | 5 | 2 | 15 |
| Future Vol, veh/h | 8 | 54 | 40 | 5 | 2 | 15 |
| 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 | 9 | 59 | 43 | 5 | 2 | 16 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 48 | 0 | - | 0 | 123 | 46 |
| Stage 1 | - | - | - | - | 46 | - |
| Stage 2 | - | - | - | - | 77 | - |
| 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 | 1559 | - | - | - | 872 | 1023 |
| Stage 1 | - | - | - | - | 976 | - |
| Stage 2 | - | - | - | - | 946 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1559 | - | - | - | 867 | 1023 |
| Mov Cap-2 Maneuver | - | - | - | - | 867 | - |
| Stage 1 | - | - | - | - | 970 | - |
| Stage 2 | - | - | - | - | 946 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.9 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1559 | - | - | - | 1002 |
| HCM Lane V/C Ratio | 0.006 | - | - | - | 0.018 |
| HCM Control Delay (s) | 7.3 | 0 | - | - | 8.7 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.8 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 43 | 36 | 1 | 2 | 9 |
| Future Vol, veh/h | 12 | 43 | 36 | 1 | 2 | 9 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 3 |
| 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 | 13 | 47 | 39 | 1 | 2 | 10 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 40 | 0 | - | 0 | 113 | 43 |
| Stage 1 | - | - | - | - | 40 | - |
| Stage 2 | - | - | - | - | 73 | - |
| 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 | 1570 | - | - | - | 884 | 1027 |
| Stage 1 | - | - | - | - | 982 | - |
| Stage 2 | - | - | - | - | 950 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1570 | - | - | - | 876 | 1024 |
| Mov Cap-2 Maneuver | - | - | - | - | 876 | - |
| Stage 1 | - | - | - | - | 973 | - |
| Stage 2 | - | - | - | - | 950 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.6 | 0 | 8.7 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1570 | - | - | - | 993 |
| HCM Lane V/C Ratio | 0.008 | - | - | - | 0.012 |
| HCM Control Delay (s) | 7.3 | 0 | - | - | 8.7 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.3 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 71 | 8 | 0 | 61 | 5 | 0 |
| Future Vol, veh/h | 71 | 8 | 0 | 61 | 5 | 0 |
| 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 | 77 | 9 | 0 | 66 | 5 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 86 | 0 | 148 | 82 |
| Stage 1 | - | - | - | - | 82 | - |
| Stage 2 | - | - | - | - | 66 | - |
| 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 | - | - | 1510 | - | 844 | 978 |
| Stage 1 | - | - | - | - | 941 | - |
| Stage 2 | - | - | - | - | 957 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1510 | - | 844 | 978 |
| Mov Cap-2 Maneuver | - | - | - | - | 844 | - |
| Stage 1 | - | - | - | - | 941 | - |
| Stage 2 | - | - | - | - | 957 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 9.3 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 844 | - | - | 1510 | - |
| HCM Lane V/C Ratio | 0.006 | - | - | - | - |
| HCM Control Delay (s) | 9.3 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.3 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 63 | 8 | 0 | 56 | 5 | 0 |
| Future Vol, veh/h | 63 | 8 | 0 | 56 | 5 | 0 |
| 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 | 68 | 9 | 0 | 61 | 5 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 77 | 0 | 134 | 73 |
| Stage 1 | - | - | - | - | 73 | - |
| Stage 2 | - | - | - | - | 61 | - |
| 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 | - | - | 1522 | - | 860 | 989 |
| Stage 1 | - | - | - | - | 950 | - |
| Stage 2 | - | - | - | - | 962 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1522 | - | 860 | 989 |
| Mov Cap-2 Maneuver | - | - | - | - | 860 | - |
| Stage 1 | - | - | - | - | 950 | - |
| Stage 2 | - | - | - | - | 962 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 9.2 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 860 | - | - | 1522 | - |
| HCM Lane V/C Ratio | 0.006 | - | - | - | - |
| HCM Control Delay (s) | 9.2 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 2 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 0 | 6 | 7 | 3 | 6 |
| Future Vol, veh/h | 0 | 0 | 6 | 7 | 3 | 6 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| 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 | 0 | 0 | 7 | 8 | 3 | 7 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 29 | - | 10 | 0 | - | 0 |
| Stage 1 | 7 | - | - | - | - | - |
| Stage 2 | 22 | - | - | - | - | - |
| Critical Hdwy | 6.42 | - | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | - | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | 986 | 0 | 1610 | - | - | - |
| Stage 1 | 1016 | 0 | - | - | - | - |
| Stage 2 | 1001 | 0 | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 982 | - | 1610 | - | - | - |
| Mov Cap-2 Maneuver | 982 | - | - | - | - | - |
| Stage 1 | 1012 | - | - | - | - | - |
| Stage 2 | 1001 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 3.3 | 0 |
| HCM LOS | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1610 | - | - | - | - |
| HCM Lane V/C Ratio | 0.004 | - | - | - | - |
| HCM Control Delay (s) | 7.2 | 0 | 0 | - | - |
| HCM Lane LOS | A | A | A | - | - |
| HCM 95th %tile Q(veh) | 0 | - | - | - | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 3.9 | | | | | |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 14 | 0 | 13 | 3 | 0 |
| Future Vol, veh/h | 0 | 14 | 0 | 13 | 3 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| 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 | 0 | 15 | 0 | 14 | 3 | 0 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 17 | 3 | - | 0 | - | 0 |
| Stage 1 | 3 | - | - | - | - | - |
| Stage 2 | 14 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | - | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | - | - | - | - |
| Pot Cap-1 Maneuver | 1001 | 1081 | 0 | - | - | 0 |
| Stage 1 | 1020 | - | 0 | - | - | 0 |
| Stage 2 | 1009 | - | 0 | - | - | 0 |
| Platoon blocked, % | | | | - | - | |
| Mov Cap-1 Maneuver | 1001 | 1081 | - | - | - | - |
| Mov Cap-2 Maneuver | 1001 | - | - | - | - | - |
| Stage 1 | 1020 | - | - | - | - | - |
| Stage 2 | 1009 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 8.4 | 0 | 0 |
| HCM LOS | A | | |

| Minor Lane/Major Mvmt | NBT | EBLn1 | SBT |
|---|---|---|---|
| Capacity (veh/h) | - | 1081 | - |
| HCM Lane V/C Ratio | - | 0.014 | - |
| HCM Control Delay (s) | - | 8.4 | - |
| HCM Lane LOS | - | A | - |
| HCM 95th %tile Q(veh) | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 45 | 0 | 0 | 37 | 0 | 0 |
| Future Vol, veh/h | 45 | 0 | 0 | 37 | 0 | 0 |
| 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 | 49 | 0 | 0 | 40 | 0 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 49 | 0 | 89 | 49 |
| Stage 1 | - | - | - | - | 49 | - |
| Stage 2 | - | - | - | - | 40 | - |
| 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 | - | - | 1558 | - | 912 | 1020 |
| Stage 1 | - | - | - | - | 973 | - |
| Stage 2 | - | - | - | - | 982 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1558 | - | 912 | 1020 |
| Mov Cap-2 Maneuver | - | - | - | - | 912 | - |
| Stage 1 | - | - | - | - | 973 | - |
| Stage 2 | - | - | - | - | 982 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 0 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 1558 | - |
| HCM Lane V/C Ratio | - | - | - | - | - |
| HCM Control Delay (s) | 0 | - | - | 0 | - |
| HCM Lane LOS | A | - | - | A | - |
| HCM 95th %tile Q(veh) | - | - | - | 0 | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 4 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 15 | 17 | 6 | 0 | 0 | 10 |
| Future Vol, veh/h | 15 | 17 | 6 | 0 | 0 | 10 |
| 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 | 16 | 18 | 7 | 0 | 0 | 11 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 7 | 0 | - | 0 | 57 | 7 |
| Stage 1 | - | - | - | - | 7 | - |
| Stage 2 | - | - | - | - | 50 | - |
| 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 | 1614 | - | - | - | 950 | 1075 |
| Stage 1 | - | - | - | - | 1016 | - |
| Stage 2 | - | - | - | - | 972 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1614 | - | - | - | 941 | 1075 |
| Mov Cap-2 Maneuver | - | - | - | - | 941 | - |
| Stage 1 | - | - | - | - | 1006 | - |
| Stage 2 | - | - | - | - | 972 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 3.4 | 0 | 8.4 |
| HCM LOS | | | A |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1614 | - | - | - | 1075 |
| HCM Lane V/C Ratio | 0.01 | - | - | - | 0.01 |
| HCM Control Delay (s) | 7.3 | 0 | - | - | 8.4 |
| HCM Lane LOS | A | A | - | - | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 36 | 497 | 40 | 420 | 362 | 6 | 14 | 257 | 323 | 2 | 195 | 32 |
| Future Volume (veh/h) | 36 | 497 | 40 | 420 | 362 | 6 | 14 | 257 | 323 | 2 | 195 | 32 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 0.96 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1525 | 1525 | 1525 | 1768 | 1697 | 1768 | 1870 | 1870 | 1870 | 1870 | 1945 | 1870 |
| Adj Flow Rate, veh/h | 52 | 567 | 53 | 438 | 418 | 10 | 18 | 352 | 145 | 3 | 224 | 34 |
| Peak Hour Factor | 0.69 | 0.92 | 0.72 | 0.96 | 0.91 | 0.50 | 0.79 | 0.73 | 0.86 | 0.58 | 0.87 | 0.85 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 48 | 527 | 49 | 456 | 447 | 11 | 31 | 361 | 343 | 20 | 272 | 41 |
| Arrive On Green | 0.42 | 0.42 | 0.42 | 0.27 | 0.27 | 0.27 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |
| Sat Flow, veh/h | 116 | 1263 | 118 | 1684 | 1650 | 39 | 43 | 1581 | 1502 | 0 | 1191 | 178 |
| Grp Volume(v), veh/h | 672 | 0 | 0 | 438 | 0 | 428 | 370 | 0 | 145 | 261 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1496 | 0 | 0 | 1684 | 0 | 1689 | 1625 | 0 | 1502 | 1369 | 0 | 0 |
| Q Serve(g_s), s | 75.0 | 0.0 | 0.0 | 46.1 | 0.0 | 44.4 | 0.0 | 0.0 | 14.8 | 0.1 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 75.0 | 0.0 | 0.0 | 46.1 | 0.0 | 44.4 | 40.9 | 0.0 | 14.8 | 41.0 | 0.0 | 0.0 |
| Prop In Lane | 0.08 | | 0.08 | 1.00 | | 0.02 | 0.05 | | 1.00 | 0.01 | | 0.13 |
| Lane Grp Cap(c), veh/h | 625 | 0 | 0 | 456 | 0 | 458 | 392 | 0 | 343 | 333 | 0 | 0 |
| V/C Ratio(X) | 1.08 | 0.00 | 0.00 | 0.96 | 0.00 | 0.93 | 0.94 | 0.00 | 0.42 | 0.78 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 625 | 0 | 0 | 459 | 0 | 461 | 392 | 0 | 343 | 333 | 0 | 0 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 52.4 | 0.0 | 0.0 | 64.5 | 0.0 | 63.9 | 68.1 | 0.0 | 59.2 | 62.5 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 58.2 | 0.0 | 0.0 | 32.2 | 0.0 | 27.1 | 32.2 | 0.0 | 1.8 | 12.3 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 38.4 | 0.0 | 0.0 | 24.0 | 0.0 | 22.8 | 20.6 | 0.0 | 5.9 | 12.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 110.5 | 0.0 | 0.0 | 96.7 | 0.0 | 91.0 | 100.3 | 0.0 | 61.0 | 74.8 | 0.0 | 0.0 |
| LnGrp LOS | F | A | A | F | A | F | F | A | E | E | A | A |
| Approach Vol, veh/h | | 672 | | | 866 | | | 515 | | | 261 | |
| Approach Delay, s/veh | | 110.5 | | | 93.9 | | | 89.2 | | | 74.8 | |
| Approach LOS | | F | | | F | | | F | | | E | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 46.0 | | 80.0 | | 46.0 | | 53.7 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 41.0 | | 75.0 | | 41.0 | | 49.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 43.0 | | 77.0 | | 42.9 | | 48.1 | | | | |
| Green Ext Time (p_c), s | | 0.0 | | 0.0 | | 0.0 | | 0.6 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 95.5 | | | | | | | | | |
| HCM 6th LOS | | | F | | | | | | | | | |

## Mānoa Banyan Court

Honolulu, Island of O‘ahu, Hawai‘i

**Tax Map Keys: (1) 2-9-043:002 & 003**

# Preliminary Drainage Assessment

**Prepared for:**

**Lin Yee Chung Association**
**3430 East Mānoa Road**
**Honolulu, HI 96816**

SIGNATURE
Expiration Date: 4/30/24

**Prepared by:**

G70
111 S. King Street, Suite 170
Honolulu, Hawaii 96813

**September 2022**

**G70 Project No. M22100-23**

## TABLE OF CONTENTS



**LIST OF TABLES**



**APPENDIX A**



**APPENDIX B**



**APPENDIX C**

# 1 Introduction

## 1.1 Purpose

The purpose of this report is to provide a preliminary assessment of the application of the City and County of Honolulu's Drainage Standards to the proposed Mānoa Banyan Court project. The report describes the existing conditions and the proposed drainage concept design, outlines the general City and County of Honolulu code requirements, and describes how the proposed improvements, generally, will intend to meet these requirements.

## 1.2 Project Description

The new Mānoa Banyan Court project consists of an approximately 288-unit elderly affordable rental housing community, a community garden, and parking lots located at TMK (1) 2-9-043:002 (14.6 acres) and a new community center located at TMK (1) 2-9-043:003 (0.9 acres). The project is in the heart of Mānoa Valley between East Mānoa Road and Lower Road. The project is bounded by East Mānoa Road to the north and Lower Road to the south. The construction of the 288-unit elderly affording rental housing community will be divided into 4 phases – 144 one-bedroom units to East Mānoa Road, and 144 one-bedroom units to Lower Road, respectively, to be completed in four phases of 72 units each.

The project site at TMK (1) 2-9-043:002 currently consists of two dwellings and storage sheds, a small area of garden, portion of the Mānoa Chinese Cemetery (owned by Lin Yee Chung Association), and densely vegetated, wooded area with a mixture of canopy trees and non-native invasive species that covers most of the property. The site is bisected by an existing dry ditch, known as Woodlawn Ditch, which is understood to not be under the jurisdiction of the U.S. Army Corps of Engineers and is not classified as a wetland or "water of the United States". The project site at TMK (1) 2-9-043:003 currently consists of Memorial Hall (owned by Lin Yee Chung Association), a small dwelling, and a 6-stall parking area.

Proposed on-site improvements include asphalt parking lots, concrete curbs, sidewalks, landscaping, and underground utilities to support the housing and community center/common areas. Driveway aprons on East Mānoa Road and Lower Road will be installed for vehicular access to the site. Three driveway aprons on East Mānoa Road will be the main access and one driveway apron on Lower Road will be the optional access. Existing utilities surrounding the site will provide service for the development and are anticipated to have capacity. Refer to the Environmental Assessment, prepared by Harold Senter, for additional information.

See **Appendix A, Figure 1 – Location Map**.

# 2 Existing Conditions

## 2.1 Topography

The topography at the existing site is relatively flat with an average slope of 5% towards makai/Woodlawn Ditch and with elevations between 280′ to 200′ above mean sea level (MSL) based on a topographic survey by Gil Surveying Services, Inc, dated November 22, 2017.

## 2.2 Soil Type and Ground Cover

Soil type and ground cover play a critical role in understanding the site runoff properties. The following provides general soil information on site from publicly available resources.

The U.S. Department of Agriculture (USDA), Natural Resources Conservation Services (NRCS) Web Soils Survey identifies the onsite soil material as the following types:

**Table 1: Soil Types**

| Map Symbol | Name | Hydrologic Group | Saturated Hydraulic Conductivity (Ksat) |
|---|---|---|---|
| **LoB** | Lolekaa silty clay, 3-8% slopes | C | 0.06-0.60 in/hr |
| **LoC** | Lolekaa silty clay, 8-15% slopes | C | 0.06-0.60 in/hr |

The NRCS classifies the soils by hydrologic soils group using factors of land use, management practices, and hydrologic conditions. The hydrologic soils group assigns soils into groups sharing similar runoff potential under similar storm and ground cover conditions. The development of these group assignments standardizes the relationship between soils and geographic criteria to supply consistent information to evaluate and assess site runoff. Table 1 above shows the soil composition, the NRCS hydrologic soils group, and the saturated hydraulic conductivity (Ksat) indicating the rate at which infiltration occurs through particular soil mediums.
**Refer to Figure 2 – Soil Map**.

Due to the clay nature of the soil, it is anticipated that infiltration of stormwater for water quality or retention will not be allowed by the City.

## 2.3 FEMA Flood Zone

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), community-panel number 15003C0360G, the site is located in Zone X, "areas determined to be outside of 0.2% annual choice floodplain". Woodlawn Ditch is within Zone "X". **Refer to Figure 3 – FEMA Flood Map**.

### 2.4 Other Studies/As-builts

The flood study reports used for this preliminary drainage assessment include *Engineering Documentation Report for the Ala Wai Flood Risk Management Project, by U.S. Army Corps of Engineers (July 16, 2020), Technical Summary Report Mānoa Watershed Project, by Oceanit (December 2008)*, and *Ala Wai Canal Project Feasibility Study Appendix A, by Oceanit (December 2008, edited in February 2017)*. The project site is in the Mānoa Sub-Watershed which is one of the watersheds in the Ala Wai Canal flood study, by the U.S. Army Corps of Engineers. Woodlawn Ditch is a part of the drainage infrastructure in the Mānoa Sub-Watershed and thus is included in the flood study. Analysis from this study is included for reference in this report.

# 3 Methodology

### 3.1 Hydrologic Calculations

In conformance with the City and County of Honolulu's *Rules Related to Strom Drainage Standards (2017)*, the Rational Method was used to determine 10-year peak flows for the existing and proposed drainage basins located within the project area because the tributary areas are less than 100 acres.

The Rational Formula, **Q = C I A**, calculates the design storm discharge for this project.

Where:

| | |
|---|---|
| Q = | Storm runoff peak flow rate, cubic feet per second (cfs) |
| C = | Runoff coefficient, (C-value) |
| I = | Rainfall intensity, (in/hr) (National Oceanic and Atmospheric Administration Precipitation Frequency Data Server) |
| A = | Drainage area, (acres) |

Runoff coefficients (C-values) were based on the landcover. **Table 2** shows the primary C-values used.

| TABLE 2: RUNOFF COEFFICIENTS | |
|---|---|
| **Land Cover** | **C-Value** |
| Residential/Apartment area | 0.70 |
| Roof | 0.90 |
| Pavement | 0.90 |
| Landscaping and planting area, flat pervious area, cemetery area | 0.40 |

Composite C-values were developed for areas that had more than one land cover type (e.g. landscaping and roadways) using the NRCS equation below:

$$C_w = \frac{\sum_{i=1}^{n} C_i A_i}{A_t}$$

Where:

$C_w$ = Composite Weighted Runoff Coefficient
$C_{1,2,\ldots n}$ = Runoff Coefficient for each Land Use Cover Type
$A_{1,2,\ldots n}$ = Drainage Area to each Land Use Cover Type, acres (ac)
$A_t$ = Total Drainage Area, acres (ac)

# 4 Existing Drainage Conditions

As previously noted, most of the site at TMK (1) 2-9-043:002 is currently undeveloped and consists of grass and trees on a gentle to moderate sloping surface. A small portion of the site consists of 2 dwellings and storage sheds with asphalt-paved parking and driveway areas, and another portion is part of the Mānoa Chinese Cemetery. Runoff from the site sheet flows towards the south. Runoff either infiltrates into the ground, discharges into the onsite Woodlawn Ditch, or continues to flow towards a bermed/interceptor swale mauka of the adjacent parcels that conveys water to the ditch. The onsite runoff combines with runoff generated from the upstream adjacent parcels and flows towards the south and discharges into Woodlawn Ditch, then ultimately discharges into Mānoa Stream. A portion of the site on the east side on Woodlawn Ditch discharges into a drain inlet at the corner of the property. From this inlet, flow is conveyed via pipe back into Woodlawn Ditch downstream of the property.

The site at TMK (1) 2-9-043:003 currently consists of Memorial Hall, a small dwelling, and a 6-stall parking area. Runoff from the site sheet flows towards the west into an existing City catch basin in East Manoa Road, then enters a City 18″ concrete drain pipe that discharges to the onsite bermed/interceptor swale that conveys water to Woodlawn Ditch. Existing hydrology conditions are evaluated and the results are listed below in **Table 3**.

**Table 3 – Existing Condition Hydrology Calculations**

| Drainage Basin | Runoff Coefficient C | $T_c$ (min) | Corrected Rainfall Intensity, $i_{10}$ (in/hr) | Area (ac) | Runoff $Q_{10}$ (cfs) | Discharge Point |
|---|---|---|---|---|---|---|
| ***A1*** | 0.51 | 10.12 | 6.35 | **3.1** | **10.1** | Woodlawn Ditch |
| ***A2*** | 0.40 | 14.29 | 5.68 | **1.1** | **2.5** | Basin C3 |
| ***A3*** | 0.40 | 11.04 | 6.18 | **0.5** | **1.2** | Offsite/Lower Road R.O.W. |
| ***B1*** | 0.43 | 12.32 | 5.97 | **1.7** | **4.4** | Basin B2 |
| ***B2*** | 0.49 | 9.60 | 6.45 | **2.4** | **7.6** | Woodlawn Ditch |
| ***C1*** | 0.40 | 14.09 | 5.71 | **0.8** | **1.8** | Woodlawn Ditch |
| ***C2*** | 0.43 | 11.75 | 6.06 | **2.0** | **5.2** | Woodlawn Ditch |
| ***C3*** | 0.41 | 8.96 | 6.59 | **0.5** | **1.4** | Basin D2 |
| ***D1*** | 0.40 | 7.89 | 6.83 | **0.5** | **1.4** | Woodlawn Ditch |
| ***D2*** | 0.40 | 12.31 | 5.97 | **2.0** | **4.8** | Catch Basin (Private) (To City) |
| ***E*** | 0.46 | 9.94 | 6.38 | **0.9** | **2.6** | Catch Basin (City) |
| | | | **TOTAL** | **15.5** | **43.0** | |

See **Appendix A, Figure 4 – Existing Drainage Map**

Woodlawn Ditch is a major stormwater conveyance in the project site. Based on the *Engineering Documentation Report for the Ala Wai Flood Risk Management Project, Appendix A – Hydrology & Hydraulic Analysis, Table 4, by U.S. Army Corps of Engineers (July 16, 2020)*, the $Q_{10}$ and $Q_{100}$ were estimated to be 600 cfs and 1190 cfs, respectively. The Qs were determined with NRCS TR-55, using rainfall data, Curve Number, Manning n, and topographic data. See Woodlawn Ditch's channel section and flow capacity calculations in **Appendix B**.

# 5 Proposed Drainage Conditions

After the proposed improvements to the site, runoff from the site will be collected, treated, detained, and discharged into the onsite Woodlawn Ditch, or other discharge points, to match existing conditions.

Proposed hydrology conditions are evaluated based upon the proposed development of the Mānoa Banyan Court project and the results are listed below in **Table 4**.

**Table 4 – Proposed Condition Hydrology Calculations**

| Drainage Basin | Runoff Coefficient C | $T_c$ (min) | Corrected Rainfall Intensity, $i_{10}$ (in/hr) | Area (ac) | Runoff $Q_{10}$ (cfs) | Discharge Point |
|---|---|---|---|---|---|---|
| ***A1*** | 0.51 | 10.12 | 6.35 | **3.1** | **10.1** | Woodlawn Ditch |
| ***A2*** | 0.40 | 14.29 | 5.68 | **1.1** | **2.5** | Catch Basin (Private) |
| ***A3*** | 0.40 | 11.04 | 6.18 | **0.5** | **1.2** | Offsite/Lower Road R.O.W. |
| ***B1*** | 0.70 | 7.63 | 6.90 | **1.7** | **8.2** | Basin B2 |
| ***B2*** | 0.70 | 6.73 | 7.14 | **2.4** | **12.0** | Woodlawn Ditch |
| ***C1*** | 0.40 | 14.09 | 5.71 | **0.8** | **1.8** | Woodlawn Ditch |
| ***C2*** | 0.70 | 7.14 | 7.03 | **2.0** | **9.8** | Woodlawn Ditch |
| ***C3*** | 0.70 | 5.25 | 7.62 | **0.5** | **2.7** | Basin D2 |
| ***D1*** | 0.40 | 7.89 | 6.83 | **0.5** | **1.4** | Woodlawn Ditch |
| ***D2*** | 0.70 | 7.03 | 7.05 | **2.0** | **9.9** | Catch Basin (Private) |
| ***E*** | 0.70 | 6.53 | 7.20 | **0.9** | **4.5** | Catch Basin (City) |
| | | | **TOTAL** | **15.5** | **64.1** | |

See **Appendix A, Figure 5 – Proposed Drainage Map**.

Overall, onsite peak stormwater flow amounts would increase from the existing to proposed conditions by 21.1 cfs, without any peak flow attenuation (i.e. detention), due to the proposed development on site and increased impervious areas, from the currently undeveloped site. This is a conservative estimate using a residential runoff coefficient of C = 0.70. The project anticipates incorporating as much green space as possible which would potentially reduce C values and therefore, reduce peak runoff flow rates due to increased pervious areas within the overall development.

To mitigate the increase, runoff from the project's phases and improvements will be conveyed to onsite detention ponds or underground chambers to attenuate the proposed onsite peak stormwater runoff. All detention ponds will discharge the attenuated runoff to Woodlawn Ditch, except the detention pond in Basin C3, where it will discharge to Basin D2 and to the existing private catch basin. With the detention systems in each phase, the proposed onsite peak stormwater runoff will be less than that of existing.

**Table 5 – Detention System Summary**

| Drainage Basin | Existing $Q_{10}$ (cfs) | Proposed $Q_{10}$ (cfs) | Detained $Q_{10}$ (cfs) |
|---|---|---|---|
| ***A1*** | 10.1 | 10.1 | N/A (10.1) |
| ***A2*** | 2.5 | 2.5 | N/A (2.5) |
| ***A3*** | 1.2 | 1.2 | N/A (1.2) |
| ***B1*** | 4.4 | 8.2 | 3.8 |
| ***B2*** | 7.6 | 12.0 | 5.2 |
| ***C1*** | 1.8 | 1.8 | N/A (1.8) |
| ***C2*** | 5.2 | 9.8 | 4.1 |
| ***C3*** | 1.4 | 2.7 | 0.9 |
| ***D1*** | 1.4 | 1.4 | N/A (1.4) |
| ***D2*** | 4.8 | 9.9 | 4.6 |
| ***E*** | 2.6 | 4.5 | 1.0 |
| **TOTAL** | **43.0** | **64.1** | **36.6** |

See **Appendix C, Detention System Hydrographs**.

Detention systems could have overflows and divert overflows away from adjacent properties, including berms, weirs, and swales.

# 6 Stormwater Quality Strategies

The City and County of Honolulu's *Rules Relating to Water Quality (August 16, 2016, as amended)* was used for appropriate and acceptable stormwater quality design requirements, criteria, and calculations. Because the project has a disturbed area of greater than one (1) acre as both individual phases and for the overall development, the project must meet Priority A water quality requirements.

The project stormwater quality design follows the 3-step approach: Step 1 – Low Impact Development (LID) Site Design Strategies, Step 2 – Source Control Best Management Practices (BMPs), and Step 3 – Treatment Control BMPs.

<u>Step 1 – LID Site Design Strategies</u>

LID site design strategies help to maintain or restore the site's pre-development hydrology and allow development with minimal impact to the natural environment. The LID site design strategies will include the following – conserve natural areas and minimize disturbance, minimize soil compaction, minimize impervious surfaces, direct runoff to landscaped areas and reduce directly connected impervious areas, and maintain self-mitigating areas.

Step 2 – Source Control BMPs

The second step is to implement source control BMPs to the maximum extent practicable (MEP). The following activities will be included and thus require source control BMPs:

- Landscaped areas
- Automatic irrigation systems
- Storm drain inlets
- Residential vehicle/equipment washing for condominium & apartment
- Parking areas with impervious surfaces

Step 3 – Treatment Control BMPs

The last step is to incorporate treatment control BMPs that are appropriate for the site. Treatment control BMPs are engineered practices that treat stormwater runoff by implementing retention, biofiltration, or filtration by other means. The following treatment control BMPs are determined to be appropriate for the site (as infiltration of stormwater is not anticipated to be allowed):

- Vegetated biofilter
- Vegetated swale
- Vegetated buffer strip

Biofilters may consist of planters at building downspouts, vegetated/grassed swales, along parking areas or property lines, and buffer strips, along downstream areas protecting the top banks of Woodlawn Ditch. See Sample BMP Sizing Worksheet in **Appendix B**.

# 7 Conclusion

The proposed conceptual grading and drainage design for the proposed development is anticipated to be in accordance with the *City and County of Honolulu Storm Drainage Standards (2017)*. The proposed drainage system for the Mānoa Banyan Court project, as indicated conceptually in this report and on plans to be prepared, would not result in any significant increase in the peak stormwater runoff utilizing peak flow attenuation through onsite detention systems. Therefore, the proposed development of the project is not anticipated to create any adverse drainage impacts to Woodlawn Ditch and the surrounding properties. Compared to the overall Q in Woodlawn Ditch per the Engineering Documentation Report by USACE, the project's impact to flow rates are negligible to $Q_{10}$ = 600 cfs / $Q_{100}$ = 1190 cfs, estimated to be conveyed within Woodlawn Ditch at the downstream end of the project site. The proposed stormwater quality sizing is anticipated to meet the requirements of The City and County of Honolulu's *Rules Relating to Water Quality (August 16, 2016, as amended).*

# 8 References

"*Ala Wai Flood Risk Management Project, Honolulu, Hawaii, Engineering Documentation Report"* Department of the Army, U.S. Army Corps of Engineers, July 16, 2020

*"Ala Wai Canal Project Feasibility Study Appendix A*", Oceanit, December 2008 (last edited in February 2017)

City and County of Honolulu, Department of Planning and Permitting, *Honolulu's Rules Relating to Water Quality*, August 16, 2016, as amended

City and County of Honolulu, Department of Planning and Permitting, *Storm Drainage Standards*, August 2017

*"Technical Summary Report Mānoa Watershed Project*", Oceanit, December 2008

Websites Accessed:

U.S. Federal Emergency Management Agency, Flood Hazard Assessment Map

U.S. National Oceanic and Atmospheric Administration, National Weather Service
HDSC Precipitation Frequency Data Server https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_hi.html

# APPENDIX A

# Figures


Figure 1 - Location Map
Mānoa Banyan Court

G70

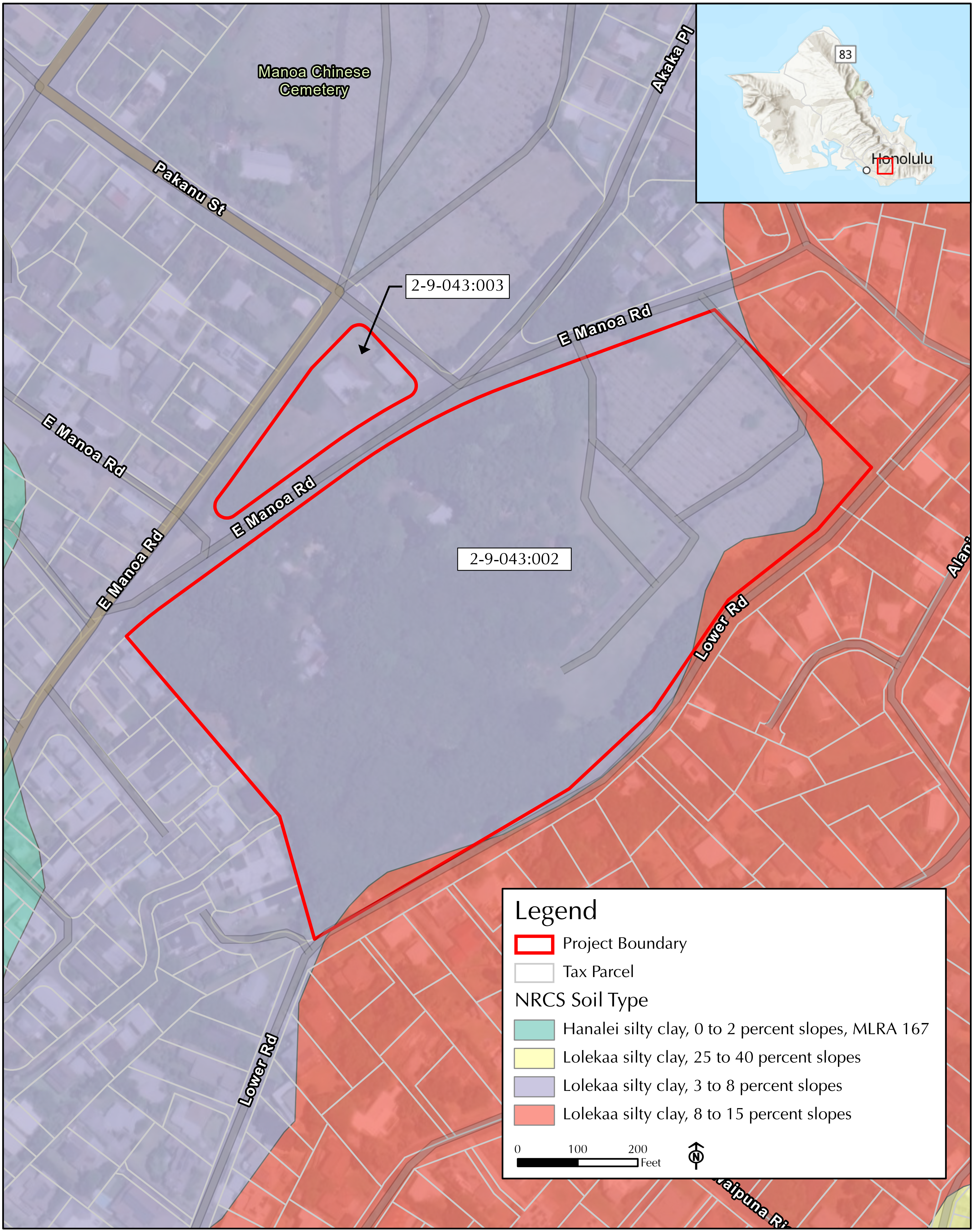



Figure 2 - Soil Map
Mānoa Banyan Court

G70

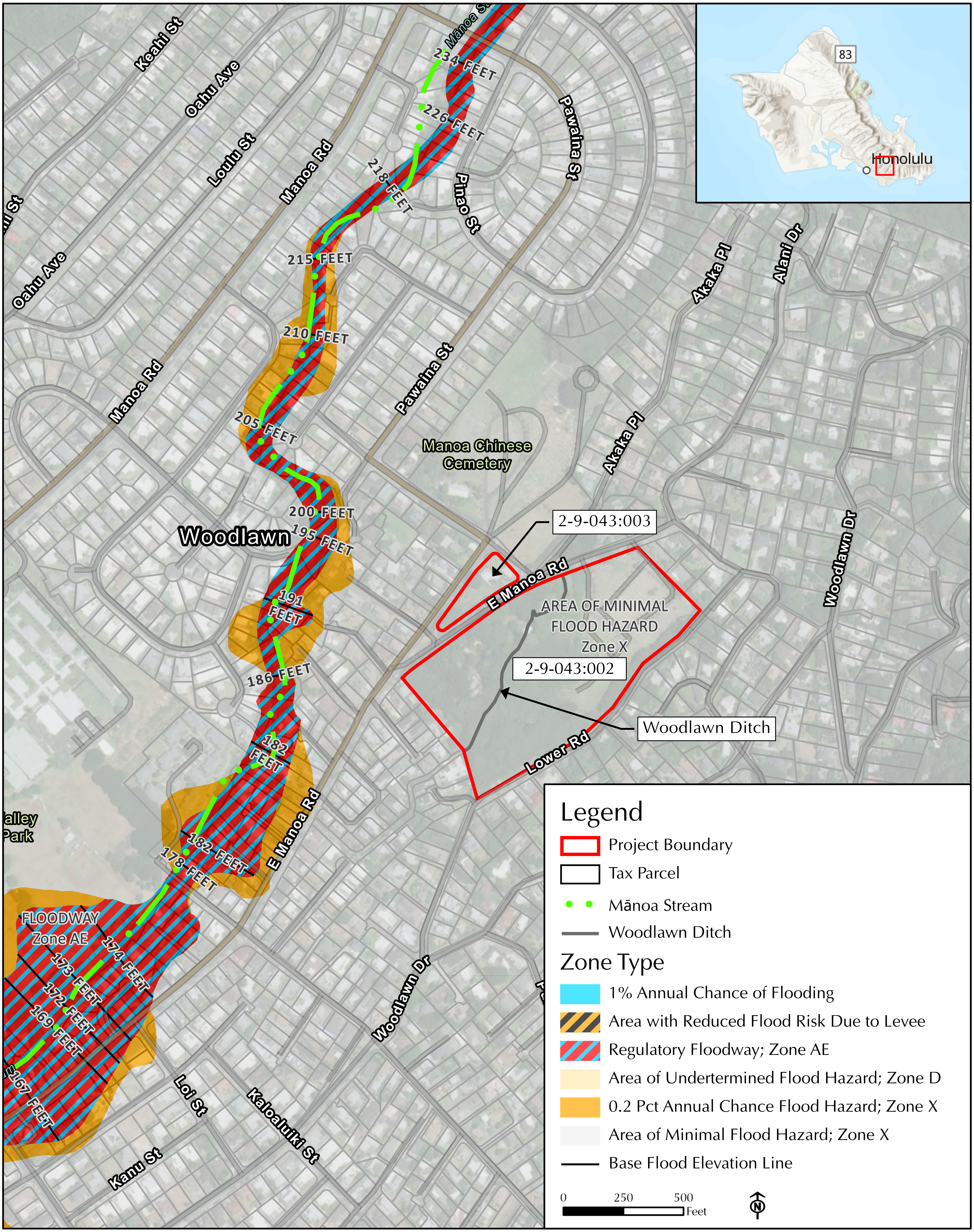
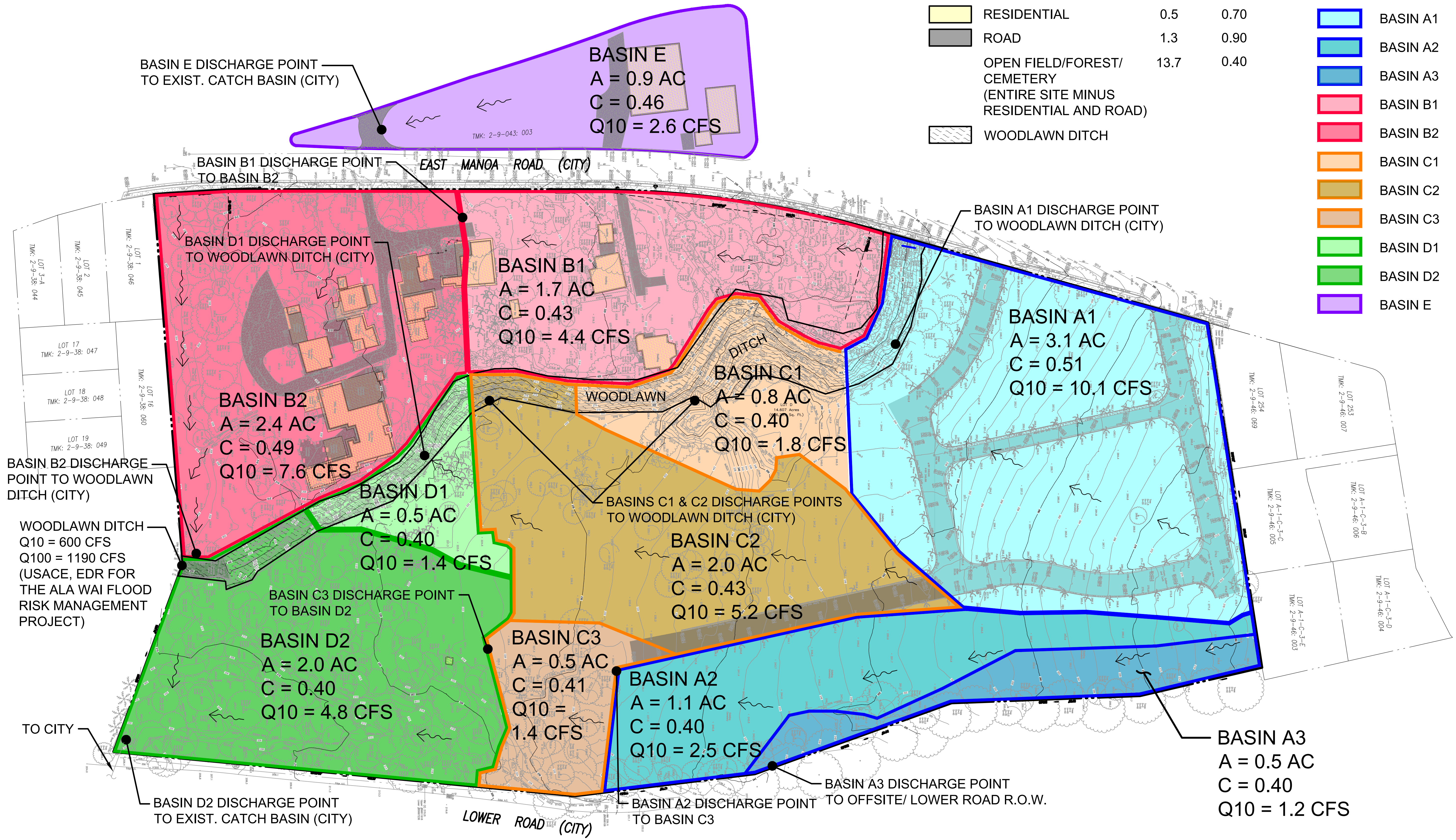



Figure 3 - FEMA Flood Map
Mānoa Banyan Court

G70




## LEGEND

| | TYPE OF AREA | AREA (AC) | C |
|---|---|---|---|
| | RESIDENTIAL | 0.5 | 0.70 |
| | ROAD | 1.3 | 0.90 |
| | OPEN FIELD/FOREST/ CEMETERY (ENTIRE SITE MINUS RESIDENTIAL AND ROAD) | 13.7 | 0.40 |
| | WOODLAWN DITCH | | |

## BASIN LEGEND

| BASIN | AREA |
|---|---|
| BASIN A1 | 3.1 AC |
| BASIN A2 | 1.1 AC |
| BASIN A3 | 0.5 AC |
| BASIN B1 | 1.7 AC |
| BASIN B2 | 2.4 AC |
| BASIN C1 | 0.8 AC |
| BASIN C2 | 2.0 AC |
| BASIN C3 | 0.5 AC |
| BASIN D1 | 0.5 AC |
| BASIN D2 | 2.0 AC |
| BASIN E | 0.9 AC |

# MANOA BANYAN COURT

EXISTING DRAINAGE MAP

100 0 100 200

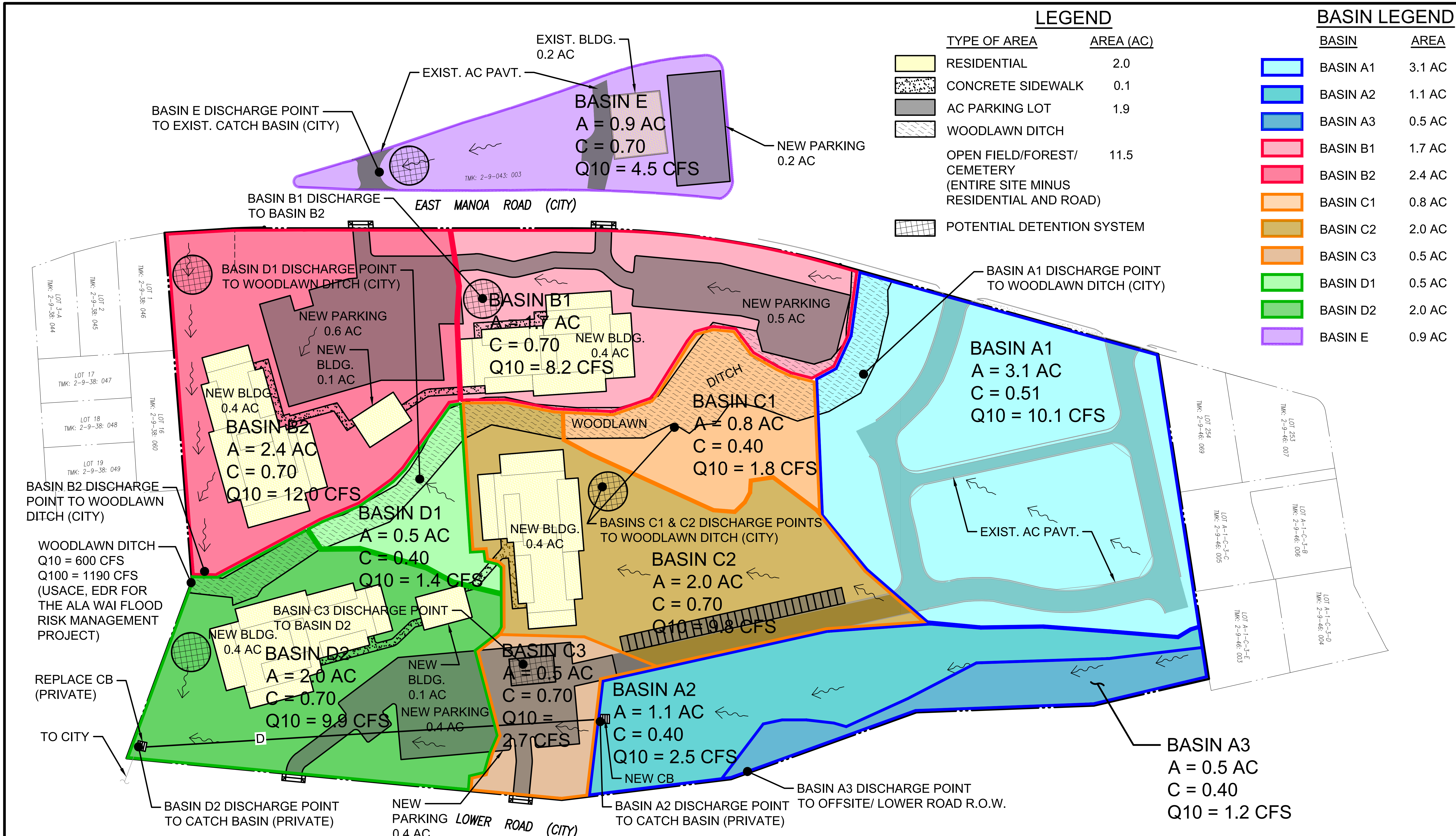
SCALE IN FEET

G70

111 S. KING STREET, SUITE 170
HONOLULU, HAWAII 96813
808.523.5866
WWW.G70.DESIGN

September 2022

FIGURE 4




# MANOA BANYAN COURT

PROPOSED DRAINAGE MAP

100 0 100 200
SCALE IN FEET

G70
111 S. KING STREET, SUITE 170
HONOLULU, HAWAII 96813
808.523.5866
WWW.G70.DESIGN
September 2022

FIGURE 5

# APPENDIX B

# Supporting Documents for Calculations

*G70*
*111 South King Street, Suite 170*
*Honolulu, Hawaii 96813*
*Phone: 523-5866*
*Fax: 523-5874*

**Manoa Banyan Court**
**Job No.: M22100-23**
**Prepared by: SFT**
**Date: September 2022**

Methodology from The Department of Planning and Permitting City & County of Honolulu *Storm Drainage Standards*, August 2017, as amended.

*Runoff Flow Rate (Rational Method) - Q = CIA:*
*$Q_{10}$ = Flowrate For 10-Year Event, cfs*
*C = Runoff Coefficient --> Table 1 & Table 2*
*$I_{10}$ = 1-Hour Rainfall Intensity For 10-Year Event, in/hr --> NOAA Rainfall Data*
*$T_c$ = Time of Concentration --> Plate 3*
*Rainfall Intensity Correction Factor --> Plate 4*
*A = Drainage Area, acres*

***Q(10) Value for Designated Areas***

| Onsite Drainage Basin | Runoff Coefficient C | 1-Hour Rainfall Intensity, $I_{10}$ (in/hr) | Length L (ft) | Slope % | Time of Concentration $T_c$ (min) | Rainfall Intensity Correction Factor | Corrected Rainfall Intensity, $i_{10}$ (in/hr) | Area (ac) | Runoff $Q_{10}$ (cfs) |
|---|---|---|---|---|---|---|---|---|---|
| ***A1*** | 0.51 | 2.79 | 550 | 7.6% | 10.12 | 2.28 | 6.35 | **3.1** | **10.1** |
| ***A2*** | 0.40 | 2.79 | 680 | 7.4% | 14.29 | 2.04 | 5.68 | **1.1** | **2.5** |
| ***A3*** | 0.40 | 2.79 | 395 | 8.6% | 11.04 | 2.22 | 6.18 | **0.5** | **1.2** |
| ***B1*** | 0.43 | 2.79 | 450 | 4.2% | 12.32 | 2.14 | 5.97 | **1.7** | **4.4** |
| ***B2*** | 0.49 | 2.79 | 300 | 3.3% | 9.60 | 2.31 | 6.45 | **2.4** | **7.6** |
| ***C1*** | 0.40 | 2.79 | 610 | 6.2% | 14.09 | 2.05 | 5.71 | **0.8** | **1.8** |
| ***C2*** | 0.43 | 2.79 | 455 | 6.2% | 11.75 | 2.17 | 6.06 | **2.0** | **5.2** |
| ***C3*** | 0.41 | 2.79 | 170 | 3.5% | 8.96 | 2.36 | 6.59 | **0.5** | **1.4** |
| ***D1*** | 0.40 | 2.79 | 145 | 5.5% | 7.89 | 2.45 | 6.83 | **0.5** | **1.4** |
| ***D2*** | 0.40 | 2.79 | 400 | 5.0% | 12.31 | 2.14 | 5.97 | **2.0** | **4.8** |
| ***E*** | 0.46 | 2.79 | 310 | 4.2% | 9.94 | 2.29 | 6.38 | **0.9** | **2.6** |
| | | | | | | | **TOTAL** | **15.5** | **43.0** |

## FIGURE 1 - EXISTING CONDITION HYDROLOGY CALCULATIONS

*G70*
*111 South King Street, Suite 170*
*Honolulu, Hawaii 96813*
*Phone: 523-5866*
*Fax: 523-5874*

**Manoa Banyan Court**
**Job No.: M22100-23**
**Prepared by: SFT**
**Date: September 2022**

Methodology from The Department of Planning and Permitting City & County of Honolulu *Storm Drainage Standards*, August 2017, as amended.

*Runoff Flow Rate (Rational Method) - Q = CIA:*
*$Q_{10}$ = Flowrate For 10-Year Event, cfs*
*C = Runoff Coefficient --> Table 1 & Table 2*
*$I_{10}$ = 1-Hour Rainfall Intensity For 10-Year Event, in/hr --> NOAA Rainfall Data*
*$T_c$ = Time of Concentration --> Plate 3*
*Rainfall Intensity Correction Factor --> Plate 4*
*A = Drainage Area, acres*

***Q(10) Value for Designated Areas***

| Onsite Drainage Basin | Runoff Coefficient C | 1-Hour Rainfall Intensity, $I_{10}$ (in/hr) | Length L (ft) | Slope % | Time of Concentration $T_c$ (min) | Rainfall Intensity Correction Factor | Corrected Rainfall Intensity, $i_{10}$ (in/hr) | Area (ac) | Runoff $Q_{10}$ (cfs) |
|---|---|---|---|---|---|---|---|---|---|
| ***A1*** | 0.51 | 2.79 | 550 | 7.6% | 10.12 | 2.28 | 6.35 | **3.1** | **10.1** |
| ***A2*** | 0.40 | 2.79 | 680 | 7.4% | 14.29 | 2.04 | 5.68 | **1.1** | **2.5** |
| ***A3*** | 0.40 | 2.79 | 395 | 8.6% | 11.04 | 2.22 | 6.18 | **0.5** | **1.2** |
| ***B1*** | 0.70 | 2.79 | 450 | 4.2% | 7.63 | 2.47 | 6.90 | **1.7** | **8.2** |
| ***B2*** | 0.70 | 2.79 | 300 | 3.3% | 6.73 | 2.56 | 7.14 | **2.4** | **12.0** |
| ***C1*** | 0.40 | 2.79 | 610 | 6.2% | 14.09 | 2.05 | 5.71 | **0.8** | **1.8** |
| ***C2*** | 0.70 | 2.79 | 455 | 6.2% | 7.14 | 2.52 | 7.03 | **2.0** | **9.8** |
| ***C3*** | 0.70 | 2.79 | 170 | 3.5% | 5.25 | 2.73 | 7.62 | **0.5** | **2.7** |
| ***D1*** | 0.40 | 2.79 | 145 | 5.5% | 7.89 | 2.45 | 6.83 | **0.5** | **1.4** |
| ***D2*** | 0.70 | 2.79 | 400 | 5.0% | 7.03 | 2.53 | 7.05 | **2.0** | **9.9** |
| ***E*** | 0.70 | 2.79 | 310 | 4.2% | 6.53 | 2.58 | 7.20 | **0.9** | **4.5** |
| | | | | | | | **TOTAL** | **15.5** | **64.1** |

**FIGURE 2 - PROPOSED CONDITION HYDROLOGY CALCULATIONS**

**NOAA Atlas 14, Volume 4, Version 3**
**Location name: Honolulu, Hawaii, USA***
**Latitude: 21.3158°, Longitude: -157.8022°**
**Elevation: 209.26 ft****
* source: ESRI Maps
** source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

S. Perica, D. Martin, B. Lin, T. Parzybok, D. Riley, M. Yekta, L. Hiner, L.-C. Chen, D. Brewer, F. Yan, K. Maitaria, C. Trypaluk, G. M. Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

## PF tabular

**PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)**[1]

| Duration | Average recurrence interval (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **5** | **10** | **25** | **50** | **100** | **200** | **500** | **1000** |
| **5-min** | **0.437** (0.387-0.484) | **0.532** (0.470-0.597) | **0.684** (0.600-0.772) | **0.809** (0.703-0.916) | **0.987** (0.843-1.13) | **1.13** (0.952-1.30) | **1.29** (1.06-1.48) | **1.45** (1.17-1.69) | **1.68** (1.30-1.98) | **1.87** (1.40-2.22) |
| **10-min** | **0.648** (0.574-0.717) | **0.788** (0.696-0.885) | **1.01** (0.890-1.15) | **1.20** (1.04-1.36) | **1.46** (1.25-1.67) | **1.68** (1.41-1.93) | **1.91** (1.57-2.20) | **2.15** (1.73-2.50) | **2.49** (1.93-2.93) | **2.77** (2.08-3.29) |
| **15-min** | **0.813** (0.721-0.901) | **0.990** (0.874-1.11) | **1.27** (1.12-1.44) | **1.51** (1.31-1.71) | **1.84** (1.57-2.10) | **2.11** (1.77-2.42) | **2.40** (1.97-2.76) | **2.70** (2.17-3.14) | **3.13** (2.43-3.68) | **3.48** (2.61-4.14) |
| **30-min** | **1.15** (1.01-1.27) | **1.39** (1.23-1.56) | **1.79** (1.57-2.02) | **2.12** (1.84-2.40) | **2.59** (2.21-2.95) | **2.97** (2.50-3.41) | **3.37** (2.78-3.89) | **3.80** (3.06-4.42) | **4.41** (3.42-5.18) | **4.90** (3.68-5.82) |
| **60-min** | **1.51** (1.34-1.67) | **1.83** (1.62-2.06) | **2.36** (2.07-2.66) | **2.79** (2.42-3.16) | **3.40** (2.91-3.88) | **3.91** (3.28-4.48) | **4.43** (3.65-5.12) | **5.00** (4.02-5.82) | **5.80** (4.50-6.82) | **6.45** (4.84-7.66) |
| **2-hr** | **2.02** (1.78-2.20) | **2.49** (2.20-2.81) | **3.22** (2.83-3.64) | **3.81** (3.31-4.32) | **4.65** (3.97-5.30) | **5.32** (4.47-6.12) | **6.03** (4.97-6.98) | **6.78** (5.47-7.91) | **7.83** (6.08-9.24) | **8.69** (6.53-10.4) |
| **3-hr** | **2.28** (2.02-2.49) | **2.90** (2.57-3.27) | **3.76** (3.30-4.25) | **4.45** (3.87-5.06) | **5.43** (4.63-6.20) | **6.21** (5.22-7.14) | **7.03** (5.79-8.14) | **7.90** (6.36-9.22) | **9.12** (7.07-10.8) | **10.1** (7.58-12.1) |
| **6-hr** | **2.95** (2.59-3.24) | **3.72** (3.29-4.18) | **4.86** (4.25-5.48) | **5.76** (5.00-6.52) | **7.03** (5.99-8.01) | **8.05** (6.75-9.23) | **9.11** (7.49-10.5) | **10.2** (8.22-11.9) | **11.8** (9.14-13.9) | **13.1** (9.80-15.6) |
| **12-hr** | **3.60** (3.16-3.96) | **4.58** (4.04-5.16) | **6.02** (5.27-6.81) | **7.17** (6.22-8.14) | **8.77** (7.48-10.0) | **10.1** (8.43-11.6) | **11.4** (9.35-13.2) | **12.8** (10.3-14.9) | **14.7** (11.4-17.4) | **16.3** (12.2-19.4) |
| **24-hr** | **4.22** (3.76-4.75) | **5.53** (4.91-6.23) | **7.38** (6.53-8.33) | **8.86** (7.80-10.0) | **10.9** (9.55-12.5) | **12.6** (10.9-14.4) | **14.4** (12.3-16.5) | **16.2** (13.7-18.8) | **18.8** (15.6-22.1) | **20.9** (17.1-24.7) |
| **2-day** | **5.73** (5.17-6.38) | **7.41** (6.67-8.26) | **9.71** (8.72-10.9) | **11.5** (10.3-12.9) | **14.0** (12.4-15.8) | **15.9** (14.0-18.0) | **17.9** (15.6-20.4) | **20.0** (17.2-22.9) | **22.8** (19.2-26.4) | **25.0** (20.8-29.3) |
| **3-day** | **6.41** (5.78-7.12) | **8.28** (7.46-9.22) | **10.8** (9.71-12.1) | **12.8** (11.4-14.3) | **15.4** (13.7-17.4) | **17.5** (15.4-19.8) | **19.6** (17.0-22.3) | **21.7** (18.7-24.9) | **24.7** (20.8-28.6) | **26.9** (22.4-31.5) |
| **4-day** | **7.08** (6.39-7.86) | **9.14** (8.24-10.2) | **11.9** (10.7-13.3) | **14.0** (12.6-15.7) | **16.9** (15.0-19.0) | **19.1** (16.8-21.6) | **21.3** (18.5-24.2) | **23.5** (20.2-27.0) | **26.5** (22.4-30.7) | **28.8** (24.0-33.7) |
| **7-day** | **8.43** (7.62-9.37) | **10.8** (9.74-12.0) | **13.9** (12.5-15.6) | **16.3** (14.6-18.3) | **19.5** (17.3-22.0) | **21.9** (19.3-24.8) | **24.3** (21.2-27.7) | **26.8** (23.0-30.7) | **30.1** (25.4-34.8) | **32.6** (27.1-38.1) |
| **10-day** | **9.71** (8.77-10.8) | **12.3** (11.1-13.7) | **15.8** (14.2-17.7) | **18.4** (16.5-20.6) | **21.8** (19.4-24.6) | **24.5** (21.5-27.7) | **27.1** (23.6-30.8) | **29.7** (25.5-34.0) | **33.1** (28.0-38.4) | **35.8** (29.7-41.8) |
| **20-day** | **13.2** (12.0-14.7) | **16.5** (14.9-18.4) | **20.8** (18.7-23.2) | **24.0** (21.4-26.9) | **28.1** (24.9-31.7) | **31.2** (27.4-35.3) | **34.3** (29.8-39.0) | **37.3** (32.1-42.8) | **41.3** (34.9-47.8) | **44.3** (36.8-51.7) |
| **30-day** | **16.5** (14.9-18.4) | **20.4** (18.4-22.8) | **25.4** (22.9-28.4) | **29.2** (26.1-32.7) | **34.0** (30.1-38.3) | **37.5** (33.0-42.5) | **41.0** (35.7-46.7) | **44.5** (38.3-51.0) | **49.0** (41.4-56.7) | **52.3** (43.5-61.1) |
| **45-day** | **21.0** (19.0-23.4) | **25.7** (23.1-28.6) | **31.7** (28.5-35.4) | **36.2** (32.3-40.5) | **41.8** (37.1-47.1) | **46.0** (40.5-52.0) | **50.1** (43.6-57.0) | **54.1** (46.5-61.9) | **59.2** (50.0-68.5) | **63.0** (52.4-73.5) |
| **60-day** | **25.2** (22.7-28.0) | **30.5** (27.5-34.0) | **37.4** (33.6-41.8) | **42.4** (37.9-47.5) | **48.7** (43.2-54.9) | **53.4** (46.9-60.4) | **57.9** (50.4-65.9) | **62.3** (53.6-71.4) | **67.9** (57.4-78.6) | **72.0** (59.9-84.1) |

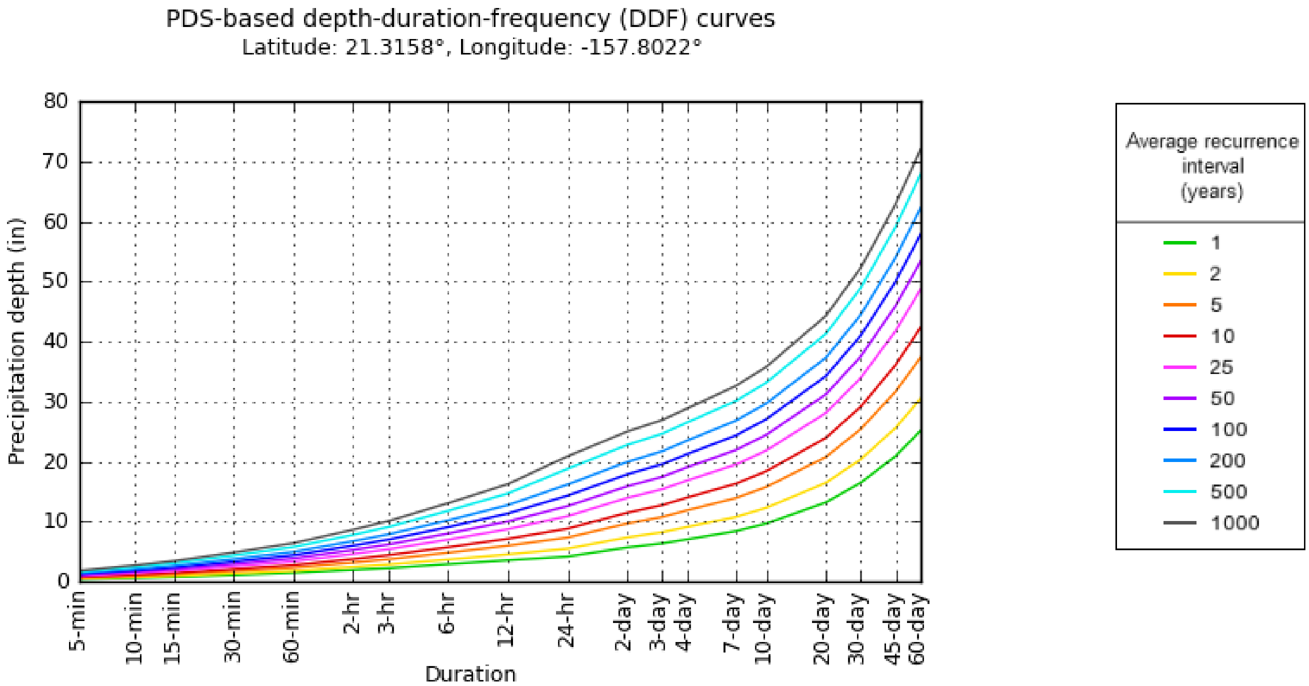
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

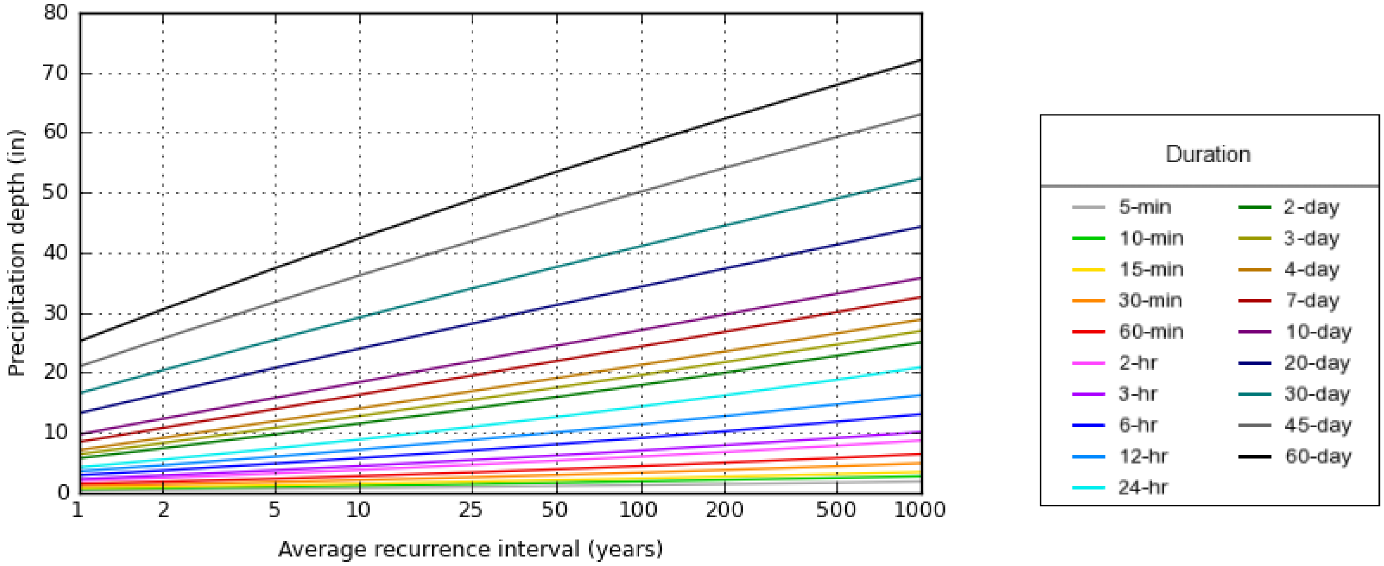
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

## PF graphical



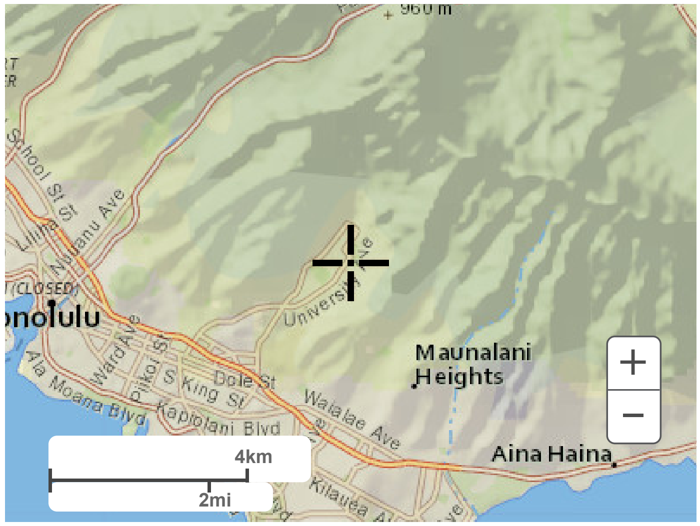

NOAA Atlas 14, Volume 4, Version 3

Created (GMT): Wed Jul 27 02:32:16 2022

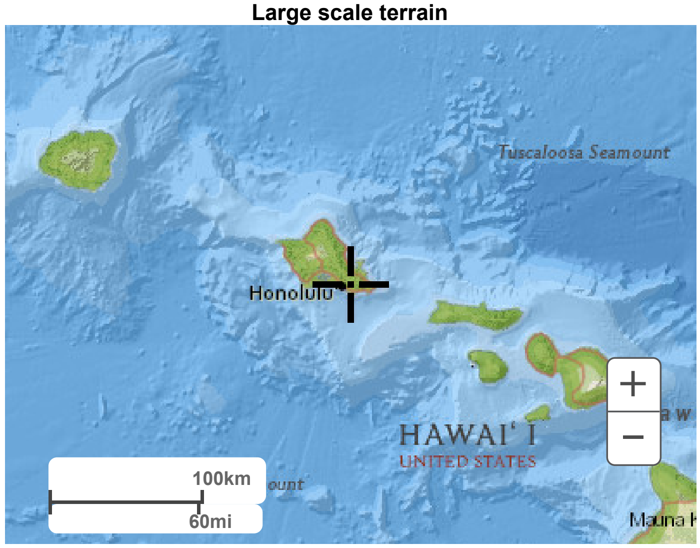
Back to Top

## Maps & aerials

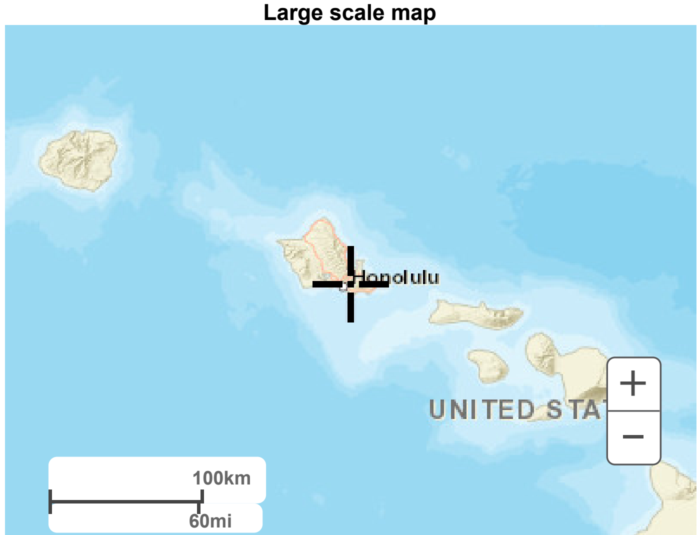
### Small scale terrain




**Large scale terrain**




**Large scale map**




**Large scale aerial**


Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

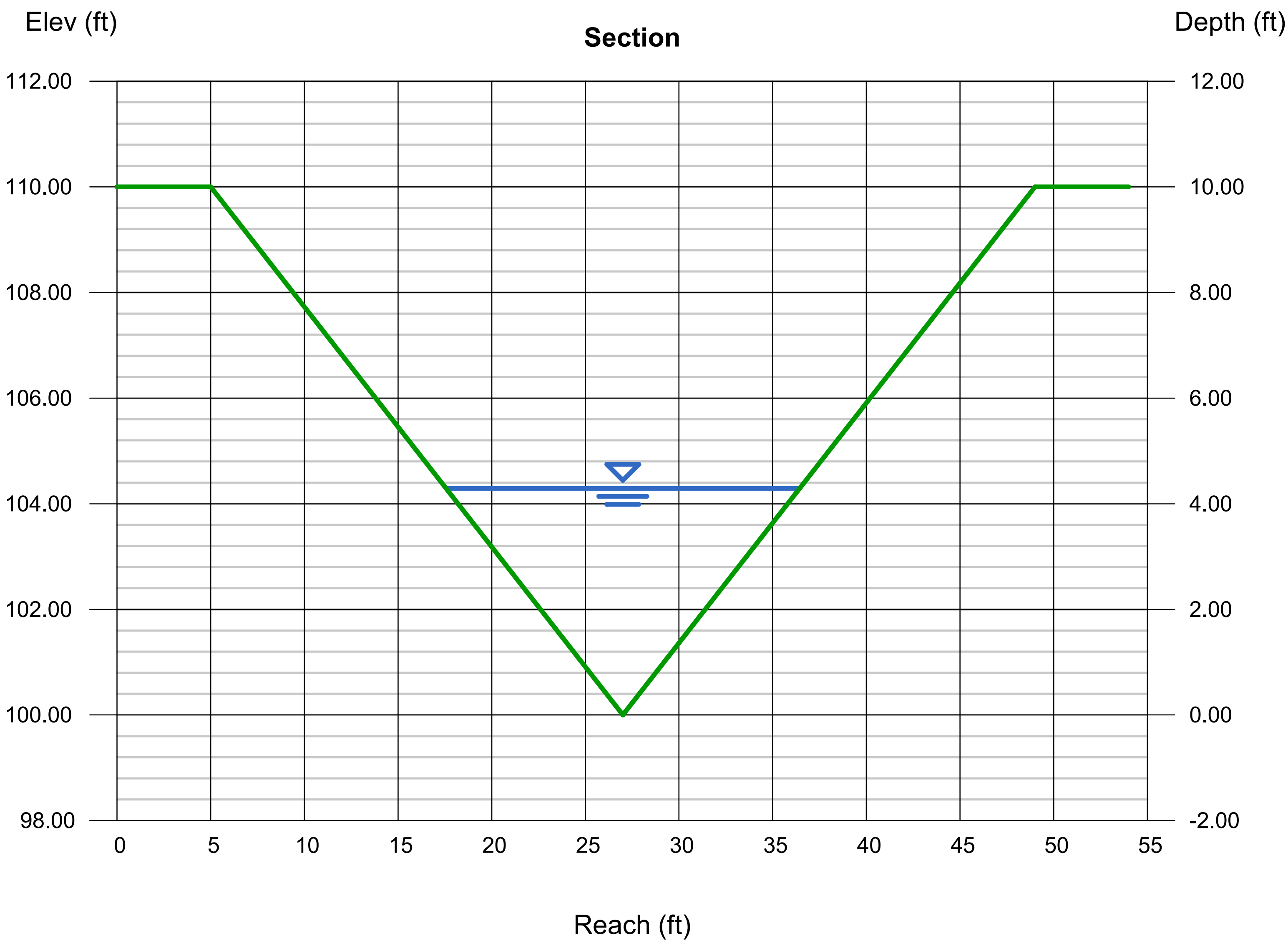
Disclaimer

# Channel Report



## Woodlawn Ditch Q10

| | | | |
|---|---|---|---|
| **Triangular** | | **Highlighted** | |
| Side Slopes (z:1) | = 2.20, 2.20 | Depth (ft) | = 4.29 |
| Total Depth (ft) | = 10.00 | Q (cfs) | = 600.00 |
| | | Area (sqft) | = 40.49 |
| Invert Elev (ft) | = 100.00 | Velocity (ft/s) | = 14.82 |
| Slope (%) | = 5.00 | Wetted Perim (ft) | = 20.73 |
| N-Value | = 0.035 | Crit Depth, Yc (ft) | = 5.41 |
| | | Top Width (ft) | = 18.88 |
| **Calculations** | | EGL (ft) | = 7.70 |
| Compute by: | Known Q | | |
| Known Q (cfs) | = 600.00 | | |

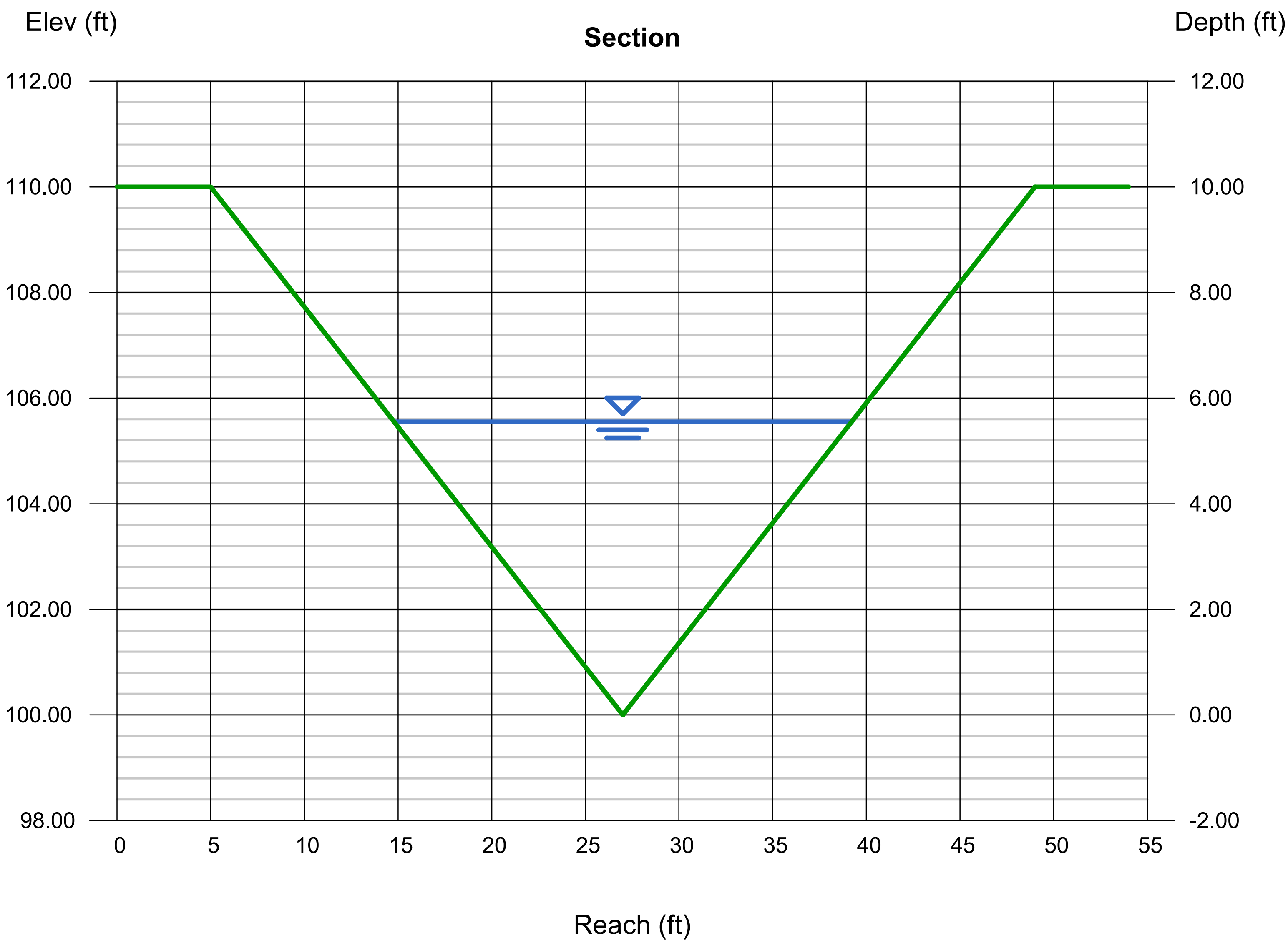


# Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Sep 8 2022

## Woodlawn Ditch Q100

| | | | |
|---|---|---|---|
| **Triangular** | | **Highlighted** | |
| Side Slopes (z:1) | = 2.20, 2.20 | Depth (ft) | = 5.55 |
| Total Depth (ft) | = 10.00 | Q (cfs) | = 1,190 |
| | | Area (sqft) | = 67.77 |
| Invert Elev (ft) | = 100.00 | Velocity (ft/s) | = 17.56 |
| Slope (%) | = 5.00 | Wetted Perim (ft) | = 26.82 |
| N-Value | = 0.035 | Crit Depth, Yc (ft) | = 7.12 |
| | | Top Width (ft) | = 24.42 |
| **Calculations** | | EGL (ft) | = 10.34 |
| Compute by: | Known Q | | |
| Known Q (cfs) | = 1190.00 | | |



# Sample BMP Sizing Worksheet: Vegetated Bio-Filter

**Worksheet No.** 1

**Project:** Manoa Bayan Court (Drainage Management Area for B1) **Date:** Sep-22

| | | |
|---|---|---|
| **1. Water Quality Volume** | | |
| a. BMP Tributary Drainage Area, **A** | 1.70 | ac |
| b. % Impervious Area, **I** | 72.0 | % |
| c. Water Quality Design Storm Depth, **P** | 1.5 | in |
| d. Volumetric Runoff Coefficient, **C** | 0.70 | |
| e. Water Quality Volume, **WQV** | 6,461 | cu-ft |
| **2. Filter Bed Surface Area** | | |
| a. Planting Media Depth, $\mathbf{l_m}$ (2.0 - 4.0 ft) | 2.0 | ft |
| b. Maximum Ponding Depth, $\mathbf{d_p}$ (max 12 in) | 6.0 | in |
| c. Planting Media Coefficient of Permeability, **k** | 1 | ft/day |
| d. Filter Bed Drain Time, **t** | 48 | hrs |
| e. Filter Bed Surface Area, $\mathbf{A_{BMP}}$ | 2,872 | sq-ft |
| **3. BMP Area** | | |
| a. Side Slopes (length per unit height), **z** | 0 | ft/ft |
| b. Freeboard, **f** | 0.5 | ft |
| c. Filter Bed Width, $\mathbf{w_b}$ | 5.0 | ft |
| d. Filter Bed Length, $\mathbf{l_b}$ | 574.3 | ft |
| e. Top Width, $\mathbf{w_t}$ | 5.0 | ft |
| f. Top Length, $\mathbf{l_t}$ | 574.3 | ft |
| g. Min. Top Surface Area excluding pretreatment, $\mathbf{A_{BMP}}$ | 2,872 | sq-ft |

# APPENDIX C

# Detention System Hydrographs

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 4.414 | 1 | 12 | 3,178 | ------ | ------ | ------ | Basin B1 - Existing |
| 2 | Rational | 8.219 | 1 | 8 | 3,945 | ------ | ------ | ------ | Basin B1 - Proposed |
| 3 | Reservoir | 3.756 | 1 | 14 | 4,064 | 2 | 101.58 | 1,770 | Basin B1 - Detention |
| 4 | Rational | 7.569 | 1 | 10 | 4,541 | ------ | ------ | ------ | Basin B2 - Existing |
| 5 | Rational | 12.06 | 1 | 7 | 5,064 | ------ | ------ | ------ | Basin B2 - Proposed |
| 6 | Reservoir | 5.182 | 1 | 14 | 5,465 | 5 | 102.56 | 2,022 | Basin B2 - Detention |
| 7 | Rational | 5.193 | 1 | 12 | 3,739 | ------ | ------ | ------ | Basin C2 - Existing |
| 8 | Rational | 10.05 | 1 | 7 | 4,220 | ------ | ------ | ------ | Basin C2 - Proposed |
| 9 | Reservoir | 4.082 | 1 | 15 | 5,397 | 8 | 101.78 | 2,869 | Basin C2 - Detention |
| 10 | Rational | 1.366 | 1 | 9 | 737 | ------ | ------ | ------ | Basin C3 - Existing |
| 11 | Rational | 2.732 | 1 | 5 | 820 | ------ | ------ | ------ | Basin C3 - Proposed |
| 12 | Reservoir | 0.925 | 1 | 8 | 818 | 11 | 101.86 | 472 | Basin C3 - Detention |
| 13 | Rational | 4.830 | 1 | 12 | 3,478 | ------ | ------ | ------ | Basin D2 - Existing |
| 14 | Rational | 10.05 | 1 | 7 | 4,220 | ------ | ------ | ------ | Basin D2 - Proposed |
| 15 | Reservoir | 4.638 | 1 | 11 | 4,216 | 14 | 102.15 | 2,113 | Basin D2 - Detention |
| 16 | Rational | 2.664 | 1 | 10 | 1,599 | ------ | ------ | ------ | Basin E - Existing |
| 17 | Rational | 4.522 | 1 | 7 | 1,899 | ------ | ------ | ------ | Basin E - Proposed |
| 18 | Reservoir | 0.963 | 1 | 13 | 1,894 | 17 | 102.01 | 1,394 | Basin E - Detention |

| | | |
|---|---|---|
| MBC_Hydraflow.gpw | Return Period: 10 Year | Wednesday, 09 / 21 / 2022 |

# Multi-Hydrograph Plot

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4

### Hyd. No. 1

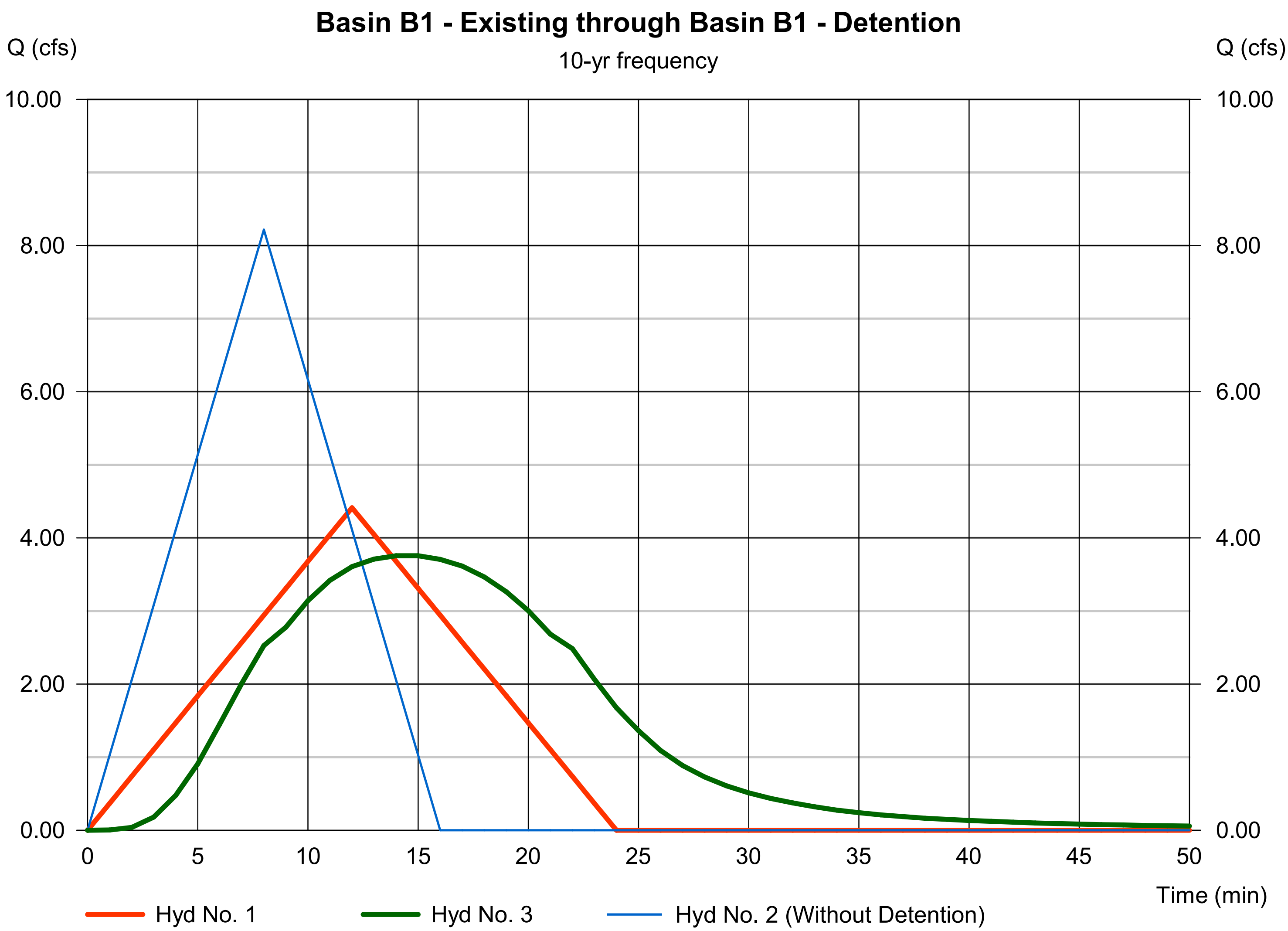
Basin B1 - Existing

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 4.414 cfs |
| Time to peak | = | 12 min |
| Hyd. Volume | = | 3,178 cuft |

### Hyd. No. 3

Basin B1 - Detention

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 3.76 cfs |
| Time to peak | = | 14 min |
| Hyd. Volume | = | 4,064 cuft |
| Storage Volume | = | 1,770 cuft |



# Multi-Hydrograph Plot

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4

## Hyd. No. 4

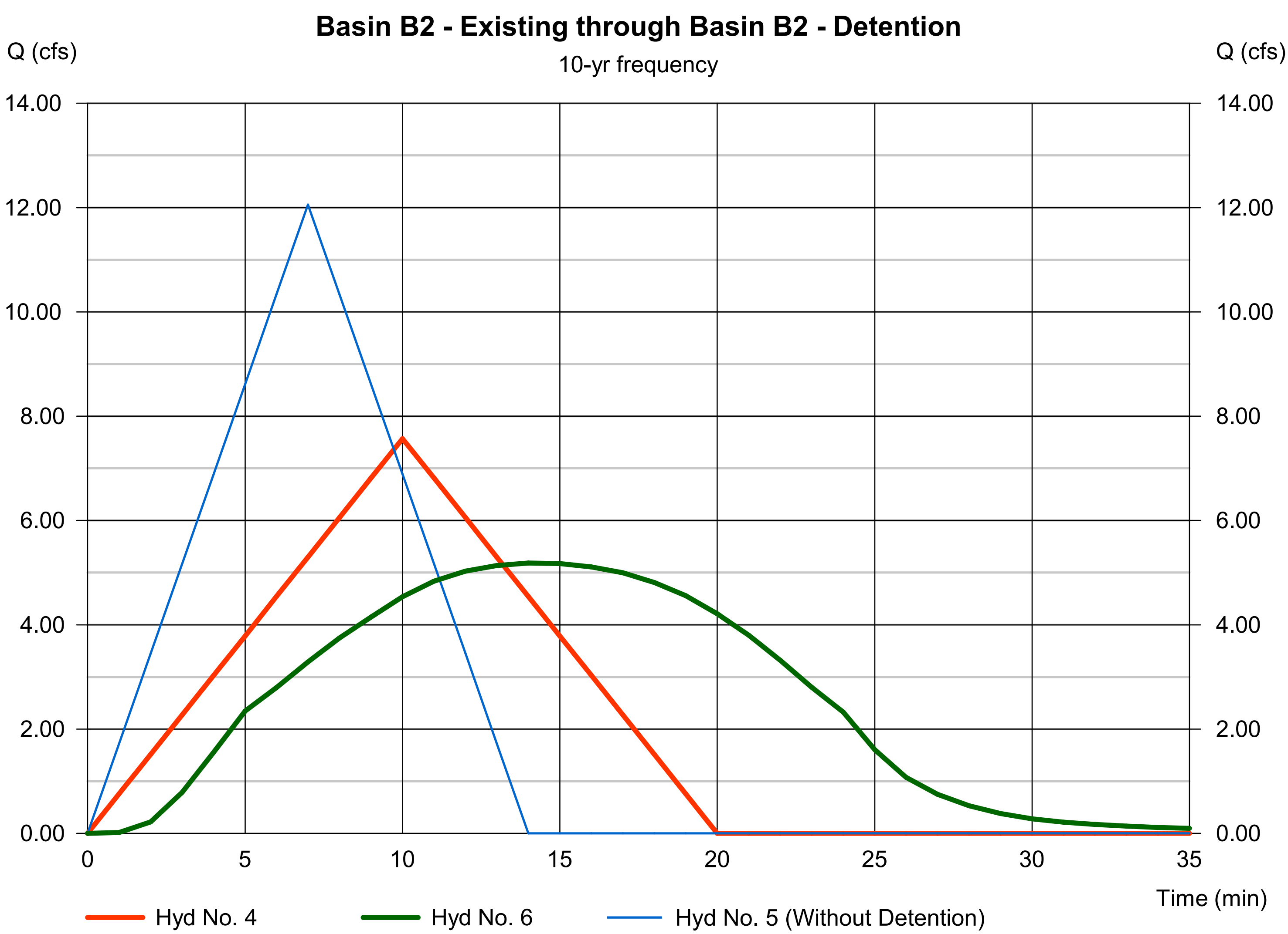
Basin B2 - Existing

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 7.569 cfs |
| Time to peak | = | 10 min |
| Hyd. Volume | = | 4,541 cuft |

## Hyd. No. 6

Basin B2 - Detention

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 5.18 cfs |
| Time to peak | = | 14 min |
| Hyd. Volume | = | 5,465 cuft |
| Storage Volume | = | 2,022 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 7

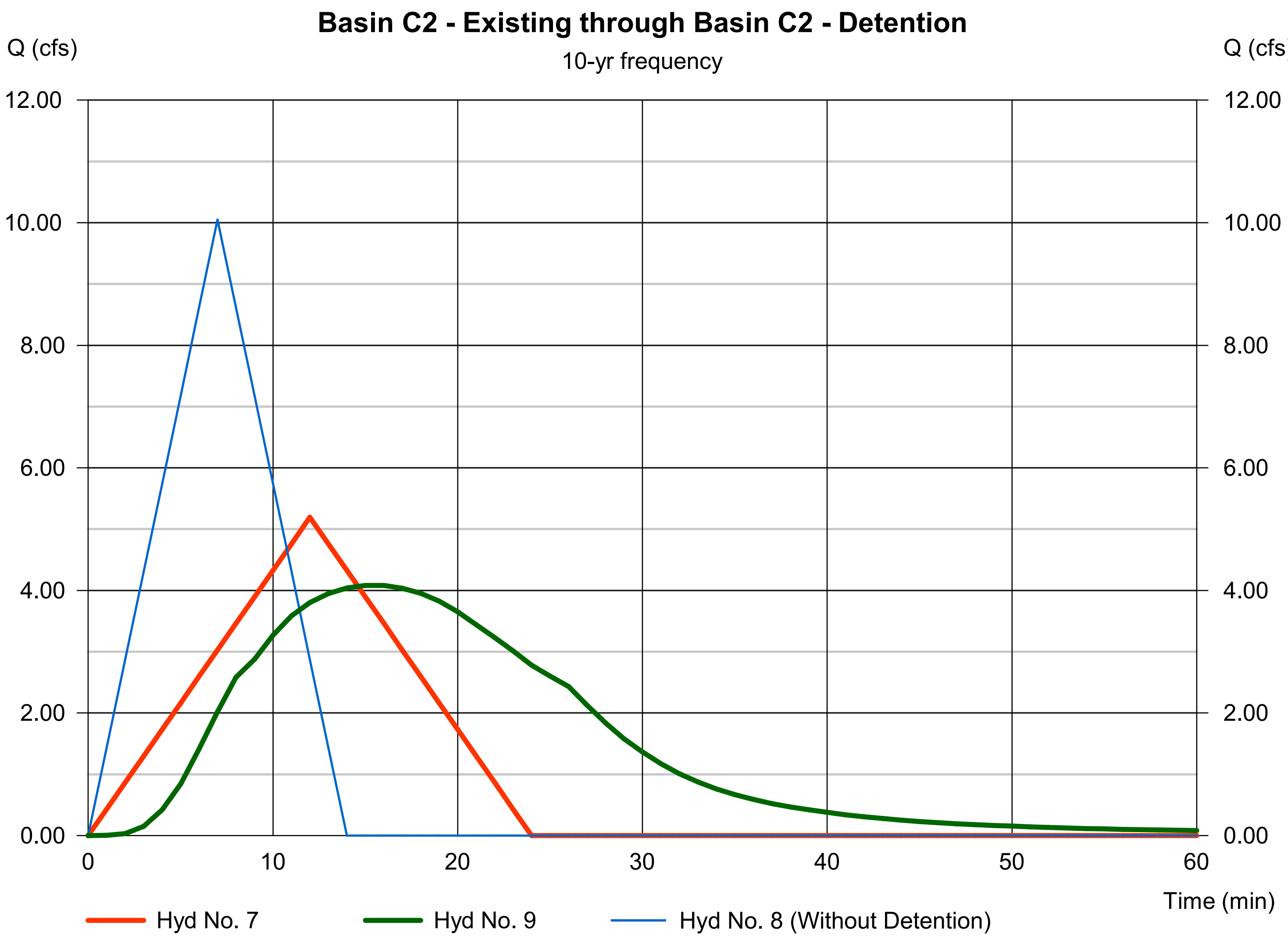
Basin C2 - Existing

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 5.193 cfs |
| Time to peak | = | 12 min |
| Hyd. Volume | = | 3,739 cuft |

## Hyd. No. 9

Basin C2 - Detention

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 4.08 cfs |
| Time to peak | = | 15 min |
| Hyd. Volume | = | 5,397 cuft |
| Storage Volume | = | 2,869 cuft |



# Multi-Hydrograph Plot

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4

**Hyd. No. 10**

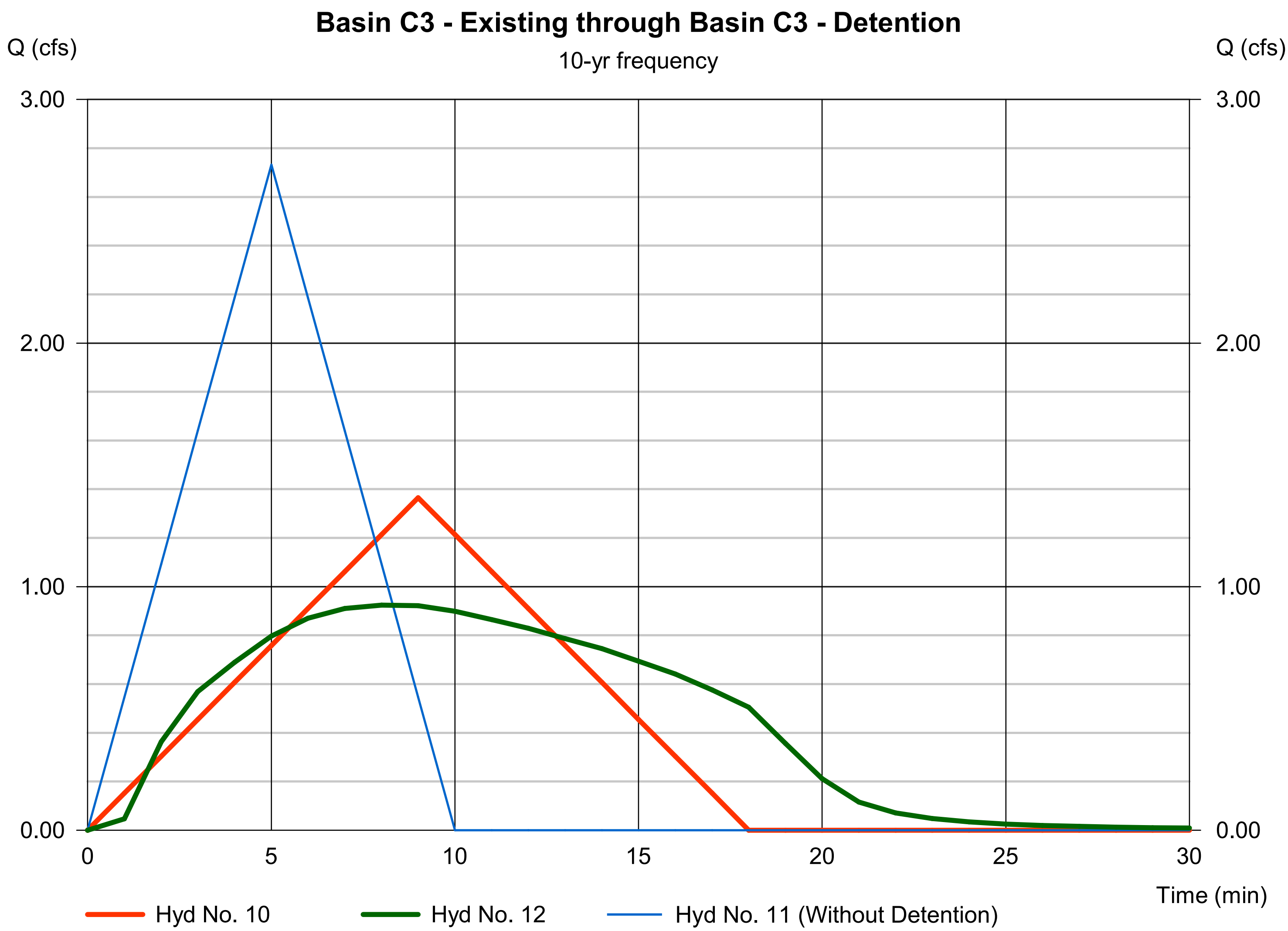
Basin C3 - Existing

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 1.366 cfs |
| Time to peak | = | 9 min |
| Hyd. Volume | = | 737 cuft |

**Hyd. No. 12**

Basin C3 - Detention

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 0.92 cfs |
| Time to peak | = | 8 min |
| Hyd. Volume | = | 818 cuft |
| Storage Volume | = | 472 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 13

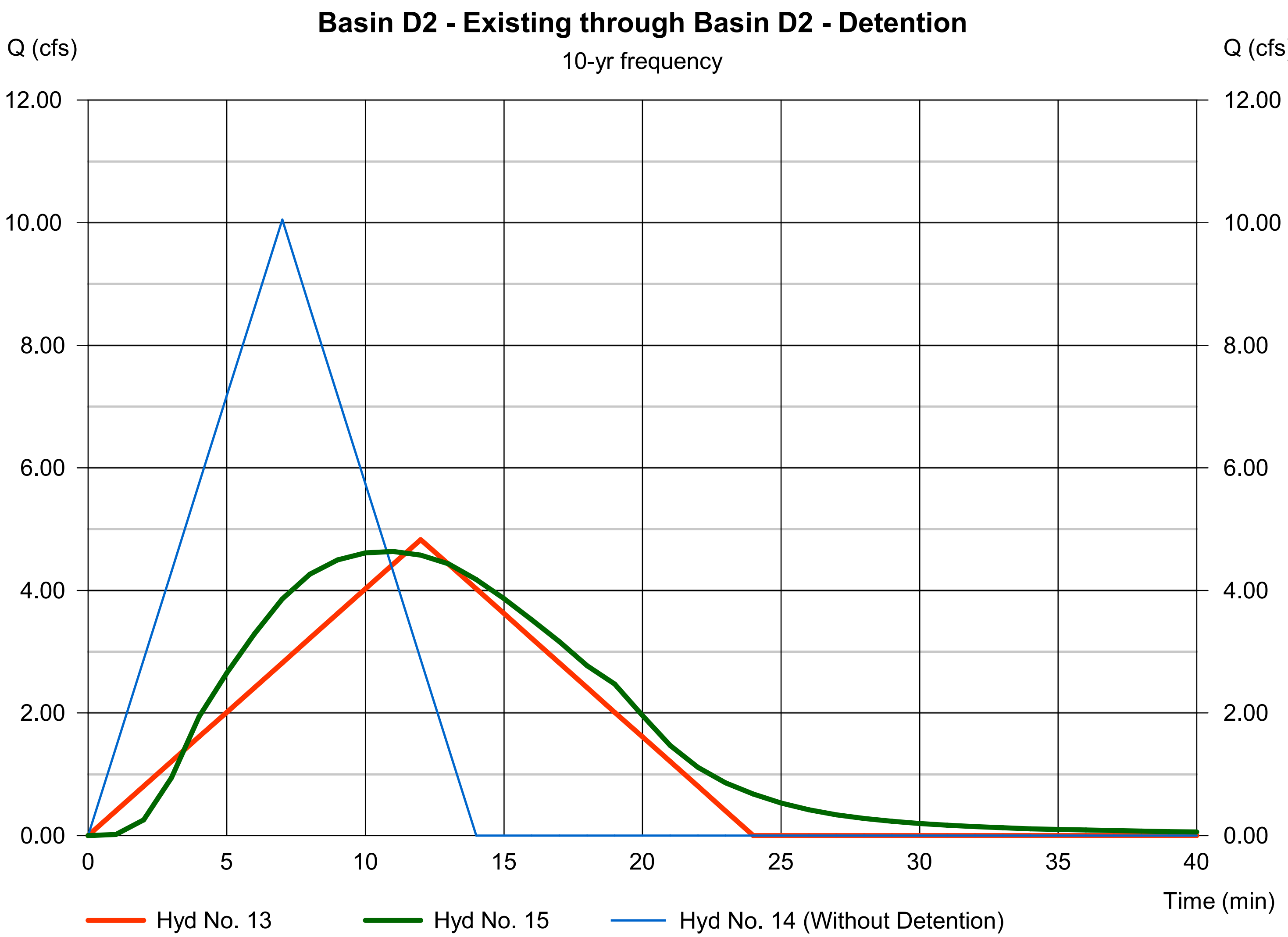
Basin D2 - Existing

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 4.830 cfs |
| Time to peak | = | 12 min |
| Hyd. Volume | = | 3,478 cuft |

## Hyd. No. 15

Basin D2 - Detention

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 4.64 cfs |
| Time to peak | = | 11 min |
| Hyd. Volume | = | 4,216 cuft |
| Storage Volume | = | 2,113 cuft |



# Multi-Hydrograph Plot

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4

## Hyd. No. 16

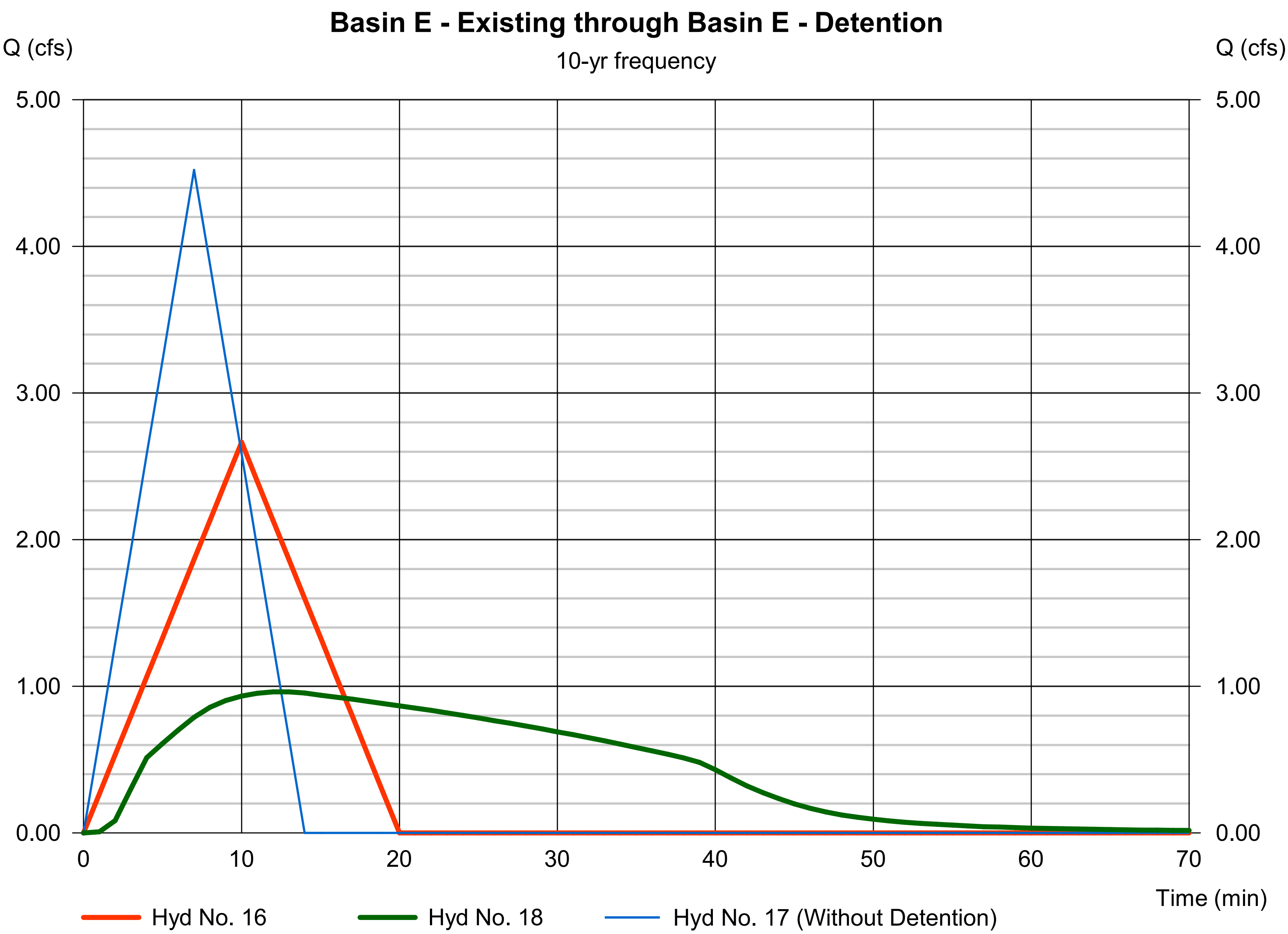
Basin E - Existing

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 2.664 cfs |
| Time to peak | = | 10 min |
| Hyd. Volume | = | 1,599 cuft |

## Hyd. No. 18

Basin E - Detention

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 0.96 cfs |
| Time to peak | = | 13 min |
| Hyd. Volume | = | 1,894 cuft |
| Storage Volume | = | 1,394 cuft |



# Pond Report



### Pond No. 1 - Basin B1 Dentetion Pond

### Pond Data

**Trapezoid -** Bottom L x W = 20.0 x 40.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 3.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 100.00 | 800 | 0 | 0 |
| 0.30 | 100.30 | 911 | 257 | 257 |
| 0.60 | 100.60 | 1,029 | 291 | 547 |
| 0.90 | 100.90 | 1,153 | 327 | 875 |
| 1.20 | 101.20 | 1,284 | 365 | 1,240 |
| 1.50 | 101.50 | 1,421 | 406 | 1,645 |
| 1.80 | 101.80 | 1,565 | 448 | 2,093 |
| 2.10 | 102.10 | 1,715 | 492 | 2,585 |
| 2.40 | 102.40 | 1,871 | 538 | 3,123 |
| 2.70 | 102.70 | 2,034 | 586 | 3,708 |
| 3.00 | 103.00 | 2,204 | 636 | 4,344 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 12.00 | Inactive | Inactive | Inactive |
| **Span (in)** | = 12.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 100.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 50.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .013 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | Inactive | Inactive | Inactive | Inactive |
| **Crest El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = --- | --- | --- | --- |
| **Multi-Stage** | = No | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)
**TW Elev. (ft)** = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

### Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0 | 100.00 | 0.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.000 |
| 0.30 | 257 | 100.30 | 0.37 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.371 |
| 0.60 | 547 | 100.60 | 1.30 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1.299 |
| 0.90 | 875 | 100.90 | 2.41 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2.405 |
| 1.20 | 1,240 | 101.20 | 3.02 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3.020 |
| 1.50 | 1,645 | 101.50 | 3.61 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3.609 |
| 1.80 | 2,093 | 101.80 | 4.11 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4.115 |
| 2.10 | 2,585 | 102.10 | 4.57 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4.565 |
| 2.40 | 3,123 | 102.40 | 4.97 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4.975 |
| 2.70 | 3,708 | 102.70 | 5.35 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5.353 |
| 3.00 | 4,344 | 103.00 | 5.71 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5.706 |

# Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 09 / 8 / 2022

## Pond No. 2 - Basin B2 Dentetion Pond

## Pond Data

**Trapezoid -** Bottom L x W = 20.0 x 20.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 4.00 ft

## Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 100.00 | 400 | 0 | 0 |
| 0.40 | 100.40 | 502 | 180 | 180 |
| 0.80 | 100.80 | 615 | 223 | 403 |
| 1.20 | 101.20 | 740 | 271 | 674 |
| 1.60 | 101.60 | 876 | 323 | 996 |
| 2.00 | 102.00 | 1,024 | 380 | 1,376 |
| 2.40 | 102.40 | 1,183 | 441 | 1,817 |
| 2.80 | 102.80 | 1,354 | 507 | 2,324 |
| 3.20 | 103.20 | 1,537 | 578 | 2,902 |
| 3.60 | 103.60 | 1,731 | 653 | 3,555 |
| 4.00 | 104.00 | 1,936 | 733 | 4,288 |

## Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 12.00 | Inactive | Inactive | Inactive |
| **Span (in)** | = 12.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 100.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 50.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .013 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

## Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | Inactive | Inactive | Inactive | Inactive |
| **Crest El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = --- | --- | --- | --- |
| **Multi-Stage** | = No | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)

**TW Elev. (ft)** = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

## Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0 | 100.00 | 0.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.000 |
| 0.40 | 180 | 100.40 | 0.63 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.632 |
| 0.80 | 403 | 100.80 | 2.05 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2.052 |
| 1.20 | 674 | 101.20 | 3.02 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3.020 |
| 1.60 | 996 | 101.60 | 3.79 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3.785 |
| 2.00 | 1,376 | 102.00 | 4.42 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4.420 |
| 2.40 | 1,817 | 102.40 | 4.97 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4.975 |
| 2.80 | 2,324 | 102.80 | 5.47 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5.473 |
| 3.20 | 2,902 | 103.20 | 5.93 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5.930 |
| 3.60 | 3,555 | 103.60 | 6.35 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 6.354 |
| 4.00 | 4,288 | 104.00 | 6.75 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 6.752 |

# Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 09 / 8 / 2022

### Pond No. 3 - Basin C2 Dentetion Pond

### Pond Data

**Trapezoid -** Bottom L x W = 40.0 x 30.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 3.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 100.00 | 1,200 | 0 | 0 |
| 0.30 | 100.30 | 1,329 | 379 | 379 |
| 0.60 | 100.60 | 1,465 | 419 | 798 |
| 0.90 | 100.90 | 1,607 | 461 | 1,259 |
| 1.20 | 101.20 | 1,756 | 504 | 1,763 |
| 1.50 | 101.50 | 1,911 | 550 | 2,313 |
| 1.80 | 101.80 | 2,073 | 597 | 2,910 |
| 2.10 | 102.10 | 2,241 | 647 | 3,557 |
| 2.40 | 102.40 | 2,415 | 698 | 4,255 |
| 2.70 | 102.70 | 2,596 | 752 | 5,007 |
| 3.00 | 103.00 | 2,784 | 807 | 5,814 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 12.00 | Inactive | Inactive | Inactive |
| **Span (in)** | = 12.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 100.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 50.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .013 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | Inactive | Inactive | Inactive | Inactive |
| **Crest El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = --- | --- | --- | --- |
| **Multi-Stage** | = No | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)

**TW Elev. (ft)** = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

### Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0 | 100.00 | 0.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.000 |
| 0.30 | 379 | 100.30 | 0.37 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.371 |
| 0.60 | 798 | 100.60 | 1.30 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1.299 |
| 0.90 | 1,259 | 100.90 | 2.41 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2.405 |
| 1.20 | 1,763 | 101.20 | 3.02 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3.020 |
| 1.50 | 2,313 | 101.50 | 3.61 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3.609 |
| 1.80 | 2,910 | 101.80 | 4.11 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4.115 |
| 2.10 | 3,557 | 102.10 | 4.57 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4.565 |
| 2.40 | 4,255 | 102.40 | 4.97 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4.975 |
| 2.70 | 5,007 | 102.70 | 5.35 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5.353 |
| 3.00 | 5,814 | 103.00 | 5.71 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5.706 |

# Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 — Wednesday, 09 / 21 / 2022

## Pond No. 4 - Basin C3 Dentetion Pond

## Pond Data

**Trapezoid -** Bottom L x W = 10.0 x 10.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 3.00 ft

## Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 100.00 | 100 | 0 | 0 |
| 0.30 | 100.30 | 139 | 36 | 36 |
| 0.60 | 100.60 | 185 | 48 | 84 |
| 0.90 | 100.90 | 237 | 63 | 147 |
| 1.20 | 101.20 | 296 | 80 | 227 |
| 1.50 | 101.50 | 361 | 98 | 325 |
| 1.80 | 101.80 | 433 | 119 | 444 |
| 2.10 | 102.10 | 511 | 141 | 586 |
| 2.40 | 102.40 | 595 | 166 | 751 |
| 2.70 | 102.70 | 686 | 192 | 944 |
| 3.00 | 103.00 | 784 | 220 | 1,164 |

## Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 6.00 | Inactive | Inactive | Inactive |
| **Span (in)** | = 6.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 100.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 50.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .013 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

## Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | Inactive | Inactive | Inactive | Inactive |
| **Crest El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = --- | --- | --- | --- |
| **Multi-Stage** | = No | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)

**TW Elev. (ft)** = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

## Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0 | 100.00 | 0.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.000 |
| 0.30 | 36 | 100.30 | 0.23 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.230 |
| 0.60 | 84 | 100.60 | 0.53 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.525 |
| 0.90 | 147 | 100.90 | 0.64 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.644 |
| 1.20 | 227 | 101.20 | 0.74 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.743 |
| 1.50 | 325 | 101.50 | 0.83 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.831 |
| 1.80 | 444 | 101.80 | 0.91 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.910 |
| 2.10 | 586 | 102.10 | 0.98 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.983 |
| 2.40 | 751 | 102.40 | 1.05 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1.051 |
| 2.70 | 944 | 102.70 | 1.11 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1.115 |
| 3.00 | 1,164 | 103.00 | 1.17 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1.175 |

# Pond Report



## Pond No. 5 - Basin D2 Dentetion Pond

## Pond Data

**Trapezoid -** Bottom L x W = 20.0 x 30.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 4.00 ft

## Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 100.00 | 600 | 0 | 0 |
| 0.40 | 100.40 | 726 | 265 | 265 |
| 0.80 | 100.80 | 863 | 317 | 582 |
| 1.20 | 101.20 | 1,012 | 375 | 957 |
| 1.60 | 101.60 | 1,172 | 436 | 1,393 |
| 2.00 | 102.00 | 1,344 | 503 | 1,896 |
| 2.40 | 102.40 | 1,527 | 574 | 2,470 |
| 2.80 | 102.80 | 1,722 | 650 | 3,119 |
| 3.20 | 103.20 | 1,929 | 730 | 3,849 |
| 3.60 | 103.60 | 2,147 | 815 | 4,664 |
| 4.00 | 104.00 | 2,376 | 904 | 5,568 |

## Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 12.00 | Inactive | Inactive | Inactive |
| **Span (in)** | = 12.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 100.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 50.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .013 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

## Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | Inactive | Inactive | Inactive | Inactive |
| **Crest El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = --- | --- | --- | --- |
| **Multi-Stage** | = No | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)
**TW Elev. (ft)** = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

## Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0 | 100.00 | 0.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.000 |
| 0.40 | 265 | 100.40 | 0.63 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.632 |
| 0.80 | 582 | 100.80 | 2.05 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2.052 |
| 1.20 | 957 | 101.20 | 3.02 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3.020 |
| 1.60 | 1,393 | 101.60 | 3.79 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3.785 |
| 2.00 | 1,896 | 102.00 | 4.42 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4.420 |
| 2.40 | 2,470 | 102.40 | 4.97 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4.975 |
| 2.80 | 3,119 | 102.80 | 5.47 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5.473 |
| 3.20 | 3,849 | 103.20 | 5.93 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5.930 |
| 3.60 | 4,664 | 103.60 | 6.35 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 6.354 |
| 4.00 | 5,568 | 104.00 | 6.75 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 6.752 |

# Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 09 / 21 / 2022

## Pond No. 6 - Basin E Dentetion Pond

## Pond Data

**Trapezoid -**Bottom L x W = 20.0 x 20.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 3.00 ft

## Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 100.00 | 400 | 0 | 0 |
| 0.30 | 100.30 | 475 | 131 | 131 |
| 0.60 | 100.60 | 557 | 155 | 286 |
| 0.90 | 100.90 | 645 | 180 | 466 |
| 1.20 | 101.20 | 740 | 208 | 674 |
| 1.50 | 101.50 | 841 | 237 | 910 |
| 1.80 | 101.80 | 949 | 268 | 1,179 |
| 2.10 | 102.10 | 1,063 | 302 | 1,480 |
| 2.40 | 102.40 | 1,183 | 337 | 1,817 |
| 2.70 | 102.70 | 1,310 | 374 | 2,191 |
| 3.00 | 103.00 | 1,444 | 413 | 2,604 |

## Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 6.00 | Inactive | Inactive | Inactive |
| **Span (in)** | = 6.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 100.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 50.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .013 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

## Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | Inactive | Inactive | Inactive | Inactive |
| **Crest El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = --- | --- | --- | --- |
| **Multi-Stage** | = No | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)

**TW Elev. (ft)** = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

## Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0 | 100.00 | 0.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.000 |
| 0.30 | 131 | 100.30 | 0.23 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.230 |
| 0.60 | 286 | 100.60 | 0.53 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.525 |
| 0.90 | 466 | 100.90 | 0.64 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.644 |
| 1.20 | 674 | 101.20 | 0.74 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.743 |
| 1.50 | 910 | 101.50 | 0.83 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.831 |
| 1.80 | 1,179 | 101.80 | 0.91 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.910 |
| 2.10 | 1,480 | 102.10 | 0.98 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.983 |
| 2.40 | 1,817 | 102.40 | 1.05 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1.051 |
| 2.70 | 2,191 | 102.70 | 1.11 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1.115 |
| 3.00 | 2,604 | 103.00 | 1.17 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1.175 |

(Recipient)
(Address)

Honolulu, Hawaii 96813

**Pre-Consultation for an Environmental Assessment**
**Proposed Affordable Elderly Rental Housing**
**and Chinese Community Center**

**Lin Yee Chung Association**
**Tax Map Keys: 2-9-043:002 and 2-9-043:003**
**3270 East Mānoa Road**
**Honolulu, Oʻahu, Hawaiʻi**

Dear (addressee)

On behalf of the Lin Yee Chung Association (LYCA), we wish to inform you that the LYCA is proposing to develop an Affordable Rental Multi-Unit Elderly Housing project and redevelopment of the LYCA Memorial Hall on their East Mānoa Road properties in Upper Mānoa, Honolulu, Oʻahu, Hawaiʻi. The project is currently named Mānoa Banyan Court. The Proposed Action is on the undeveloped wooded portion of the Mānoa Chinese Cemetery located adjacent to East Mānoa Road and bifurcated by Woodlawn Ditch (see Location Map). The project is intended to be developed under the 201H Affordable Housing Act with assistance from the Hawaii Housing and Finance Development Corporation (HHFDC). The purpose of this project is to provide affordable rental units for elderly residents of Honolulu in support of policies of the Honolulu General Plan and the Primary Urban Core Development Plan. The location is convenient to nearby recreation and shopping amenities. A community garden area of 1.5 acres is also proposed for a portion of the property for community use. The existing Chinese Memorial Hall located on a separate parcel across from the housing units would be redeveloped as a Chinese Community Center and a Community Wellness Center in partnership with St. Francis Healthcare System both of which would be available to the Manoa Community.

The Proposed Action would consist of a total of 288 one-bedroom rental units arranged in four separated dual courtyard structures of three stories with 72 units each. These are anticipated to be developed in four phases over a 5 to 6 year period.

A small retail component of the proposed Community Center and Wellness Center would be a short walk for the project's residents and nearby neighborhood dwellings. The project is on TheBus route #6 and limited but adequate parking will be provided because not all residents are expected to own personal vehicles. Handicapped parking, bike parking, and car share services would be available for travel to other nearby amenities such as grocery shopping, banks, restaurants, and other services..

Pursuant to Chapter 343, Hawai‘i Revised Statutes, a preliminary Draft Environmental Assessment (EA) is being prepared for this project and subsequently made available for public review. If you wish to provide preliminary input on the project at this time or be a consulted party while the EA is being prepared, please review the attached maps and submit your written comments to the address below by November 30, 2021.

Mr. Charles T.Y. Wong, President
Lin Yee Chung Association
3430 East Mānoa Road
Honolulu, Hawaii 96822

Comments received during this period will be considered in the preparation of the Draft EA. When the Draft EA is completed, it will be published in the Environmental Notice by the Office of Environmental Quality Control (OEQC) for public review and comment.

We thank you for your interest and participation in this project. If you have any questions, please contact the undersigned at (808) 779-6189 or by email at charlestywong@yahoo.com

Sincerely yours,
Lin Yee Chung Association

Charles T.Y. Wong
President

Enclosures:
1. Figure 1. Project Location
2. Figure 2. Conceptual Site Plan

**FIGURE 1 – PROJECT LOCATION MĀNOA BANYAN COURT**

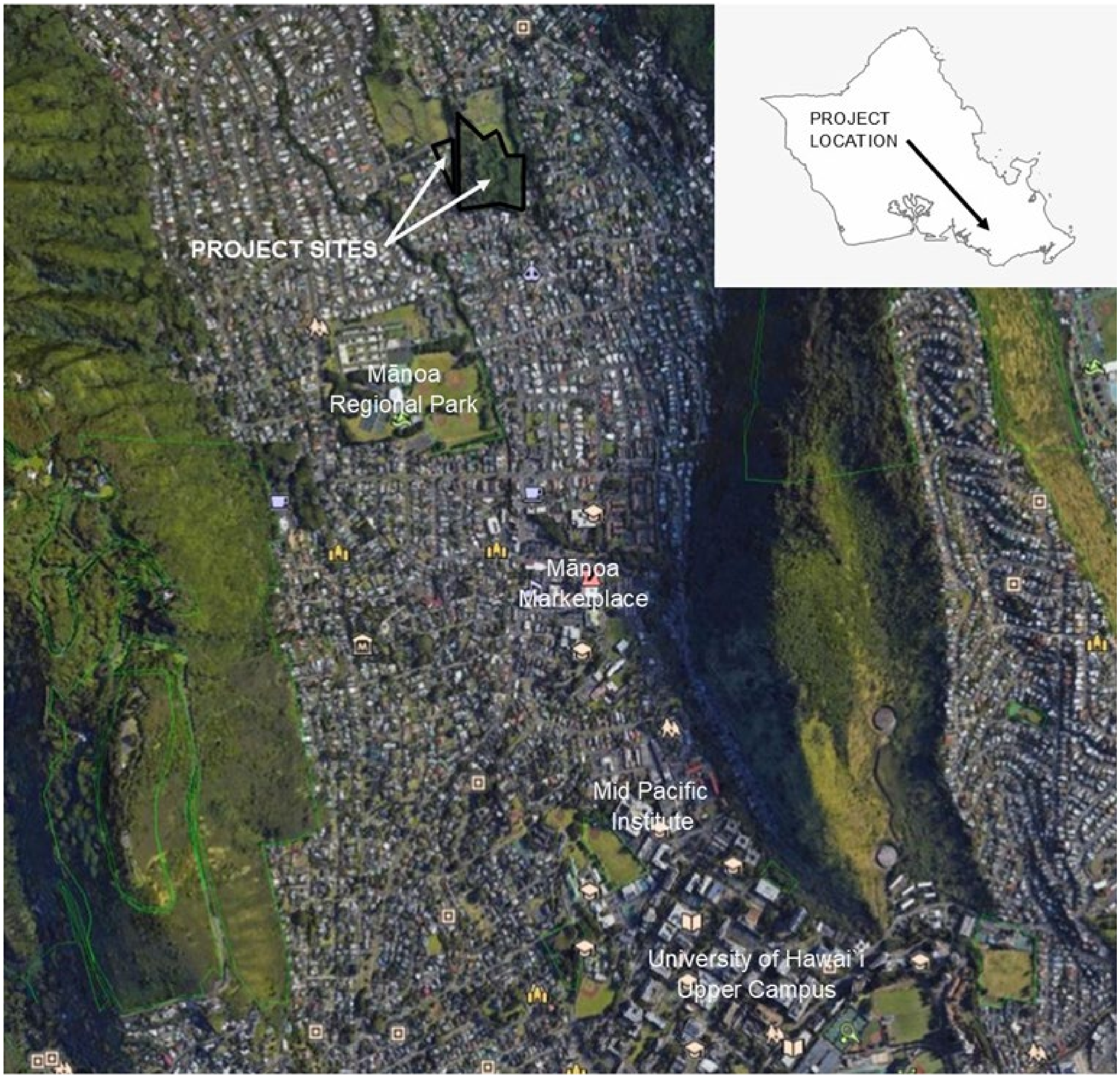


**FIGURE 2 – CONCEPTUAL SITE PLAN**

DEPARTMENT OF PLANNING AND PERMITTING
**CITY AND COUNTY OF HONOLULU**
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

RICK BLANGIARDI
MAYOR

DEAN UCHIDA
DIRECTOR

DAWN TAKEUCHI APUNA
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

September 29, 2021 2021/ELOG-1804(ZS)

Mr. Charles Wong
Lin Yee Chung Association
3430 East Manoa Road
Honolulu, Hawaii 96822

Dear Mr. Wong:

SUBJECT: Pre-Environmental Assessment (EA) Consultation
Chinese Community Center
3270 East Manoa Road - Manoa
Tax Map Keys 2-9-043: 002 and 003

This is in response to your letter, received on September 7, 2021, requesting comments for the above-mentioned EA. The proposed work involves developing affordable housing, a community garden, and redeveloping the existing the Chinese Memorial Hall into a Chinese Community Center with a retail component and a Community Wellness Center. The proposed housing component would consist of four three-story apartment buildings with 72 one-bedroom rental units each, for a total of 288 dwelling units. Our comments are as follows:

- The properties are within the P-2 General Preservation and R-7.5 Residential Districts. The proposed multi-family dwellings and retail establishments in these districts require zoning exemptions through the 201H process. Further zoning exemptions may be required depending on the components of the proposed wellness center.

- The draft EA should discuss how the proposed Project fulfills the objectives and policies of the General Plan (GP) and the proposed revised GP (Resolution No. 20-44), which is currently pending City Council review and approval.

- The draft EA should discuss how the proposed Project fulfills the policies and guidelines of the Primary Urban Center (PUC) Development Plan and how it will assist in fulfilling the long-term vision for the PUC.

- The draft EA should provide more information on the proposed affordable housing (AH), including target area median income households for the AH units, length of affordability, estimated maximum rent, and the city or state agency which will be overseeing and monitoring the AH.

- Please describe how the AH component of the Project meets the eligibility requirements for exemptions through the 201H process, either through the Hawaii Housing Finance and Development Corporation (HHFDC) or the City & County of Honolulu, Department of Planning and Permitting (DPP). Please also indicate whether you will be applying for such exemptions through the HHFDC or the DPP. Submit a separate letter to the DPP confirming eligibility of 201H processing.

Should you have any questions, please contact Zack Stoddard, of our staff, at (808) 768-8019, or zachary.stoddard@honolulu.gov.

Very truly yours,

FOR

Dean Uchida
Director

cc: Charles Wong (Via Email charlestywong@yahoo.com)

DEPARTMENT OF PLANNING AND PERMITTING
**CITY AND COUNTY OF HONOLULU**
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

FILE

RICK BLANGIARDI
MAYOR

DEAN UCHIDA
DIRECTOR

DAWN TAKEUCHI APUNA
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

2022/ED-3(ZS)
CERTIFIED MAIL

NOTICE OF INCOMPLETE ASSESSMENT

| | |
|---|---|
| Subject: | Manoa Banyan Court Draft Environmental Assessment (EA) |
| File No: | 2022/ED-3 |
| Landowner/Applicant: | Lin Yee Chung Association (Charles Wong) |
| Agent: | Sullivan Meheula Lee (Ernest Martin) |
| Location: | 3349, 3355, 3419, and 3430 East Manoa Road - Manoa |
| Tax Map Keys: | 2-9-043: 002 and 003 |
| Received: | March 4, 2022 |
| Request: | A determination of anticipated finding of no significant impact on a Draft EA for 288 new affordable rental multi-family dwelling units for the elderly, a community garden, and a community and wellness center in Manoa. |

---

We have determined that the above Draft EA is **INCOMPLETE**. The following additional information is required, at minimum, to enable the Department of Planning and Permitting to determine whether the Draft EA may be published, and to allow for meaningful public review of the document:

- *Specific income and age requirements for the entire affordable housing component.* Page 18 shows requirements and affordability rates for the first phase of the project (72 units), but such information should be disclosed for all phases.

- *A more thorough analysis of potential impacts on the character of the community.* Page 33 describes the population density of the valley, and page 58 states that the surrounding neighborhood is developed with single-family dwellings. Please disclose exactly how those existing conditions would change, and explain exactly how the proposed apartment buildings, community and wellness center, and commercial uses (retail and office) are consistent with the character of this single-family dwelling neighborhood. The analysis should identify and describe any nearby non-residential development (other than single-family dwellings).

- *A more detailed assessment of visual impacts.* Page 58 mentions views of Waahila Ridge surrounding the valley. It would be helpful to include existing and proposed elevation plans with sight lines of the ridge.

- *A more detailed analysis of flooding and stormwater management.* Page 39 states that Woodlawn Ditch, which runs through the property, is considered "impaired." Please specify the impairments and describe how this proposed Project will maintain or improve its condition.

  Page 40 describes mitigation measures relating to stormwater runoff and erosion during construction. Please also specify how stormwater will be managed on site after construction (e.g., green infrastructure features). This analysis should include calculations showing the proposed new impervious surface area and explain its impacts on stormwater infiltration and velocities.

  Page 43 mentions the ditch is dry most of the year and only has water following heavy rainfall events. It also mentions that appropriate safety measures will be incorporated to minimize flood hazards. The analysis should describe the nature and frequency of these heavy rainfall events, including site drainage patterns, and describe any flooding that occurs in the area. Proposed safety measures should be specified.

  Page 60 mentions that the site was previously considered for a detention basin to help control flooding within the Ala Wai watershed. Page 77 indicates stormwater will be retained on site to the extent possible. Please describe and/or provide plans for specific stormwater retention and management features that will be incorporated into the Project and their effectiveness in assisting with flood control, including retention capacity volumes as compared to total stormwater flow volume during heavy storm events.

  Page 149 lists the Primary Urban Center Development Plan (PUCDP) policy of developing stream greenbelts with public walkways where appropriate. The proposed site plan shows the new apartment buildings in close proximity to the ditch channel. Please show the spatial relationship of the new structures with the banks of the ditch, and discuss the possibility of a greenbelt with a public walkway.

- *A more detailed analysis of noise impacts.* Page 57 describes noise increases from the new residents, and mentions proposed special events three or four times a year at the community center. Please describe the special events that are planned. The analysis states the surrounding thick vegetation will reduce noise from the site. However, the site plans show that development, including parking lots, will extend close to the property lines. Please describe the nature and width of the vegetation to remain along the property lines and its effectiveness in mitigating visual and noise impacts.

- *A complete Traffic Impact Analysis Report prepared by a Traffic Engineer utilizing current data.*

- *The paragraph on page 66 that mentions Table 1 item 4-20, appears incomplete.* It is also not clear whether Woodlawn Ditch is identified as a historic property. Please revise this section for clarification.

- *Analysis of a separate alternative for development of the properties that would comply with the existing zoning and the PUCDP.* Meeting facilities and day-care facilities are permitted with a Conditional Use Permit in the portion of the site that is zoned R-7.5 Residential District. Language schools are permitted without a Conditional Use Permit, so long as specific conditions are met. Would these operations be able to fund the maintenance of the cemetery?

  [Note: A medical clinic, retail store and offices are not permitted in the R-7.5 Residential District.]

  The proposed affordable housing component is within the P-2 General Preservation District. The PUCDP Open Space Map shows this property designated for agricultural areas, golf courses, or cemeteries, and the PUCDP Land Use Map shows the area designated for major parks and open space. You explain that expansion of the cemetery is not possible due to proximity to the ditch, but please also give consideration to agricultural use, a park, or other open space uses. Please consider whether agricultural use such as taro fields could also serve the purpose of retaining flood water to help control flooding within the Ala Wai watershed.

We have enclosed your receipts for the review and processing fees, as well as Check No. 1527. We are processing a refund check for the $1,000 processing fee, which will be mailed to you directly.

The assessment may be resubmitted when it is complete. If the additional analysis reveals potential significant impacts, the document should be resubmitted as an environmental impact statement preparation notice. Should you have any questions, please contact Zack Stoddard, of our Land Use Approval Branch, at (808) 768-8019 or via email zachary.stoddard@honolulu.gov.

for Dean Uchida
Director

Date: March 28, 2022

Note: If you have appointed an agent to represent you, all future correspondence will be with the agent. If you should change agents, please notify the Department of Planning and Permitting immediately.

Enclosures: Receipt Nos. 135385 and 135386
Check No. 1527

OFFICIAL RECEIPT
**DEPARTMENT OF PLANNING AND PERMITTING**
CITY AND COUNTY OF HONOLULU

135385

Date: March 9, 2022

Received From: Lin Yee Chung Association

Two hundred and no/100 DOLLARS

For: 2022/ED-3 app review fee

Tax Map Key: 2-9-043: 002 and 003

$200.00

DEPARTMENT OF PLANNING AND PERMITTING

FHB-Main-✓#1528

---

OFFICIAL RECEIPT
**DEPARTMENT OF PLANNING AND PERMITTING**
CITY AND COUNTY OF HONOLULU

135386

Date: March 9, 2022

Received From: Lin Yee Chung Association

One thousand and no/100 DOLLARS

For: 2022/ED-3 processing fee

Tax Map Key: 2-9-043: 002 and 003

$1,000.00

DEPARTMENT OF PLANNING AND PERMITTING

FHB-Main-✓#1536

7020 3160 0000 7736 9210

**U.S. Postal Service™**
**CERTIFIED MAIL® RECEIPT**
*Domestic Mail Only*

For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

Certified Mail Fee
$

Extra Services & Fees *(check box, add fee as appropriate)*
- ☐ Return Receipt (hardcopy) $
- ☐ Return Receipt (electronic) $
- ☐ Certified Mail Restricted Delivery $
- ☐ Adult Signature Required $
- ☐ Adult Signature Restricted Delivery $

Postage

Postmark Here

Mr. Ernest Y. Martin
733 Bishop Street, Suite 200
Honolulu, Hawaii 96813

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

**STATE OF HAWAII**
**DEPARTMENT OF LAND AND NATURAL RESOURCES**
**LAND DIVISION**

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 14, 2021

LD 1036

Charles T.Y. Wong, President
Lin Yee Chung Association
3270 East Manoa Road
Honolulu, HI 96822

*Via email: charlestywong@yahoo.com*

Dear Mr. Wong:

SUBJECT: **Pre-Consultation for an Environmental Assessment**
**Proposed Affordable Elderly Rental Housing**
**3270 East Manoa Road, Honolulu, Island of O'ahu, Hawai'i**
**TMK: (1) 2-9-043:002 and 003**

Thank you for the opportunity to review and comment on the subject project. The Land Division of the Department of Land and Natural Resources (DLNR) distributed copies of your request to various DLNR divisions, as indicated on the attached, for their review and comment.

Attached are comments received from our (a) Engineering Division and (b) Division of Forestry and Wildlife. Should you have any questions, please feel free to contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Attachments

Cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

**STATE OF HAWAII**
**DEPARTMENT OF LAND AND NATURAL RESOURCES**
**LAND DIVISION**

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 27, 2021

LD 1036

**MEMORANDUM**

FROM:
~~TO:~~ **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: rubyrosa.t.terrago@hawaii.gov)*
__Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
__Office of Conservation & Coastal Lands
X Land Division – Oahu District *(via email: barry.w.cheung@hawaii.gov)*

TO:
~~FROM:~~ Russell Y. Tsuji, Land Administrator Russell Tsuji

SUBJECT: **Pre-Consultation for Environmental Assessment, Proposed Affordable Elderly Rental Housing, Chinese Community Center**

LOCATION: 3349, 3355, 3419 E. Manoa Road, Honolulu, Island of Oahu, Hawaii
TMK: (1) 2-9-043:002 and 2-9-043:003

APPLICANT: **Lin Yee Chung Association**

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **October 13, 2021** to barbara.j.lee@hawaii.gov at the Land Division.

If no response is received by the above due date, we will assume your agency has no comments at this time. Should you have any questions about this request, please contact Barbara Lee at barbara.j.lee@hawaii.gov. Thank you.

**BRIEF COMMENTS:**

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed: [signature]
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Oct 6, 2021

Attachments
Cc: Central Files

**DEPARTMENT OF LAND AND NATURAL RESOURCES**
**ENGINEERING DIVISION**

**LD/Russell Y. Tsuji**
**Ref: Pre-Consultation for Environmental Assessment,**
**Proposed Affordable Elderly Rental Housing, Chinese Community Center**
**Location: 3349, 3355, 3419 E. Manoa Road, Honolulu, Island of Oahu, Hawaii**
**TMK(s): (1) 2-9-043:002 and 2-9-043:003**
**Applicant: Lin Yee Chung Association**

**COMMENTS**

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). Be advised that 44CFR, Chapter 1, Subchapter B, Part 60 reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood zones subject to NFIP requirements are identified on FEMA's Flood Insurance Rate Maps (FIRM). The official FIRMs can be accessed through FEMA's Map Service Center (msc.fema.gov). Our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT) could also be used to research flood hazard information.

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7139.
- Kauai: County of Kauai, Department of Public Works (808) 241-4849.

Signed: ______________________
CARTY S. CHANG, CHIEF ENGINEER

Date: Oct 6, 2021

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

**STATE OF HAWAII**
**DEPARTMENT OF LAND AND NATURAL RESOURCES**
**LAND DIVISION**

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 27, 2021

LD 1036

**MEMORANDUM**

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: rubyrosa.t.terrago@hawaii.gov)*
__Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
__Office of Conservation & Coastal Lands
X Land Division – Oahu District *(via email: barry.w.cheung@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator Russell Tsuji

SUBJECT: **Pre-Consultation for Environmental Assessment, Proposed Affordable Elderly Rental Housing, Chinese Community Center**

LOCATION: 3349, 3355, 3419 E. Manoa Road, Honolulu, Island of Oahu, Hawaii
TMK: (1) 2-9-043:002 and 2-9-043:003

APPLICANT: **Lin Yee Chung Association**

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **October 13, 2021** to barbara.j.lee@hawaii.gov at the Land Division.

If no response is received by the above due date, we will assume your agency has no comments at this time. Should you have any questions about this request, please contact Barbara Lee at barbara.j.lee@hawaii.gov. Thank you.

**BRIEF COMMENTS:**

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✔) Comments are included/attached.

Signed: [signature]
Print Name: DAVID G. SMITH, Administrator
Division: Division of Forestry and Wildlife
Date: Oct 12, 2021

Attachments
Cc: Central Files

**BOARD OF WATER SUPPLY**

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com



March 31, 2021

Mr. Charles Tsu Yew Wong
Lin Yee Chung Association
3430 East Manoa Road
Honolulu, Hawaii 96822

Dear Mr. Wong:

Subject: Your Letter Dated March 5, 2021 Requesting Comments on the Availability of Water for the Proposed 288-Unit 201H Manoa Banyan Court Project on East Manoa Road, Tax Map Key: 2-9-043: 002

Thank you for your letter regarding the proposed 288-unit development.

The existing water system is adequate to accommodate the proposed affordable housing development. However, please be advised that this information is based upon current data, and therefore, the Board of Water Supply (BWS) reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

The applicant will be required to pay our Water System Facilities Charges (WSFC) for resource development, transmission, and daily storage.

BWS may waive the WSFC and new meter costs for qualified on-site affordable and homeless dwelling units, up to 500 dwelling units per year. The waivers will be granted when the building permit is submitted for approval. To qualify, the dwelling units must be certified as either affordable or homeless dwelling units by the appropriate agency of the City and County of Honolulu and the certification provided when the building permit application is submitted for review and approval.

Water conservation measures are required for all proposed developments. These measures include utilization of nonpotable water for irrigation using rain catchment, drought tolerant plants, xeriscape landscaping, efficient irrigation systems, such as a drip system and moisture sensors, and the use of Water Sense labeled ultra-low flow water fixtures and toilets.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

**BOARD OF WATER SUPPLY**

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

September 20, 2021



Mr. Charles T.Y. Wong
Lin Yee Chung Association
3430 East Manoa Road
Honolulu, Hawaii 96822

Dear Mr. Wong:

Subject: Your Letter Dated September 1, 2021 Requesting Comments on the Environmental Assessment Pre-Consultation for the Proposed Affordable Elderly Rental Housing and Chinese Community Center off East Manoa Road – Tax Map Key: 2-9-043: 002 & 003

Thank you for the opportunity to comment on the proposed 288-unit rental unit and Chinese Community Center and Community Wellness Center project.

The existing water system is adequate to accommodate the proposed mixed-use low-rise and commercial development. However, please be advised that this information is based upon current data, and therefore, the Board of Water Supply (BWS) reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

When water is made available, the applicant will be required to pay our Water System Facilities Charges (WSFC) for resource development, transmission, and daily storage.

Water conservation measures are required for all proposed developments. These measures include utilization of nonpotable water for irrigation using rain catchment, drought tolerant plants, xeriscape landscaping, efficient irrigation systems, such as a drip system and moisture sensors, and the use of Water Sense labeled ultra-low flow water fixtures and toilets.

The construction drawings should be submitted for our review and the construction schedule should be coordinated to minimize impact to the water system.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

...questions, please contact Robert Chun, Project Review Branch of our

**BOARD OF WATER SUPPLY**

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

September 20, 2021



Mr. Charles T.Y. Wong
Lin Yee Chung Association
3430 East Manoa Road
Honolulu, Hawaii 96822

Dear Mr. Wong:

Subject: Your Letter Dated September 1, 2021 Requesting Comments on the Environmental Assessment Pre-Consultation for the Proposed Affordable Elderly Rental Housing and Chinese Community Center off East Manoa Road – Tax Map Key: 2-9-043: 002 & 003

Thank you for the opportunity to comment on the proposed 288-unit rental unit and Chinese Community Center and Community Wellness Center project.

The existing water system is adequate to accommodate the proposed mixed-use low-rise and commercial development. However, please be advised that this information is based upon current data, and therefore, the Board of Water Supply (BWS) reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

When water is made available, the applicant will be required to pay our Water System Facilities Charges (WSFC) for resource development, transmission, and daily storage.

Water conservation measures are required for all proposed developments. These measures include utilization of nonpotable water for irrigation using rain catchment, drought tolerant plants, xeriscape landscaping, efficient irrigation systems, such as a drip system and moisture sensors, and the use of Water Sense labeled ultra-low flow water fixtures and toilets.

The construction drawings should be submitted for our review and the construction schedule should be coordinated to minimize impact to the water system.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

...questions, please contact Robert Chun, Project Review Branch of our

DEPARTMENT OF PLANNING AND PERMITTING
**CITY AND COUNTY OF HONOLULU**
650 SOUTH KING STREET * HONOLULU, HAWAII 96813
Phone: (808) 768-8209 * Fax: (808) 768-4210

# SEWER CONNECTION APPLICATION

APPLICATION NO.: **2021/SCA-0236** STATUS: **Approved with conditions**

DATE RECEIVED: **02/12/2021** IWDP APP. NO.:

PROJECT NAME: **2021/SCA-0236 Manoa Banyan Court - 288 New MFD (201H Projec**

**$1,333,785.60**
Estimated Wastewater System Facility Charge*

LOCATION:

| Zone | Section | Plat | Parcel |
|---|---|---|---|
| 2 | 9 | 043 | 002 |

**3349 EAST MANOA RD Honolulu / I** **636,280** Sq. Ft.

SPECIFIC LOCATION: **3349 and 3419 EAST MANOA RD**

APPLICANT: **Charles Tsu Yew Wong**
3430 East Manoa Road
Honolulu, HI 96822

DEVELOPMENT TYPE: **Dwelling, Multi-family** SEWER CONNECTION WORK DESIRED:

OTHER USES:

NON-RESIDENTIAL AREA: s.f. APPROXIMATE DATE OF CONNECTION:

| PROPOSED UNITS | | EXISTING UNITS | | UNITS TO BE DEMOLISHED | |
|---|---|---|---|---|---|
| No. of New Units: | **288** | No. of Existing Units: | **0** | No. of Units to be Demolished: | **0** |
| Studios: | | Studios: | | Studios: | |
| 1-Bedroom: | **288** | 1-Bedroom: | | 1-Bedroom: | |
| 2-Bedroom: | | 2-Bedroom: | | 2-Bedroom: | |
| 3-Bedroom: | | 3-Bedroom: | | 3-Bedroom: | |
| 4-Bedroom: | | 4-Bedroom: | | 4-Bedroom: | |
| 5-Bedroom: | | 5-Bedroom: | | 5-Bedroom: | |
| 6-Bedroom: | | 6-Bedroom: | | 6-Bedroom: | |

REMARKS **Submit construction plans for review and approval if a new sewer lateral will be installed.**

APPROVAL DATE: **02/25/2021**

EXPIRATION DATE: **02/25/2023**

*Valid 2-years after approval date. Construction plans shall be completed and approved within this 2-year period. Construction shall commence within 1-year after approval of plans.*
** Applicable WSFC shall be collected at the prevailing rate in accordance with ROH 1990, Chapter 14, Sections 14-10.3, 14-10.4, 14-10.5 and Appendix 14-D.*

REVIEWED BY: ***Jing Meng***

Site Development Division, Wastewater Branch

ExternalID: **090010453-001** JobId: **90010453**

DEPARTMENT OF PLANNING AND PERMITTING

# CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET * HONOLULU, HAWAII 96813
Phone: (808) 768-8209 * Fax: (808) 768-4210

# SEWER CONNECTION APPLICATION

APPLICATION NO.: **2021/SCA-0236** STATUS: **Approved with conditions**

DATE RECEIVED: **02/12/2021** IWDP APP. NO.:

PROJECT NAME: **2021/SCA-0236 Manoa Banyan Court - 288 New MFD (201H Projec**

**$1,333,785.60**
Estimated Wastewater System Facility Charge*

LOCATION:

| Zone | Section | Plat | Parcel |
|---|---|---|---|
| 2 | 9 | 043 | 002 |

**3349 EAST MANOA RD Honolulu / I** **636,280** Sq. Ft.

SPECIFIC LOCATION: **3349 and 3419 EAST MANOA RD**

APPLICANT: **Charles Tsu Yew Wong**
3430 East Manoa Road
Honolulu, HI 96822

DEVELOPMENT TYPE: **Dwelling, Multi-family**

SEWER CONNECTION WORK DESIRED:

OTHER USES:

NON-RESIDENTIAL AREA: s.f.

APPROXIMATE DATE OF CONNECTION:

| PROPOSED UNITS | EXISTING UNITS | UNITS TO BE DEMOLISHED |
|---|---|---|
| No. of New Units: **288** | No. of Existing Units: **0** | No. of Units to be Demolished: **0** |
| Studios: | Studios: | Studios: |
| 1-Bedroom: **288** | 1-Bedroom: | 1-Bedroom: |
| 2-Bedroom: | 2-Bedroom: | 2-Bedroom: |
| 3-Bedroom: | 3-Bedroom: | 3-Bedroom: |
| 4-Bedroom: | 4-Bedroom: | 4-Bedroom: |
| 5-Bedroom: | 5-Bedroom: | 5-Bedroom: |
| 6-Bedroom: | 6-Bedroom: | 6-Bedroom: |

REMARKS **Submit construction plans for review and approval if a new sewer lateral will be installed.**

APPROVAL DATE: **02/25/2021**

EXPIRATION DATE: **02/25/2023**

*Valid 2-years after approval date. Construction plans shall be completed and approved within this 2-year period. Construction shall commence within 1-year after approval of plans.*
** Applicable WSFC shall be collected at the prevailing rate in accordance with ROH 1990, Chapter 14, Sections 14-10.3, 14-10.4, 14-10.5 and Appendix 14-D.*

REVIEWED BY: ***Jing Meng***

Site Development Division, Wastewater Branch

ExternalID: **090010453-001** JobId: **90010453**

**DEPARTMENT OF DESIGN AND CONSTRUCTION**
**CITY AND COUNTY OF HONOLULU**
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

RICK BLANGIARDI
MAYOR

ALEX KOZLOV, P.E.
DIRECTOR

HAKU MILLES, P.E.
DEPUTY DIRECTOR

September 16, 2021

Mr. Charles T.Y. Wong
President
Lin Yee Chung Association
3430 East Manoa Road
Honolulu, Hawaii 96822

Dear Mr. Wong,

Subject: Pre-Consultation for an Environmental Assessment
Proposed Affordable Elderly Rental Housing Chinese Community Center
Lin Yee Chung Association
Tax Map Keys: 2-9-043:002 and 2-9-043:003
3270 East Manoa Road, Honolulu, Oahu, Hawaii

Thank you for the opportunity to review and comment. The Department of Design and Construction has no comments to offer at this time.

Should you have any further questions, please contact me at 768-8480.

Sincerely,

for Alex Kozlov, P.E.
Director

AK:krn (861698)

October 17, 2022

Mr. Charles Wong
President
Lin Yee Chung Association
3430 East Manoa Road
Honolulu, HI 96822

Dear Mr. Wong:

Re: Manoa Banyan Court
3349, 3355 and 3419 East Manoa Road
Honolulu, HI 96822
TMK: 2-9-043:02

This is in response to your request for a "Will Serve" letter for the above project location.

We have an existing distribution circuit along East Manoa Road that could potentially be used to serve your future project. Please keep in mind that this circuit may need to be upgraded depending on the size of this project's load. At this time, we do not have sufficient information and detailed plans to make this determination.

We request that you keep us informed on the status of your project. As soon as you have detailed plans, please create a Service Request with us, and be sure to allow sufficient time for us to work on the project.

Please let us know if we can be of assistance in any other way. Should you have any questions, please call me at 543-7590.

Sincerely,

Eric Shimono
Supervisor
Transmission and Distribution Engineering Department
Engineering Division

HAWAI'I GAS
THE CLEAN ENERGY COMPANY

July 7, 2022

Mr. Charles Wong
President
Lin Yee Chung Association
3355 East Manoa Road
Honolulu, Hawaii 96822

Re: Manoa Banyan Court
3355 East Manoa Road "Project"

Dear Mr. Wong:

Thank you for sharing information on the proposed "Project". We are excited to be a part of the development and are happy to provide gas service subject to the assumptions stated herein. We understand that the Project will be comprised of water heating, residential ranges, and dryers, and that the projected load is 19,390,800 btu/hr of synthetic natural gas. This will confirm that our current infrastructure in the area is presently adequate to serve the Project.

Please contact Sharon Shigemoto in our Sales Department at 808-594-5534 to coordinate infrastructure details to the building. If you have any questions, please contact me at 808-594-5574.

Sincerely,

Hawaii Gas

Keith K. Yamamoto
Manager, Engineering

KKY:krs

HAWAI'I GAS
THE CLEAN ENERGY COMPANY

July 7, 2022

Mr. Charles Wong
President
Lin Yee Chung Association
3355 East Manoa Road
Honolulu, Hawaii 96822

Re: Manoa Banyan Court
3355 East Manoa Road "Project"

Dear Mr. Wong:

Thank you for sharing information on the proposed "Project". We are excited to be a part of the development and are happy to provide gas service subject to the assumptions stated herein. We understand that the Project will be comprised of water heating, residential ranges, and dryers, and that the projected load is 19,390,800 btu/hr of synthetic natural gas. This will confirm that our current infrastructure in the area is presently adequate to serve the Project.

Please contact Sharon Shigemoto in our Sales Department at 808-594-5534 to coordinate infrastructure details to the building. If you have any questions, please contact me at 808-594-5574.

Sincerely,

Hawaii Gas

Keith K. Yamamoto
Manager, Engineering

KKY:krs

HONOLULU FIRE DEPARTMENT

**CITY AND COUNTY OF HONOLULU**

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

RICK BLANGIARDI
MAYOR

LIONEL CAMARA JR.
ACTING FIRE CHIEF

SHELDON K. HAO
ACTING DEPUTY FIRE CHIEF

September 21, 2021

Mr. Charles T.Y. Wong, President
Lin Yee Chung Association
3430 East Manoa Road
Honolulu, Hawaii 96822

Dear Mr. Wong:

Subject: Pre-consultation for Draft Environmental Assessment
Proposed Affordable Elderly Rental Housing
Chinese Community Center-Lin Yee Chung Association
3355 East Manoa Road
Honolulu, Hawaii 96822
Tax Map Key: 2-9-043: 002

In response to your letter dated September 20, 2021, regarding the abovementioned subject, the Honolulu Fire Department (HFD) reviewed the submitted information and requires that the following be complied with:

1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 feet (46 meters) from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; 2012 Edition, Sections 18.2.3.2.2 and 18.2.3.2.2.1.)

   A fire department access road shall extend to within 50 feet (15 meters) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1; 2012 Edition, Section 18.2.3.2.1.)

2. A water supply approved by the county, capable of supplying the required fire flow for fire protection, shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter

constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet (45,720 millimeters) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ [Authority Having Jurisdiction]. (NFPA 1; 2012 Edition, Section 18.3.1, as amended.)

3. The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. (NFPA 1; 2012 Edition, Sections 18.2.3.4.1.1 and 18.2.3.4.1.2, as amended.)

4. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Battalion Chief Reid Yoshida of our Fire Prevention Bureau at 723-7151 or ryoshida@honolulu.gov.

Sincerely,

JASON SAMALA
Assistant Chief

JS/TC:ns

**Mānoa Neighborhood Board No. 7**
**Resolution Opposing the Manoa Banyan Court Project as Proposed**

WHEREAS, the Mānoa Chinese Cemetery was established in 1851, and is owned and managed by the Lin Yee Chung Association (LYCA); and

WHEREAS, at the February 2, 2022 Mānoa Neighborhood Board meeting, LYCA presented a proposed development project entitled Mānoa Banyan Court (MBC), located on parcels adjacent to the cemetery; and

WHEREAS, the MBC would consist of four (4) residential courtyard buildings, each three (3) stories tall with an approximate footprint of 230' x 130' and 72 dwelling units, creating a total complex of 288 dwelling units ("the residential area"), also containing areas devoted to commercial uses, including meeting halls, classrooms, offices, and a café ("the commercial area"), and would include approximately 185 parking stalls and be available for those of age 55 and older who meet income restrictions; and

WHEREAS, the residential area of MBC development would be built on land currently zoned Preservation (P-2) consisting mostly of heavy vegetation and large trees with a few small structures, and the commercial area would be built on land currently zoned Residential (R-7.5); and

WHEREAS, LYCA seeks exemptions to existing zoning through Hawaii Revised Statutes § 201H-38, to allow it to build medium-density apartments on Preservation (P-2) land and commercial structures on Residential (R-7.5) land; and

WHEREAS, the surrounding neighborhoods to MBC are all zoned Residential (R-7.5 and R-10); and

WHEREAS, in a written communication to Board members, the President of the LYCA stated that due to a dwindling cash flow and income stream, "if no decisive action is taken, the LYCA will go bankrupt within several years' time"; and

WHEREAS, the LYCA presented the MBC project as its preferred solution to its cash flow problems and represented to this Board that the alternative to approval of the project was bankruptcy; and

WHEREAS, the MBC was an agenda item at the February 2, 2022, March 2, 2022 and April 6, 2022 (163 Webex community participants) Manoa Neighborhood Board meetings, at which a substantial majority of residents expressed opposition to MBC; and

WHEREAS, residents opposed to the MBC proposal set up a petition on www.change.org on August 31, 2022 and have collected nearly 3155 signatures; and

WHEREAS, two (2) non-profit organizations and Council Member Calvin Say organized a Manoa Town Hall meeting held on April 30, 2022 that was attended by approximately 300 people to provide the community a chance to express themselves; and

WHEREAS, 30 speakers at the Town Hall testified, 27 opposed the project, 2 didn't express a position, one testifier supported the project, and many supported keeping the area as green space; and

WHEREAS, this Board received 43 letters of testimony from Mānoa residents, 39 expressing opposition to the MBC project, 4 in support of the project; and

WHEREAS, many of these letters argued that there were reasonable alternatives to the project that the LYCA should explore, alternatives which would not require any construction; and

WHEREAS, the City and County of Honolulu's Department of Planning and Permitting in its Notice of Incomplete Assessment, required that the LYCA consider the alternatives of less intrusive construction projects as well as agricultural, park, or other open space uses; now, therefore,

BE IT RESOLVED that the Mānoa Neighborhood Board No. 7 stands in opposition to the Mānoa Banyan Court Project as proposed and encourages the Lin Yee Chung Association to explore alternatives to the proposed project; and

BE IT FURTHER RESOLVED that copies of this resolution be transmitted to the Director and Deputy Director of the Department of Planning and Permitting for the City and County of Honolulu, the Executive Director and Deputy Director of Hawaii Housing Finance & Development Corporation for the State of Hawaii, the Governor of the State of Hawaii, each member of the Hawaii State Legislature, the Mayor of the City and County of Honolulu, and each Councilmember of the City and County of Honolulu.

***The Manoa Neighborhood Board No. 7 PASSED this resolution***
***By MAJORITY vote of 10-0-3***
***at the Wednesday, September 7, 2022 Regular Meeting.***

**Submitted by:** Jeremy K. Hopkins
**Jeremy "Kama" Hopkins, Board Chair**

## LETTER AGAINST FOREST CLEARING FOR MANOA BANYAN COURT

**Dear Manoa Neighborhood Board,**

**There are many reasons to oppose Manoa Banyan Court. From the way it was hidden from the community for as long as possible, to the way almost any community input is ignored by the Cemetery leadership and developers (whose reputations are very concerning) to the radical size and excesses of the project. But I would focus on a few specific points having to do with community safety.**

**The land is zoned as forest preservation with good reason. There is very little absorbent green-space in the valley with most of it paved or lawns (turf-grass does not compare to intact forest in water absorption and retention), and with over 125 inches of annual rainfall across upper Manoa (165 inches at Lyon Arboreutum), and even more upstream, there are frequent intense rainfall events. This is not the same climate as downtown, there are orders of magnitude more rain throughout the year. The forest in that corridor lies right along a drainage and serves to mitigate floods by absorbing intense rainfall falling there *and upstream* which is slowly released into Manoa Stream. Converting essentially all of the forest to roofs and concrete (and turf-grass) will make flooding events more frequent and more intense. This is a fact, not conjecture.**

**The intention of the 201H exemption was to encourage developers to create more low income housing *instead* of high-cost investment properties for out of state investors. The exemption was not intended to allow a mismanaged entity to circumvent important environmentally-based zoning laws to develop forest lands we need for flood mitigation and water quality. Furthermore, during the more frequent droughts caused by climate change, the forest space will hold and release water sustainably into Manoa stream. As more of the valley is paved, extremes will become the norm; floods will become worse and so too will the dry periods. With fewer trees to buffer the water cycle in the Valley it is conceivable that Manoa stream will run dry during droughts - completely changing the ecosystem, wiping out any Native Hawaiian Gobies and other fish, while greatly benefitting the mosquitos which are currently limited by the presence of fish. None of this is hypothetical; the impacts of forest loss are well understood. The addition of a dog park and community garden will not only fail to provide adequate mitigation, they will make things worse: lawns are not able to absorb nearly the water that forest can, nor will they store it during dry periods. The Cemetery needs to think beyond their own, immediate financial needs; there has to be some form of compromise.**

**More low income housing is needed, and a lower density development might be compatible with both the neighborhood and the environmental**

services we need from the forest (like flood abatement) that the zoning originally was made to protect. However, allowing this large-scale development to proceed endangers the community, lowers environmental quality for all, and sets a precedent for the development of any area, regardless of the broader impacts. This proposed development is simply too big and too dense to ignore. Some kinds of zoning restrictions must be maintained for the greater good and public safety.

The only option the Cemetery trust has considered at all is to build affordable housing and avoid the zoning laws, but the proposed high density housing and the additional tree removal for a community garden and a dog park-- when both already exist a mere 5 minute walk away at the Manoa District Park-- is gratuitous destruction of forested land with little concern for the impacts. The forest is needed for *more* than just aesthetics and this plan needs to be moderated to fit in with the environmental needs of the public and the hydrology of the valley. The intent of the affordable housing exemption is to make a dense urban core not to foster urban sprawl destroying neighborhoods and endangering our homes and environment with the elimination of green space along a flood prone area.
- Dan Rubinoff

Get Involved!

Sign the online petition to

**Stop Manoa Banyan Court**

**www.change.org/p/stop-manoa-banyan-court**

Or get more information

at our website

**stopmanoabanyancourt.weebly.com**

# PRESERVE MĀNOA!

What can the Manoa Chinese Cemetery do to raise the funds necessary to maintain its grounds?

- **Sell and/or borrow against the multiple properties owned by the Cemetery that are not being used for burials, such as 3476 East Manoa Road (estimated value: $1.6 million).**

- **Reorganize itself to become a functioning non-profit organization.**
  - o Usie funds generated from property sales or transactions to (1) create an endowment that is professionally managed and (2) hire an Executive Director with fund-raising experience.
  - o Change its bylaws to allow anyone to become a trustee, such as people with relevant management or fund-raising experience.

- **Task the new Executive Director and Officers to raise funds through:**
  - o Reviving and expanding the annual Ching Ming Festival.
  - o Actively seeking donations on a yearly basis from:
    - Chinese societies in Hawaii and elsewhere.
    - Families with loved ones / ancestors buried at the Cemetery.
    - Manoa residents.
  - o Actively applying for federal, state and private grants each year.
  - o Creating a social media presence and on-going fund-raising campaign.

- **Change the Cemetery's business model into that of on-going, active business.**
  - o Request a license change to allow sales of lots before death.
  - o Build a columbarium/niche wall and actively sell spaces in it.

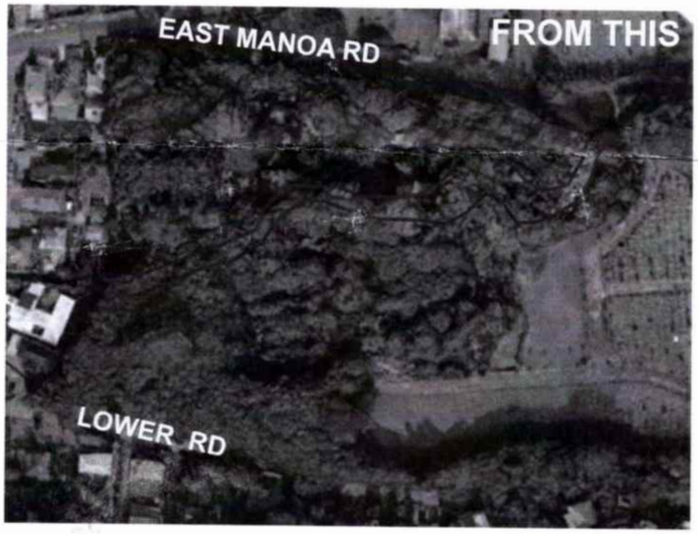
- **Restore Memorial Hall and work with the community to find acceptable revenue-generating activities for it.**
  - o Create a historical tour, which ends at a gift shop at Memorial Hall.

- **Rent preservation land to commercial and/or community farmers, restoring it to its historical use.**

- **Request community help with physical maintenance of the Cemetery.**
  - o Seek volunteers from Malama Manoa, The Outdoor Circle-Manoa, Manoa Heritage Center, Historic Hawaii Foundation, Manoa Lions Club, Chinese societies, Manoa residents and families with ancestors buried at the Cemetery to help with groundskeeping work.

# DO YOU WANT BIG DEVELOPMENT IN DEEP MANOA?

## A LARGE APARTMENT COMPLEX IS BEING PROPOSED IN THE PRESERVATION ZONE FOREST SPACE THAT IS PART OF THE CHINESE CEMETERY





## What exactly is the Manoa Banyan Court Development ("the Development") proposed by Lin Yee Chung Association ?

- Destruction of preservation forest between East Manoa Road and Lower Road near the Manoa Chinese Cemetery in order to build four 3-story structures, housing 288 affordable 1-bedroom rental units for residents age 55+, with common areas and 185 parking spaces;
- Creation of a 1.5-acre community garden;
- Development of a Community Center and Wellness Center on the triangular parcel on E. Manoa Road, including the creation of 20 parking stalls;
- In order to accommodate the increased traffic Lower road will require widening to two full 12 ft. lanes with curbs and sidewalks along a 300-500 ft. stretch.

## What's *wrong* with the Development in its current form?

### PRESERVATION FOREST WILL BE LOST

- One of the few remaining preservation forests within the interior of Manoa valley will be almost entirely razed to make way for parking lots and buildings.

### IT'S NOT RIGHT FOR MANOA

- The Development is a high-density, 3-story apartment project in a neighborhood of nearly all single-family homes; it's not a good fit with the character of the neighborhood.
- The Development will be a bustling focal point – filled with people, cars and activity – next to a cemetery of ancestors at rest, and in a quiet, residential part of Manoa.

## IT MAY CAUSE FLOODS IN MANOA AND ELSEWHERE

- During the construction phase of the Development, after the forest is removed and the site is being developed, neighbors and those downstream will be at increased risk for soil erosion, dirt runoff and floods.
- Because of the lack of planning for the Development's impact on Woodlawn Ditch and Manoa Stream, the completed Development may increase the risk of floods to those downstream in Manoa, Moilili and Waikiki.

## IT WILL HURT MANOA'S RESIDENTS

- The Development will bring potentially 576 new residents into Manoa Valley, increasing congestion within the Valley and at the two access points in and out of the Valley.
- The Development will add traffic to East Manoa Road, Woodlawn and Lower Road, and the parking provided on site may be inadequate and cause spillover into the neighboring streets.
- The quiet, rural character of the single-lane Lower Road will be forever changed.
- Cars entering and existing the Development off East Manoa Road and Lower Road will impede the flow of traffic for Manoa residents traveling deeper into the Valley, particularly for those living on Lower Road, Puhala Rise, Waipuna Rise, Seaview Rise, Alani, Paty, Beaumont Place, Anoai Place, Melemele Place, Woodlawn Terrace, and Anela Place.

## THIS DEVELOPMENT IS BEING FAST-TRACKED FOR CONSTRUCTION APPROVAL, UNDER-THE-RADAR OF THE MANOA COMMUNITY

- The Developer is seeking to take advantage of a statute (Haw. Rev. Stat. § 201H-38) that allows for a development to be exempted from statutes, ordinances and rules relating to planning, zoning and construction standards; in other words, the Developer is trying to fast-track the Development, limit customary review by governmental agencies and curtail input from Manoa residents.
- The Developer did not meaningfully engage those living in the immediate vicinity of the proposed Development – such as those on East Manoa Road, Alani Drive, and Lower Road – during the conceptual phase of the Development. - In other words this is not being undertaken in a pono way.

**JOIN OUR RALLY AT MANOA CHINESE CEMETERY**
**SATURDAY MARCH 26th, 10 AM.**
**Meet at the triangle of East Manoa Rd/Old East Manoa Rd.**

**Sign our online petition to STOP MANOA BANYAN COURT DEVELOPMENT**
https://www.change.org/p/stop-manoa-banyan-court

**VOICE YOUR CONCERNS AT THE NEXT MANOA NEIGHBORHOOD BOARD MEETING on WEDNESDAY APRIL 6TH, 7PM**

**For more info, go to our website:** http://stopmanoabanyancourt.weebly.com/

# Appendix G

# Hawaii's Population Continues A Slide That Began In 2017, New Data Shows

## The pandemic interrupted survey collection efforts but researchers say the new data can be helpful to chart Hawaii's demographic shifts.

CIVIL BEAT By Anita Hofschneider / March 27, 2022

Hawaii's population continues to decrease and get older on average, according to federal data released over the past two weeks.

The state's population fell by more than 10,000 in the year ending July 1, continuing a trend since 2017, said state economist Eugene Tian, citing population estimates released Thursday. At the same time, Hawaii's elderly community is growing, and slightly more are living in poverty, even as poverty fell for Hawaii residents overall, according to American Community Survey data collected between 2016 and 2020 and published this month.
The U.S. Census Bureau cautions the new American Community Survey data is less accurate than previous data due to the pandemic.

Honolulu's population fell between 2020 and 2021, but some counties like Kauai and Hawaii saw their populations grow. Kendrick Leong, research and data analysis lead at the Hawaii Data Collaborative, says only about 70% of people replied to the American Community Survey in 2020 compared to more than 80% the previous year, and the respondents skewed wealthier. That prompted data collectors to supplement the survey responses with property tax records, federal tax data and information from the U.S. Postal Service, Long said.

Justin Hong, an independent research consultant, said the result is that 2016-2020 data "is probably more representative of a time period pre-Covid than it is the Covid period."
Still, many of the findings match long-known trends. The proportion of people aged 65 and up who live in Hawaii grew by more than 40% between the 2006-2010 American Community Survey and the 2016-2020 survey. On Maui County, that rate was 67.3%.

Keali'i Lopez, state director of the American Association of Retired Persons, said Hawaii has long had a fast-aging population. She urged policymakers to "recognize that there's a lot more that we're going to have to do as more people become older and become a majority of the population."

That includes addressing the cost of long-term care, helping people save for retirement and overcoming community opposition to affordable housing for elderly people, said Lopez, who has been lobbying the Legislature on several bills this year.
"Policymakers and such need to stop kicking the can down the road," Lopez said. "It's been a long time coming and the community as a whole, the state as a whole, has to start paying attention."

## Kauai And Hawaii Counties Grow

The U.S. Census Bureau last year reported the state's population grew 7% from 2010 to 2020, but Tian, the state economist, said that the state population has declined since 2017.
Tian thinks the downward trend is due to a combination of fewer births, more deaths and more people moving to the mainland where food and housing is more affordable.

Nationally, birth rates have been on the decline, and the U.S. Census Bureau found that Covid-related deaths contributed to a record number of counties reporting deaths exceeding births.
But not every county saw its population shrink. While Honolulu and Maui counties' populations fell, Hawaii and Kauai counties' grew.

That may reflect domestic migration patterns. Remote work allowed some people living on the mainland to move to Hawaii, and even though international migration was down, so many people moved domestically between 2020 and 2021 that more counties nationwide saw their populations grow than shrink.

## Economic Changes

The data revealed numerous economic and social shifts for Hawaii residents over the past decade. More people had health insurance between 2016 and 2020 than between 2011 and 2015. Both Medicaid and private health insurance options through the Affordable Care Act marketplace expanded over the past decade.
Hawaii homeowners' mortgage burdens decreased, which Tian thinks may be related to the lower interest rates that allowed homeowners to refinance.
Poverty fell in every state, including Hawaii, when comparing the 2016-2020 survey data to the 2011-2015 data. But in Hawaii, poverty grew slightly for people over the age of 65, from 7.6% to 8.3%.

Hong, the independent research consultant, thinks that poverty might be higher in the community than reflected in the data because the interrupted data collection in 2020 didn't fully capture the economic disruption wrought by Covid.
"You're looking at a period of time that can really mask recent changes," Hong said of the 2016-2020 data.

Incomes also rose, with nearly 49% of Hawaii families earning $100,000 or more in the 2016-2020 survey compared with 43% in the 2011-2015 survey. The median household income in Hawaii grew from $75,810 in 2011-2015 to $83,173 in 2016-2020.
Tian, the state economist, said Hawaii consistently has among the highest household incomes in the nation but added that the state also has the largest household size, with multiple generations often living under the same roof.

He thinks a better metric for comparison than median household income is per capita income — about $37,000 in the latest data — which is closer to the national average of $35,384.
Click here to explore the new data.
*Civil Beat's health coverage is supported by the Atherton Family Foundation, Swayne Family Fund of Hawaii Community Foundation, Cooke Foundation and Papa Ola Lokahi.*