DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
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DEPUTY DIRECTOR

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DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-091

September 14, 2021

Mary Alice Evans, Director
State of Hawai'i, Office of Planning and Sustainable Development
Environmental Review Program
235 S. Beretania Street, Room 702
Honolulu, Hawai'i 96813

Dear Ms. Evans:

SUBJECT: Draft Environmental Assessment and Anticipated Finding of No Significant Impact - ENV Support Facilities Access Road and Utility Improvements and 'Ewa Refuse Convenience Center Relocation Project

With this letter, the City and County of Honolulu Department of Environmental Services (ENV) hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the ENV Support Facilities Access Road and Utility Improvements and 'Ewa Refuse Convenience Center Relocation Project situated at TMKs 9-1-013:007, 9-1-069:003, 9-1-069:004, 9-1-126:014, and Roosevelt Ave Right-of-Way (ROW), Geiger Road ROW, and Oahu Railway and Land (OR&L) railway ROW in the 'Ewa District on the island of O'ahu for publication in the next available edition of The Environmental Notice. This agency letter accompanies the online ERP Publication Form that was completed and submitted for this project.

Should you have any questions, please contact Mr. Paul Christiansen, Civil Engineer, at (808) 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

22-033

From: webmaster@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Thursday, September 16, 2021 2:59:16 AM

Action Name

ENV Support Facilities Access Road and Utility Improvements and ʻEwa Refuse Convenience Center Relocation Project

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
- (4) Propose any use within any historic site as designated in the National Register or Hawaiʻi Register

Judicial district

ʻEwa, Oʻahu

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

9-1-013:007, 9-1-069:003, 9-1-069:004, 9-1-126:014, Roosevelt Ave Right-of-Way (ROW), Geiger Road ROW, Oʻahu Railway and Land (OR&L) Railway ROW

Action type

Agency

Other required permits and approvals

Numerous. Permits and approvals are identified in the Draft EA.

Proposing/determining agency

City and County of Honolulu, Department of Environmental Services

Agency contact name

Paul Christiansen

Agency contact email (for info about the action)

p.christiansen@honolulu.gov

Email address or URL for receiving comments

p.christiansen@honolulu.gov

Agency contact phone

(808) 768-3470

Agency address

1000 Uluʻohia Street, Suite 201
Kapolei, Hawaiʻi 96767-2040
United States
Map It

Was this submittal prepared by a consultant?

Yes

Consultant

AECOM

Consultant contact name

Rae Loui

Consultant contact email

rae.loui@aecom.com

Consultant contact phone

(808) 529-7221

Consultant address

1001 Bishop Street 16th Floor
Honolulu, Hawaiʻi 96813
United States
Map It

Action summary

This project will provide three access points to the property that will accommodate the ENV Support Facilities adjacent to the Honouliuli Wastewater Treatment Plant (WWTP). One access will be a dedicated driveway for a leased cell tower facility, the remaining two accesses will provide entry to the ENV Support Facilities from Renton Rd and Roosevelt Ave. The work includes widening Roosevelt Ave to install a median left-turn lane, reconstruction of Malio St, improving two existing driveway crossings of the historic OR&L right-of-way and railroad tracks, installing underground utilities at the same crossings, and installing a driveway off Roosevelt Ave. The project also will construct a potable water main extension between the existing main at Geiger Rd and Kamakana St and the existing main at Renton Rd. Additionally, the existing ʻEwa Refuse Convenience Center will be relocated within the WWTP site.

Reasons supporting determination

The Draft EA submitted herewith is subject to public review as prescribed by HRS Chapter 343 and HAR 11 200.1. ENV has determined that a Finding of No Significant Impact is appropriate for the ENV Support Facilities Access Road and Utility Improvements and ʻEwa Refuse Convenience Center Relocation Project based on the information provided in the Draft EA.
To determine whether a proposed action may have a significant impact on the environment, the proposing agency needs to consider all phases of the action, the expected primary and secondary consequences, cumulative effect, and the short- and long-term effects. The review and evaluation of the proposed action would result in a determination that either: 1) the action may have a significant effect on the environment, and an EIS Preparation Notice should be issued, or 2) the action is not likely to have a significant effect and notice of a Finding of No Significant Impact should be issued.
Based on the findings presented in the EA, the Proposed Action is not expected to result in a significant impact on the environment. In accordance with Chapter 343, HRS and Section 11-200.1, HAR, the City determined that the Proposed Action will not have a significant environmental impact and an EIS will not be required. A Finding of No Significant Impact is anticipated to be issued.
The determination was based on review and analysis of the significance criteria specified in Section 11-200.1-13, HAR. An action shall be determined to have a significant effect on the environment if it meets any of the criteria.

Attached documents (signed agency letter & EA/EIS)

- ENV-Supp-Fac-Access-Roads-Draft-EA-Submittal.pdf
- ENV-Supp-Fac-Access-Roads-Draft-EA-Mailing-List.pdf
- PRO-21-091-ltr-to-ERP-RE-ENV-Supp-Fac-Access-Roads-Draft-EA-Submittal.pdf

Action location map

- Shapefiles.zip

Authorized individual

Aaron Weieneth

Authorization

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

DRAFT
ENVIRONMENTAL ASSESSMENT FOR ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND ‘EWA REFUSE CONVENIENCE CENTER RELOCATION PROJECT

City & County of Honolulu
Department of Environmental Services
1000 Ulu‘ohia Street, Suite 201
Kapolei, Hawai‘i 96707-2040

September 2021

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DRAFT
ENVIRONMENTAL ASSESSMENT FOR ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND ‘EWA REFUSE CONVENIENCE CENTER RELOCATION PROJECT

Prepared for:

City & County of Honolulu
Department of Environmental Services
1000 Uluʻohia Street, Suite 201
Kapolei, Hawaiʻi 96707-2040

Prepared by:

AECOM Technical Services, Inc.
1001 Bishop Street, Suite 1600
Honolulu, Hawaiʻi 96813-3698

September 2021

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PROJECT SUMMARY

Agency	City and County of Honolulu Department of Environmental Services
Contact	Paul Christiansen, City and County of Honolulu Department of Environmental Services
Location	‘Ewa District, O‘ahu
Tax Map Key	9-1-013:007, 9-1-069:003, 9-1-069:004, 9-1-126:014, Roosevelt Ave Right-of-Way (ROW), Geiger Road ROW, Oahu Railway and Land (OR&L) railway ROW
Parcel Land Area	104.23 acres excluding ROWs; 105.57 acres including footprint within ROWs
Recorded Fee Owner	City and County of Honolulu, State of Hawai‘i
Existing Use	Honouliuli Wastewater Treatment Plant (WWTP), ‘Ewa Refuse Convenience Center (ERCC), existing road ROWs, OR&L railway ROW, and vacant land
Proposed Use	WWTP and support facilities, access roads, relocated ERCC, and potable water main
Community Plan	‘Ewa Development Plan
State Land Use	Urban and Agricultural Districts
County Zoning	AG-1 Restricted Agriculture and I-2 Intensive Industrial Districts
Special Management Area	N/A
Flood Zone	• Zone D – Unstudied areas where flood hazards are undetermined, but flooding is possible • Zone X – Areas of minimal flood hazard that are outside of the 1-percent annual chance flood areas or areas protected from the 1-percent annual chance flood by levees
Agency Determination	Anticipated Finding of No Significant Impact
Trigger for an Environmental Document under HRS 343	Use of State Lands, Use of County Lands, Use of County Funds; Use within any historic site as designated in the National Register or Hawai’i Register
Proposing Agency	City and County of Honolulu, Department of Environmental Services (ENV)
Project Name	ENV Support Facilities Access Road and Utility Improvements and ‘Ewa Refuse Convenience Center Relocation Project
Project Location	Honouliuli WWTP at 91-1000 Geiger Rd, ‘Ewa Beach, HI 96706, OR&L railway ROW, and portions of Roosevelt Avenue, Malio Street, and Geiger Road in the vicinity of the WWTP

Proposed Action	This project will provide three access points to the property that will accommodate the ENV Support Facilities adjacent to the Honouliuli WWTP. One access will be a dedicated driveway for a leased cell tower facility, the remaining two accesses will provide entry to the ENV Support Facilities, which include the central laboratory, central maintenance and storage, administrative offices, and the central SCADA/telemetering/emergency management facilities, from Renton Road and Roosevelt Avenue. The work includes widening Roosevelt Avenue to install a median left-turn lane, reconstruction of Malio Street, improving two existing crossings of the OR&L railway on Hawai’i Department of Transportation (HDOT) right-of-way, and installing a driveway off Roosevelt Avenue. The project also will construct a potable water main extension between the existing main at Geiger Road and Kamakana Street and the existing main at Renton Road. Additionally, the existing ERCC will be relocated within the WWTP site. Relocation, upgrade, or alteration of electrical and communication utilities related to this project may include work located in State of Hawai’i ROWs, such as the Roosevelt Avenue ROW. It is anticipated that such work is covered in the Comprehensive Exemption List for the State of Hawai’i Department of Transportation, and the procedures for using the Exemption List will be followed to meet Hawai‘i Revised Statutes (HRS) Chapter 343 requirements.

TABLE OF CONTENTS

APPENDICES

FIGURES

TABLES

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ACRONYMS AND ABBREVIATIONS

AAQS	ambient air quality standards
BMP	best management practice
BWS	Board of Water Supply, City and County of Honolulu
CAA	Clean Air Act
CCD	census county division
City	City and County of Honolulu
CO	carbon monoxide
CO_2	carbon dioxide
CZM	Coastal Zone Management
dBA	decibel (A-weighted scale)
DBEDT	Department of Business, Economic Development and Tourism
DOH	Department of Health
DPP	Department of Planning and Permitting
DPR	Department of Parks and Recreation
DTS	Department of Transportation Services
EIS	Environmental Impact Statement
ENV	Department of Environmental Services, City and County of Honolulu
EPA	Environmental Protection Agency, United States
ERCC	‘Ewa Refuse Convenience Center
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
GHG	greenhouse gas
GMSL	global mean sea level
H_2S	hydrogen sulfide
HAR	Hawai‘i Administrative Rules
HCM	Highway Capacity Manual
HDOT	Hawai‘i Department of Transportation
HEPA	Hawai‘i Environmental Policy Act
HHW	household hazardous waste
HRS	Hawai‘i Revised Statutes
HSP	Hawai‘i State Plan
HWRF	Honouliuli Water Recycling Facility
LOS	level of service
LUO	Land Use Ordinance
mgd	million gallons per day
mph	miles per hour
MSL	mean sea level
MSW	municipal solid waste
NAAQS	National Ambient Air Quality Standards
NHPA	National Historic Preservation Act

no.	number
NO_2	nitrogen dioxide
NRHP	National Register of Historic Places
O_3	ozone
OR&L	Oahu Railway and Land
Pb	lead
$PM_{2.5}$	particulate matter with a diameter ≤ 2.5 micrometers
PM_{10}	particulate matter with a diameter ≤ 10 micrometers
ROH	Revised Ordinances of Honolulu
ROW	right-of-way
SCADA	Supervisory Control and Data Acquisition
SHPD	State Historic Preservation Division
SIHP	State Inventory of Historic Properties
SLUDBA	State Land Use District Boundary Amendment
SMA	Special Management Area
SO_2	sulfur dioxide
SWMPP	Storm Water Management Protection Plan
SWPCP	Storm Water Pollution Control Plan
TIAR	Traffic Impact Analysis Report
UOA	Use and Occupancy Agreement
U.S.	United States
USCB	United States Census Bureau
USFWS	United States Fish and Wildlife Service
WWTP	Wastewater Treatment Plant

1.0 SETTING, PURPOSE AND NEED, AND PROJECT DESCRIPTION

1.1 PROJECT NAME

The City and County of Honolulu (City), Department of Environmental Services (ENV) is planning to undertake the ENV Support Facilities Access Road and Utility Improvements and ‘Ewa Refuse Convenience Center Relocation Project. This project is covered in its entirety as a single project in this Environmental Assessment (EA); however, the project often is referred to and assessed within this document as its three component projects: ENV Support Facilities Access Road Improvements, ‘Ewa Refuse Convenience Center Relocation or ERCC Relocation, and Potable Water Main Extension. ENV anticipates the construction phase will be implemented for these three components as separate construction projects.

1.2 SITE LOCATION AND SETTING

The project site is in the ‘Ewa District of Oahu, Hawai‘i (see Figure 1-1). The project area is adjacent to the Coral Creek Golf Course and includes the existing Honouliuli Wastewater Treatment Plant (WWTP) located at 91-1000 Geiger Road, the 48-acre WWTP expansion property to the north and east, and the existing ERCC. The project area also includes portions of Roosevelt Avenue, Malio Street, and Geiger Road, as well as the Oahu Railway and Land Company (OR&L) railway. The project site is located south of ‘Ewa Villages and ‘Ewa Gentry, northeast of the Kalaeloa Airport, north of Barbers Point Golf Course, and west of Fort Weaver Road. Topography within the ‘Ewa Plains in the project area is gently sloping and relatively flat. Elevation around the project site ranges from 25 to 45 feet above mean sea level (AECOM 2017).

1.3 PURPOSE AND NEED FOR PROJECT

The ENV Support Facilities Access Road and Utility Improvements project is needed to provide critical access to City-owned property for the ENV Support Facilities that are being constructed adjacent to the Honouliuli WWTP and were evaluated in the “Honouliuli Wastewater Treatment Plant Secondary Treatment and Support Facilities, Final Environmental Impact Statement” (FEIS), dated March 2017 (“2017 FEIS”). The permanent driveway and road improvements are required to accommodate future traffic conditions associated with operation of the ENV Support Facilities. The future employee traffic must be kept separate from the WWTP operation areas for safety reasons. The improvements provide needed connectivity for vehicle traffic and access to public transportation, bikeways, and pedestrian walkways consistent with transportation plans for the ‘Ewa community. The proposed driveways also will improve safety by allowing the construction contractor and maintenance vehicles, unrelated to the WWTP operations, to access the ENV Support Facilities site directly without going through the WWTP.

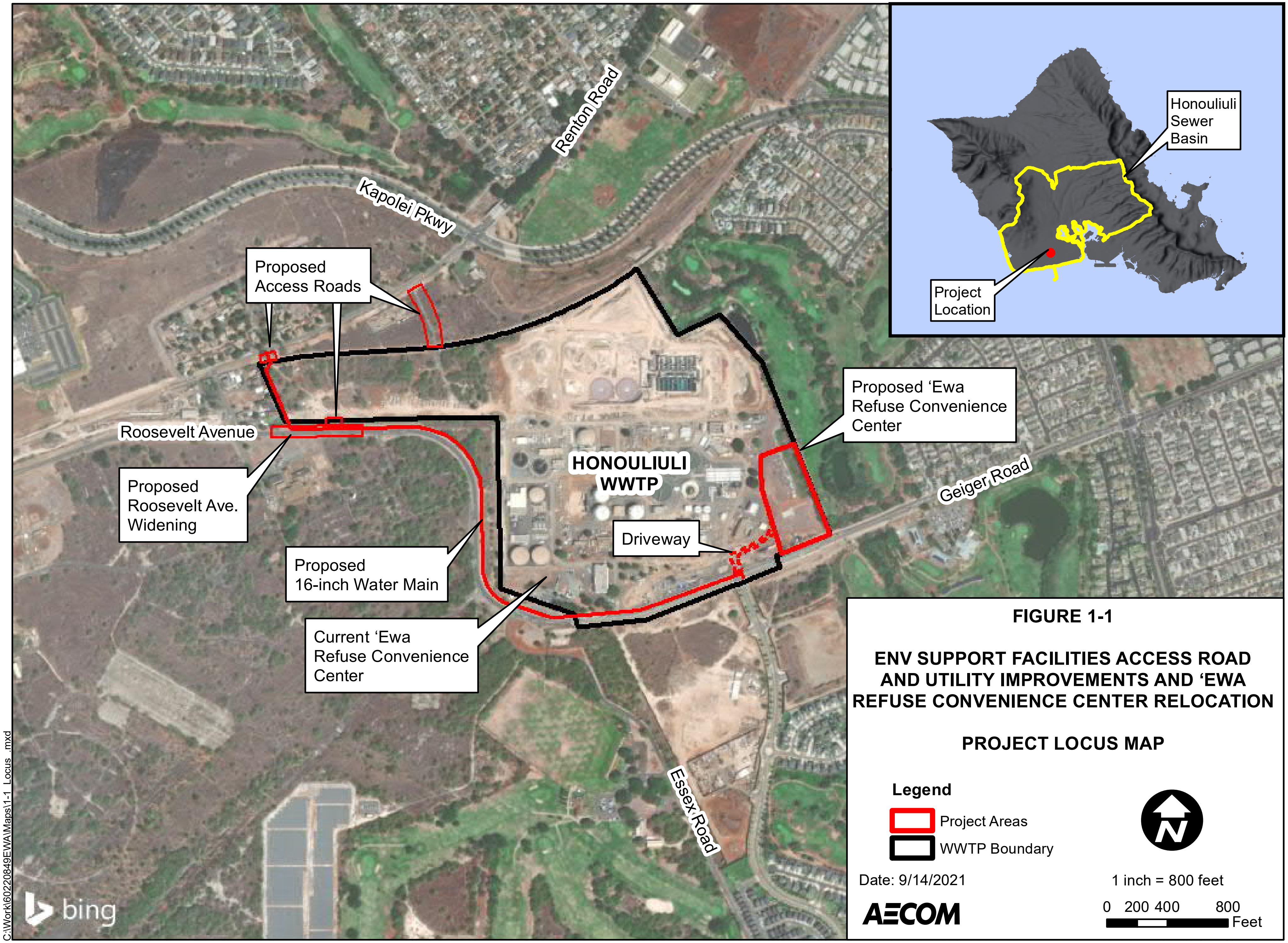


FIGURE 1-1

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND ‘EWA REFUSE CONVENIENCE CENTER RELOCATION

PROJECT LOCUS MAP

Relocation of the City’s existing ERCC within the Honouliuli WWTP site is needed to improve access to the facility, accommodate growing refuse needs, and alleviate traffic congestion along Geiger Road.

The proposed potable water main extension will create a pipeline loop system, thereby establishing sufficient redundancy in the WWTP potable water system to provide reliable water service and fire protection to the ENV Support Facilities.

1.4 PROPOSED ACTION

As stated above, the Proposed Action is comprised of three component projects: ENV Support Facilities Access Road Improvements, ‘Ewa Refuse Convenience Center Relocation, and Potable Water Main Extension. These projects are described in the following sections.

Relocation, upgrade, or alteration of electrical and communication utilities related to this project may include work located in State of Hawai’i right-of-ways (ROWs), such as the Roosevelt Avenue ROW. It is anticipated that such work is covered in the Comprehensive Exemption List for the State of Hawai’i Department of Transportation, and the procedures for using the Exemption List will be followed to meet Hawaiʻi Revised Statutes (HRS) Chapter 343 requirements.

1.4.1 Environmental Services Support Facilities Access Road Improvements

The City purchased 48 acres of land adjacent to the Honouliuli WWTP in 2010 for the purpose of expanding the existing WWTP and for related support facilities. The expansion includes upgrading the Honouliuli WWTP to full secondary treatment by June 1, 2024, in accordance with the requirements of the 2010 Consent Decree entered into by the U.S. Environmental Protection Agency, the State of Hawaiʻi, and the City. The 2010 Consent Decree requires upgrading both the Honouliuli WWTP and the Sand Island WWTP to full secondary treatment. Due to the limited available land at the Sand Island WWTP site, the City has proposed to relocate certain non-process support facilities currently located at the Sand Island WWTP site to the Honouliuli WWTP expansion property. These support facilities include the central laboratory, central maintenance and storage, administrative offices, and the central Supervisory Control and Data Acquisition (SCADA)/telemetering/emergency management facilities. The City also plans to construct an Administration Building for ENV on the Honouliuli WWTP expansion property. As noted above, the 2017 FEIS evaluated these proposed ENV Support Facilities, and they are not the subject of this Draft EA.

One existing driveway and one existing roadway connect the Honouliuli WWTP expansion property to Renton Road to the north. These points of access cross the 40-ft wide ROW of the former OR&L railroad that is now under the jurisdiction of the Hawaiʻi Department of Transportation (HDOT). Both points of access were used by the previous owner at the time the City purchased the property, and the City plans to retain these points of access and provide upgrades appropriate for continued use into the future. The existing driveway located at the western end of the WWTP expansion property was previously used for access by various agriculture support activities and includes an existing OR&L railroad crossing. Later, when a cell phone communication tower was built on the property, the driveway was allowed to be used as the access driveway to the cell tower for maintenance purposes. The cell tower is currently in active use under a lease agreement with the City, operating under arrangements similar to those with the previous owner. The existing roadway is Malio Street, which is located approximately in the middle of the WWTP expansion property and includes an existing OR&L railroad crossing. Malio Street has a history going back to before World War II when it served as an important connection between agriculture-related activities on both sides of the railroad tracks during the time of active OR&L railroad operations. Both points of access are currently unimproved gravel roads. The locations of the proposed access road and driveway improvements from and to Renton Road for the ENV Support Facilities were selected to utilize these existing points of access to avoid creating new crossings of the OR&L ROW.

The continued use of these two points of access on Renton Road is important for the planned development of the WWTP expansion land by the City. The increase in activity on the site resulting from the new ENV Support Facilities will include a large volume of daily commuter traffic. The points of access are needed for access to the site, for both normal and emergency access purposes, and will mitigate traffic congestion and bottlenecks that would otherwise occur. This access will allow traffic to flow directly from Kapolei Parkway and Kualakai Parkway to the WWTP expansion property, helping to minimize addition of congestion to Geiger Road and Fort Weaver Road. Since the points of access are currently unimproved gravel roads, the City plans to pave the existing driveway and roadway, and improve the railroad crossings consistent with the Secretary of the Interior’s Standards for the Treatment of Historic Properties and similar to treatment of the same track at other crossing locations. The proposed project would restore, repair, and sustain the railroad tracks at these crossing locations. The railroad crossings will include appropriate safety markings, signals and/or gates as required. The proposed future underground utilities to be located at these access roads may include potable water, recycled water, sewer, electrical, and communication lines. Pedestrian and bicycle access will be provided at these two access roads to meet the need for pedestrian and bicycle access between the ENV Support Facilities and the new Leeward Bikeway being constructed by the State in the OR&L ROW, as well as to Renton Road and the surrounding communities. The Leeward Bikeway is a key part of the overall traffic planning for the community, as well as fulfillment of a primary purpose for the HDOT OR&L ROW, and the connection to the new ENV Support Facilities at the two existing points of access will be a beneficial addition to both the City’s and the State’s projects.

A new access road from the WWTP expansion property to Roosevelt Avenue is planned for purposes of improved access and mitigation of traffic bottlenecks that would otherwise occur as a result of future traffic associated with the ENV Support Facilities. This new access road is important for commuters coming to the site from Geiger Road and Roosevelt Avenue. Without this access, traffic would need to traverse through the existing WWTP facilities in order to reach the new ENV Support Facilities. This would not be acceptable because of the anticipated heavy volume of daily traffic, and because of the need to limit access to the WWTP facilities for security and public safety reasons. Proposed future underground utilities to be located at this driveway may include potable water, recycled water, sewer, electrical, and communication lines.

To safely accommodate Roosevelt Avenue traffic turning left into the new access driveway, a median left-turn lane in Roosevelt Avenue is proposed to allow left-turning vehicles a protected area out of the flow of through traffic while waiting for a safe gap in traffic to execute their turn. To accommodate this median left-turn lane, Roosevelt Avenue will be widened within its existing ROW. The conceptual design of this left-turn lane is based on the result of the evaluation of projected traffic volumes and is described as a mitigation measure in Section 2.11.2.7.

The proposed access roads and Roosevelt Avenue widening are shown in Figure 1-2.

1.4.2 ‘Ewa Refuse Convenience Center Relocation

The existing ERCC is one of the City’s nine public refuse drop-off locations that is used by residents to dispose of household rubbish. It is especially intended for receiving residents’ solid waste not appropriate to be placed in the residents’ curb-side carts for pick-up. This includes bulky waste items and some items that should be recycled, such as white goods, tires, and similar types of recyclable waste. The convenience center is currently located on Geiger Road, on the same City property as the WWTP, to the west of the main WWTP entrance (Figure 1-1). On certain collection days (e.g., weekends, holidays), due to the current limited space and capacity for vehicle unloading, high usage of the convenience center results in congestion and backup of traffic on Geiger Road, including blockage of the main Honouliuli WWTP driveway. Relocation of the ERCC to an available open area within the WWTP property is proposed to alleviate this traffic congestion on Geiger Road and provide a more efficient space to accommodate waiting vehicles on site, which will help prevent vehicles from backing up on Geiger Road, and a larger footprint and additional collections areas to allow unloading to be done quicker, and aid in traffic circulation (Figure 1-3).

1.4.3 Potable Water Main Extension

In a letter, dated July 19, 2016, providing comments on the Draft Environmental Impact Statement (EIS) for the Honouliuli WWTP Secondary Treatment and Support Facilities, the City Board of Water Supply (BWS) commented that the existing potable water system does not have sufficient redundancy to provide reliable water service and fire protection for expansion of the WWTP (BWS 2016). The BWS therefore recommended that a 16-inch pipeline be extended from Geiger Road and Roosevelt Avenue, through Malio Street, to the Renton Road/Kapolei Parkway intersection to create a pipeline loop system. The 2017 FEIS acknowledged that water system improvements near the Honouliuli WWTP may be required to improve the reliability of the existing potable water system and for the expansion of the WWTP.

FIGURE 1-2

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND ‘EWA REFUSE CONVENIENCE CENTER RELOCATION

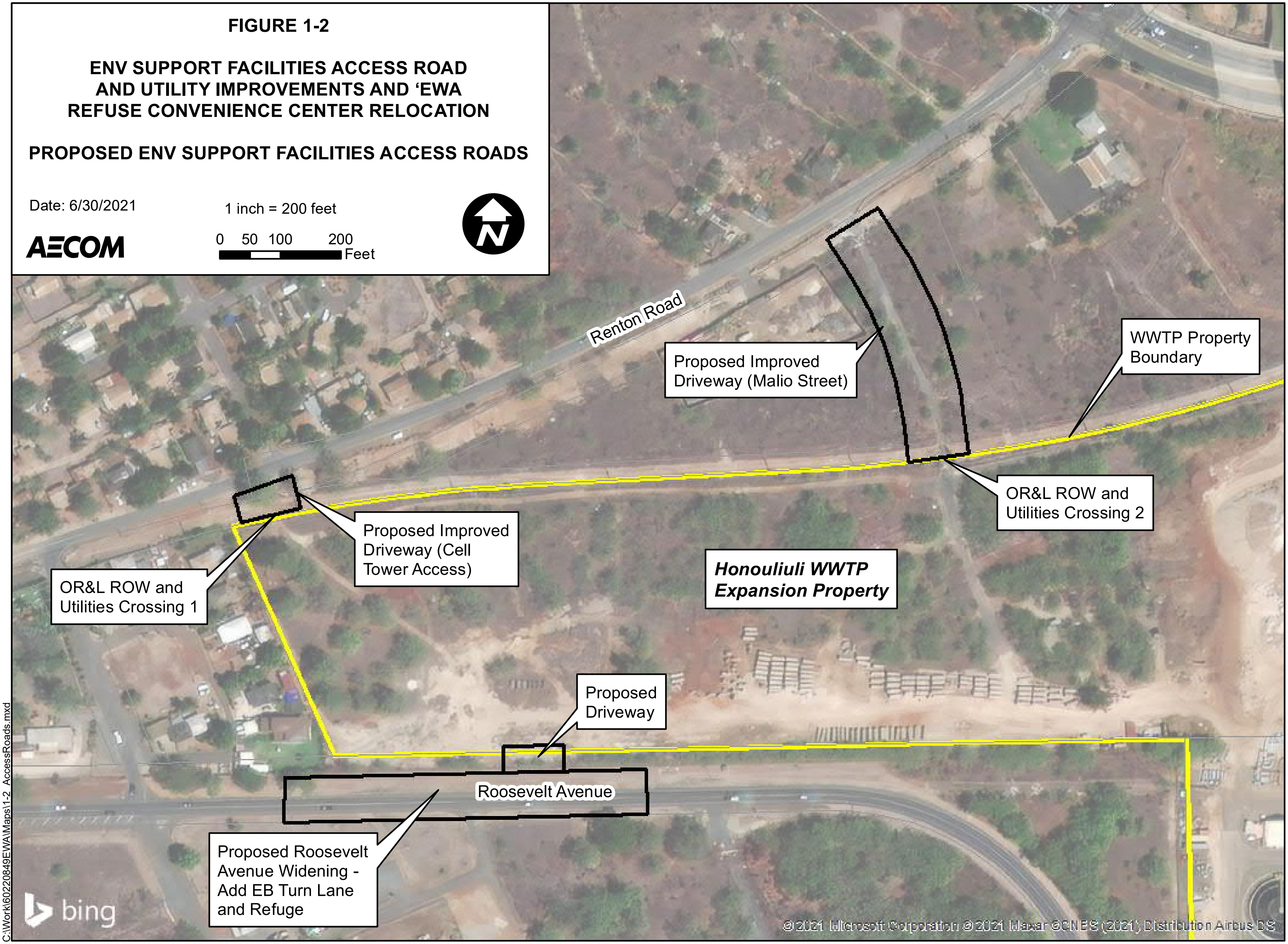
PROPOSED ENV SUPPORT FACILITIES ACCESS ROADS

Date: 6/30/2021

1 inch = 200 feet

0 50 100 200 Feet

AECOM



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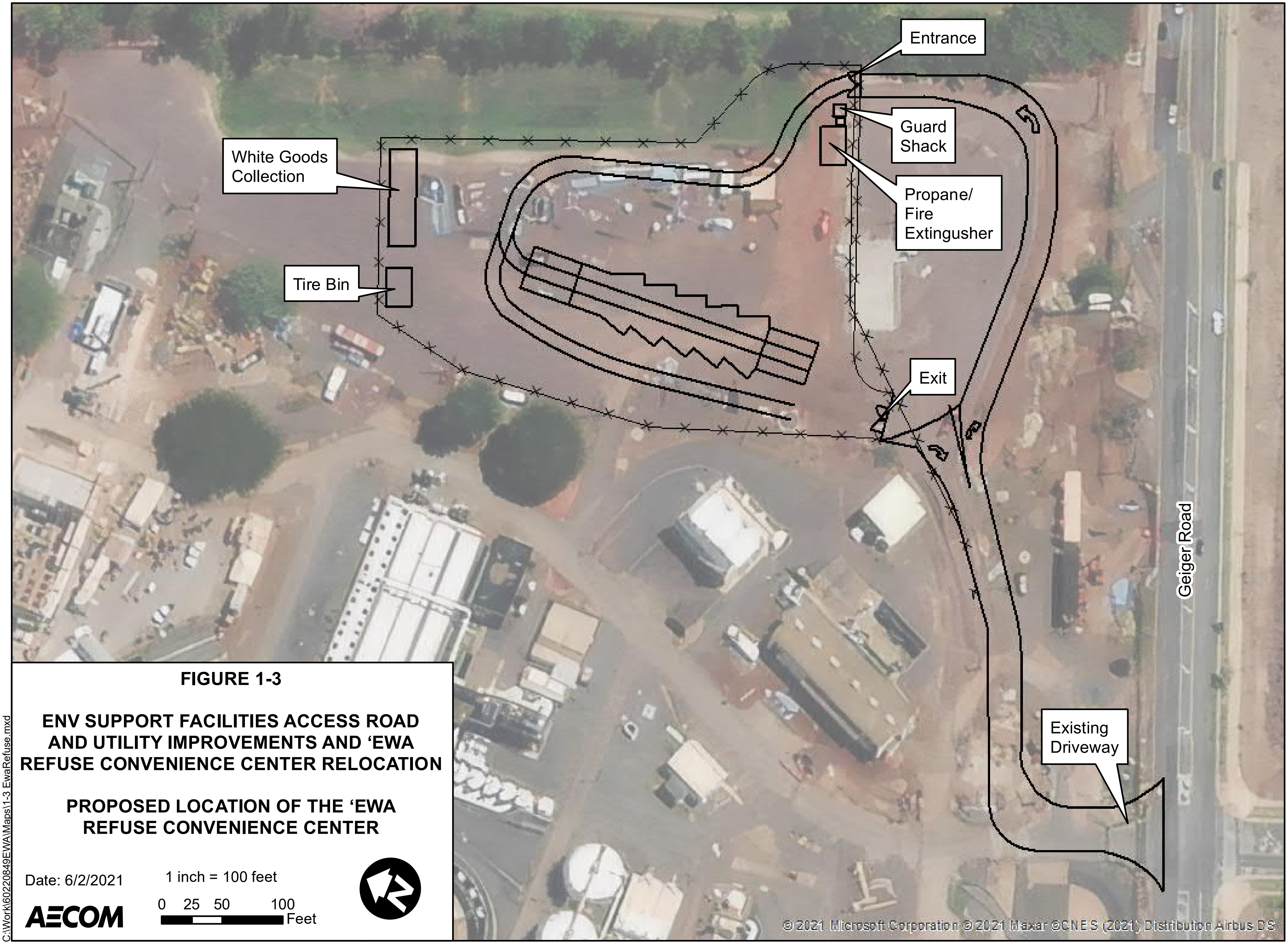

FIGURE 1-3

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND ‘EWA REFUSE CONVENIENCE CENTER RELOCATION

PROPOSED LOCATION OF THE ‘EWA REFUSE CONVENIENCE CENTER

Date: 6/2/2021

1 inch = 100 feet

0 25 50 100 Feet

AECOM

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The new 16-inch potable water main is proposed to be a joint project between ENV and BWS. As shown in Figure 1-4, progressing from east to west, the proposed approximately 4,500-linear foot alignment of the water main extends from the Geiger Road/Kamakana Street intersection within WWTP property along Geiger Road, to the western end of the WWTP property within the Roosevelt Avenue ROW, and to Renton Road within the WWTP expansion property along the western property boundary of the WWTP. At its eastern end, the proposed 16-inch water main will connect to the existing 16-inch main on the south side of Geiger Road at Kamakana Street. At its western end, the proposed main will cross the OR&L ROW at the location of the cell tower access driveway and connect to the existing 8-inch main on the south side of Renton Road.

1.5 NEED FOR AN ENVIRONMENTAL ASSESSMENT

This Draft EA was prepared in accordance with HRS Chapter 343, as implemented by Hawaiʻi Administrative Rules (HAR) Title 11, Chapter 200.1. These requirements apply to the City's Proposed Action due to the use of County lands and funds, use of State lands, and use within any historic site as designated in the National Register or Hawaiʻi Register. The Proposed Action is not an exempt action as defined in HAR § 11-200.1-8.

This Draft EA is also a requirement for obtaining HDOT's approval of a Use and Occupancy Agreement (UOA) to cross the State of Hawaii historic OR&L ROW in two locations. These locations currently have unimproved crossings that have been used for decades but lack a current UOA. Pursuant to the deed dated June 5, 1980, which transferred the former OR&L ROW to HDOT, "all licenses, permits, or easements authorizing the use or occupancy of the 40-foot railroad right-of-way will be issued only subsequent to the written approval of the Hawaii State Historic Preservation Officer and the written authorization of the Hawaii Division Administrator, Federal Highway Administration."

ENV is seeking UOAs with HDOT for the two OR&L ROW crossings. The UOAs require Federal Highway Administration (FHWA) approval, which is a federal action requiring compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA) and Section 4(f) of the United States (U.S.) Department of Transportation Act of 1966, or FHWA concurrence that the proposed reconstruction of the crossings are exempt in accordance with the Advisory Council on Historic Preservation Program Comments.

On July 17, 2020 ENV submitted documentation to HDOT (Appendix A) that the proposed rail crossings were exempt from NHPA Section 106 and U.S. Department of Transportation Act Section 4(f) pursuant to the Program Comments. In a letter to FHWA dated September 18, 2020 (Appendix A), HDOT concurred that the crossings were exempt; however, HDOT recommended that the cell tower vehicle crossing improvements be eliminated. HDOT recommended that underground utility crossings be permitted at both crossing locations provided trenchless installation methods were used or open trench construction was done concurrently with crossing improvements (i.e., at Malio Street).

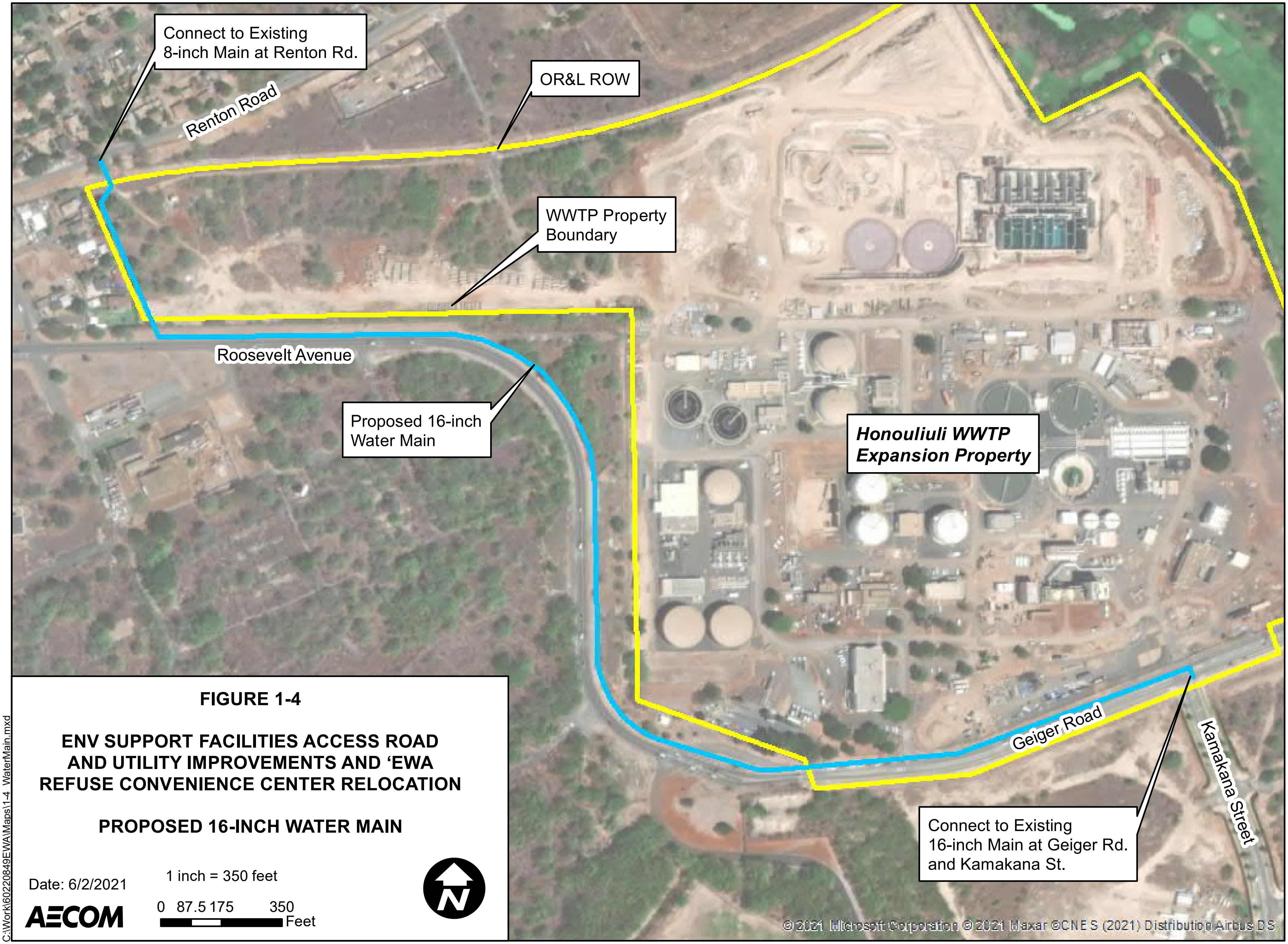

FIGURE 1-4

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND ‘EWA REFUSE CONVENIENCE CENTER RELOCATION

PROPOSED 16-INCH WATER MAIN

Date: 6/2/2021

C:\Work\60220849EWA\Maps\1-4 WaterMain.mxd

This Draft EA provides an update and additional details on the proposed access driveways and road improvements, which were described in the 2017 FEIS, and assesses the proposed relocation of the ERCC within the WWTP site and the proposed 16-inch water main.

1.6 PREVIOUS ENVIRONMENTAL REVIEWS ON THE PROJECT SITE

A FEIS was completed in April 2017 for the Honouliuli WWTP (AECOM 2017), which included assessment of the proposed ENV Support Facilities and identified the access roads that are part of the Proposed Action presented in this Draft EA.

1.7 REGULATORY OVERVIEW AND REQUIRED PERMITS

This Draft EA has been prepared based upon federal and state law, statutes, regulations, and policies that are pertinent to the implementation of the Proposed Action, including the following:

- Clean Air Act (CAA) (42 USC section 7401 et seq.);
- Clean Water Act (33 USC section 1251 et seq.);
- Coastal Zone Management Act (16 USC section 1451 et seq.);
- National Historic Preservation Act (NHPA) (as amended) (54 USC section 306108 et seq.);
- Department of Transportation Act section 4(f) (49 USC section 303);
- Endangered Species Act (16 USC section 1531 et seq.);
- Safe Drinking Water Act of 1974 (42 USC section 300f et seq.);
- Migratory Bird Treaty Act (16 USC sections 703-712);
- Executive Order 11988, Floodplain Management;
- Executive Order 11990, Protection of Wetlands;
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations;
- Chapter 343, HRS, and Title 11, Chapter 200.1, HAR;
- Chapter 342D, HRS, and Title 11, Chapter 54 and 55, HAR;
- Chapter 342F, HRS, and Title 11, Chapter 46, HAR;
- Chapter 6E-8, HRS, and Title 13, Chapter 275, HAR; and
- Chapter 195D, HRS, and Title 13, Chapter 107 and 124, HAR.

No federal funds are associated with this project. FHWA authorization is required for the UOAs pursuant to the Deed dated June 5, 1980 that transferred the former OR&L ROW to HDOT. On November 6, 2018, FHWA sent a letter to HDOT advising that if a project or use involves the exempt activities listed in the Advisory Council on Historic

Preservation Program Comments, HDOT should cite which of the activities it falls under along with sufficient relevant information such as plans, photographs, or material specifications to support the opinion. If FHWA concurs with the findings, the Section 106 and Section 4(f) processes are complete and no future federal approval is required.

ENV submitted a letter to HDOT on July 17, 2020 (Appendix A) requesting concurrence that the proposed reconstruction of the crossings is exempt from the NHPA Section 106 and U.S. DOT Act Section 4(f) processes in accordance with exempt activities listed in the Program Comments. In a letter to FHWA dated September 18, 2020 (Appendix A), HDOT concurred that the crossings were exempt; however, HDOT recommended that the cell tower vehicle crossing improvements be eliminated. HDOT recommended that underground utility crossings be permitted at both crossing locations provided trenchless installation methods were used or open trench construction was done concurrently with crossing improvements (i.e., at Malio Street).

A description of the Proposed Action’s consistency with the relevant laws, policies and regulations is included in Section 3. Permits and approvals required are listed in Table 1-1.

Previously requested and/or granted approvals associated with this project are:

- A Special Use Permit to allow expansion of the WWTP was approved by the State Land Use Commission in December 2017.
- The ERCC will be relocated to a new tax map parcel (TMK: 9-1-069-003). Although a portion of this parcel is undergoing State Land Use District Boundary Amendment (SLUDBA) to reclassify that portion from Agriculture to Urban district, the portion where the ERCC will be located is already classified as Urban.
- A Special Use Permit was approved by the State Land Use Commission on December 8, 2017 to allow the expansion of the Honouliuli Wastewater Treatment Plant for the development of full secondary treatment and support facilities within the State Land Use Agricultural District, subject to several conditions. ENV submitted Annual Reports for 2019 and 2020 that document progress with complying with the conditions of the approval.
- A waiver from the height restrictions of the A-1 zone has been requested and approved. Any additional waivers from the standards of the AG-1 and I-2 zones will be identified during the design phase.
- A Conditional Use Permit for the project was approved by the City Department of Planning and Permitting (DPP) August 23, 2019 to allow the joint development of two zoning lots, subject to several conditions.
- A Zoning Waiver for Land Use Ordinance (LUO) Section 21-3.50-4 and Table 21-3.1 to allow construction of seven non-process support facilities that exceed the maximum allowable height limit in the AG-1 district was approved by the City DPP on January 22, 2019, subject to several conditions and completion of the SLUDBA.

Table 1-1. Permits and Approvals Required

Permit/Approval/Consultation	Agency
Federal	
Section 106, National Historic Preservation Act consultation	State Historic Preservation Officer
Section 4(f), Department of Transportation Act	Federal Highway Administration
Use and Occupancy Agreement	Federal Highway Administration (authority delegated to State of Hawai‘i Department of Transportation)
State	
HRS Chapter 343 Compliance	State of Hawai‘i Department of Health
NPDES General Permits	State of Hawai‘i Department of Health
HRS Chapter 6E-8 Historic Preservation Review	State Historic Preservation Division
Use and Occupancy Agreement	Hawai‘i Department of Transportation
Solid Waste Management Permit (Update-Amendment)	State of Hawai‘i Department of Health
Community Noise Permit	State of Hawai‘i Department of Health
City and County of Honolulu (City)	
Engineering and Construction Permits (building, grading, trenching)	Department of Planning and Permitting
Construction Permits (building, trenching)	Board of Water Supply
Construction Plan Approval	Department of Planning and Permitting
Waiver of Height Restrictions from AG District (additional waivers may be identified during design phase)	Department of Planning and Permitting

1.8 ALTERNATIVES CONSIDERED

1.8.1 Environmental Services Support Facilities Access Road and Utility Improvements

The following alternatives were identified but not carried forward for the purposes of further analysis in this Draft EA since they were determined to not meet the purpose and need of the Proposed Action:

- Roosevelt Avenue Driveway Only: For this alternative, only a new driveway would be constructed off Roosevelt Avenue to provide access to the ENV Support Facilities, and access to the ENV Support Facilities from Renton Road would not be provided. This alternative would not provide sufficient points of access to the ENV Support Facilities for both normal and emergency access purposes. It would also result in traffic impacts on Roosevelt Avenue, Geiger Road, Phillipine Sea Extension Road, Fort Barrette Road, and other feeder roads since all future traffic associated with ENV Support Facilities employees and visitors would be restricted to a single point of access. The concentration of the ENV Support Facilities traffic at one access could potentially require the installation of a traffic signal at the Roosevelt Avenue driveway.

- Malio Street Driveway Only: For this alternative, the existing Malio Street would be improved to provide access to the ENV Support Facilities from Renton Road, and access to the ENV Support Facilities from Roosevelt Avenue would not be provided. Similar to the Roosevelt Avenue Driveway Only alternative, this alternative would not provide sufficient points of access to the ENV Support Facilities for both normal and emergency access purposes. It would also result in traffic impacts on Renton Road, Kapolei Parkway, Phillipine Sea Extension Road, and other feeder roads since all future traffic associated with ENV Support Facilities employees and visitors would be restricted to a single point of access. The concentration of the ENV Support Facilities traffic at one access could potentially require widening of Renton Road to accommodate a new dedicated turning lane and create operational impacts to the Kapolei Parkway/Renton Road and Philippine Sea/Roosevelt Avenue intersections.
- New Geiger Road Driveway: For this alternative, a new driveway would be constructed off Geiger Road and a new perimeter access road within the WWTP site would provide access to the ENV Support Facilities. This alternative was determined to be unacceptable due to safety concerns associated with ENV Support Facility employees and visitors having access to and driving within the secure WWTP operations site. In addition, there is insufficient space to properly design and site a new driveway due to proximity to the existing WWTP entrance on Geiger Road. Like the Roosevelt Avenue Only alternative, this alternative would not provide sufficient points of access to the ENV Support Facilities for both normal and emergency access purposes.
- Malio Street Water Main Alignment: As noted in Section 1.4.1, in its July 19, 2016 letter providing comments on the Draft EIS for the Honouliuli WWTP Secondary Treatment and Support Facilities, the BWS recommended that a 16-inch potable water pipeline be extended from Geiger Road and Roosevelt Avenue to the Renton Road/Kapolei Parkway intersection to create a pipeline loop system, and that the pipeline transit through Malio Street to connect to the existing 8-inch main at Renton Road. However, a pipeline alignment that crosses the OR&L ROW at Malio Street would conflict with programmed ENV design-build construction. Therefore, this pipeline alignment was eliminated from further consideration in favor of the proposed crossing of the OR&L ROW at the location of the cell tower access driveway.
- R-1 Pipeline and Pump Improvements: Also in its July 19, 2016 letter, the BWS commented that, depending on the anticipated R-1 recycled water demand, additional R-1 pipeline and/or pump improvements may be necessary to supply the required fire flow for fire protection to all facilities or buildings (BWS 2016). To verify that the fire flow demands of the proposed ENV Support Facilities will be met, Mechanical Engineers of Hawaii calculated the estimated fire flow demand and pressure for the new buildings (R.M. Towill Corporation 2020). The fire flow analysis determined that the WWTP water system should be able to

meet the fire flow demands for the ENV Support Facilities, although fire protection should be verified once design of the facilities is complete and the water system improvements are constructed. Based on this finding, additional pipeline and pump improvements are not needed.

- No Action: The "No Action" alternative would not address any of the Proposed Action objectives. For this alternative, the ENV Support Facilities access road and utility improvements would not be implemented, and the existing Honouliuli WWTP entrance on Geiger Road would be the only available access to the expansion property and the new ENV Support Facilities. This alternative would require the high volume of public and employee traffic associated with the ENV Support Facilities to drive through the Honouliuli WWTP. This would not be acceptable because the WWTP is not laid out for through traffic and the route to access the ENV Support Facilities would be circuitous and confusing. The existing plant roads are not designed for the traffic loads that would be caused by the projected heavy daily traffic volumes associated with the support facilities. The existing plant roads are narrow and mostly one-lane, and there is insufficient space to widen or improve these internal roads to meet the future needs. Also, because of the need to limit access to the essential WWTP facilities for security and public safety reasons, only vehicles necessary for WWTP operations and maintenance activities should be allowed to drive within the WWTP site. Directing all traffic through the existing Honouliuli WWTP entrance would result in traffic impacts on Geiger Road, and this alternative would not provide sufficient points of access to the ENV Support Facilities for both normal and emergency access purposes. Further, the "No Action" alternative would not create a pipeline loop system and, therefore, would not provide additional redundancy in the WWTP potable water system needed for expansion of the plant.

1.8.2 ‘Ewa Refuse Convenience Center Relocation

The "No Action" alternative does not meet the present and future need for a safe, modern, and efficient facility to provide a necessary public service. The ERCC would remain at its existing location. There would continue to be occasional congestion and backup of traffic on Geiger Road, including blockage of the main Honouliuli WWTP driveway. The No Action alternative is not carried forward for the purposes of further analysis in this Draft EA since it was determined to not meet the purpose and need of the Proposed Action. No other feasible alternatives could be identified.

1.9 PROJECT SCHEDULE

The preliminary construction schedule for the ENV Support Facilities Access Road and Utility Improvements and ‘Ewa Refuse Convenience Center Relocation component projects is provided in Table 1-2. The anticipated years of construction are subject to change as project designs progress and the schedule is refined.

Table 1-2. Preliminary Construction Schedule

Project	Anticipated Years of Construction
ENV Support Facilities Access Road Improvements	2022-2023
Potable Water Main Extension	2023-2024
‘Ewa Refuse Convenience Center Relocation	2022-2023

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2.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND PROPOSED MITIGATION

2.1 CLIMATE AND AIR QUALITY

2.1.1 Affected Environment

2.1.1.1 CLIMATE

The climate in Hawaii is considered subtropical. The mean monthly temperatures in the project area range 73°F in January and February to 81°F in August. The project area is located within the leeward physiographic zone of Oahu; therefore, the area experiences relatively low rainfall. The mean annual rainfall in the region ranges from 20 to 30 inches, with summer months being the driest. The islands are exposed to trade winds from the northeast and Kona winds from the south. Trade winds prevail approximately 70 percent of the time. Average wind in the area ranges from 15 to 25 miles per hour (mph) with gusts of over 35 mph.

2.1.1.2 AIR QUALITY

Regional and local climate, together with the amount and type of human activity, generally dictate the air quality of a given location.

To protect public health and welfare, the Environmental Protection Agency (EPA), under the requirements of the 1970 Clean Air Act (CAA) as amended in 1977 and 1990, has established National Ambient Air Quality Standards (NAAQS) for six air pollutants known as criteria pollutants (40 CFR 50): carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} [particulate matter with a diameter ≤ 10 micrometers], and $PM_{2.5}$ [particulate matter with a diameter ≤ 2.5 micrometers]), lead (Pb), and sulfur dioxide (SO_2). The State of Hawaiʻi has adopted somewhat more stringent air quality standards than federal standards under Hawaiʻi Administrative Rules (HAR) Title 11, Chapter 59 (Table 2-1).

Air quality data is collected at four stations on Oʻahu. The closest station to the project location is the Kapolei Station, located at 2052 Lauwiliwili Street in the Kapolei Business Park. Excluding the exceedances due to the Kilauea eruption in the Lower East Rift Zone, in 2018 the State of Hawaii was in attainment of all NAAQS. The EPA considers the volcano a natural, uncontrollable event and the state requested exclusion of higher levels of SO_2 and $PM_{2.5}$ that occurred due to this event (DOH CAB 2020).

Table 2-1. State and Federal Ambient Air Quality Standards (AAQS)

Air Pollutant	Averaging Time	Hawai‘i State Standard	Federal Primary Standard	Federal Secondary Standard
CO	1-hour	9 ppm	35 ppm	None
	8-hour	4.4 ppm	9ppm	
NO_2	1-hour	---	0.100 ppm	---
	Annual	0.4 ppm	0.053 ppm	0.53 ppm
PM_{10}	24-hour	150 µg/m^3	150 µg/m^3	---
	Annual	50 µg/m^3	---	---
$PM_{2.5}$	24-hour	---	35 µg/m^3	35 µg/m^3
	Annual		12 µg/m^3	15 µg/m^3
O_3	8-hour	0.08 ppm	0.070 ppm	0.070 ppm
SO_2	1-hour	---	0.075 ppm	---
	3-hour	0.5 ppm	---	0.5 ppm
	24-hour	0.14 ppm	---	---
	Annual	0.03 ppm	---	---
Pb	Rolling 3-month	1.5 µg/m^3	0.15 µg/m^3	0.15 µg/m^3
H_2S	1-hour	0.025 µg/m^3	None	None

Source: State of Hawai‘i Annual Summary 2018 Air Quality Data. 2020. https://health.hawaii.gov/cab/files/2020/05/aqbook_2018.pdf

µg/m^3 microgram per cubic meter

ppm part per million

In addition to the establishing the NAAQS, the CAA also sets permit rules and emission standards for stationary pollution sources of certain sizes. The DOH has adopted the EPA-established stationary source regulations and acts as the administrator to enforce stationary source air pollution control regulations in Hawaii (DOH, Title 11, Chapter 60.1, Air Pollution Control). DOH grants an air permit to applicable facilities for not only federal enforceable major sources but also non-major sources in the state. The Honouliuli WWTP is a minor source for criteria pollutants and is operating under a non-covered source permit (Number (No.) 0215-020N) issued by the DOH under HAR Chapter 60.1

Although there are currently no greenhouse gas (GHG) emission limits for the City’s WWTPs, in 2007 the Hawaii State Legislature passed Act 234, “Global Warming Solutions Act” which Governor Linda Lingle signed into law. Act 234 required the

Department of Business, Economic Development and Tourism (DBEDT) and Department of Health (DOH) to update their Inventory of GHG Emissions Estimates for 1990 by December 31, 2008 and to reduce the amount of GHG emissions in Hawaii to levels at or below 1990 levels by 2020.

Hawai‘i’s contribution to GHGs includes the following (City and County of Honolulu Climate Change Commission 2018):

- In 2007, Hawaiʻi's total GHG emissions were 24 million metric tons of carbon dioxide (CO_2) equivalent.
- Total CO_2 emissions have slightly declined in the last decade, largely due to energy efficiency gains in the electricity sector.
- Oʻahu had 20.8 percent of net sales of electricity from sources deemed renewable in 2017; the law requires 100 percent by 2045.
- Fossil fuel use for transportation continues to increase.
- Hawaiʻi's CO_2 emissions are 20 percent lower than the national average.
- However, United States CO_2 emissions per capita are over three (3) times the world average and Hawaiʻi's are approximately twelve (12) times larger than other Pacific Islands.

In 2018 HB 2182 was passed, establishing a Greenhouse Gas Sequestration Task Force and setting a 2023 deadline for crafting a plan to meet a zero emissions target by 2045. Also passed in 2018, HB 1986 directs the state Office of Planning to work with the task force to create a carbon offset program (City and County of Honolulu Climate Change Commission 2018).

In 2016, GHG emissions from the waste sector accounted for four percent of total Hawaii emissions (0.78 million metric tons of CO_2 equivalents). The greatest share of waste sector emissions is attributable to landfills. Wastewater treatment accounted for nine percent of the waste sector GHG emissions (0.07 million metric tons of CO_2 equivalents). Both methane and nitrous oxide are generated during the wastewater treatment process. Emissions from wastewater treatment were 32 percent lower in 2016 than 1990 (ICF and University of Hawaiʻi Economic Research Organization 2019).

2.1.2 Potential Environmental Consequences and Mitigation Measures

2.1.2.1 CONSTRUCTION

During construction, transportation of materials, road and utility improvements, relocation of the ERCC, and fueling of equipment would contribute to Hawaiʻi's GHG emissions. Short- and long-term impacts to air quality in the project area could result from the temporary operation of machinery associated with vegetation clearing, vegetation processing and disposal, site grading, and construction activities. Long-term impacts may be associated with vehicle emissions.

Air quality in the project area is affected by the WWTP, vehicular CO emissions, and to a lesser extent nearby industrial uses. CO emissions are generated by traffic on the roads surrounding the project area and vehicles traveling into the project site. Dominant northeasterly trade winds may push on-site vehicular emissions downwind, along with emissions from nearby industrial and commercial uses, away from the project area.

All construction work would be in conformance with the air pollution control standards contained in HAR Title 11, Chapter 59, Ambient Air Quality Standards, and Chapter 60.1, Air Pollution Control, which would minimize air quality emissions. Additionally, the Proposed Action should not exceed standards set forth in Chapter 11-60 (Sections 11-60-55 and 11-60-4).

Best management practices (BMPs) to control construction emissions would be implemented to minimize visible fugitive dust emissions at the property line. The BMPs would include watering of active work areas, using wind screens, keeping adjacent paved roads clean, and covering open-bodied trucks. Additional measures can also be considered if necessary, such as using newer equipment, reducing truck on-site idling time, and moving construction materials and workers to and from the project sites during off-peak traffic hours.

Dust from short-term construction activities would be controlled by watering the construction site. Paving improvements related to the project would mitigate present dust generation at the site due to existing barren undeveloped lands and unpaved roadways. In addition to the lack of significant impacts on air quality due to the construction phase, the construction of the Proposed Action would have a less than significant impact on the climate on or around the project site.

2.1.2.2 OPERATION

The project would not significantly increase GHG emissions associated with operating the WWTP once construction is complete. The Honouliuli WWTP has six separate odor control systems that collect and treat foul air from the WWTP. Odor Control System Permit No. 0215-02-N limits the H_2S concentrations at each individual odor control system outlet. Ongoing monitoring is conducted at 13 fence line monitoring locations along the original WWTP property line and at the outlet stacks of each odor control system in compliance with permit requirements.

The new ERCC would replace a 34-year old facility and would be built in accordance with Revised Ordinances of Honolulu (ROH) Chapter 32 Building Energy Conservation Code. Relocating the ERCC would alleviate traffic congestion along Geiger Road, potentially reducing mobile source CO and GHG emissions.

The Proposed Action provides pedestrian and cyclist access ways that would link to existing and future bike routes, including the Leeward Bikeway being constructed by the State in the OR&L right-of-way (ROW), which would encourage non-motorized transportation and mitigate some of the increase in GHGs.

2.2 TOPOGRAPHY, GEOLOGY, AND SOILS

2.2.1 Affected Environment

2.2.1.1 TOPOGRAPHY

The Proposed Action would be located on the Eastern portion of the island of Oahu. The geology of this portion of the island is mostly coastal plains called the ‘Ewa Plains. Topography within the ‘Ewa Plains is gently sloping and relatively flat. Elevation around the project site ranges from 25 feet mean sea level (MSL) in the southern portion of the site to 45 feet MSL in the northern portion of the site (AECOM 2017).

2.2.1.2 GEOLOGY/SOILS

The soil association within the project area is Lualualei-Fill land-‘Ewa. This soil association is suited for sugarcane, truck crops, pasture, and urban development (Hawaii Agricultural Experiment Station 1971). According to the U.S. Department of Agricultural Soil Conservation Services Soil Survey Report of O’ahu Island, this soil association is defined as: deep, nearly level to moderately sloping, well-drained soils that have a fine textured or moderately fine textured subsoil or underlying material and areas of fill land located on coastal plains.

The surface layer of Lualualei-Fill land-‘Ewa association has a surface and subsoils that are a dark red and brown color and is a friable silty clay loam. The substratum could be either a gravely alluvium or coral limestone. The association is made up of 20% Lualualei, 20% Fill and 15% ‘Ewa soils, the remaining 45% is made up of Honouliuli, Jaucas, Kawaihapai, Makalapa, Mamala, and Pulehu soils (United States Soil Conservation Services 1972).

The United States Department of Agriculture Soil Survey GIS layer was utilized to identify the specific soil classification within the two project areas (Web Soil Survey 2020). The soil associated in the area for the proposed access roads consists of Mamala cobbly silty clay loam. The soil is found on land with a slope between 0 to 12%. The location for the proposed ERCC has four different soil types. According to Figure 2-1, the soil types for this area are a combination of Mamala cobbly silty clay loam, Waialua silty clay, Honouliuli clay, and Ewa silty clay loam. The erosion potential of the land in the project area is considered potentially highly erodible.

Agricultural productivity within the limits of the project site is considered unclassified (AECOM 2017). Although the area has historically been utilized for agricultural purposes, the project site has since been developed and urbanized; therefore, it would be considered unsuitable for crop production, either because the land value of the property is too high for unsubsidized agricultural use or because crop production would be incompatible with surrounding land uses. There are no regulations specific to this designation; however, federally assisted/managed/ funded projects may be subject to the Farmland Protection Policy Act (FPPA) (USDA NRCS 1981). According to Part 523, Subpart B, 523.10B(ii) of the FPPA Manual, lands identified as “urbanized area” on United States Census Bureau (USCB) maps are not subject to provisions of the FPPA (USDA NRCS 2013). The project site is located within an area designated as UA as shown on the 2010 Census – Urbanized Area Reference Map for Urban Honolulu (USCB 2012); therefore, it is not anticipated that the project would be subject to the FPPA (AECOM 2017).

2.2.2 Potential Environmental Consequences and Mitigation Measures

The Proposed Action would require industry-standard BMPs to preserve geologic structure, slope stability, and soil retention. After construction, slopes would be stabilized with vegetation, geotextile, rock, and/or retaining walls as needed.

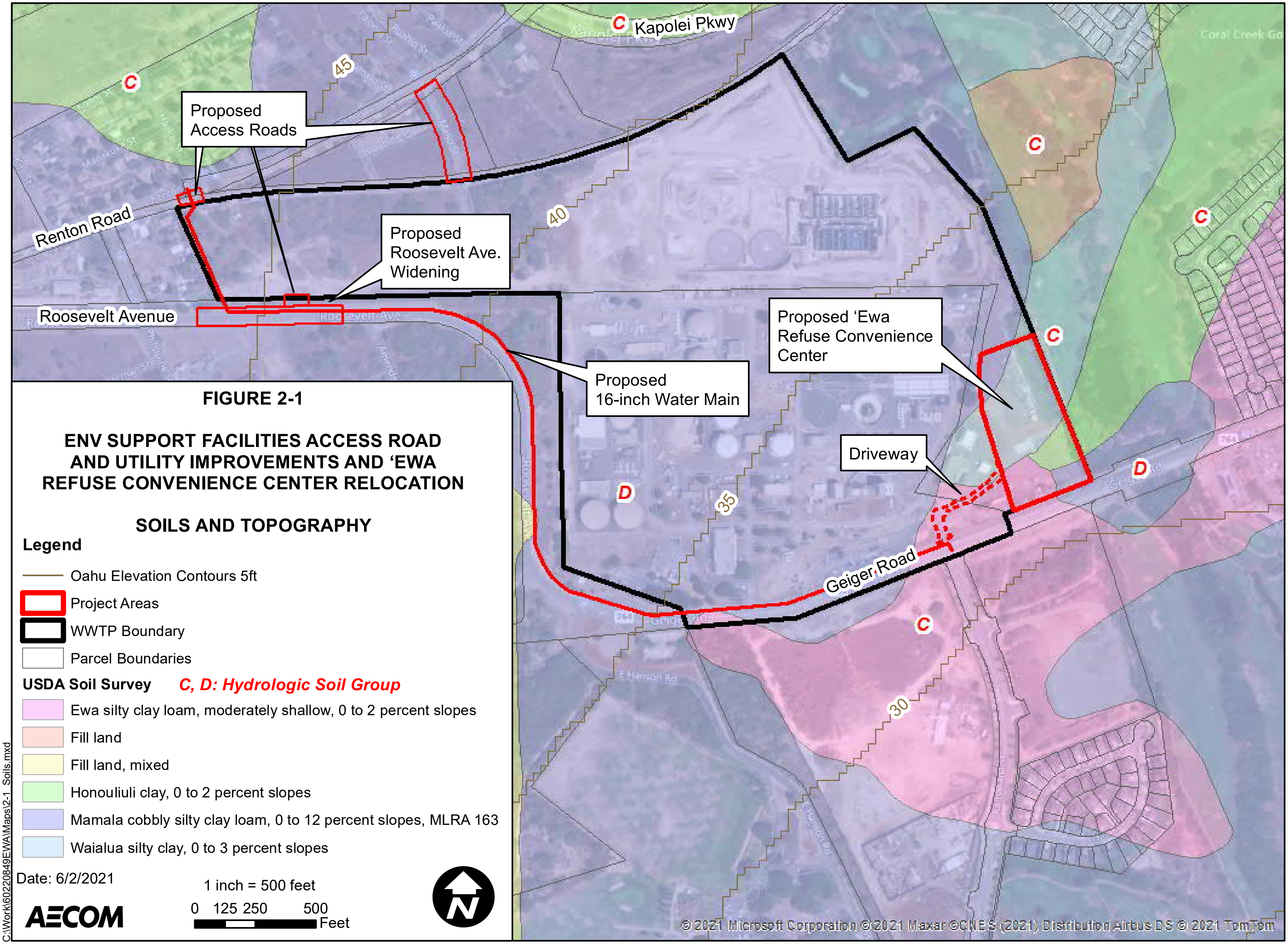

FIGURE 2-1

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND ‘EWA REFUSE CONVENIENCE CENTER RELOCATION

SOILS AND TOPOGRAPHY

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Standard BMPs such as compost filter socks, retaining-settling basins, on-site swales, and contouring would help to retain the soil as well as curb sedimentation and erosion both on- and offsite.

2.2.2.1 CONSTRUCTION

The proposed access road and utility improvements and the relocation of the ERCC are not anticipated to have effects on the topography or geology within the limit of work. The Proposed Action is on highly developed land that is relatively flat to moderately sloping, and minimal alterations to the topography or soil of the site would occur.

Design of the proposed access road and utility improvements and ERCC would balance excavation and embankment as much as possible to minimize import or export of material at the site. Final topography would be designed to blend with the existing topography.

During construction, mitigation methods would be implemented to address impacts to the topography and soils of the project site. Construction equipment would be maintained in good working condition to reduce the potential for accidental spills. In addition, although construction activities would involve grading and excavation, mitigation measures such as erosion and sedimentation controls (i.e., silt fence, filter bags) would be implemented to reduce impacts to the natural environment. Soil which is not immediately used for backfilling would be stockpiled and covered or otherwise protected (e.g., surrounded by silt fence) to prevent erosion or sedimentation. In addition, temporary seeding and mulching may be used to minimize soil erosion and provide soil stabilization on slopes.

Earthwork grading would be undertaken to prevent siltation and unnecessary runoff. During construction, a sediment and erosion control plan would alleviate impacts to the underlying soils and topography. There would be a sediment and erosion control plan in place to ensure soil is not impacted. The plan would contain standard construction BMPs for the construction phase such as erosion screens and sediment fencing.

2.2.2.2 OPERATION

The topography of the project area is not anticipated to be impacted as a result of the Proposed Action as it would remain a relatively flat area. A potential impact to soils may occur due to the additional paved area associated with the new access roads and 16-inch water main, and the relocated ERCC. The paved areas may result in a slight increase in runoff which could result in erosion of surrounding soils. However, appropriate stormwater BMPs would be implemented to control runoff and minimize impacts.

Waste that is brought to the ERCC would be placed in designated waste bins. No industrial, hazardous, or infectious waste would be accepted at the ERCC other than wastes that may be periodically accepted by appointment as part of a designated household hazardous waste collection event. In the event of an intentional or accidental disposal of prohibited materials resulting in a leak or spill of hazardous materials, a Spill Response Plan would be in place to prevent soil contamination.

2.3 HYDROLOGY

2.3.1 Affected Environment

2.3.1.1 GROUNDWATER

Groundwater supply in Oʻahu accumulates through the percolation of rain and surface water. When precipitation occurs, the rainwater seeps through the soil and then through porous volcanic rock, also known as the caprock (Hawaiʻi's Water Cycle 2020). Groundwater supply can also come from return irrigation waters and seepage from other water bodies. Once the water percolates through the caprock, it remains semiconfined beneath the caprock, if present, and forms an aquifer. The project area is located within the Pearl Harbor aquifer sector. Within this aquifer sector, there are three aquifer systems areas: the Waimalu, Waipahu-Waiawa, and ʻEwa-Kunia. The Proposed Action is located within the Waipahu-Waiawa Aquifer Systems Area. The Waipahu-Waiawa is the main water source for water for the surrounding areas (Dashiell, Oceanit, & Townscape, Inc. 2007).

According to the Commission on Water Resource Management, the sustainable yield for the Waipahu-Waiawa Aquifer is 104 million gallons per day (mgd). The permitted use is about 83 mgd, which is the highest permitted use of the aquifers in Central O'ahu. Since this is the main aquifer for drinking water, various entities withdraw water from the system. Table 2-2 represents the permitted water allocations. The Board of Water Supply (BWS) withdraws the largest amount of groundwater from the aquifer followed by private and Federal/Military withdrawals.

Table 2-2. Waipahu-Waiawa Permitted Water Withdrawal for Each Entity

Aquifer System Area	BWS (mgd)	City/ Non-BWS (mgd)	Federal/ Military (mgd)	Federal/ Non-Military (mgd)	State (mgd)	Private (mgd)	Total (mgd)	Sustainable Yield (mgd)	Available Allocation (mgd)
ʻEwa-Kunia	9.72	0.00	2.34	0.00	0.50	2.90	15.46	16	0.543
Kapolei	0.00	0.00	0.00	0.00	0.73	1.30	2.03	N/A	N/A
Malakole	0.00	0.00	0.00	0.00	0.50	5.43	5.93	N/A	N/A
Puʻuloa	0.00	0.53	5.89	0.24	0.00	8.16	14.82	N/A	N/A
Wahiawā	0.00	0.00	5.65	0.00	0.00	3.96	9.61	23	N/A
Waimalu	45.53	0.00	0.70	0.00	0.14	0.59	46.95	45	-1.951
Waipahu-Waiawa	55.09	0.00	14.98	0.18	1.36	11.30	82.91	104	21.091
Total	**111.034**	**0.53**	**29.56**	**0.42**	**3.23**	**33.64**	**177.71**	**188**	**46.416**

(Dashiell, Oceanit, & Townscape, Inc. 2007)

Groundwater recharge occurs from precipitation and seepage from surface water bodies. Water from irrigation systems have also been used to recharge the aquifer system. However, since the decline of the sugar industry, recharging of ground water from irrigation systems has dwindled. The lack of recharge water from irrigation systems resulted in the reduction of sustainable yield and an increase in saltwater intrusion (Dashiell, Oceanit, & Townscape, Inc., 2007).

The closest well to the project site is approximately 3.1 miles to the north. The project site is also located within the Southern Oʻahu Basal Aquifer, which is designated as a Sole Source Aquifer (EPA 2000). EPA review is required for federally funded projects within a Sole Source Aquifer to determine if there is potential for contamination. Groundwater moves downward until it encounters impermeable geological features and contributes to the freshwater (Ghyben-Herzberg) lens or emerges as springs. There are no public groundwater wells within a one-mile radius of the project site (AECOM 2017).

2.3.1.2 Surface Water

The project area does not have many surface streams discharging into the ocean or Mamala Bay. There are no perennial streams close to the facility; however, Kaloi Gulch, which is part of the natural drainage system, runs along the eastern border of the site. Kaloi Gulch originates at the southeastern end of the Waiʻanae Mountains as a culmination of several gulches along the southeastern side of the Waiʻanae Mountains. Figure 2-2 depicts the surface waters, stormwater BMPs, and stormwater infrastructure near the project site. BMPs are natural or man-made structures that mitigation and prevent water pollution from runoff. There are three BMPs near the proposed area for the ERCC.

There is a small wetland located over a mile from the proposed project area, and a small pond is located within the Coral Creek Golf Course about a half mile from the project area.

2.3.2 Potential Environmental Consequences and Mitigation Measures

2.3.2.1 Construction

Significant impacts to groundwater are not anticipated during construction. The excavation and installation of the water main would require excavating to a depth of approximately 5 feet for proper installation (State of Hawaiʻi 2002). It is not anticipated that the Proposed Action would impact groundwater. Any activity occurring in or near groundwater would be conducted in accordance with applicable regulations. In addition, appropriate mitigation methods (e.g., silt fences, proper storage and movement of spoils), monitoring of groundwater, and careful site preparation would be utilized to minimize adverse impacts.

It is not anticipated that surface water would be impacted by the Proposed Action. Erosion and sedimentation measures would be implemented where necessary during construction activities. Therefore, nearby off-site surface waters are not anticipated to be impacted as a result of stormwater during construction activities. Construction activities would also be conducted in compliance with a CWA 402 NPDES Construction Stormwater Permit issued by the DOH – Clean Water Branch.

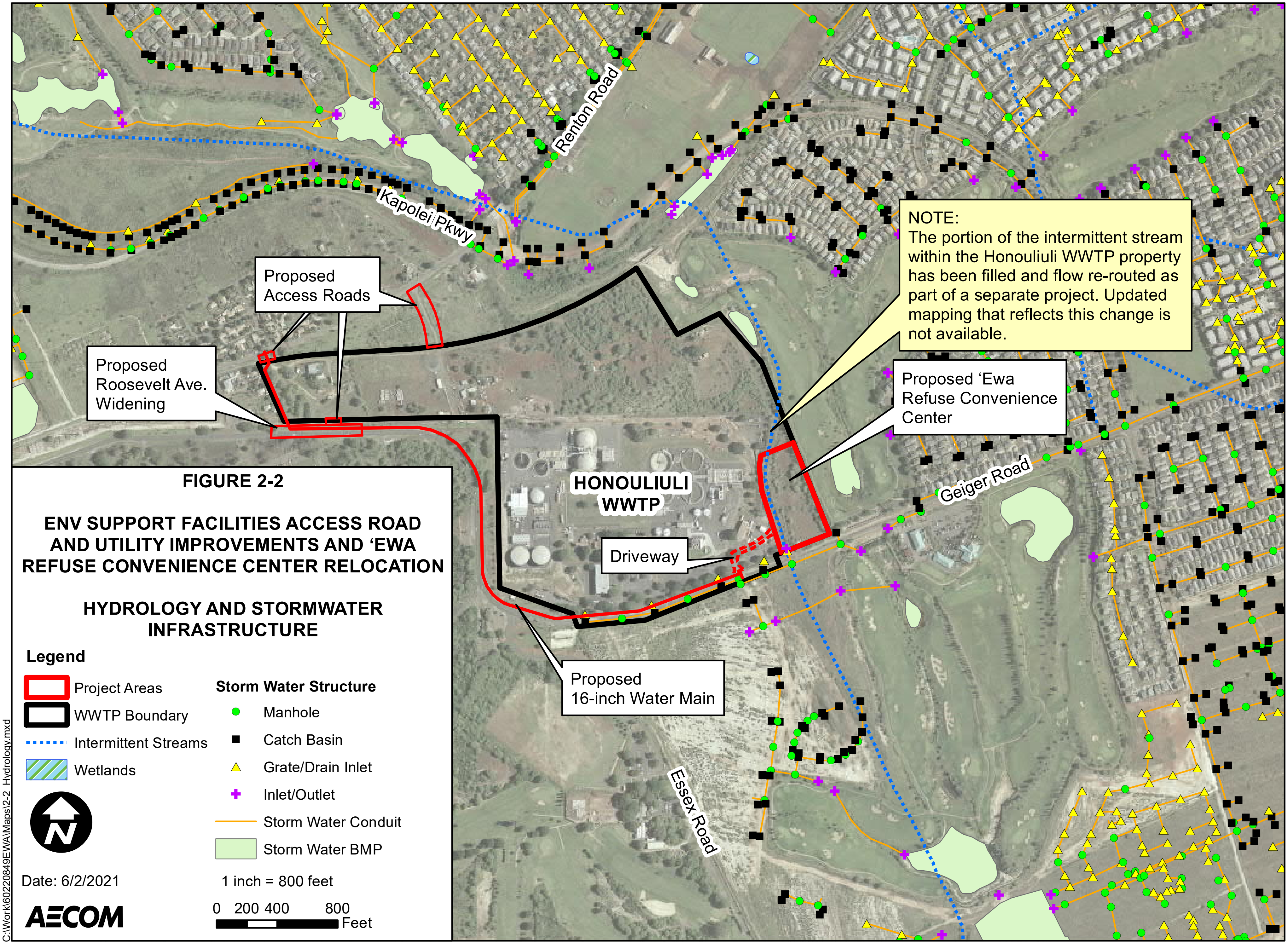

FIGURE 2-2

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND ‘EWA REFUSE CONVENIENCE CENTER RELOCATION

HYDROLOGY AND STORMWATER INFRASTRUCTURE

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2.3.2.2 Operation

Impervious surfaces would increase due to the paving of the access roads and construction of the relocated ERCC. The increase in impervious surface area may result in a small reduction to local groundwater recharge. An increase in impervious surfaces may also result in an increase in stormwater runoff. However, all development related runoff would be managed on site by a stormwater BMP system including detention/infiltration basins and vegetated drainage swales, and the project would comply with City’s NPDES MS4 Permit HI S000002 and City and County of Honolulu Administrative Rules §20-3 Rules Relating to Water Quality. Since the project is in an area of a sole source aquifer, both the construction and operation practices would be reviewed and approved by the EPA in accordance with sole source aquifer requirements.

2.4 Solid Waste and Hazardous Materials

2.4.1 Affected Environment

2.4.1.1 Solid Waste

The City maintains the Integrated Solid Waste Management Plan which outlines the strategy to manage solid waste while protecting the human health and environment (City and County of Honolulu 2019). The existing solid waste management system includes the following components:

- Solid waste collection;
- Convenience centers;
- Transfer stations;
- Energy Recovery (H-POWER);
- Landfilling;
- Recycling and bioconversion;
- Source reduction;
- Special waste management;
- Household hazardous waste and electronic waste management; and
- Public Education.

For efficient service, the island is divided into seven districts, each of which has its own collection yard. The project site is located within the Pearl City District, served by the Pearl City Collection Yard.

Municipal solid waste (MSW) collection through residential curbside collection is provided to single-family residences, some multi-family properties, and non-residential customers and city agencies. The waste in and around the project site for these entities is collected and brought to the Pearl City Collection Yard.

Commercial solid waste is collected by private haulers that deliver the waste to City disposal facilities at Honolulu Program of Waste Energy Recovery (H-Power), or the Waimanalo Gulch Sanitary Landfill, or to City transfer stations.

Commercial construction and demolition debris is not accepted at either H-POWER or Waimanalo Gulch Sanitary Landfill but can be taken to the privately-owned construction and demolition landfill operated by PVT Land Company, Ltd. in Nanakuli. As the PVT landfill is anticipated to expend its remaining capacity within the next several years (Hawaii News Now 2020), the City currently is considering alternative disposal sites for construction and demolition debris.

The existing ERCC is one of nine public refuse drop-off locations used by residents to dispose of household solid waste that cannot be placed in curb-side pickup carts. The ERCC accepts residential refuse, green waste , auto batteries, tires, compressed gas cylinders, and appliances. The refuse is then separated and delivered to the appropriate disposal or recycling location. Multiple roll-off dumpsters are used onsite for the separate collection of different types of materials: combustibles are processed at the H-POWER, non-combustibles are taken to the Waimanalo Gulch Landfill in Kahe Valley; yard waste is hauled to mulching and composting sites; and large appliances, tires and auto batteries are taken to recycling facilities. All convenience centers are open daily from 7 AM to 6 PM.

Transfer stations consolidate waste from MSW trucks into larger transfer trailers to transport to the H-POWER. There are no transfer stations in the Pearl City District.

The City-owned H-POWER facility is the only Waste-to-Energy facility on Oahu. H-POWER has been in commercial operation since 1990. The majority of residential and commercial MSW collected on the island for disposal, as well as some WWTP biosolids, are delivered there.

2.4.1.2 POTENTIAL POLLUTANTS AND HAZARDOUS MATERIALS

Convenience centers are limited to accepting residential household waste, while commercial or business refuse is strictly prohibited. Household generated waste is not considered hazardous waste under federal RCRA rules and State Hazard Waste Management rules. However, some components of household generated waste may pose human health or environmental hazards when improperly managed (CCH ENV 2019a).

Any potential pollutants at the ERCC would be related to the residential refuse, green waste, auto batteries, tires, compressed gas cylinders such as propane tanks and fire extinguishers, and appliances accepted at the facility (CCH DFM 2016). These items are separated and delivered to the proper disposal facility.

Proper management of household hazardous waste (HHW) is essential to protect the health and welfare of the public. The City provides residents with detailed information on waste prevention, safe handling, and proper disposal of HHW on its opala.org website. Many types of HHW can be safely disposed of in the City’s existing refuse and sewage systems; otherwise, collection events are planned for waste that requires special handling (CCH ENV 2019b).

The EPA web-based tool NEPAssist (epa.gov/nepa/nepassist) shows three sites listed as hazardous waste generators off of Renton Road, just northeast of Malio street: EWA Mill at 91-1201 Renton Road and the Hawaiian Railway Society at 91-1001 Renton Road, and West Loch Elderly Village (owned by the City and County of Honolulu) at 91-1472 Renton road for mercury.

2.4.2 Potential Environmental Consequences and Mitigation Measures

In the event of an intentional or accidental disposal of prohibited materials resulting in a leak or spill of hazardous materials, the Spill Response Plan from the 2016 Storm Water Management Protection Plan (SWMPP) would be implemented (CCH DFM 2016). The Spill Response Plan outlines detailed procedures to be followed in the event of a spill, including notifying appropriate authorities and documenting the event. Following any spill cleanup, a review is conducted to assess the effectiveness of the spill response plan and determine areas for improvement.

2.4.2.1 Construction

Wastes generated or introduced during construction activities, such as oil leaks from vehicles, would be handled and disposed of properly. In addition to the site-specific BMPs developed in the 2016 SWMPP, BMPs would be put in place prior to any construction activities. Spill prevention and response procedures are outlined in the SWMPP to prevent and minimize the discharge of pollutants off the site during the construction phase. Impacts from the construction phase would be less than significant with implementation of these procedures and controls. The Proposed Action is not anticipated to generate hazardous waste that would enter the surrounding soil or groundwater.

2.4.2.2 Operation

The operation of the Proposed Action would not alter any current procedures in place to manage solid or hazardous waste disposal. The mix, quantity, and type of refuse at the site would not change with operation of the Proposed Action. Relocating the ERCC would improve access to and functioning of the convenience center, and accommodate growing refuse needs. The Proposed Action is expected to have less than significant impacts on the site associated with solid and hazardous waste.

2.5 Natural Hazards

2.5.1 Affected Environment

2.5.1.1 Earthquakes

Oʻahu does not have any active volcanoes; therefore, the island is not subject to significant earthquakes from volcanic activity. However, earthquakes are not uncommon in Hawaiʻi. Most earthquakes in the Hawaiian Islands are caused by volcanic activity on the island of Hawaiʻi, the Big Island. Earthquakes that reach Oʻahu are generally not strong and cause little or no damage. One of the larger and more recent earthquakes occurred offshore of Puakō, Hawaiʻi in 2006. The earthquake measured 6.7 on the Richter scale and caused minor damages on the island of Oʻahu. In 2017, a magnitude 5.28 earthquake occurred southeast of Volcano, Hawaiʻi and was felt on Oʻahu, Maui, and Hawaiʻi (AECOM 2017).

The International Building Code classifies the likelihood of seismic activity into zones ranging from 0 to 4. Seismic Zone 0 represents no chance of severe ground shaking and Seismic Zone 4 represents a 10% chance of severe shaking in a 50-year interval. The International Building Code classifies Oʻahu as Seismic Zone 2A.

2.5.1.2 HURRICANES

Tropical storm systems that have sustained winds exceeding 73 miles per hour, form in warm tropical waters near the equator, and strike in the Atlantic and Eastern Pacific Oceans are known as hurricanes. Similar tropical storm systems that strike in the Western Pacific Ocean, Indian Ocean and Southern Pacific Oceans are called typhoons and cyclones, respectively. Due to the geographic location of Hawaiʻi within the Eastern Pacific Ocean, tropical storms that strike Hawaiʻi are referred to as hurricanes. In Hawaiʻi, hurricane season runs from June 1 to November 30. The last major hurricane (Category 4) was Iniki, which passed over Kauaʻi on September 11, 1992. Although most of the damage was on Kauaʻi, Oʻahu also experienced some damage from wind and storm surge, which did not impact the Honouliuli WWTP vicinity. When a hurricane hits the island, the Honouliuli WWTP and existing ERCC are just as likely to be damaged as any other structure in the area. Roads may be damaged due to flooding but are less vulnerable to the impacts of high winds than structures.

2.5.1.3 TSUNAMIS

Tsunamis are a series of waves that are created by sea floor movements caused by earthquakes, landslides, or volcanic eruptions. The Hawaiian Islands are always at risk for tsunamis, as the islands are susceptible to tsunamis generated from earthquake and volcanic activity from the area bordering the Pacific Ocean (also known as the "Rim of Fire"). Between 1812 and December 2017, a total of twenty-seven tsunamis with runup heights greater than one meter made landfall in Hawaiʻi (Tetra Tech, Inc. 2018). The last major tsunami was the 1960 Hilo tsunami. Although this particular tsunami did not affect Oʻahu, tsunamis can be a hazard on Oʻahu. Three of the six tsunamis that have crossed the Pacific Ocean in the last decade have required mandatory shoreline evacuations.

Tsunamis can strike anywhere along the coast. Areas that are less than 25 feet above sea level and within one mile of the shoreline are at the greatest risk to tsunamis (Tetra Tech, Inc. 2018). The City and County of Honolulu Department of Emergency Management has developed maps that depict tsunami evacuation zones for public safety as part of its emergency management program. In the projected worst-case scenario for the State – a Great Aleutian Tsunami, which has an expected recurrence interval of 1,000 years – approximately 61 square miles, or 10 percent of the total area of the City would be inundated (Tetra Tech, Inc. 2018). The Great Aleutian Tsunami inundation area has been used by the City as the basis for new secondary evacuation zones, which are known as Extreme Tsunami Evacuation Zones. The Evacuation Zone and Extreme Tsunami Evacuation Zone are displayed in Figure 2-3.

According to the tsunami evacuation zone maps, the Proposed Action site is not located within either the Evacuation Zone or the Extreme Tsunami Evacuation Zone. The site of the proposed relocated ERCC is located just north of the Extreme Tsunami Evacuation Zone. The project is located approximately 1.5 miles north of the shoreline. According to the Federal Emergency Management Agency (FEMA), areas within 1 mile of the coastline are at greater risk to tsunamis.

The National Oceanic and Atmospheric Administration has two tsunami warning centers – the Pacific Tsunami Warning Center in ʻEwa Beach and the National Tsunamic Warning Center in Palmer, Alaska – which provide early warnings of potentially destructive tsunamis. The Pacific Tsunami Warning Center provides the official tsunami warnings for Hawaiʻi, including warnings, watches, advisories, information statements, seismic information statements, and warning cancellations. Sirens are used as an attention alert signal.

2.5.1.4 FLOODING

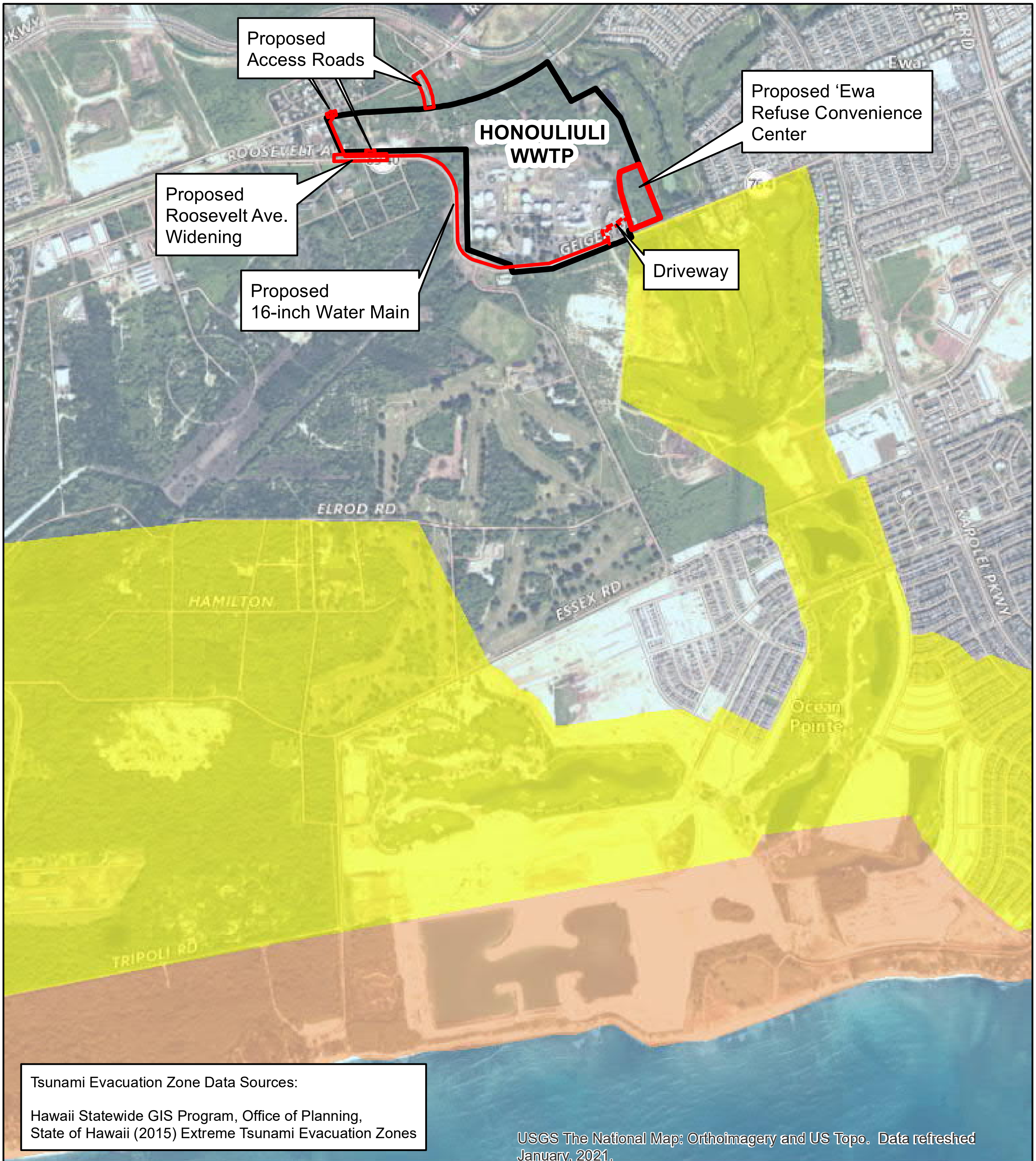
The Proposed Action is located to the north of the southwestern coastline on the island of Oʻahu at the Honouliuli WWTP. According to the digitized FEMA Special Flood Hazard Areas for the State of Hawaiʻi GIS data layer, most of the project is located in Zone D. Zone D is designated as unstudied areas where flood hazards are undetermined, but possible. A portion of TMK 9-1-069-003 is located within Zone X, which includes areas outside of the 1-percent annual chance flood areas or areas protected from the 1-percent annual chance flood by levees. Zone X is an area of minimal flood hazard. The developed portion of this parcel is not located within a flood prone area (Figure 2-4). The project is located on FIRM panel 15003C0310G, effective January 29, 2011. The digitized data for the City was published November 5, 2014 and includes Letter of Map Revision updates through October 30, 2018.

2.5.1.5 CLIMATE CHANGE AND SEA LEVEL RISE

Climate change refers to any significant change in the measures of climate lasting for an extended period of time (US EPA 2017). The risks of climate change include changes in rainfall intensity, sea level rise, groundwater levels, saltwater intrusion, and impacts from storm hazards.

Temperature

Impacts of changing air temperature include the following (City and County of Honolulu Climate Change Commission 2018):



Legend

Project Areas
WWTP Boundary
Extreme Tsunami Evacuation Zone
Tsunami Evacuation Zone

1 inch = 1,500 feet

0 375 750 1,500 Feet

AECOM

FIGURE 2-3

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND 'EWA REFUSE CONVENIENCE CENTER RELOCATION

EVACUATION ZONE AND EXTREME TSUNAMI EVACUATION ZONE

Date: 6/2/2021

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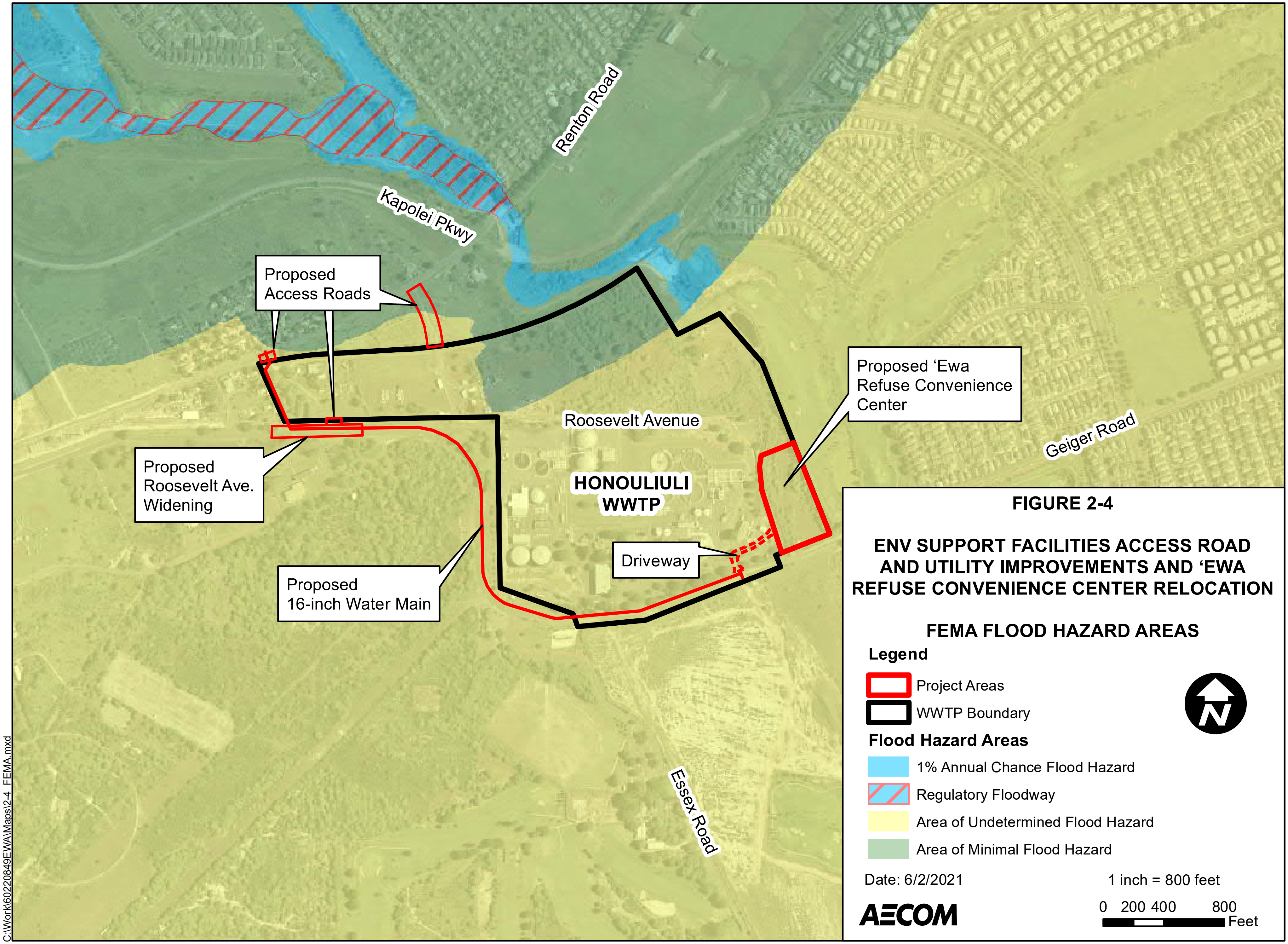

Renton Road
Kapolei Pkwy
Proposed
Access Roads
Proposed 'Ewa
Refuse Convenience
Center
Roosevelt Avenue
Geiger Road
Proposed
Roosevelt Ave.
Widening
HONOULIULI
WWTP
Driveway
Proposed
16-inch Water Main
Essex Road
FIGURE 2-4
ENV SUPPORT FACILITIES ACCESS ROAD
AND UTILITY IMPROVEMENTS AND 'EWA
REFUSE CONVENIENCE CENTER RELOCATION
FEMA FLOOD HAZARD AREAS
Legend
Project Areas
WWTP Boundary
Flood Hazard Areas
1% Annual Chance Flood Hazard
Regulatory Floodway
Area of Undetermined Flood Hazard
Area of Minimal Flood Hazard
Date: 6/2/2021
1 inch = 800 feet
0 200 400 800
Feet
AECOM
N
C:\Work\60220849EWA\Maps\2-4_FEMA.mxd

- In Hawaiʻi, the rate of warming air temperature has increased in recent decades. Currently, the air is warming at 0.3°F per decade, four times faster than half a century ago.
- Statewide, average air temperature has risen by 0.76°F over the past 100 years, and 2015 and 2016 were the warmest years on record.
- Warming air temperatures lead to heat waves, expanded pathogen ranges and invasive species, thermal stress for native flora and fauna, increased electricity demand, increased wildfire, potential threats to human health, and increased evaporation which both reduces water supply and increases demand. Rapid warming at highest elevations impedes precipitation, the source of Hawaiʻi's freshwater. During the strong El Niño of 2015, Honolulu set or tied 11 days of record heat. This compelled the local energy utility to issue emergency public service announcements to curtail escalating air conditioning use that stressed the electrical grid.
- Some model projections for the late 21st century indicate that surface air temperature over land will increase 1.8^{o} to 7.2 °F with the greatest warming at the highest elevations and on leeward sides of the major islands.
- Under continued strong GHG emissions, high elevations above 9,800 feet are predicted to reach up to 7.2° to 9°F warmer temperatures by the late 21st century.

Wind and Precipitation

Impacts of changing wind and precipitation include the following (City and County of Honolulu Climate Change Commission 2018):

- The frequency of gale-force winds is increasing in the western and south Pacific but decreasing in the central Pacific.
- Average daily wind speeds are slowly declining in Honolulu and Hilo, while remaining steady across western and south Pacific sites.
- Studies indicate there will be future changes to winds and waves due to climate change, which affects ecosystems, infrastructure, freshwater availability, and commerce.
- Hawaiʻi has seen an overall decline in rainfall over the past 30 years, with widely varying precipitation patterns on each island. The period since 2008 has been particularly dry.
- Declining rainfall has occurred in both the wet and dry seasons and has affected all the major islands. On Oʻahu, the largest declines have occurred in the northern Koʻolau mountains.
- Heavy rainfall events and droughts have become more common, as well as increasing runoff, erosion, flooding, and water shortages.
- Consecutive wet days and consecutive dry days are both increasing in Hawaiʻi.

- There is disagreement regarding predicted precipitation at the end of the century. Model projections range from small increases to increases of up to 30% in wet areas, and from small decreases to decreases of up to 60% in dry areas.
- Generally, windward sides of the major islands will become cloudier and wetter. The dry leeward sides will generally have fewer clouds and less rainfall.
- Stream flow in Hawaiʻi has declined over approximately the past century, consistent with observed decreases in rainfall. This indicates declining groundwater levels.
- More frequent tropical cyclones are projected for the waters near Hawaiʻi. This is not necessarily because there will be more storms forming in the east Pacific; rather, it is projected that storms will follow new tracks that bring them into the region of Hawaiʻi more often.

Sea Level Rise

In June of 2018, the City and County of Honolulu Climate Change Commission adopted guidance based on findings included in the “Sea Level Rise Vulnerability and Adaptation Report” prepared by the Climate Change Mitigation and Adaptation Commission (Tetra Tech, Inc. et al. 2017) and other scientific literature. This guidance provides specific policy and planning guidance on responding to sea level rise by the City. The following is the summary of key findings:

A. Relative to the year 2000, the projected rise of global mean sea level (GMSL) by the end of the century is 1.0 to 4.3 feet (Church et al. 2013).

B. High tide flooding will arrive decades ahead of any GMSL rise scenarios (EIA 2017).

i. Based on the location of the Honolulu Tide Station, high tide flooding will occur by mid-century and as early as 2028, at least two (2) dozen times per year, at certain locations in the 3.2 sea level rise-exposure area (Fletcher et al. 2012).

C. Modeling results, as mapped in the Hawaiʻi Sea Level Rise Viewer, reveal a critical elevation in GMSL rise between 2.0 and 3.2 feet relative to mean higher high water.

i. This is a critical range of rising sea level where there is rapid increase in the amount of land exposed to hazards on low-lying coastal plains, such as characterize the urbanized south shore of Oʻahu.

ii. This is a dangerous elevation range, where reacting after the fact to establish adaption strategies is likely to be less successful and costlier than taking proactive measures.

Planning for Climate Change

The City has taken steps to plan for the impacts of climate is change. The City and County of Honolulu Climate Change Commission adopted a Climate Change Brief in June 2018 to establish the factual basis and impacts of climate change for the City. In July of 2018, the Mayor of Honolulu issued Directive 18-02, which requires each City department and agency to:

- Consider the need for both climate change mitigation and adaptation as pressing and urgent matters;
- Take a proactive approach in both reducing GHG and adapting to impacts caused by sea level rise; and
- Align programs whenever possible to help protect and prepare the infrastructure, assets, and citizens of the City for the physical and economic impacts of climate change.

Based on the collective findings of the 2017 Sea Level Rise Report and previous scientific works, the City and County of Honolulu Climate Change Commission recommended setting a planning benchmark up to 3.2 feet of GMSL rise by mid-century to account for chronic high tide flooding. Additionally, the research finds that it is reasonable to set as a planning benchmark up to 6 feet of GMSL in later decades of the century, especially for critical infrastructure with long expected lifespans and low risk tolerance. These scenarios are required to be used in by City departments in their plans, programs, policies, and capital improvement decisions.

Based on the guidance in the Sustainability and Resiliency’s Sea Level Rise Guidance, planning benchmarks of 3.2 feet and 6 feet of sea level rise are considered and mapped. Figure 2-5 shows exposure to the 3.2 feet sea level rise scenario and a 6 feet sea level rise scenario for the project area. As shown in this figure, the project is not located within the extent of either the 3.2 feet or 6 feet of sea level rise scenarios. The project site is located at an elevation that ranges from 25 to 40 feet above sea level.

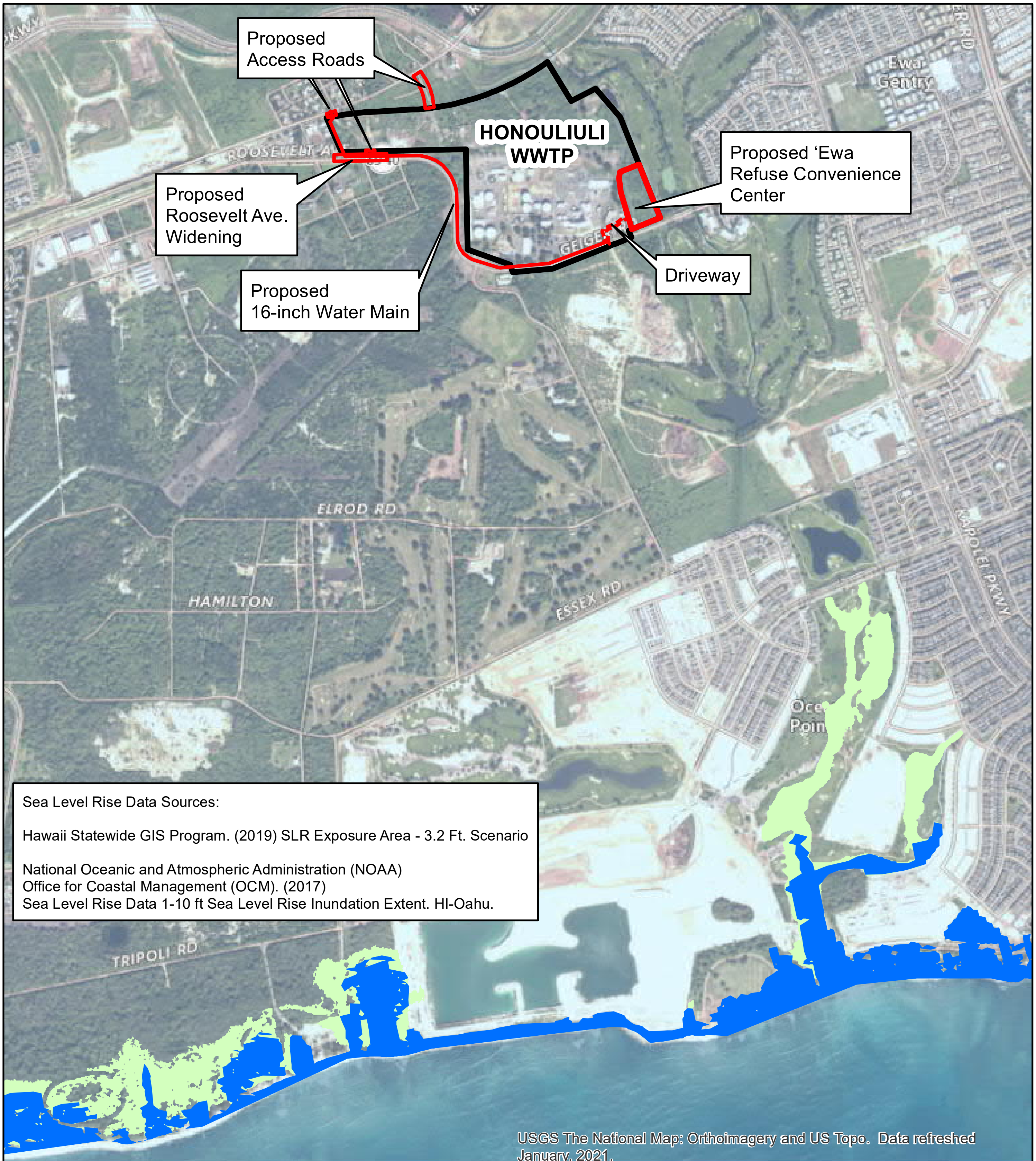
Resiliency to withstanding flood events would be appropriately addressed during the design phase. The project would be designed in compliance with standards for flood management that are in affect at the time that designs are submitted.

Refer to section 2.1 for information about Hawaiʻi’s contribution to GHG emissions.

2.5.2 Environmental Consequences and Mitigation Measures

2.5.2.1 CONSTRUCTION

While construction activities would not increase the likelihood of natural hazards occurring, natural hazards may impact construction. All hazards have the potential to cause delays to the construction schedule and increase project cost.



Legend

- WWTP Boundary
- Project Areas
- SLR Exposure Area 3.2 ft
- SLR Exposure Area 6.0 ft

1 inch = 1,500 feet

0 375 750 1,500 Feet

AECOM

FIGURE 2-5

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND 'EWA REFUSE CONVENIENCE CENTER RELOCATION

EXTENT OF 3.2 FEET SEA LEVEL RISE AND 6 FEET SEA LEVEL RISE

Date: 6/2/2021

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An earthquake can cause structural damage, instability, liquefaction, and potential injuries to personnel. Hurricanes and storm events may cause flooding. Construction activities could exacerbate the local impacts of these events. Disturbance of soil and vegetation during construction could result in a loss of the filtration services provided by vegetation, as well as cause increased sedimentation and erosion. Increased precipitation associated with climate change could further exacerbate surface water runoff impacts during construction, resulting in potential delays and impacts to water quality.

Flood mitigation measures include development and implementation of a stormwater pollution control plan (SWPCP). Furthermore, as directed by the City Department of Parks and Recreation (DPR), and consistent with the Mayor’s commitment to plant 100,000 trees by 2025 and achieve 35% canopy cover by 2035, the removal of trees would be mitigated with replacement planting. This would contribute to stormwater management on site. Stormwater BMPs would help mitigate the potential increase in pollutants carried off-site by storms, tsunamis or flooding, siltation, and clogging of drainage swales due to destabilized soils and vegetative cover. As part of the construction process, the site would be graded and filled consistent with engineering plans, the City Grading Ordinance ROH Section 14-13, and the Drainage, Flood and Pollution Control Ordinance ROH Section 14-12. This would ensure that the site is stabilized, drainage infrastructure is adequate, and appropriate vegetation and ground cover is installed. While natural hazards cannot be avoided during the construction phase, the impacts would be less than significant and reduced to the degree possible with the incorporation of the actions and practices outlined above.

Sea level rise is not anticipated to have a direct impact on near-term construction activities; however, a severe storm could result in flooding of roadways that impacts access to the site. Identification of alternative routes to access the site would mitigate this potential risk.

High winds or extreme heat may create hazardous working conditions, which could also result in project delays. These high winds can introduce more particulate matter into the environment and could impair nearby waterbodies and air quality. Adherence to warnings, forecasts, and alerts about potential hazards and weather events would reduce the potential for impacts to the project, environment, and personnel.

The ENV Division of Refuse Collection and Disposal maintains an Emergency Operations Plan , which is designed to protect people and assets of the Department, and details preparation measures, standard operating procedures, notifications, and evacuation plans in the event of a natural hazard.

2.5.2.2 Operation

To mitigate the hazards associated with potential earthquakes, structures would be designed to meet Seismic Zone 2A requirements and applicable International Building Code, federal, state, and City requirements.

The anticipated 3.2-foot sea level rise was compared to the map of the proposed project site and its surrounding environs on the Hawaii Sea Level Rise Viewer (“Hawaiʻi Sea Level Rise Viewer | PacIOOS” n.d.). More specifically, passive flooding, high wave flooding, and coastal erosion scenarios were simulated on the Hawaiʻi Sea Level Rise Viewer. The resultant maps identified no sea level rise exposure areas on the project site. Minimal flooding associated with 3.2-foot sea level rise and with passive flooding is anticipated in low lying areas of the Coral Creek Golf Course, located east of the project site.

After construction, the Proposed Action would operate under the same level of risk of all natural hazards. However, the impact from natural hazards would be alleviated by the application of the building code, grading ordinance, revegetation plan, emergency management operations protocol, and adherence to applicable standard operating procedures and BMPs.

The Proposed Action would not significantly increase or exacerbate risks to human health or property from natural hazards including potential 3.2-foot or 6-foot sea level rise, and the impacts would be less than significant.

2.6 BIOLOGICAL RESOURCES

2.6.1 Affected Environment

2.6.1.1 FLORA

The vegetation observed within the project area is typical of disturbed urban areas on the leeward side of Oʻahu. Grasses and other herbaceous vegetation growing along both sides of Geiger Road and Roosevelt Avenue are regularly mowed. The property fence line along Geiger Road and Roosevelt Avenue is lined with Manila tamarind (*Pithecellobium dulce*) and kiawe (*Prosopis pallida*) trees (Figure 2-6), along with a few royal poinciana trees (*Delonix regia*) near the existing ERCC. Understory vegetation observed along the shoulder of Geiger Road and Roosevelt Avenue within the alignment of the proposed 16-inch water main include buffel grass (*Cenchrus ciliaris*), uhaloa (*Waltheria indica*), love in the mist (*Passiflora foatida*), fourspike heliotrope (*Heliotropium procumbens*), and Chinese violet (*Asystasia gangetica*).

These same species were observed near the proposed location of the Roosevelt Avenue access road along with koa haole (*Leucaena leucocephala*), khaki weed (*Alternanthera pungens*), Guinea grass (*Urochloa maxima*), and other non-native annual grasses growing on the margins of open areas, between extensive patches of bare ground, gravel, and asphalt.

Vegetation where the 16-inch water main will cut across on the west side of the WWTP expansion property includes kiawe trees, Manila tamarind trees, buffel grass, khaki weed, golden crown-beard (*Verbesina encelioides*), and a single large weeping fig (*Ficus benjamina*).

Figure 2-6. Manila Tamarind and Kiawe Trees Lining the Property Fence Line along Roosevelt Avenue

Along Malio Street and the undeveloped south side of Renton Road, the dominant vegetation is koa haole, with an understory of buffel grass and Guinea grass (Figure 2-7). Kiawe trees, hairy abutilon (*Abutilon grandifolium*) and shower tree saplings (*Cassia fistula*) were also observed growing along Malio Street and Renton Road. The cell tower driveway on Renton Road is flanked on both sides by two large kiawe trees. The vegetation along the north side of Renton Road includes kiawe, koa haole, buffel grass and Guinea grass, as well as other landscaping and mature trees in the yards of the plantation village homes.

Figure 2-7. View from Renton Road of Koa Haole, Kiawe, Buffel Grass, and Guinea Grass Growing along Malio Street

A natural resources survey of the Honouliuli WWTP expansion property was conducted by SWCA in 2015. The survey included the proposed relocation site for the ERCC on the east side of the property. The survey report describes the expansion property as highly disturbed, characterizing the existing vegetation as a kiawe forest, with a spare Guinea grass understory. Other species noted in the kiawe forest included scattered koa haole and Manila tamarind trees, with lion’s ear (*Leonotis nepetifolia*) and golden crown-beard (*Verbesina encelioides*) widely distributed throughout the understory.

All species observed were non-native. No state or federally listed threatened, endangered, or candidate plant species were observed. There are no Exceptional Trees listed under Act 105 (The Exceptional Tree Act) in the project area.

2.6.1.2 FAUNA

The fauna within the surveyed vicinity of the WWTP site is dominated by non-native birds and mammals. Nine introduced and one indigenous bird species were recorded during the natural resources survey of the WWTP site (SWCA 2015). Introduced bird species observed included the cattle egret (*Bubulcus ibis*), common myna (*Acridotheres tristis*), house finch (*Haemorhous mexicanus*), House sparrow (*Passer domesticus*), Saffron finch (*Sicalis flaveola*), spotted dove (*Streptopelia chinensis*), zebra dove (*Geopelia striata*), koloa-mallard hybrids (*Anas wyvilliana* x *platyrhynchos*), and a single domestic duck (*Anas platyrhynchos domesticus*). The common myna was the most frequently observed. All of these introduced species, except for the domestic duck are common to the main Hawaiian Islands, particularly in urban or disturbed areas (HAS 2005; as referenced in SWCA 2015). Only one native species, the migratory Pacific golden plover (*Pluvialis fulva*), was observed. This species is abundant throughout Hawaiʻi during the winter, outside their breeding and nesting season. The Pacific golden plovers that visit Hawaiʻi as part of their annual migration return to Western Alaska in the summer where they breed.

Four migratory bird species protected under the amended Migratory Bird Treaty Act of 1918 were observed during the survey, including the indigenous Pacific golden plover, and the introduced cattle egret, house finch, and koloa-mallard hybrids (SWCA 2015 and 50 CFR § 10.13). These species are abundant and widespread in urban areas across the Hawaiian Islands.

Other fauna observed during the survey included mammals: feral cats (*Felis catus*) and small Asian mongooses (*Herpestes javanicus*); and invertebrates: the globe skimmer (*Pantala flavescens*) and two butterflies, including the Gulf fritillary (*Agraulis vanillae*) and the western pygmy blue butterfly (*Brephidium exilis*). The globe skimmer is native to Hawaiʻi. No reptiles or amphibians were observed during the survey. No aquatic habitat or aquatic species were identified in the project area.

No state or federally listed threatened, endangered, or candidate wildlife species were observed during the survey of the Honouliuli WWTP site. In response to an October 15, 2020 letter from the Hawaiʻi Department of Transportation (HDOT), a United States Fish and Wildlife Service (USFWS) letter dated December 8, 2020 (Appendix A) noted that three Hawaiian seabirds—i.e., the federally listed endangered Hawaiian petrel (*Pterodroma sandwichensis*), threatened Newell’s shearwater (*Puffinus auricularis newelli*), and endangered Hawaii Distinct Population Segment of the band-rumped storm petrel (*Oceanodroma castro*)—and the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) may occur in, or transit through, the vicinity of the proposed action area. Additionally, USFWS stated that there is no designated critical habitat within the proposed action area.

Hawaiian Waterbirds

The proposed relocation site for the ERCC is located directly adjacent to the Coral Creek Golf Course, which contains water features that could be attractive to endangered Hawaiian waterbirds, including the Hawaiian stilt (*Himantopus knudseni*), Hawaiian coot (*Fulica alai*), Hawaiian moorhen (*Gallinula chloropus*), and Hawaiian goose or nēnē (*Branta sandvicensis*) (SWCA 2015). As a result, it is possible that the endangered waterbirds could be present in close proximity to the proposed project area. Hawaiian stilts, as well as Hawaiian coots, are highly mobile and may occupy newly, sometimes unintentionally, created habitat for foraging and even nesting, such as areas that hold standing water after heavy rainfall. Oʻahu has the largest number of Hawaiian silts in the state and is the most likely Hawaiian waterbird species to be present in the vicinity of the project area. It is very unlikely that nēnē, Hawaiian coots, or Hawaiian moorhens would be present in the vicinity of the site as they have very small populations on Oʻahu. There is currently no suitable foraging or nesting habitat for Hawaiian waterbirds within the proposed project area.

Hawaiian Hoary Bat

The state and federally endangered Hawaiian hoary bat or ʻōpeʻapeʻa was not observed during the survey. The habitat requirement of the Hawaiian hoary bat is not well-understood and has been identified as one of the primary data needs for species recovery (USFWS 1998 and Gorresen et al. 2013). The species has been observed foraging in both open and forested habitats (USFWS 1998). The mobility of the species by flight results in all areas from the coast to the highest mountains bring accessible to foraging by the Hawaiian hoary bat (Gorresen et al. 2013). Therefore, the project area may contain suitable foraging and roosting habitat for this species (Smith 2020). Hawaiian hoary bats forage for insects as low as 3 feet above the ground in a variety of habitats; making entanglement in barbed wire fencing a threat for this species (USFWS 1998). The bats are solitary roosting in both native and non-native trees greater than 15 feet in height (Bonaccorso et al. 2015). During the Hawaiian hoary bat birthing and pup rearing season, from June 1 through September 15, bat pups that cannot yet fly may be present in roost trees.

Hawaiian Short-Eared Owl

The endemic Hawaiian short-eared owl or pueo (*Asio flammeus sandwichensis*) is State listed as endangered on the Island of Oʻahu. Pueo occupy a variety of habitats, including wet and dry forests and urban areas, but are most common in open habitats such as grasslands and shrublands (Mitchell et al. 2005). While not observed during the survey, the project area may contain suitable foraging and nesting habitat for this species (Smith 2020). The pueo is a diurnal, crepuscular species that is most active at dawn and dusk. Their nests consist of simple scrapes in the ground lined with grass or down feathers.

Hawaiian Seabirds

Threatened and endangered Hawaiian seabirds include the endangered Hawaiian petrel, endangered band-rumped storm-petrel, and threatened Newell's shearwater. These threatened and endangered Hawaiian seabird species would not be expected to nest in or use habitat in the project area. These birds travel between their nesting colonies in the mountains and the ocean where they feed (Young and VanderWerf 2016). They may fly over the project area at night during their breeding, nesting, and fledging seasons from September 15 to December 15 (Smith 2020).

Invasive Species

As a facility that receives and transfers waste it is likely that invasive mammals such as rats, cats, and mongoose may feed and reproduce at the existing ERCC. Both cats and mongoose were observed during the survey of the site.

Green waste received at the ERCC may contain seeds and propagules of invasive plant species, as well as insect pests. Coconut rhinoceros beetles (*Oryctes rhinoceros*) chew into the emerging fronds of palm trees to feed on sap, killing the tree if they eat into the meristem. Once the palm dies, eggs are laid. These beetles may also attack and feed on Pandanus species, banana, pineapple, and sugar cane. Breeding populations and larvae of this species are often found in mulch and green waste piles. It is possible that the ERCC may receive green waste containing adult coconut rhinoceros beetles, eggs, and/or larvae.

To manage and control the propagation and spread of invasive species, all rubbish received at the ERCC is placed inside 40-yard bins that are off hauled within 48 hours of filling. The ERCC does not accept wet kitchen or food waste, and green waste is not stockpiled at the facility.

The movement of plant and soil material between worksites, such as fill can result in the spread of invasive species. Soils and plant materials may contain invasive fungal pathogens (e.g. Rapid ʻŌhiʻa Death), vertebrate and invertebrates pest (little fire ants, coconut rhinoceros beetles), or invasive plant parts that could harm our native species and ecosystem (Smith 2020).

2.6.1.3 WETLANDS

Waters of the United States including jurisdictional wetlands are protected under Section 404 of the Clean Water Act. In April 2020 the EPA and U.S. Army Corps of Engineers published the Navigable Waters Protection Rule to finalize a revised definition of "waters of the United States" under the Clean Water Act. This final rule became effective in June 2020 and is being implemented by the EPA and the U.S. Army Corps of Engineers in most states including the State of Hawaiʻi. Under the new rule federally regulated waters of the United States include:

- The territorial seas and traditional navigable waters;
- Perennial and intermittent tributaries to those waters;
- Certain lakes, ponds, and impoundments; and

- Wetlands adjacent to jurisdictional waters.

The EPA and U.S. Army Corps of Engineers define wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Most streams from the Waiʻanae Mountains are intermittent; discharging only during flood events from heavy rain fall (Nichols et al. 1997). In general, water readily infiltrates across the porous dry landscape of the ʻEwa Plain. There are no perennial streams in the in the vicinity of the project area.

The Kaloʻi Gulch Stream, an intermittent stream, is located to the north and east of the project site. Manmade, irrigated ponds located within the golf course to the north and east of the project area are connected to this stream. One of these manmade ponds within the golf course is located adjacent to the WWTP property. City GIS data shows an abandoned irrigation ditch that used to flow from this pond south through the WWTP property adjacent to the proposed relocation site for the ERCC. The abandoned irrigation ditch, which did not meet the definition of a water of the United States under the Clean Water Act, was previously filled and graded as part of a separate project.

No wetlands were identified during the survey. The abandoned irrigation ditch and adjacent areas are not inundated or saturated by surface water or ground water at a frequency or duration that would support the formation of hydric soils or support vegetation adapted for life in saturated soil conditions. No obligate or facultative wetland plants were observed along the abandoned irrigation ditch or within the WWTP expansion property. The presence of facultative and facultative upland plant species were noted during the survey of the WWTP expansion property. These species can occur in wetland and non-wetland environments and do not necessarily indicate the presence of wetlands in the survey area; especially in the absence of obligate or facultative wetland plants. The vegetation growing along the abandoned irrigation ditch includes kiawe and koa haole, which are generally associated with arid areas and are not adapted for life in saturated soil conditions. Based on these findings there are no wetlands or other waters of the United States under federal jurisdiction within the project area. The State of Hawaiʻi Department of Land and Natural Resources, Division of Aquatic Resources noted in their review of pre-assessment materials that the proposed project activities are not expected to have adverse impacts on aquatic resources, as there are no streams or waterbodies within the project area (Higashi 2020).

2.6.2 Potential Environmental Consequences and Mitigation Measures

Recommendations received from for the Department of Land and Natural Resources, Division of Forestry and Wildlife for the protection of threatened and endangered species and Hawaiʻi's unique flora and fauna have been incorporated into the avoidance and mitigation measures described below.

2.6.2.1 CONSTRUCTION

Flora

Native, Threatened, and Endangered Plant Species

No federal or state threatened or endangered plant species are found in the project area. The only native species observed in the project area is uhaloa, a common species found across Oʻahu in disturbed areas and along roadway shoulders. Therefore, construction activities would have no impact on plant species protected under the Endangered Species Act or Hawaiʻi Revised Statutes (HRS) Chapter 195D.

Trees

The project would have no impacts to Exceptional Trees protected under Act 105, as none are present in the project area. The project would require the limited removal of Manila tamarind and kiawe trees, and potentially other non-native trees, as needed to facilitate construction. Therefore, the project would have a less than significant impact on trees.

Fauna

Endangered Hawaiian Waterbirds

No Hawaiian waterbirds were observed in the project area during the survey and currently there is no suitable open water habitat for these species at the project site. During construction, efforts would be made to prevent creating areas that would hold standing water, which may be attractive to Hawaiian waterbirds, and open trenches would be covered. If Hawaiian waterbirds are observed in the project area, nest surveys would be conducted by a qualified biologist (in areas where these birds have been observed) before work begins and after any subsequent delay in work of three or more days (during which birds may attempt nesting). If a nest with eggs or chicks is discovered, work would cease within 150 feet of the nest until after the chicks have fledged and are no longer present in the project area. If an endangered Hawaiian waterbird is observed in the project area during construction, all work within 50 feet of the bird would cease. Work would not resume until the bird leaves the area of its own accord. With these avoidance and mitigation measures, the construction activities would have a less than significant impact no endangered Hawaiian waterbirds.

Hawaiian Hoary Bat

To avoid mortality to Hawaiian hoary bat pups that may be present in trees and cannot yet fly, trees and woody plants greater than 15 feet in height would not be disturbed, removed, or trimmed during the bat birthing and pup rearing period from June 1 through September 15. To avoid risk of entanglement, no new barbed wire fencing would be installed as part of the Proposed Action. With these avoidance and mitigation measures, construction activities would have a less than significant impact on the Hawaiian hoary bat.

Hawaiian Short-Eared Owl

Pueo are a ground nesting, crepuscular species, most active during dawn and dusk twilights. To avoid impact to this species, twilight pre-construction surveys would be performed by a qualified biologist prior to clearing vegetation. If pueo nests are discovered, the Department of Land and Natural Resources, Division of Forestry and Wildlife would be notified. In addition, a 100-foot buffer would be established around the active nest in which no vegetation clearing, or other construction activities would occur until the nesting ceases. With these avoidance and mitigation measures, the construction activities would have a less than significant impact on the Hawaiian short-eared owls.

Hawaiian Seabirds

Outdoor lighting from construction can result in disorientation, fallout, and injury or mortality of Hawaiian seabirds. Seabirds are attracted to lights and, after circling the lights, may become exhausted and collide with nearby wires, buildings, or other structures, or may land on the ground. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and predation by dogs, cats, and other predators. Young birds (fledglings) traversing the project area between September 15 and December 15, in their first flights from their mountain nests to the sea, are particularly vulnerable.

To avoid impacts to Hawaiian seabirds, all construction activities would take place during daylight hours and night construction lighting would be avoided to the maximum extent possible. If night construction activities and the use of outdoor lighting is required, it would be scheduled to avoid the seabird fledging season from September 15 through December 15. If night constructing lighting is used it would be downward facing and fully shielded. With these mitigation measures, the construction activities would have a less than significant impact on Hawaiian seabirds.

Invasive Species

To avoid the proliferation of non-native predatory mammals, such as cats, rats, and mongoose, during construction the contractor would follow good housekeeping practices. All food waste would be properly disposed of in covered trash receptacles and removed from the site on a regulator basis.

Soils and plant materials may contain invasive fungal pathogens (e.g., Rapid ʻŌhiʻa Death), vertebrate and invertebrates pest (little fire ants, coconut rhinoceros beetles), or invasive plant parts that could harm our native species and ecosystem. To minimize the spread and movement of invasive species, all equipment and material would be cleaned of excess soil and debris. Gear that may contain soil such as work boots and vehicles would be thoroughly cleaned with water to prevent the spread of Rapid ʻŌhiʻa Death and other harmful fungal pathogens. With these mitigation measures, the construction activities would have a less than significant impact on the proliferation and spread of invasive species.

Wetlands

No wetlands are found in the proposed project area. Therefore, construction of the Proposed Action would have no impact to wetlands.

2.6.2.2 Operation

Flora

Native, Threatened, and Endangered Plant Species

No federal or state threatened or endangered plant species are found in the proposed project area. The only native species observed in the project area is uhaloa, a common species found across Oʻahu in disturbed areas and along roadway shoulders. Therefore, operation of the Proposed Action would have no impact to plant species protected under the Endangered Species Act or HRS Chapter 195D.

Trees

Operation of the facility would have no impact to trees at the site.

Fauna

Endangered Hawaiian Waterbirds

No Hawaiian waterbirds were observed in the project area during the survey and currently there is no suitable open water habitat for these species at the project site. During operation, efforts would be made to avoid allowing water to pond at the facility, as ponded water may be attractive to Hawaiian waterbirds. If Hawaiian waterbirds are observed in the project area, nest surveys would be conducted by a qualified biologist (in areas where these birds have been observed). If a nest with eggs or chicks is discovered, a 150-foot buffer would be established around the nest until after the chicks have fledged and are no longer present at the facility. If an endangered Hawaiian waterbird is observed at the facility, all operations within 50 feet of the bird would cease. Operations would not resume until the bird leaves the area of its own accord. With these avoidance and mitigation measures, operation of the Proposed Action would have less than significant impact on endangered Hawaiian waterbirds.

Hawaiian Hoary Bat

Bat mortality has been documented in Hawaiʻi as a result of ensnarement in barbed wire. For security reasons the existing WWTP facility is surrounded by barbed wire fencing. However, no new barbed wire would be installed as part of the Proposed Action. Operation of the Proposed Action would not require regular disturbance to, or trimming of, trees at the site that have the potential to be used by hoary bats for roosting. Any required tree maintenance and trimming would be performed outside of the bat birthing and pup rearing period from June 1 through September 15. With these proposed measures, operation of the Proposed Action would have a less than significant impact on Hawaiian hoary bats.

Hawaiian Short-Eared Owl

Operation of the facility would not involve any vegetation clearing or grading. Only minor vegetation maintenance of previously disturbed landscaped areas and areas used as part of daily plant operations would be performed. Therefore, operation of the Proposed Action would have no impact on Hawaiian short-eared owls.

Hawaiian Seabirds

Outdoor lighting can result in seabird disorientation, fallout, and injury or mortality of Hawaiian seabirds. Seabirds are attracted to lights and, after circling the lights, may become exhausted and collide with nearby wires, buildings, or other structures, or may land on the ground. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and predation by dogs, cats, and other predators. Young birds (fledglings) traversing the site between September 15 and December 15, in their first flights from their mountain nests to the sea, are particularly vulnerable.

All operational activities would take place during daylight hours. Any new exterior lighting, including streetlights and security lighting would be downward facing and fully shielded to minimize impacts to seabirds. Any new exterior lighting associated with the refuse convenience center would have automatic motion sensors or would be turned off when not in use. Per ROH Chapter 21-4.100 *Outdoor Lighting*, the new lighting would be shielded with full cut-off fixtures to eliminate direct illumination to any adjacent areas. With these proposed measures to install only new seabird-friendly lighting, the Proposed Action would have a less than significant impact on Hawaiian seabirds.

Invasive Species

As a facility that receives and transfers waste it is likely that invasive mammals such as rats, cats, and mongoose may feed and reproduce at the ERCC. Both cats and mongoose were observed during the survey of the site. Green waste received at the ERCC may contain seeds and propagules of invasive plant species, as well as insect pests.

To manage and control the propagation and spread of invasive species, all rubbish received at the facility would be placed inside 40-yard bins that are off hauled within 48 hours of filling. The Convenience Center would not accept wet kitchen or food waste; and green waste is not stockpiled at the facility. With the measures currently in place, the proliferation and spread of invasive species would be controlled and minimized.

Wetlands

No wetlands are found at the facility. Therefore, operation of the Proposed Action would have no impact to wetlands.

2.7 HISTORIC AND CULTURAL RESOURCES

Historic and cultural resources include archaeological sites, historic buildings and structures, places of cultural and architectural importance, and sites associated with cultural practices.

This also includes historic properties that are eligible for listing on the National Register of Historic Places (NRHP) and Hawaiʻi Register of Historic Places (HRHP). To be eligible for listing on the NRHP the property must meet one or more of the following significance criteria:

A. Property is associated with events that have made a significant contribution to the broad patterns of our history.
B. Property is associated with the lives of persons significant in our past.
C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
D. Property has yielded, or is likely to yield, information important in prehistory or history.

To be eligible for listing on the NRHP the property must also possess integrity of location, design, setting, materials, workmanship, feeling, and association.

The evaluation of significance (under HRS Chapter 6E and HAR Chapter 13-275) for listing on the HRHP considers the same aspects of integrity and uses these same significance criteria, referred to as Criterion a, b, c, and d; as well as Criterion e., which is “Having an important value to the native Hawaiian people or to another ethnic group for the state due to association with cultural practices once carried out, or still carried out, at the property or due to association with traditional beliefs, events or oral accounts--these associations being important to the group’s history and cultural identify.”

On September 30, 2020, ENV submitted a letter to the State Historic Preservation Division (SHPD) (Appendix A) requesting review of the project and a determination letter in accordance with HRS Chapter 6E-8 Historic Preservation Review and HAR Chapter 13-275 (Appendix A). Subsequently, on February 12, 2021, ENV submitted a letter (Appendix A) notifying SHPD of the expansion of the project scope to include installation of a potable water main and providing supplemental information regarding the proposed water main.

2.7.1 Affected Environment

2.7.1.1 PRE-CONTACT

The project area is within an inland, dry coral plain that in pre-Contact times had a thin to absent soil layer. Due to its distance from the coast and Pearl Harbor, and from an adequate source of fresh water, this inland area was little used during the period prior to Western contact. Within or in the vicinity of the project area, there are no Land Commission Awards, indicating that during the division and redistribution of land in 1848 there were no verified claims to lands in the area. From the late 1800s through the late 1900s, a century of commercial sugar cane cultivation was enabled by the drilling of groundwater wells and the diversion of surface water from distant stream systems, as well as by the hydraulic transport of soils from mountain slopes to the plain. The intensive land disturbance associated with the establishment and operation of the cane plantations probably removed most of any evidence of pre-Contact use that may have existed.

Previous archaeological studies have not reported archaeological resources within or in the vicinity of the project area, and the archaeological sensitivity of the area is generally regarded as low. O'Hare et al. (2011) noted that the project area has been extensively disturbed by prior infrastructure construction and is of relatively low archaeological concern. In another study, O'Hare et al. (2007) focused on the area in the vicinity of the expansion property, along the north and east sides of the Honouliuli WWTP, but identified no historic properties. This study found evidence of extreme ground disturbance and did not find Hawaiian traditional features on the surface. O'Hare et al. (2007) concluded that it is highly unlikely that there are any subsurface Hawaiian features intact.

On October 24, 2014, Cultural Surveys Hawaiʻi conducted a reconnaissance survey of the Honouliuli WWTP expansion property including the proposed location of the ERCC. No historic properties were identified. Cultural Surveys Hawaiʻi recommended no further archeological work for the Honouliuli WWTP expansion property.

2.7.1.2 Plantation Era and World War II Era

The discovery of artesian water in 1879 in Honouliuli allowed for the commercial agriculture development of the ʻEwa Plain; with the incorporation of the ʻEwa Plantation Company in 1890. Benjamin Franklin Dillingham played a major role in the development of the sugar industry in west Oʻahu. In addition to subletting more than 11,000 acres of land to the newly formed ʻEwa Plantation Company, he was the founder and visionary behind the (OR&L) Company which transported these crops from the fields to the dock of Honolulu for shipment overseas.

The ʻEwa Plain also has a rich military history. The former ʻEwa Field Marine Base was located south of the project area and was one of the military installations attacked on the morning of December 7, 1941, as part of the larger surprise attack by the Imperial Japanese Navy on U.S. military bases in Hawaiʻi, including Pearl Harbor.

There are several historic properties within and adjacent to the project area that are associated with the plantation era and World War II (WWII) era. These historic properties are listed in Table 2-3 and shown on Figure 2-8. Several of these properties are listed on both the NRHP and HRHP. A description of each historic property follows.

Table 2-3. Historic Properties in the Vicinity of the Project Area

Historic Property	State Inventory of Historic Places (SIHP) No.	NRHP Reference No.	Relation to Project Area
Oʻahu Railway and Land Company (OR&L) Right-of-Way (ROW)	50-80-12-09714	75000621	Partially within project area
Hawaiian Railway Society ‘Ewa Railroad Yard	50-80-12-07387	N/A	Hawaiian Railway Society ‘Ewa Railroad Yard ≈ 300 ft from project area
Railway Rolling Stock	50-80-08-09761	N/A	Hawaiian Railway Society ‘Ewa Railroad Yard ≈ 300 ft from project area
Waialua Agricultural Company Engine No. 6	50-80-08-09708	74000719	Hawaiian Railway Society ‘Ewa Railroad Yard ≈ 300 ft from project area
‘Ewa Sugar Plantation Villages	50-80-12-09786	N/A	Partially within project area
‘Ewa Plain Battlefield	50-80-12-08025	16000273	Partially within project area

Oʻahu Railway and Land Company Right-of-Way

The OR&L ROW (SHIP 50-80-12-09714 / NRHP Reference No. 75000621) contains the longest stretch of narrow-gauge railroad track in Hawaiʻi. The section of OR&L ROW listed on the HRHP and NRHP is 40 feet wide and 15 miles long, running from Honouliuli to Nanakuli, and contains five bridges (Cummins 1974a).

Benjamin Franklin Dillingham, founder of the OR&L was an entrepreneur who leased large parcels of land from James Campbell for the development of sugar plantations in ‘Ewa and Kahuku. He envisioned a railroad to carry produce from these plantations to the Honolulu docks for shipment overseas. Sharing in Dillingham’s view of the importance of developing rail systems in Hawaiʻi, in 1878, the Kingdom of Hawaiʻi, during the reign of King Kalakaua enacted “An Act to Promote the Construction of Railroads.” Among other things, the Act allowed for the granting of railroad ROWs over government lands to railroad companies for depots, stations, and related structures. The OR&L was chartered on February 4, 1889, with construction of the railroad beginning immediately. The railroad was formally opened to the public on November 16, 1889 with tracks running from the Honolulu docks to Aiea. Dillingham progressively extended his line around the westside of the island, reaching ‘Ewa Plantation in 1892, Waianae Plantation in 1895, Waialua Mill in 1898, and Kahuku in 1899. A spur was added over the saddle of the island in 1906 to reach the James Dole pineapple fields in Wahiawa. At its maximum extent, the OR&L rail lines consisted of 175 miles of track (Rewick 2012).

During the plantation era, prior to WWII, Malio Street ran through the former Japanese Village and provide access to agricultural areas and ‘Ewa Plantation Village housing on opposite sides of the OR&L tracks. This road is no longer in active use, but the dirt and gravel roadway with patches of degraded asphalt still remains.

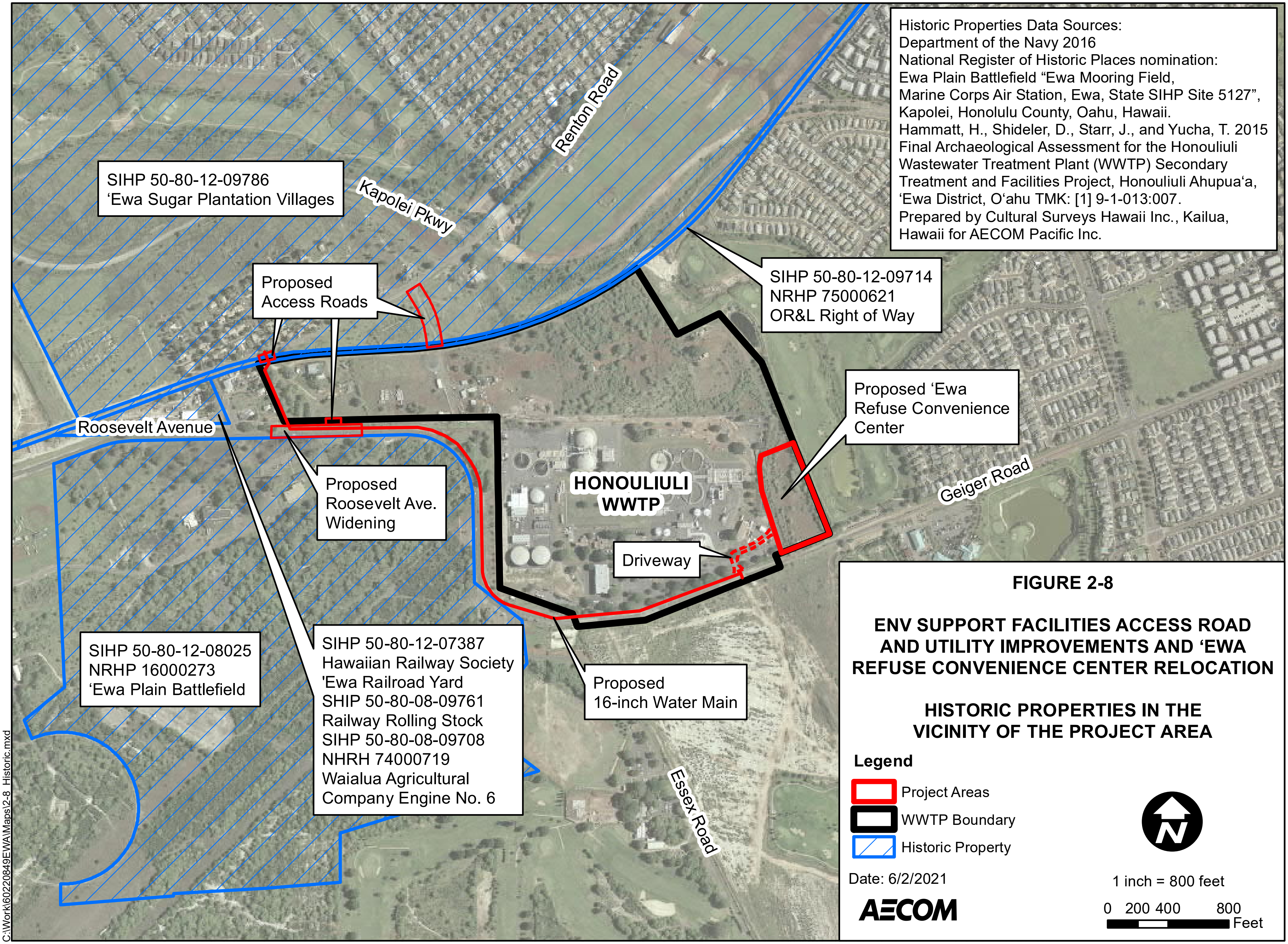

FIGURE 2-8

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND 'EWA REFUSE CONVENIENCE CENTER RELOCATION

HISTORIC PROPERTIES IN THE VICINITY OF THE PROJECT AREA

In addition to supporting agriculture, the development of Pearl Harbor, Schofield Barracks, Wheeler, and ʻEwa Field led to the military becoming one of the railroad's most important customers. The railway also had a successful passenger business, with 133,644 passengers in 1891; 446,318 in 1908; nearly 1,000,000 in 1915; and approximately 1,400,000 in 1922 (Rewick 2012). There was a decline in ridership in the 1930s coinciding with improvements to the Oʻahu roadway system. WWII temporarily reversed this trend with ridership reaching an all-time high of 2,642,516 tickets sold in 1943. The railway also played an important role during the war by carrying supplies, munitions, troops, and defense workers.

In 1950, the U.S. Navy purchased the tracks and ROW from Pearl Harbor to the Naval Ammunition Depot access road in Nanakuli for one dollar ($1.00) for "National Defense." Over the 1950s, various portions of the track were acquired by the State of Hawaiʻi leaving only a 13-mile portion that was active until 1968.

In 1975, the 15-mile section of the former OR&L ROW from Fort Weaver Road to Lualualei was listed on the NRHP. The property was determined eligible for listing on the NRHP under the following criteria:

A. Property is associated with events that have made a significant contribution to the broad patterns of our history.

B. Property is associated with the lives of persons significant in our past.

C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction (Cummins 1974a).

On November 28, 1978, the U.S. General Services Administration transferred this section of the former OR&L ROW to the Federal Highway Administration (FHWA). On June 5, 1980, the FHWA transferred this section of former OR&L ROW to the HDOT for the purpose of constructing bike lanes and pedestrian walkways. The Deed for this transfer contains various conditions. Specifically, the Deed states that all licenses, permits or easements authorizing the use or occupancy of the 40-foot railroad ROW will be issued only subsequent to the written approval of the Hawaiʻi State Historic Preservation Officer and the Hawaiʻi Division of the FHWA. Further, this FHWA approval is considered a federal action requiring compliance with Section 106 of the NHPA and Section 4(f) of the Department of Transportation Act.

The Hawaiian Railway Society ʻEwa Railroad Yard, including Railway Rolling Stock

The Hawaiian Railway Society ʻEwa Railroad Yard (SIHP 50-80-12-07387) is located approximately 300 feet from the project area. It is a 3.81-acre site located at 91-1001 Renton Road in ʻEwa, makai of the former OR&L ROW. The site has five narrow gauge siding tracks and one bypass track connected by railroad switches to the OR&L ROW tracks. This is not the site of the original railroad support facility. The original support facility, which was located in Iwilei in Honolulu, was demolished and redeveloped in the late 1950s and early 1960s (Rewick 2012). The present facility was established by the Hawaiian Railway Society for the maintenance and restoration of rolling stock and as a museum of railroad memorabilia.

Contributing resources of this historic property include 72 units of rolling stock including engineers, box cars, flat cars, coaches, cane cars, hand operated track inspection car, and the narrow-gauge tracks (Rewick 2012). The most prominent features in the collection include the OR&L Parlor Car No. 64, OR&L Locomotive No. 6 "Kauila," and OR&L Locomotive No. 12 which are listed on the HRHP as "Railway Rolling Stock" (SIHP No. 50-80-08-9761); and Waialua Agricultural Company Locomotive No. 6 which is listed on the HRHP (SIHP No. 50-80-08-9708), and listed separately on the NRHP (Reference No. 74000719). The Waialua Agricultural Company Locomotive No. 6 is discussed further below.

Waialua Agricultural Company Engine No. 6

The Waialua Agricultural Company Engine No. 6 (SHIP 50-80-08-09708 / NRHP Reference No. 74000719) is located at the Hawaiian Railway Society ʻEwa Railroad Yard approximately 300 feet from the project area. It is the only fully operational and authentically restored Hawaiian sugar plantation locomotive in the world; and the only locomotive designed and built in Hawaiʻi. It is an excellent type example of steam-powered locomotives used on Hawaiian plantations during the late 19th and early 20th centuries (Cummins 1974b).

The Waialua Agricultural Company Engine No. 6 was listed on the NRHP in 1974, under the following criteria:

A. Property is associated with events that have made a significant contribution to the broad patterns of our history.

B. Property is associated with the lives of persons significant in our past.

C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction (Cummins 1974b).

The period of significance is from 1900 to 1924. Between 1916 and 1919, Locomotive No. 6 was built in the Waialua Agricultural Company shops by employees. It was of a similar design to the Baldwin Company "saddle tanker" locomotive, a type widely used on Hawaiian sugar plantations. When completed, it was a well-designed, functional piece of equipment that remained in constant service from 1919 to 1952 (Cummins 1974b).

ʻEwa Sugar Plantation Villages

During its operation, the ʻEwa Sugar Plantation built more than 1,200 residences in eight distinct villages (Moy 1995). Each village has/had its own architectural and landscape character representative of the different cultural and ethnic groups which predominantly lived there. These distinct villages were also physically separated by cane fields. Four of these villages remain and three—Renton, Tenney, and Varona Villages—are listed on both the HRHP and NRHP as the ʻEwa Sugar Plantation Villages historic district (SHIP 50-80-12-09786).

The historic district contains a total of 287 contributing resources, comprised of 285 buildings, 1 site, and 1 object (Moy 1995). The NRHP nomination form describes 15 contributing sites, two of which are partially located within the proposed project area: the Varona Village and the OR&L ROW (described above). Renton Road is also part of the historic district, having served as the original spine along which the villages and other facilities were built.

The Varona Village, also referred to as "Filipino Camp" since the population was primarily Filipino, was originally constructed in 1933 and expanded in 1957. The Varona type homes constructed in the 1930s are small, simple rectangular homes, of board-n-batten single wall construction, 20 feet wide by 38 feet deep, with corrugated metal gable roofs, small eaves, pine floors, and cane ceilings. The homes constructed in 1958 are very similar in form but are constructed of tongue-n-groove and feature a distinctive decorative trellis at the porch entrance.

The streets in the villages vary in width from 9 feet to 55 feet (Renton Road) without curbs and sidewalks, which contributes to the rural ambiance.

Sugar plantations played a major role in the emergence of modern Hawaiʻi. The bringing in of workers from many countries has given Hawaiʻi its multi-ethnic character and landscape. Maintaining sugar production and operation for over 110 years, ʻEwa Plantation is significant as the largest and most intact sugar plantation in Hawaiʻi and one of the largest plantations in the United States (Moy 1995).

Like other plantations, ʻEwa Plantation was a self-contained community where people worked, lived, conducted most of their business, and were often buried. In contrast to older Southern United States plantations, it is further significant for the notable strides it made towards the fair and just treatment of its workers; providing pioneering social service programs such as well-baby clinic, nutritional education program, medical and dental care, pre-kindergarten, and cultural and recreational facilities (Moy 1995).

ʻEwa Plantation is also significant architecturally, for its vernacular that has influenced the suburban housing of Hawaiʻi. Many residential homes constructed between the 1950s to the 1960s echo the simple efficient floor plans, single-wall construction and lanai entries of plantation homes. Several notable buildings in the villages were designed by master architects including Hart Wood and William Furer.

The historic district was determined eligible for listing on the NRHP under the following criteria:

A. Property is associated with events that have made a significant contribution to the broad patterns of our history.

B. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

The period of significance is from 1890 to 1957 (Moy 1995). The National Register Nomination Form provides the following narrative regarding the integrity of the historic district:

> "*Although many of the 1,200 houses have been demolished and the mill, recreation center and hospital are noticeably absent, there is a great amount of historic fabric that still exists – more than any other sugar plantation in the state. The most prominent buildings of the village – the Plantation manager's house, the plantation office, the plantation store, the supervisor's houses and the bachelor's quarters retain a great amount of integrity and most of the houses, though in poor condition retain much of their original fabric*" (Moy 1995).

ʻEwa Plain Battlefield

The Battle of ʻEwa Plain began on the morning of December 7, 1941 and was part of the larger surprise attack by the Imperial Japanese Navy on U.S. military bases in Hawaiʻi, including Pearl Harbor.

On December 7, 1941, ʻEwa Field was still under construction. The new Marine base was composed of an airfield, airplanes, and a temporary Marine camp. The base had been constructed at a former sisal (*Agave sisalana*) plantation. The approximately 200-acre site was situated on a relatively flat ancient coral limestone reef, surrounded by sisal and kiawe trees. Most of the vegetation within the base had been cleared to construct the camp and aviation facilities. At the time of the battle, the camp, located north of the runway, consisted of a mixture of quickly constructed wooden buildings and tents with wooden floors organized in a grid system along several streets, some of which were still awaiting construction (Navy 2016). Other based facilities including the hanger and swimming pool were also under construction at the time of the attack.

While all buildings and structures that were present at ʻEwa Field on December 7, 1941, have been torn down, the runway and road network are still visible. These remaining remnants of the 1941 airfield still wear the battle scars of the December 7th attack including the presence of aircraft burn areas and strafing marks (cannon/machine gunfire) from Japanese aircraft on the former warm-up platform.

At the time of the attack, the field contained two intersecting runways, forming a large asphalt-paved "X" in the middle of a square cleared area of bright white coral terrain providing a clear visual point of reference for the Japanese aircraft (Navy 2016).

Features at the site that are still visible and help convey conditions at the time of the battle include the asphalt runways and aircraft parking aprons, the concrete warm up platform, concrete building foundations, the swimming pool (which was under construction at the time of the battle), the OR&L railroad spur, the base fence, and the 1941 roadway network. The 1941 roadway network includes Philippine Sea at the Main Gate (formerly D Street), Ackerman Street (formerly Fourth Street), First Street, Vinson Road (formerly Second Street), Roosevelt Avenue (formerly North Hanson Road), Ticonderoga, and the Old Beach Access Road.

The original base fence was constructed in 1925 and reconstructed in 1941. A portion of the fence line from this period still remains, north of Roosevelt Avenue (Figure 2-9). The fence material is zinc galvanized steel chain link with an H-shaped post type. The fence topper has triangular shaped arms of pressed steel used to carry the five barbwire strands, one at the apex and two strands on each arm. The identifier “COLO 14-H” on the topper likely denotes the Colorado Chain Link Fence Company as the manufacturer, with the “H” referring to the post type. The U.S. military sourced most of their installation fencing from the Colorado Chain Link Fence Company. The fence style was very common for the time and was manufactured in similar form by several steel fence companies. This type of fencing, posts, and toppers were in use from the 1920s until possibly as recently as the 1990s.

Figure 2-9. ‘Ewa Field Base Fence, North of Roosevelt Avenue

The ‘Ewa Plain Battlefield historic district (SHIP 50-80-12-08025 / NRHP Reference No. 16000273) was determined eligible for listing on the NRHP under the following criteria:

A. Property is associated with events that have made a significant contribution to the broad patterns of our history.

B. Property has yielded, or is likely to yield, information important in prehistory or history.

The period of significance for the ‘Ewa Plain Battlefield historic district as stated in the NRHP Registration Form is 1941, corresponding with the December 7, 1941 Japanese attack.

After the December 7, 1941 Japanese attack, the World War II buildup of ‘Ewa Field was immediately rushed by workers brought from the adjacent Barber’s Point Naval Air Station, where construction had been started the previous month. During the war, numerous roads were added to access the newly built facilities. This included the realignment of Geiger Road and the extension of East Hanson Road. North Hanson Road (current Roosevelt Avenue) provided access to the main gate of ‘Ewa Field and the Barber’s Point Naval Air Station further to the west.

After the end of World War II, activities at ‘Ewa Field were quickly demobilized. The facility continued to be used to support clean-up actions on islands in the Pacific. ‘Ewa Field was also used by the global Military Air Transport Service Squadron until 1949.

In March 1949, ‘Ewa Field was consolidated into the larger Barber’s Point Naval Air Station. When the Navy absorbed ‘Ewa Field they renamed all the streets after Navy ships. Roosevelt Avenue (formally North Hanson Road) was named for the visit of President Roosevelt in 1944, and runs in the same location today, just south of the former north perimeter fence line of ‘Ewa Field.

Following the incorporation into the Barber’s Point NAS, some new facilities were constructed in the north area to support Cold War activities. The former ‘Ewa field also operated as the headquarters building for anti-submarine patrol flights taking off from the Barber’s Point airfield.

By 1962, many of the roads in the south portion of ‘Ewa Field were abandoned or unused. This was less the case in the north area of the airfield because of the limited use of this area as part of the Barber’s Point Naval Air Station. Roosevelt Avenue continued to be used, maintained, and improved as it served as the main through road providing access to both ‘Ewa Field and the main Barber’s Point Naval Air Station.

2.7.2 Potential Environmental Consequences and Mitigation Measures

The evaluation of potential environmental consequences considers the irrevocable commitment of a cultural or historic resource, as well as impacts to the integrity of a historic property. Aspects of integrity include integrity of location, design, setting, materials, workmanship, feeling, and association. Actions that diminish or destroy the integrity of a historic property are considered to have an adverse impact. Actions that restore, repair, and sustain a historic property are considered to have beneficial impacts. In determining whether the Proposed Action would have a significant effect on a resource, both the potential impacts and proposed mitigation measures are considered.

2.7.2.1 CONSTRUCTION

Pre-Contract Historic and Cultural Resources

Due to its distance from the coast and Pearl Harbor, and from an adequate source of fresh water, this inland area was little used during the period prior to Western contact. The intensive land disturbance associated with the establishment and operation of the cane plantations probably removed most of any evidence of pre-contact use that may have existed. No native Hawaiian archeological sites, historic properties, or cultural resources have been identified within or in the vicinity of the project area, and the archaeological sensitivity of the area is generally regarded as low.

If human remains or subsurface archaeological resources are encountered during construction, work would immediately stop, and the SHPD would be contacted in accordance with State law and rules. With this mitigation measure, the construction activities would have no impact on pre-contact native Hawaiian historic or cultural resources.

Oʻahu Railway and Land Company Right-of-Way

Both Malio Street and the cell tower driveway currently cross the OR&L ROW. The proposed improvements to these roadways and installation of utilities under the cell tower driveway and Malio Street, including the proposed 16-inch water main under the cell tower driveway, would result in temporary construction impacts to the OR&L ROW. The proposed project would restore, repair, and sustain the railroad tracks at these crossing locations. The locations of the proposed access road and driveway improvements were selected to utilize an existing roadway (Malio Street) and an existing driveway (providing access to a cell tower) to avoid creating new crossings of the OR&L ROW.

The footprint of the crossing improvements would be minimized as much as possible, considering engineering and safety standards. The crossing design would salvage (depending on condition) and rehabilitate the existing narrow-gauge railroad track. Any track hardware and ties that cannot be reused would be offered to the Hawaiian Railway Society for their use. Rail subgrade and ballast would be replaced with new material meeting design standards for anticipated loads. The deteriorated ties would be replaced with new hardwood ties, consistent with the material used for the existing ties. New concrete panels would be installed on each side of the tracks and between the tracks to protect them from vehicle loads. The alignment and elevation of the tracks would not be altered. The effect of the visual change due to the installation of the concrete crossing panels would be minimized by keeping the same railroad track alignment and grade. The size and type of rail infrastructure would remain the same. The design would be consistent with Secretary of the Interior's Standards for the Treatment of Historic Properties and similar to other treatment of the same track at other crossing locations.

While not part of the listing of the OR&L ROW on the NRHP, the use of the tracks by the Hawaiian Railway Society is part of the significance and bolsters the integrity of association. The proposed crossing improvements would not limit future use of this section of track by the Hawaiian Railway Society or others. Because this section of the track normally is not used by the Hawaiian Railway Society for their museum railroad operations or tours, the construction of the crossing improvements would not impact these operations or tours.

The HDOT, FHWA, the Hawaiian Railway Society, the Historic Hawaiʻi Foundation, and the Department of Land and Natural Resources SHPD will be consulted on the design for the proposed crossing improvements to ensure the design does not diminish the integrity of the OR&L ROW and maintains the rural character. These parties will also be consulted on appropriate traffic control and safety measures. The entire project will be reviewed by SHPD and other interested persons, including the Historic Hawaiʻi Foundation, in accordance with HRS Chapter 6E-8 and HAR 13-275, which is required for all state and county projects which may affect historic resources. The proposed mitigation commitments for effects to the OR&L ROW will be subject to approval by the SHPD, in accordance with HAR 13-275.

The portion of the project area within OR&L ROW requiring a use and occupancy agreement from HDOT, subject to FHWA approval, is considered a federal action requiring compliance with Section 106 of the NHPA and Section 4(f) of the Department of Transportation Act, or FHWA concurrence that the proposed reconstruction of the crossings are exempt in accordance with the 2018 Advisory Council on Historic Preservation Program Comments to exempt consideration of effects to rail properties within rail right-of-way. On July 17, 2020, ENV submitted documentation to HDOT (Appendix A) that the proposed rail crossings were exempt from NHPA Section 106 and U.S. Department of Transportation Act Section 4(f) pursuant to the Program Comments. In a letter to FHWA dated September 18, 2020 (Appendix A), HDOT concurred that the crossings were exempt; however, HDOT recommended that the cell tower vehicle crossing improvements be eliminated. HDOT recommended that underground utility crossings be permitted at both crossing locations provided trenchless installation methods were used or open trench construction was done concurrently with crossing improvements (i.e., at Malio Street).

Effects to the OR&L ROW would be mitigated through the design of the crossings in coordination with SHPD and other interested persons as part of the HRS Chapter 6E-8 historic preservation review process. Consistent with the HDOT recommendation noted above, to mitigate potential impacts to the ROW, trenchless installation methods may be used for underground utility crossings at the cell tower access driveway and open trench installation may be executed concurrently with crossing improvements at the Malio Street driveway. Therefore, construction of the Proposed Action would have a less than significant impact on the OR&L ROW.

The Hawaiian Railway Society ʻEwa Railroad Yard, including Railway Rolling Stock

The Hawaiian Railway Society ʻEwa Railroad Yard and rolling stock are located approximately 300 feet from the project area and would not be affected by construction activities. Construction of the Proposed Action would not diminish or destroy the integrity of this historic property. Therefore, construction of the Proposed Action would have no impact to the Hawaiian Railway Society ʻEwa Railroad Yard or the rolling stock.

Waialua Agricultural Company Engine No. 6

The Waialua Agricultural Company Engine No. 6 is located at Hawaiian Railway Society ʻEwa Railroad Yard approximately 300 feet from the project area and would not be affected. Construction of the Proposed Action would not diminish or destroy the integrity of this historic property. Therefore, construction of the Proposed Action would have no impact to the Hawaiian Railway Society ʻEwa Railroad Yard and rolling stock.

ʻEwa Sugar Plantation Villages

Renton Road, Malio Street, and the cell tower driveway are located within the ʻEwa Sugar Plantations Villages historic district. The paving and other improvements to Malio Street and the cell tower driveway would be designed to preserve the historic character of the Plantation Village. The Proposed Action would not affect any of the existing homes or other buildings in the Varona Village. The SHPD and Historic Hawaiʻi Foundation will be consulted on the design for the Malio Street and cell tower driveway improvements to ensure the rural character is preserved and the integrity of the historic district is not diminished. With these proposed measures, construction of the Proposed Action would have a less than significant impact on the ʻEwa Sugar Plantation Villages historic district.

ʻEwa Plain Battlefield

The proposed project would affect Roosevelt Avenue, which is part of the 1941 Road Network and identified in the National Register Nomination. Proposed modifications to Roosevelt Avenue include widening the roadway for installation of an eastbound left-turn lane and installation of a new driveway into the ENV Support Facilities from Roosevelt Avenue. The left-turn lane is a safety and operational improvement that separates the left-turning traffic from eastbound through traffic on Roosevelt Avenue. The installation of the proposed driveway would require creating an opening and installing a gate in the ʻEwa Field base fence on the north side of Roosevelt Avenue. Also, installing the proposed 16-inch water main would require a temporary opening in the fence during construction.

The following measures are proposed to mitigate for effects to the ʻEwa Plain Battlefield:

- The footprint of the Roosevelt Avenue widening would be minimized as much as possible, considering engineering and safety standards.
- Only a small section, approximately 50 feet, of existing fencing would be removed for the proposed driveway.
- Once construction of the water main is complete, the chain link fence would be restored to existing conditions.

- The rest of the existing fence and fence alignment would be retained and protected in place.
- To minimize visual change the entry gate would be inset (away from Roosevelt Avenue) by approximately 20 feet. The result is expected to have minimal visual impact on the historic fence line.
- New fencing to create the opening and gate would use similar chain link fence material and would be aesthetically consistent with the original base fence. However, barbwire would not be used as part of the new fencing and gate. Barbwire has been shown to pose an entanglement hazard to the endangered Hawaiian hoary bat and would not be included in this project to avoid potential take and adverse effects to endangered species.

The SHPD and Historic Hawaiʻi Foundation will be consulted on the design of the opening and gate in the ʻEwa Field base fence. With these design considerations, the integrity of the historic district would not be diminished. Therefore, construction of the Proposed Action would have a less than significant impact on the ʻEwa Plain Battlefield historic district.

2.7.2.2 Operation

Pre-Contract Historic and Cultural Resources

No pre-contact native Hawaiian archeological sites, historic properties, or cultural resources have been identified within or in the vicinity of the project area. If human remains or subsurface archaeological resources are encountered during operations, work would immediately stop, and SHPD would be contacted in accordance with State law and rules. With this mitigation measure, the operation of the Proposed Action would have no impact on pre-contact native Hawaiian historic or cultural resources.

Oʻahu Railway and Land Company Right-of-Way

The operation of the proposed crossings over the OR&L ROW at Mailo Street and the Cell Tower driveway are not anticipated to affect or damage the OR&L ROW or limit the Hawaiian Railway Society's future operation of trains along this section of track. Concrete panels would be installed on each side of the tracks and between the tracks to protect them from vehicle loads. In the unlikely event the railroad tracks or any other element of the OR&L ROW are damaged due to operation of the crossings, relevant parties would be notified, the damage repaired, and measures implemented to avoid and minimize the risk of future damage. With these measures the integrity of the OR&L ROW would not be diminished. The proposed crossing improvements are proposed to include appropriate traffic control and safety measures that would provide for the safe stopping of driveway traffic should the museum train be operated on this section of the railroad tracks in the future. Therefore, operation of the Proposed Action would have a less than significant impact on the OR&L ROW.

The Hawaiian Railway Society ‘Ewa Railroad Yard, including Railway Rolling Stock

The Hawaiian Railway Society ‘Ewa Railroad Yard and rolling stock are located approximately 300 feet from the project area and would not be affected by operation of the Proposed Action. Operation of the Proposed Action would not diminish or destroy the integrity of this historic property. Therefore, operation of the Proposed Action would have no impact to the Hawaiian Railway Society ‘Ewa Railroad Yard and rolling stock.

Waialua Agricultural Company Engine No. 6

The Waialua Agricultural Company Engine No. 6 is located at Hawaiian Railway Society ‘Ewa Railroad Yard approximately 300 feet from the project area and would not be affected by operation of the Proposed Action. Operation of the Proposed Action would not diminish or destroy the integrity of this historic property. Therefore, operation of the Proposed Action would have no impact to the Hawaiian Railway Society ‘Ewa Railroad Yard and rolling stock.

‘Ewa Sugar Plantation Villages

The operation of the Proposed Action, including the use of Mailo Street and increased use of Renton Road and the cell tower driveway for access to ENV Support Facilities is not anticipated to affect the ‘Ewa Sugar Plantation Villages. Increased use of these roads would not diminish or destroy the integrity of the historic district. Therefore, operation of the Proposed Action would have a less than significant impact on the ‘Ewa Sugar Plantation Villages historic district.

‘Ewa Plain Battlefield

The operation of the Proposed Action, including the use of the driveway off of Roosevelt Avenue that would pass through the former ‘Ewa Field base fence is not anticipated to affect the ‘Ewa Plain Battlefield historic district. In the unlikely event the fence is damaged due to operation of the driveway, relevant parties would be notified, the damage repaired, and measures implemented to avoid and minimize the risk of future damage. With these measures the integrity of the ‘Ewa Plain Battlefield would not be diminished. Therefore, operation of the Proposed Action would have a less than significant impact on the ‘Ewa Plain Battlefield.

2.8 RECREATION

2.8.1 Affected Environment

Recreational areas within an approximate 1-mile radius of the project area include golf courses, parks, and a planned rail/bike trail.

Barbers Point Golf Course and Coral Creek Golf Course are located south of Geiger Road, and southeast and southwest of the Honouliuli WWTP, respectively. Barbers Point Golf Course is 18-hole course for military clients with a clubhouse, driving range, practice areas, and shop. The Coral Creek Golf course is a public course with 18-holes and standard amenities. ‘Ewa Villages Golf Course, located north of the project area and north of Renton Road and Kapolei Parkway, is a City municipal golf course operated and maintained by the Golf Courses Division of the City’s Department of Enterprise Services (CCH DES 2020).

Geiger Community Park is located east of the existing WWTP and is approximately 10 acres in size. The outdoor facility, maintained by the City’s Department of Parks and Recreation, has a soccer field, two softball fields, two basketball courts and two picnic sites. Coral Creek Golf Course and a residential neighborhood are located between the park and the existing WWTP and Convenience center. The ‘Ewa Mahiko District Park, approximately 27 acres and also maintained by the City’s Department of Parks and Recreation, is located north of the WWTP. This facility has both indoor and outdoor recreational opportunities including basketball, tennis and softball/baseball. In addition, the indoor facility contains volleyball courts and multipurpose rooms. Also, on the property of the ‘Ewa Mahiko District Park is within the ‘Ewa Sugar Company Plantation historic district as discussed in Section 2.7.

West of the expansion property and proposed ENV Support Facilities and northwest of the existing WWTP is the Hawaiian Railway Society (HRS) train yard, toy museum, and picnic area. The educational non-profit organization offers train rides along the former OR&L railway on Saturdays and Sundays throughout the year. A portion of the railway crosses over the two existing access roads from Renton Road that are proposed to be improved as part of the Proposed Action. Based on discussion with the HRS, this portion of railway is not used for the typical train rides and may only be used for special events or for periodic maintenance access.

Lastly, within the project area, the Leeward Bikeway is planned within the OR&L ROW as part of the overall traffic planning for the community.

Figure 2-10 shows the parks and recreational areas in the project area. Of the recreational areas listed above, Coral Creek Golf Course and rail trail/bike path are located closest to project activities; the golf course lies directly adjacent to the eastern boundary of the WWTP parcel and the bike path is located to the north of the expansion property and ENV Support Facilities.

2.8.2 Potential Environmental Consequences and Mitigation Measures

Significant impacts to recreation are any action that curtails the range of beneficial uses of recreational areas. This curtailment may result from actions directly impacting the size of or affecting user experience in the existing recreational areas. Examples of significant impacts to recreation could include development encroaching onto recreational sites, or construction or other project-related activities that create noise or visual impacts to users of recreational sites or create impacts to the accessibility of the recreational areas.

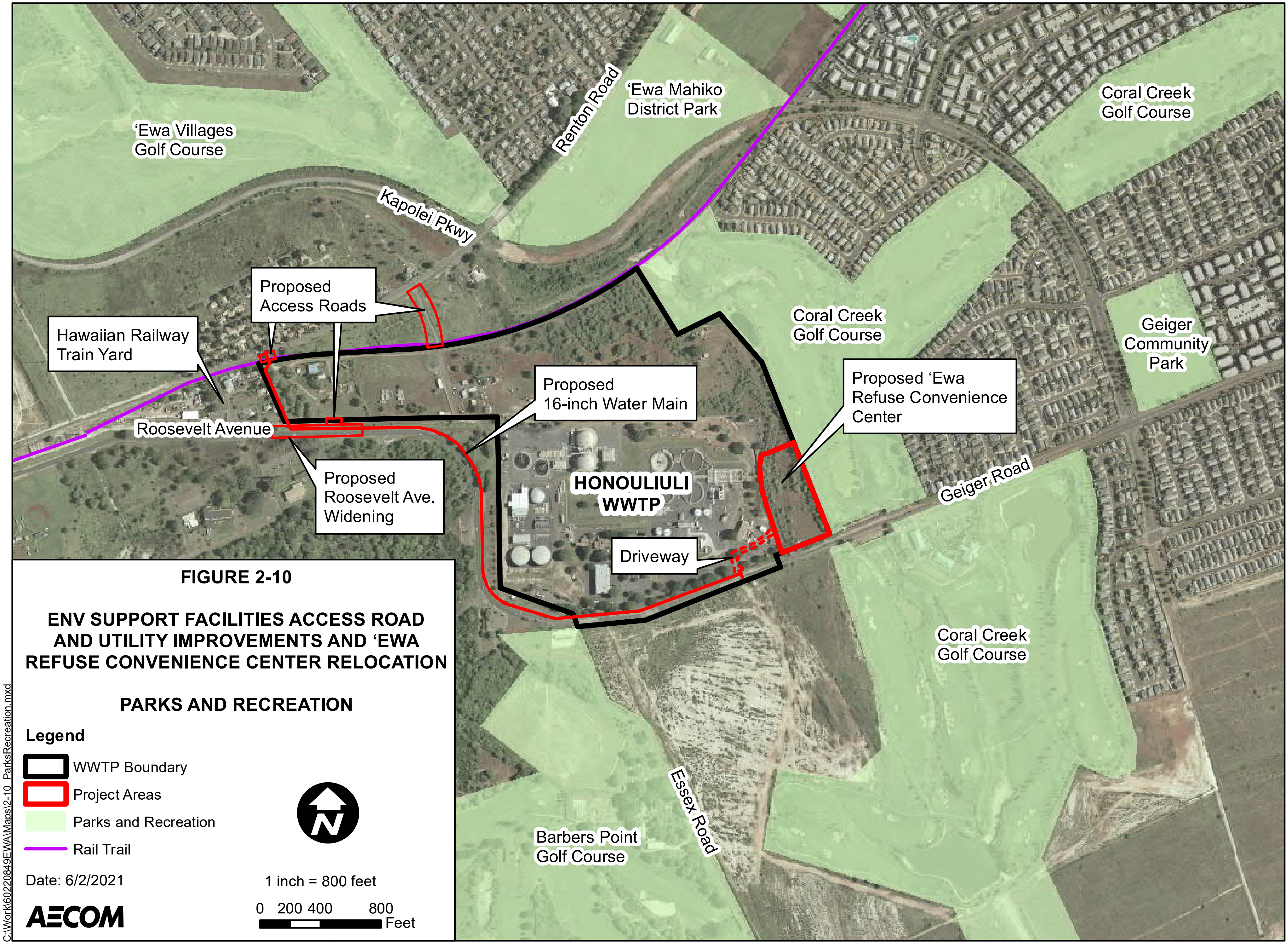

FIGURE 2-10

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND 'EWA REFUSE CONVENIENCE CENTER RELOCATION

PARKS AND RECREATION

2.8.2.1 CONSTRUCTION

The access road improvements may have temporary impacts to the proposed OR&L and Leeward Bikeway during construction as it involves upgrade and construction on the existing railway crossings. Construction activities would include an improvement to the existing railway crossings to meet requirements of HDOT and the HRS, such as safety signs, signals and/or gates, as required. To mitigate potential impacts to the OR&L ROW, trenchless installation methods may be used for underground utility crossings at the cell tower access driveway and open trench installation may be executed concurrently with crossing improvements at the Malio Street driveway. Impacts would be temporary in nature and cease after construction. Construction activities adjacent to Renton Road and within Roosevelt Avenue may temporarily impact access to recreational areas due to delays related to construction equipment and activity. If the Leeward Bikeway has been built prior to construction of the rail crossings, safe temporary detours through or around the construction zone would be provided for Leeward Bikeway users. These activities would be temporary and are not anticipated to be significant. Relocation of the ERCC would be located entirely within the WWTP property boundary. Therefore, no impacts to the surrounding recreational areas are anticipated.

2.8.2.2 OPERATION

The Proposed Action would not result in a decrease in acreage of the existing recreational areas around the project site. The proposed access road improvements from Renton Road to the ENV Support Facilities would directly impact the OR&L ROW tracks and future Leeward Bikeway as each roadway has an existing railway crossing. One existing access road would continue to be used primarily for access to a cell tower for occasional maintenance. Malio Street would have increased commuter traffic; however, the vehicles would be moving slow with signs to identify the railroad crossing, and bicycle and pedestrian traffic. The Proposed Action would improve the current conditions of the rail crossings and include the addition of safety markings, signals and/or gates, as required. The use of these access roads is not anticipated to be a significant impact to the railway as the HRS does not normally run trains in this area. In addition, pedestrian and bicycle access would be provided to encourage pedestrian and bicycle access between the ENV Support Facilities and the Leeward Bikeway.

The relocation of the ERCC would not have a direct impact to the recreational resources around the project area. However, the relocation is anticipated to improve traffic congestion on Geiger Road during peak use, which may improve travel time to the surrounding recreational areas.

2.9 VISUAL RESOURCES

2.9.1 Affected Environment

The visual character of the project site is primarily an industrial setting due to the existing treatment facilities. The WWTP, existing ERCC, and expansion property are visible from nearby golf courses, including Coral Creek Golf Course to the east of the site and Barbers Point Golf Course located to the south of the project site, and residential neighborhoods located along the western and northwestern expansion property boundary. Views of the WWTP, existing ERCC, and expansion property from the golf courses are partially screened by the existing tree canopy located between the project site and the golf courses on each golf course property. The project site would also be visible from a proposed rail trail/bike path within the old OR&L railway, located immediately north of the expansion property. Trees within the expansion property currently provide a visual screen between the existing WWTP and the Coral Creek Golf Course, residential areas, and the rail trail. Other nearby properties within viewing distance of the project site include industrial land uses.

2.9.2 Potential Environmental Consequences and Mitigation Measures

2.9.2.1 Construction

Construction activities would be contained within the WWTP property boundary, Malio Street, the proposed driveways, Roosevelt Avenue, and along Geiger Road. The presence of heavy equipment, construction materials, and construction activities may impact the aesthetics of the property during the construction phase. Tree clearing and disturbed land for the improved roadways north of the expansion property would temporarily impact the viewshed from the proposed Leeward Bikeway and residential neighborhoods north of Renton Road. Impacts to the viewshed from the ‘Ewa Villages Golf Course are not anticipated due to the existing tree canopy and residential neighborhoods between them. Visual impacts during construction as viewed from Barbers Point Golf Course are anticipated to be minimal as a result of an existing tree canopy between the site and the golf course. Visual impacts to the viewshed from Coral Creek Golf Course due to the relocation of the ERCC would be considered negligible due to the existing view of the WWTP.

During construction, fencing surrounding the construction sites may be provided as needed to provide a visual screen from construction equipment. Any construction impacts regarding visual aesthetics are expected to be short-term and would cease after construction.

2.9.2.2 Operation

The viewshed from the residential neighborhoods, the OR&L ROW tracks, and the proposed Leeward Bikeway north of the expansion property would be altered due to the upgraded roadways and rail crossings. The rail crossings would include crossing panels and pavement that may detract from the historic character of the rural, unpaved crossings. However, the area impacted would be relatively small given the length of the OR&L ROW. To mitigate alteration of the viewshed, it may be possible to preserve the rural character by only installing signs if signals are not required for safety. The new access road from Roosevelt Avenue would require a portion of the existing fence be removed and tree clearing; however, the visual change is not anticipated to negatively impact the area due to the existing industrial nature of the area. Similarly, the relocation of the ERCC to an open area within the

WWTP may change the viewshed from the Coral Creek Golf Course, but it would be consistent with the industrial look that currently exists.

2.10 NOISE

2.10.1 Affected Environment

In accordance with Hawaii Administrative Rules Title 11, DOH, Chapter 26 Community Noise Control, there is a classification of zoning districts which have defined maximum permissible sound levels in dBA (decibel (A-weighted scale)). The existing WWTP site and ERCC location is zoned as I-2 Intensive Industrial District and the expansion property, including the ENV Support Facilities and proposed access road improvements sites are zoned as AG-1 Restricted Agricultural district (CCH Department of Planning). Both of these zones are included in the Class C zoning districts which include all areas equivalent to lands zoned agriculture, country, industrial or similar type. The maximum permissible sound levels which apply to stationary noise sources and equipment related to agricultural, construction, and industrial activities in the Class C zoning district is 70 dBA during the daytime (7 AM to 10 PM) and nighttime (10 PM to 7 AM). Further, the administrative rule stipulates that noise levels shall not exceed the maximum permissible sound levels for more than 10% of the time within any 20-minute period, at any time except by permit or variance.

A noise study was conducted in October 2014 that determined the WWTP was in full compliance with the 70 dBA criteria. The existing major sources of noise in and around the site consisted of the WWTP buildings and equipment including the Dewatering Building Centrifuge, Influent Pump Station, Blower Building #1 (Primary), BioTower Pump Station Booster Fan, and Caustic Scrubber Odor Control Blower. Vehicular traffic and aircraft noise were the dominant sources during the day (AECOM 2017). Results of the study indicated that the WWTP site was within the 70 dBa criterion.

2.10.2 Potential Environmental Consequences and Mitigation Measures

2.10.2.1 CONSTRUCTION

Noise levels would increase slightly during construction activities. Proposed construction activities would generate some noise primarily from mechanical equipment used for vegetation removal, grading, clearing and other construction activities. The noise may be audible at the property line intermittently and some noise may be audible on adjoining properties during the construction phase.

Construction activities would be carried out in accordance with HRS Chapter 342F, Noise Pollution, Hawaii Administrative Rules (HAR) Title 11, Chapter 46, Community Noise Control and all Federal, State, and City laws and regulations. According to HAR Title 11, Chapter 46, construction activity is permitted Monday through Friday from 7:00 am to 6:00 pm and Saturday from 9:00 am to 6:00 pm. Construction activities associated with the proposed project would comply with these time restrictions to the extent practicable. A Community Noise Variance would be required to exceed the maximum permissible sound levels or for work outside of normal hours.

2.10.2.2 OPERATION

The only new additional noise generator after completion of the construction phase would be the increase in commuter traffic using the access roads to the ENV Support Facilities. However, this increase in noise would likely occur during commuter hours. In addition, the commuters would not all be using the same access road as there would be the option to access the ENV Support Facilities from Renton Road or from Roosevelt Avenue to minimize congestion. It is anticipated that the noise from the operation of the Proposed Action would not be significant.

There is no anticipated noise impact as a result of the ERCC relocation as the facility would still be within the WWTP boundary.

2.11 TRANSPORTATION

2.11.1 Affected Environment

Primary access to the Honouliuli WWTP is through an entrance on Geiger Road, hereafter referred to as “Honouliuli Driveway 1 (DW1)”, west of the Coral Creek Golf Course and south of the Honouliuli WWTP Control Building. The Septage Receiving Station is accessed through a separate entrance from Geiger Road east of the main entrance and opposite Kamakana Street, hereafter referred to as “Honouliuli Driveway 2 (DW2)”.

The Proposed Action addresses roadway improvements associated with the ENV Support Facilities and the relocation of the ERCC. The ENV Support Facility property can currently be accessed via Geiger Road from the internal road system of the WWTP. The existing ERCC is currently accessed from Geiger Road west of DW1.

2.11.1.1 EXISTING ROADWAYS

Key roadways in the vicinity of the Honouliuli WWTP are:

1. Kapolei Parkway
2. Geiger Road/Roosevelt Avenue
3. Renton Road

Kapolei Parkway is an arterial roadway that connects the ‘Ewa and ‘Ewa Beach areas with Kapolei. In the ‘Ewa Beach area, Kapolei Parkway has a North-South orientation that transitions into a West-East orientation North of Renton Road. In the vicinity of the Honouliuli WWTP, Kapolei Parkway is a six-lane, divided roadway (three lanes in each direction) with a raised median and curb and gutters. Between Renton Road and Geiger Road, there are detached sidewalks along both sides of the road. In the vicinity of the project, the posted speed limit is 30 mph. Kapolei Parkway is under the jurisdiction of the City and County of Honolulu.

Geiger Road is a major collector roadway providing West-East mobility within the ‘Ewa area. It connects to Roosevelt Avenue on its West end and Iroquois Point Road on its East end. Along with Roosevelt Avenue, it is one of the connecting routes between ‘Ewa Beach and Kapolei. In the vicinity of Honouliuli WWTP, Geiger Road is mostly a four-lane, undivided roadway (two lanes in each direction). It transitions to a two-lane, undivided roadway at the existing entrance to the ERCC Driveway before turning into Roosevelt Avenue. Most of Geiger Road has curb and gutter except for the frontage of the Honouliuli WWTP where it has a paved shoulder. The posted speed limit in the vicinity of Honouliuli WWTP is 30 mph. Geiger Road is under the jurisdiction of the City and County of Honolulu.

Roosevelt Avenue begins on the West end of Geiger Road and continues along the roadway corridor that provides an alternative connection between ‘Ewa Beach and Kapolei and access into the Kalaeloa area. In the vicinity of the Honouliuli WWTP, Roosevelt Avenue is a two-lane, undivided roadway with painted shoulders. There are no sidewalks on either side of the road. The posted speed limit is generally 25 mph for this segment. The posted speed limit in the Westbound direction increases to 35 mph in the vicinity of Philippine Sea Road. Roosevelt Avenue is under the jurisdiction of the State of HDOT.

Renton Road is a West-East oriented collector roadway that provides access to Kapolei Parkway and beyond to Fort Weaver Road. Its West end begins near Kihi Street in Varona Village and terminates near Asing Community Park on its East end. Between Kihi Street and Kapolei Parkway, Renton Road is two-lane, undivided roadway with unpaved shoulders along both sides of the road. East of Kapolei Parkway, Renton Road transitions into a four-lane, divided roadway with a raised median and curb and gutters and sidewalks along both sides of the road. The posted speed limit in the vicinity of the site is 25 mph. Renton Road is under the jurisdiction of the City and County of Honolulu.

2.11.1.2 EXISTING INTERSECTION CONFIGURATIONS

Key intersections in the vicinity of the Honouliuli WWTP are:

1. Kapolei Parkway/Renton Road
2. Renton Road/Philippine Sea
3. Kapolei Parkway/Geiger Road
4. Geiger Road/Honouliuli WWTP DW2/Kamakana Street
5. Geiger Road/Honouliuli WWTP DW1
6. Geiger Road/ERCC Driveway
7. Roosevelt Avenue/Philippine Sea

The intersection of Kapolei Parkway and Renton Road is a four-legged signalized intersection. The Eastbound Renton Road approach has an exclusive left-turn lane and a shared through/right-turn lane. The Westbound approach has separate right-turn, through, and left-turn lanes. On both the Northbound and Southbound Kapolei

Parkway approaches, each has an exclusive left-turn lane, two through lanes, and one shared through/right-turn lane. There are marked crosswalks across all legs of this intersection.

The intersection of Renton Road and Philippine Sea is an unsignalized “T”-intersection with STOP-sign control on the Philippine Sea approach. On the Westbound Renton Road, there is a single shared through/left-turn lane, and on the Eastbound approach, there is a single shared through/right-turn lane. On the Philippine Sea approach, there is a single shared left-turn/right-turn lane. There are no marked crosswalks at this intersection.

The Kapolei Parkway and Geiger Road intersection is a four-legged signalized intersection. The Kapolei Parkway approaches each have an exclusive right-turn lane, an exclusive left-turn lane, and two through lanes. The Geiger Road approaches each have an exclusive left-turn lane, a through lane, and a shared through/right-turn lane. There are marked crosswalks across all legs of the intersection.

The Geiger Road and Honouliuli WWTP DW2/Kamakana Street intersection is an unsignalized four-legged intersection with STOP-sign control at the Honouliuli WWTP Driveway 2 and Kamakana Street approaches. Each Geiger Road approach has an exclusive left-turn lane, a through lane, and a shared through/right-turn lane. The Honouliuli WWTP Driveway 2 approach has one shared lane for the left-turn/through/right-turn movement. The Kamakana Street approach has an exclusive left-turn lane and a shared through/right-turn lane. There is a marked crosswalk across the Kamakana Street approach.

The Geiger Road and Honouliuli WWTP DW1 intersection is an unsignalized “T”-intersection with an implied STOP-sign control at the Honouliuli WWTP DW1. The Westbound Geiger Road approach includes two through lanes and an exclusive right-turn lane. The Eastbound Geiger Road approach has an exclusive left-turn lane and a single through lane. The Honouliuli WWTP Driveway 1 has a shared left-turn/right-turn lane. There are no marked crosswalks at this intersection.

The Geiger Road and ERCC driveway intersection is an unsignalized “T”-intersection with a STOP-sign control along the ERCC driveway. The Westbound Geiger Road approach has an exclusive right-turn lane and a through lane. The Eastbound Geiger Road approach has a shared through/left-turn lane. The ERCC driveway has a shared left-turn/right-turn lane. There are no marked crosswalks at this intersection.

The Roosevelt Avenue and Philippine Sea intersection is an unsignalized four-legged intersection with STOP-sign control on the Philippine Sea approaches. On the Roosevelt Avenue Westbound and Eastbound approaches, there is a single shared left-turn/through/right-turn lane. On the Philippine Sea approaches, there is a single shared left-turn/through/right-turn lane. There are no marked crosswalks across the legs at this intersection

2.11.1.3 EXISTING PEDESTRIAN AND BICYCLE CONDITIONS

Kapolei Parkway and Geiger Road have sidewalks. Roosevelt Avenue has paved shoulders, while Renton Road has unpaved shoulders. All signalized intersections have crosswalks across all approaches.

There are shared pedestrian/bicycle paths on Kapolei Parkway and on Geiger Road. The Kapolei Parkway path is on its East side, and on Geiger Road, it is on the South side. Roosevelt Avenue has paved shoulders that could be utilized by bicycles. Bicycles on Renton Road share the road with vehicles.

2.11.1.4 EXISTING PUBLIC TRANSIT CONDITIONS

The City and County of Honolulu Department of Transportation Services (DTS) through Oahu Transit Service operates the TheBus. The following describes the bus routes in the vicinity of the Honouliuli WWTP.

Route 41 (Kapolei/‘Ewa Beach) connects Kapolei and ‘Ewa Beach via Roosevelt Avenue and Geiger Road. Route 41 runs from approximately 5:00 AM to 11:00 PM (span of 18 hours).

Route 44 (Waipahū –‘Ewa Beach) connects Waipahū and ‘Ewa Beach via Renton Road, Philippine Sea, Roosevelt Avenue, Geiger Road, and Kapolei Parkway. It runs from approximately 4:00 AM to 12:00 AM (span of 20 hours). Bus stops are provided on Philippine Sea: the Northbound bus stop located closer to Renton Road (Stop #1826) and the Southbound stop located closer to Roosevelt Avenue (Stop #4392). Along Renton Road, there are four bus stops: two near Ha‘akei Street: Stop #1825 for the Westbound buses and Stop #1827 for the Eastbound buses and two further east near Malio Street for the buses traveling in the Westbound direction (Stop #1824) and the ‘Ewa Hongwanji Mission for the Eastbound buses (Stop #1828).

The bus stops on Roosevelt Avenue/Geiger Road are common to both routes. Two bus stops are located near the intersection of Roosevelt Avenue and Essex Road: on the North side of the road (Stop #1775) and on the South side of the road (Stop #1800). On Geiger Road, there are four other bus stops: East of the Coral Creek Golf Course- Westbound direction (Stop #1774) and Eastbound direction (Stop #1801) and near the intersection with Kapolei Parkway- Westbound direction (Stop #1773) and Eastbound direction (Stop #1802).

2.11.1.5 EXISTING INTERSECTION TRAFFIC VOLUMES

Manual traffic volumes turning movement counts and observations were conducted by Austin, Tsutsumi and Associates as part of the Traffic Impact Analysis Report (TIAR) for the Honouliuli WWTP, dated April 9, 2018. The traffic turning movement counts were conducted on September 27, 2017. From these counts, the AM commuter peak hour was determined to occur from 6:45 AM to 7:45 AM, and the PM commuter peak hour was determined to occur from 4:00 PM to 5:00 PM.

These traffic turning movement volumes were used as a basis for the ENV Support Facilities Access Road and Utility Improvements and ERCC Relocation TIAR (hereinafter referred to as the “Project TIAR") with adjustments to account for differences in access configurations.

The Project TIAR utilized the traffic turning movements collected at the following intersections:

1. Renton Road/Kapolei Parkway – immediately north of the Honouliuli WWTP property
2. Renton Road/Philippine Sea – west of the Honouliuli WWTP property
3. Roosevelt Avenue/Philippine Sea – southwest of the Honouliuli WWTP property
4. Roosevelt Avenue/Geiger Road/Essex Road – immediately southwest of the Honouliuli WWTP property
5. Geiger Road/ERCC Driveway – in the southwest corner of the Honouliuli WWTP
6. Geiger Road/DW1 – located at the southern boundary of the Honouliuli WWTP property
7. Geiger Road/DW2/Kamakana Street – located in the southeast corner of the Honouliuli WWTP property
8. Geiger Road/Kapolei Parkway – southeast of the Honouliuli WWTP property

Figure 2-11 summarizes the Existing AM and PM peak hour turning movement volumes at these intersections.

2.11.1.6 EXISTING INTERSECTION OPERATIONS

Intersection operational analysis results from the TIAR for the Honouliuli WWTP were used as a basis for the intersection operational analysis for the Project TIAR.

The intersections were analyzed using the unsignalized and signalized intersection capacity methods described in the 2016 Highway Capacity Manual (HCM) through the Synchro/Sim Traffic software. The results are summarized as vehicle delay (seconds per vehicle) and level of service (LOS). LOS is a qualitative index that references a performance measure such as intersection delay to express the quality of traffic services ranging from A-little or no delay to F-significant delay.

Table 2-4 summarizes the intersection operational measures for the existing AM and PM peak hour time periods.

As shown, the signalized intersections and most, but not all, key turning movements of the unsignalized intersections operate well during both peak periods.

The two signalized intersections operate with a LOS C or better during the peak periods.

At the unsignalized intersections, most evaluated movements operate with LOS C or better. The Philippine Sea/Roosevelt Ave intersection shows an existing poor LOS of E for selected movements.

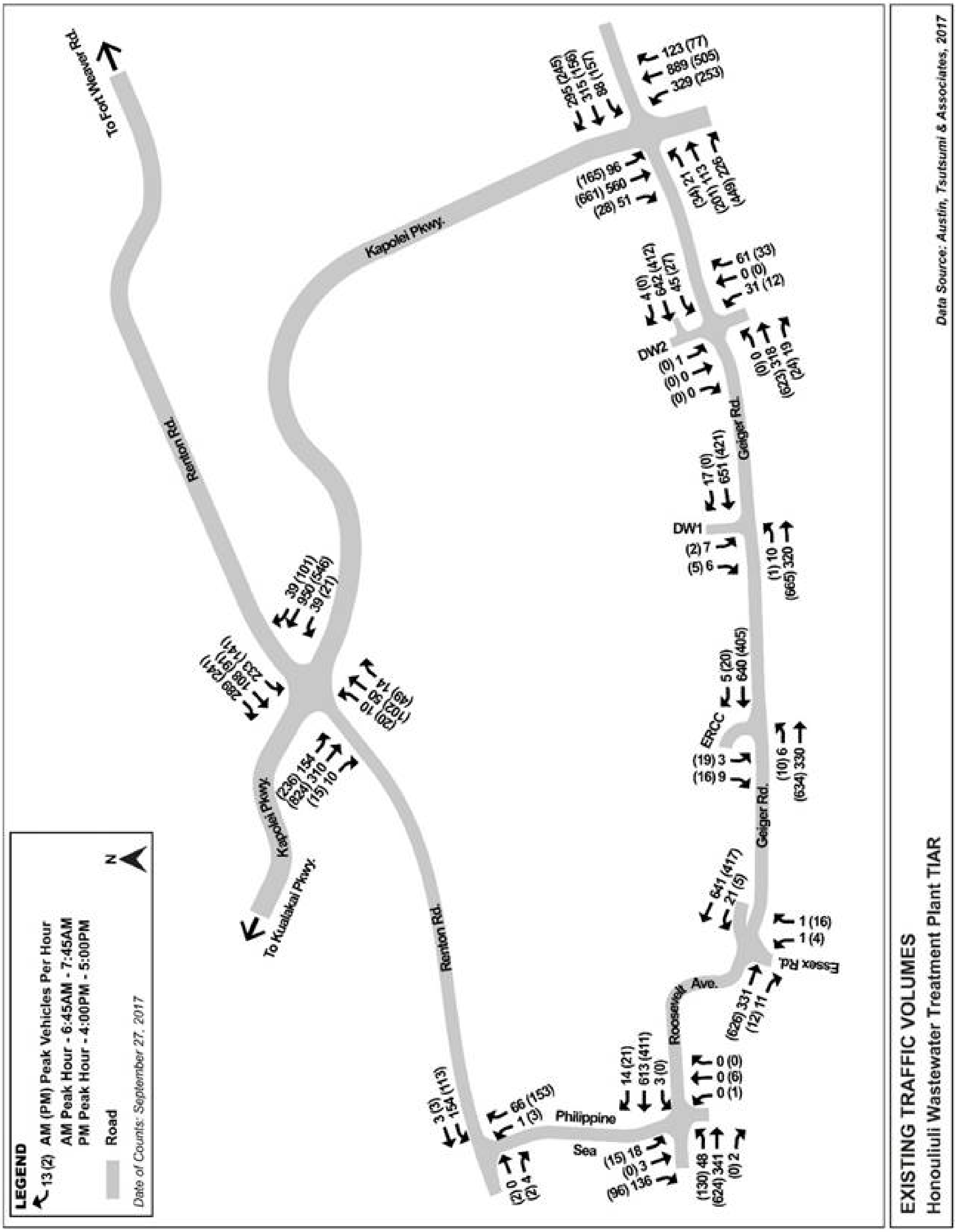

Figure 2-11. Existing Traffic Volumes

Table 2-4. Existing Intersection Operations

Intersection	AM Peak Hour Delay (sec/veh)	AM Peak Hour LOS	PM Peak Hour Delay (sec/veh)	PM Peak Hour LOS
Kapolei Pkwy & Renton Rd (signalized)				
Kapolei Pkwy & Renton Rd	22.1	C	18.6	B
Renton Rd & Philippine Sea (unsignalized 2-way STOP)				
Renton Rd WB LT/TH	7.5	A	7.4	A
Philippine Sea LT/RT	8.6	A	9.0	A
Roosevelt Ave & Philippine Sea (unsignalized 2-way STOP)				
Philippine Sea NB LT/TH/RT	0.0	A	43.9	E
Roosevelt Ave WB LT/TH/RT	8.0	A	0.0	A
Philippine Sea SB LT/TH/RT	23.0	C	35.2	E
Roosevelt Ave EB LT/TH/RT	9.2	A	8.8	A
Geiger Rd/Roosevelt Ave & Essex Rd (unsignalized 2-way STOP)				
Essex Rd LT/TR	15.6	C	15.4	C
Geiger Rd WB LT	8.1	A	9.0	A
Geiger Rd & ERCC Driveway (unsignalized 2-way STOP)				
ERCC Dwy LT/RT	15.2	C	18.4	C
Geiger Rd EB LT/TH	9.0	A	8.3	A
Geiger Rd & Honouliuli DW1 (unsignalized 2-way STOP)				
Honouliuli Dwy 1 LT/RT	16.8	C	13.8	B
Geiger Rd EB LT	9.2	A	8.3	A
Geiger Rd & Honouliuli DW2/Kamakana St (unsignalized 2-way STOP)				
Kamakana St LT	20.5	C	24.0	C
Kamakana St TH/RT	9.7	A	10.9	B
Geiger Rd WB LT	8.2	A	9.2	A
Honouliuli Dwy 2 LT/TH/RT	24.7	C	0.0	A
Geiger Rd EB LT	0.0	A	0.0	A
Kapolei Pkwy & Geiger Rd (signalized)				
Kapolei Pkwy & Geiger Rd	32.7	C	34.0	C

Notes: Based on counts conducted on September 27, 2017 by ATA
AM Peak Hour: 6:45-7:45 AM, PM Peak Hour: 4:00-5:00 PM
sec/veh = seconds per vehicle, LOS = Level of Service
LT = left turn, TH = through, RT = right turn

2.11.2 Potential Environmental Consequences and Mitigation Measures

The buildout of the Honouliuli WWTP improvements, including the ENV Support Facilities and the relocation of the ERCC, is proposed to be completed by Year 2026, and that is the time frame used for analyses for the projected environment.

2.11.2.1 ROADWAYS

The ENV Support Facilities are proposed to have two access driveways: one on Roosevelt Avenue between Ticonderoga Street and Essex Street and one on Renton Road via Malio Street.

A segment of Roosevelt Avenue is proposed to be widened to accommodate a median left-turn lane at the ENV Support Facilities Driveway. The widening of Roosevelt Avenue is proposed to occur within the existing roadway right-of-way. The ENV Support Facilities Driveway would cross and would be designed to accommodate future underground utilities running parallel to Roosevelt Avenue. Roosevelt Avenue is currently under the jurisdiction of HDOT, and both the new ENV Support Facilities Driveway and the proposed median left-turn lane will require HDOT approval. The proposed water main would be installed in the shoulder of Roosevelt Avenue.

Renton Road is proposed to be left in its current configuration, respecting the historic nature of the ‘Ewa plantation area. There may be minor modifications at Malio Street to accommodate proposed improvements to the Malio Street access to the ENV Support Facilities.

An existing minor driveway on Renton Road that leads to a cell phone tower is also proposed to be improved. This driveway is expected to be used only for occasional cell phone tower maintenance. A portion of the proposed 16-inch water main would be installed in this driveway and would be connected to an existing 8-inch water main at Renton Road. Renton Road is proposed to be left in its current configuration at this location.

Both Malio Street and the cell phone tower driveway have existing crossings of the OR&L ROW. Future plans call for the OR&L ROW to include a combined pedestrian-bike path. The existing crossings of the OR&L ROW by Malio Street and the cell phone tower driveway would be improved according to HDOT standards.

The relocated ERCC would utilize the Geiger Road/Honouliuli WWTP DW2/Kamakana Street intersection and the existing ERCC Driveway would only have occasional use by ENV operations. The Geiger Road/Honouliuli WWTP DW2/Kamakana Street intersection has existing median left-turn lanes, so no further roadway improvement is proposed. At its eastern end, the proposed 16-inch water main would cross under Geiger Road and connect to the existing 16-inch water main on the south side of Geiger Road at Kamakana Street.

No other roadway improvements are proposed. Figure 1-2 illustrates the proposed access to the ENV Support Facility area.

2.11.2.2 INTERSECTIONS

The intersections into the main Honouliuli WWTP are located on Geiger Road. This segment of Geiger Road has already been improved to a four-lane roadway with median left-turn lanes at the Honouliuli WWTP DW1 and DW2 intersections. No further improvements are proposed for these intersections.

As described previously, the ENV Support Facilities Driveway is proposed to have a median left-turn lane added in Roosevelt Avenue for traffic safety and operational reasons. The conceptual design parameters of this left-turn lane are based on the result of the evaluation of projected traffic volumes and will be described as part of the mitigation measures. The configuration of the ENV Support Facilities Driveway is recommended to have separate lanes for left and right-turn traffic movements.

The Malio Street access is proposed to be improved to City standards including its intersection with Renton Road. In keeping with the historic nature of Renton Road, shared lane approaches on Renton Road would be maintained.

2.11.2.3 PROJECTED PEDESTRIAN AND BICYCLE CONDITIONS

There are no changes to pedestrian facilities along Kapolei Parkway, Geiger Road, or Roosevelt Avenue as part of the Proposed Action.

There may be pedestrian facility improvements along Renton Road as part of the Varona Village Redevelopment. None of the roadway improvements proposed as part of the ENV Support Facility access preclude these pedestrian facility improvements.

The HDOT Bike Plan Hawaii – Master Plan and the City and County of Honolulu DTS O‘ahu Bike Plan 2019 Update were both reviewed. The following prioritized proposed bicycle projects in the vicinity of the project site are identified.

Tier 1 (high priority) projects within the vicinity of the Honouliuli WWTP are as follows:

- Kapolei Parkway – Buffered bike lanes within the existing travelway. This would require the reallocation of the curb lanes on both sides of Kapolei Parkway;
- Leeward Bikeway (Phase 1) – shared use path located South of the OR&L train tracks. Phase 1 is located between Waipio Point Access Road and the Hawaiian Railroad Society Train Station; and
- Renton Road – Shared roadway operation between Kapolei Parkway and Philippine Sea.

Tier 2 (medium priority) projects are as follows:

- Geiger Road – Bike lanes between Fort Weaver Road and Roosevelt Avenue; and
- Roosevelt Avenue – Bike lanes between Geiger Road and Kualakaʻi Parkway

Tier 3 (lower priority) projects are as follows:

- Essex Road – Shared roadway operation between Geiger Road and White Plains Beach.

Proposed roadway improvements for the Honouliuli WWTP would not conflict with the future implementation of any of these proposed bicycle projects.

There is also a proposed bicycle path that is anticipated to be constructed as part of the overall upgrade of the Honouliuli WWTP. This proposed bicycle path will connect Geiger Road to the proposed Leeward Bikeway. This bicycle path may be included into a future separate project, with a schedule to be determined.

2.11.2.4 Projected Public Transit Conditions

The City and County of Honolulu is currently constructing a high-capacity rail transit system. When that system starts operating, it is projected that the two municipal bus routes currently serving the Honouliuli WWTP area will be modified to integrate bus and rail operations.

Route 41 (Kapolei/ʻEwa Beach) connects Kapolei and ʻEwa Beach via Roosevelt Avenue and Geiger Road and will probably continue to provide this service.

Route 44 (Waipahū –ʻEwa Beach) currently connects Waipahū and ʻEwa Beach via Renton Road, Philippine Sea, Roosevelt Avenue, Geiger Road, and Kapolei Parkway. It is likely this route would be modified to connect the ʻEwa Beach area to the Kualakaʻi (East Kapolei) rail station. However, in the vicinity of the Honouliuli WWTP, the route would probably remain similar to its existing configuration.

It is also possible that other routes would be added to provide increased connectivity to the rail station. In any case, transit service in the vicinity of the Honouliuli WWTP is projected to at least remain at the current level of service.

2.11.2.5 Projected Intersection Traffic Volumes

Future intersection traffic volumes summarized in the TIAR for the Honouliuli WWTP were used as a basis for the projected future intersection traffic volumes in this study. These base traffic volumes were modified to include the shift of traffic from the existing ERCC driveway to the DW2 to reflect the relocation of the ERCC and the additional traffic on Renton Road generated by the proposed redevelopment of Varona Village, located north of Renton Road, in the vicinity of Malio Street. The specific modifications are documented in the Project TIAR, which is provided in Appendix B.

Figure 2-12 summarizes the projected Year 2026 peak hour intersection traffic volume turning movements.

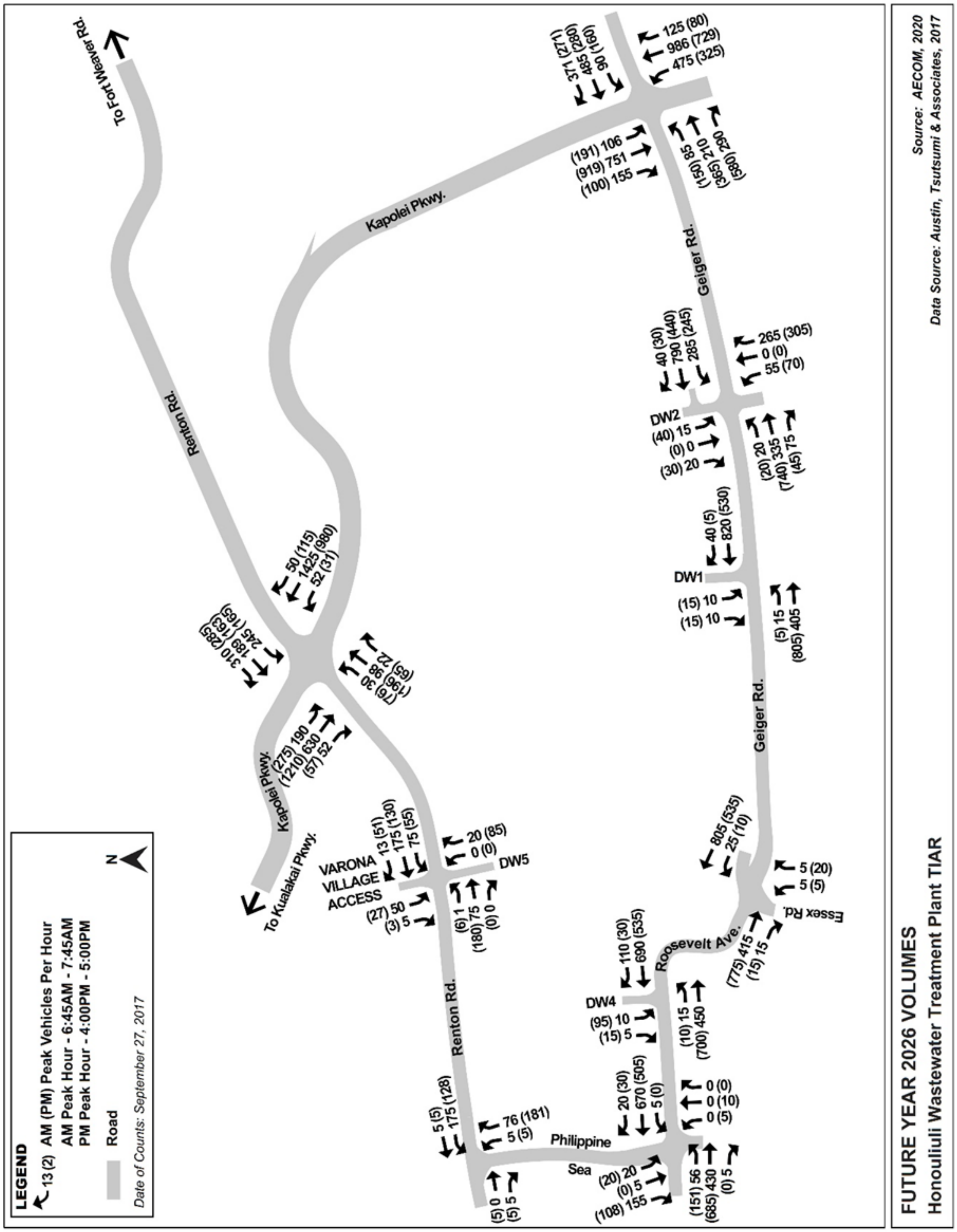

Figure 2-12. Future Year 2026 Traffic Volumes

2.11.2.6 PROJECTED INTERSECTION OPERATIONS

The projected Year 2026 AM and PM peak hour traffic volumes with the additional volumes from the Varona Village redevelopment and redistribution of the ERCC traffic were evaluated using the unsignalized and signalized Highway Capacity Manual method as implemented by the Synchro analysis software. The signalized analysis was conducted using the 2000 HCM method as the results from this method are the most similar to the 2016 HCM. The unsignalized analysis was conducted using the 2010 HCM method.

The Synchro analysis worksheets completed for this study can also be found in the Project TIAR (see Appendix B).

Table 2-5 and Table 2-6 compare the intersection operations for the AM peak hour conditions and Table 2-7 and Table 2-8 compare the intersection operations for the PM peak hour conditions for the projected Year 2026 traffic volumes between the TIAR for the Honouliuli WWTP conducted previously in 2018 and this current Project TIAR.

As shown in these tables, the relocation of the ERCC operations to the DW2 Driveway does result in increases in delay to vehicles exiting Honouliuli DW2 and Kamakana Street. It does not change the operational LOS for these movements.

Intersection operations at other intersections are similar between the two studies, even accounting for the additional traffic from the future Varona Village redevelopment.

With the two accesses as proposed (Malio Street on Renton Road and DW4 on Roosevelt Avenue), the ENV Support Facilities Access Road and Utility Improvements traffic impacts are able to be accommodated by the existing roadway network with roadway improvements at the proposed accesses.

Table 2-5. Projected Year 2026 AM Peak Hour Intersection Operations Comparison Part 1

Intersection	2018 Honouliuli WWTP TIAR		2020 Project TIAR	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Kapolei Pkwy & Renton Rd (signalized)				
Kapolei Pkwy & Renton Rd	29.1	C	30.2	C
Renton Rd & Honouliuli WWTP DW5/Varona Village Access (unsignalized 2-way STOP)				
Honouliuli WWTP DW5 NB LT/TH/RT	8.8	A	8.8	A
Renton Rd WB LT	7.5	A	7.5	A
Varona Village Access LT/TH/RT	-	-	13.1	B
Renton Rd EB LT	-	-	7.6	A
Renton Rd & Philippine Sea (unsignalized 2-way STOP)				
Renton Rd WB LT/TH	7.5	A	7.5	A
Philippine Sea LT/RT	8.9	A	8.9	A
Roosevelt Ave & Philippine Sea (unsignalized 2-way STOP)				
Philippine Sea NB LT/TH/RT	0.0	A	0.0	A
Roosevelt Ave WB LT/TH/RT	8.3	A	8.3	A
Philippine Sea SB LT/TH/RT	33.2	D	34.1	D
Roosevelt Ave EB LT/TH/RT	9.5	A	9.5	A
Roosevelt Ave & Honouliuli WWTP DW4 (unsignalized 2-way STOP)				
Roosevelt Ave EB LT	9.7	A	9.7	A
Honouliuli WWTP DW4 LT/RT	24.2*	C*	17.5	C
Honouliuli WWTP DW4 RT	-	-	14.6	B
Geiger Rd/Roosevelt Ave & Essex Rd (unsignalized 2-way STOP)				
Essex Rd LT/TR	20.4	C	20.4	C
Geiger Rd WB LT	8.4	A	8.4	A

Notes:
sec/veh = seconds per vehicle, LOS = Level of Service
LT = left turn, TH = through, RT = right turn
* Shared left and right on DW4 approach, no median refuge in Roosevelt

Table 2-6. Projected Year 2026 AM Peak Hour Intersection Operations Comparison Part 2

Intersection	2018 Honouliuli WWTP TIAR Delay (sec/veh)	2018 Honouliuli WWTP TIAR LOS	2020 Project TIAR Delay (sec/veh)	2020 Project TIAR LOS
Geiger Rd & ERCC Dwy (unsignalized 2-way STOP)				
ERCC Dwy LT/RT	20.1	C	-	-
Geiger Rd EB LT/TH	9.8	A	-	-
Geiger Rd & Honouliuli DW1 (unsignalized 2-way STOP)				
Honouliuli DW1 LT/RT	21.7	C	22.0	C
Geiger Rd EB LT	10.0	B	10.0	B
Geiger Rd & Honouliuli DW2/Kamakana St (unsignalized 2-way STOP)				
Kamakana St LT	183.4	F	213.9	F
Kamakana St TH/RT	12.4	B	12.3	B
Geiger Rd WB LT	9.6	A	9.5	A
Honouliuli DW2 LT/TH/RT	85.9	F	133.4	F
Geiger Rd EB LT	9.8	A	9.9	A
Geiger Rd & Honouliuli DW3 (unsignalized 2-way STOP)				
Honouliuli DW3 LT/RT	38.3	E	-	-
Geiger Rd EB LT	11.3	B	-	-
Kapolei Pkwy & Geiger Rd (signalized)				
Kapolei Pkwy & Geiger Rd	49.5	D	49.5	D

Notes:
sec/veh = seconds per vehicle, LOS = Level of Service
LT = left turn, TH = through, RT = right turn

Table 2-7. Projected Year 2026 PM Peak Hour Intersection Operations Comparison Part 1

Intersection	2018 Honouliuli WWTP TIAR		2020 Project TIAR	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Kapolei Pkwy & Renton Rd (signalized)				
Kapolei Pkwy & Renton Rd	27.6	C	28.4	C
Renton Rd & Honouliuli WWTP DW5/Varona Village Access (unsignalized 2-way STOP)				
Honouliuli WWTP DW5 NB LT/TH/RT	9.8	A	9.8	A
Renton Rd WB LT	7.7	A	7.7	A
Varona Village Access LT/TH/RT	-	-	14.6	B
Renton Rd EB LT	-	-	7.6	A
Renton Rd & Philippine Sea (unsignalized 2-way STOP)				
Renton Rd WB LT/TH	7.4	A	7.4	A
Philippine Sea LT/RT	9.2	A	9.2	A
Roosevelt Ave & Philippine Sea (unsignalized 2-way STOP)				
Philippine Sea NB LT/TH/RT	84.3	F	89.8	F
Roosevelt Ave WB LT/TH/RT	0.0	A	0.0	A
Philippine Sea SB LT/TH/RT	42.0	E	43.9	E
Roosevelt Ave EB LT/TH/RT	9.3	A	9.3	A
Roosevelt Ave & Honouliuli WWTP Dwy 4 (unsignalized 2-way STOP)				
Roosevelt Ave EB LT	8.8	A	8.8	A
Honouliuli WWTP DW4 LT/RT	62.6*	F*	23.6	C
Honouliuli WWTP DW4 RT	-	-	12.4	B
Geiger Rd/Roosevelt Ave & Essex Rd (unsignalized 2-way STOP)				
Essex Rd LT/TR	19.5	C	19.5	C
Geiger Rd WB LT	9.7	A	9.7	A

Notes:
sec/veh = seconds per vehicle, LOS = Level of Service
LT = left turn, TH = through, RT = right turn
* Shared left and right on DW4 approach, no median refuge in Roosevelt

Table 2-8. Projected Year 2026 PM Peak Hour Intersection Operations Comparison Part 2

Intersection	2018 Honouliuli WWTP TIAR		2020 Project TIAR	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Geiger Rd & ERCC Dwy (unsignalized 2-way STOP)				
ERCC Dwy LT/RT	24.8	C	-	-
Geiger Rd EB LT/TH	8.7	A	-	-
Geiger Rd & Honouliuli DW1 (unsignalized 2-way STOP)				
Honouliuli DW1 LT/RT	24.7	C	24.4	C
Geiger Rd EB LT	8.7	A	8.7	A
Geiger Rd & Honouliuli DW2/Kamakana St (unsignalized 2-way STOP)				
Kamakana St LT	495.0	F	513.1	F
Kamakana St TH/RT	20.1	C	19.4	C
Geiger Rd WB LT	12.3	B	12.0	B
Honouliuli DW2 LT/TH/RT	146.8	F	513.1	F
Geiger Rd EB LT	8.4	A	8.5	A
Geiger Rd & Honouliuli DW3 (unsignalized 2-way STOP)				
Honouliuli DW3 LT/RT	53.6	F	-	-
Geiger Rd EB LT	9.3	A	-	-
Kapolei Pkwy & Geiger Rd (signalized)				
Kapolei Pkwy & Geiger Rd	52.9	D	54.6	D

Notes:
sec/veh = seconds per vehicle, LOS = Level of Service
LT = left turn, TH = through, RT = right turn

2.11.2.7 PROPOSED TRANSPORTATION MITIGATION MEASURES

Transportation mitigation measures are recommended at the proposed access points to the ENV Support Facilities.

DW4 on Roosevelt Avenue is a new driveway to the ENV Support Facilities. To safely accommodate traffic turning left into DW4, a median left-turn lane in Roosevelt Avenue is recommended. This would allow left-turning vehicles a protected area out of the flow of through traffic in Roosevelt Avenue while waiting for a safe gap in traffic to execute their turn. A median left-turn refuge is also recommended for traffic turning left out of DW4. Providing this median refuge would allow vehicles turning left out of DW4 to first clear the westbound Roosevelt lanes in one stage and then execute a merge into the eastbound Roosevelt lanes in a second stage. This is projected to decrease delay to vehicles turning left out of DW4. To accommodate this median left-turn lane and refuge, the existing Roosevelt Avenue needs to be widened. This widening can be implemented within the existing Roosevelt Avenue ROW. The Roosevelt Avenue improvements will require a Use and Occupancy Agreement (UOA) from HDOT. The new ENV Support Facilities Driveway would be located approximately 150 feet east of the existing Ticonderoga Street intersection on Roosevelt Avenue, and the proposed median left-turn lane for the ENV Support Facilities Driveway would extend past Ticonderoga Street. It is, therefore, recommended to restrict the low-volume Ticonderoga Street to right-in/right-out traffic movements. Figure 2-13 illustrates a conceptual drawing of this improvement.

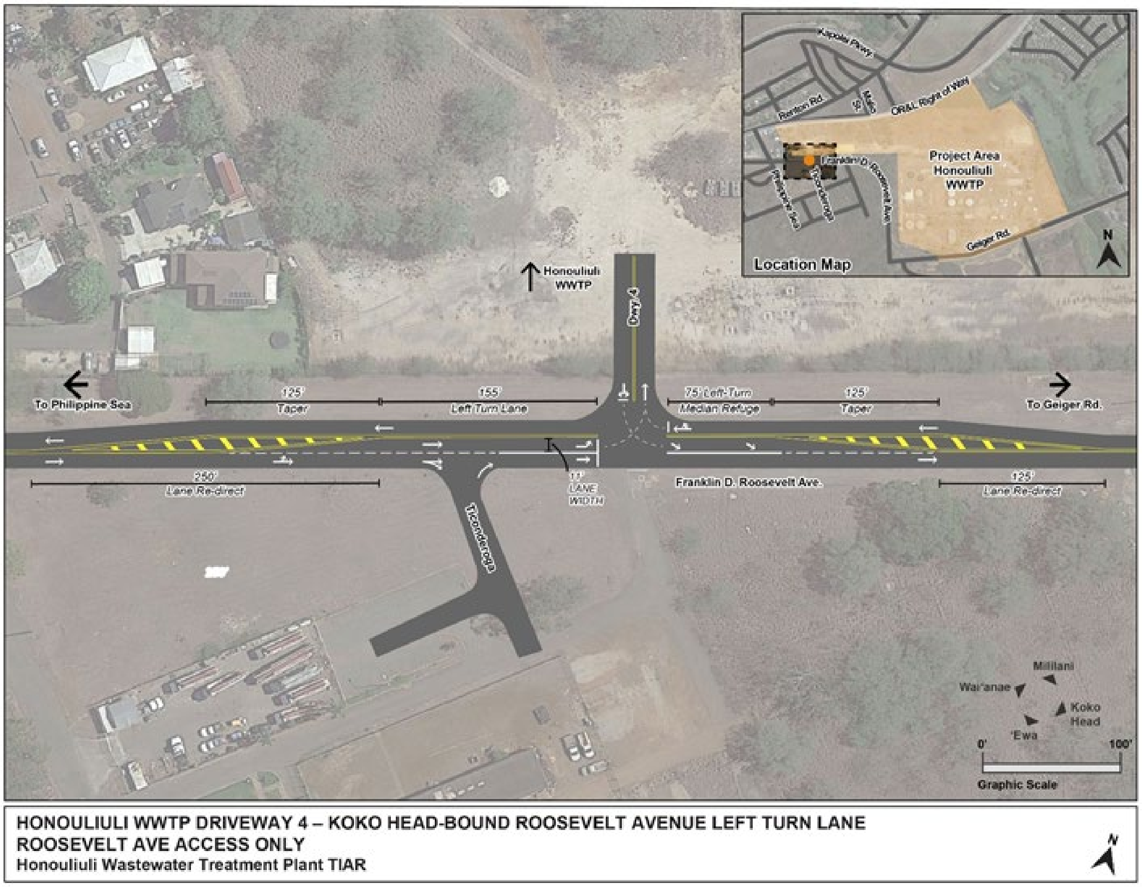

Figure 2-13.Conceptual Drawing of DW4 Driveway on Roosevelt Avenue

The access to the proposed ENV Support Facilities from Renton Road utilizes existing Malio Street. The Malio Street crossing of the OR&L ROW would be improved per HDOT standards. The crossing design will incorporate measures to acknowledge the safety needs regarding pedestrian and bicycle use of the OR&L ROW. The crossing will require FHWA and HDOT approval and will also require a Use and Occupancy Agreement from HDOT.

All construction activity on Geiger Road, Roosevelt Avenue, Renton Road, and Malio Street would include installation of BMPs for drainage and any damage to roadways that occur during construction would be corrected to City Standards and accepted by the City.

2.12 UTILITIES AND PUBLIC SERVICES

2.12.1 Affected Environment

This section summarizes and outlines utilities and public services in the project’s general vicinity. Potable water, power, and communications utilities are present on the site. Storm drainage and drainage infrastructure are discussed in Section 2.3.

2.12.1.1 UTILITIES

Potable water to the site is provided by the Honolulu BWS. The BWS relies solely on groundwater for potable water supply. The Honouliuli WWTP site is located within the Waipahu-Waiawa system, which is the primary source of drinking water for the study area. The closest well to the WWTP site is approximately 3.1 miles to the north. For industrial and irrigation purposes, the BWS utilizes the Honouliuli Water Recycling Facility (HWRF), operated by Veolia Water North America and located on the western side of the Honouliuli WWTP, which recycles wastewater for non-potable uses. Access to the HWRF is through the main access gate of the Honouliuli WWTP along Geiger Road. The HWRF provides tertiary treatment to approximately 13 mgd of secondary effluent from the WWTP.

Hawaiʻi Electric Company supplies electricity to the majority of Oahu. Two of Hawaiʻi Electric Company’s major facilities, the Kahe and Waiau Power Plants, are located approximately 5 miles of the WWTP site. Above ground electrical lines deliver power to the site, and these are complemented by underground electric service conduits leading to various structures on the site.

Telephone and internet services within the project area are provided by Hawaiian Telcom and Spectrum. Spectrum also provides cable services within the project area. These services are transmitted through underground and aerial lines located in the project area. There are two cell phone towers located on the WWTP property, one in the southeast corner and the other in the northwest corner of the site.

The US Army has a Joint Trunking System communication cable south of the fence along Roosevelt Avenue. The Roosevelt Avenue driveway would cross the underground cable. There is a concrete structure east of the Roosevelt Driveway (“JTS Hut 54N”), on the Roosevelt side of the fence.

Hawaiʻi Gas maintains underground utility gas mains which serve commercial and residential customers throughout the project area. There are no known major gas lines within the proposed project site. There was an active jet fuel line located in the vicinity of the project area, near the proposed location for the ERCC, but the fuel line has been decommissioned and abandoned. There are active Par Pacific fuel lines located within the OR&L ROW.

2.12.1.2 PUBLIC SERVICES

The Honolulu Police Department and Honolulu Fire Department provide emergency services to the island of Oahu. The Honolulu Police Department has divided the island into eight patrol districts with five district stations. The Kapolei district station is located within the project area (District 8). The Kapolei Police Station is the closest police station and is located 3.5 miles from the project site. Two of the Honolulu Fire Department districts are located within a 3-mile radius of the project site. The nearest fire station is the Fire Station 24 ‘Ewa Beach, which is located 1.8 miles east of the project area. The second closest fire station is Fire Station 43 East Kapolei, which is located 2 miles to the north.

The nearest hospital is The Queen's Medical Center, which is located 3.8 miles from the project area. The second closest hospital is Kahi Mohala, which is located approximately 4 miles from the project area.

There are several schools located in the vicinity of the project area, including:

- ‘Ewa Makai Middle School (approximately 1 mile);
- ‘Ewa Literacy School (approximately 2 miles);
- ‘Ewa Elementary School (approximately 2 miles);
- Lanakila Baptist School (approximately 2 miles);
- Friendship Christian Schools (approximately 2 miles);
- Keone’ula Elementary School (approximately 2 miles);
- ‘Ewa Beach Elementary School (approximately 3 miles);
- James Campbell High School (approximately 3 miles);
- Kaimiloa Elementary School (approximately 3 miles);
- Kapolei High School (approximately 3 miles);
- Kapolei Middle School (approximately 3 miles); and
- Rio School (approximately 3 miles).

Additionally, the following childcare facilities are located in the vicinity of the project area:

- Ohana Kinder Care (approximately 2 miles);
- Seagull School at Ewa Beach (approximately 2 miles);
- Kalaeloa Preschool - Kamaaina Kids (approximately 2 miles); and
- Blessings from Heaven (approximately 3 miles).

2.12.2 Potential Environmental Consequences and Mitigation Measures

2.12.2.1 CONSTRUCTION

Utilities

All existing underground and above ground utilities would be confirmed and identified during the design process. During construction, safety procedures would be followed to avoid impacts to existing utilities. New underground utilities associated with the Proposed Action, including the new 16-inch water main, will be designed to meet engineering needs and design standards, and they would be located a minimum of 3 feet below a finished surface per DPP requirements. Construction of the Proposed Action would not impact the HWRF since no work would occur near the facility.

Relocation, upgrade, or alteration of electrical and communication utilities related to this project may include work located in State of Hawai’i ROWs, such as the Roosevelt Avenue ROW. It is anticipated that such work is covered in the Comprehensive Exemption List for the State of Hawai’i Department of Transportation, and the procedures for using the Exemption List will be followed to meet HRS Chapter 343 requirements.

Public Services

Coordination with the Honolulu Police Department may be needed during construction activities. In instances when traffic control cannot be provided by the contractor(s) employees, an off-duty police officer would be scheduled and hired to provide those services.

Schools and childcare facilities are not anticipated to be impacted from construction activities of this project. Noise disturbance is not anticipated for the schools and childcare facilities due to the distance between the schools/childcare facilities and the project area. The closest school is the ‘Ewa Makai Middle School which is 1.3 miles southeast from the project area, and the closest childcare facility is 1.8 miles from the project area.

2.12.2.2 OPERATION

Utilities

During the operational phase, the BWS would continue to serve the site with potable water. The proposed 16-inch potable water main extension would create a pipeline loop system, thereby establishing sufficient redundancy in the WWTP potable water system to provide reliable water service and fire protection to the ENV Support Facilities. An increase in potable water consumption during the operational phase is not anticipated. Therefore, the project would have less than significant impacts on potable water resources.

Any required upgrades or alterations to the electrical system would be completed to accommodate the Proposed Action. Therefore, the impacts on the electrical power system are anticipated to be less than significant during the operational phase.

Impacts to the telecommunication system are anticipated to be less than significant during the operational phase.

Public Services

The Proposed Action would result in provision of sufficient access points to the future ENV Support Facilities to accommodate both operation and emergency access needs. No feature of the Proposed Action would result in the need for enhanced or altered police, fire, or EMS resources. Also, no population or employment increase is directly associated with the Proposed Action. Therefore, no increases in the demands for public services would be expected during the operational phase. Activities at the Proposed Action site would not affect the provision of utilities and public services to adjacent land uses, and therefore impacts would be less than significant.

2.13 SOCIOECONOMIC FACTORS

2.13.1 Affected Environment

2.13.1.1 POPULATION

The Honouliuli WWTP is located in ʻEwa census county division (CCD), a subdivision of Honolulu County recognized by the USCB. ʻEwa CCD encompasses a land area of approximately 165 square miles, representing about 27.4 percent of the county land area (USCB 2019).

The USCB conducts a census of the United States every 10 years, in years ending in zero, to count the population and housing units for the entire United States. The most recent completed decennial census was the 2010 Census, although the 2020 Census is underway. Table 2-9 presents population statistics for ʻEwa CCD. Population data were derived based on the 2000 Census and the 2010 Census.

Table 2-9. Population, 2000 and 2010, and Population Density, 2010

Geographic Area	Land area (square miles)	Population			2010 Density (persons per square mile)[1]
		2000	2010	Percent Change 2000-2010[1]	
ʻEwa CCD	164.7	272,328	323,118	18.7	1,962
Honolulu County	600.6	876,156	953,207	8.8	1,587
Hawaiʻi	6,422.4	1,211,537	1,360,301	12.3	212

Sources: USCB 2019; USCB 2020, 2000 Census and 2010 Census, DEC Summary File 1 Table P1, Total Population.

[1]Values were calculated based on USCB estimates.

The Honouliuli WWTP is located in a relatively densely populated and robust region. ʻEwa CCD population density is about 1,960 persons per square mile; substantially higher than the approximately 1,590 persons per square mile population density of Honolulu County and the 210 persons per square mile density of the State of Hawaiʻi. ʻEwa CCD encompasses a land area of approximately 165 square miles and a water area of about 77 square miles (USCB 2019).

Population growth from 2000 to 2010 was slower in Honolulu County than the statewide average, as it has been for several decades (SMS Research & Marketing Services, Inc. 2016). The population of ʻEwa CCD increased approximately 18.7 percent from 2000 to 2010; higher than the 12.3 percent increase in population of the State of Hawaiʻi during that time period and more than twice the 8.8 percent increase in population of Honolulu County. Between 2000 and 2010, ʻEwa CCD was the fastest growing among the seven CCDs in the county. Based on USCB American Community Survey five-year estimates for 2014-2018, the population of ʻEwa CCD totaled 344,887 (USCB 2020, 2014-2018 American Community Survey 5-Year Estimates, Table B01003, Total Population).

Table 2-10 provides population projections for Honolulu County and the State of Hawaiʻi prepared by the DBEDT (2018). Based on DBEDT population projections, the resident population of Honolulu County will be about 1,062,100 in 2035, an approximately 7.0 percent cumulative increase over the 19 years from 2016 or about 0.4 percent annually. For the State of Hawaiʻi, DBEDT estimates an approximately 11.5 percent cumulative increase between 2016 and 2035, or about a 0.6 percent annual increase. This rate of increase for the state is higher than the anticipated increase in Honolulu County.

Table 2-10. Population Projections, 2016-2045

Geographic Area	2016[1]	2025[2]	2035[2]	2045[2]
Honolulu County	992,605	1,032,705	1,062,059	1,073,796
Hawaiʻi	1,428,557	1,514,723	1,592,684	1,648,609

Source: DBEDT 2018.
[1]July 2016 estimates by USCB.
[2]DBEDT projections.

Based on the USCB American Community Survey five-year estimates for 2014-2018, the number of housing units in ʻEwa CCD and Honolulu County totaled about 103,300 and 348,500, as shown in Table 2-11. In the next ten years, Honolulu County is projected to need approximately 10,400 to 21,390 additional housing units (DBEDT 2019). Approximately 5.4 percent of the housing units in ʻEwa CCD were vacant. The vacancy rates for Honolulu County and Hawaiʻi were substantially higher, at 10.6 and 15.3 percent, respectively.

Table 2-11. Housing Units, 2014-2018

Geographic Area	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacant[1]
ʻEwa CCD	103,303	97,728	5,575	5.4
Honolulu County	348,497	311,525	36,972	10.6
Hawaiʻi	539,053	456,782	82,271	15.3

Source: USCB 2020, 2014-2018 American Community Survey 5-Year Estimates, Table DP04, Selected Housing Characteristic.

2.13.1.2 ECONOMY AND INCOME

Table 2-12 presents income and poverty estimates for ʻEwa CCD from the 2014-2018 American Community Survey 5-Year Estimates. Median household income in ʻEwa CCD was approximately 15.7 percent higher than in Honolulu County and 22.8 percent higher than in Hawaiʻi overall. Nonetheless, per capita income was lower in ʻEwa CCD than in the county and the state; about 4.9 percent and 1.7 percent lower, respectively. The poverty rate in ʻEwa CCD was lower than in both the county and the state.

Table 2-12. Income and Poverty, 2014-2018

Geographic Area	Income in 2018 Dollars		Persons in Poverty (percent)
	Median Household	Per Capita	
ʻEwa CCD	95,891	33,460	6.0
Honolulu County	82,906	35,202	8.7
Hawaiʻi	78,084	34,035	9.9

Sources: USCB 2020, 2014-2018 American Community Survey 5-Year Estimates, Table S1901, Income in the Past 12 Months; Table S1902, Mean Income in the Past 12 Months; Table S1701, Poverty Status in the Past 12 Months.

Unemployment rates in Honolulu County decreased by approximately 1.0 percent over the three years from 2015 to 2017, and then increased by 0.2 percent from 2017 to 2019, as shown in Table 2-13. The unemployment rates for the State of Hawaiʻi followed a similar trend over the five-year period, although the rates for the state consistently were higher than the rates for Honolulu County. For the County and the state, the unemployment rates reached lows in 2017 at about 2.3 percent and 2.4 percent, respectively; the lowest annual average county unemployment rate in Hawaiʻi and the lowest state rate in the United States.

Table 2-13. Annual Average Labor Force, 2015-2019

Geographic Area	2015	2016	2017	2018	2019
Honolulu County					
Labor Force	462,771	466,140	464,734	458,052	450,562
Employed	447,183	453,131	453,882	446,999	438,936
Unemployed	15,588	13,009	10,852	11,053	11,626
Unemployment Rate (%)	3.4	2.8	2.3	2.4	2.6
Hawai‘i					
Unemployment Rate (%)	3.6	3.0	2.4	2.5	2.7

Source: United States Bureau of Labor Statistics 2020, Labor Force Data by County, Annual Averages; Unemployment Rates for States, Annual Averages.

Based on estimates by the United States Bureau of Economic Analysis, total employment in Honolulu County was approximately 625,440 jobs in 2013 and 663,990 jobs five years later, in 2018, as shown in Table 2-14. The number of nonfarm jobs increased by approximately 38,310, or about 6.2 percent, between 2013 and 2018. The industries that provided the most jobs in the County in 2018 were accommodations and food services (10.6 percent), state and local government (10.4 percent), health care and social assistance (9.3 percent), retail trade (9.2 percent), and the military (7.8 percent). Construction provided approximately 33,360 jobs, contributing about 5.0 percent of total employment in Honolulu County.

Table 2-14. Honolulu County Civilian Employment by Industry, 2013-2018

Industry	2013	2018	Change[1]	
			Number	Percent
Farm employment	2,695	2,941	246	9.1
Nonfarm employment	622,745	661,053	38,308	6.2
Private nonfarm employment	470,144	509,187	39,043	8.3
Forestry, fishing, and related activities	1,072	1,051	-21	-2.0
Mining, quarrying, and oil and gas extraction	639	449	-190	-29.7
Utilities	2,759	2,784	25	0.9
Construction	28,924	33,356	4,432	15.3
Manufacturing	13,284	13,812	528	4.0
Wholesale trade	16,667	16,237	-430	-2.6
Retail trade	60,160	61,168	1,008	1.7
Transportation and warehousing	22,423	32,368	9,945	44.4

Industry	2013	2018	Change[1]	
			Number	Percent
Information	8,652	9,111	459	5.3
Finance and insurance	23,593	24,349	756	3.2
Real estate and rental and leasing	25,039	29,251	4,212	16.8
Professional, scientific, and technical services	34,891	35,767	876	2.5
Management of companies and enterprises	7,808	8,702	894	11.4
Administrative and support and waste management and remediation services	42,993	43,739	746	1.7
Educational services	16,012	16,228	216	1.3
Health care and social assistance	58,056	61,903	3,847	6.6
Arts, entertainment, and recreation	13,010	14,432	1,422	10.9
Accommodation and food services	61,935	70,215	8,280	13.4
Other services (except government and government enterprises)	32,227	34,265	2,038	6.3
Government and government enterprises	152,601	151,866	-735	-0.5
Federal civilian	31,107	31,078	-29	-0.1
Military	54,252	52,011	-2,241	-4.1
State and local	67,242	68,777	1,535	2.3
State government	54,927	56,352	1,425	2.6
Local government	12,315	12,425	110	0.9

Source: United States Bureau of Economic Analysis 2019, Regional Economic Accounts, Table CAEMP25N.
[1]Values were calculated based on Bureau of Economic Analysis estimates.

2.13.2 Potential Environmental Consequences and Mitigation Measures

2.13.2.1 Construction

The Proposed Action would construct driveway and road improvements, a new driveway, utility improvements including a new water main, and a new ERCC, and remove as needed unnecessary facilities from the existing convenience center site. The Proposed Action would have a beneficial short-term effect on the economy, due to a temporary increase in construction-related jobs, increasing employment opportunities for the construction workforce and increasing revenues for local businesses and government generated from construction activities and workers. However, any increase would be temporary, lasting only as long as the construction. Construction activities would not result in impacts to population or housing.

2.13.2.2 OPERATION

The Proposed Action would not provide new facilities that would result in an increase in resident or visitor populations, that in turn would affect demographics or the demand for housing, or alter the housing inventory. Once construction is completed, with operation of the Proposed Action, no increase in ENV personnel is anticipated, and no long-term changes in regional employment or income patterns are expected.

3.0 RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS

3.1 STATE OF HAWAIʻI PLANS AND POLICIES

The State of Hawaiʻi maintains a statewide planning system that includes State and County Land Use Plans, Policies and Controls to provide standards and guidelines for development. At the State level, this Draft EA assesses the Proposed Action's compliance and consistency with the Hawaiʻi State Plan (HSP), State Functional Plans, Hawaiʻi 2050 Sustainability Plan, Coastal Zone Management (CZM) Program, and State Land Use Classification. Appropriate Plans, Policies, and Controls to assist in evaluating the options to best meet future needs are referenced below.

3.1.1 Hawaiʻi Environmental Policy Act

The Hawaiʻi Environmental Policy Act (HEPA) outlines the process of environmental review for the state and counties. HEPA is codified in HRS Chapter 343 and implemented through HAR 11-200.1. The review ensures that environmental concerns are appropriately considered in decision-making. For the Proposed Action, an environmental review is required due to the following:

- Trigger Number 1: Use of state or county lands and/or funds.
- Trigger Number 4: Use within any historic site as designated in the National Register or Hawaiʻi Register.

The 2020 filing of the Draft EA and publication in the Environmental Review Program *The Environmental Notice* is the formal initiation of the HEPA process. This Draft EA was prepared in accordance with all applicable provisions from both HRS Chapter 343 and HAR 11-200.1.

3.1.2 Coastal Zone Management Act

Per the National Coastal Zone Management Act of 1972, Hawaiʻi's CZM Program outlines objectives and policies to guide the effective management, beneficial use, protection, and development of the coastal zone. The entire State of Hawaiʻi is located within the jurisdiction of the CZM Program. Hawai'i's CZM Program was established through HRS Chapter 205A. The objectives and policies in HRS Chapter 205A-2 were reviewed and it has been determined that the Proposed Action is not inconsistent with any of the objectives and policies of Chapter 205A-2.

Table 3-1 lists applicable objectives and policies of the HRS Chapter 205A-2, followed by a discussion of their consistency with the Proposed Action. Where an Objective and Policy section of HRS Chapter 205A-2 is not listed below, it has been analyzed and determined to be not applicable to the Proposed Action.

Table 3-1. Coastal Zone Management Act Chapter 205A, HRS

C=Consistent; N/C=Not Consistent; N/A=Not Applicable

Recreational Resources			
Objective: (A) Provide coastal recreational opportunities accessible to the public.			
Policies:	**C**	**N/C**	**N/A**
(A) Improve coordination and funding of coastal recreational planning and management.			X
(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:			
(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;	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: Recreational areas within an approximately 1-mile radius of the Proposed Action include public and private golf courses, parks, and the Leeward Bikeway, which is a planned bike/rail trail along the OR&L ROW, which is part of the overall traffic planning for the community. Construction activities to improve the existing railway crossings and to meet the requirements of Hawaiʻi Department of Transportation (HDOT) and HRS may result in temporary impacts to the Leeward Bikeway during construction. These temporary impacts are not anticipated to be significant.			

Historic Resources			
Objective: (A) Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.			
Policies:	**C**	**N/C**	**N/A**
(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		
Discussion: No native Hawaiian archaeological sites, historic properties, or cultural resources have been identified within or in the vicinity of the project area, and the archaeological sensitivity of the area is generally regarded as low. If human remains or subsurface archaeological resources are encountered during construction, work would immediately stop, and the State Historic Preservation Division (SHPD) would be contacted in accordance with State law and rules. Historic resources have been documented in Section 2.7 of this Draft EA, and it was determined that construction of the project would have a less than significant impact on the following: pre-contact historic and cultural resources, OR&L ROW, ‘Ewa Sugar Plantation Villages, and ‘Ewa Plain Battlefield; and no impact on The Hawaiian Railway Society ‘Ewa Railroad Yard, including Railway Rolling Stock, and Waialua Agricultural Company Engine No. 6. See Section 2.7 for additional details. Similarly, operations of the Proposed Action were assessed to determine potential impacts to historic resources. Measures to mitigation potential impacts to the OR&L ROW and ‘Ewa Plain Battlefield have been proposed. With these measures, it was determined that the Proposed Action would have a less than significant impact on the following: OR&L ROW, ‘Ewa Sugar Plantation Villages, ‘Ewa Plain Battlefield, and ‘Ewa Runway WWII Site; and no impact on pre-contact historic and cultural resources, the Hawaiian Railway Society ‘Ewa Railroad Yard, including Railway Rolling Stock, and Waialua Agricultural Company Engine No. 6. See Section 2.7 for additional details.			

Scenic and Open Space Resources			
Objective: (A) Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.			
Policies:	**C**	**N/C**	**N/A**
(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

Scenic and Open Space Resources			
Policies:	C	N/C	N/A
(D) Encourage those developments that are not coastal dependent to locate in inland areas.	X		
Discussion: The Proposed Action is located in a primarily industrial setting due to the existing treatment facilities. The WWTP and existing ʻEwa Refuse Convenience Center (ERCC) are visible from nearby golf courses, residential neighborhoods, and a rail trail/bike path within the old OR&L railway. The site is partially screened by vegetation and trees.			

Coastal Ecosystems			
Objective: (A) Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.			
Policies:	**C**	**N/C**	**N/A**
(A) Exercise an overall conservation ethic, and 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: Due to the lack of any coastal resources or ecosystems associated with the project site, these policies are generally inapplicable. However, the Storm Water Pollution Control Plan (SWPCP) will outline possible best management practices (BMPs) and mitigation measures to control point and nonpoint source water pollution both on- and off-site.			

Coastal Hazards			
Objective: (A) Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.			
Policies:	**C**	**N/C**	**N/A**
(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		

Coastal Hazards			
Policies:	C	N/C	N/A
(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 improvements associated with the Proposed Action will be designed and constructed in compliance with current building codes to mitigate natural disasters and flooding. including tsunami and earthquakes. The grading and filling on the site will be engineered to provide stability and allow proper drainage to prevent erosion. The threat from inland flooding is minimal. This area is located primarily in Flood Zone D – *Unstudied areas where flood hazards are undetermined, but flooding is possible*. During the construction phase, an updated SWPCP for the site will likely be required. This will provide BMPs and mitigation measures to prevent erosion and storm drain pollution on the site during construction as well as and impacts to water resources off the site during operation.			

Beach Protection			
Objective: (A) Protect beaches for public use and recreation.			
Policies:	**C**	**N/C**	**N/A**
(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
Discussion: These policies are not applicable as the Proposed Action is not located on or near the shoreline or shoreline setback areas.			

Based on the above discussion and as analyzed in the various chapters of this Draft EA, the ENV has determined that the Proposed Action is consistent, to the maximum extent practicable, with the objectives and policies of the State CZM Program outlined in HRS 205A-2 and ROH Section 25.

3.1.3 State Land Use District

The Hawaiʻi Land Use Commission administers the statewide zoning law under the authority granted by the State Land Use Law. The Land Use Commission regulates land use through land classification into one of four districts: Urban, Agriculture, Conservation, and Rural. The land classification system is intended to preserve, protect, and encourage development and preservation of lands for those uses to which they are best suited in the interest of public health and welfare of the people (Hawaiʻi Land Use Commission 2019). Each district has specific land use objectives and development constraints.

The project area extends over portions of land within two of the four land use districts (Figure 3-1):

- Urban District – areas with "city-like" concentrations of people, structures and services and vacant areas for future development. Jurisdiction lies with the respective county through ordinances and rules.
- Agricultural District – includes lands for cultivation of crops, aquaculture, raising livestock, wind energy facility, timber cultivation, agriculture support activities and land with significant potential for agriculture uses.

Urban districts are those lands that are now in urban use and include a sufficient reserve area for foreseeable urban growth (HRS Chapter 205-2). Activities or uses as provided by ordinances or regulations of the county within which the urban district is situated, as well as geothermal resource exploration and geothermal resources, are permissible in the urban district. Permissible uses are subject to conditions imposed by the commission. Uses that are permitted by the City are described in Land Use / Zoning (Section 3.2.4).

Per HRS 205-2, the greatest possible protection shall be given to those lands with a high capacity for intensive cultivation that comprise the agricultural districts. Permissible uses within the agricultural districts are identified in HRS Chapter 205-4.5. Per Chapter 205-4.5(7), the following are permissible:

- Public, private, and quasi-public utility lines and roadways, transformer stations, communications equipment buildings, solid waste transfer stations, major water storage tanks, and appurtenant small buildings such as booster pump stations, but not including offices or yards for equipment, material, vehicle storage, repair or maintenance, treatment plants, corporation yards, or other similar structures.

Accordingly, the proposed ENV Support Facilities access roads and utilities, including a short segment of the driveway to the relocated ERCC, would be permissible within the agricultural district. Solid waste transfer stations are permissible within the agricultural district. A Special Use Permit to allow expansion of the WWTP was approved by the State Land Use Commission in December 2017.

3.1.4 Hawaiʻi State Plan

The Hawaiʻi State Planning Act was adopted in 1978 and is codified under Hawaiʻi Revised Statutes (HRS) Chapter 226. As defined in HRS Chapter 226-1, the HSP guides the future long-range development of the State. The Plan outlines the goals, objectives, policies, and priorities for the State.

The purpose of the Hawaiʻi State Plan, as defined in HRS Chapter 226, is to:

- Serve as a guide for the future long-range development of the State;
- Identify the goals, objectives, policies, and priorities for the State;

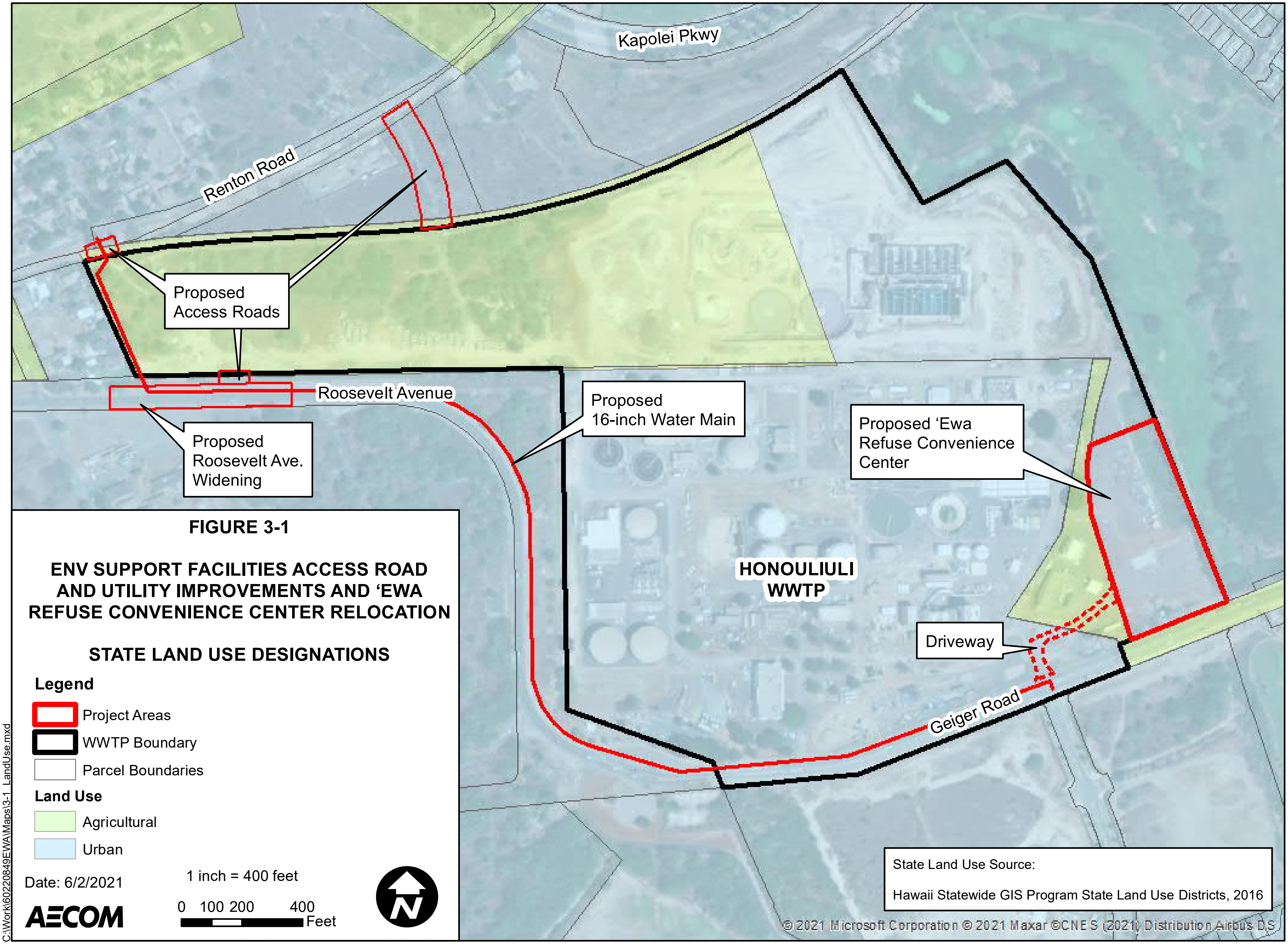

FIGURE 3-1

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND ‘EWA REFUSE CONVENIENCE CENTER RELOCATION

STATE LAND USE DESIGNATIONS

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- Provide a basis for determining priorities and allocating limited resources, such as public funds, services, human resources, land, energy, water, and other resources;
- Improve coordination of federal, state, and county plans, policies, programs, projects, and regulatory activities;
- Establish a system for plan formulation and program coordination to provide for an integration of all major state, and county activities (HRS Title 13, Chapter 226).

Table 3-2 lists applicable themes, goals, objectives, and policies of the HSP, followed by a discussion of their consistency with the Proposed Action. Where an Objective and Policy section of HRS Chapter 226-1 is not listed below, it has been analyzed and determined to be not applicable to the Proposed Action.

Table 3-2. State Plan, Chapter 226, HRS

C = Consistent; N/C = Not Consistent; N/A = Not Applicable.

HRS § 226-6: Objectives and policies for the economy – in general			
Objective: Planning for the State’s economy in general shall be directed toward achievement of the following objectives:	**C**	**N/C**	**N/A**
1. Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people, while at the same time stimulating the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.	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
Policies:	**C**	**N/C**	**N/A**
1. Promote and encourage entrepreneurship within Hawaii by residents and nonresidents of the State.			X
2. Expand Hawaii's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.			X
3. Promote Hawaii as an attractive market for environmentally and socially sound investment activities that benefit Hawaii's people.			X
4. Transform and maintain Hawaii 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 Hawaii.			X

HRS § 226-6: Objectives and policies for the economy – in general			
6. Seek broader outlets for new or expanded Hawaii business investments.			X
7. Expand existing markets and penetrate new markets for Hawaii's products and services.			X
Policies:	**C**	**N/C**	**N/A**
8. Assure that the basic economic needs of Hawaii'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 Hawaii'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 Hawaii.			X
13. Foster greater cooperation and coordination between the government and private sectors in developing Hawaii'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 Hawaii's workers.			X
16. Provide equal employment opportunities for all segments of Hawaii'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 Hawaii's economy, particularly with respect to emerging industries in science and technology.			X
19. Promote and protect intangible resources in Hawaii, 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 or innovative potential growth industries in particular.			X

HRS § 226-6: Objectives and policies for the economy – in general			
21. Foster a business climate in Hawaii--including attitudes, tax and regulatory policies, and financial and technical assistance programs--that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry.			X
Discussion: The Proposed Action will support future employment at the site and is consistent with objective to increase employment opportunities. The project will establish permanent roadway improvements for future traffic changes due to future operation of the ENV Support Facilities that will result in a significant increase in staffing levels at the site compared to existing conditions.			

HRS § 226-12: Objectives and policies for the physical environment scenic, natural beauty, and historic resources			
Objective: Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaiʻi's scenic assets, natural beauty, and multi-cultural/historical resources.			
Policies:	**C**	**N/C**	**N/A**
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 Hawaiʻi's ethnic and cultural heritage.	X		
5. Encourage the design of developments and activities that complement the natural beauty of the islands.			X
Discussion: The structures, equipment, and water main associated with the Proposed Action would be placed at an existing, industrially developed site. A vegetated buffer and tree planting of disturbed area would help screen the site from adjacent land uses, including two golf courses, residential neighborhoods located along the western and northwestern expansion property boundary, and the rail trail/bike path within the OR&L railway. The existing canopy will minimize visual impact during construction. The water main would be located underground along Roosevelt Avenue and Geiger Road. The Proposed Action is not anticipated to significantly alter the viewshed from the surrounding area. Proposed improvements to OR&L ROW crossings would result in the restoration and repair of the railroad tracks at these crossings and would salvage and rehabilitate the existing narrow-gauge railroad track. The design would be consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties and similar to other treatment of the same track at other crossing locations. To mitigate potential impacts to the OR&L ROW, trenchless installation methods may be used for underground utility crossings at the cell tower access driveway and open trench installation may be executed concurrently with crossing improvements at the Malio Street driveway. Measures have been proposed to mitigate for effects to the ʻEwa Field base fence, including removing only a small section of approximately 50 feet of fence, and installing new fencing to create the opening and gate using similar materials and specifications as			

the original base fence, with the exception of barbwire, which has been shown to pose an entanglement hazard to the endangered Hawaiian hoary bat.

HRS § 226-13: Objectives and policies for the physical environment land, air, and water quality			
Objective: Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:	**C**	**N/C**	**N/A**
1. Maintenance and pursuit of improved quality in Hawaiʻi's land, air, and water resources.	X		
2. Greater public awareness and appreciation of Hawaiʻi's environmental resources.			X
Policies:	**C**	**N/C**	**N/A**
1. Foster educational activities that promote 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

Discussion: The project will be located within the existing WWTP site, WWTP expansion property, and along existing roads. The project is located outside of the 100-year floodplain, tsunami evacuation zones, areas anticipated to be inundated by 3.2-feet or 6-feet of sea level rise, and areas at risk of coastal erosion. Erosion and sedimentation control during construction and stormwater management post-construction will ensure that the impact of increased impervious surfaces on water quality will be mitigated. All construction work would be in conformance with the air pollution control standards contained in HAR Title 11, Chapter 59 and Chapter 60.1 to minimize air quality emissions. Potential air quality impacts during construction will be mitigated by BMPs to control construction emissions and dust. The Proposed Action is consistent with this objective to pursue improved land, air, and water quality.

HRS § 226-14: Objective and policies for facility systems in general			
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.			
Policies:	**C**	**N/C**	**N/A**
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		
Discussion: The existing ERCC is proposed to be relocated to City-owned land. Following completion of the project, the existing ERCC site will be available for future wastewater operations. The proposed potable water main extension would create a pipeline loop system, thereby establishing sufficient redundancy in the WWTP potable water system to provide reliable water service to the ENV Support Facilities. ENV and the BWS will jointly fund the utility expansion.			

HRS § 226-15: Objectives and policies for facility systems solid and liquid wastes			
Objective: Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:	**C**	**N/C**	**N/A**
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
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 project includes relocation of, expansion of, and improved access to the ERCC, resulting in a more efficient facility with a larger footprint and additional collection areas for the growing community.			

HRS § 226-16: Objectives and policies for facility systems water				
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 adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities:		**C**	**N/C**	**N/A**
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 existing BWS water system would not provide reliable water service for the expansion of the facility. The proposed potable water main extension would create a pipeline loop system, thereby establishing sufficient redundancy in the WWTP potable water system to provide reliable water service and fire protection to the ENV Support Facilities. The water pipeline loop improvements also would provide increased system reliability to the other water customers in the nearby vicinity.				

HRS § 226-17: Objectives and policies for facility systems transportation				
Objective: Planning for the State's facility systems with regard to transportation shall be directed towards the achievement of the following objectives:		**C**	**N/C**	**N/A**
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
Policies:				
1.	Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter.			X

HRS § 226-17: Objectives and policies for facility systems transportation			
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 Hawaii'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.	X	
13.	Encourage diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency.		X

Discussion: The Proposed Action would enhance access to the ERCC. The proposed roadway improvements for the ENV Support Facilities would not conflict with the future implementation of the Tier 1 (high priority), Tier 2 (medium priority), or Tier 3 (lower priority) bicycle projects in the vicinity of the WWTP that are identified in the HDOT Bike Plan Hawaii Master Plan and the DTS Oʻahu Bike Plan 2019 Update. Inclusion of access ways in the Honouliuli WWTP perimeter fence to the Leeward Bikeway in the OR&L ROW and the bus stop in Renton Road will facilitate bicycle and pedestrian access for employees. Transit services in the vicinity of the WWTP are projected to remain at the current level of service or may increase. Congestion mitigation measures, including median left-turn lanes and road widening, are proposed to minimize the impact of traffic to the ENV Support Facilities on the surrounding transportation system and community.

The table above identifies all objectives and policies as outlined in HRS 226. Where a policy has been marked “N/A”, it has been determined that the policy is not applicable to the Proposed Action.

In addition to the various objectives and policies discussed above, HRS Chapter 226, Part III outlines various Priority Guidelines through which a project analysis should be filtered. For this Draft EA, an exercise was completed to analyze the Proposed Action through all the Priority Guidelines. Applicable guidelines are displayed in Table 3-3.

Table 3-3. Hawai‘i State Plan, Chapter 226, HRS – Priority Guidelines

C = Consistent; N/C = Not Consistent; N/A = Not Applicable.

HRS § 226-108: Sustainability				
Priority guidelines and principles to promote sustainability shall include:		**C**	**N/C**	**N/A**
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
Priority guidelines and principles to promote sustainability shall include:		**C**	**N/C**	**N/A**
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 ahupuaa system.			X
7.	Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawaii.	X		
Discussion: Relocation of and enhancements to the ERCC will continue to facilitate recycling and result in appropriate refuse disposal and diversion of white goods, tires, and other solid waste from landfills, reserving capacity for the future.				

HRS § 226-109: Climate change adaptation priority guidelines			
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:	**C**	**N/C**	**N/A**

HRS § 226-109: Climate change adaptation priority guidelines				
1.	Ensure that Hawai’i’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 Hawai’i’s climate and the impacts of climate change on the State.			X
4.	Consider native Hawaiian 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
	Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and build environments.			X
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:		**C**	**N/C**	**N/A**
6.	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		
7.	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
8.	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.			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.	X		

Discussion: The Proposed Action accommodates access to the future ENV Support Facilities, including the central laboratory, central maintenance and storage, administrative offices, and the central SCADA/telemetering/emergency management facilities. The Proposed Action also includes relocation of the ERCC to a location that is not vulnerable to the established planning thresholds of 3.2 and 6 feet of sea level rise, consistent with Directive 18-02. Potential climate change impacts including sea level rise, temperature, and wind have been identified during the planning phase of the project.

3.1.5 Functional Plans

State Functional Plans provide the framework for implementation of the Hawaiʻi State Plan by establishing policies and guidelines for specific activities. State Functional Plans are developed by the agency responsible for the functional area, with public input. Functional areas include agriculture, conservation lands, education, energy, higher education, health, historic preservation, housing, recreation, tourism, and transportation.

A review of the Functional Plans found two plans and related policies applicable to the Proposed Action. A discussion of the Proposed Action’s consistency with the Health Functional Plan and Transportation Functional Plan follows:

Health Functional Plan

Issue Area 5: Environmental Health and Protection

Policy: Air, Land and Water Quality Programs

Implementing Action: Develop and implement a comprehensive Solid and Hazardous Waste Management Program.

Discussion: The ENV has a comprehensive solid waste management regime in compliance with the above policy. ENV’s 2019 Integrated Solid Waste Management Plan Update outlines existing programs for diversion, reuse, and recycling of a range of materials. The ERCC is one of six convenience centers on Oahu where residents can dispose of household waste, including residential refuse, green waste auto batteries, tires, compressed gas cylinders, and appliances. The City has numerous ordinances, mandates, goals, enforcement tools, permits, and monitoring procedures as part of its comprehensive solid waste program. Many elements of the solid waste program are codified in ROH Chapter 9, *Collection and Disposal of Refuse.* The Proposed Action is consistent with applicable provisions of the Health Functional Plan.

Transportation Functional Plan

Underlying Strategies to address congestion, economic development, funding, and economic development includes the following relevant strategy:

- Construct facility and infrastructure improvements in support of Hawaiʻi’s thriving economy and growing population base.

Discussion: The Proposed Action includes improvements to the ENV Support Facilities access roads and utilities that are required for the planned development of the WWTP expansion land by the City. The increase in activity on the site resulting from the new ENV Support Facilities will include a significant volume of daily commuter traffic. The driveways are needed for access to the site. The driveways will mitigate traffic congestion and bottlenecks that would otherwise occur and minimize congestion on Geiger Road and Fort Weaver Road. Pedestrian and bicycle access will be provided at the driveways to meet the need for pedestrian and bicycle access between the ENV Support Facilities and to the new Leeward Bikeway being constructed by the State in the OR&L ROW, as well as to Renton Road and the surrounding communities.

3.2 CITY AND COUNTY OF HONOLULU PLANS AND POLICIES

3.2.1 General Plan

The General Plan for the City and County of Honolulu was adopted in 1977 with subsequent amendments leading to the adoption of the 2002 amended General Plan. The General Plan is "a comprehensive statement of objectives and policies which sets forth the long-range aspirations of O‘ahu's residents and the strategies to achieve them" (CCH DPP 2002). The General Plan is a two-fold document that includes:

1) a statement of the long-rage social, economic, environmental, and design objectives for the general welfare and prosperity of the people of O‘ahu, and

2) a statement of board policies which facilitate the attainment of the objectives of the General Plan.

The Plan contains eleven subject areas:

I. Population

II. Economic Activity

III. The Natural Environment

IV. Housing

V. Transportation and Utilities

VI. Energy

VII. Physical Development and Urban Design

VIII. Public Safety

IX. Health and Education

X. Culture and Recreation

XI. Government Operations and Fiscal Management

Of these, the subject areas that are applicable to the Proposed Action are:

- Section III. The Natural Environment;
- Section V: Transportation and Utilities;
- Section VII: Physical Development and Urban Design;
- Section X. Culture and Recreation; and
- Section XI. Government Operations and Fiscal Management.

Below is a discussion of how the Proposed Action would be consistent with applicable themes, goals, objectives, and policies of the General Plan.

3.2.1.1 SECTION III. NATURAL ENVIRONMENT

Objective A: To protect and preserve the natural environment.

Policy 6: Design surface drainage and flood-control systems in a manner which will help preserve their natural settings.

Discussion: Construction and post-construction BMPs would be implemented to mitigate potential impacts of the project. This includes erosion and sedimentation measures and installation of stormwater infrastructure on the northern side of the project location where access roads are proposed, and stormwater infrastructure is not currently in place. Construction activities will be conducted in compliance with the CWA 402 NPDES Construction Stormwater Permit issued by the DOH Clean Water Branch.

3.2.1.2 SECTION V. TRANSPORTATION AND UTILITIES

Objective B: To meet the needs of the people of O‘ahu for an adequate supply of water and for environmentally sound systems of waste disposal.

Policy 5: Provide safe, efficient, and environmentally sensitive waste collection and waste disposal services.

Policy 6: Support programs to recover resources from solid waste and recycle wastewater.

Discussion: The Proposed Action would provide improved efficiency of recycling and waste management. The Proposed Action would also provide improved access to the ERCC and mitigate the anticipated increase in congestion and bottlenecks on Geiger Road and Fort Weaver Road associated with the planned development of the WWTP expansion land.

Objective C: To maintain a high level of service for all utilities.

Policy 3: Plan for the timely and orderly expansion of utility systems.

Discussion: The Proposed Action includes improvements to the ENV Support Facilities access roads and utilities that are required for the planned development of the WWTP expansion land by the City. The proposed water main would provide reliable water service that is necessary for the expansion of ENV Support Facilities. The BWS recognized that the existing potable water system does not have sufficient redundancy to provide reliable water service when responding to the draft Honouliuli WWTP Secondary Treatment and Facilities Environmental Impact Statement in 2016.

Objective D: To maintain transportation and utility systems which will help O‘ahu continue to be a desirable place to live and visit.

Policy 4: Evaluate the social, economic, and environmental impact of additions to the transportation and utility systems before they are constructed.

Discussion: The potential social, economic, and environmental impact of the proposed access roads and water main that are part of the Proposed Action have been evaluated in this Draft EA. As noted in Section 1.4.1, in its July 19, 2016 letter providing comments on the Draft Environmental Impact Statement (EIS) for the Honouliuli WWTP Secondary Treatment and Support Facilities, the BWS recommended that a 16-inch potable water pipeline be extended from Geiger Road and Roosevelt Avenue to the Renton Road/Kapolei Parkway intersection to create a pipeline loop system, and that the pipeline transit through Malio Street to connect to the existing 8-inch main at Renton Road. However, a pipeline alignment that crosses the OR&L ROW at Malio Street would conflict with programmed ENV design-build construction and pass through an area of contaminated soil on the WWTP expansion property. Therefore, this pipeline alignment was eliminated from further consideration in favor of the proposed crossing of the OR&L ROW at the location of the cell tower access driveway.

3.2.1.3 Section 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.

Policy 8: Locate community facilities on sites that will be convenient to the people they are intended to serve.

Discussion: The Proposed Action would relocate the ERCC to a nearby site that will provide more convenient access for residents. Transportation improvements associated with the Proposed Action will also improve convenience.

3.2.1.4 Section X. Culture and Recreation

Objective B: To protect Oahu’s cultural, historic, architectural, and archaeological resources.

Policy 1: Encourage the restoration and preservation of early Hawaiian structures, artifacts, and landmarks.

Discussion: Cultural, historic, and archaeological resources have been examined in this EA. The project would require creating an opening and installing a gate in the historic ‘Ewa Field base fence on the north side of Roosevelt Avenue. The existing fence and fence alignment would be retained and protected with the exception of a 50-foot section, which would be removed. New fencing to create the opening and gate would use similar specifications as the original base fence, with the exception that no barbed wire will be installed. The proposed improvements to roadways and installation of utilities under the cell tower driveway and Malio Street would result in temporary construction impacts to the OR&L ROW. The proposed project would restore, repair, and sustain the railroad tracks at these crossing locations. The locations of the proposed access road and driveway improvements were selected to utilize an existing roadway (Malio Street) and an existing driveway (providing access to a cell tower) to avoid creating new crossings of the OR&L ROW. The footprint of the crossing improvements will be minimalized as much as possible, considering engineering and safety standards. To mitigate potential impacts to the OR&L ROW, trenchless installation methods may be used for underground utility crossings at the cell tower access driveway and open trench installation may be executed concurrently with crossing improvements at the Malio Street driveway. The crossing design would salvage (depending on condition) and rehabilitate the existing narrow-gauge railroad track. Any track hardware and ties that cannot be reused will be offered to the Hawaiian Railway Society for their use. The proposed crossing improvements would not limit future use of this section of track by the Hawaiian Railway Society or others.

3.2.1.5 SECTION 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.

Policy 1: Maintain City and County government services at the level necessary to be effective.

Discussion: The Proposed Action is necessary as part of the continued operation of an effective solid waste and wastewater management systems that serves the needs of Oʻahu. The new relocated ERCC will provide improved access for residents dropping off refuse. The driveway and road expansions will reduce congestion and bottlenecks associated with the ENV Support Facilities and expansion of the WWTP. The addition of the water main will provide sufficient potable water for the facility expansion and for fire protection. The Proposed Action will enable ENV to continue to provide effective wastewater management.

3.2.2 ʻEwa Development Plan

The ʻEwa Revised Development Plan (DP) was adopted in July 2013 and amended on December 23, 2020. This plan is one of the eight community-oriented plans that guide Oʻahu's population growth and land use development over a 20+ year time span. The development plan for ʻEwa is directed toward considerable growth and significant progress to provide a Secondary Urban Center for Oʻahu, centered in the Kapolei area, and to guide development decisions and actions needed to support the growth.

ʻEwa serves as the second urban center for Oʻahu, provides a range of master planned residential areas to relieve development pressures on Oʻahu's rural areas and housing options not prevalent in the Primary Urban Center, and protects and promotes diversified agriculture on prime agricultural lands. The Plan's vision to 2035 includes significant growth.

Section 4.1 Transportation Systems includes the following General Policies (Section 4.6.1):

- To support ‘Ewa's role as the site for the Secondary Urban Center and a major growth area for new residential and employment development, its transportation system should:
  - Provide adequate access between residences and jobs, shopping, and recreation centers in ‘Ewa as development occurs;
  - Provide improved access to and from adjacent areas, especially Central O‘ahu;
  - Provide adequate capacity for major peak-hour commuting to work in the Primary Urban Center.
  - Design and develop the roadway system to increase connections between parallel major collectors and arterials - e.g., between Kualaka‘i Parkway and Fort Weaver Road - rather than relying primarily upon loop roads to feed the major roadways. Planning for East Kapolei and for Kalaeloa are important opportunities for creating such connections.
  - Design circulation systems to facilitate bicycle and pedestrian travel, to increase transit use, and to reduce dependence on automobile travel.
  - Provide circulation systems with separated pedestrian and bicycle paths and convenient routes for public transit service.
  - Develop major bike paths along the OR&L right-of-way, Kapolei Parkway, the Kualaka‘i Parkway, and Fort Weaver Road.
  - Incorporate bikeways into other major roadways.

Discussion: Relocation of the ERCC is expected to result in traffic improvements to Geiger Road. Improvement of the existing gravel driveways and establishing a new driveway is important for the planned development of the WWTP expansion land by the City. The driveways are needed for access to the site, for both normal and emergency access purposes, and will mitigate traffic congestion and bottlenecks that would otherwise occur. This access will allow traffic to flow directly from Kapolei Parkway and Kualaka’i Parkway to the WWTP expansion property, helping to minimize addition of congestion to Geiger Road and Fort Weaver Road. A new access driveway from the WWTP expansion property to Roosevelt Avenue is planned for purposes of improved access and mitigation of traffic bottlenecks that would otherwise occur. This access is important for commuters coming from Geiger Road and Roosevelt Avenue.

Pedestrian and bicycle access will be provided at these two rail crossing driveways to meet the need for pedestrian and bicycle access between the ENV facilities and the new Leeward Bikeway being constructed by the State in the OR&L ROW, as well as to Renton Road and the surrounding communities. The Leeward Bikeway is a key part of the overall traffic planning for the community, as well as fulfillment of a primary purpose for the HDOT OR&L ROW, and the proposed connection to the new ENV facilities at the two existing driveways will be a beneficial addition to both the City’s and the State’s projects.

Section 4.2 of the ‘Ewa DP addresses water allocation and system development. The section includes the following applicable policies:

Water Use Efficiency and Conservation

- Development and Allocation of Potable and Nonpotable Water – The State Commission on Water Resource Management has authority in all matters regarding administration of the State Water Code. By City Charter, the BWS has the authority to manage, control, and operate the water systems of the City, and therefore should coordinate the development and allocation of potable and nonpotable water sources and systems intended for municipal use on O‘ahu as guided by the City’s land use plans and the OWMP [O‘ahu Water Management Plan].

Discussion: The Proposed Action includes installation of a 16-inch water main in order to provide reliable water service. The need to extend the BWS waterline from Geiger Road to Renton Road was identified by the BWS following review of the draft Honouliuli WWTP Secondary Treatment and Facilities Environmental Impact Statement in 2016 and subsequently in 2017 and 2020. The inclusion of the water main as part of the Proposed Action was determined through coordination between ENV and BWS.

Section 4.3 of the ‘Ewa DP addresses wastewater treatment public facilities and infrastructure policies and guidelines. The section outlines the following applicable policies:

- Require all wastewater produced by new developments in ‘Ewa to be connected to a regional or municipal sewer service system.
- Locate wastewater treatment plants in areas shown as planned for industrial use and away from residential areas shown on the Urban Land Use Map in Appendix A. Existing treatment plants are shown on the Urban Land Use Map and the Public Facilities Map in Appendix A.
- Use a City review and approval process, which provides adequate public notice and input, complete technical analysis of the project by the Department of Planning and Permitting, and approval by the City Council, for any major new private wastewater treatment plant. Other system elements, such as pump stations and mains, should not require such comprehensive review and policy approval (DPP 2013).

Discussion: The Proposed Action would provide access to the future ENV Support Facilities for the Honouliuli WWTP and improved access to the facility. The project supports improved wastewater treatment in compliance with the 2010 Consent Decree. These improvements include increased capacity and connection of currently unsewered areas. Thus, the Proposed action adheres to the wastewater treatment policies and guidelines for ‘Ewa.

Section 4.5 addresses solid waste handling and disposal. Resolution 04-348, adopted in December 2004, included the following measures:

- Required the City to develop alternative technologies and extract the maximum recyclable materials, energy and alternative products to minimize the waste placed in landfills in order to effectively eliminate, to the extent possible, the need for a landfill by 2008.

Discussion: The Proposed Action includes expansion and relocation of the existing ERCC to better serve the community's solid waste disposal and recycling needs.

Chapter 5 Phasing of Development

Section 5.1.2 of ʻEwa DP addresses phasing public facility investment priorities. In addition to specific, targeted residential and non-residential development that would be supported by the Proposed Action, significant capital improvement projects of highest priority include:

- Expanded wastewater treatment plant capacity, and recycling of non-potable water reclaimed from wastewater effluent at the Honouliuli WWTP (DPP 2013).

Discussion:

The Proposed Action does not directly involve wastewater recycling; however, a portion of the effluent from the Honouliuli WWTP is reclaimed to provide R-1 water, as defined in HAR Title 11, Chapter 62, and reverse osmosis water for irrigation and industrial uses.

3.2.3 Special Management Area (SMA)

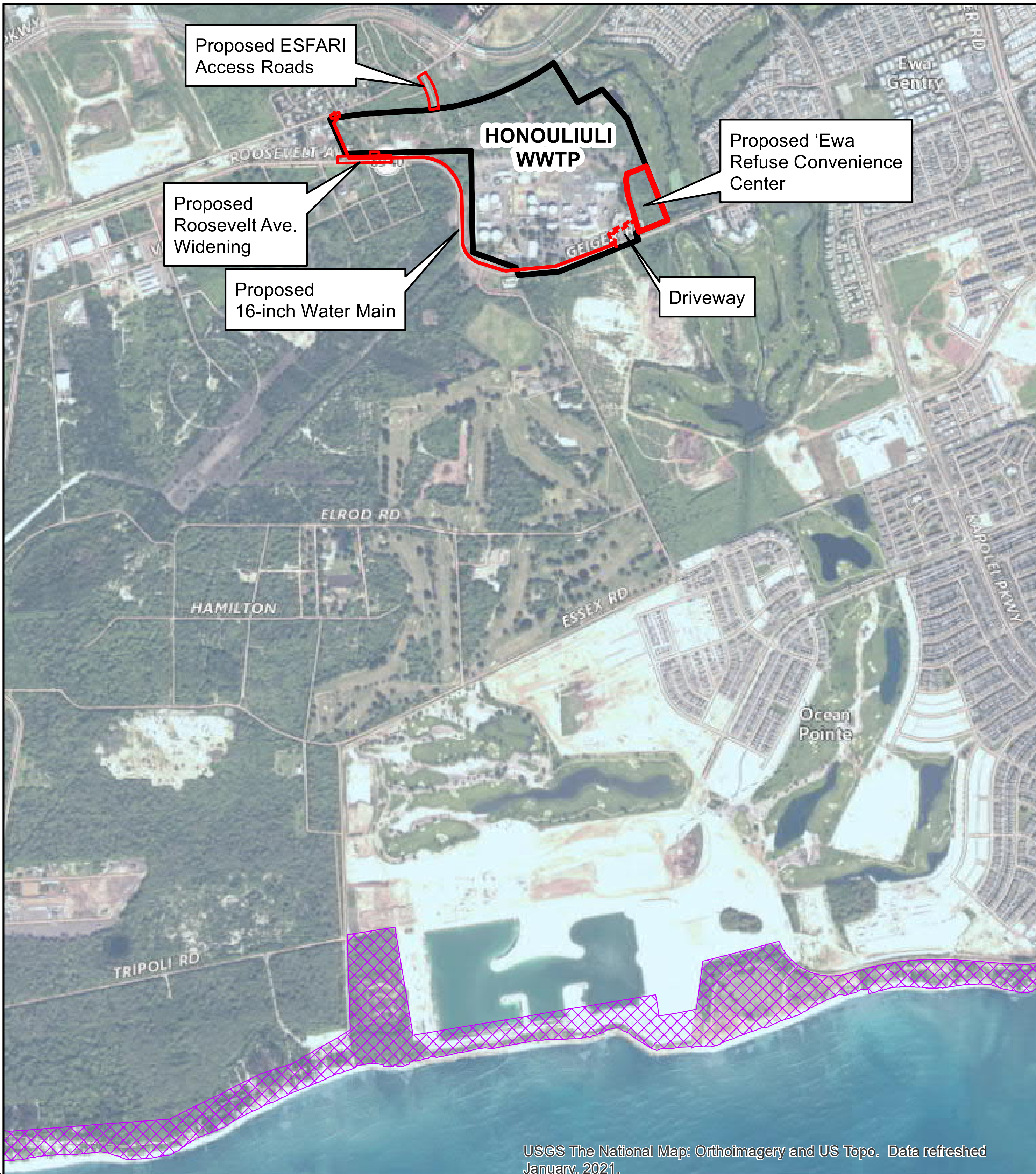
Per the Federal Coastal Zone Management Act of 1972, Hawaiʻi's CZM Program outlines objectives and policies to guide the use of the State's coastal resources. The entire State of Hawaiʻi is included in the State's CZM Program Area.

As codified in HRS Chapter 205A, each county in the State of Hawaiʻi provides its own laws and regulations to implement the CZM Program within its respective jurisdiction through the Special Management Area (SMA) process. The area for the Proposed Action does not lie within the County-delineated SMA as designated in HRS Chapter 205A (Figure 3-2).

3.2.4 City and County of Honolulu Land Use Ordinance

Land uses within the City jurisdiction are regulated under ROH Chapter 21, Land Use Ordinance (LUO). The purpose and intent of the LUO is:

- To regulate land use in a manner that will encourage orderly development in accordance with adopted land use policies, including the Oʻahu general plan and development plans, and to promote and protect the public health, safety and welfare (Section 21-1.20).



Legend

Special Management Areas
WWTP Boundary
Project Areas

1 inch = 1,500 feet

0 375 750 1,500 Feet

AECOM

FIGURE 3-2

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND 'EWA REFUSE CONVENIENCE CENTER RELOCATION

SPECIAL MANAGEMENT AREAS

Date: 6/2/2021

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The Proposed Action is located within two zoning districts: AG-1 Restricted Agriculture District, and I-2 Intensive Industrial District (Figure 3-3).

The purpose and intent of the AG-1 zone as defined in the LUO is:

- To maintain a strong agricultural economic base, to prevent unnecessary conflicts among incompatible uses, to minimize the cost of providing public improvements and services and to manage the rate and location of physical development consistent with the city's adopted land use policies. To promote the viability and economic feasibility of an existing agricultural operation, accessory agribusiness activities may be permitted on the same site as an adjunct to agricultural uses. These accessory activities must be compatible with the on-site agricultural operation and surrounding land uses. The intent of the AG-1 restricted agricultural district is to conserve and protect important agricultural lands for the performance of agricultural functions by permitting only those uses which perpetuate the retention of these lands in the production of food, feed, forage, fiber crops and horticultural plants. Only accessory agribusiness activities which meet the above intent shall be permitted in this district.

According to LUO Table 21-3, *public uses and structures* are considered a permitted use in AG-1. Public uses and structures are defined in the LUO as uses conducted by or structures owned or managed by the federal government, the State of Hawai‘i or the City to fulfill a governmental function, activity or service for public benefit. *Utility installations, Type A* are considered a permitted use in AG-1 subject to standards in Article 5 of the LUO. *Utility installations, Type A* include water distribution with a minor impact on adjacent land uses. LUO Section 21-5.650 contains standards for utility installations; these standards are not applicable to the proposed water main.

The Proposed Action is consistent with the permitted *public uses and structures* and *utility installations, Type A*. A waiver from the height restrictions of the A-1 zone has been requested and approved. Any additional waivers from the standards of the AG-1 and I-2 zones will be identified during the design phase.

Within the AG-1 District, the development standards presented in Table 3-4 apply.

The purpose and intent of the industrial districts, including I-2, is:

- To recognize the importance of industrial uses to the welfare of city residents by providing areas for industrial uses without undue competition from other uses and ensuring compatibility with nonindustrial areas. Typical uses include manufacturing, refining, sorting, processing and storage of materials and products. Limited business activities that directly support the industrial uses or those employed by industries therein are permitted in these districts.

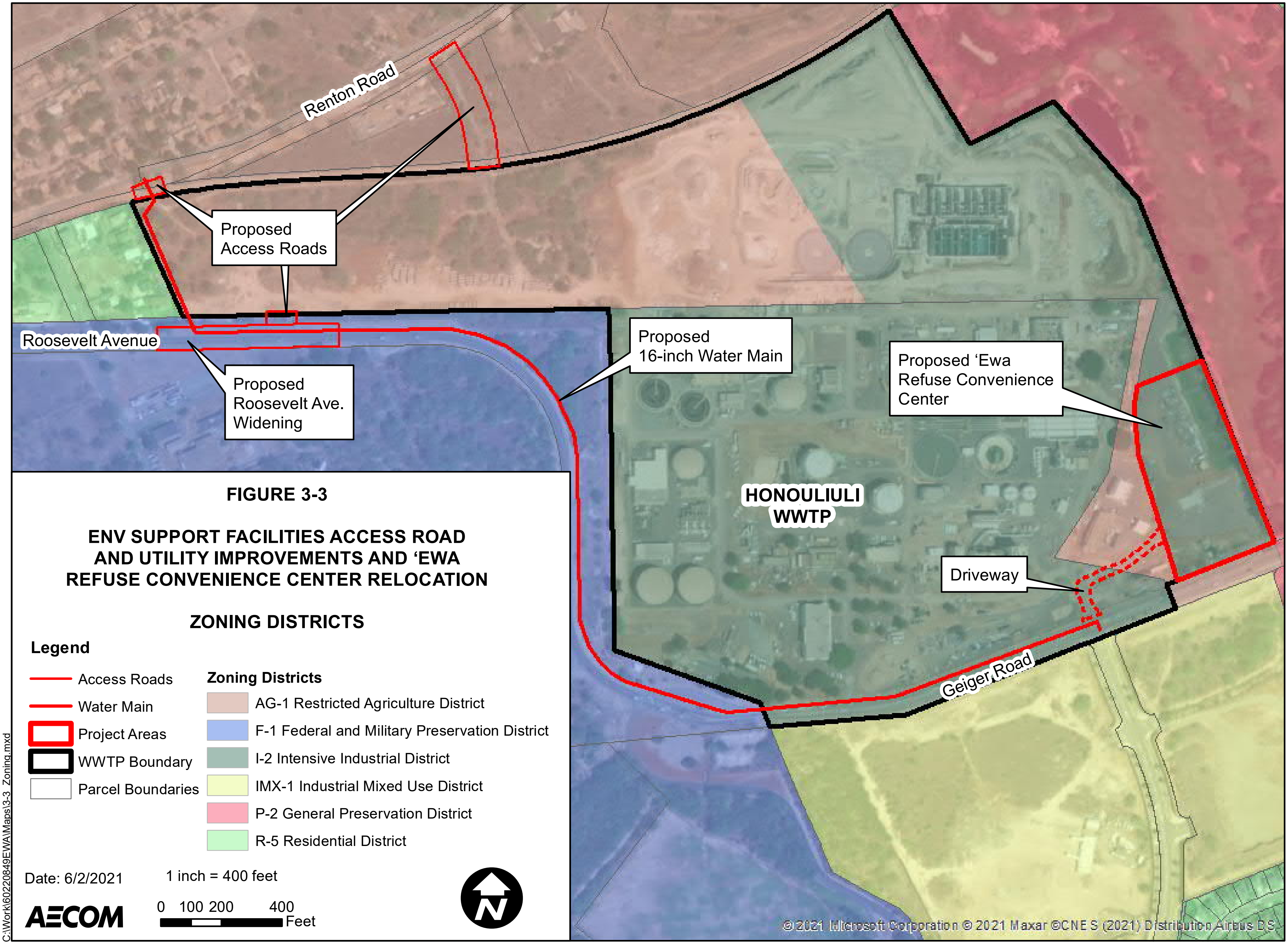

FIGURE 3-3

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND 'EWA REFUSE CONVENIENCE CENTER RELOCATION

ZONING DISTRICTS

Legend

- Access Roads
- Water Main
- Project Areas
- WWTP Boundary
- Parcel Boundaries

Zoning Districts

- AG-1 Restricted Agriculture District
- F-1 Federal and Military Preservation District
- I-2 Intensive Industrial District
- IMX-1 Industrial Mixed Use District
- P-2 General Preservation District
- R-5 Residential District

Date: 6/2/2021

1 inch = 400 feet

0 100 200 400 Feet

AECOM

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Table 3-4. AG-1 District Development Standards

Description	AG-1 Zoning Requirement
Minimum lot area (acres)	5
Minimum lot width and depth (feet)	150
Front yard setback (feet)	15
Side and rear yard setback (feet)	10
Maximum building area (percent of parcel)	10[1]
Maximum height (feet)	15-25[2]
Height Setbacks	See note 3

Note:
1. For nonagricultural structures.
2. The maximum height may be increased from 15 to 25 feet if height setbacks are provided.
3. Any portion of a structure exceeding 15 feet must be set back from every front, side, and rear buildable area boundary line one foot for each two feet of additional height above 15 feet.
4. A waiver of the strict application of the development or design standards of this chapter may be granted by the director for the following: (1) Public or public/private uses and structure, including utility installations (Source: ROH Chapter 21-3.1).

The intent of the I-2 intensive industrial district is to:

- Set aside areas for the full range of industrial uses necessary to support the city. It is intended for areas with necessary supporting public infrastructure, near major transportation systems and with other locational characteristics necessary to support industrial centers. It shall be located in areas away from residential communities where certain heavy industrial uses would be allowed.

According to LUO Table 21-3, *public uses and structures* are considered a permitted use in I-2. Public uses and structures are defined in the LUO as uses conducted by or structures owned or managed by the federal government, the State of Hawaiʻi or the City to fulfill a governmental function, activity or service for public benefit. *Utility installations, Type A* are permitted in I-2 subject to the standards in Article 5. The standards of Article 5 are not applicable to installation of the water main. The Proposed Action is consistent with these uses.

Table 3-5 lists information from ROH Table 21-3.1 outlining the development standards applicable to new development in the I-2 Intensive Industrial District and the Proposed Action's compliance with the development standards in the I-2 zone. ROH Section 21-2.130 allows a waiver from development standards for public and public/private uses and structures.

3.3 COMPLIANCE WITH PREVIOUSLY ISSUED LAND USE PERMITS

The project will comply with previously issued land use permits:

- The ERCC will be relocated to a new tax map parcel (TMK: 9-1-069-003). Although a portion of this parcel is undergoing SLUDBA to reclassify that portion from Agriculture to Urban district, the portion where the ERCC will be located is already classified as Urban.

Table 3-5. I-2 District Development Standards

Description	I-2 Zoning Requirement
Minimum lot area (sq ft)	7,500
Minimum lot width and depth (feet)	60
Front yard setback (feet)[1]	5
Side and rear yard setback (feet)	0[2]
Maximum building area (percent of parcel)	80[3]
Maximum height (feet)	Per zoning map

Note:

1. Except for necessary access drives and walkways, all front yards shall be landscaped. Where a zoning lot adjoins a residential, apartment, apartment mixed use or resort district and forms a continuous front yard, the lot or the first 100 feet of the lot (whichever is less) shall conform to the front yard requirements for the dwelling use of the adjoining district (see Figure 21-3.6).
2. Where the side or rear property line of a zoning lot adjoins the side or rear yard of a zoning lot in a residential, apartment, apartment mixed use or resort district, there shall be a side or rear yard which conforms to the side or rear yard requirements for dwelling use of the adjoining district. In the I-3 district only, this yard shall be not less than 15 feet. In addition, see Section 21-4.70-1 for landscaping and buffering requirements.
3. The building area may be increased to include all of the buildable area of the zoning lot provided all structures beyond the designated 80 percent building area shall: a) Provide a minimum clear interior height of 18 feet; b) Contain no interior walls, except for those between a permitted use and a special accessory office; and c) Provide a minimum distance of 40 feet between interior columns and other structural features.
4. A waiver of the strict application of the development or design standards of this chapter may be granted by the director for the following: (1) Public or public/private uses and structure, including utility installations (Source: ROH Chapter 21-3.1).

- A Special Use Permit was approved by the State Land Use Commission on December 8, 2017 to allow the expansion of the Honouliuli Wastewater Treatment Plant for the development of full secondary treatment and support facilities within the State Land Use Agricultural District, subject to several conditions. ENV submitted Annual Reports for 2019 and 2020 that document progress with complying with the conditions of the approval.
- A Conditional Use Permit for the project was approved by the City DPP August 23, 2019 to allow the joint development of three zoning lots, subject to several conditions.
- A Zoning Waiver for LUO Section 21-3.50-4 and Table 21-3.1 to allow construction of seven non-process support facilities that exceed the maximum

allowable height limit in the AG-1 district was approved by the City DPP on April 12, 2019, subject to several conditions.

- The approved Zoning Waiver is not applicable to relocation of the ERCC, as the convenience center will be in a portion of tax map parcel TMK: 9-1-069-003 that is zoned I-2 district. The heights of proposed facilities within the relocated ERCC will not exceed the maximum allowable height limit in the I-2 district of 60 feet (DPP 2021).
- The proposed access roads are located on parcels that are not subject to the SLUDBA or the change in County zoning requirements.
- The proposed potable water main is located both on parcels that are not included in the SLUDBA and on the extreme western portion of tax map parcel TMK: 9-1-069-003, which is within the SLUDBA petition area. However, in the AG-1 district, as well as the I-2 district, Type A utility installations (installations with minor impact on adjacent land uses, such as underground water distribution lines) are permitted uses subject to standards in Article 5 of City ROH Chapter 21 Land Use Ordinance.

3.4 PERMITS AND APPROVALS REQUIRED FOR THE PROPOSED ACTION

Table 3-6 outlines the required permits to implement the Proposed Action.

Table 3-6. Required Permits and Approvals

Permit/Approval/Consultation	Agency
Federal	
Section 106, National Historic Preservation Act consultation	State Historic Preservation Officer
Section 4(f), Department of Transportation Act	Federal Highway Administration
Use and Occupancy Agreement	Federal Highway Administration (authority delegated to State of Hawai‘i Department of Transportation)
State	
HRS Chapter 343 Compliance	State of Hawai‘i Department of Health
NPDES General Permits	State of Hawai‘i Department of Health
HRS Chapter 6E-8 Historic Preservation Review	State Historic Preservation Division
Solid Waste Management Permit (Update-Amendment)	State of Hawai‘i Department of Health
Community Noise Permit	State of Hawai‘i Department of Health
Use and Occupancy Agreement	State of Hawai‘i Department of Transportation
City and County of Honolulu	
Engineering and Construction Permits (building, grading, trenching)	Department of Planning and Permitting
Construction Permits (building, trenching)	Board of Water Supply
Construction Plan Approval	Department of Planning and Permitting
Waiver of Height Restrictions from AG District (additional waivers may be identified during design phase)	Department of Planning and Permitting

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4.0 DIRECT, INDIRECT, AND CUMULATIVE IMPACTS AND MITIGATION MEASURES

4.1 DIRECT AND INDIRECT IMPACTS

“Primary impact”, “primary effect”, “direct impact”, or “direct effect” means effects caused by the action and occur at the same time and place. For direct impacts to occur, a resource must be present in the particular project site. “Secondary impact”, “secondary effect”, “indirect impact”, or “indirect effect” means effects caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect impacts may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems (HAR §11-200.1-2).

The Proposed Action is not a population generator. The Proposed Action would not provide new facilities that would result in an increase in resident or visitor populations, and no long-term changes in regional employment or income patterns are expected. Operation of the ERCC, in the proposed new location, would not be altered relative to the procedures currently in place, and it is not anticipated that the mix or quantity of refuse handled at the site would change. The Proposed Action is not anticipated to result in adverse secondary impacts, such as population changes or effects on public facilities.

Relocating the ERCC would accommodate growing refuse needs and improve access to and functioning of the convenience center. Improved access to the ERCC would alleviate traffic congestion and backups along Geiger Road, potentially reducing mobile source greenhouse gas (GHG) emissions and emissions of carbon monoxide (CO), nitrogen oxides, and volatile organic compounds. These air quality improvements potentially would be augmented by the Proposed Action’s provision of pedestrian and cyclist access ways that would link to existing and future bike routes, as these linkages would encourage non-motorized transportation by workers at the WWTP.

Improving the current conditions of railroad crossings, including the addition of safety markings, signals and/or gates, as required, would benefit public safety. The proposed 16-inch potable water main extension would create a pipeline loop system, thereby establishing sufficient redundancy in the WWTP potable water system to provide reliable water service and fire protection to the ENV Support Facilities. Construction under the Proposed Action would have a beneficial short-term effect on the economy, due to a temporary increase in construction-related jobs, increasing employment opportunities for the construction workforce and increasing revenues for local businesses and government generated from construction activities and workers.

4.2 CUMULATIVE IMPACTS

As defined in HAR §11-200.1-2, “cumulative impacts” are the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The cumulative impacts of implementing the Proposed Action, along with past and reasonably foreseeable future projects proposed, were assessed based on available information.

4.2.1 Current and Proposed Use

Renton Road and Roosevelt Avenue are existing, two-lane, paved roads. Two of the proposed three accesses are an existing, unimproved gravel driveway from Renton Road to a telecommunications facility, and the existing, unimproved gravel Malio Street and access driveway connecting Renton Road to the ENV Support Facilities property. Both cross the OR&L railway on the Hawaiʻi Department of Transportation (HDOT) right-of-way. The proposed water main would cross the OR&L ROW at the location of the existing cell tower access driveway. The third access, a new driveway, would traverse directly between Roosevelt Avenue and the ENV Support Facilities property.

The existing ERCC would be relocated to an available open area within the Honouliuli WWTP property. The relocated convenience center would be accessed via an existing driveway on Geiger Road, and a proposed access road crossing WWTP property and connecting the driveway and the new facility.

4.2.2 Past and Reasonably Foreseeable Future Projects

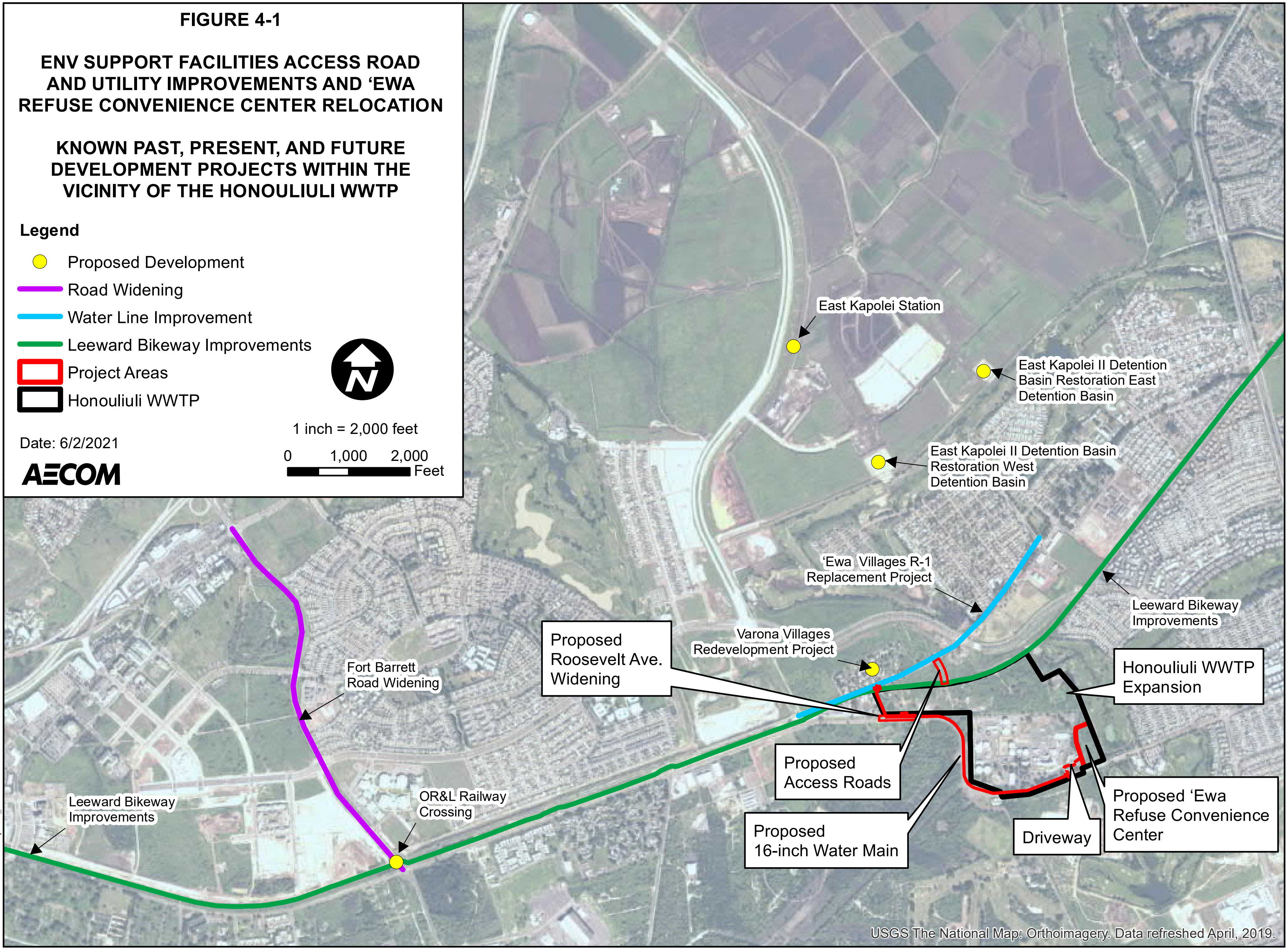
The following are known past, present, and reasonably foreseeable future actions within the general vicinity of the Proposed Action location. These projects have the potential to interact with the Proposed Action and, as such, are evaluated in this cumulative impact analysis. The approximate locations of the projects are identified in Figure 4-1.

- Honouliuli WWTP Expansion – The Honouliuli WWTP is in the process of being upgraded to comply with a Consent Decree. The City purchased 48 acres of land adjacent to the Honouliuli WWTP in 2010 for the purpose of expanding the existing WWTP and for related support facilities. The expansion includes upgrading the Honouliuli WWTP to full secondary treatment and accommodate projected wastewater flows by June 1, 2024.

FIGURE 4-1

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND ‘EWA REFUSE CONVENIENCE CENTER RELOCATION

KNOWN PAST, PRESENT, AND FUTURE DEVELOPMENT PROJECTS WITHIN THE VICINITY OF THE HONOULIULI WWTP



Due to the limited available land at the Sand Island WWTP site, which the Consent Decree also requires be upgraded to provide secondary treatment, the City has proposed to relocate certain non-process support facilities currently located at the Sand Island WWTP site to the Honouliuli WWTP expansion property. These support facilities include the central laboratory, central maintenance and storage, administrative offices, and the central SCADA/ telemetering/emergency management facilities. The City also plans to construct an Administration Building for ENV on the Honouliuli WWTP expansion property. These are the ENV Support Facilities for which the access roads included in the Proposed Action being assessed in this Draft EA are proposed. A Final Environmental Impact Statement (FEIS) was prepared for this project in 2017.

- East Kapolei Station — The Honolulu Authority for Rapid Transportation is constructing the Honolulu Rail Transit Project, a 20-mile, 21-station, elevated fixed guideway transit system that will extend from East Kapolei to Ala Moana Center (Honolulu Authority for Rapid Transportation and Federal Transit Administration 2013, Honore 2020). A portion of this rail line is located to the north and west of the Honouliuli WWTP and has the potential to encourage higher density, transit-oriented development near rail stations (PBR Hawaiʻi & Associates, Inc. 2020). At the system’s western terminus, major infrastructure construction for the East Kapolei Station has been completed along the east side of Kualakaʻi Parkway, at Keahumoa Parkway. Any remaining improvements to the East Kapolei Station would be completed prior to construction of the proposed project.
- East Kapolei II Detention Basin Restoration — The Department of Hawaiian Home Lands plans to undertake the East Kapolei II Detention Basin Restoration to restore two existing detention basins. The work will include an estimated 8,415 cubic yards of excavation and 605 cubic yards of embankment construction to restore the two basins, as well as 7.1 acres of grass establishment in finished graded areas (Hawaii State Procurement Office 2019). The project was previously bid, but not awarded. The Department of Hawaiian Home Lands is planning to re-advertise the construction contract later this year, with a tentatively construction schedule of Spring 2021 through Fall 2022.
- ‘Ewa Villages R-1 Replacement Project — The City Department of Facility Maintenance is proposing to construct a R-1 (non-potable) water line along Renton Road to upgrade existing irrigation water service to the ‘Ewa Villages community (Helber Hastert & Fee, Planners, Inc. [HHF Planners] 2020). The Final EA and Finding of No Significant Impact for this project was published in February 2020 and is scheduled to move to construction in 2020 once all permits have been secured (HHF Planners 2020). The Proposed Action would not conflict with the planned R-1 water line installation because construction of the R-1 water line would be completed in approximately 6 months prior to the start of construction on the proposed WWTP access road improvements.
- Leeward Bikeway — HDOT is constructing the Leeward Bikeway, from 1601 Philippine Sea Road to Waipahu Depot Street (HDOT 2021). The project includes construction of two new bikeway sections connecting with the existing ends of

the West Loch Bike Path. These new sections are being constructed within the 40-foot wide former OR&L ROW. This project fulfills a provision of the 1980 deed which transferred this ROW from the federal Government to HDOT, for the purpose of developing “bicycle lanes or paths and pedestrian walkways.” Construction of the bikeway is expected to be completed in 2022.

- Fort Barrette Road Widening — The HDOT plans to widen Fort Barrette Road, from Farrington Highway to the gate of Former Naval Air Station Barbers Point Gate at Roosevelt Avenue (HDOT 2006, 2021). The project will include upgrading a crossing of the former Oahu OR&L ROW, immediately south of Renton Road, from asphalt to concrete, installing automatic gates and crossing signals, and reconstructing existing pavement adjacent to the crossing. This project is currently in construction.
- Varona Village Redevelopment Project — The redevelopment of Varona Village, a 26-acre former plantation community, is a long-standing project that has been under discussion for many years. The City issued a request for proposals in 2017 to rebuild the plantation community and has plans in partnership with Hawai‘i Habitat for Humanity and Savio Growth Varona Camp to redevelop the Varona Village into an affordable housing plantation camp. The proposed redevelopment plan would include the construction of 88 new homes, with the hopes of retaining the historic elements of the area.

In accordance with HAR 11-200.1, a discussion of cumulative impacts resulting from projects that are proposed, under construction, recently completed, or anticipated to be implemented in the near future is included in this Draft EA.

The Proposed Action may have less than significant cumulative impacts on historic and cultural resources and transportation resources. Both the Proposed Action and the Fort Barrette road widening project result in crossing and upgrade of the OR&L ROW, as well as improvements to the roadway. Malio Street and the cell phone tower driveway have existing crossings of the OR&L right-of-way. The proposed improvements to these roadways and installation of utilities under the cell tower driveway and Malio Street would result in temporary construction impacts to the OR&L ROW. Improving the railroad crossings, including the addition of safety markings, signals and/or gates, as required, would benefit public safety. The proposed project would restore, repair, and sustain the railroad tracks at these crossing locations. The locations of the proposed access road and driveway improvements were selected to utilize an existing roadway (Malio Street) and an existing driveway (providing access to a cell tower) to avoid creating new crossings of the OR&L ROW.

Future plans call for the OR&L ROW to be improved into a combined pedestrian-bike path. The existing crossings of the OR&L ROW by Malio Street and the cell phone tower driveway will be improved according to State of HDOT standards. However, the operation of the proposed crossings over the OR&L ROW at Malio Street and the Cell Tower driveway are not anticipated to affect or damage the OR&L ROW or limit the Hawaiian Railway Society’s future operation of trains along this section of track or use of this section by others.

The Proposed Action results in changes to transportation. The Proposed Action may result in temporary increases in traffic associated with construction; however, one of the primary objectives of the ERCC is to improve transportation by mitigating the current backups on Geiger Road, which are common on weekends, holidays, and even midweek. Any increase in traffic associated with increased employees at the site will be mitigated by the proposed roadway improvements. Additionally, the proposed roadway improvements would not conflict with the future implementation of the proposed bicycle projects. Rather, the Proposed Action would provide pedestrian and cyclist access ways that would link to existing and future bike routes, including the Leeward Bikeway being constructed by the State in the OR&L ROW.

It is not anticipated that the Proposed Action would have any significant or less than significant impacts on other resources. Table 4-1 summarizes the anticipated impacts or lack thereof for the various resources analyzed in this document.

As with impacts, where appropriate, conditions and best management practices (BMPs) are listed in each of their respective resource sections in this EA. These mitigation measures are summarized in Table 4-2.

Table 4-1. Anticipated Impacts on Resources

Resource	Direct Impacts	Indirect Impacts	Cumulative Impacts
Climate and Air Quality	Less than Significant	Less than Significant	None
Topography, Geology, and Soils	Less than Significant	None	None
Hydrology	Less than Significant	None	None
Solid Waste and Hazardous Materials	Less than Significant	None	None
Natural Hazards	None	None	None
Biological Resources	Less than Significant	None	None
Historic and Cultural Resources	Less than Significant	None	Less than Significant
Recreation	None	None	None
Visual Resources	Less than Significant	None	None
Noise	Less than Significant	None	None
Transportation	Less than Significant	None	Less than Significant
Utilities and Public Services	Less than Significant	None	None
Socioeconomic Factors	None	None	None

Source: AECOM 2020 (this report).

Table 4-2. Summary of Conditions and Best Management Practices

Resource	Conditions and Best Management Practices
Climate and Air Quality	Implement BMPs to minimize visible fugitive dust emissions at the property line. All construction work would be in conformance with the air pollution control standards contained in HAR Title 11, Chapter 59, Ambient Air Quality Standards, and Chapter 60.1, Air Pollution Control, which would minimize air quality emissions. Additionally, the Proposed Action should not exceed standards set forth in Chapter 11-60 (Sections 11-60-55 and 11-60-4). Construct the ENV Support Facilities and the relocated ERCC in accordance with Revised Ordinances of Honolulu (ROH) Chapter 32 Building Energy Code. Provide pedestrian and cyclists access ways to encourage non-motorized transportation and mitigation any increase in GHGs associated with increased travel to the site.
Topography, Geology, and Soils	Implement industry-standard BMPs to preserve geologic structure, slope stability, and soil retention. After construction, slopes would be stabilized with vegetation, geotextile, rock, and/or retaining walls. Standard BMPs such as compost filter socks, retaining-settling basins, on-site swales, and contouring would help to retain the soil as well as curb sedimentation and erosion both on- and offsite. Comply with all provisions of the ROH Chapter 14 Article 15, Grading, Grubbing and Stockpiling permit to be issued for the project.
Hydrology	Install BMPs to alleviate potential increase in stormwater runoff associated with increased impervious surfaces. Comply with and maintain approved Storm Water Pollution Control Plan (SWPCP) mitigation measures as part of NPDES MS4 Permit HI S000002.
Solid Waste and Hazardous Materials	Comply with the City's Integrated Solid Waste Management Plan and 2016 Stormwater Management Protection Plan (SWMPP) Spill Response Plan. Comply with and maintain approved SWPCP mitigation measures as part of DOH Solid Waste Permit TF-0015-15.
Natural Hazards	None.
Biological Resources (trees)	The City will enlist the services of a qualified arborist approved by the DPR, Division of Forestry, Urban Forestry Administration. The qualified arborist will prepare a Tree Assessment Report and Tree Protection Zone Fencing Plan to provide mitigation measures for the protection of trees to be retained. The removal of trees will be mitigated through replacement tree planting. The number, species, and location of tree planting will be determined by the qualified arborist in coordination with DPR, Neighborhood Board No. 23 (ʻEwa), and other interested parties.

Resource	Conditions and Best Management Practices
Biological Resources (Hawaiian waterbirds)	To avoid attracting Hawaiian waterbirds efforts will be made to avoid creating areas that would hold standing water. If Hawaiian waterbirds are observed in the project area, nest surveys will be conducted by a qualified biologist (in areas where these birds have been observed) before work begins and after any subsequent delay in work of three or more days. If a nest with eggs or chicks is discovered, work will cease within 150 feet of the nest until after the chicks have fledged and are no longer present in the project area. If an endangered Hawaiian waterbird is observed during construction or operation, all work within 50 feet of the bird will cease. Work will not resume until the bird leaves the area of its own accord.
Biological Resources (Hawaiian hoary bat)	To avoid mortality to Hawaiian hoary bat pups that may be present in trees and cannot yet fly, trees and woody plants greater than 15 feet in height will not be disturbed, removed, or trimmed during the bat birthing and pup rearing period from June 1 through September 15. To avoid risk of entanglement, no new barbed wire fencing will be installed.
Biological Resources (Hawaiian short-eared owl)	To avoid impact to Hawaiian short-eared owl twilight pre-construction surveys will be performed by a qualified biologist prior to clearing vegetation. If pueo nests are discovered, the Department of Land and Natural Resources, Division of Forestry and Wildlife will be notified. In addition, a 100-foot buffer will be established around the active nest in which no vegetation clearing, or other construction or operational activities will occur until the nesting ceases.
Biological Resources (Hawaiian seabirds)	To avoid impacts to Hawaiian seabirds, all construction and operational activities would take place during daylight hours and night construction lighting would be avoided as much as possible. If night construction activities and the use of outdoor lighting is required, it will be scheduled to avoid the seabird fledging season from September 15 through December 15. If night constructing lighting is used it will be downward facing and fully shielded. Any new exterior lighting, including streetlights and security lighting will be downward-facing and fully shielded to minimize impacts to seabirds. Per ROH Chapter 21-4.100 *Outdoor Lighting*, the new lighting will be shielded with full cut-off fixtures to eliminate direct illumination to any adjacent areas.

Resource	Conditions and Best Management Practices
Biological Resources (invasive species)	To avoid the proliferation of non-native predatory mammals, good housekeeping practices will be followed including the proper disposal of all food waste in covered trash receptacles. To minimize the spread and movement of invasive species all equipment, material will be cleaned of excess soil and debris. Gear that may contain soil such as work boots and vehicles will be thoroughly cleaned with water to prevent the spread of Rapid ‘Ōhi‘a Death and other harmful fungal pathogens. To manage and control the propagation and spread of invasive species, all rubbish received at the facility will be placed inside 40-yard bins that are off hauled within in 48 hours of filling. The Convenience Center will not accept wet kitchen or food waste; and green waste is not stockpiled at the facility.
Historic and Cultural Resources	If human remains or subsurface archaeological resources are encountered during construction, work would immediately stop, and the SHPD would be contacted in accordance with State law and rules. The footprint of the crossing improvements will be minimalized as much as possible, considering engineering and safety standards. The OR&L crossing design would salvage (depending on condition) and rehabilitate the existing narrow-gauge railroad track. Any tracks that cannot be reused will be provided to the Hawaiian Railway Society for their use. Concrete panels would be installed on each side of the tracks and between the tracks to protect them from vehicle loads. The alignment of the tracks will not be altered. The design would be consistent with Secretary of the Interior’s Standards for the Treatment of Historic Properties and similar to other treatment of the same track at other crossing locations. The HDOT, FHWA, the Hawaiian Railway Society, the Historic Hawai‘i Foundation and the SHPD will be consulted on the design for the proposed crossing improvements to ensure the design does not diminish the integrity of the OR&L ROW. Rail subgrade and ballast will be replaced with new material meeting design standards for anticipated loads. To mitigate potential impacts to the OR&L ROW, trenchless installation methods may be used for underground utility crossings at the cell tower access driveway and open trench installation may be executed concurrently with crossing improvements at the Malio Street driveway. The SHPD and Historic Hawai‘i Foundation will be consulted on the design for the Malio Street and cell tower driveway improvements to ensure the rural character is preserved and the integrity of the ‘Ewa Sugar Plantation Villages historic district is not diminished. The footprint of the Roosevelt Avenue widening will be minimized as much as possible. Only a small section, approximately 50 feet, of the existing ‘Ewa Field base fence would be removed. The rest of the existing fence and fence alignment would be retained and protected in place. To minimize visual change the entry gate will be inset (away from Roosevelt Avenue) by approximately 20 feet. The result is expected to have minimal visual impact on the historic fence line. New fencing to create the opening and gate would use similar chain link fence materials and will be aesthetically consistent with the original base fence.

Resource	Conditions and Best Management Practices
Recreation	Pedestrian and bicycle access would be provided to encourage pedestrian and bicycle access between the ENV Support Facilities and the Leeward Bikeway.
Visual Resources	During construction, fencing surrounding the construction sites may be provided as needed to provide a visual screen from construction equipment.
Noise	Construction would comply accordance with HRS Chapter 342F, Noise Pollution, Hawaii Administrative Rules (HAR) Title 11, Chapter 46, Community Noise Control and all Federal, State, and City laws and regulations. A Community Noise Variance would be required to exceed the maximum permissible sound levels or for work outside of normal hours.
Transportation	To safely accommodate traffic turning left into DW4 on Roosevelt Avenue, a median left-turn lane in Roosevelt Avenue is recommended. This will allow left-turning vehicles a protected area out of the flow of through traffic in Roosevelt Avenue while waiting for a safe gap in traffic to execute their turn. To accommodate this median left-turn lane, the existing Roosevelt Avenue needs to be widened. This widening can be implemented within the existing Roosevelt Avenue ROW. The new ENV Support Facilities Driveway would be located approximately 150 feet east of the existing Ticonderoga Street intersection on Roosevelt Avenue, and the proposed median left-turn lane for the ENV Support Facilities Driveway would extend past Ticonderoga Street. It is, therefore, recommended to restrict the low-volume Ticonderoga Street to right-in/right-out traffic movements. The Malio Street crossing of the OR&L ROW will be improved per HDOT standards. The crossing design will incorporate measures to acknowledge the safety needs regarding pedestrian and bicycle use of the OR&L ROW. The crossing will require FHWA and HDOT approval and will also require a Use and Occupancy Agreement from HDOT. All construction activity on Geiger Road, Roosevelt Avenue, Renton Road, and Malio Street will include installation of BMPs for drainage and any damage to roadways that occur during construction will be corrected to City Standards and accepted by the City.
Utilities and Public Services	All existing underground and above ground utilities will be confirmed and identified during the design process. During construction, safety procedures will be followed to avoid impacts to existing utilities. New underground utilities associated with the Proposed Action will be designed to meet engineering needs and design standards, and they will be located a minimum of 3 feet below a finished surface per DPP requirements. Coordination with the Honolulu Police Department may be needed during construction activities. In instances when traffic control cannot be provided by the contractor(s) employees, an off-duty police officer would be scheduled and hired to provide those services. Any required upgrades or alterations to the electrical system would be completed to accommodate the Proposed Action.
Socioeconomic Factors	None.

5.0 DETERMINATION AND FINDINGS

5.1 HAR 11-200.1 SIGNIFICANCE CRITERIA

The significance criteria outlined in HAR §11-200.1-13 were reviewed and analyzed to determine whether the Proposed Action would have a significant effect on the environment. The following discussion identifies each criterion followed by an analysis of whether the project meets the criterion.

1. **Irrevocably commit a natural, cultural, or historic resource.**

   The project sites and their immediate surroundings comprise lands that have been previously used for sugar cane cultivation. The site is dominated by non-native plant species commonly found in disturbed areas and does not contain any unique or sensitive plant communities or wildlife habitat. No federal or state threatened or endangered plant species inhabit the project area. The project will implement standard measures recommended by USFWS and Division of Forestry and Wildlife for the protection of threatened and endangered wildlife species which could be present in the vicinity of the project area. The removal of trees will be mitigated through replacement tree planting. During construction, efforts would be made to prevent creating areas that would hold standing water, which may be attractive to Hawaiian waterbirds, and open trenches would be covered. No significant archaeological or cultural resources are anticipated, and Native Hawaiian cultural practices would not be impacted. Likewise, the integrity of the significant historic property in the project area, including the OR&L ROW, ‘Ewa Sugar Plantation Villages historic district, and ‘Ewa Battlefield will not be diminished by the Proposed Action. To mitigate potential impacts to the OR&L ROW, trenchless installation methods may be used for underground utility crossings at the cell tower access driveway and open trench installation may be executed concurrently with crossing improvements at the Malio Street driveway. The Proposed Action would not result in adverse effects to historic properties and would not limit their future use or rehabilitation. Other than an irrevocable commitment of energy and materials for construction, the Proposed Action is not anticipated to irrevocably commit any natural, cultural, or historic resource.

2. **Curtail the range of beneficial uses of the environment.**

   Existing and proposed uses conform to existing zoning and land use designations. Widening one existing road and reconstructing an existing unimproved and existing unimproved driveway preserve use of the surrounding area for other uses. Relocating the existing ERCC would support the City’s efforts to send recyclable waste, large appliances, tires, and auto batteries to recycling facilities, combustibles to the H-POWER waste-to-energy plant, and yard waste to mulching and composting sites, thereby diverting municipal solid waste from the Waimanalo Gulch Landfill. Construction and operation of the new infrastructure and facility would be performed in accordance with applicable state and county regulations, thereby minimizing potential impacts to air and water quality and ambient noise levels. The Proposed Action is not anticipated to curtail the range of beneficial uses of the environment.

3. **Conflicts with the State’s environmental policies or long-term environmental goals established by law.**

   The 2021 filing of the draft EA and publication in the Environmental Review Program *Environmental Notice* is the formal initiation of the Hawaiʻi Environmental Policy Act (HEPA) process. This EA was prepared in accordance with all applicable provisions from both HRS Chapter 343 and HAR 11-200. HRS Chapter 344 establishes the State of Hawaiʻi Environmental Policy. The stated purpose of Chapter 344 is to “establish a state policy which will encourage productive and enjoyable harmony between people and their environment, promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, and enrich the understanding of the ecological systems and natural resources important to the people of Hawaiʻi” (HRS Chapter 344-1). The Proposed Action is consistent with the State’s long-term environmental policies and guidelines established by law.

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

   The Proposed Action would have a beneficial short-term effect on the economy, due to a temporary increase in construction-related jobs, increasing employment opportunities for the construction workforce and increasing revenues for local businesses and government generated from construction activities and workers. Once construction is completed, with operation of the Proposed Action, no long-term changes in regional employment or income patterns are expected. Cultural practices are not known to be performed at the project sites. No adverse effects on the economic welfare, social welfare, or cultural practices of the community or State are anticipated.

5. **Have a substantial adverse effect on public health.**

   During construction activities, short-term impacts to air quality would result from emissions of fugitive dust and emissions of engine exhausts both from on-site construction equipment, and from vehicles used by construction workers and from trucks traveling to and from the project construction sites. However, the construction equipment required for the proposed project is typical of equipment used for routine infrastructure development projects in urban areas, and hot spot air quality concerns associated with concentrated equipment operations would be limited. All construction work would be in conformance with the air pollution control standards contained in HAR Title 11, Chapter 59, Ambient Air Quality Standards, and Chapter 60.1, Air Pollution Control, which would minimize air quality emissions. The relocated ERCC would be constructed in accordance with Revised Ordinances of Honolulu (ROH) Chapter 32 Building Energy Code, thereby conforming to the state’s energy requirements. The project involves relocating an existing facility, therefore no significant changes to long term air quality impacts are anticipated.

Proposed construction activities would generate some noise primarily from mechanical equipment used for vegetation removal, grading, clearing and other construction activities. However, construction activities would be carried out in accordance with HAR Title 11, Chapter 46, Community Noise Control and all federal, state, and City laws and regulations. During operation, the only new additional noise generator would be the increase in commuter traffic using the access roads to the ENV facilities; however, the resulting increase in noise likely would be limited to commuter hours. No significant adverse impacts to public health are anticipated to result from the Proposed Action.

Improving the current conditions of railroad crossings, including the addition of safety markings, signals and/or gates, as required, would benefit public safety.

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

   The Proposed Action would not provide new facilities that would result in an increase in resident or visitor populations, and no long-term changes in regional employment or income patterns are expected. Operation of the ERCC, in the proposed new location, would not be altered relative to the procedures currently in place, and it is not anticipated that the mix or quantity of refuse handled at the site would change. The Proposed Action is not anticipated to result in adverse secondary impacts, such as population changes or effects on public facilities.

   Improved access to the ERCC would alleviate traffic congestion and backups along Geiger Road, potentially reducing mobile source greenhouse gas (GHG) emissions and emissions of carbon monoxide (CO), nitrogen oxides, and volatile organic compounds. These air quality improvements potentially would be augmented by the Proposed Action’s provision of pedestrian and cyclist access ways that would link to existing and future bike routes, as these linkages would encourage non-motorized transportation by workers at the WWTP.

7. **Involve a substantial degradation of environmental quality.**

   Typical short-term construction-related impacts are anticipated but would be temporary in nature and would comply with State of Hawai’i and City and County of Honolulu regulations. The use of standard construction and erosion control best management practices (BMPs) would minimize anticipated construction-related short-term impacts (i.e., noise, air quality, water quality, geology/soils, solid waste generation, and traffic). All development related runoff would be managed on site by a stormwater BMP system including detention/infiltration basins and vegetated drainage swales. The Proposed Action would not involve substantial degradation of environmental quality.

8. **Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions.**

   Although the Proposed Action may result in cumulative effects to historic properties, effects would be mitigated through the design of roadway and driveway improvements and fencing and would be less than significant. Operation of the ERCC in the proposed new location would not be altered relative to the procedures currently in place and would not cause a commitment to other actions. The Proposed Action is not anticipated to have cumulatively substantial adverse impacts on the environment or involve a commitment for larger actions.

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

   The project sites and their immediate surroundings comprise lands that have been previously used for sugar cane cultivation and have long been used for urban and industrial development. No federal or state threatened or endangered plant or animal species, or native plant or animal species inhabit the project area. No substantial adverse effect on a rare, threatened, or endangered species or its habitat is expected to occur as a result of the Proposed Action.

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

    During construction activities, short-term impacts to air quality would result from emissions of fugitive dust and emissions of engine exhausts both from on-site construction equipment, and from vehicles used by construction workers and from trucks traveling to and from the project construction sites. However, the construction equipment required for the proposed project is typical of equipment used for routine infrastructure development projects in urban areas, and hot spot air quality concerns associated with concentrated equipment operations would be limited. All construction work would be in conformance with the air pollution control standards contained in HAR Title 11, Chapter 59, Ambient Air Quality Standards, and Chapter 60.1, Air Pollution Control, which would minimize air quality emissions. The relocated ERCC would be constructed in accordance with ROH Chapter 32 Building Energy Code, thereby conforming to the state's energy requirements. The project relocates an existing facility, therefore no significant changes to long term air quality impacts associated with operation of the facility are anticipated. Local transportation-related emissions may increase associated with future increases in employment at the WWTP, however pedestrian and cyclist amenities are proposed to encourage non-motorized transportation. Construction and post-construction stormwater BMPs are proposed to mitigate any potential impacts to surface and groundwater associated with the project, including the increase in stormwater anticipated road widening.

    Proposed construction activities would generate some noise primarily from mechanical equipment used for vegetation removal, grading, clearing and other construction activities. However, construction activities would be carried out in accordance with HAR Title 11, Chapter 46, Community Noise Control and all federal, state, and City laws and regulations. During operation, the only new additional noise generator would be the increase in commuter traffic using the access roads to the ENV Support Facilities; however, the resulting increase in noise likely would be limited to commuter hours. No substantial adverse effects on air or water quality, or ambient noise levels are anticipated to result from the Proposed Action.

Improved access to the ERCC would alleviate traffic congestion and backups along Geiger Road, potentially reducing mobile source GHG emissions and emissions of CO, nitrogen oxides, and volatile organic compounds. These air quality improvements potentially would be augmented by the Proposed Action's provision of pedestrian and cyclist access ways that would link to existing and future bike routes, as these linkages would encourage non-motorized transportation by workers at the WWTP.

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 in a developed area that is not environmentally sensitive. There are no active volcanoes on Oʻahu, therefore the island is not subject to significant earthquakes from volcanic activities. Any earthquakes that reach Oʻahu are not typically strong or damage causing.

    The Proposed Action is not located along the coast nor is it within the Tsunamis Evacuation Zone or Extreme Tsunami Evacuation Zone. The Proposed Action is primarily located in the Federal Emergency Management Agency (FEMA) Zone D with a portion of the project located within Zone X. Neither of these flood zones are located within the Special Flood Hazard Area at higher risk of flooding.

    Implementation of the Proposed Action would not result in an increased threat from sea level rise or inundation related to threats on or near the project site. The project site is located outside of the extent of the 3.2 feet and 6 feet of sea level rise scenarios. Furthermore, it is also located outside of the County-delineated Special Management Area as designated in HRS Chapter 205A.

    The Proposed Action is not anticipated to adversely impact environmentally sensitive areas or hazard zones.

12. **Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies.**

    Any construction impacts to scenic vistas and view planes are expected to be short-term and would cease after construction. In the long term, the Proposed Action is not anticipated to significantly alter the viewshed from the surrounding area. No substantial adverse effect on scenic vistas or view planes identified in county or state plans or studies are anticipated to result from the Proposed Action.

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

    The Proposed Action would involve the commitment of fuel for equipment, vehicles, and machinery during the construction and operational phases. However, the resulting consumption of energy and emission of greenhouse gases would be minimal and are not anticipated to have a significant adverse effect. The Proposed Action is not anticipated to require substantial energy consumption or emit substantial greenhouse gases.

The Proposed Action’s provision of improved access to the ERCC, which would alleviate traffic congestion and backups along Geiger Road, and pedestrian and cyclist access ways, which would encourage non-motorized transportation by workers at the WWTP, potentially would reduce mobile source GHG emissions.

5.2 ANTICIPATED DETERMINATION PURSUANT TO CHAPTER HRS CHAPTER 343

Based on the above stated criteria, ENV as the approving agency anticipates that the Proposed Action would not have any significant adverse environmental impacts, and that an environmental impact statement (EIS) would not be required for the project.

This Draft EA is subject to public review as prescribed by HRS Chapter 343 and HAR 11-200.1. ENV has determined that a Finding of No Significant Impact is appropriate for the ENV Support Facilities Access Road and Utility Improvements and ‘Ewa Refuse Convenience Center Relocation Project based on the information provided in this Draft EA.

To determine whether a proposed action may have a significant impact on the environment, the proposing agency needs to consider all phases of the action, the expected primary and secondary consequences, cumulative effect, and the short- and long-term effects. The review and evaluation of the proposed action would result in a determination that either: 1) the action may have a significant effect on the environment, and an EIS Preparation Notice should be issued, or 2) the action is not likely to have a significant effect and notice of a Finding of No Significant Impact should be issued.

Based on the findings presented in this document, the Proposed Action is not expected to result in a significant impact on the environment. In accordance with Chapter 343, HRS and Section 11-200.1, HAR, the City determined that the Proposed Action will not have a significant environmental impact and an EIS will not be required. A Finding of No Significant Impact is anticipated to be issued.

The determination was based on review and analysis of the significance criteria specified in Section 11-200.1-13, HAR. An action shall be determined to have a significant effect on the environment if it meets any of the above criteria.

6.0 AGENCY REVIEW AND PUBLIC OUTREACH

6.1 PRE-ASSESSMENT CONSULTATION

The agencies and organizations consulted during the Draft EA Pre-Assessment Consultation process that took place in early 2020 are listed in Table 6-1. All comment letters received, as well as formal response letters to the same, are included as Appendix C.

Table 6-1. Agencies and Organizations Consulted – Pre-Assessment

	Comments Received?	
Agency/Organization	**Yes**	**No**
Federal		
Department of the Interior, Fish and Wildlife Service		X
Federal Highway Administration		X
U.S. Environmental Protection Agency		X
State of Hawai‘i		
Department of Business, Economic Development and Tourism		X
Department of Business, Economic Development and Tourism, Office of Planning		X
Department of Hawaiian Home Lands		X
Department of Health		X
Department of Land and Natural Resources – Land Division	X	
Department of Land and Natural Resources – State Historic Preservation Division		X
Department of Transportation	X	
Department of Transportation Highways Division Right-Of-Way Branch		X
Department of Accounting and General Services	X	
House of Representatives District 39		X
House of Representatives District 40		X
House of Representatives District 41		X
Office of Hawaiian Affairs		X
State Senator District 19	X	
State Senator District 20		X
City and County of Honolulu		
Board of Water Supply	X	
Department of Design and Construction	X	

	Comments Received?	
Agency/Organization	**Yes**	**No**
Department of Facility Maintenance	X	
Department of Land Management		X
Department of Parks and Recreation	X	
Department of Planning and Permitting	X	
Department of Transportation Services		X
Honolulu Fire Department	X	
Honolulu Police Department	X	
‘Ewa Neighborhood Board		X
Makakilo Kapolei Honokai Hale Neighborhood Board		X
City Council District 1		X
City Council District 9		X
Private/Individuals		
Hawaiian Electric Company		X
Island Energy		X
Coral Creek Golf Course		X
Hawaiian Railway Society	X	
Kanehili Cultural Hui Save ‘Ewa Field		X
Hawai‘i Gas		X
Hunt Hawai‘i Development		X
Gentry Homes	X	
Honpa Hongwanji Mission of Hawai‘i		X
Melvin Masuda, J.D., M.P.A. on behalf of the Hawaiian Railway Society	X	
Michael Rice	X	
Rayne Kauhi	X	
Hawaiian Historic Foundation	X	

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Appendix A: Agency Correspondence

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DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

KIRK CALDWELL
MAYOR

LORI M.K. KAHIKINA, P.E.
DIRECTOR

TIMOTHY A. HOUGHTON
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO
PRO 20-060

July 17, 2020

Mr. Jade T. Butay, Director
Hawai'i Department of Transportation
869 Punchbowl Street
Honolulu, Hawai'i 96813

Dear Director Butay:

SUBJECT: ENV Support Facilities Access Road Improvements
Section 106 and Section 4(f) Exemption

The City and County of Honolulu, Department of Environmental Services (ENV) is planning new facilities (ENV Support Facilities) on property adjacent to the Honouliuli Wastewater Treatment Plant (WWTP). The project includes new Administration, Central Shops, Laboratory, and Warehouse buildings, and will relocate over 300 ENV daytime employees to the property. Enclosure 1 is the proposed site plan for the ENV Support Facilities.

The new Administration Building will consolidate ENV's administrative, engineering, and operations management staff into one location, and will include the Emergency Operations Center with central communication to island-wide treatment plants and pump stations. The Central Shops and Warehouse will be a centralized location for maintenance, receiving, storage of parts and equipment, and will include storage of critical vehicles and equipment needed for responding to disasters and other emergencies. The Laboratory performs daily analyses that are required for regulatory purposes to monitor treatment plant performance and environmental conditions.

The plan for this project includes development of access driveways and infrastructure to accommodate daily commuter traffic, to avoid the creation of bottlenecks or unnecessarily add to traffic congestion. The only paved access currently available is through the WWTP, however, use of this access is impractical for the planned facilities given the anticipated traffic volumes, and the need to limit access to the WWTP facilities for security and public safety reasons. The plan for the access driveways also includes pedestrian and bicycle access, access to bus stops on Renton

Road and to the future commuter rail station on Kualakai Parkway, and underground utilities crossings needed for providing services to the site.

An Environmental Impact Statement (EIS) was completed in April, 2017 for the project. The EIS showed access to the property from the north (via Renton Road and Malio Street) and a new driveway to the south (via Roosevelt Avenue). The EIS also showed an existing leased cell tower located in the northwest corner of the property that has its own dedicated access. The Malio Street and cell tower accesses to the property have existing unimproved crossings of the historic O'ahu Railway and Land Company (OR&L) railroad located on State of Hawai'i right-of-way (ROW). These crossings, although they have existed for decades, lack a current Use and Occupancy Agreement (UOA). Enclosure 2 is a page from the EIS showing the existing and proposed accesses to the parcel, and Enclosure 3 shows photographs of the two existing railway crossings.

ENV has issued a Pre-Assessment Consultation letter, dated May 15, 2020, for an Environmental Assessment (EA) for the "ENV Support Facilities Access Road Improvements and Ewa Refuse Convenience Center Relocation" project. The purpose of the EA is to provide an update and more details on the proposed access driveways and road improvements. Also included in this EA is the proposed relocation of the Ewa Refuse Convenience Center within the Honouliuli WWTP property. The common purpose of these proposed actions is to provide traffic improvements. The EA will meet Hawaii Revised Statute (HRS) Chapter 343 requirements, and is needed for HDOT approval of an UOA for the proposed crossings.

In the deed dated June 5, 1980 (Deed – Enclosure 4) the Federal Highway Administration (FHWA) transferred the former OR&L ROW to the Hawai'i Department of Transportation (HDOT). Section 4 of the Deed states that "all licenses, permits or easements authorizing the use or occupancy of the 40-foot railroad right-of-way will be issued only subsequent to the written approval of the Hawai'i State Historic Preservation Officer and the written authorization of the Hawai'i Division Administrator, Federal Highway Administration."

ENV is seeking UOAs with HDOT for the two OR&L ROW crossings. The UOAs require FHWA authorization pursuant to the Deed. The FHWA authorization is a federal action requiring compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA) and Section 4(f) of the United States Department of Transportation Act of 1966 (USDOT Act).

Enclosure 5 contains the plans for upgrades of the two crossings.

Crossing #1 (cell tower) is located on an existing unpaved driveway to Renton Road that crosses the OR&L ROW. Crossing #1 was originally used for agricultural and residential purposes, and more recently by cell tower maintenance vehicles. This crossing has very low traffic volume, however, grades are steep and an upgraded, paved crossing is warranted to prevent vehicles damaging the tracks and for safety reasons. Underground utility crossings are proposed at Crossing #1 for future utilities. Bicycle access to the Leeward Bikeway and pedestrian access to the nearby bus stop on Renton Road are also required at this location.

Crossing #2 is located on the existing unpaved Malio Street. Crossing #2 was previously used for agricultural and residential purposes, and, as evidenced by an historical photograph (Enclosure 6), this crossing was used during the period of OR&L train operations prior to World War II. Malio Street is planned to serve as an entrance for daily commuter traffic to the ENV Support Facilities and will provide access from Kapolei Parkway, from Kualakai Parkway and from Renton Road. This driveway will provide an efficient means for shuttling between the ENV site and the future rail station on Kualakai Parkway, and will be helpful in promoting the use of rail transit for commuting. The Malio Street access and the new Roosevelt Avenue access will be two alternate means of ingress and egress to the property. The two driveways are needed to accommodate peak commuting traffic as predicted by traffic impact studies, reduce queuing of vehicles in the Geiger Road/Roosevelt Avenue corridor, and provide alternative routes for ENV's disaster response equipment and personnel in the event of road closures during an emergency.

Underground utility crossings are proposed at Crossing #2 for future utilities. Bicycle access to the Leeward Bikeway and Malio Street, and pedestrian access are also required at this location. Appropriate signage and traffic calming features will be provided at this driveway crossing to address safety. Crossing #2 also provides a needed connection between City-owned parcels of land on either side of the OR&L ROW.

Only the improvements within the former OR&L ROW, to be authorized under a UOA between ENV and HDOT, are subject to FHWA approval and are considered a federal action requiring NHPA Section 106 and USDOT Act Section 4(f) compliance. Therefore, the Area of Potential Effect (APE) for this undertaking corresponds with the boundaries for the UOA shown on the enclosed construction plans. The APE for Railroad Crossing #1 is 1,800 square feet. The APE for Railroad Crossing #2 is 1,808 square feet.

On August 24, 2018, the Advisory Council for Historic Preservation (ACHP) issued a "Program Comment to Exempt Consideration of Effects to Rail Properties within Rail Right-of-Way" (Program Comment). The proposed track and trackbed replacement, reconstruction, and upgrade of these two existing roadway crossings over the OR&L are exempt from Section 106 and Section 4(f) in accordance with the Program Comment, Appendix A., Section II (Exempt Activities List).

On November 6, 2018, FHWA sent a letter to HDOT advising that if a project or use involves the exempt activities listed in Appendix A of the Program Comment, HDOT should cite which of the activities it falls under along with sufficient relevant information such as plans, photographs, or material specifications to support the opinion. If FHWA concurs with these findings, the Section 106 and Section 4(f) processes are complete. Enclosure 7 includes the Program Comment and FHWA letter to HDOT.

The proposed undertaking involves the following exempt activities listed in the Program Comment, Appendix A, Section II (Exempt Activities List):

"A. Track and Trackbed

1. Track and trackbed maintenance, repair, replacement, and upgrades within the existing footprint (i.e., existing subgrade, sub-ballast, ballast, and rails and crossties [track]). These activities must not include alterations to the trackbed that would result in substantial visual change (i.e., elevation or alignment) in the relationship between the trackbed and the surrounding landscape or built environment."

The track and trackbed adjacent to the two crossings will be replaced and upgraded within the existing footprint using new materials in accordance with accepted industry construction standards and specifications. The new crossings will be built to current standards using precast concrete panels; the track and trackbed on either side of the crossings will be replaced to provide an engineered transition to the relatively inflexible precast concrete crossing panels. The railroad grades and existing footprint will not be changed. There will be a visual change at the crossings themselves due to the concrete panel installation; however, this is not considered substantial as it does not change the elevation or alignment.

"E. Railroad and Rail Transit/Roadway At Grade Crossings and Grade Separations

2. Replacement of at-grade railroad and rail transit crossings on existing railroads, rail transit lines, and roadways, including components such as crossing signs, signals, gates, warning devices and signage,

> *highway traffic signal pre-emption, road markings, paving and resurfacing, and similar safety features."*

Appropriate rail crossing signage and signals (if warranted) will be installed at the crossings as part of safety improvements, including safety upgrades to accommodate bicycles and pedestrians using the future Leeward Bikeway. Roadway surfaces will be asphalt paved, and the crossings will be constructed from precast concrete panels. The replacement of the existing at-grade crossings will enhance safety for the trains and equipment, vehicle traffic, bicycles, and pedestrians present on the historic resource.

ENV is aware that some exemptions in the Program Comment apply to in-kind replacement (e.g., Appendix A, Section II, Paragraphs E.4 and E.5). Please note that Appendix A, Section II, Paragraphs A.1 and E.2 (the paragraphs applicable to ENV's proposed track and crossing replacement) do not specify in-kind replacement. ENV's project will upgrade the crossings to withstand the new traffic volumes while providing appropriate safety improvements for pedestrians, bicycles, vehicles, and trains. This construction replaces the trackbed and at-grade crossings to preserve the historic resource while installing safety features for the anticipated increase in crossing utilization.

In accordance with the November 6, 2018, letter to the HDOT from the FHWA regarding *Section 106 and Section 4(f) Review of Uses of the Right-of-Way of the Former Oahu Railway and Land Company,* we are requesting FHWA concurrence that the proposed reconstruction of these crossings are exempt from the NHPA Section 106 and U.S. DOT Act Section 4(f) process in accordance with exempt activities listed in Appendix A of the ACHP Program Comments. We would appreciate a response at your earliest convenience.

Should you have any questions, please contact Paul Christiansen at (808) 768-3470 or at p.christiansen@honolulu.gov.

Sincerely,

Lori M. K. Kahikina, P.E.
Director

Enclosures:

1 ENV Support Facilities Site Plan
2 Figure 4-8, 2017 Final Environmental Impact Statement
3 Existing Condition Photographs
4 Deed dated June 5, 1980 (without attachments)
5 Proposed Crossing Plans
6 1941 Photograph Showing Rail Crossings
7 Program Comment and FHWA Letter to HDOT

cc: FHWA, Hawai'i Federal-Aid Division

ENCLOSURE 1

ENV Support Facilities Site Plan

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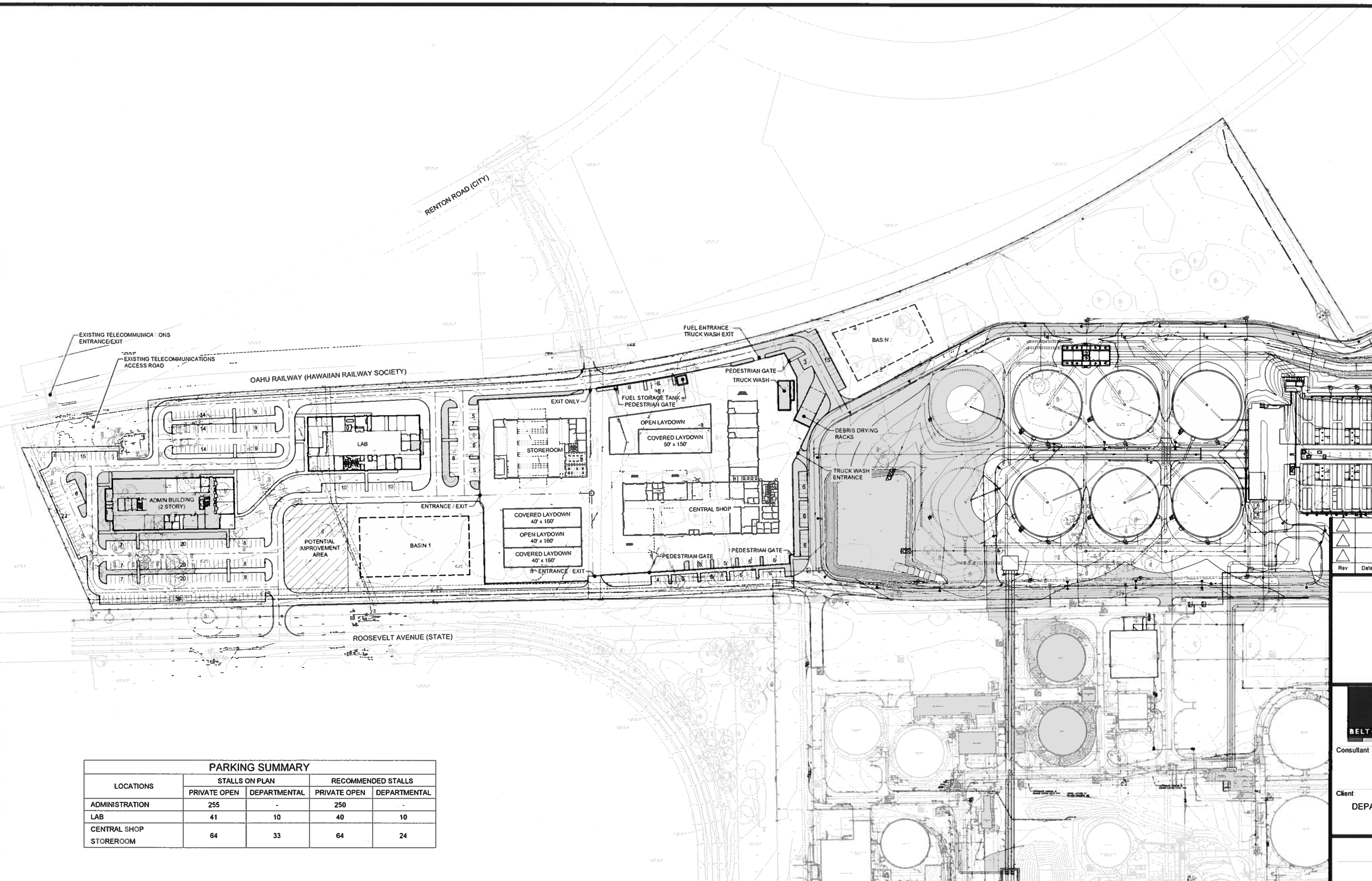

GRAPHIC SCALE

100 0 100 200

PARKING SUMMARY

LOCATIONS	STALLS ON PLAN		RECOMMENDED STALLS	
	PRIVATE OPEN	DEPARTMENTAL	PRIVATE OPEN	DEPARTMENTAL
ADMINISTRATION	255	-	250	-
LAB	41	10	40	10
CENTRAL SHOP STOREROOM	64	33	64	24

NORTH

SITE PLAN

SCALE 1"=100'

Rev	Date	Description	Eng	App

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION

APRIL 30, 2020
EXPIRATION DATE OF THE LICENSE

PLANNING • CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL CONSULTING

BELT COLLINS

Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819
T: 808.521.5361 • F 808.538.7819
www.beltcollins.com

Consultant

Client
CITY AND COUNTY OF HONOLULU
DEPARTMENT OF ENVIRONMENTAL SERVICES
1000 ULU'OHI'A STREET, SUITE 308
KAPOLEI, HI 96707

ENV SUPPORT FACILITIES
AT HONOULIULI WWTP

SITE PLAN

Designed By LLN
Drawn By JS
Project No. 2018.71.0300
Date DECEMBER 2018

Approved By

Date

Date

Date

FIGURE 2

FILE	POCKET	FOLDER	NO.

Tue, 23 Apr 2019 - 10:03am
M:\ENV Support Facilities\2018710300 Honouliuli WWTP\04 Graphics\CAD\Sheets\C-XXX - SITE PLAN - 100 SCALE.dwg

Trim: 22"x34"

SHEET - of - Sheets

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ENCLOSURE 2

Figure 4-8, 2017 Final Environmental Impact Statement

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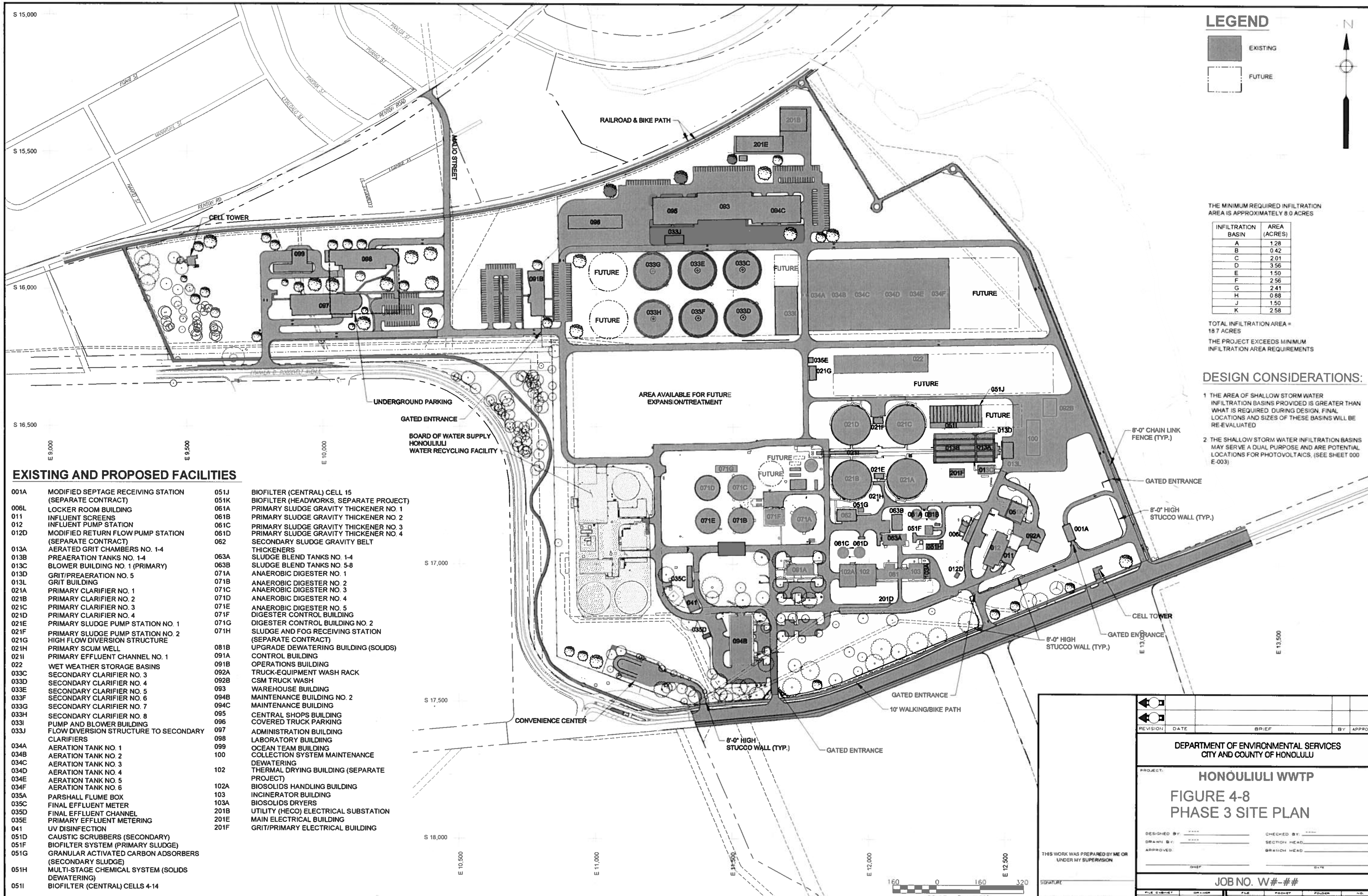

THE MINIMUM REQUIRED INFILTRATION AREA IS APPROXIMATELY 8.0 ACRES

INFILTRATION BASIN	AREA (ACRES)
A	1.28
B	0.42
C	2.01
D	3.56
E	1.50
F	2.56
G	2.41
H	0.88
J	1.50
K	2.58

TOTAL INFILTRATION AREA = 18.7 ACRES

THE PROJECT EXCEEDS MINIMUM INFILTRATION AREA REQUIREMENTS

DESIGN CONSIDERATIONS:

1. THE AREA OF SHALLOW STORM WATER INFILTRATION BASINS PROVIDED IS GREATER THAN WHAT IS REQUIRED. DURING DESIGN, FINAL LOCATIONS AND SIZES OF THESE BASINS WILL BE RE-EVALUATED
2. THE SHALLOW STORM WATER INFILTRATION BASINS MAY SERVE A DUAL PURPOSE AND ARE POTENTIAL LOCATIONS FOR PHOTOVOLTAICS, (SEE SHEET 000 E-003)

EXISTING AND PROPOSED FACILITIES

001A	MODIFIED SEPTAGE RECEIVING STATION (SEPARATE CONTRACT)
006L	LOCKER ROOM BUILDING
011	INFLUENT SCREENS
012	INFLUENT PUMP STATION
012D	MODIFIED RETURN FLOW PUMP STATION (SEPARATE CONTRACT)
013A	AERATED GRIT CHAMBERS NO. 1-4
013B	PREAERATION TANKS NO. 1-4
013C	BLOWER BUILDING NO. 1 (PRIMARY)
013D	GRIT/PREAERATION NO. 5
013L	GRIT BUILDING
021A	PRIMARY CLARIFIER NO. 1
021B	PRIMARY CLARIFIER NO. 2
021C	PRIMARY CLARIFIER NO. 3
021D	PRIMARY CLARIFIER NO. 4
021E	PRIMARY SLUDGE PUMP STATION NO. 1
021F	PRIMARY SLUDGE PUMP STATION NO. 2
021G	HIGH FLOW DIVERSION STRUCTURE
021H	PRIMARY SCUM WELL
021I	PRIMARY EFFLUENT CHANNEL NO. 1
022	WET WEATHER STORAGE BASINS
033C	SECONDARY CLARIFIER NO. 3
033D	SECONDARY CLARIFIER NO. 4
033E	SECONDARY CLARIFIER NO. 5
033F	SECONDARY CLARIFIER NO. 6
033G	SECONDARY CLARIFIER NO. 7
033H	SECONDARY CLARIFIER NO. 8
033I	PUMP AND BLOWER BUILDING
033J	FLOW DIVERSION STRUCTURE TO SECONDARY CLARIFIERS
034A	AERATION TANK NO. 1
034B	AERATION TANK NO. 2
034C	AERATION TANK NO. 3
034D	AERATION TANK NO. 4
034E	AERATION TANK NO. 5
034F	AERATION TANK NO. 6
035A	PARSHALL FLUME BOX
035C	FINAL EFFLUENT METER
035D	FINAL EFFLUENT CHANNEL
035E	PRIMARY EFFLUENT METERING
041	UV DISINFECTION
051D	CAUSTIC SCRUBBERS (SECONDARY)
051F	BIOFILTER SYSTEM (PRIMARY SLUDGE)
051G	GRANULAR ACTIVATED CARBON ADSORBERS (SECONDARY SLUDGE)
051H	MULTI-STAGE CHEMICAL SYSTEM (SOLIDS DEWATERING)
051I	BIOFILTER (CENTRAL) CELLS 4-14
051J	BIOFILTER (CENTRAL) CELL 15
051K	BIOFILTER (HEADWORKS, SEPARATE PROJECT)
061A	PRIMARY SLUDGE GRAVITY THICKENER NO. 1
061B	PRIMARY SLUDGE GRAVITY THICKENER NO. 2
061C	PRIMARY SLUDGE GRAVITY THICKENER NO. 3
061D	PRIMARY SLUDGE GRAVITY THICKENER NO. 4
062	SECONDARY SLUDGE GRAVITY BELT THICKENERS
063A	SLUDGE BLEND TANKS NO. 1-4
063B	SLUDGE BLEND TANKS NO. 5-8
071A	ANAEROBIC DIGESTER NO. 1
071B	ANAEROBIC DIGESTER NO. 2
071C	ANAEROBIC DIGESTER NO. 3
071D	ANAEROBIC DIGESTER NO. 4
071E	ANAEROBIC DIGESTER NO. 5
071F	DIGESTER CONTROL BUILDING
071G	DIGESTER CONTROL BUILDING NO. 2
071H	SLUDGE AND FOG RECEIVING STATION (SEPARATE CONTRACT)
081B	UPGRADE DEWATERING BUILDING (SOLIDS)
091A	CONTROL BUILDING
091B	OPERATIONS BUILDING
092A	TRUCK-EQUIPMENT WASH RACK
092B	CSM TRUCK WASH
093	WAREHOUSE BUILDING
094B	MAINTENANCE BUILDING NO. 2
094C	MAINTENANCE BUILDING
095	CENTRAL SHOPS BUILDING
096	COVERED TRUCK PARKING
097	ADMINISTRATION BUILDING
098	LABORATORY BUILDIING
099	OCEAN TEAM BUILDING
100	COLLECTION SYSTEM MAINTENANCE DEWATERING
102	THERMAL DRYING BUILDING (SEPARATE PROJECT)
102A	BIOSOLIDS HANDLING BUILDING
103	INCINERATOR BUILDING
103A	BIOSOLIDS DRYERS
201B	UTILITY (HECO) ELECTRICAL SUBSTATION
201E	MAIN ELECTRICAL BUILDING
201F	GRIT/PRIMARY ELECTRICAL BUILDING

REVISION | DATE | BRIEF | BY | APPROVED

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WWTP

FIGURE 4-8
PHASE 3 SITE PLAN

DESIGNED BY: ---- CHECKED BY: ----
DRAWN BY: ---- SECTION HEAD:
APPROVED: BRANCH HEAD:
CHIEF DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SIGNATURE
EXPIRATION DATE OF THE LICENSE

JOB NO. W#-##

FILE CABINET | DRAWER | FILE | POCKET | FOLDER | NO.

DRAWING 000 G-023 SHEET 23 OF 169

PATH/FILENAME: S:\PROJECTS_LEGACY\USIG\WASTEWATER\60182388-HONOULIULI FAC PLAN\400 TECH INFO\434 TASK 12\434.15 TASK 12.0 CONCEPTUAL DESIGN\DRAWINGS\CAD FILES\60220849-HONOULIULI WWTP\SHEETS\000 G-023.DWG
LAST UPDATE: Wednesday, March 16, 2016 3:07:40 PM PLOT DATE: Wednesday, March 16, 2016 3:15:01 PM

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ENCLOSURE 3

Existing Condition Photographs

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Existing Condition Photographs

ENV Support Facilities Access Road Improvements

Oahu Rail and Land Company Right-of-Way Crossings

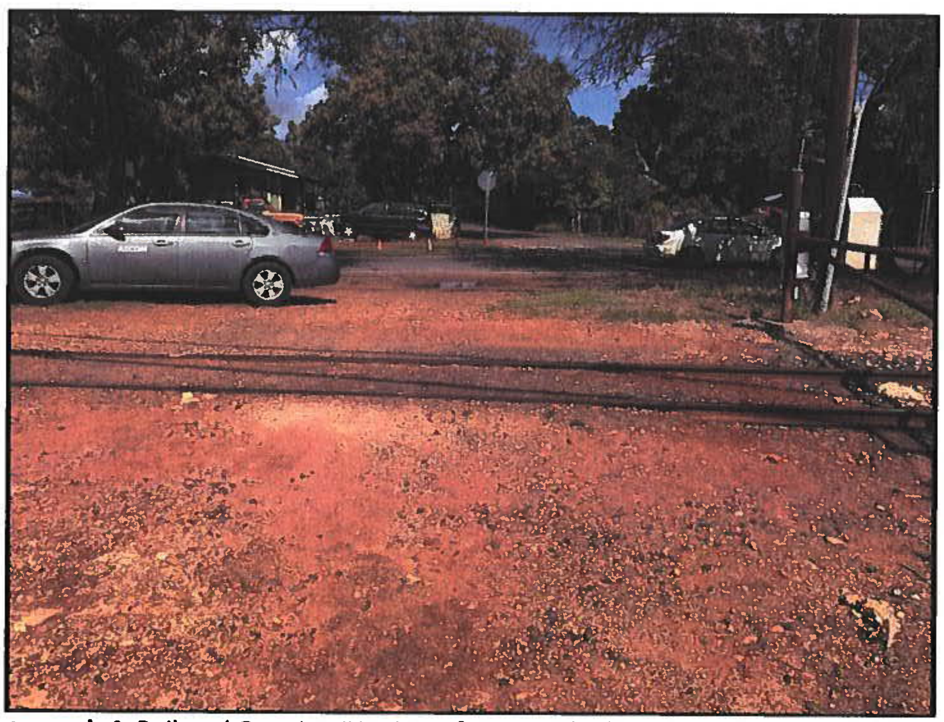
Photograph 1. Railroad Crossing #1, view of crossing from Renton Road looking south.

Photograph 2: Railroad Crossing #1, view of OR&L ROW looking east from crossing.

Existing Condition Photographs

ENV Support Facilities Access Road Improvements
Oahu Rail and Land Company Right-of-Way Crossings

Photograph 3: Railroad Crossing #1, view of OR&L ROW looking west from crossing.



Photograph 4: Railroad Crossing #1, view of crossing looking north toward Renton Road.

Existing Condition Photographs

ENV Support Facilities Access Road Improvements

Oahu Rail and Land Company Right-of-Way Crossings

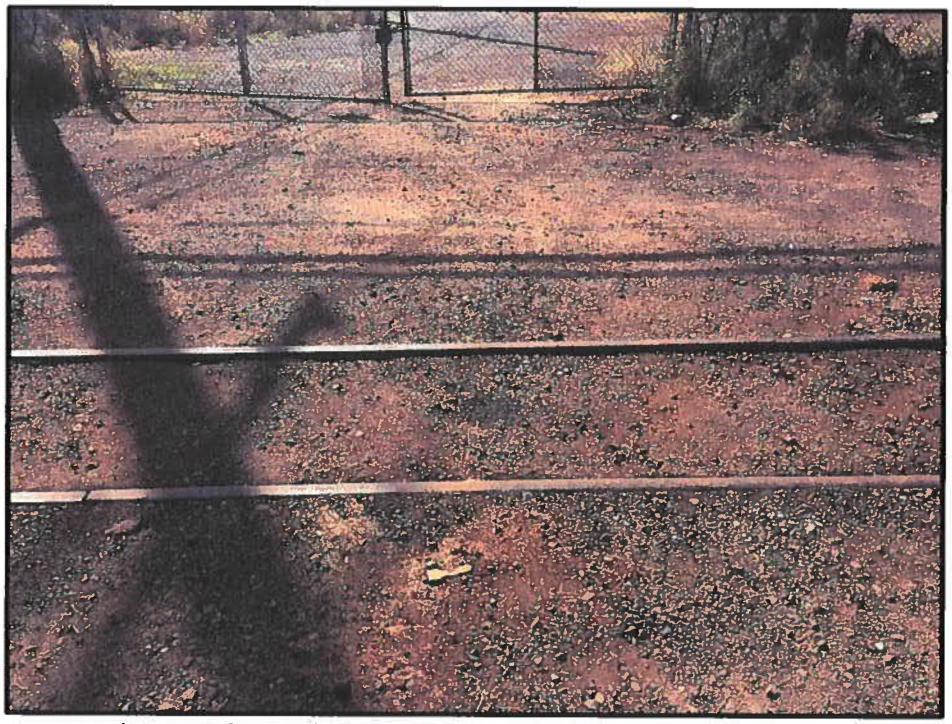
Photograph 5: Railroad Crossing #2 looking south on Malio Street.

Photograph 6: Railroad Crossing #2 looking north on Malio Street.

Existing Condition Photographs

ENV Support Facilities Access Road Improvements

Oahu Rail and Land Company Right-of-Way Crossings



Photograph 7: Railroad Crossing #2 Existing tracks and trackbed.

Photograph 8. Railroad Crossing #2, view of OR&L ROW looking west from Malio Street.

Photograph 9. Railroad Crossing #2, view of OR&L ROW looking east from Malio Street.

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ENCLOSURE 4

Deed Dated June 5, 1980 (without attachments)

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RECORDATION REQUESTED BY
DEPARTMENT OF TRANSPORTATION
ABSTRACTING SECTION
AFTER RECORDATION, RETURN TO
DEPARTMENT OF TRANSPORTATION
ABSTRACTING SECTION
RETURN BY: MAIL ☐ . PICKUP ☐

80- 68673

80 JUN 26 P2:33

14814 320

DEED

THIS DEED, made this 5th day of June, 1980, by and between the UNITED STATES OF AMERICA, acting by and through the DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, hereinafter referred to as the DEPARTMENT, and the STATE OF HAWAII, DEPARTMENT OF TRANSPORTATION, hereinafter referred to as the GRANTEE:

W I T N E S S E T H:

WHEREAS, the STATE OF HAWAII has filed application under the provisions of the Act of Congress approved August 27, 1958, as amended (Title 23, United States Code, Section 317), for the transfer to the GRANTEE of lands hereinafter described situated in the STATE OF HAWAII, and under the control and jurisdiction of the General Services Administration, and

WHEREAS, this transfer is further authorized under the provisions of the Act of Congress approved October 15, 1966 (80 Stat. 931, ~~937,~~ Section 6(a)(1)(A)), and the Act of Congress approved August 13, 1973, 87 Stat. 262, Section 124 (Title 23, United States Code, Section 217), authorizes the construction of separate or preferential bicycle lanes or paths and pedestrian walkways in conjunction or connection with Federal-aid highways, and

WHEREAS, the Regional Federal Highway Administrator, pursuant to delegations of authority from the Secretary of Transportation and the Federal Highway Administrator, has determined that the lands covered by the application are reasonably necessary in connection with the construction of Project BW 0300(8), State of Hawaii, and

EXEMPT—HAWAII CONVEYANCE TAX
ey
CERTIFICATE NOT REQUIRED

WHEREAS, the General Services Administration has authorized the DEPARTMENT to transfer the lands to the GRANTEE.

NOW, THEREFORE, the DEPARTMENT USA as authorized by law, does hereby appropriate, remise, release, quitclaim, and transfer unto the GRANTEE 54 Oct the lands and interests in lands described in Attachment One, Parcels 2, 3, 4, 6, 7, 8, 9, 10, 11, and 12, attached hereto and made a part hereof.

TO HAVE AND TO HOLD, the above-mentioned lands and interests in lands unto the GRANTEE, for so long a time as such are needed for highway purposes, i.e., bicycle lanes or paths and pedestrian walkways upon the express condition that if, at any time, the need for such highway purposes shall no longer exist, notice of the fact shall be given by the GRANTEE to the DEPARTMENT and such lands and interests in lands shall immediately revert to the United States of America and to the control of the General Services Administration as such control existed prior to this instrument, and subject to the following covenants and conditions, which shall be binding on the GRANTEE, its successors and assigns:

1. The GRANTEE, in consideration of the conveyance of said lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns that it will preserve the integrity of the railroad facilities located on said right-of-way including all rails, ties, signals, and appurtenances in their existing condition, natural and unavoidable deterioration excepted, provided, however, that said railroad facilities may be operated by an assignee as a non-profit historic railroad museum and provided that the operation, maintenance or alteration of said facilities shall be in accordance with State and Federal requirements applicable to facilities listed on the National Register of Historic Places including but not limited to:

a. Title 1 of the National Environmental Policy Act of 1969 (NEPA) 42 U.S.C. Section 4321 et seq.;

b. Section 106 of the National Historic Preservation Act of 1966 16 U.S.C. Section 470f;

c. Section 1(3) and 2(b) of Executive Order 11593, May 13, 1971, "Protection and Enhancement of the Cultural Environment";

d. Procedures of the Advisory Council on Historic Preservation for the Protection of Historic and Cultural Properties (36 CFR Part 800); and

e. Section 4(f) of the Department of Transportation Act and 23 U.S.C. Section 138.

Any salvage resulting from tracks, ties or other railroad facilities not needed for the development of the operating railroad museum shall be returned to the General Services Administration.

2. No motorized behicles shall be permitted on the bicycle lanes or paths or pedestrian walkways except for maintenance purposes conducted by the GRANTEE, its successors or assigns.

3. The GRANTEE, in consideration of the conveyance of said lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns that it will comply ith the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. Sections 2000d-2000d-4) and the regulations set forth in Title 49 - Transportation, Subtitle A, Part 21, Code of Federal Regulations (49 CFR 21.1-21.23) (1970), specifically that: (a) no members of the traveling public and users of the Federally-assisted highway shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subject to discrimination in their access to, and use of, said highway or their access to and use of the facilities and services provided for public accommodations (such as eating, sleeping, rest, recreation, and vehicle servicing) constructed on, over, or under the right-of-way of said highway; and (b) the GRANTEE shall use the said lands so conveyed in compliance with all other requirements imposed pursuant to said Title 49, Subtitle A, Code of Federal Regulations, Part 21.

√ 4. The GRANTEE, in consideration of the conveyance of said lands, does hereby covenant and agree that all licenses, permits or easements authorizing the use or occupancy of the 40' railroad right-of-way will be issued only subsequent to the written approval of the Hawaii State Historic Preservation Officer and the written authorization of the Hawaii Division Administrator, Federal Highway Administration.

5. The GRANTEE further covenants and agrees that authority to use said right-of-way as above conditioned shall be by revocable permit or license except in those instances where the applicant satisfactorily demonstrates that its use of said property requires that it be given an easement granting an interest in said property. In all licenses, permits or easements the GRANTEE shall include a provision that in the event of the breach of any covenant or condition, the GRANTEE reserves the right to declare the authority to use the property terminated in whole or in part and to revest title to the State of Hawaii. Further, the GRANTEE shall include in all authorizations to use said property a provision that will revest title to the State of Hawaii in the event of abandonment or non-use by the licensee, permittee or grantee for a period to two years.

√ 6. In the event of breach of the above provided covenants, the DEPARTMENT reserves the right to declare the terms of this grant terminated in whole or in part and to revest title in the United States of America and to the control of the General Services Administration as such control existed prior to this instrument.

IN WITNESS WHEREOF, I, William B Furnier, Regional Counsel, pursuant to delegations of authority from the Secretary of Transportation, the Federal Highway Administrator, the Regional Federal Highway Administrator, and the Chief Counsel, Federal Highway Administration, by virtue of authority in me vested by law, have hereunto subscribed my name as of the day and year first above written.

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

WITNESS:

John Balchan

Harry M. Atkin

William B Furnier
Regional Counsel

STATE OF CALIFORNIA)
COUNTY OF SAN FRANCISCO)

On this 5th day of June, 1980, before me Lynne McClelland, a Notary Public in and for the State of California, personally came William B. Furnier, Regional Counsel of the Federal Highway Administration, Region IX, San Francisco, California, to me known to be the person described in and who executed the foregoing instrument and he acknowledged to me that he executed the same as Regional Counsel for the Federal Highway Administration.

In witness whereof I have hereunto set my hand and official seal this 5th day of June, 1980.

OFFICIAL SEAL
LYNNE A. MC CLELLAND
NOTARY PUBLIC - CALIFORNIA
SAN FRANCISCO COUNTY
My comm. expires APR 30, 1982

Lynne A. McClelland
Notary Public

In compliance with the conditions set forth in the foregoing grant, the STATE OF HAWAII, certifies and, by the acceptance of this grant, accepts the terms thereof and agrees for itself, its successors and assigns, forever to abide by the conditions set forth in said grant.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION

By Ryokichi Higashionna
Its Director

STATE OF HAWAII)
)
CITY AND COUNTY OF HONOLULU)

On this 24th day of June, 1980, before me appeared Ryokichi Higashionna, to me personally known, who, being by me duly sworn, did say that he is the Director of the Department of Transportation, State of Hawaii, and that the foregoing instrument was signed in behalf of said Department of Transportation, State of Hawaii, and the said Ryokichi Higashionna acknowledged said instrument to be the free act and deed of said Department.

Katsumi Uyeoka
Notary Public, State of Hawaii
My Commission expires: Dec. 17, 1983

ENCLOSURE 5

Proposed Crossing Plans

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JOB NO. WXX-XX

HONOULIULI WWTP
RAILROAD CROSSINGS

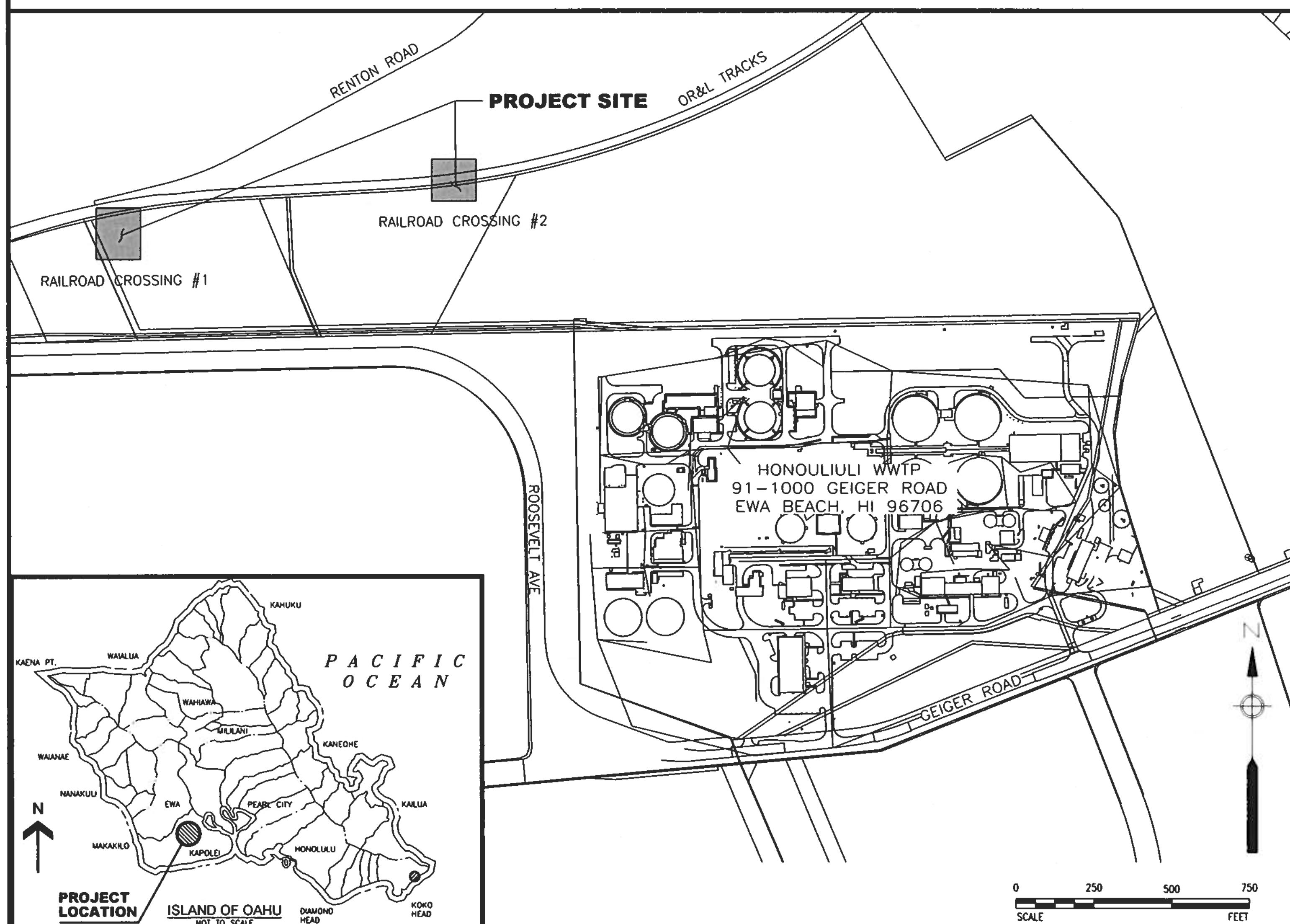
HONOULIULI, EWA, OAHU, HAWAII

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY & COUNTY OF HONOLULU

PREPARED BY:

AECOM
1001 BISHOP ST
AMERICAN SAVINGS TOWER, SUITE 1600
HONOLULU, HAWAII 96813

LOCATION MAP



INDEX OF DRAWINGS

DWG NO.	SHEET NO.	SHEET TITLE
G001	1	TITLE SHEET
G002	2	GENERAL NOTES
C001	3	ALIGNMENT AND CONTROL PLAN
C002	4	TYPICAL SECTIONS 1
C002A	5	TYPICAL SECTIONS 2
C003	6	DEMOLITION PLAN
C004	7	EROSION CONTROL PLAN
C005	8	ROADWAY PLAN
C006	9	SITE GRADING
C007	10	ROADWAY PROFILES
C008	11	CROSS SECTIONS
CS001	12	SIGNING AND STRIPING PLAN
CS002	13	GENERAL TRAFFIC PLAN AND NOTES
CS003	14	TRAFFIC CONTROL PLAN
CS500	15	EROSION CONTROL DETAILS
CS501	16	STRIPING AND MARKING STANDARD PLANS
CS502	17	ROADSIDE SIGNS AND BOLLARD DETAILS
CS503	18	RAILROAD CROSSING DETAILS
CS504	19	TRACK CROSSING PLANS

APPROVED

_______________________ DATE
ADMINISTRATOR, HIGHWAYS DIVISION
STATE DEPARTMENT OF TRANSPORTATION
(APPROVAL GRANTED FOR WORK WITHIN STATE RIGHT-OF-WAY ONLY. ID NO. ______________,
LETTER OF APPROVAL NO. HWY-O ______________
DATED ______________ .)

_______________________ DATE
DIRECTOR, DEPT OF ENVIRONMENTAL SERVICES
CITY & COUNTY OF HONOLULU

60% DRAFT - HONOULIULI WASTEWATER BASIN ODOR CONTROL PROJECT

PATH/FILENAME: S:\PROJECTS_LEGACY\USIC\WASTEWATER\60182588-HONOULIULI FAC PLAN\400 TECH INFO\436 TASK 14\HONOULIULI EASEMENTS\RAILROAD CROSSING\SHEETS\G001 TITLE SHEET.DWG
LAST UPDATE: Friday, February 08, 2019 5:18:46 PM PLOT DATE: Friday, February 15, 2019 1:37:50 PM

100% DESIGN SUBMITTAL

DRAWING G001 SHEET 1 OF 19

FILE CABINET	DRAWER	FILE	POCKET	FOLDER	NO

S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\G002 General Notes.dwg

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GENERAL CONSTRUCTION NOTES:

1. TOPOGRAPHIC AND UTILITY SURVEYS FOR THIS PROJECT WERE COMPLETED BY:
   AECOM
   1001 BISHOP STREET, SUITE 1600
   HONOLULU, HI 96813
2. DATE OF SURVEY: 8/29/2011 TO 2/16/2012 WITH ADDITIONAL SURVEY TAKEN 7/17/2012 TO 10/31/2012.
3. ALL ELEVATIONS ARE BASED ON MEAN SEA LEVEL.
4. EXCESS EXCAVATED MATERIAL SHALL BE HAULED OFF-SITE AND LEGALLY DISPOSED OF IN A SUITABLE LOCATION.
5. LOCATIONS AND ELEVATIONS OF EXISTING SITE FEATURES AND UNDERGROUND UTILITIES ARE BASED ON THE BEST AVAILABLE INFORMATION INCLUDING TOPOGRAPHIC SURVEYS AND RECORD DRAWINGS. EXACT LOCATIONS AND COMPLETENESS IS NOT GUARANTEED. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO VERIFY ALL SUCH LOCATIONS ABOVE AND BELOW THE GROUND SURFACE PRIOR TO CONSTRUCTION. DAMAGE TO EXISTING UTILITIES AS A RESULT OF CONSTRUCTION ACTIVITIES SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE. INJURY TO PERSONNEL RESULTING FROM CONTACT WITH THE EXISTING UTILITIES SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
6. WITHIN THE LIMITS INDICATED ON THE DRAWINGS, THE CONTRACTOR SHALL PROVIDE NEW PAVEMENT IN ACCORDANCE WITH THE DRAWINGS AND DETAILS. FOR ADDITIONAL REQUIREMENTS, REFER TO THE SPECIFICATIONS.
7. ALL NEW STRUCTURES AND ROADWAYS SHALL BE LOCATED BY THE COORDINATES OR DIMENSIONS GIVEN ON THE DRAWINGS.
8. EXISTING TREES, BUSHES, AND SHRUBS SHALL BE PROTECTED BY CONTRACTOR FROM ALL DAMAGE UNLESS IN DIRECT CONFLICT WITH CONSTRUCTION.
9. UNPAVED AREAS DISTURBED BY THE CONTRACTOR SHALL BE CLEARED AND GRUBBED IF REQUIRED, AND RESTORED WITH LOAM AND SEED.
10. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND VERIFYING THE ACCURACY OF ALL BENCHMARK ELEVATIONS.
11. EXCAVATION OF ANY TYPE SHALL BE ACCOMPLISHED IN SUCH A MANNER THAT UNDERGROUND UTILITIES OR STRUCTURES ARE NOT DAMAGED. ALL ROADWAYS, PARKING AREAS, SIDEWALKS, AND OTHER STRUCTURES DISTURBED BY CONSTRUCTION IN OR OUTSIDE THE PROJECT AREA SHALL BE RETURNED TO THEIR ORIGINAL CONDITION OR BETTER. ALL COSTS RELATED TO THE RELOCATION AND REPAIR OF DAMAGED UTILITIES AND SITE FEATURES SHALL BE BORNE BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL COST FOR THE REMOVAL AND DISPOSAL OF ALL DEBRIS.
12. THE CONTRACTOR SHALL NOTIFY THE OFFICER IN CHARGE OF ANY DISCREPANCIES BETWEEN PLAN AND FIELD CONDITIONS PROMPTLY UPON DISCOVERY. ANY CONFLICT OR DISCREPANCIES WITHIN THE CONSTRUCTION PLANS SHALL BE REPORTED IMMEDIATELY TO THE OFFICER IN CHARGE FOR CLARIFICATION. FAILURE TO DO SO SHALL RESULT IN CONTRACTOR'S LIABILITY FOR ISSUES ARISING FROM SUCH CONFLICTS OR DISCREPANCIES.
13. UNLESS RELOATION IS CALLED FOR ON THE PLANS, EXISTING UTILITIES SHALL REMAIN IN SERVICE AND IN PLACE. IF RELOCATION OF EXISTING UTILITIES IS REQUIRED FOR THE CONTRACTOR'S CONVENIENCE, INTERRUPTION OF SERVICE SHALL BE KEPT TO A MINIMUM AND A WRITTEN REQUEST FOR SHUTDOWN SHALL BE SUBMITTED FOR APPROVAL AT LEAST 7 CALENDAR DAYS IN ADVANCE OF THE PROPOSED SHUTDOWN DATE. SHUTDOWNS SHALL BE DONE AT THE CONTRACTOR'S EXPENSE AND ONLY WITH THE APPROVAL OF THE OFFICER IN CHARGE.
14. THE CONTRACTOR SHALL ERECT EROSION CONTROL CHECKS PRIOR TO COMMENCING ANY EXCAVATION OR STORAGE OF BACKFILL MATERIAL ON-SITE. REFER TO SPECIFICATIONS AND DETAILS.
15. ALL AREAS OF EXCAVATION, BACKFILL, FILL AND GRADING SHALL BE RETURNED TO THE ORIGINAL GRADE UNLESS OTHERWISE SHOWN ON THE DRAWINGS.
16. THE CONTRACTOR SHALL RESTORE TO ITS ORIGINAL CONDITION ALL IMPROVEMENTS DAMAGED AS A RESULT OF CONSTRUCTION, INCLUDING PAVEMENTS, EMBANKMENTS, CURBS, SIGNS, LANDSCAPING, STRUCTURES, UTILITIES, WALLS, FENCES, ETC. UNLESS PROVIDED FOR SPECIFICALLY IN THE PROPOSAL, DEMOLITION AND RESTORATION OF EXISTING ITEMS SHALL BE INCIDENTAL TO THE VARIOUS CONTRACT ITEMS.
17. THE EXISTING IMPROVEMENTS ON THE PREMISES, AND IN ADJACENT AREAS, THAT ARE NOT TO BE REMOVED, SHALL BE PRESERVED AND PROTECTED. ANY AND ALL DAMAGES RESULTING FROM THE CONTRACTOR'S CONSTRUCTION OPERATIONS SHALL BE REPLACED AND REPAIRED TO ORIGINAL CONDITION, TO THE SATISFACTION OF THE OWNER AND PAID FOR BY THE CONTRACTOR.
18. NO CONTRACTOR SHALL PERFORM ANY CONSTRUCTION OPERATION SO AS TO CAUSE ROCKS, SOIL, OR DEBRIS IN ANY FORM TO FALL, SLIDE, OR FLOW INTOR EXISTING CITY DRAINAGE SYSTEMS, OR ADJOINING PROPERTIES, STREETS, OR NATURAL WATERCOURSES. SHOULD SUCH VIOLATIONS OCCUR, THE CONTRACTOR MAY BE CITED AND THE CONTRACTOR SHALL IMMEDIATELY MAKE ALL REMEDIAL ACTIONS NECESSARY.
19. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES AND SHALL PROVIDE ALL NECESSARY CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE AND STRENGTH TO PREVENT ACCESS TO ALL OPEN EXCAVATIONS AT THE COMPLETION OF EACH DAY'S WORK. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
20. STOCKPILING OF CONSTRUCTION MATERIALS WITHIN 100 FT. OF WETLANDS IS PROHIBITED.
21. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS SHOWN ON THE PLANS FOR ALL STRUCTURES AS WELL AS ALL UTILITY LOCATIONS ENSURING THERE ARE NO CONFLICTS.
22. NOTIFY THE OFFICER IN CHARGE 7 CALENDAR DAYS PRIOR TO BEGINNING OF CONSTRUCTION.
23. CONTRACTOR TO INSTALL TRAFFIC RATED STEEL COVER PLATES TO PROTECT TRENCH AREAS LEFT OPEN AT THE END OF EACH WORK DAY.

GENERAL CONSTRUCTION NOTES (CONT'D):

24. ALL CONSTRUCTION MUST CONFORM TO ENGINEERS' STANDARDS AND SPECIFICATIONS.
25. ALL CONSTRUCTION VEHICLES SHALL PARK IN AREAS DESIGNATED BY THE OFFICER IN CHARGE.
26. THE INFORMATION PROVIDED IN THESE PLANS IS SOLELY TO ASSIST THE CONTRACTOR IN ACCESSING THE NATURE AND EXTENT OF CONDITIONS WHICH WILL BE ENCOUNTERED DURING THE COURSE OF WORK. ALL CONTRACTORS ARE DIRECTED PRIOR TO BIDDING TO CONDUCT WHATEVER INVESTIGATION THEY MAY DEEM NECESSARY TO ARRIVE AT THEIR OWN CONCLUSION REGARDING THE ACTUAL CONDITIONS THAT WILL BE ENCOUNTERED AND UPON WHICH THEIR BIDS WILL BE BASED.
27. THE CONTRACTOR'S WORKING HOURS SHALL BE MONDAY THRU FRIDAY FROM 8:30 AM TO 3:30 PM UNLESS OTHERWISE APPROVED BY THE OFFICER IN CHARGE.
28. THE CONTRACTOR SHALL COVER STOCK PILES WITH VISQUEEN OR APPROVED SUBSTITUTE FOR EROSION AND DUST CONTROL.
29. THE GENERAL CONTRACTOR/DEVELOPER/OWNER OF THE PROJECT SHALL BE RESPONSIBLE FOR CONFORMANCE WITH APPLICABLE PROVISIONS OF THE HAWAII ADMINISTRATIVE RULES, TITLE 11, CHAPTER 54, "WATER QUALITY STANDARDS," AND TITLE 11, CHAPTER 55, "WATER POLLUTION CONTROL."

    IN ACCORDANCE WITH STATE LAW, ALL DISCHARGES RELATED TO PROJECT CONSTRUCTION OR OPERATIONS ARE REQUIRED TO COMPLY WITH STATE WATER QUALITY STANDARDS (HAWAII ADMINISTRATIVE RULES, CHAPTER 11-54). BEST MANAGEMENT PRACTICES SHALL BE USED TO MINIMIZE OR PREVENT THE DISCHARGE OF SEDIMENT, DEBRIS, AND OTHER POLLUTANTS TO STATE WATERS. PERMIT COVERAGE IS AVAILABLE FROM THE DEPARTMENT OF HEALTH, CLEAN WATER BRANCH AT HTTP://HEALTH.HAWAII.GOV/CWB. THE OWNER/DEVELOPER/CONTRACTOR IS RESPONSIBLE FOR OBTAINING OTHER FEDERAL, STATE, OR LOCAL AUTHORIZATIONS AS REQUIRED BY LAW.
30. PURSUANT TO CHAPTER 6E, HRS, IN THE EVENT ANY ARTIFACTS OR HUMAN REMAINS ARE UNCOVERED DURING CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL IMMEDIATELY SUSPEND WORK AND NOTIFY THE HONOLULU POLICE DEPARTMENT, THE STATE DEPARTMENT OF LAND AND NATURAL RESOURCES-HISTORIC PRESERVATION DIVISION (808 692-8015). IN ADDITION, THE CONTRACTOR SHALL NOTIFY THE RESPONSIBLE CITY AGENT.
31. EQUIPMENT AND MATERIALS SHALL BE STORED IN AREAS SECURED BY THE CONTRACTOR. CONSTRUCTION AND STORAGE AREAS SHALL BE KEPT NEAT AND CLEAN.
32. CONTRACTOR TO VERIFY THE ELEVATIONS OF ALL TIE-IN POINTS FOR INSTALLATION OF UTILITIES, CURB & GUTTER AND PAVING.
33. ALL EXISTING ELECTRICAL BOXES, WATER METER BOXES, AND VALVE BOXES, WHICH ARE TO REMAIN SHALL BE SET FLUSH WITH THE TOP OF THE PROPOSED GRADE.
34. AREAS INTENDED TO SUPPORT PAVEMENT OR NEW FILL SHALL BE PROOFROLLED WITH A 20 TO 30 TON LOADED TRUCK OR OTHER PNEUMATIC-TIRED VEHICLE OF SIMILAR SIZE AND WEIGHT IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER TO LOCATE WEAK, SOFT OR EXCESSIVELY WET MATERIALS. AREAS WHICH PUMP WHILE PROOFROLLED SHALL BE UNDERCUT AND BACK-FILLED IN ACCORDANCE WITH SPECIFICATIONS.
35. THE CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS TO THE OFFICER IN CHARGE UPON COMPLETION OF CONSTRUCTION.
36. ALL APPLICABLE CONSTRUCTION WORK SHALL BE DONE IN ACCORDANCE WITH THE "STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION," SEPTEMBER 1984, AS AMENDED, AND THE "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION," SEPTEMBER 1986, OF THE CITY AND COUNTY OF HONOLULU DEPARTMENT OF PUBLIC WORKS, AND THE REVISED ORDINANCES OF HONOLULU, 1990, AS AMENDED.
37. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY CONSTRUCTION PERMITS.
38. THE CONTRACTOR SHALL PROVIDE ACCESS TO AND FROM DRIVEWAYS AND PUBLIC STREETS AT ALL TIMES.
39. ALL EXISTING UTILITIES SHALL BE PROTECTED AT ALL TIMES BY THE CONTRACTOR DURING CONSTRUCTION, AND ANY DAMAGE TO THEM SHALL BE REPAIRED AND PAID FOR BY THE CONTRACTOR.

BEST MANAGEMENT PRACTICES (BMP) NOTES MINIMUM:

DURING CONSTRUCTION

1. DURING CONSTRUCTION, DUST POLLUTION SHALL BE KEPT TO A MINIMUM.
2. EXCAVATED MATERIAL THAT WILL BE USED FOR BACKFILL SHALL BE PLACED ADJACENT TO THE OPEN ROADWAY. IN THE EVENT OF A RAIN STORM, THE MATERIAL SHALL BE COVERED TO MINIMIZE SEDIMENT RUNOFF.
3. THE CONTRACTOR SHALL ENSURE THAT ALL TIRES OF CONSTRUCTION VEHICLES ARE SUFFICIENTLY CLEANED OFF SO THAT DIRT OR DEBRIS IS NOT TRACKED OFF THE CONSTRUCTION SITE. WASHING OFF TIRES WITH WATER WILL NOT BE ACCEPTABLE UNLESS THE RUNOFF IS CONTAINED.

POST-CONSTRUCTION

1. THE CONSTRUCTION AREA SHALL BE CLEARED OF ALL TRASH AND DEBRIS.
2. ALL MOBILIZED EQUIPMENT SHALL BE REMOVED.
3. EXCESS EXCAVATED MATERIAL NOT UTILIZED FOR BACKFILL SHALL BE REMOVED AND DISPOSED OF IN ACCORDANCE WITH THE CITY & COUNTY REGULATIONS.

MECHANICAL/ELECTRICAL DESIGN AND ENGINEERING DIVISION NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES TO THE EXISTING STREET LIGHTING FACILITIES. ANY AND ALL DAMAGES TO THESE FACILITIES SHALL BE REPAIRED AND PAID FOR BY THE CONTRACTOR IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY AND COUNTY OF HONOLULU.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES TO THE CITY'S EXISTING COMMUNICATIONS FIBER OPTIC CABLE SYSTEM. ANY AND ALL DAMAGES TO THESE FACILITIES SHALL BE REPAIRED AND PAID FOR BY THE CONTRACTOR IN ACCORDANCE WITH HE REQUIREMENTS OF THE CITY AND COUNTY OF HONOLULU.

CLEARING NOTES:

1. UTILITIES MAY EXIST WHICH ARE NOT SHOWN ON THE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING ALL UTILITY COMPANIES HAVING UTILITIES WITHIN OR ADJACENT TO THE WORK AREA. THE CONTRACTOR SHALL HAVE THE UTILITIES FIELD LOCATED AND COORDINATE WITH UTILITY COMPANIES TO HAVE THEM RELOCATED AND/OR ADAPTED. CONTRACTOR SHALL NOT DISTURB ANY UTILITY WITHOUT THE PRIOR APPROVAL OF IT'S OWNER.
2. CONTRACTOR SHALL CLEARLY MARK AND MAINTAIN MONUMENTATION AND BENCHMARKS WHENEVER POSSIBLE AND WILL BE RESPONSIBLE FOR THE COST OF REPLACING THEM IF DISTURBED OR DESTROYED.
3. ALL VEGETATION (UNLESS OTHERWISE NOTED), EXISTING ASPHALT PAVEMENT, ORGANICS AND UNSUITABLE BEARING SOILS SHALL BE STRIPPED FROM THE SURFACE WITHIN THE CONSTRUCTION LIMITS AND DISPOSED OF LEGALLY OFFSITE.
4. THE CONTRACTOR SHALL LEAVE THE SITE IN A CLEAN AND NEAT CONDITION. ALL DEBRIS AND VEGETATION WHICH HAS BEEN REMOVED; LUMBER, CONCRETE, ETC., SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF.
5. CONTRACTOR SHALL HAVE THE LIMITS OF CLEARING AND ALL BUFFERS STAKED WITH FLAGGING STRUNG AT CLEARING LIMITS TO INSURE THE PROPER LOCATION OF TREE SAVE FENCE AND PROPOSED IMPROVEMENTS.
6. ALL VEGETATION, ROOT SYSTEMS, TOPSOIL, REFUSE AND OTHER DELETERIOUS, NON-SOIL MATERIAL SHALL BE STRIPPED FROM THE PROPOSED CONSTRUCTION AREAS. CLEAN TOPSOIL MAY BE STOCKPILED AND REUSED IMMEDIATELY AFTER THE TRENCH HAS BEEN BACK FILLED OR LATER IN LANDSCAPED AREAS.

PUBLIC HEALTH, SAFETY, AND CONVENIENCE NOTES:

1. THE CONTRACTOR SHALL OBSERVE AND COMPLY WITH ALL FEDERAL, STATE, AND LOCAL LAWS REQUIRED FOR THE PROTECTION OF PUBLIC HEALTH AND SAFETY AND ENVIRONMENTAL QUALITY.
2. THE CONTRACTOR, AT HIS OWN EXPENSE, SHALL KEEP THE PROJECT AND ITS SURROUNDING AREAS FREE FROM DUST NUISANCE. THE WORK SHALL BE IN CONFORMANCE WITH THE AIR POLLUTION STANDARDS AND REGULATIONS OF THE STATE DEPARTMENT OF HEALTH. THE CITY AND COUNTY OF HONOLULU MAY REQUIRE SUPPLEMENTARY MEASURES AS NECESSARY.

PUBLIC HEALTH, SAFETY, AND CONVENIENCE NOTES:

1. COORDINATE WITH ISLAND ENERGY SERVICES (SEE IES GUIDELINES)

COORDINATION WITH OTHER PROJECTS:

1. THE CONTRACTOR SHALL COORDINATE WITH THE STATE OF HAWAII DOT HIGHWAYS DIVISION LEEWARD BIKEWAY PROJECT NO. STP-0300(8)

LEGEND:

EXISTING FUEL —— F ——

ABBREVIATIONS

AC.	ACRES	MAX	MAXIMUM
AC, A.C.	ASPHALT CONCRETE	MECH	MECHANICAL
APPROX	APPROXIMATELY	MID	MID-POINT OF CURVE
ARA	AMERICAN RAILWAY ASSOCIATION	MIN	MINIMUM
AREMA	AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION	MISC	MISCELLANEOUS
CF	CUBIC FEET	MON	MONUMENT
℄	CENTERLINE	N	NORTHING
CONC	CONCRETE	NTS	NOT TO SCALE
CY	CUBIC YARD	OFF, O/S	OFFSET
Δ	CURVE CENTRAL ANGLE	OC	ON CENTER
DEMO	DEMOLISH	PC	POINT OF CURVATURE
DIA	DIAMETER	PCC	POINT OF COMPOUND CURVATURE
DIST	DISTANCE	PGL	PROFILE GRADE LINE
DWG(S)	DRAWING(S)	PI	POINT OF INTERSECTION
E	EASTING	PP	POWER POLE
EA	EACH	PT	POINT OF TANGENCY
ECR	EROSION CONTROL ROLL	PVC	POLYVINYL CHLORIDE
EG	EXISTING GROUND	PVI	POINT OF VERTICAL INTERSECTION
ELEC	ELECTRIC, ELECTRICAL	PVMT	PAVEMENT
EL, ELEV	ELEVATION	R	RADIUS
EP	ALIGNMENT END	RD	ROAD
EP	EDGE OF PAVEMENT	REINF	REINFORCEMENT
EXC	EXCAVATION	REF	REFERENCE
EXP	EXPANSION	RPM	RAISED PAVEMENT MARKERS
EX, EXST, EXIST	EXISTING	RT	RIGHT
FH	FIRE HYDRANT	ROW	RIGHT OF WAY
FT	FEET	SHT(S)	SHEETS
GALV	GALVANAIZED	SPECS	SPECIFICATIONS
GP	GATE POST	S	SOUTHING
GRVL	GRAVEL	STA	STATION
GUY	GUY WIRE ANCHOR	STD	STANDARD
GV	GATE VALVE	STL	STEEL
H	HEIGHT	ST	STREET
HOR	HORIZONTAL	SQ	SQUARE
IN	INCH(ES)	TCP	TRAFFIC CONTROL PLAN
INV	INVERT	TF	TOTAL FEET
K	CURVE K VALUE	TP	TELEPHONE POLE
L	LENGTH	TYP	TYPICAL
LC	LENGTH OF CURVE	UOA	USE OF OCCUPANCY AGREEMENT
LF	LINEAR FEET	UP	UTILITY POLE
LVC	LENGTH OF VERTICAL CURVE	WM	WATER MAIN
MAINT	MAINTENANCE	WV	WATER VALVE

REVISION	DATE	BRIEF	BY	APPROVED

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION

SIGNATURE

4/30/20
EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM:
GENERAL NOTES

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:

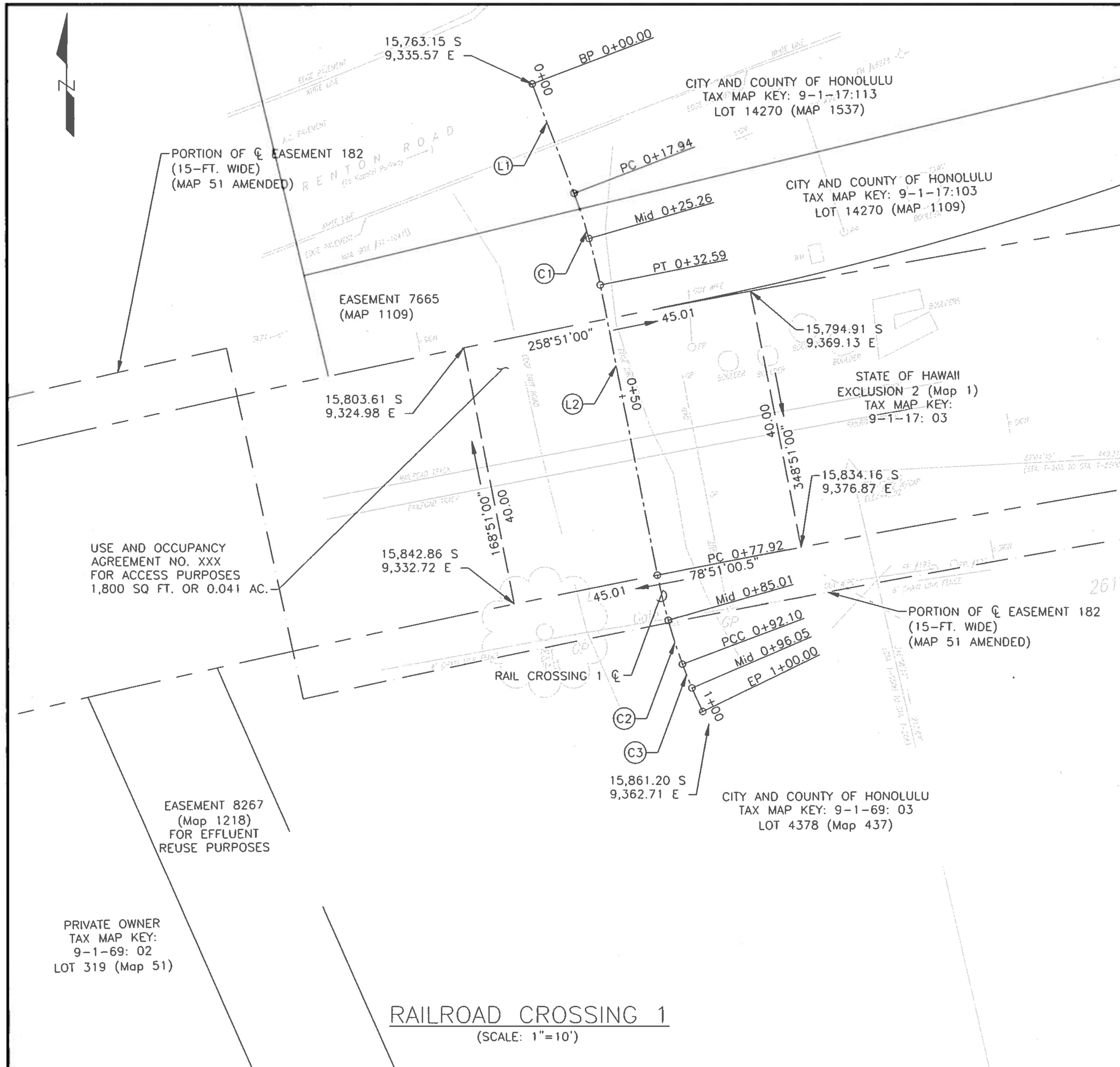
CHIEF
DATE

100% DESIGN SUBMITTAL

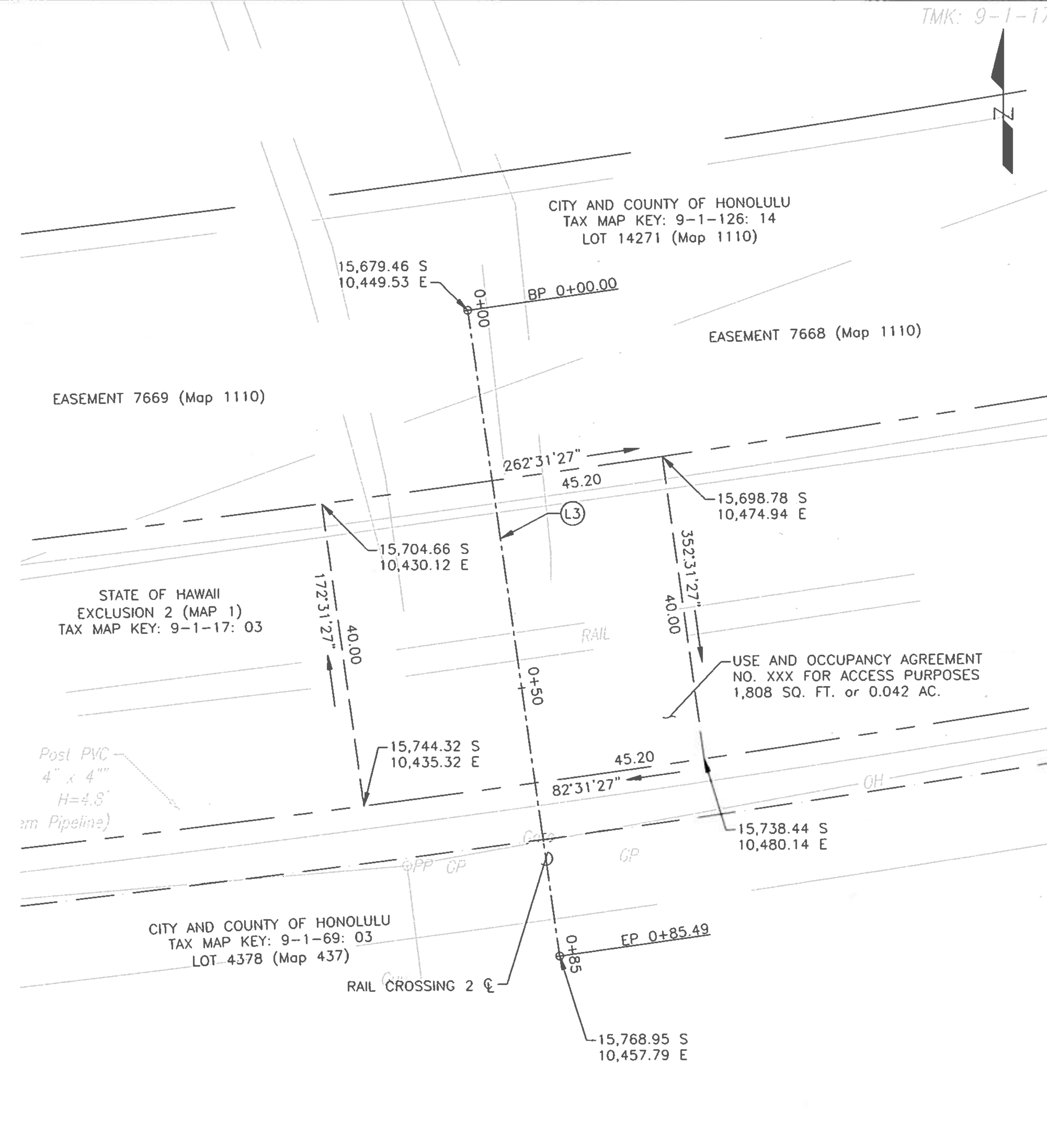
DRAWING G002

SHEET 2 OF 19

FILE	POCKET	FOLDER	NO.



RAILROAD CROSSING 1
(SCALE: 1"=10')



RAILROAD CROSSING 2
(SCALE: 1"=10')

Railroad Crossing 1					
ID	R	Length or Chord	Azimuth	Lc	Δ
L1		17.94'	339°04'50"		
C1	86.00'	14.64'	343°57'40"	14.66'	9°46'00"
L2		45.33'	348°50'40"		
C2	86.00'	14.16'	344°07'20"	14.18'	9°26'40"
C3	86.00'	7.90'	336°46'00"	7.90'	5°16'00"

Railroad Crossing 2					
ID	R	Length or Chord	Azimuth	Lc	Δ
L3		85.49'	352°20'30"		

NOTES:
1. ORIGIN OF AZIMUTH: "KAPUAI NEW" △
2. COORDINATES REFERRED TO "KAPUAI NEW" △
3. UOA NO. XXX FOR ACCESS PURPOSES IN FAVOR OF THE CITY & COUNTY OF HONOLULU = 1,808 SQ. FT.

0 10 20 Feet

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SIGNATURE
4/30/20
EXPIRATION DATE OF THE LICENSE

REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: ALIGNMENT AND CONTROL PLAN

DESIGNED BY: DI
CHECKED BY: JH
DRAWN BY: DI
SECTION HEAD:
APPROVED:
BRANCH HEAD:
CHIEF
DATE

S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C001 Alignment and Control Plan.dwg

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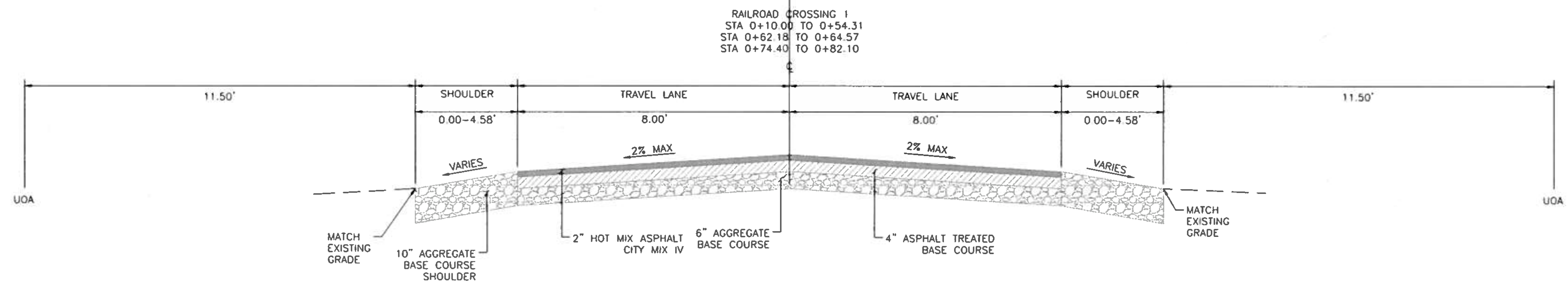
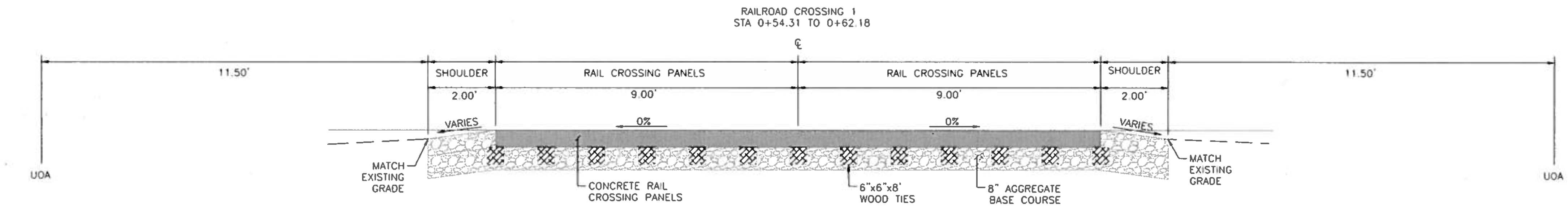
DRAWING C001 SHEET 3 OF 19

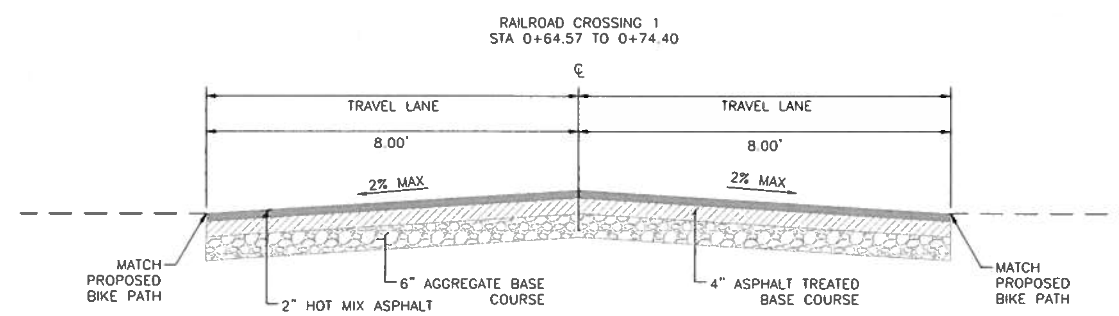
FILE	POCKET	FOLDER	NO.



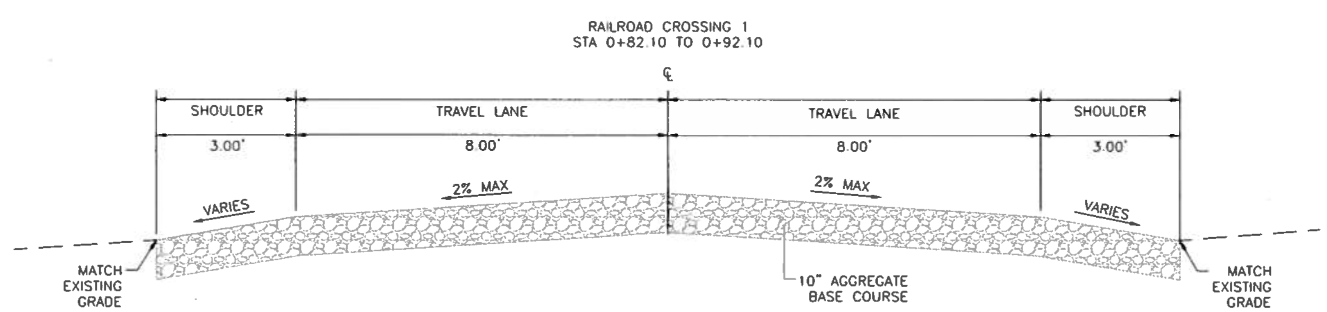
TYPICAL SECTIONS – ROADWAY



TYPICAL SECTIONS – RAIL CROSSING PANELS



TYPICAL SECTIONS – ROADWAY @ BIKE PATH CROSSING



TYPICAL SECTIONS – GRAVEL TRANSITION

NOTES:

1. CREATE SMOOTH TRANSITION FROM ROADWAY CROWN TO RAIL CROSSING PANELS
2. PROPOSED BIKE PATH BY OTHERS. SEE GENERAL NOTES.

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SIGNATURE

4/30/20
EXPIRATION DATE OF THE LICENSE

REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: TYPICAL SECTIONS RAILROAD CROSSING 1

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:
CHIEF
DATE

DRAWING C002 SHEET 4 OF 19

FILE	POCKET	FOLDER	NO

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S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C002 – Typical Sections.dwg

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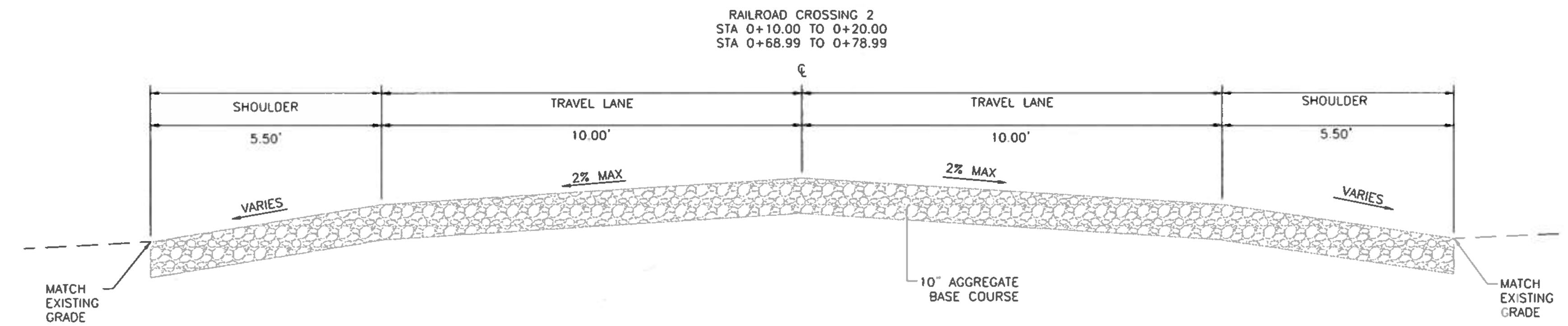
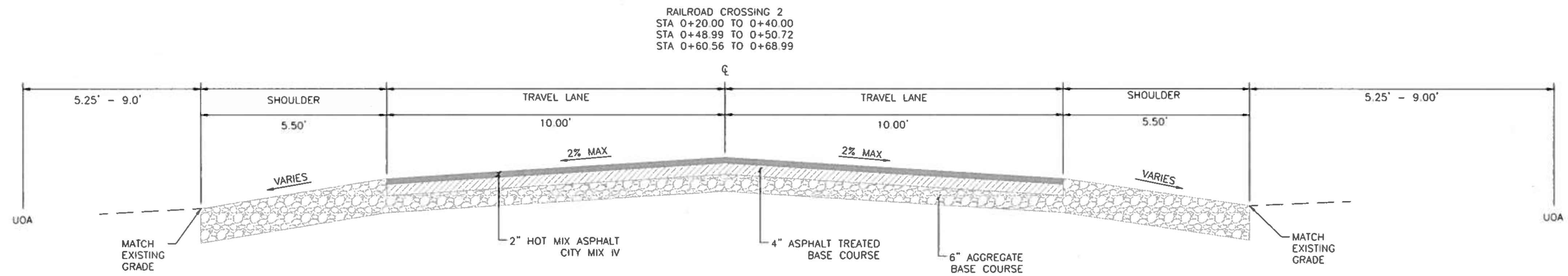
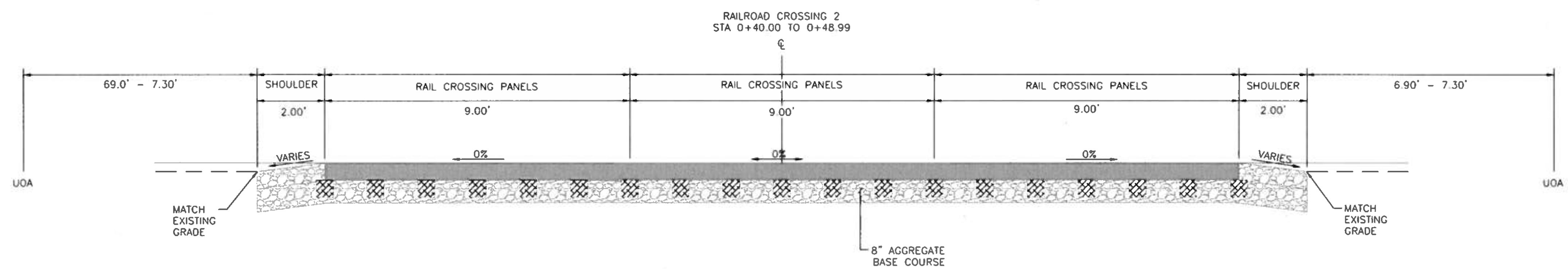


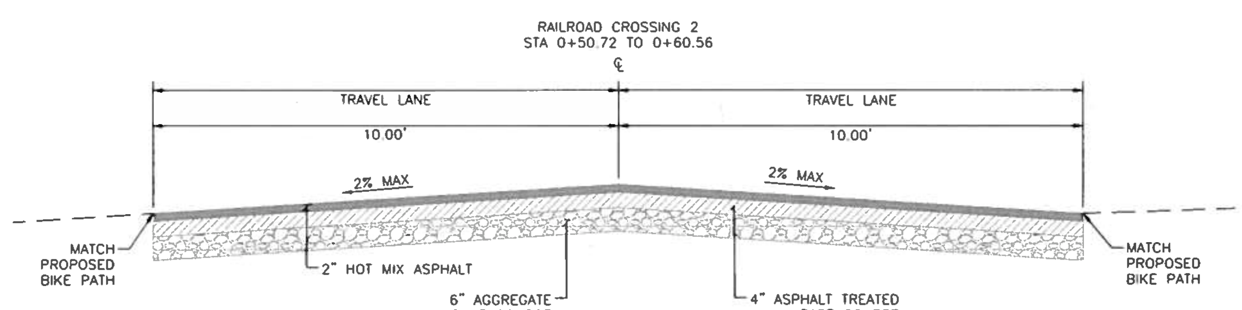
TYPICAL SECTIONS – GRAVEL TRANSITION



TYPICAL SECTIONS – ROADWAY



TYPICAL SECTIONS – RAIL CROSSING PANELS



TYPICAL SECTIONS – ROADWAY @ BIKE PATH CROSSING

NOTES:

1. CREATE SMOOTH TRANSITION FROM ROADWAY CROWN TO RAIL CROSSING PANELS
2. PROPOSED BIKE PATH BY OTHERS. SEE GENERAL NOTES.

REVISION	DATE	BRIEF	BY	APPROVED

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

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SIGNATURE ____ 4/30/20 EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT RAILROAD CROSSINGS

ITEM: TYPICAL SECTIONS RAILROAD CROSSING 2

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:
CHIEF
DATE

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DRAWING C002A

FILE	POCKET	FOLDER	NO.

S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C003 Demolition Plan.dwg

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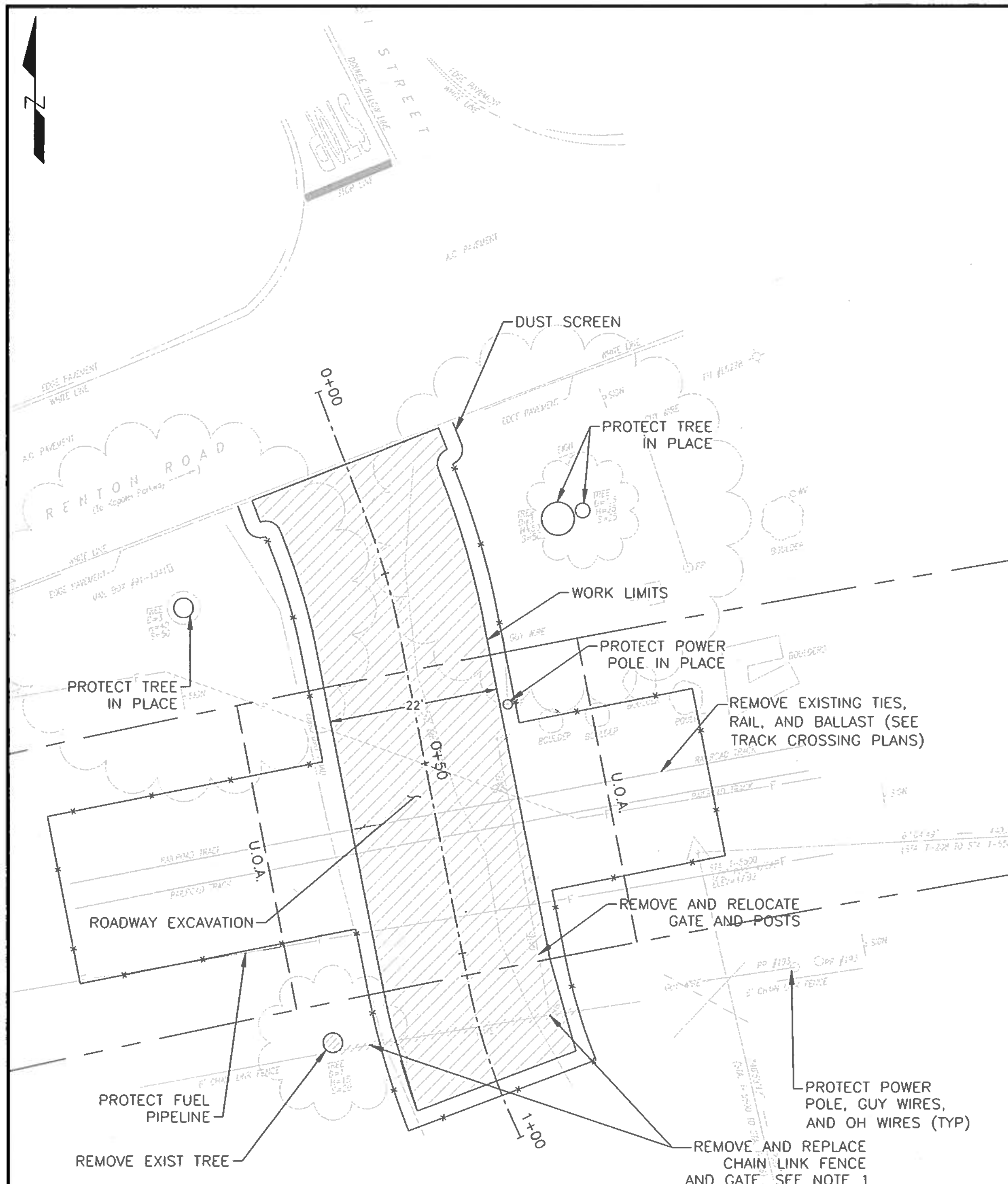
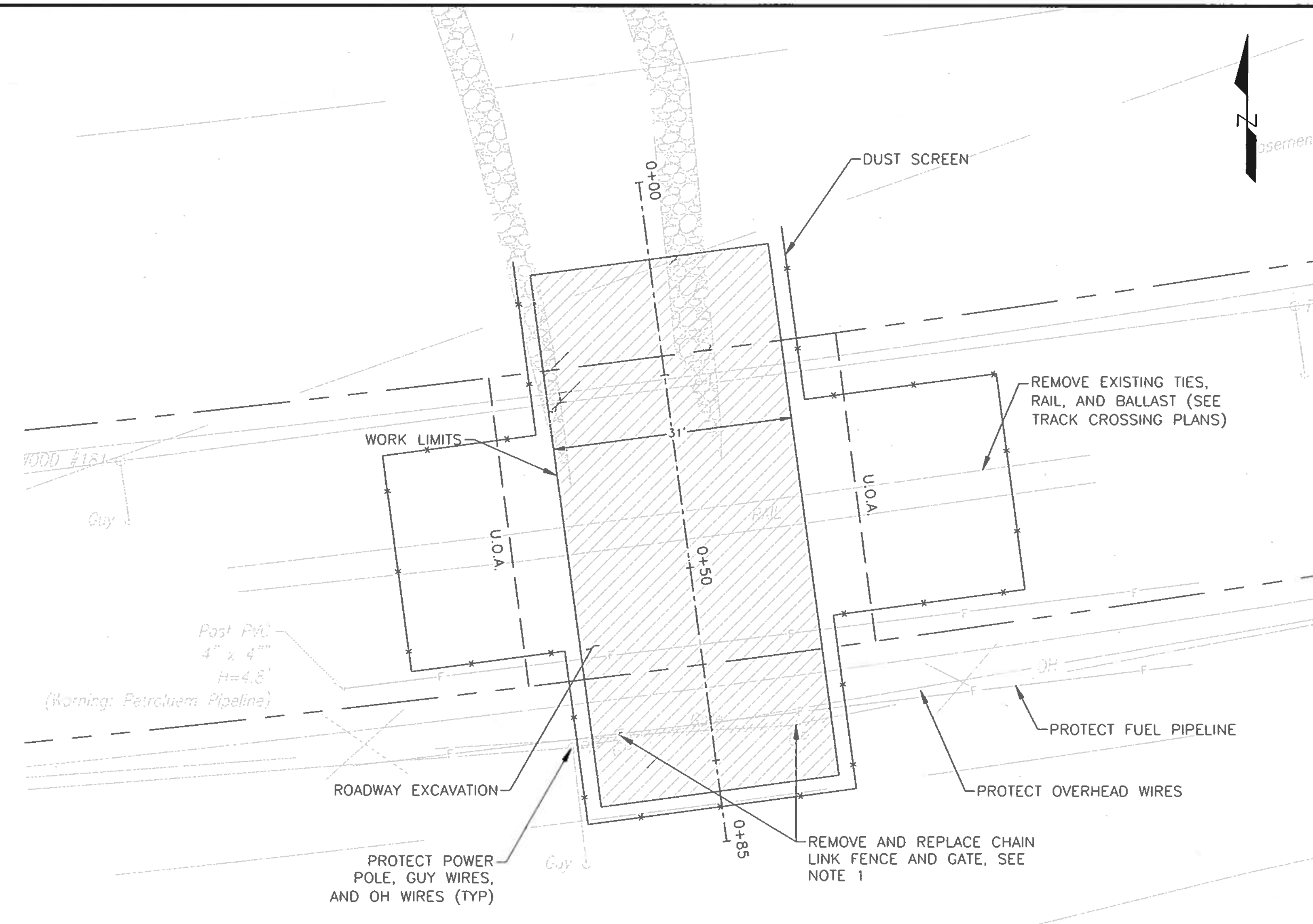


RAILROAD CROSSING 1
(SCALE: 1"=10')



RAILROAD CROSSING 2
(SCALE: 1"=10')

0 10 20 Feet

NOTES:

1. REMOVE EXISTING CHAIN LINK FENCE AND GATE AS REQUIRED PRIOR TO THE WORK. PROTECT FENCING DURING CONSTRUCTION AND REPLACE THE SAME CHAIN LINK FENCE AND GATE AFTER THE WORK IS COMPLETED.

2. CONTRACTOR TO COORDINATE WITH AND PROVIDE ACESS CELL TOWER OPERATOR AT RAIL CROSSING 1.

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SIGNATURE

4/30/20
EXPIRATION DATE OF THE LICENSE

REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: DEMOLITION PLAN

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:
CHIEF
DATE

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DRAWING C003 SHEET 6 OF 19

FILE	POCKET	FOLDER	NO.

S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C004 Erosion Control Plan.dwg

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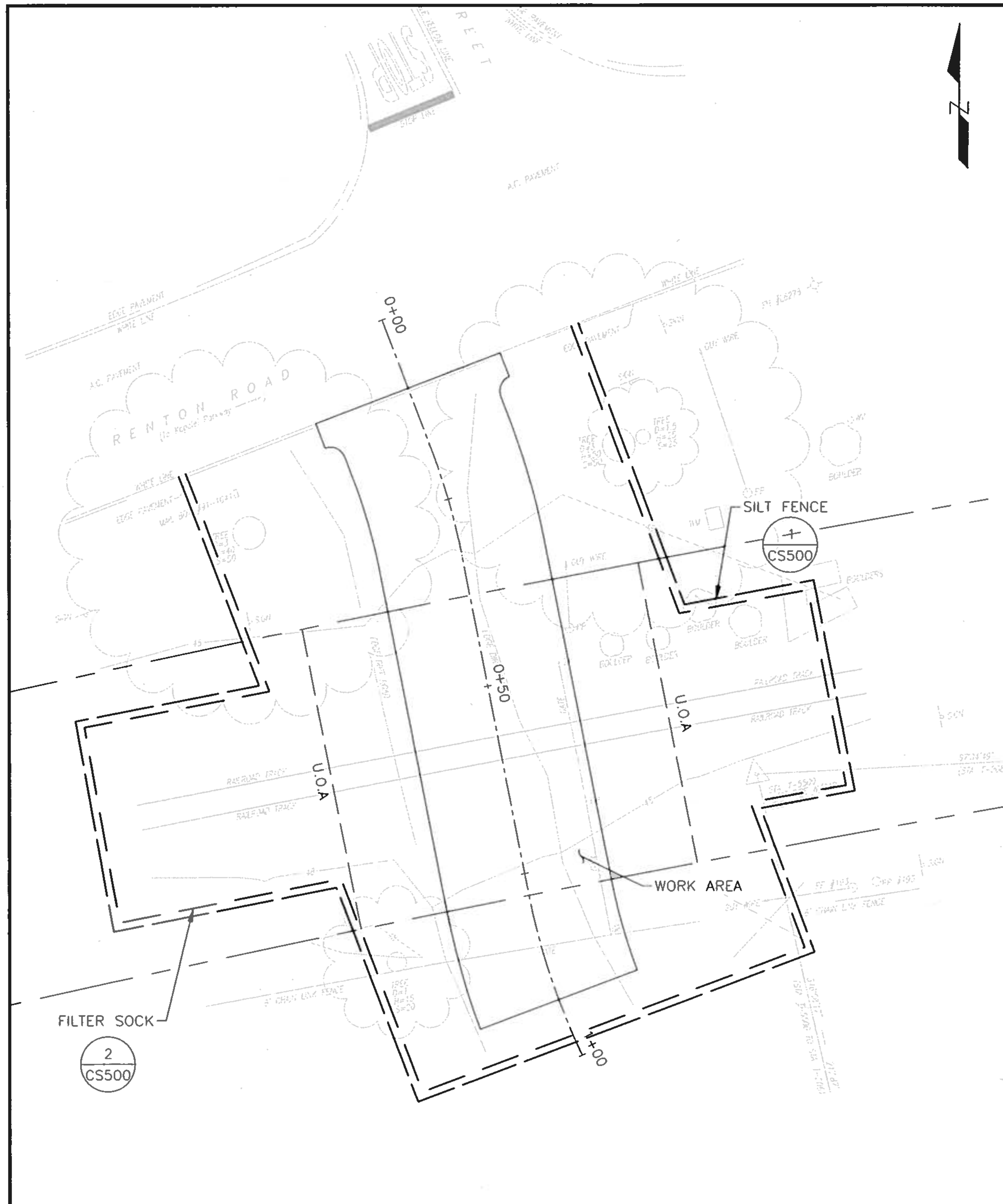
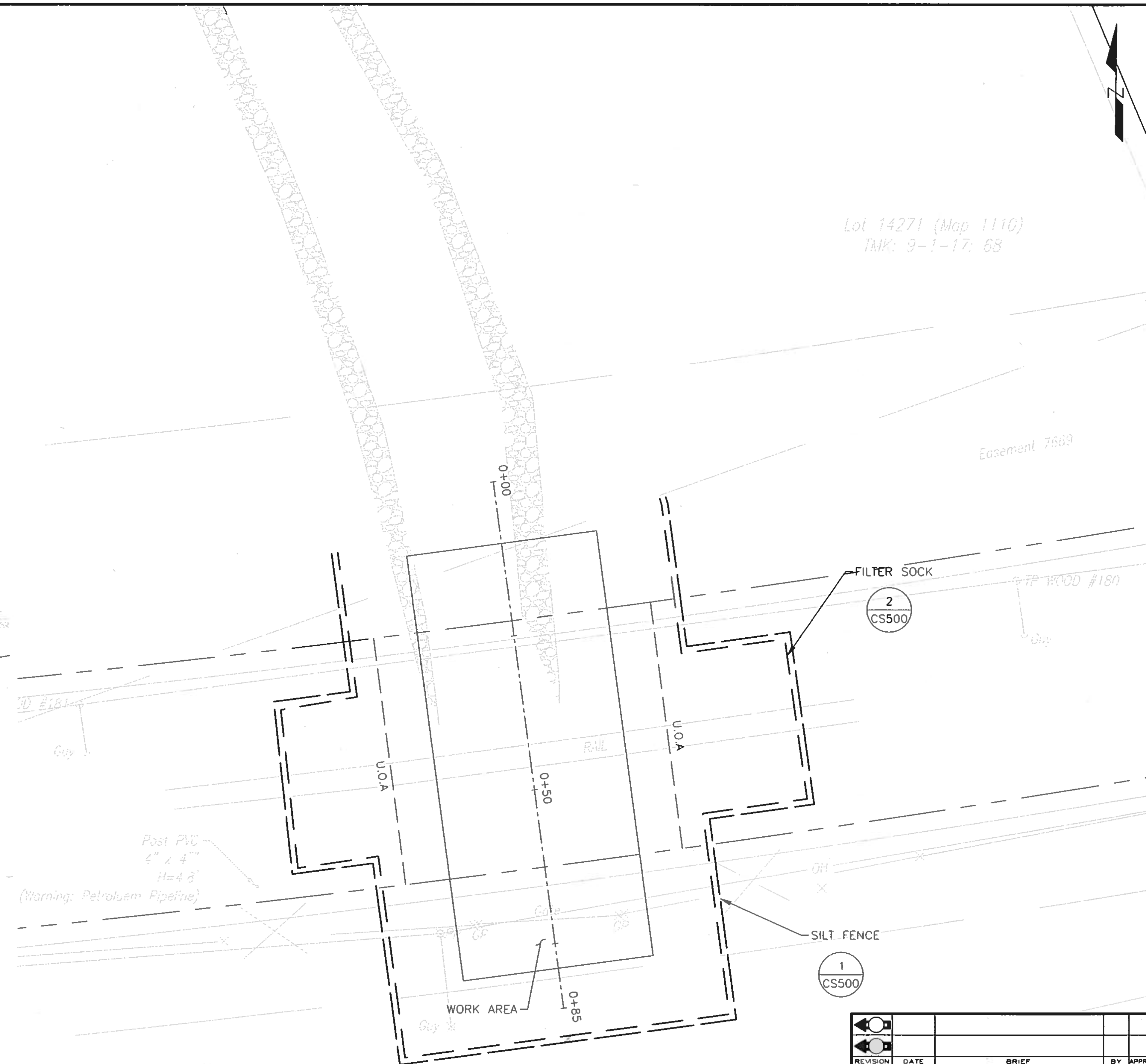


RAILROAD CROSSING 1
(SCALE: 1"=10')



RAILROAD CROSSING 2
(SCALE: 1"=10')

0 10 20 Feet

REVISION	DATE	BRIEF	BY	APPROVED

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LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

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SIGNATURE

4/30/20
EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM:
EROSION CONTROL PLAN

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:

CHIEF
DATE

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DRAWING C004 SHEET 7 OF 19

FILE	POCKET	FOLDER	NO.

S:\Projects_Legacy\USG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C005 Roadway Plan.dwg

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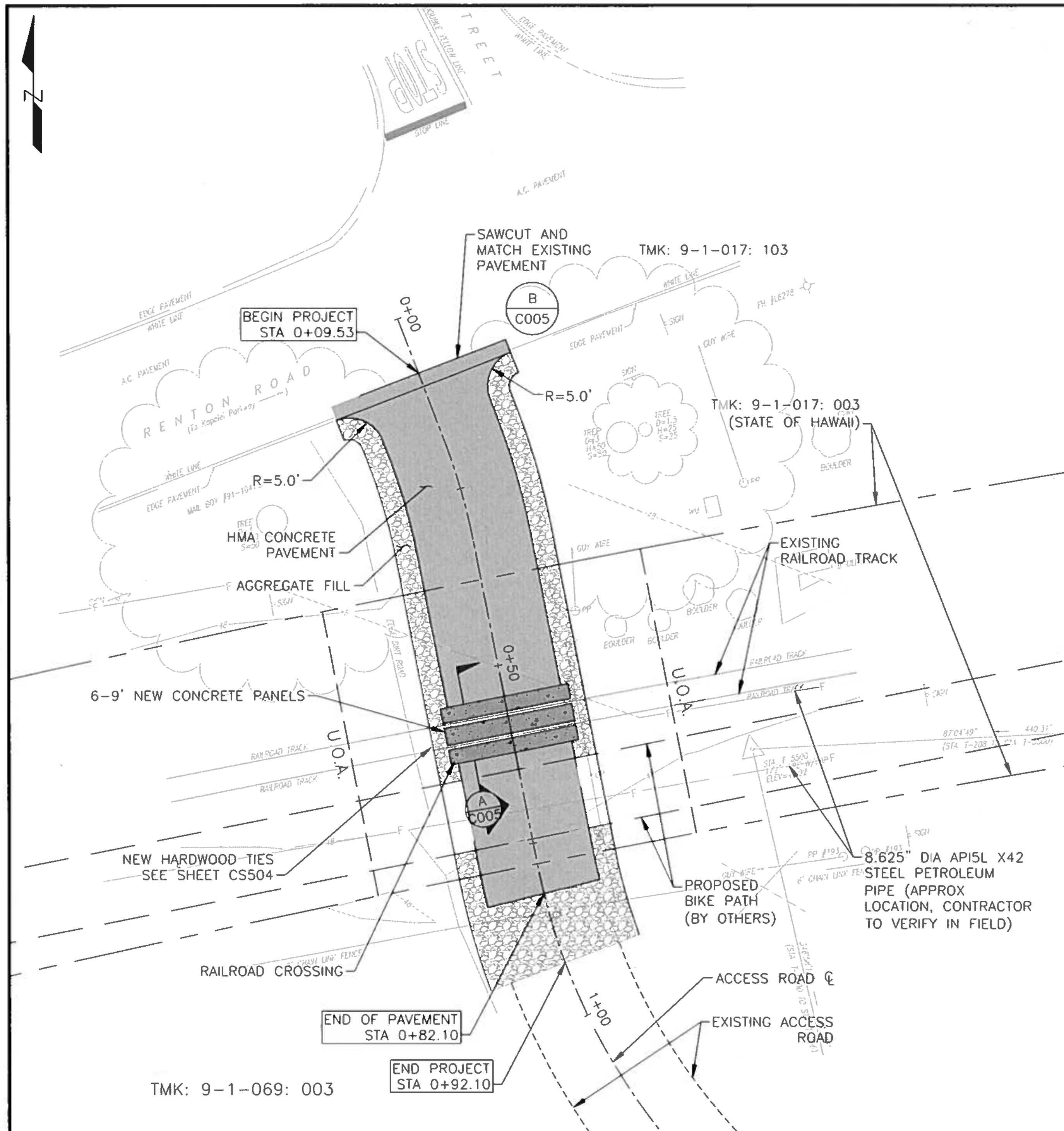
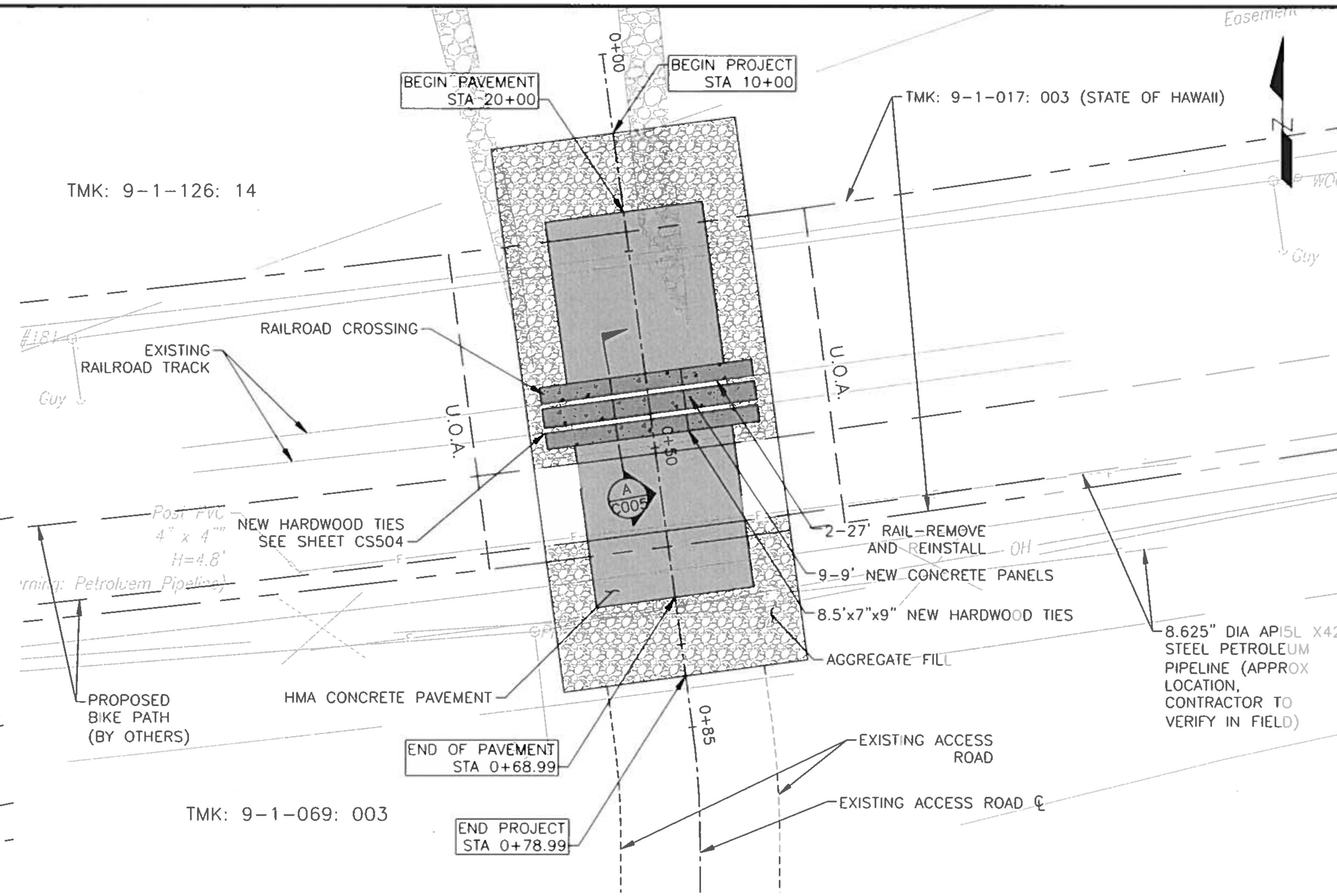


RAILROAD CROSSING 1
(SCALE: 1"=10')



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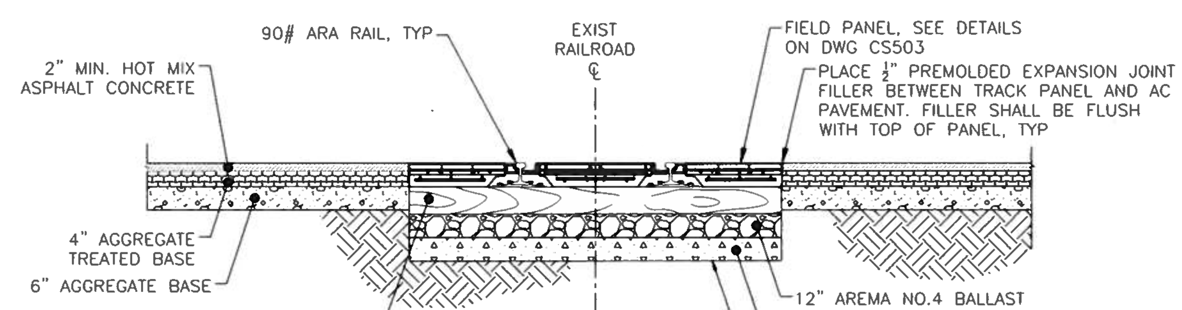
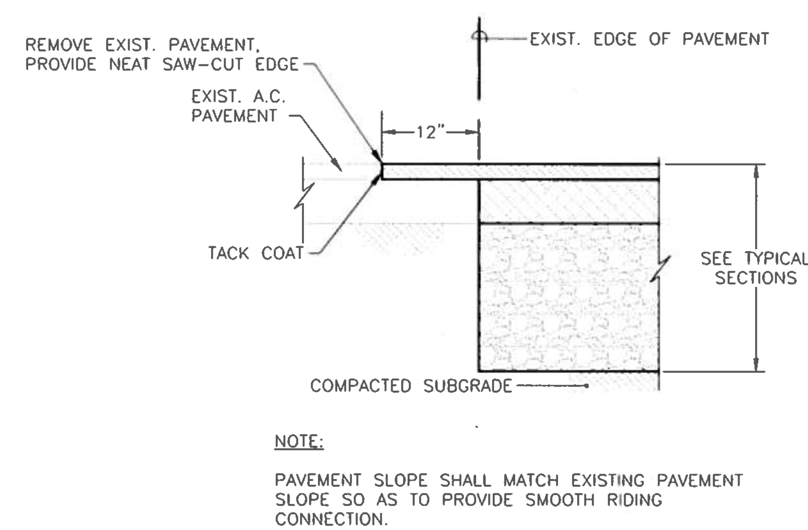


A C005 SECTION
SCALE: NTS



NOTE:

PAVEMENT SLOPE SHALL MATCH EXISTING PAVEMENT SLOPE SO AS TO PROVIDE SMOOTH RIDING CONNECTION.

B C005 TYPICAL A.C. PAVEMENT CONNECTION
SCALE: NTS

0 10 20 Feet

REVISION	DATE	BRIEF	BY	APPROVED

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No. 17903-C
HAWAII U.S.A.

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SIGNATURE

4/30/20 EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM:
ROADWAY PLANS

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:

CHIEF

DATE

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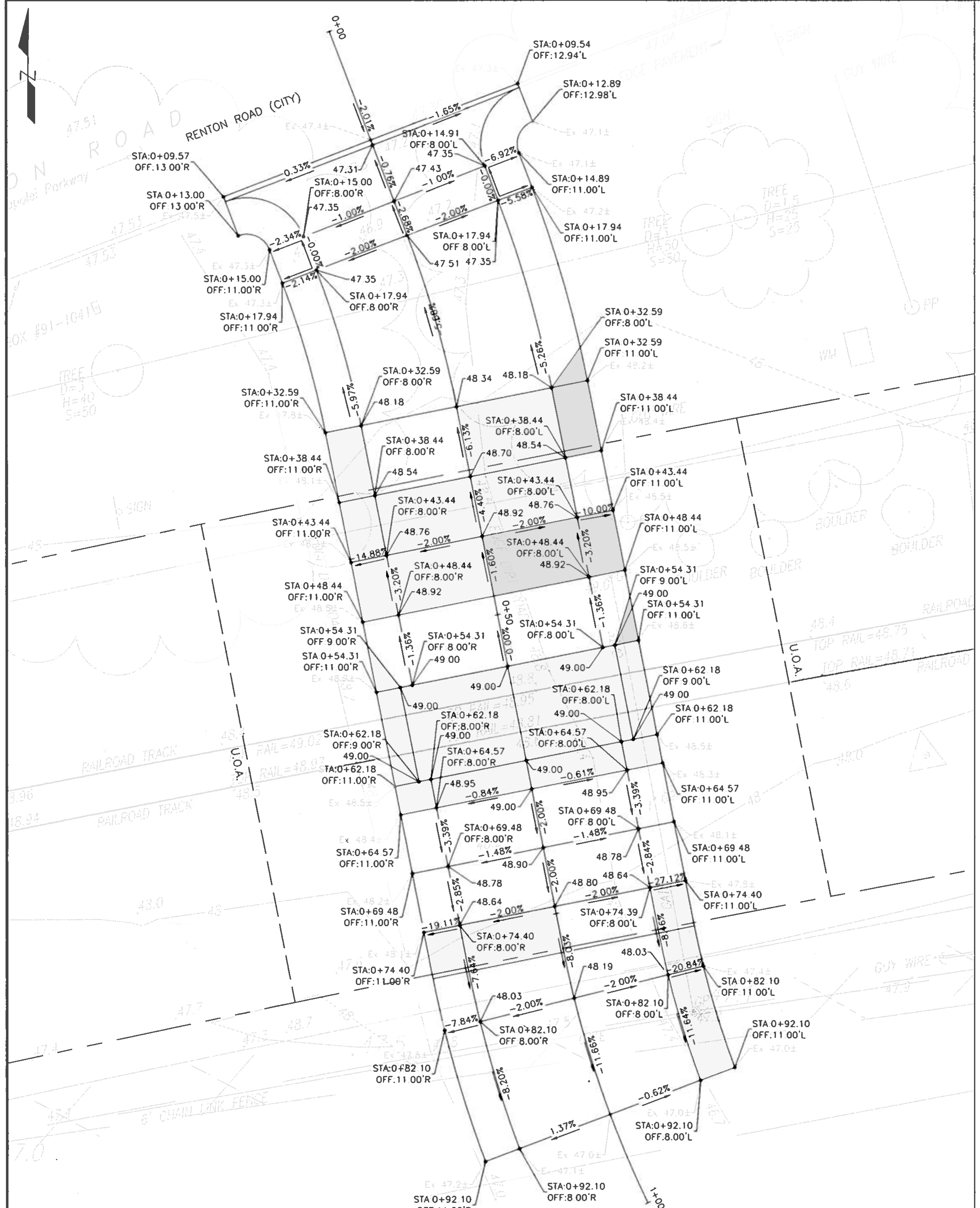
DRAWING C005 SHEET 8 OF 19

FILE	POCKET	FOLDER	NO.



RAILROAD CROSSING 1

(SCALE: 1"=5')

RAILROAD CROSSING 2

(SCALE: 1"=5')

S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C006-C008 Grading, Profile, Typ Sections.dwg

2/15/2019 1:43 PM

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REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM:
SITE GRADING

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

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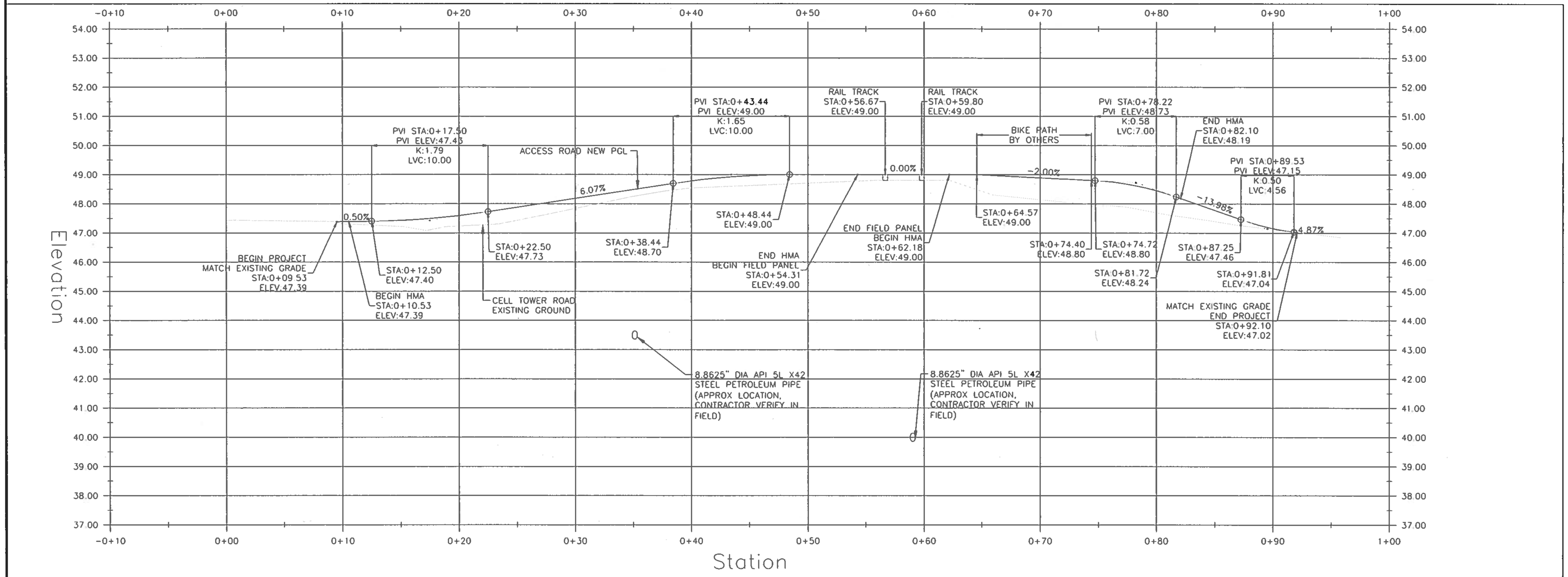
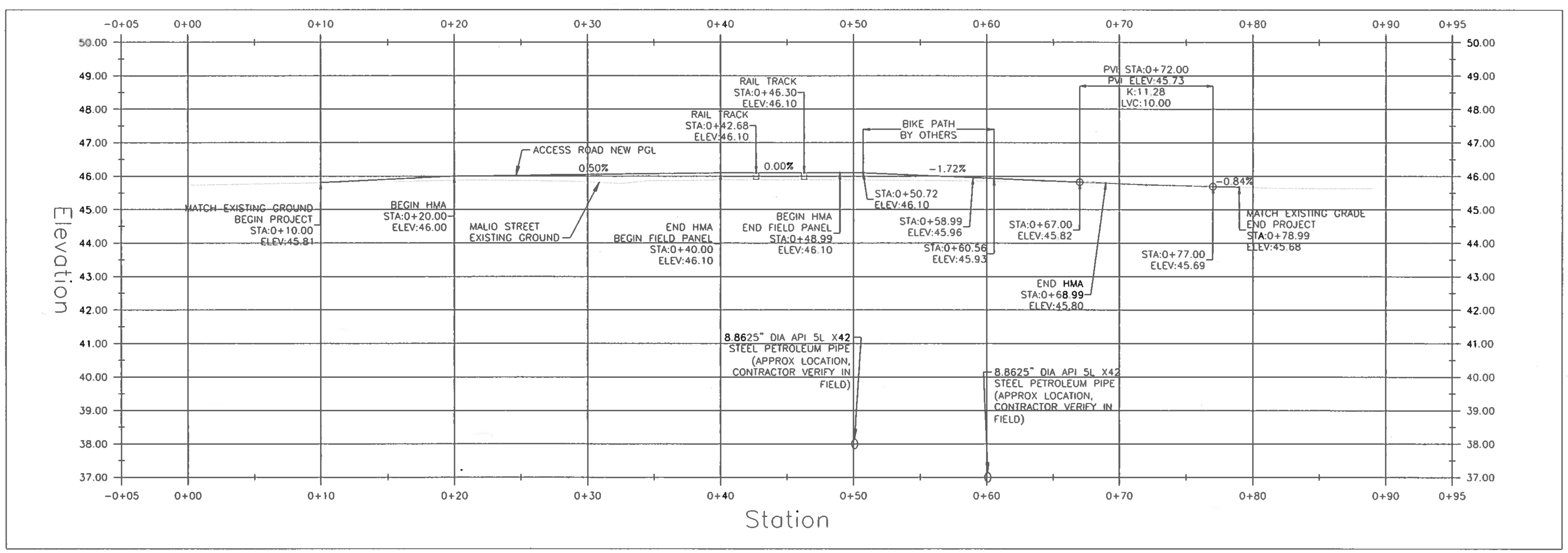
SIGNATURE
4/30/20
EXPIRATION DATE OF THE LICENSE

0 5 10 Feet

DRAWING C006 SHEET 9 OF 19



RAILROAD CROSSING 1



RAILROAD CROSSING 2

VERT. SCALE: 0 2 4 Feet
HOR. SCALE: 0 5 10 Feet

REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION

SIGNATURE — 4/30/20 EXPIRATION DATE OF THE LICENSE

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM:
ROADWAY PROFILES

DESIGNED BY: DI — CHECKED BY: JH
DRAWN BY: DI — SECTION HEAD:
APPROVED: — BRANCH HEAD:
CHIEF — DATE

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DRAWING C007 SHEET 10 OF 19

FILE	POCKET	FOLDER	NO.

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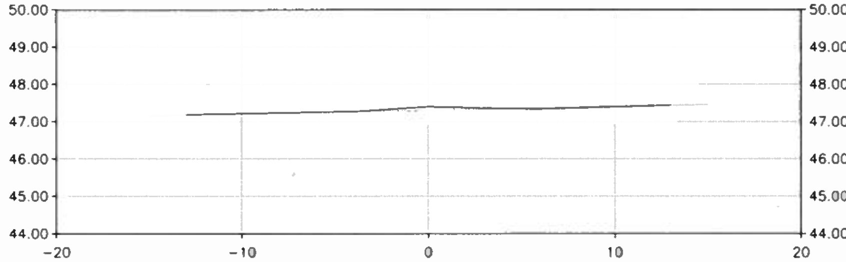
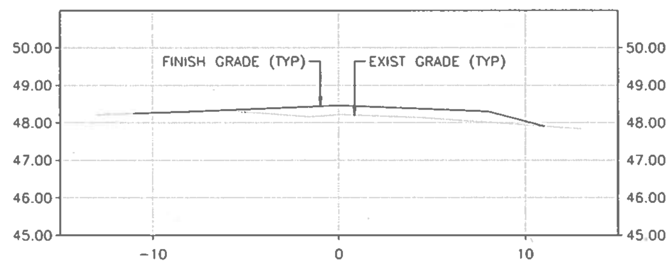
2/15/2019 1:45 PM

Railroad Crossing 1 – 0+10.00



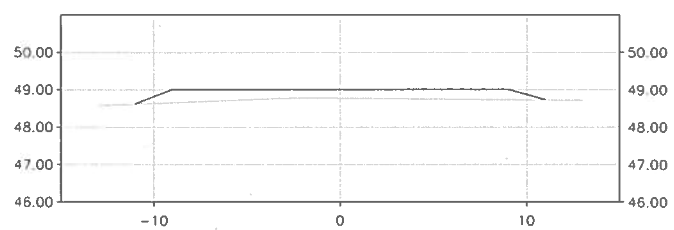
CROSS SECTION

Railroad Crossing 1 – 0+34.55



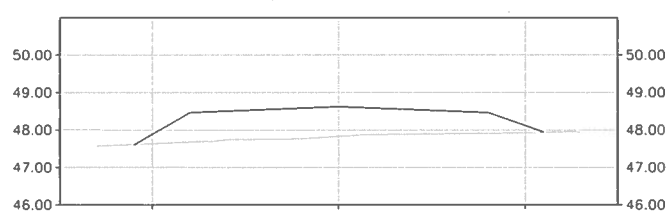
CROSS SECTION

Railroad Crossing 1 – 0+54.31



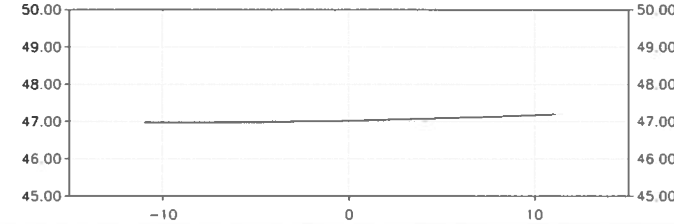
CROSS SECTION

Railroad Crossing 1 – 0+78.22



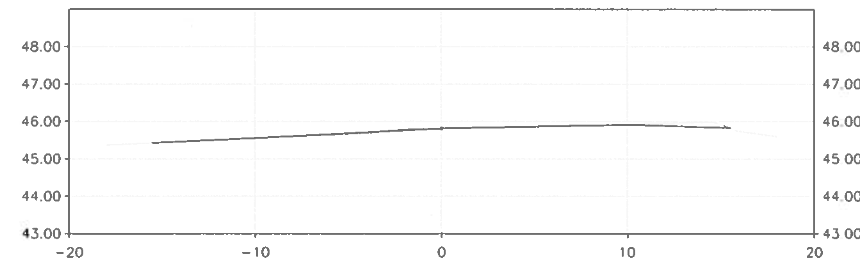
CROSS SECTION

Railroad Crossing 1 – 0+92.10



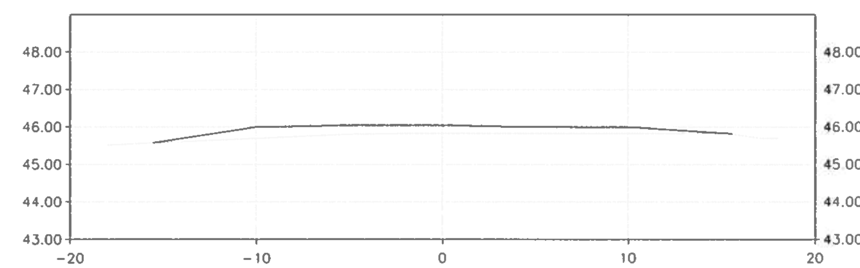
CROSS SECTION

Railroad Crossing 2 – 0+10.00



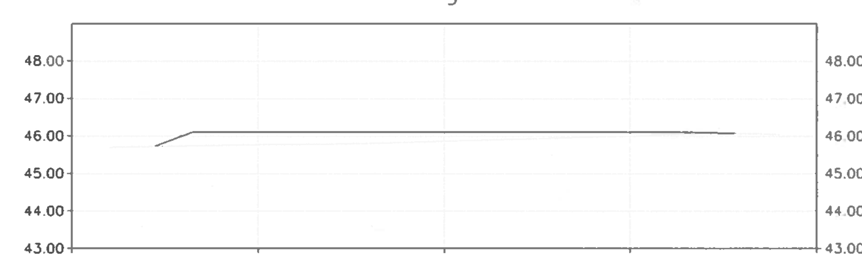
CROSS SECTION

Railroad Crossing 2 – 0+30.00



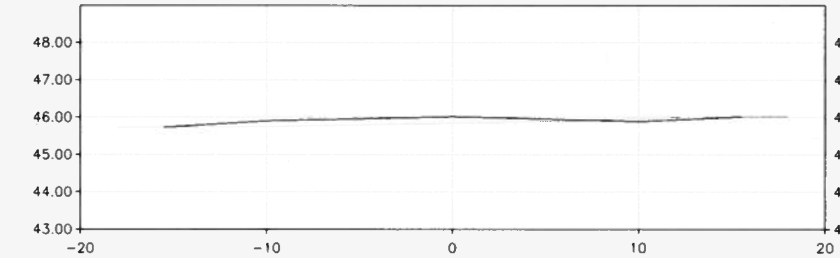
CROSS SECTION

Railroad Crossing 2 – 0+40.00



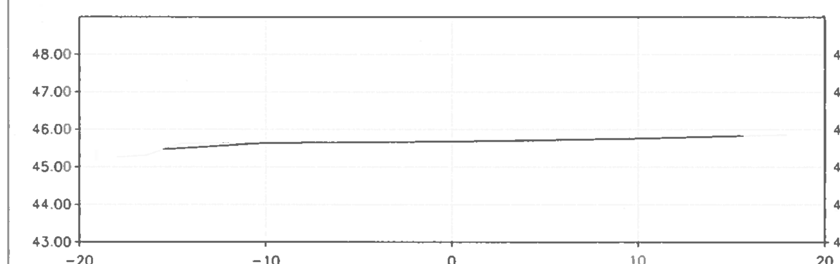
CROSS SECTION

Railroad Crossing 2 – 0+55.64



CROSS SECTION

Railroad Crossing 2 – 0+78.99



CROSS SECTION

0 2.5 5 Feet
VERT SCALE: 1"=2.5'
0 5 10 Feet
HOR. SCALE: 1"=5'

REVISION	DATE	BRIEF	BY	APPROVED

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION

SIGNATURE
4/30/20
EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM:
CROSS SECTIONS 1

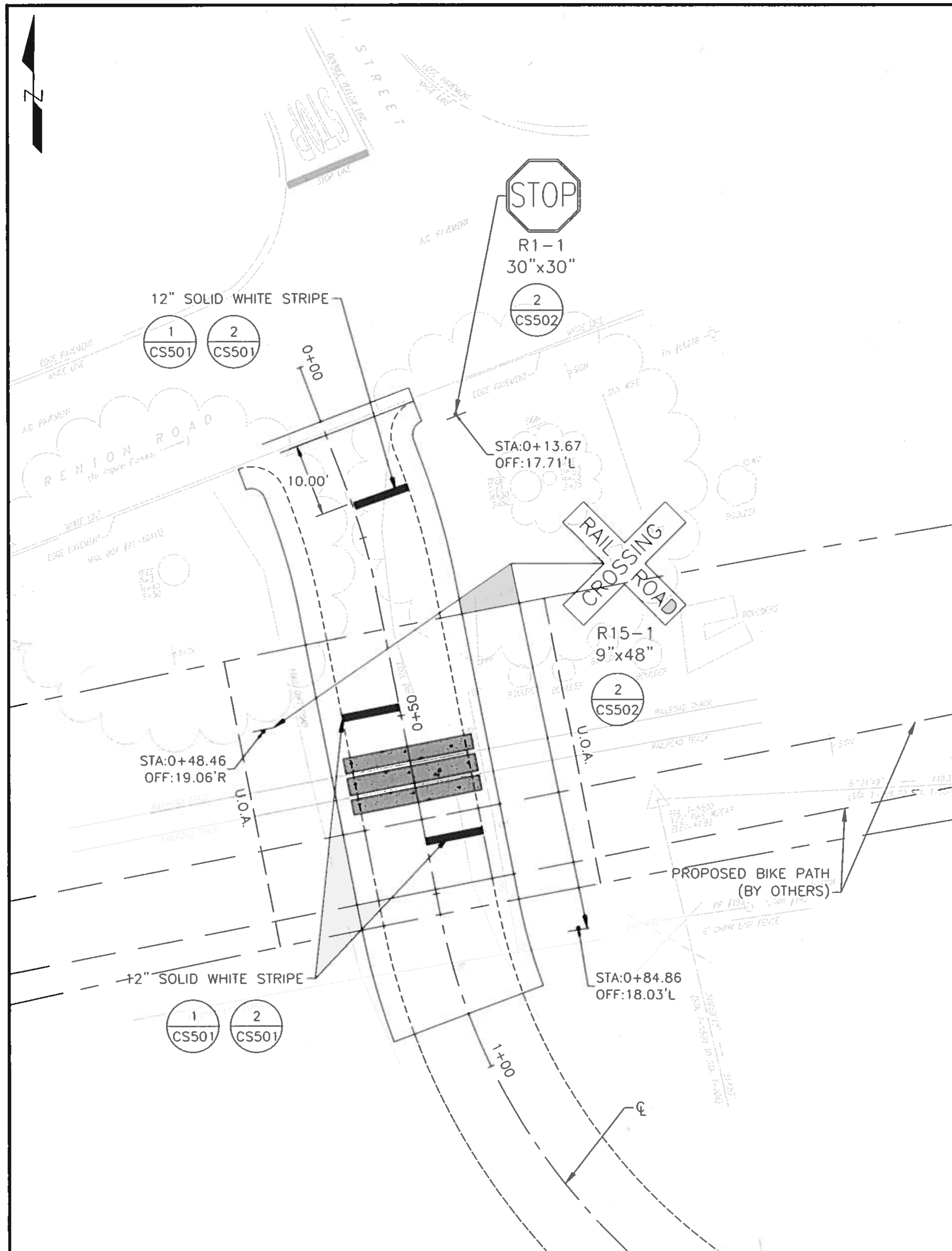
DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: AS
SECTION HEAD:
BRANCH HEAD:
CHIEF
DATE

100% DESIGN SUBMITTAL

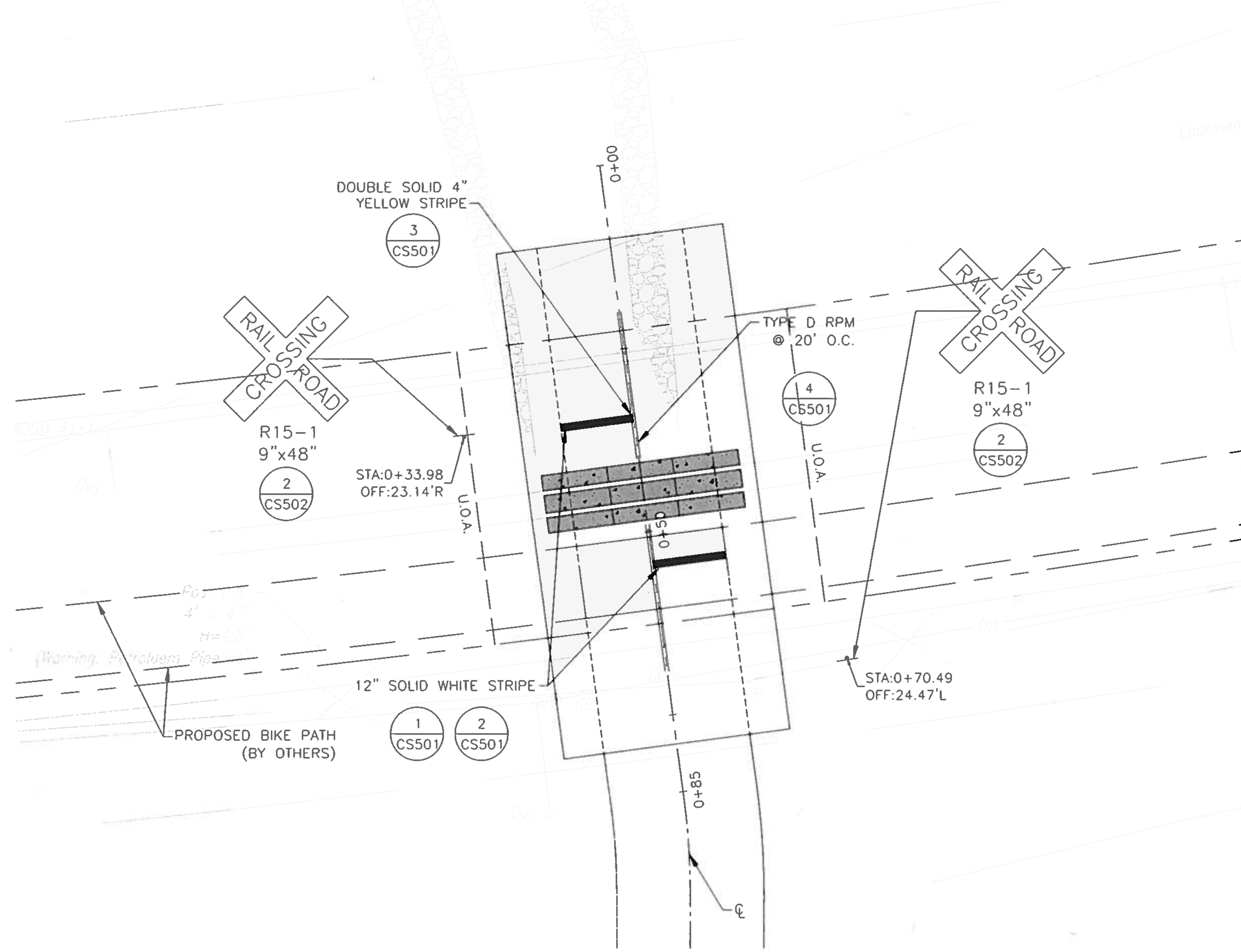
DRAWING C008

SHEET 11 OF 19

FILE	POCKET	FOLDER	NO.



RAILROAD CROSSING 1



RAILROAD CROSSING 2

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2/15/2019 1:46 PM

REVISION	DATE	BRIEF	BY	APPROVED

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION

SIGNATURE — 4/30/20 EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT RAILROAD CROSSINGS

ITEM: SIGNING AND STRIPING PLAN

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:
CHIEF
DATE

100% DESIGN SUBMITTAL

DRAWING CS001 SHEET 12 OF 19

FILE	POCKET	FOLDER	NO.

GENERAL NOTES FOR TRAFFIC CONTROL PLAN

1. THE PERMITEE SHALL MAKE MINOR ADJUSTMENTS AT INTERSECTIONS, DRIVEWAYS, BRIDGES, STRUCTURES, ETC., TO FIT FIELD CONDITIONS.
2. CONES OR DELINEATORS SHALL BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.
3. TRAFFIC CONTROL DEVICES SHALL BE INSTALLED SUCH THAT THE SIGN OR DEVICE FARTHEST FROM THE WORK AREA IS PLACED FIRST. THE OTHERS SHALL THEN BE PLACED PROGRESSIVELY TOWARD THE WORK AREA.
4. REGULATORY AND WARNING SIGNS WITHIN THE CONSTRUCTION ZONE THAT ARE IN CONFLICT WITH THE TRAFFIC CONTROL PLANS SHALL BE REMOVED OR COVERED.
5. FLAGGERS AND/OR POLICE OFFICERS SHALL BE IN SIGHT OF EACH OTHER OR IN DIRECT COMMUNICATION AT ALL TIMES.
6. WHEN REQUIRED BY THE ISSUING OFFICE, THE PERMITTEE SHALL INSTALL A FLASHING ARROW SIGNAL AS SHOWN ON THE TRAFFIC CONTROL PLANS.
7. ALL TRAFFIC LANES SHALL BE A MINIMUM OF 10-FEET WIDE.
8. ALL CONSTRUCTION WARNING SIGNS SHALL BE PROMPTLY REMOVED OR COVERED WHENEVER THE MESSAGE IS NOT APPLICABLE OR NOT IN USE.
9. THE BACKS OF ALL SIGNS USED FOR TRAFFIC CONTROL SHALL BE APPROPRIATELY COVERED TO PRECLUDE THE DISPLAY OF INAPPLICABLE SIGN MESSAGES (I.E., WHEN SIGNS HAVE MESSAGES ON BOTH FACES).
10. LANE CLOSURE SHALL BE LIMITED ONLY TO THE EXTENT OF ACCOMPLISHING EACH DAY'S WORK. AS SOON AS EACH DAY'S WORK IS COMPLETED, THE PERMITTEE SHALL REMOVE ALL TRAFFIC CONTROL DEVICES NO LONGER NEEDED TO PERMIT FREE AND SAFE PASSAGE OF PUBLIC TRAFFIC. REMOVAL SHALL BE IN THE REVERSE ORDER OF INSTALLATION. EXISTING FADED OR OBLITERATED PAVEMENT MARKINGS THAT ARE NECESSARY FOR SAFE TRAFFIC FLOW IN THE CONSTRUCTION AREA SHALL BE REPLACED WITH TEMPORARY OR PERMANENT MARKINGS BEFORE OPENING THE ROADWAY TO PUBLIC TRAFFIC EACH DAY.
11. PERMANENT PAVEMENT MARKINGS AND TRAFFIC SIGNS SHALL BE REPLACED UPON COMPLETION OF EACH PHASE OF WORK.
12. CONES AND DELINEATORS SHALL BE SPACED AT A MAXIMUM DISTANCE OF 20-FEET APART. A MINIMUM OF SIX (6) CHANNELIZING DEVICES SHALL BE USED FOR EACH TAPER LENGTH.
13. DRIVEWAYS SHALL BE KEPT OPEN UNLESS THE OWNERS OF THE PROPERTY USING THE RIGHT-OF-WAY ARE OTHERWISE PROVIDED FOR SATISFACTORILY. FURTHER, THE PERMITTEE SHALL CONTROL TRAFFIC GOING IN AND OUT OF DRIVEWAYS.
14. BUFFER AND TAPER AREAS ON APPROACH TO ANY WORK AREA SHALL BE KEPT CLEAR OF VEHICLES AND EQUIPMENT.
15. A HIGH-LEVEL WARNING DEVICE (FLAG TREE) SHALL BE INSTALLED ON APPROACH TO ALL WORK AREAS.
16. "NO PARKING" SIGNS SHALL BE POSTED WITHIN ANY WORK AREA AND FOR THE BUFFER AND TAPER AREAS APPROACHING THE WORK AREA.
17. TRAFFIC CONTROL PLANS ARE APPROVED FOR WORK ON ANY CITY STREET AREA ONLY BETWEEN THE HOURS OF 8:30 AM AND 3:30 PM.
18. CONTRACTOR TO COORDINATE TRAFFIC ACCESS WITH EXISTING LOT OWNERS.

GENERAL PLAN
SCALE: 1"= 80'

REVISION	DATE	BRIEF	BY	APPROVED

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No 17903-C
HAWAII U.S.A.

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SIGNATURE
4/30/20
EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT RAILROAD CROSSINGS

ITEM: GENERAL TRAFFIC PLAN AND NOTES

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:
CHIEF
DATE

S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\TR001-TR002 Traffic Control.dwg

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FILE	POCKET	FOLDER	NO.

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LEGEND:

- WORK AREA LIMITS
- DIRECTION OF TRAFFIC FLOW
- DELINEATOR/CONE
- SIGN
- POLICE OFFICER TO MONITOR, DIRECT AND CONTROL TRAFFIC FLOW

APPROVED:

CHIEF, TRAFFIC REVIEW BRANCH, DPP — DATE

TRAFFIC CONTROL PLAN

SCALE: 1"= 30'

REVISION	DATE	BRIEF	BY	APPROVED

JARRETT T. BROWN
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No. 17903-C
HAWAII U.S.A.

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SIGNATURE

4/30/20
EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM:
TRAFFIC CONTROL PLAN

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHIEF

CHECKED BY: JH
SECTION HEAD
BRANCH HEAD
DATE

100% DESIGN SUBMITTAL

DRAWING ____ SHEET 14 OF 19

FILE	POCKET	FOLDER	NO

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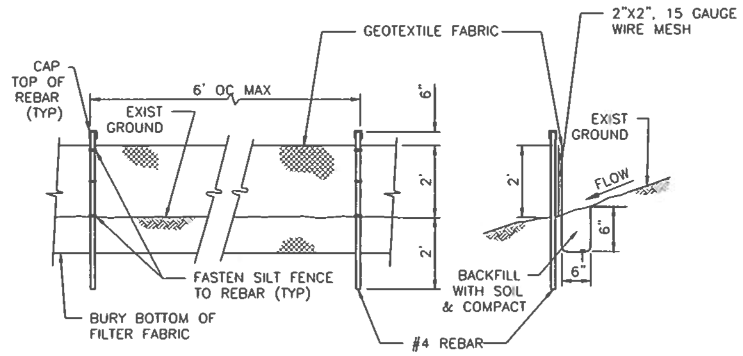
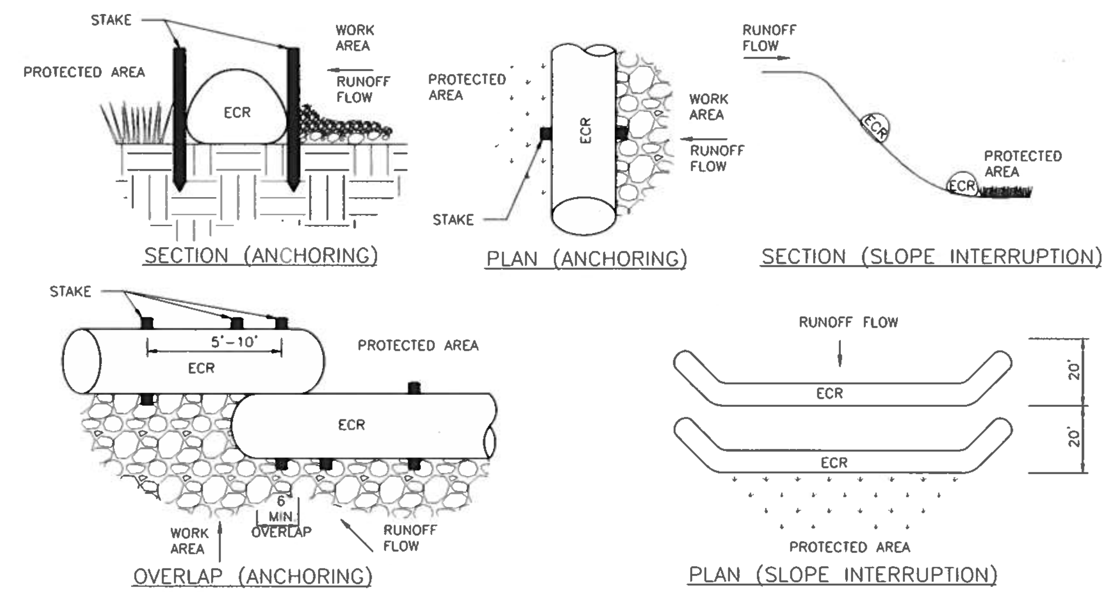
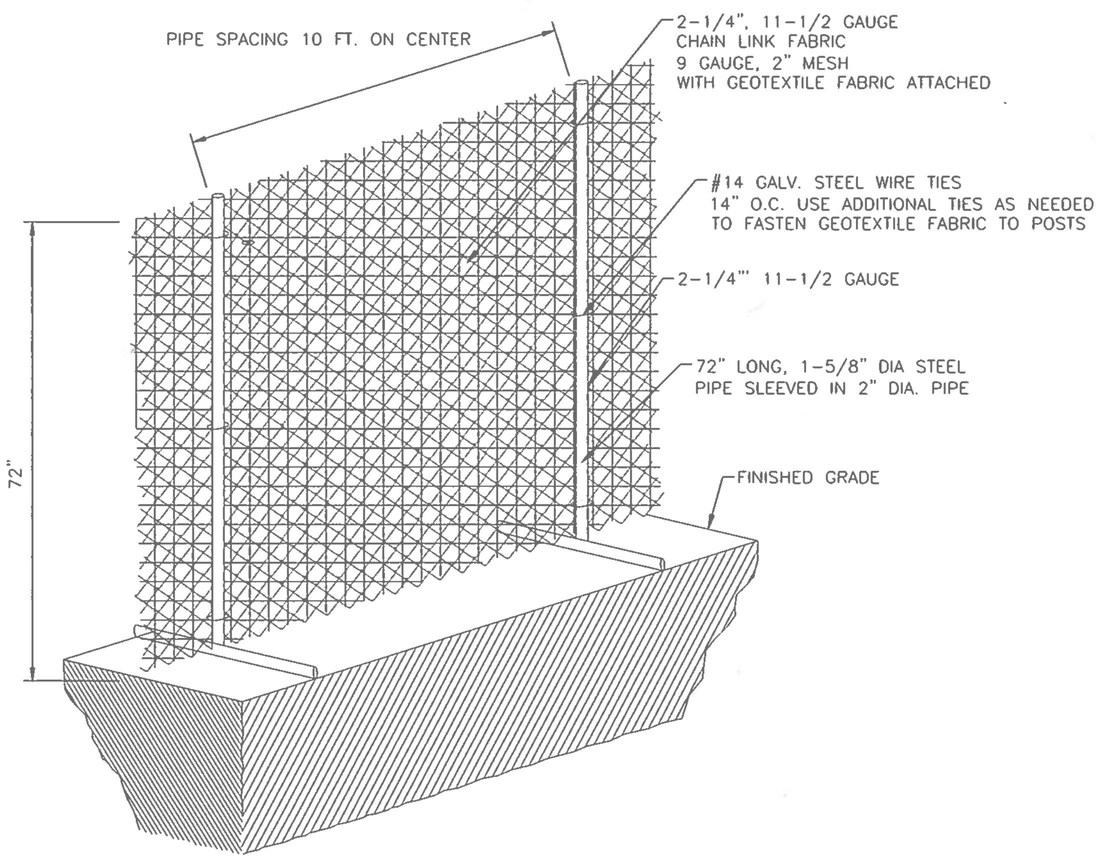


NOTE:
DUST SCREEN MAY BE USED AS SILT FENCE IF GEOTEXTILE FABRIC MEETS THE SILT FENCE REQUIREMENTS.

1 CS500 SILT FENCE
NTS



2 CS500 EROSION CONTROL ROLL ECR INSTALLATION
NTS



3 CS500 TEMPORARY DUST FENCE DETAIL
NTS

REVISION	DATE	BRIEF	BY	APPROVED

JARRETT T. BROWN LICENSED PROFESSIONAL ENGINEER No. 17903-C HAWAII U.S.A.

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SIGNATURE — 4/30/20 EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT RAILROAD CROSSINGS

ITEM: EROSION CONTROL DETAILS

DESIGNED BY: DI — CHECKED BY: JH
DRAWN BY: DI — SECTION HEAD:
APPROVED: — BRANCH HEAD:
CHIEF — DATE

2/15/2019 1:46 PM

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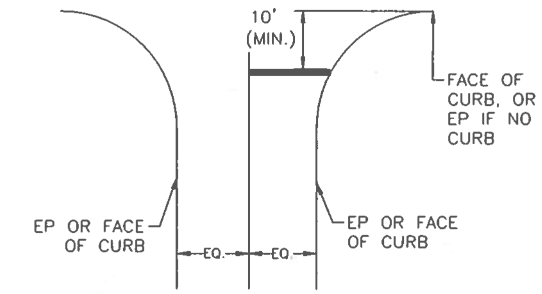
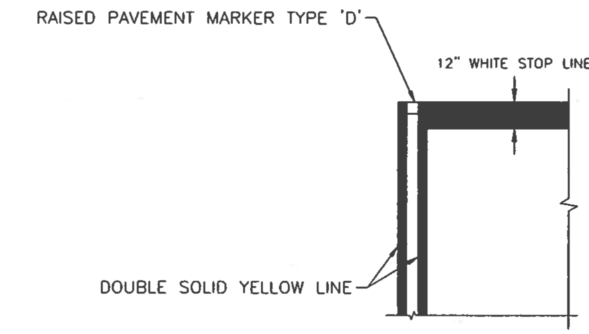
DRAWING CS500 SHEET 15 OF 19

FILE	POCKET	FOLDER	NO.

1. ALL TRAFFIC SIGN AND PAVEMENT MARKING INSTALLATIONS SHALL BE DONE IN ACCORDANCE WITH THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS," 2009 EDITION, AS AMENDED, THE LATEST SPECIFICATIONS FROM THE TRAFFIC REVIEW BRANCH, DEPARTMENT OF PLANNING AND PERMITTING, AND AS SHOWN ON THE PLANS.
2. THE CONTRACTOR SHALL NOTIFY AND COORDINATE WITH THE CIVIL ENGINEERING BRANCH, DEPARTMENT OF PLANNING AND PERMITTING, ONE (1) WEEK IN ADVANCE OF COMMENCING WORK AT 768-8084.
3. CONTACTOR SHALL SUBMIT MATERIAL BROCHURES FOR ALL SIGNS AND PAINT MATERIALS TO THE CIVIL ENGINEERING BRANCH, DEPARTMENT OF PLANNING AND PERMITTING.
4. THE SIGNING AND/OR STRIPING CONTRACTOR SHALL KEEP ONE (1) SET OF APPROVED PLANS AT THE PROJECT SITE AT ALL TIMES DURING CONSTRUCTION WORK.
5. THE CONTRACTOR SHALL NOTIFY THE CIVIL ENGINEERING BRANCH, DEPARTMENT OF PLANNING AND PERMITTING AT 768-8084, (3) DAYS IN ADVANCE OF FINAL INSPECTION.
6. THE CONTRACTOR SHALL MEET WITH THE INSPECTOR FROM THE CIVIL ENGINEERING BRANCH, DEPARTMENT OF PLANNING AND PERMITTING DURING THE FINAL INSPECTION.
7. CONTRACTOR SHALL PAINT TEMPORARY GUIDELINES AND OUTLINE OF ARROWS, LEGENDS, AND CROSSWALKS WITH A TWO INCH (2") WIDE BRUSHED LINE OF THE DAY THE ROADWAY IS OPENED TO TRAFFIC. THESE MARKINGS MUST BE APPROVED BY THE INSPECTOR FROM THE CIVIL ENGINEERING BRANCH, DEPARTMENT OF PLANNING AND PERMITTING.
8. WITHIN TEN (10) DAYS FOLLOWING NOTIFICATION OF AWARD OF CONTRACT, THE CONTRACTOR SHALL SUBMIT TO THE DEPARTMENT OF PLANNING AND PERMITTING (PHONE: 768-8084) FOR APPROVAL, A LIST OF ANY SIGNING AND PAVEMENT MARKING MATERIAL WHICH THE CONTRACTOR PROPOSES TO INSTALL. THE LIST SHALL BE COMPLETE AS TO THE NAME OF MANUFACTURER, CATALOG NUMBER, AND SHALL BE SUPPLEMENTED WITH MATERIAL BROCHURES.
9. UPON FINAL INSPECTION OF THE PROJECT, THE CONTRACTOR SHALL SUBMIT A LETTER OF CERTIFICATION FOR ALL TRAFFIC SIGNING AND PAVEMENT MARKING MATERIALS INSTALLED.
10. SIGNS SHALL BE ATTACHED TO BRACKETS WITH $\frac{5}{16}$" ZINC PLATED STEEL BOLTS, NUTS AND WASHERS. SIGNS 48" WIDE OR LARGER THAN 10 SQ. FT. IN AREA SHALL BE MOUNTED ON TWO 2" GALV. PIPE POST. THE SIGN SHALL BE INSTALLED WITH AT LEAST (1) ONE FOOT CLEARANCE FROM THE SIGN EDGE TO THE CURB FACE.
11. ALL TRAFFIC SIGNS SHALL BE REFLECTORIZED.
12. RAISED PAVEMENT MARKERS SHALL BE INSTALLED IN ACCORDANCE WITH THE DEPARTMENT OF PLANNING AND PERMITTING STANDARDS.
13. LOCATION OF "STOP" SIGN:
    A. INSTALL "STOP" SIGN AT CURB TANGENT POINT.
    B. INSTALL "STOP" SIGN ON METAL STREET LIGHT STANDARD IF A STANDARD IS LOCATED WITHIN 10 FEET OF CURB RETURN.
    C. INSTALL "STOP" SIGN IN FRONT OF UTILITY POLE IF A POLE IS LOCATED WITHIN 10 FEET OF CURB RETURN.
14. PAVEMENT WORD AND SYMBOL MARKINGS SHALL BE IN ACCORDANCE WITH THE DEPARTMENT OF PLANNING AND PERMITTING STANDARDS.
15. THE CONTRACTOR SHALL USE THERMOPLASTIC MATERIAL, APPROVED BY THE CIVIL ENGINEERING BRANCH, DEPARTMENT OF PLANNING AND PERMITTING, FOR ALL CROSSWALKS, STOP BARS, PAVEMENT ARROWS, CENTER LINES, LANE LINES, ARC LINES, CHANNELIZED TRAFFIC ISLANDS, AND LEGENDS.

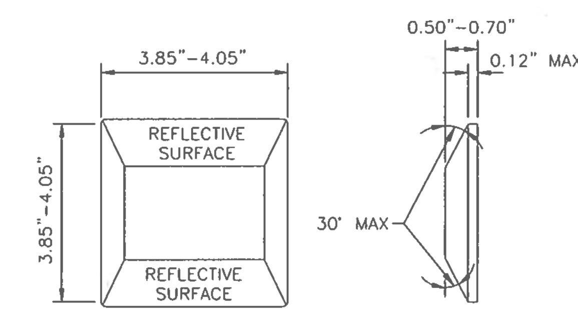


1 CS501 STOP BAR DETAILS
NTS



2 CS501 STOP BAR & DOUBLE YELLOW LINE
NTS

3 CS501 DOUBLE SOLID YELLOW LINE
NTS



4 CS501 TYPE D: TWO-WAY YELLOW REFLECTIVE MARKER
NTS

JARRETT T. BROWN
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No. 17903-C
HAWAII U.S.A.

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SIGNATURE
4/30/20
EXPIRATION DATE OF THE LICENSE

REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT RAILROAD CROSSINGS

ITEM: STRIPING AND MARKING STANDARD PLANS

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHIEF
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:
DATE

100% DESIGN SUBMITTAL

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FILE	POCKET	FOLDER	NO.

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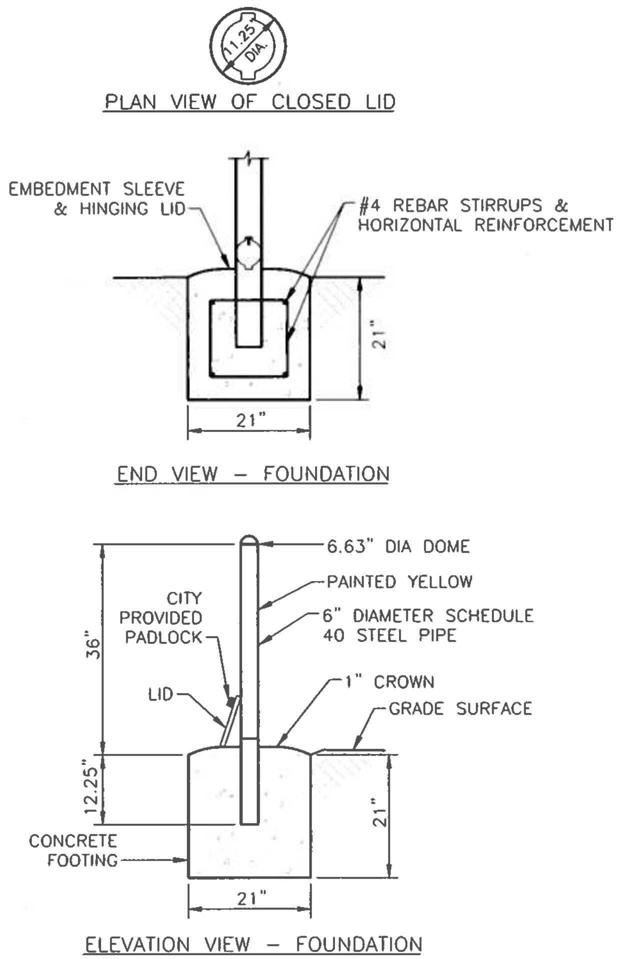
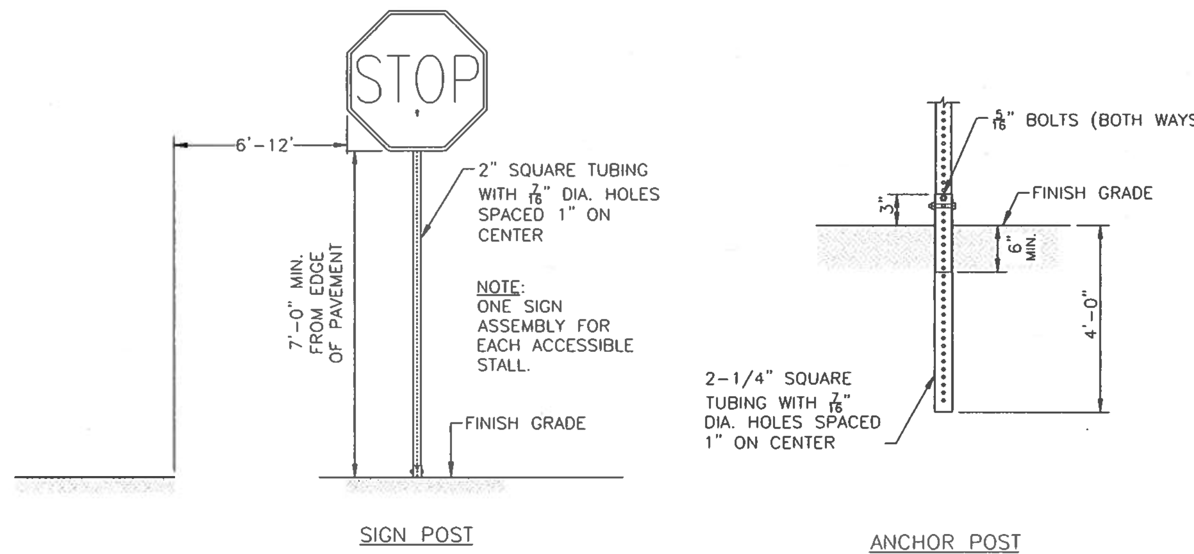


NOTES:

1. DIMENSIONS SHOWN ARE APPROXIMATE. FOLLOW MANUFACTURER'S RECOMMENDATION FOR INSTALLATION

1 / CS502 REMOVABLE BOLLARD
NTS



NOTES:

1. THE INSIDE OF THE 2-1/4" ANCHOR POST MUST BE KEPT FREE OF IMPEDIMENTS TO ASSURE EASY INSERTION OF THE 2" SIGN POST
2. SQUARE TUBE POSTS SHALL BE TELESCOPING PERFORATED TUBING.

2 / CS502 SIGN POST DETAIL
NTS

REVISION	DATE	BRIEF	BY	APPROVED

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

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SIGNATURE
4/30/20 EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: ROADSIDE SIGN AND BOLLARD DETAILS

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:
CHIEF
DATE

S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\CS502 Roadside Sign and Bollard Details.dwg

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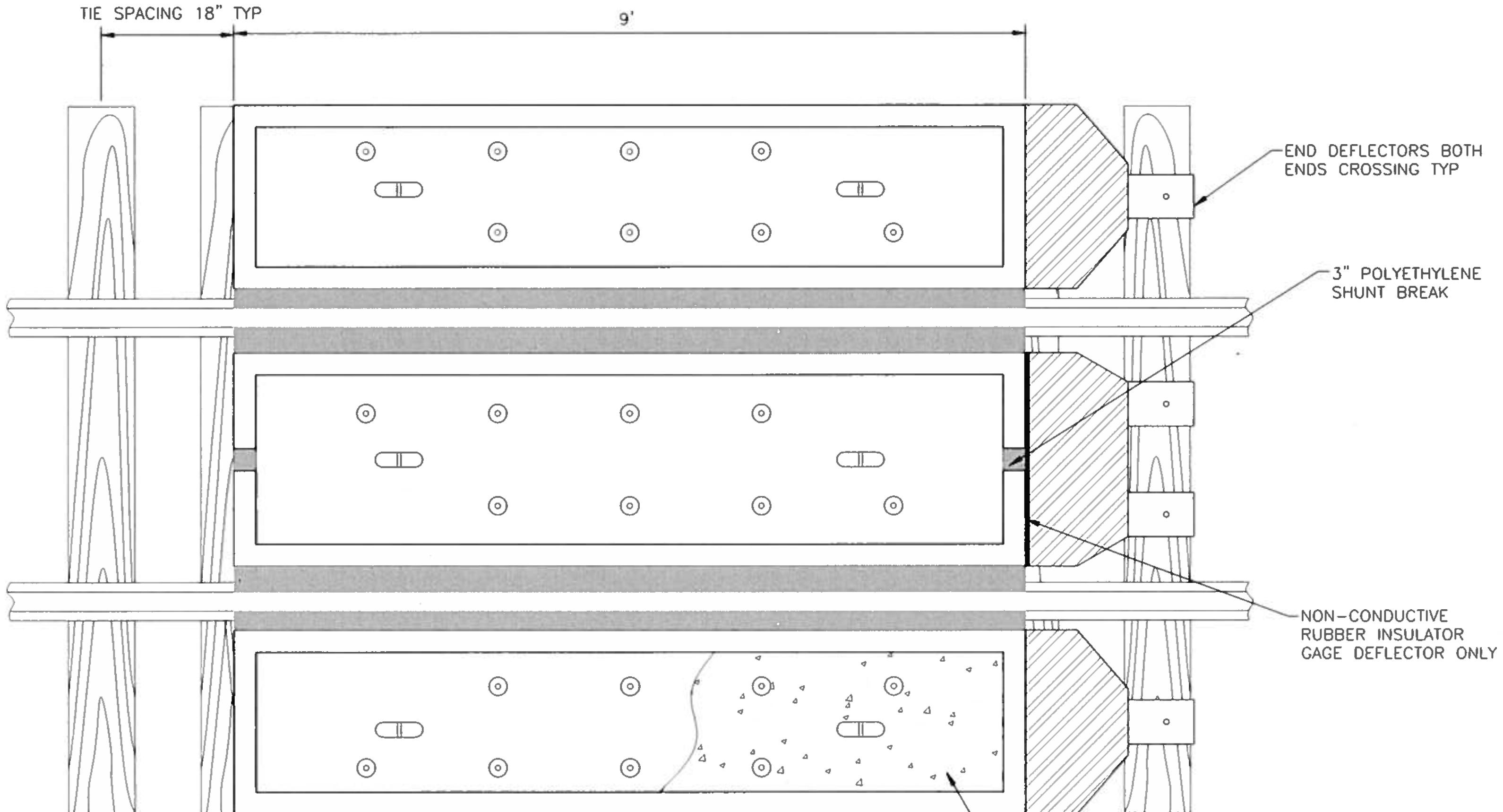
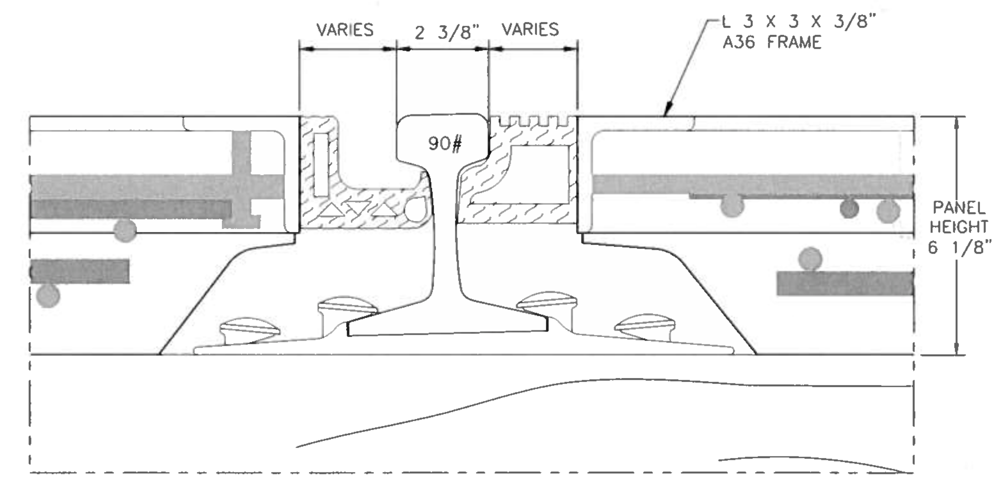
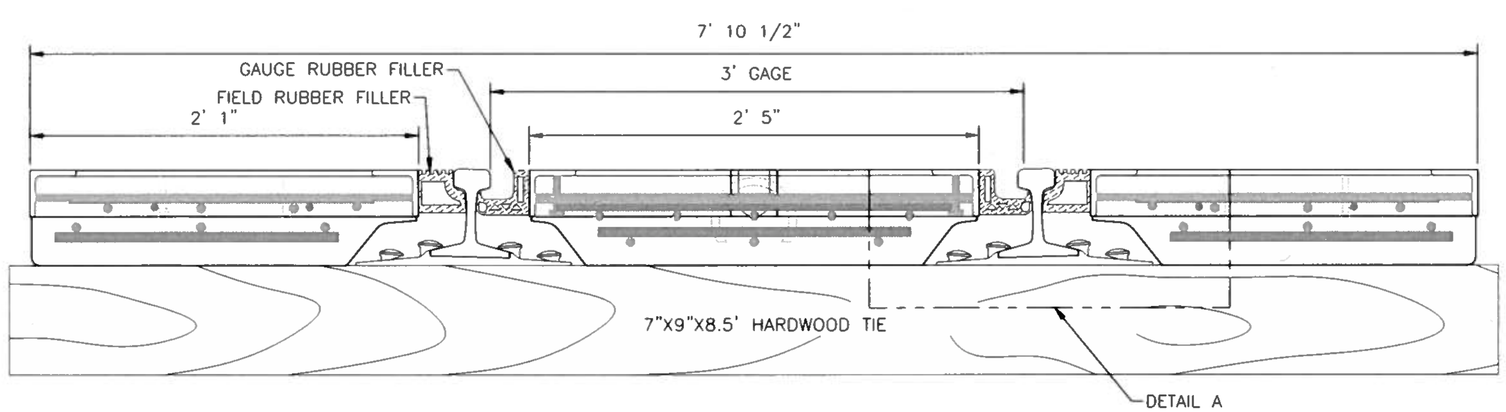


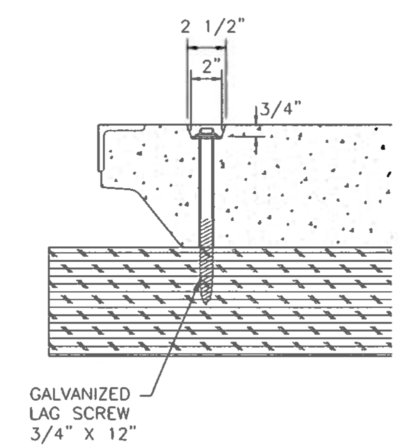
1 CS503 GAUGE AND FIELD PANEL PLAN
(SCALE: 1"=1')



DETAIL A
(SCALE: 1"=1/5')



TYPICAL SECTION
(SCALE: 1"=1/2')



TIMBER SPIKE
(SCALE: 1"=1/2')

REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: RAILROAD CROSSING DETAILS

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD
BRANCH HEAD
CHIEF
DATE

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

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SIGNATURE
4/30/20
EXPIRATION DATE OF THE LICENSE

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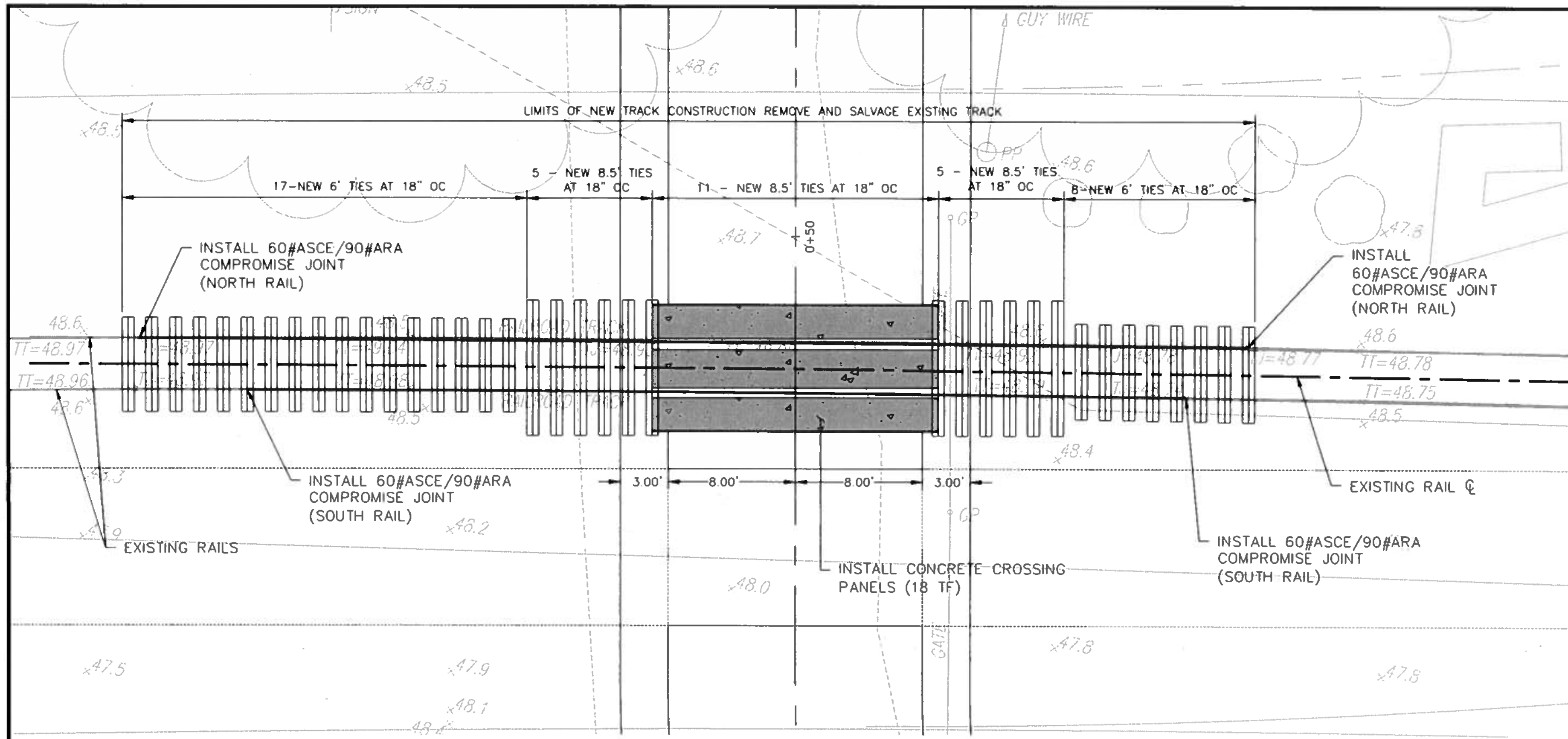
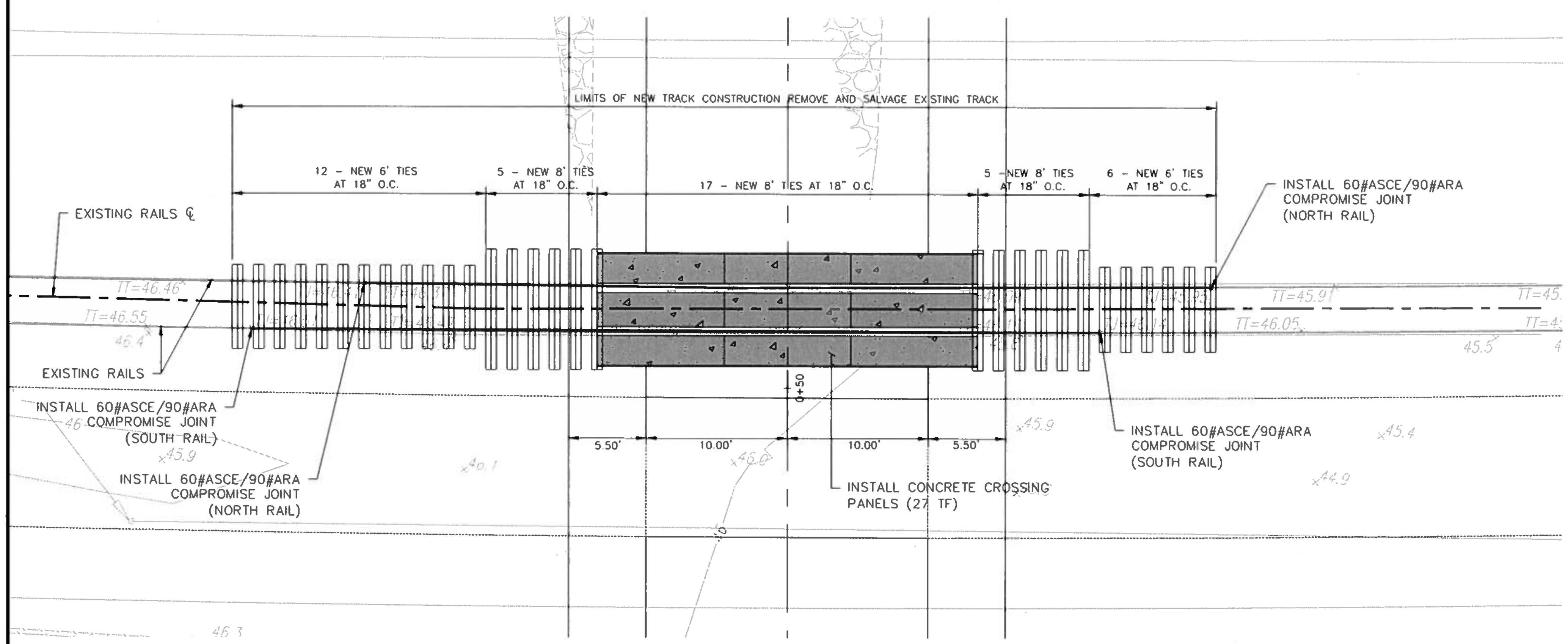
FILE	POCKET	FOLDER	NO.



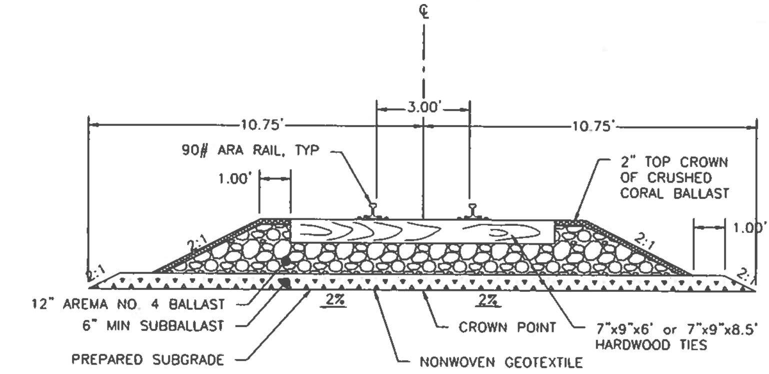
RAILROAD CROSSING 1

(SCALE: 1"=5')



RAILROAD CROSSING 2

(SCALE: 1"=5')



OPEN TRACK SECTION

(SCALE: NONE)

NOTE:

1. THE CONTRACTOR SHALL PROTECT ALL FOUNDATIONS AND EXISTING UNDERGROUND UTILITIES FROM DAMAGE BY EXCAVATION ACTIVITIES.

2. CONTRACTOR SHALL NOTIFY THE ENGINEER FOR INSPECTION OF CROSSING SUBGRADE, CONTRACTOR SHALL NOT COVER UP THE SUBGRADE UNTIL AFTER INSPECTION AND APPROVAL.

3. IF ALL OR PART OF THE SUBGRADE CANNOT ATTAIN SUITABLE COMPACTION, CONTRACTOR SHALL OVER EXCAVATE AND PLACE AND COMPACT SUITABLE ORDINARY BACKFILL MATERIAL AS DIRECTED BY THE ENGINEER. REMOVED EXISTING BALLAST MAY BE USED AS ORDINARY BACKFILL UNLESS DETERMINED BY THE ENGINEER TO BE UNSUITABLE.

4. ROADWAY SURFACES SHALL NOT ALLOW STORM WATER TO DRAIN INTO THE TRACK.

5. CONTRACTOR IS RESPONSIBLE FOR ORDERING PREMANUFACTURED CONCRETE CROSSING PANELS SPECIFICALLY FOR THE SIZE OF RAIL AND TIE PLATES, AND ANCHORS (IF USED) AT THE CROSSING. CONTRACTOR MUST ENSURE THAT THE PANEL HEIGHT WILL MATCH RAIL HEIGHT AND THAT SUFFICIENT CLEAR SPACE IS AVAILABLE UNDER THE PANELS FOR TIE PLATES AND RAIL FASTENINGS. CONTRACTOR MUST ALSO ENSURE THAT PREMANUFACTURED CROSSING PANELS ARE ORDERED TO MATCH TRACK CURVATURE. TIE LENGTH AND SPACING MUST CONFORM TO THE INSTALLATION REQUIREMENTS PROVIDED BY THE CROSSING MANUFACTURER.

REVISION	DATE	BRIEF	BY	APPROVED

JARRETT T. BROWN — LICENSED PROFESSIONAL ENGINEER — No. 17903-C — HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION

SIGNATURE — 4/30/20 EXPIRATION DATE OF THE LICENSE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: **HONOULIULI WASTEWATER TREATMENT PLANT RAILROAD CROSSINGS**

ITEM: TRACK CROSSING PLANS

DESIGNED BY: DI — CHECKED BY: JH
DRAWN BY: DI — SECTION HEAD:
APPROVED: — BRANCH HEAD:
CHIEF — DATE

DRAWING CS504 — SHEET 19 OF 19

FILE	POCKET	FOLDER	NO.

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ENCLOSURE 6

1941 Photograph Showing Rail Crossings

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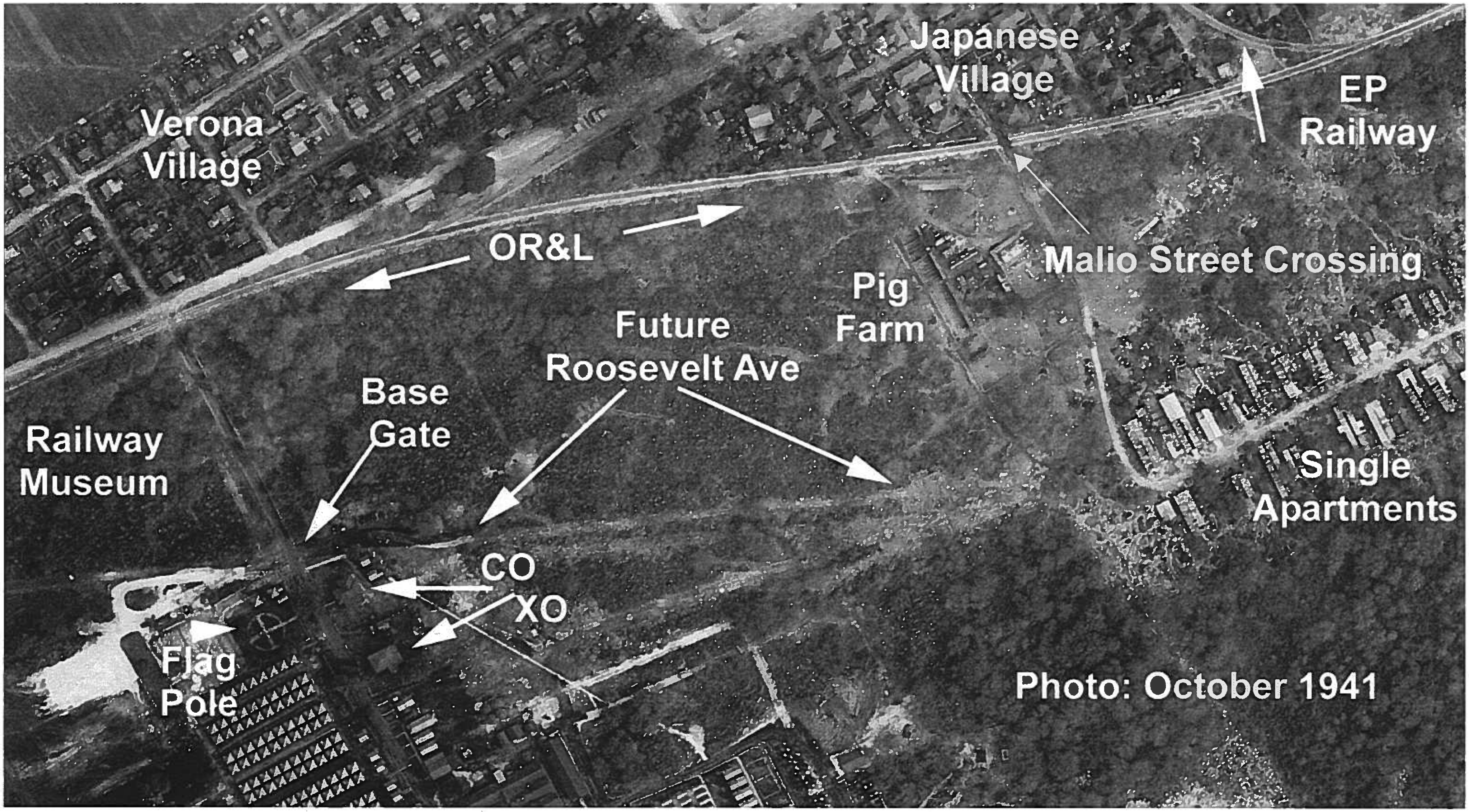
Japanese Village
EP Railway
Verona Village
OR&L
Malio Street Crossing
Pig Farm
Future Roosevelt Ave
Base Gate
Railway Museum
Single Apartments
CO
XO
Flag Pole
Photo: October 1941

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ENCLOSURE 7

Program Comment and FHWA Letter to HDOT

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U.S. Department of Transportation
Federal Highway Administration

Hawaii Federal-Aid Division

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

November 6, 2018

In Reply Refer To:
HDA-HI

Mr. Jade T. Butay
Director of Transportation
Hawaii Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96850

Subject: Section 106 and Section 4(f) Review of Uses of the Right-of-Way of the Former Oahu Railway and Land Company

Dear Director Butay:

Section 11504 of the Fixing America's Surface Transportation Act (FAST Act) exempts rail properties within railroad rights-of way from review under Section 106 of the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act. On August 24, 2018, the Advisory Council for Historic Preservation (ACHP) issued a "Program Comment to Exempt Consideration of Effects to Rail Properties Within Rail Rights-of-Way" (enclosed). This program comment implements Section 11504 of the FAST Act. The ACHP has exempted certain activities from the requirements of Section 106 regardless of whether the rail properties effected are eligible for or listed on the National Register of Historic Places, therefore the exemptions apply to the former Oahu Railway and Land Company (OR&L) currently under the ownership of the Hawaii Department of Transportation (HDOT). On October 29, 2018, the Federal Highway Administration (FHWA) published a final rule which provides essentially the same exemption under Section 4(f) of the Department of Transportation Act [23 CFR 774.13(a)(2)].

The full list of exemptions is contained in Appendix A of the program comment, and includes routine maintenance of the track and track bed, maintenance and rehabilitation of at grade crossings, adding lanes to existing crossings, maintenance and repair of existing above ground and underground utilities, and the addition of new at grade crossings. Note that non-rail related historic resources and archeological sites of any nature within the undisturbed portions of the rail right-of-way are not included in the exemptions. Some activities require the oversight of Secretary of the Interior qualified personnel.

Consequently, effective immediately we are instituting new procedures to address Sections 106 and 4(f) in relation to the OR&L for both Federal-aid highway projects that impact the right-of-way and for non-highway uses that require our approval under the deed provisions.

If a project or use involves the exempt activities listed in Appendix A of the program comment, HDOT should simply cite which of the activities it falls under (e.g., Appendix A, II. Exempted Activities List, K.1.). HDOT should include sufficient relevant information such as plans, photographs, or material specifications to support the opinion. If we concur with HDOT's finding, the Section 106 and Section 4(f) processes will be completed. The usual consulting parties will be notified of the undertaking and our finding.

The Section 106 programmatic agreement (PA) on the OR&L that is currently under development should incorporate the program comment and the procedures we have outlined above. Note that the program comment is in effect and you should not wait for completion of the PA to begin using the new procedures. Of course, the program comment does not affect State review requirements under HRS 343 or Section 6E.

If you have any questions regarding this matter, please contact me at (808) 541-2312 or Meesa Otani, our Environmental Engineer, at (808) 541-2316.

Sincerely yours,

Digitally signed by
RALPH RIZZO
Date: 2018.11.06
11:09:23 -10'00'

Ralph J. Rizzo
Division Administrator

Enclosure

cc: Ed Sniffen, Deputy Director Highways Division (HDOT)
Marshall Ando, Highways Administrator (HDOT)
Dr. Alan Downer, State Historic Preservation Division
Sarah Stokely, Advisory Council on Historic Preservation
Steve Vendt, Hawaiian Railway Society
Kiersten Faulkner, Historic Hawai'i Foundation

Enclosure

Dated: August 10, 2018.

Suzanne M. Frisbie,

Deputy Director, Technology Transfer and Intellectual Property Office, National Institute of Allergy and Infectious Diseases.

[FR Doc. 2018–18397 Filed 8–23–18; 8:45 am]

BILLING CODE 4140–01–P

ADVISORY COUNCIL ON HISTORIC PRESERVATION

Notice of Issuance of Program Comment To Exempt Consideration of Effects to Rail Properties Within Rail Rights-of-Way

AGENCY: Advisory Council on Historic Preservation.

ACTION: Program Comment issued to exempt consideration of effects to rail properties within rail rights-of-way.

SUMMARY: The Advisory Council on Historic Preservation ("ACHP") issued a Program Comment to exempt consideration of effects to rail properties within rail rights-of-way at the request of the U.S. Department of Transportation to accelerate the review of these undertakings under Section 106 of the National Historic Preservation Act and to meet the requirement of Section 11504 of the Fixing America's Surface Transportation Act. The Program Comment can be used by any federal agency with responsibility to consider the effects of undertakings within rail rights-of-way. Federal agencies using the Program Comment may fulfill their Section 106 responsibilities for the relevant undertakings by implementing the terms of this comment, which include identifying those activities that meet the conditions in Appendix A and opting into the process to identify excluded historic rail properties and seek further streamlining of the review process under the property-based approach.

DATES: The Program Comment was issued by the ACHP on August 17, 2018.

ADDRESSES: Address all questions concerning the Program Comment to Kelly Y. Fanizzo, Office of General Counsel, Advisory Council on Historic Preservation, 401 F Street NW, Suite 308, Washington, DC 20001–2637. You may submit questions through electronic mail to: *kfanizzo@achp.gov*.

FOR FURTHER INFORMATION CONTACT: Kelly Y. Fanizzo, (202) 517–0193, *kfanizzo@achp.gov*.

SUPPLEMENTARY INFORMATION: Section 106 of the National Historic Preservation Act ("NHPA"), as amended, 54 U.S.C. 306108 ("Section 106"), requires federal agencies to take into account the effects of undertakings they carry out, license, permit, or fund to historic properties and provide the Advisory Council on Historic Preservation ("ACHP") a reasonable opportunity to comment with regard to such undertakings. The ACHP has issued the regulations that set forth the process through which federal agencies comply with these responsibilities. Those regulations are codified under 36 CFR part 800 ("Section 106 regulations").

Under Section 800.14(e) of those regulations, federal agencies can request the ACHP to issue a "Program Comment" on a particular category of undertakings in lieu of conducting reviews for each individual undertaking in the category. An agency can meet its Section 106 responsibilities with regard to the effects of those undertakings by implementing an applicable Program Comment that has been issued by the ACHP.

I. Background

At the request of the U.S. Department of Transportation ("USDOT"), the ACHP has issued a Program Comment that provides new efficiencies in the Section 106 review for undertakings with the potential to affect historic rail properties within railroad and rail transit rights-of-way ("rail ROW"). Section 11504 of the Fixing America's Surface Transportation Act ("FAST Act") (49 U.S.C. 24202), enacted on December 4, 2015, mandated the development of a Section 106 exemption for "railroad rights-of-way." The FAST Act required that "the Secretary [of the USDOT] shall submit a proposed exemption of railroad rights-of-way from the review under section 306108 of title 54 to the [ACHP] for consideration, consistent with the exemption for interstate highways approved on March 10, 2005 (70 FR 11928)." The FAST Act continued that, "Not later than 180 days after the date on which the Secretary submits the proposed exemption . . . to the Council, the Council shall issue a final exemption of railroad rights-of-way from review under chapter 3061 of title 54 consistent with the exemption for interstate highways approved on March 10, 2005 (70 FR 11928)." While the Section 106 regulations provide the process and criteria for development of program alternatives, the FAST Act modified the timeframe and directed agency actions.

The ACHP worked closely with the Federal Railroad Administration ("FRA"), the Federal Transit Administration ("FTA"), the Federal Highway Administration ("FHWA"), and the Office of Policy Development, Strategic Planning, and Performance within the Office of the Secretary, USDOT ("OST–P"); representatives from the railroad and rail transit industries; and historic preservation stakeholders to develop the final Section 106 program alternative for rail ROW. The ACHP communicated extensively with the staff of the Senate Committee on Commerce, Science, and Transportation ("Senate Committee") as well in developing this program alternative. The ACHP recommended incorporating the originally proposed exemption within a Program Comment to better achieve the intent and purpose of the FAST Act and meet the needs of the various stakeholders.

The Program Comment is the product of consultation and careful review. The USDOT and FRA conducted outreach on the preliminary exemption concept and early drafts prior to submitting a formal request to the ACHP in July 2017. The ACHP in turn published the draft Program Comment in the **Federal Register** (82 FR 54390, November 17, 2017), and hosted additional meetings with industry and preservation representatives in 2018. Recognizing the complexity of the issues to be addressed and wanting to ensure the final product met the statutory requirement of the FAST Act to be consistent with the interstate highway exemption, the staff for the Senate Committee extended the deadline for the final issuance of the Program Comment. The final Program Comment takes into account the many significant comments and questions raised by various stakeholders over the course of its development and represents the collective work of the ACHP, USDOT (inclusive of FRA, FTA, FHWA, and OST–P), and the Senate Committee staff to ensure that it meets the FAST Act requirement.

The Program Comment is comprised of two major parts: (1) An activity-based approach, and (2) a property-based approach. The activity-based approach provides a list of activities in Appendix A for which, when the specific conditions are met, no further Section 106 review is required. Based on the past experience of USDOT Operating Administrations ("USDOT OAs"), undertakings limited to the activities specified in Appendix A have typically resulted in effects to historic properties that are either minimal or not adverse. The property-based approach establishes a process whereby project sponsors can opt to work with the relevant USDOT OA and stakeholders to develop a list of excluded historic rail properties that would remain subject to Section 106 review, and exempt from review the effects of undertakings to all other historic rail properties within a designated area. While the activity-based approach will be immediately effective, the property-based approach does not go into effect until USDOT publishes implementing guidance. Once in effect, both the activity-based approach and the property-based approach are available for use by all federal agencies with a responsibility to carry out Section 106 review for undertakings that may affect rail properties within rail ROW.

The Program Comment does not apply to undertakings that are located within or would affect historic properties located on tribal lands; undertakings consisting of activities not included in Appendix A and that may affect an excluded historic rail property designated by USDOT; undertakings that could affect historic buildings, structures, sites, objects, or districts that do not have a demonstrable relationship to the function and operation of a railroad or rail transit system; undertakings that could affect archaeological sites located in undisturbed portions of rail ROW, regardless of whether the sites are associated with railroads or rail transit systems; and undertakings that could affect historic properties of religious and cultural significance to federally recognized Indian tribes or Native Hawaiian organizations. There is no sunset clause in the Program Comment; however, there will be regular program review and evaluations between the USDOT and the ACHP to ensure its proper implementation.

II. Public Participation and Response to Comments

The USDOT conducted outreach between 2016–2018 with a variety of stakeholders, including State Historic Preservation Officers ("SHPOs"), Tribal Historic Preservation Officers ("THPOs"), Indian tribes, Native Hawaiian organizations, national historic preservation organizations, national railroad and rail transit associations, state departments of transportation, and railroad and rail transit companies, regarding development of the Program Comment; this included webinars; conference calls and in-person meetings to address concerns of specific stakeholders; presentations at national transportation conferences, and sharing and seeking informal comments on early drafts. The ACHP published the draft Program Comment in the **Federal Register** (82 FR 54390, November 17, 2017). The ACHP notified SHPOs, THPOs, Indian tribes, Native Hawaiian organizations, national preservation organizations, and other stakeholders via emails on November 21, 2017, to provide them notice of the publication and solicit input. The public comment period was open until December 8, 2017, and the ACHP and USDOT received a total of 261 comments from 48 commenters: 11 SHPOs; 6 Indian tribes; 7 state DOTs; 5 transit organizations; 5 federal agencies; 4 railroad organizations; 4 trade organizations; 2 stakeholders; and 4 other organizations.

The comments raised several procedural and substantive issues, including the following: Questioning the consistency of the draft Program Comment with the interstate highway exemption as required by the FAST ACT; clarifying the types of historic properties that may be covered by the Program Comment including historic properties of religious and cultural significance to Indian tribes and Native Hawaiian organizations, and archaeological sites; clarifying the SHPOs' and THPOs' roles regarding the development of the excluded historic properties lists; questioning the potential conflict of the Program Comment's requirements with Section 4(f) of the US Department of Transportation Act; monitoring the accountability of the project sponsor in appropriately applying the Program Comment; asking about the need for a dispute resolution provision; clarifying and defining specific terminology; specifying annual reporting requirements; questioning the types of activities that should or should not be exempt from Section 106 review under Appendix A; and questioning the types of activities in Appendix A that should be subject to review or supervision by an individual meeting the Secretary of the Interior's ("SOI") Professional Qualifications Standards for Archaeologists or Architectural Historians.

In response to the comments received to the November 2017 publication, the ACHP and USDOT made several revisions to the Program Comment. The exclusion for historic properties of religious and cultural significance to Indian tribes and Native Hawaiian organizations and archaeological sites was clarified. The ACHP and USDOT also clarified how the USDOT would publish implementing guidance to provide further detail regarding the identification and evaluation of excluded historic rail properties. The Program Comment incorporates dispute resolution provisions, additional clarification or removal of specific terms and definitions, and a revised list of activities in Appendix A.

The ACHP and USDOT hosted meetings and invited representatives of the National Conference of State Historic Preservation Officers ("NCSHPO"), the National Trust for Historic Preservation, the National Association of Tribal Historic Preservation Officers, and the railroad and rail transit industries in February and May 2018. These meetings continued discussions about the draft Program Comment and in particular, addressed the list of activities to be included in Appendix A and determining which activities should require supervision of SOI-qualified personnel, and the process for establishing the lists of excluded historic rail properties and the scope of the exemption under the property-based approach. Draft versions of Appendix A and the property-based approach were circulated for additional review and comment following the May meeting. By the June 4, 2018, comment response date, the ACHP and USDOT received a total of 128 additional comments from 16 commenters: 11 SHPOs, including NCSHPO; 4 industry representatives; and 1 historic preservation stakeholder.

The SHPOs provided several general comments and many specific comments on both the revised draft Appendix A and the property-based approach. Some questioned the broad scope of the Program Comment; however, due to the requirements of the FAST Act, the two-part approach has been retained in the final version as the ACHP and USDOT believe it represents the best way to achieve the intent and purpose of the statutory mandate.

Many SHPOs asked for annual reporting in the Program Comment. The Program Comment was initially revised to clarify an annual reporting requirement as well as the information that agencies must include in such reports. Several SHPOs asked that an expiration date be included in the Program Comment. While the sunset clause and reporting requirement have been removed, as noted in the discussion of additional comments below, the revised Program Comment requires a regular evaluation be conducted (within one year of issuance and every two years thereafter) to ensure the effective operation of the Program Comment and that its terms are being met. The lack of an expiration date and process for regular evaluations is consistent with the interstate highway exemption.

Many SHPOs asked for a dispute resolution process both in the decision-making under Appendix A and the development of the excluded historic property lists. The Program Comment was revised to include an opportunity for objection under Appendix A implementation when it appears that a specific activity may be adversely affecting historic properties. It was also clarified that USDOT may request ACHP assistance in resolving any disputes or questions in the development of the excluded historic property lists. The ACHP, rather than the Keeper of the National Register, is the appropriate entity to resolve disputes in the development of the excluded historic property lists because such disputes are about the applicability of the Program Comment rather than the National Register eligibility of any property. Should a question regarding a property's eligibility be raised during the implementation of the Program Comment, USDOT may consult with the Keeper at any time to resolve questions or disagreements.

One SHPO remarked that it would like to see more checks and balances in the Program Comment to ensure effects to historic properties are minimal or not adverse. The Program Comment has been revised to incorporate the comments received into the list of activities in Appendix A and to incorporate SHPO and tribal involvement in the development of the excluded historic property lists. The Program Comment includes activities that may adversely affect historic properties and is not limited to the conditions imposed on exemptions per 36 CFR 800.14(c). In response to a concern that this approach is contrary to the NHPA and other preservation laws, the ACHP and USDOT believe the Program Comment, with its two-part approach, strikes the right balance to achieve the requirements of the FAST Act and is consistent with the interstate highway exemption. Further, one SHPO recommended that traditional cultural properties also be listed as a property type to be excluded from the terms of the Program Comment. The applicability of the Program Comment is consistent with that of the interstate highway exemption in that it does not modify the Section 106 review of effects to non-rail properties, historic properties of religious and cultural significance to Indian tribes or Native Hawaiian organizations, or to archaeological sites located in undisturbed locations. Because the Program Comment specifies that it does not apply to, and Section 106 continues to apply to these properties, the ACHP determined it was not necessary to specify that traditional cultural properties are not covered by the Program Comment.

Finally, a concern was again raised regarding the coordination or impact of this Program Comment on a federal agency's Section 4f requirement. The Program Comment does not modify in any way USDOT's responsibility to comply with Section 4f or an agency's or project sponsor's responsibility to comply with any other applicable federal, state, or local legal requirement. In regard to discovery situations of non-rail historic properties, all relevant laws, for example those related to treatment of human remains, continue to apply.

In response to many comments, the introduction and applicability section of Appendix A was revised and clarified. Most SHPOs suggested specific edits to the list of activities and conditions in Appendix A. A number of SHPOs suggested that SOI-qualified professionals review additional activities or asked that specific activities be removed from the Appendix. Other SHPOs asked to be more involved in the Appendix A process and to be provided an opportunity to review any activity that requires SOI-qualified professional's involvement. Changes were made to many individual activities, such as certain work done to meet the Americans with Disabilities Act, replacement of light fixtures in public spaces, and the addition of lanes and road widening for at-grade crossings within a National Register-eligible or listed historic district. In other cases, the ACHP and USDOT believe the activities and conditions in Appendix A work to reasonably ensure the activities would have minimal or no adverse effect on historic properties. The Program Comment includes an objection process in cases where there is a concern that an adverse effect is occurring or occurred, and the regular program evaluations would provide an additional opportunity to assess the implementation of Appendix A.

SHPOs raised a concern that the use of in-kind replacement might result in a loss of integrity to a historic district. Further, one SHPO said no loss of a character-defining feature should be exempted from Section 106 review. The ACHP and USDOT believe Appendix A allows for a measured balance of preservation and greater efficiency by exempting consideration of effects under Section 106 for those activities that would likely result in minimal or no adverse effect to historic properties.

Some SHPOs asked how federal agencies and project sponsors without SOI-qualified professionals on staff would determine whether the proposed activity had the potential to affect archaeological sites in undisturbed locations. In response, a definition of "previous disturbance" was added to the definitions section of the Program Comment to better clarify for all users the scope of the Program Comment. In addition, many ground disturbing activities in Appendix A require the involvement of an SOI-qualified professional.

NCSHPO, and all of the commenting SHPOs, expressed concern with the lack of SHPO and other stakeholder involvement in the development of the excluded historic property lists. Further, several expressed concern regarding the sources of information that project sponsors would be instructed to consult in developing their initial proposed list as well as the timeline for any SHPO or tribal review of draft lists. In response, the Program Comment was revised to require SHPO and tribal notification by project sponsors in the initial development of the proposed lists and by USDOT in determining the final lists. The USDOT is required to seek public review and comment on each proposed list, and may also require a project sponsor to conduct additional evaluation, including field surveys, or prepare documentation to show how it identified historic properties. It is the USDOT who makes the final decision regarding the list of excluded historic rail properties following the outlined process, not the project sponsor. Additional information regarding USDOT's coordination with project sponsors during the development of the excluded historic property lists, recommended outreach to knowledgeable stakeholders, and the timelines for SHPO and tribal review will be provided in the implementing guidance.

Some SHPOs were concerned with the resource-specific approach that is allowed under the property-based approach. Part of this concern was that it may allow inadvertent effects to other historic properties by its misapplication or by a lack of knowledge about other historic properties that may be present within an undertaking's area of potential effects. Further, one SHPO asked how the context and significance of rail properties that may extend beyond a specific study area would be evaluated. As noted above, the Program Comment now includes a requirement for SHPO and tribal notification and a request for input in the development of the excluded historic property lists. The intent is for the determination of each study area to be meaningful and cognizant of the rail line's or rail transit system's historic context. The Program Comment also includes a regular evaluation requirement to allow the ACHP, USDOT, and other stakeholders the opportunity to review its implementation and determine its effectiveness. Should evaluation show that other historic properties are being adversely affected by a misapplication of the program comment, the parties would be able to address it, for example, via the amendment process in the Program Comment.

Further, commenters expressed concern about potential unintended or unknown adverse effects, including visual effects, to archaeological sites and traditional cultural properties. Consistent with the interstate highway exemption, the Program Comment does not apply to non-rail historic properties and any archaeological site of any nature in undisturbed locations. Section 106 review to consider the effects to these types of historic properties would still need to occur, even if specific activities or effects to certain rail properties would be streamlined under the terms of the Program Comment.

There was some confusion as to whether the criteria for including a rail property on the excluded property list was just an assessment of its National Register eligibility or whether such evaluation only considered rail properties significant at the national level. On a related point, one SHPO said it appeared the duties of the SHPO regarding developing and maintaining lists of eligible and listed historic properties were being given to the USDOT. The excluded historic property lists only refer to the applicability of the Program Comment, not to any particular property's eligibility for the National Register. The Program Comment is not intended to modify the process for determining properties eligible for listing on the National Register. While there is reference to a property's significance, properties significant at the state and local level may also be considered for inclusion in the excluded historic property lists. The same criteria for developing the lists of excluded historic properties was used in the interstate highway exemption, and per the requirement of the FAST Act, this Program Comment is consistent with that approach. In response to a concern raised about any change to the process of de-listing a property from the National Register, the relevant text has been deleted.

There was also a question whether the term "non-rail" historic property should be more clearly defined. In response, the ACHP and USDOT reviewed the definition of rail historic property and believe it is clear, including any temporal association. The use of these terms relates to the mandate of the FAST Act to exempt effects within rail ROW.

Many SHPOs requested that any surveys be done by SOI-qualified professionals and more generally, that project sponsors be required to use SOI-qualified professionals in proposing excluded historic rail properties. USDOT may require a project sponsor to conduct additional evaluation, including field surveys, and prepare documentation to show how it identified historic properties. SHPOs also raised a question about whether the property-based approach would allow for a loss of integrity to historic districts due to cumulative effects. The Program Comment has been revised to require specific opportunities for SHPO and tribal involvement in the development of the excluded historic property lists. It is also important to note that the Program Comment does not apply to consideration of effects to any non-rail historic properties.

Many SHPOs noted concern about the level of detail to be provided in the implementing guidance as well as a concern with the lack of required consultation with SHPOs and other parties by the USDOT and the ACHP in developing the guidance. In response, more details were added in the Program Comment to the description of the content of the guidance. Further, this approach models the approach taken in the interstate highway exemption by USDOT to develop implementing guidance to assist in the implementation of the program alternative.

The National Trust for Historic Preservation endorsed the comments provided by the Colorado SHPO as well as provided a few additional points. They asked that revisions be made to clarify the continued applicability of Section 4f and National Environmental Policy Act to undertakings that may be subject to the Program Comment, and that SOI-qualified personnel be involved in additional activities in Appendix A. They asked that a dispute resolution process be added to Appendix A as well. Finally, they expressed concern about the level of detail to be included in the implementing guidance document and the lack of consultation with SHPOs and other parties in its development. These comments reflect points raised and addressed in the discussion above.

Four industry representatives provided comments on the drafts of Appendix A and the property-based approach shared with stakeholders in May 2018 (the American Public Transportation Association, Amtrak, the Association of American Railroads [AAR] and American Short Line and Regional Railroad Association collectively). They reiterated previous concerns that this draft was not consistent with the interstate highway exemption and did not do enough to effectively streamline the review process for undertakings within rail ROW. However, Amtrak said the Program Comment would enhance its ability to perform crucial maintenance and enhancement projects in a timely manner. As noted above, the ACHP and USDOT believe this two-part Program Comment meets the statutory requirement to exempt the consideration of effects within rail ROW consistent with the interstate highway exemption. The industry representatives asked that the sunset clause be deleted from the draft, and it has been removed and replaced with regular evaluations. They expressed concern over the reporting requirement as being too burdensome under Appendix A. The reporting requirement was initially revised to be an annual report. Finally, the industry representatives noted concern over the title of the "excluded" historic property lists, and revisions were made to the section headings to clarify the applicability and context for these lists.

After making the edits noted above, USDOT submitted a revised final draft Program Comment to the ACHP on June 25, 2018. The ACHP made further revisions and circulated this draft to its council members and industry representatives for an informal review. In response, AAR and the Senate Committee staff asked for additional changes to the Program Comment, and in particular, asked the ACHP to remove the reporting requirement as it was still seen as overly burdensome on industry. The final version of the Program Comment does not include any annual reporting requirement but requires more frequent program evaluations and requires USDOT OAs to review their use and application of the Program Comment.

III. Final Text of the Program Comment

The following is the text of the Program Comment as issued by the ACHP:

Program Comment Program Comment To Exempt Consideration of Effects to Rail Properties Within Rail Rights-of-Way

Section 106 of the National Historic Preservation Act ("NHPA"), 54 U.S.C. 306108 ("Section 106"), requires federal agencies to take into account the effects of their undertakings on historic properties and to provide the Advisory Council on Historic Preservation ("ACHP") a reasonable opportunity to comment with regard to such undertakings. The ACHP has issued regulations that set forth the process through which federal agencies comply with these responsibilities. Those regulations are codified under 36 CFR part 800 ("Section 106 regulations").

Under section 800.14(e) of the Section 106 regulations, agencies can request the ACHP to provide a program comment on a particular category of undertakings in lieu of conducting separate reviews of each individual undertaking under such category, as set forth in 36 CFR 800.3 through 800.7. Federal agencies can satisfy their Section 106 responsibilities with regard to the effects of undertakings on rail properties located in railroad and rail transit rights-of-way ("rail ROW") by following this program comment and the steps set forth therein.

I. Introduction

The ACHP is issuing this program comment to exempt consideration of effects under Section 106 to rail properties located within rail ROW. This program comment has been developed in accordance with Section 11504 of the Fixing America's Surface Transportation Act ("FAST Act") (49 U.S.C. 24202), which mandated the development of a Section 106 exemption for "railroad rights-of-way." More specifically, it required the Secretary of Transportation to submit a proposed exemption to the ACHP for consideration, and for the ACHP to issue a final exemption not later than 180 days after the date of receipt of the U.S. Department of Transportation's ("USDOT") submittal.

This program comment establishes two methods to meet the statutory directive: An activities-based approach and a property-based approach. The activities-based approach described in section III exempts from Section 106 review the activities listed in Appendix A, "Exempted Activities List," provided the conditions outlined therein are met. Those activities involve maintenance, repair, and upgrades to rail properties that are necessary to ensure the safe and efficient operation of freight, intercity passenger, commuter rail, and rail transit operations. While those activities may over time alter various historic elements within rail ROW, these changes are likely to be minimal or not adverse and are necessary to continue meeting the transportation needs of the nation. The property-based approach described in section IV provides an optional process for identifying excluded historic rail properties that are subject to Section 106 review, while exempting consideration of effects to other rail properties.

If a federal agency responsible for carrying out, licensing, permitting, or assisting an undertaking with the potential to affect historic rail properties meets the terms of this program comment, its Section 106 responsibility to take into accounts those effects will be satisfied.

II. Applicability

A. Applicability of Program Comment

1. The program comment applies to undertakings that may affect rail properties located within rail ROW. Any federal agency responsible for an undertaking located within rail ROW may utilize this program comment to satisfy its Section 106 responsibilities for those undertakings.

2. Under the Surface Transportation Project Delivery Program, codified at 23 U.S.C. 327, a state may assume the Secretary of Transportation's responsibilities to comply with Section 106 for certain projects or classes of projects. In such cases, the state may rely on this program comment to fulfill its Section 106 responsibilities.

3. Where a program alternative developed pursuant to 36 CFR 800.14, such as a statewide programmatic agreement, delegates Section 106 responsibility to another entity, that entity may also utilize the terms of this program comment for relevant undertakings as applicable. This program comment does not supersede or modify any existing program alternatives, including existing executed programmatic agreements. In cases when this program comment and one or more other program alternatives apply to a proposed undertaking, the federal agency has discretion to determine which program alternative to follow.

B. Continued Applicability of Section 106

1. This program comment does not apply to, and the federal agency must comply with the requirements of 36 CFR part 800, or adhere to the terms of an applicable program alternative executed pursuant to 36 CFR 800.14, for the following:

a. Undertakings within rail ROW in the following situations:

i. Undertakings that are located within or would affect historic properties located on tribal lands;

ii. Undertakings consisting of activities not included in Appendix A and that may affect an excluded historic rail property designated by USDOT pursuant to section IV;

iii. Undertakings that could affect historic buildings, structures, sites, objects, or districts that do not have a demonstrable relationship to the function and operation of a railroad or rail transit system;

iv. Undertakings that could affect archaeological sites located in undisturbed portions of rail ROW, regardless of whether the sites are associated with railroads or rail transit systems. An archaeologist meeting the Secretary of the Interior's Professional Qualifications ("SOI-qualified professional") may assist in identifying undisturbed soils; and

v. Undertakings that could affect historic properties of religious and cultural significance to federally recognized Indian tribes or Native Hawaiian organizations ("NHOs").

b. Undertakings that are not within rail ROW. For undertakings for which the area of potential effects ("APE") is partially within but extends beyond rail ROW, this program comment applies only to the portions of the undertaking within rail ROW. Federal agencies must consider potential effects to properties adjacent to rail ROW that could be affected by the undertaking, including noise or vibration effects or changes to a historic property's setting.

2. If an unanticipated discovery of a non-rail historic property, archaeological site of any nature, or human remains, or an unanticipated adverse effect on a previously identified non-rail historic property is made during the implementation of an exempted activity listed in Appendix A, the Section 106 requirements at 36 CFR 800.13 and/or applicable burial law, as appropriate depending on the nature of the resource, apply because effects to such resources are not covered by this program comment. At minimum, the Project Sponsor must cease all work in the affected area, secure the area, and notify the federal agency within 72 hours. The federal agency will consult with the State Historic Preservation Officer (SHPO), federally recognized Indian tribes, NHOs, and any other stakeholders as appropriate, to determine the appropriate course of action. If an undertaking involves multiple exempted activities listed in Appendix A, those that do not involve or affect the non-rail resource, as determined by the federal agency, may continue. The Project Sponsor must comply with any applicable state and/or local law regarding the resource.

C. This program comment does not alter the requirements of any applicable easements, covenants, and/or state or local historic preservation ordinances. Other federal and state laws such as the National Environmental Policy Act and Section 4(f) of the USDOT Act also remain applicable, as appropriate.

III. Activities-Based Approach to Exempting Consideration of Effects Under Section 106

A. Undertakings to maintain, improve, or upgrade rail properties located in rail ROW that are limited to the activities specified in Appendix A are exempt from the requirements of Section 106 because their effects on historic rail properties are foreseeable and likely to be minimal or not adverse. The activities included in Appendix A are exempt from further Section 106 review regardless of whether the rail properties affected are eligible for or listed on the National Register of Historic Places or whether the activities may affect an excluded historic rail property as designated by USDOT pursuant to section IV.

B. If a SHPO, a federally recognized Indian tribe, or an NHO believe an undertaking carried out under Appendix A is adversely affecting or has adversely affected a historic rail property, the SHPO, Indian tribe, or NHO may notify the federal agency responsible for the undertaking of its concern. The federal agency will promptly investigate the concern within 72 hours of the notification. The federal agency will then determine the appropriate course of action, in consultation with the Project Sponsor, SHPO, Indian tribe, NHO, and other stakeholders, as appropriate.

IV. Property-Based Approach to Exempting Consideration of Effects Under Section 106

Project Sponsors may opt to collaborate with a USDOT Operating Administration ("OA") to designate excluded historic rail properties within a defined study area, as described in section IV.A, for which the federal agency must comply with requirements of Section 106 for undertakings that have the potential to affect those properties. Once a USDOT OA formally excludes historic rail properties within a study area, consideration of effects to all other evaluated rail properties within that study area shall be exempt from Section 106 review for any undertaking by any federal agency. In accordance with section IV.C. below, USDOT will publish implementing guidance that will provide further detail regarding the identification and evaluation of excluded historic rail properties. This property-based approach shall go into effect on the date USDOT publishes the implementing guidance within nine months of issuance of this Program Comment.

A. Identification of Excluded Historic Rail Properties

1. A Project Sponsor that opts to follow the property-based approach to identify excluded historic rail properties must follow the steps outlined below, in accordance with the implementing guidance. To provide maximum flexibility and utility in this process, a Project Sponsor can opt-in on its preferred timeline.

a. A Project Sponsor must clearly define the study area, *i.e.*, the portion of rail ROW to be evaluated, which can be identified by location (*e.g.*, state, county), name of rail corridor, railroad, rail transit system or line, and/or mile-post information, etc.

b. A Project Sponsor may choose to evaluate for designation as excluded historic rail properties either (i) all rail properties in the defined study area, or (ii) a particular property type or types, such as rail bridges, stations and depots, tunnels, etc. within the defined study area.

c. A Project Sponsor's evaluation efforts should also be informed by a variety of available and existing information, including historic context studies, local and state inventories, surveys and evaluations; railroad company records (*e.g.*, bridge inventories or inspection reports); knowledgeable railroad and rail transit personnel; railroad and rail transit historical society museum and archival collections; railroad and rail transit enthusiast website publications; state or local historic preservation organizations; and other relevant documentation and professional experience and expertise. Prior to submitting its proposed list to the USDOT OA, each Project Sponsor must notify the SHPO(s) in the state(s) within which the study area lie(s), and Indian tribes or NHOs who may attach religious and cultural significance to historic properties within the study area, of its evaluation efforts to identify excluded properties and request their input. If existing information is not available to determine the potential historic significance of rail properties within the defined study area, the USDOT OA may require the Project Sponsor to conduct a physical survey of the study area carried out by or under the direct supervision of individuals meeting the SOI's professional qualifications.

d. A Project Sponsor must submit to the USDOT OA the rail properties it proposes be designated as excluded historic rail properties, along with a summary of its evaluation efforts including whether it evaluated all rail properties within the study area or only a certain type(s) of rail property, in accordance with the implementing guidance.

2. Once a Project Sponsor submits a proposal to designate excluded historic rail properties for a study area to the USDOT OA, the USDOT OA will take the following actions to review and designate excluded historic rail properties:

a. The USDOT OA will review each proposal received from a Project Sponsor in accordance with the implementing guidance. The USDOT OA shall notify and request the input of the SHPO(s), Indian tribes, and/or NHOs when reviewing a Project Sponsor's proposal. The USDOT OA will have the discretion to require a Project Sponsor to conduct additional evaluation and/or provide additional documentation to demonstrate that the Project Sponsor made a reasonable effort to identify potential excluded rail properties. Following its review of a Project Sponsor's proposal, the USDOT OA will make the proposed list, modified as necessary based on its review and any consultation or additional evaluation or documentation, available for public review and comment, and will consider input from interested parties and the public before designating the excluded historic rail properties within a study area. The USDOT OA may seek input from the ACHP, including advice regarding resolution of any objections or concerns from commenters, before making such designations. The USDOT may, as needed, consult with the Keeper of the National Register to resolve questions or disagreements about the National Register eligibility of any rail properties.

b. The USDOT OA will designate excluded historic rail properties within a study area within 12 months of receipt of a Project Sponsor's adequately supported proposal, in accordance with the implementing guidance.

c. USDOT will publish and periodically update the list of designated excluded historic rail properties on its website (*www.transportation.gov*).

B. Effect of Designation as an Excluded Historic Rail Property

1. All undertakings that may affect USDOT-designated excluded historic rail properties are subject to Section 106. However, undertakings that include activities listed in Appendix A require no further Section 106 review regardless of the rail property that would be affected, including excluded historic rail properties.

2. Once a USDOT OA designates excluded historic rail properties within a study area and the list is published on the USDOT website, consideration of effects to all other evaluated rail properties within that study area are exempt from Section 106 review. If a Project Sponsor chooses to evaluate only a specific rail property type, rather than all historic properties, within a study area, then consideration of effects to rail properties other than the type evaluated remain subject to Section 106.

C. Implementing Guidance

1. Within nine months of the ACHP's issuance of the final Program Comment, USDOT, in coordination with the ACHP and other federal agencies who may have an interest in utilizing the Program Comment, will publish guidance for implementing the property-based approach.

2. The guidance will: Provide further instruction and examples for evaluating rail properties for potential designation as excluded historic rail properties to remain subject to Section 106; describe the process by which a Project Sponsor may propose excluded historic rail properties to a USDOT OA, including early coordination between the Project Sponsor and the USDOT OA; establish timeframes for USDOT OA review of proposals and designation of excluded historic rail properties; and establish public involvement methods.

V. Definition of Terms

Any terms not defined below shall follow the definitions in the NHPA, 54 U.S.C. 300301–300321, and in 36 CFR parts 60 and 800.

A. "Area of potential effects" is defined in 36 CFR 800.16(d) and means 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 area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

B. "Excluded historic rail properties" means those historic properties that illustrate the history of the development of the nation's railroads or rail transit systems and:

1. Are at least 50 years old, possess national significance, and meet the National Register eligibility criteria as defined in 36 CFR 60.4;

2. are less than 50 years old, possess national significance, meet the National Register eligibility criteria, and are of exceptional importance;

3. were listed in the National Register, or determined eligible for the National Register by the Keeper pursuant to 36 CFR part 63, prior to the effective date of the Program Comment and retain eligibility as determined by the USDOT OA; or

4. are at least 50 years old and meet the National Register eligibility criteria at the state or local level of significance, as determined by the USDOT OA.

C. "Historic property" is defined in 36 CFR 800.16(l) and means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of religious and cultural importance to a federally recognized Indian tribe or Native Hawaiian organization that meet the National Register criteria.

D. "In-kind" means that new materials used in repairs or replacements match the material being repaired or replaced in design, color, texture, other visual properties, and, where possible, materials. For more information, see The Secretary of the Interior's Standards for Rehabilitation, at *https://www.nps.gov/tps/standards/rehabilitation.htm*.

E. "National significance" means a historic property that is eligible or listed in the National Register and either:

1. designated as a National Historic Landmark;

2. designated as a Historical Civil Engineering Landmark;

3. listed as nationally significant in its nomination or listing in the National Register; or

4. determined by a USDOT OA to have significance at the national level.

F. "Project Sponsor" means an entity such as a state, tribal or local government, joint venture, railroad commission, compact authority, port authority, transit agency or authority, or private company that is eligible to receive federal financial assistance (*e.g.*, grant, loan). A Project Sponsor may also be an entity that requires a federal permit, license, or approval to carry out a proposed activity in rail ROW (*e.g.*, a permit under Section 404 of the Clean Water Act issued by the Army Corps of Engineers or a permit under Section 9 of the Rivers and Harbors Act of 1899 issued by the United States Coast Guard).

G. "Rail properties" means infrastructure located within rail ROW that has a demonstrable relationship to the past or current function and operation of a railroad or rail transit system, including but not limited to: Rails and tracks, ties, ballast, rail beds, signal and communication systems, switches, overhead catenary systems, signage, traction power substations, passenger stations/depots and associated infrastructure and utilities, freight transfer facilities, boarding areas and platforms, boarding platform shelters and canopies, bridges, culverts, tunnels, retaining walls, ancillary facilities, ventilation structures, equipment maintenance and storage facilities, railyards and rail transit yards, parking lots and parking structures, landscaping, passenger walkways, and security and safety fencing. Rail properties may also include a section of a railroad or rail transit line. The definition does not include properties with no demonstrable relationship to the function and operation of a railroad or rail transit system, such as: adjacent residential, commercial or municipal buildings; or property unrelated to existing or former railroads and rail transit lines that is proposed to be used for new rail infrastructure.

H. "Railroad and Rail Transit Rights-of-Way" means the land and infrastructure that have been developed for existing or former intercity passenger rail, freight rail, rail transit operations, or that are maintained for the purpose of such operations. Rail ROW includes current and/or former railroad or rail transit lines regardless of current ownership and whether there is rail service operating on the railroad or rail transit line. It includes property that was previously developed for railroad or rail transit use even though the infrastructure has been modified or removed, and the property may lack visual evidence of previous railroad or rail transit use. It does not include land that was never developed for railroad or rail transit use. Rail ROW includes and may be identifiable by the presence of infrastructure that has a demonstrable relationship to the past or current function and operation of a railroad or rail transit system that commonly includes but is not limited to the rail properties specified in the definition above.

I. "Section 106" means Section 106 of the National Historic Preservation Act, 54 U.S.C. 306108.

J. "Study area" means the portion of rail ROW identified for the purposes of the evaluation under the property-based approach described in section IV. It may be delineated by: location (*e.g.*, state, county); name of rail corridor, railroad, rail transit system or line; or mile-post information.

K. "Undertaking" is defined at 36 CFR 800.16(y) and means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; and those requiring a federal permit, license, or approval.

L. "Undisturbed portions of rail ROW" means soils that have not been physically impacted by previous construction or other ground disturbing activities such as grading. Undisturbed soils may occur below the depth of previously disturbed soils or fill.

M. "USDOT OA" means the United States Department of Transportation's Operating Administrations, including the Federal Railroad Administration ("FRA"), the Federal Transit Administration, and the Federal Highway Administration.

VI. Effective Date

The activities-based approach to exempting consideration of effects under Section 106, as described in section III, shall go into effect on the date the program comment is issued by the ACHP. At that time, federal agencies may immediately utilize the list of exempted activities in Appendix A. This includes undertakings that have not yet been initiated and undertakings for which the Section 106 review process is underway but not completed.

The property-based approach to exempting consideration of effects under Section 106, as described in section IV, shall go into effect on the date USDOT publishes the implementing guidance in accordance with section IV.C.

VII. Program Comment Review

Within one year of the issuance of this program comment, and every two years thereafter, the USDOT OAs and the ACHP shall evaluate the ongoing effectiveness and efficiency of the implementation of this program comment. The USDOT OAs shall review their use and application of the program comment, and may invite transportation stakeholders to participate in this review as appropriate.

VIII. Amendment

The ACHP may amend this program comment after consulting with the USDOT OAs and other relevant federal agencies, the National Conference of State Historic Preservation Offices ("NCSHPO"), National Association of Tribal Historic Preservation Officers ("NATHPO"), tribal representatives, the National Trust for Historic Preservation, and representatives from the railroad and rail transit industry, as appropriate. The ACHP will publish a notice in the **Federal Register** informing the public of any amendments that are made to the program comment.

IX. Withdrawal

The ACHP may withdraw this program comment, pursuant to 36 CFR 800.14(e)(6), by publication of a notice in the **Federal Register** 30 days before the withdrawal will take effect.

Appendix A: Exempted Activities List

I. General Rule

A. The federal agency is responsible for determining if an undertaking is covered by one or more activities in the Exempted Activities List. At its discretion, the federal agency may require the Project Sponsor to provide relevant documentation, such as plans, photographs, or materials specifications, so that the federal agency can determine whether the Exempted Activities List applies.

B. Whenever possible, historic materials must be repaired rather than replaced. At its discretion, the federal agency may require the Project Sponsor to provide written justification explaining why repair is not feasible. In cases where existing historic materials are beyond repair, replacement must be carried out in-kind as defined below.

C. Several of the activities in the Exempted Activities List require that the work be "in-kind." For purposes of this program comment, "in-kind" means that new materials used in repairs or replacements match the material being repaired or replaced in design, color, texture, other visual properties, and, where possible, materials. For more information, see The Secretary of the Interior's Standards for Rehabilitation, at *https://www.nps.gov/tps/standards/rehabilitation.htm*. Except where specified in the Exempted Activities List, a Project Sponsor is not required to involve an SOI-qualified professional in carrying out in-kind work. However, the federal agency, at its discretion, may require the Project Sponsor to provide documentation demonstrating that the work would be in-kind, utilize non-damaging or reversible methods, etc.

D. Certain activities, as specified in the Exempted Activities List, require that the federal agency and Project Sponsor ensure the work is performed by or under the supervision of individuals that meet the SOI's Professional Qualification Standards in Architectural History, Architecture, and/or Historic Architecture (see 36 CFR Appendix A to part 61), as appropriate, and must be performed in accordance with the SOI Standards for the Treatment of Historic Properties (*https://www.nps.gov/tps/standards.htm*). If an SOI-qualified professional is not available to assist in the evaluation and/or design of a specified activity, that activity is not exempt from Section 106 review.

E. The Exempted Activities List does not apply to archaeological sites of any nature located within undisturbed portions of rail ROW. Therefore, if an exempted activity would cause ground disturbance in undisturbed portions of the rail ROW, the federal agency is responsible for complying with Section 106 regarding consideration of potential effects to archaeological sites before approving the undertaking.

F. The Exempted Activities List does not apply to non-railroad or rail transit related buildings or structures located within or adjacent to rail ROW within an undertaking's APE. The federal agency remains responsible for determining whether an activity in the Exempted Activities List has the potential to affect non-rail historic properties and for complying with Section 106 with regard to those properties before approving the undertaking.

G. If an unanticipated discovery of a non-rail historic property, archaeological site of any nature, or human remains, or an unanticipated adverse effect on a previously identified non-rail historic property is made during the implementation of an activity on the Exempted Activities List, the Section 106 requirements at 36 CFR 800.13 and/or applicable burial law, as appropriate depending on the nature of the resource, apply because effects to such resources are not covered by this program comment. At minimum, the Project Sponsor must cease all work in and secure the area and notify the federal agency within 72 hours. The federal agency will consult with SHPO, federally recognized Indian tribes, NHOs, and other stakeholders as appropriate, to determine the appropriate course of action. The Project Sponsor must comply with any applicable state or local law regarding the resource. If an undertaking involves multiple activities on the Exempted Activities List, those that do not involve or affect the non-rail resource, as determined by the federal agency, may continue.

H. The Project Sponsor must comply with the requirements of any applicable easements, covenants, and/or state or local historic preservation ordinances. Other federal and state laws such as the National Environmental Policy Act and Section 4(f) of the USDOT Act also remain applicable to activities exempted from Section 106, as appropriate.

II. Exempted Activities List

A. Track and Trackbed

1. Track and trackbed maintenance, repair, replacement, and upgrades within the existing footprint (*i.e.*, existing subgrade, sub-ballast, ballast, and rails and crossties (track)). These activities must not include alterations to the trackbed that would result in a substantial visual change (*i.e.*, elevation or alignment) in the relationship between the trackbed and the surrounding landscape or built environment.

2. Reinstallation of double tracking on a currently single-tracked line that had historically been double-tracked.

B. Bridges and Tunnels

1. In-kind maintenance and repair of bridges and tunnels.

2. In-kind replacement of bridge hardware and mechanical and electrical components (*e.g.*, brackets, rivets, bearings, motors).

3. Maintenance or repair of tunnel ventilation structures and associated equipment (*e.g.*, fans, ducting).

4. Replacement of tunnel ventilation structures that are not located within a previously identified historic district.

5. Replacement of tunnel ventilation structures that are located and publicly visible within a previously identified historic district, provided the replaced structures are substantially the same size as or smaller than the existing structures and are visually compatible with the surrounding built environment.

6. Maintenance, repair, or replacement of tunnel emergency egress hatchways.

7. Maintenance, installation, repair, or replacement of lighting, signal and communications systems, railings, and other safety- and security-related equipment or elements located within the interiors of tunnels.

8. Removal or replacement of any bridge or tunnel material or added-on element that is not part of the original construction.

9. Actions to strengthen or repair deteriorating non-character defining structural components of bridges that are intended to maintain their useful life and safe use and that do not substantially alter the bridge from its existing appearance.

10. The following activity must be performed or supervised by an SOI-qualified professional: In-kind replacement of character-defining structural or non-structural components of a bridge superstructure or substructure that do not diminish the overall integrity of the bridge. This does not include demolition of a bridge and replacement with an entirely new structure.

C. Railroad and Rail Transit Buildings (e.g., Passenger Stations and Depots, Maintenance and Equipment Buildings, Interlocking Towers) and Boarding Platforms

1. Modifications (*e.g.*, repair, extension, widening, slope adjustments, changes in height) to non-character defining passenger platforms and walkways that are necessary to meet Americans with Disabilities Act (ADA) requirements or other federal or municipal public or life safety codes and standards, provided those changes do not require associated improvements such as relocation of station doors, construction of ramps, etc. When the original material and construction used something other than common concrete or asphalt methods (*e.g.*, decorative brick or tile), new materials (*e.g.*, non-slip) may be used but must visually match the existing decorative pattern.

2. Maintenance or repair of escalators, elevators, or stairs. Repair of decorative (*i.e.*, non-mechanical) elements must be in-kind. Repair of stairs constructed of material other than common concrete (*e.g.*, brick, tile, marble) must be in-kind.

3. Cleaning, painting, or refinishing of surfaces with a like color and where the products or methods used would not damage the original surface.

4. Maintenance, repair, or replacement of fire or security alarm or fire suppression systems, physical access controls, security cameras, wireless internet, and similar safety, security, or computer equipment and devices.

5. Installation of new fire or security alarm or fire suppression systems, physical access controls, security cameras, wireless internet, and similar safety, security, or computer equipment and devices, except within publicly accessible areas of stations or depots. Such new installations must, to the extent feasible and when appropriate, use a minimally obtrusive design; match the color of surrounding paint, wall coverings, finishes, etc.; avoid damaging or removing historic fabric; be attached to non-historic fabric; be concealed within existing enclosures or conduit or behind walls and ceilings; be co-located with existing similar modern equipment, etc.

6. Maintenance, repair, or replacement of HVAC or electrical systems.

7. Installation of new HVAC or electrical systems, except within publicly accessible areas of stations or depots. Such new installations must, to the extent feasible and when appropriate, use a minimally obtrusive design; match the color of surrounding paint, wall coverings, finishes, etc.; avoid damaging or removing historic fabric; be attached to non-historic fabric; be concealed within existing enclosures or conduit or behind walls and ceilings; be co-located with existing similar modern equipment, etc.

8. Minor ADA improvements at passenger stations that do not damage, cover, alter, or remove character-defining architectural spaces, features, or finishes. Examples include the installation of restroom stalls/partitions, hardware and fixtures such as grab bars, tilt frame mirrors, and sinks and toilets; tactile warning strips on floors, passenger walkways, and platforms; cane detectors; sidewalk curb cuts; automatic door openers; and handrails.

9. Maintenance, repair, or replacement of previously installed ADA elements.

10. Maintenance, repair, or replacement of pumps, air compressors, or fueling stations.

11. Removal of mechanical equipment inside railroad and rail transit facilities not visible to the public. Examples include relay panels, switchgear, and track diagram boards. If the equipment to be removed includes obsolete or outdated technology, the Project Sponsor must contact the SHPO, railroad museums or railroad historical societies, museums, educational institutions, or similar entities to determine if there is an entity that may be interested in purchasing or receiving the equipment as a donation, as appropriate. The Project Sponsor must demonstrate to the federal agency that it has made a good faith effort to contact such parties prior to removal and disposition of such equipment.

12. Addition of new mechanical equipment in basements, beneath platforms, in designated mechanical equipment areas, or in areas that are otherwise out of public view.

13. Paving, painting, or striping of existing parking surfaces.

14. In-kind maintenance or repair of platform boarding canopies and supports.

15. In-kind maintenance or repair of architecturally distinctive light poles and fixtures.

16. State-of-good-repair ("SOGR") activities not included elsewhere in this section that are necessary to keep a station, depot, or other railroad or rail transit building inhabitable and safe, as required by applicable federal or municipal fire, life safety, or health codes or standards, and in transportation-related use that meet the following conditions:

a. Maintenance and repair activities that affect character-defining architectural features (*e.g.*, elevator head houses and portals; roofs; doors; windows; stairs; platform canopies; columns; floors; ceilings) must be in-kind.

b. SOGR activities do not include demolition, decommissioning, or mothballing of railroad or rail transit buildings that are not in use, or reconfiguring the interior spaces of passenger stations for a new use (*e.g.*, enclosing a passenger waiting area to create new office, baggage handling, or event space).

17. Maintenance, repair, or replacement activities that are not included elsewhere on this list and involve non-character-defining non-structural elements, features, systems, hardware, and fixtures in the interior or on the exterior of non-station railroad or rail transit buildings.

18. In-kind maintenance or repair of original architectural features in the interior or on the exterior of passenger stations (*e.g.*, handrails, ticket counters, mouldings.

19. In-kind maintenance or repair of character-defining signage (*e.g.*, station identifier, wayfinding) within publicly accessible areas of stations or depots.

20. Maintenance, repair, or replacement of non-character defining signage (*e.g.*, station identifier, wayfinding) within publicly accessible areas of stations or depots.

21. The following activities must be performed or supervised by an SOI-qualified professional:

a. Replacement of character defining escalators, elevators, or stairs, and decorative elements related thereto.

b. ADA improvements at passenger stations that involve the modification or removal of character-defining features such as stairs, floors, ceilings, doors, windows, roofs, platform boarding canopies and supports, benches/seating, or ticket counters; or that involve the addition of new ramps, stairs, escalators, elevators, wheelchair lifts, wheelchair lift enclosures, station identifier and wayfinding signage, and public information display systems ("PIDS").

c. SOGR activities that include replacement of character-defining architectural features or otherwise require substantial rehabilitation to address deteriorated conditions. As previously indicated, SOGR activities do not include demolition, decommissioning, or mothballing of railroad or rail transit buildings that are not in use, or reconfiguring the interior spaces of passenger stations for a new use (*e.g.*, enclosing a passenger waiting area to create new office, baggage handling, or event space).

d. Installation of new fire or security alarm or fire suppression systems, physical access controls, security cameras, wireless internet, and similar safety, security, or computer equipment and devices within publicly accessible areas of stations or depots.

e. Installation of new HVAC or electrical systems within publicly accessible areas of stations or depots.

f. Replacement of platform boarding canopies and supports.

g. Replacement of architecturally distinctive light poles and fixtures.

h. Replacement of original architectural features in the interior or on the exterior of passenger stations (*e.g.*, handrails, ticket counters, mouldings).

i. Replacement of character-defining signage (*e.g.*, station identifier, wayfinding) within publicly accessible areas of stations or depots.

D. Signals, Communications, and Power Generation

1. Maintenance, repair, or replacement of component parts of signal, communications, catenary, electric power systems, or other mechanical equipment that retains the visual appearance of the existing infrastructure. This includes replacement of individual signal masts or transmission lines, but does not include demolition and replacement of an entire catenary system or signal bridge.

2. Maintenance, repair, or replacement of radio base stations.

3. Maintenance, repair, or replacement of the mechanical components of traction power substations, *e.g.*, transformers, circuit breakers, electrical switches. This does not include demolition and replacement of an entire substation.

4. In-kind maintenance or repair of signal bungalows, signal houses, control houses, instrument houses, and structures of similar function.

5. Installation, repair, or replacement of communications equipment on locomotives and rolling stock that are actively used for intercity passenger rail, rail transit, or freight rail. This does not apply to historic trains used for tourism.

6. The following activities must be performed or supervised by an SOI-qualified professional:

a. Replacement of signal bungalows, signal houses, control houses, instrument houses, and structures of similar function.

E. Railroad and Rail Transit/Roadway At-Grade Crossings and Grade Separations

1. Maintenance, repair, or rehabilitation of at-grade railroad and rail transit crossings including installation of railroad and rail transit crossing signs, signals, gates, warning devices and signage, highway traffic signal preemption, road markings, paving and resurfacing, and similar safety improvements.

2. Replacement of at-grade railroad and rail transit crossings on existing railroads, rail transit lines, and roadways, including components such as crossing signs, signals, gates, warning devices and signage, highway traffic signal pre-emption, road markings, paving and resurfacing, and similar safety features.

3. Expansion of sidewalks, constructed with common concrete or asphalt methods, along the sides of an existing at-grade railroad or rail transit crossing.

4. In-kind maintenance or repair of grade-separated crossings of other transportation modes (highways, local roads, pedestrian underpasses).

5. In-kind rehabilitation or replacement of grade-separated crossings of other transportation modes (highways, local roads, pedestrian underpasses). This does not include modifications to existing grade separation structures (*e.g.*, bridges, overpasses) that would result in a substantial increase in height or overall massing or substantial change in appearance. Replacements must be substantially the same appearance and size as existing.

6. Addition of lanes, turning lanes, road widening, and pavement markings at existing at-grade crossings when the crossing does not involve an individual National Register-listed or known historic roadway or a roadway that is a contributing resource to a National Register-listed or known historic district.

7. Construction of curbs, gutters, or sidewalks adjacent to existing roadway at existing at-grade crossings when the crossing does not involve an individual National Register-listed or eligible roadway or a roadway that is a contributing resource to a National Register-listed or eligible historic district.

8. The following activities must be performed or supervised by an SOI-qualified professional:

a. Addition of lanes, turning lanes, road widening, and pavement markings at existing at-grade crossings when the crossing involves an individual National Register-listed or eligible roadway or a roadway that is a contributing resource to a National Register-listed or eligible historic district.

b. Construction of curbs, gutters, or sidewalks adjacent to existing roadway at existing at-grade crossings when the crossing involves an individual National Register-listed or eligible roadway or a roadway that is a contributing resource to a National Register-listed or eligible historic district.

F. Safety and Security

1. Maintenance, repair, replacement, or installation of the following security and intrusion prevention devices adjacent to tracks or in railyards or rail transit yards: Security cameras, closed captioned television ("CCTV") systems, light poles and fixtures, bollards, emergency call boxes, access card readers, and warning signage.

2. Maintenance, repair, replacement, or installation of security and safety fencing, guardrails, and similar intrusion prevention and fall protection measures.

3. Maintenance, repair, replacement, or installation of safety equipment/fall protection equipment on rail bridges, signal bridges, or other non-station structures for the protection of rail workers or the public. Examples include railings, walkways, gates, tie-off safety cables, anchors, and warning signage.

4. Maintenance, repair, replacement, or installation of wayside detection devices.

5. Maintenance, repair, replacement, or installation of bridge clearance/strike beams.

G. Erosion Control, Rock Slopes, and Drainage

1. Placement of riprap and similar bank stabilization methods to prevent erosion affecting bridges and waterways.

2. Erosion control through slide and slope corrections.

3. Rock removal and re-stabilization activities such as scaling and bolting.

4. Maintenance, repair, or replacement of pre-cast concrete, cast iron, and corrugated metal culverts that lack stone or brick headwalls. This does not include culverts such as those built by the Civilian

Conservation Corps or those made out of unique materials (*e.g.*, a hollowed log).

5. Expansion through horizontal elongation of pre-cast concrete, cast iron, and corrugated metal culverts that lack stone or brick headwalls for the purpose of improved drainage.

6. Embankment stabilization or the re-establishment of ditch profiles.

7. Corrections to drainage slopes, ditches, and pipes to alleviate improper drainage or changing alluvial patterns.

8. In-kind maintenance, repair, or replacement of retaining walls. Replacements must be substantially the same size and appearance as existing.

9. In-kind maintenance or repair of stone or brick culvert headwalls and wingwalls.

10. Maintenance, repair, or replacement of culvert headwalls and wingwalls constructed of concrete.

11. Maintenance, repair, or alterations to the interiors of culverts and related drainage pathways.

12. The following activities must be performed or supervised by an SOI-qualified professional:

a. Replacement of stone or brick culvert headwalls and wingwalls.

b. Vertical extension of stone or brick culvert headwalls using in-kind materials and design compatible with existing.

H. Environmental Abatement

1. Removal or abatement of environmental hazards such as asbestos, treated wood, and lead or heavy-metal coatings and paintings. Activities that replace coatings, paint, flooring materials, etc. must be of the same color and appearance as the materials that have been removed or abated.

2. Removal of contaminated ballast, sub-ballast, subgrade, and soils.

I. Operations

1. Establishment of quiet zones, including the installation of required warning devices and additional safety measures installed at grade crossings that do not entail closing of existing roadways.[1]

2. Increased frequency of train or rail transit operations that do not result in noise or vibration impacts. The lead federal agency may, at its discretion, require a noise and vibration study be prepared by a qualified subject matter expert before approving the undertaking.

3. Temporary storage of rail cars or rail transit cars on active rail lines.

4. Maintenance, repair, or replacement of noise barriers. If a replaced noise barrier is to be located and publicly visible within a National Register-listed or eligible historic district, it must be substantially the same size as or smaller than existing and be visually compatible with the surrounding built environment.

[1] A quiet zone is an FRA exemption to the rule requiring trains to sound their horns when approaching public highway-rail grade crossings. More information on the creation of quiet zones is available in FRA's regulations at 49 CFR part 222, Use of Locomotive Horns at Public Highway-Rail Grade Crossings, and in guidance promulgated by FRA's Office of Railroad Safety (for example, see *https://www.fra.dot.gov/Page/P0841* and *https://www.fra.dot.gov/eLib/Details/L04781*).

J. Landscaping, Access Roads, and Laydown Areas

1. In-kind replacement of landscaping.

2. Mowing, seeding/reseeding, planting, tree trimming, brush removal, or other similar groundcover maintenance activities.

3. Maintenance of access roads and lay-down areas.

K. Utilities

1. Maintenance, repair, or replacement of above-ground and underground utilities (*e.g.*, electrical, sewer, compressed air lines, fuel lines, fiber optic cable).

2. Maintenance, repair, replacement, or installation of utility lines and conduit inside tunnels that does not involve affixing new equipment to the exterior face of tunnel portals.

3. Affixing conduit, repeaters, antennae, and similar small-scale equipment on the exterior masonry face of tunnel portals where the color of the equipment matches the existing masonry in order to limit its visibility and does not damage the masonry construction.

L. Bicycle and Pedestrian Facilities, Shared Use Paths, and Other Trails

1. Maintenance, repair, or replacement of existing bicycle lanes, pedestrian walkways, shared use paths (*e.g.*, bicycle, pedestrian), and other trails intended for non-motorized transportation that are constructed with common materials (*i.e.*, non-decorative concrete, asphalt, pavement, or gravel).

2. Adding lanes to existing shared use paths or other trails constructed with common materials.

3. Adding at-grade crossings for pedestrians and bicycle facilities, shared use paths, or other trails.

4. Maintenance, repair, replacement, or installation of bicycle aid stations, bicycle racks, and bicycle storage sheds, and similar amenities. Installation of new bicycle storage structures must be visually compatible with the surrounding building environment when located adjacent to historic passenger stations or within National Register-listed or eligible historic districts.

5. Maintenance, repair, replacement, or installation of information kiosks or displays, wayfinding signage, and similar amenities for pedestrian, bicyclists, or other path or trail users.

6. Maintenance, repair, or replacement of curbs, gutters, or sidewalks constructed with common materials.

M. Construction/Installation of New Railroad or Rail Transit Infrastructure

For any of the activities listed below, the federal agency shall require the work be performed by or under the supervision of an SOI-qualified professional, based on the scope of work and location of a specific proposal. As with all activities in this Exempted Activities List, but especially important for construction/installation of new railroad or Rail Transit infrastructure, consideration must be given to the potential for effects to non-rail properties within or adjacent to the rail ROW.

1. Minor new construction and installation of railroad or rail transit infrastructure that is compatible with the scale, size, and type of existing rail infrastructure, such as buildings for housing telecommunications equipment, signal instruments, and similar equipment; storage buildings that house landscaping or maintenance of way equipment or specialty vehicles for track repairs or inspections; locomotive and train or rail transit car service and inspection facilities; trailers or temporary structures for housing rail personnel; fueling stations; underground utilities; overhead utilities, transmission lines, and communications poles, and signage. This does not include substantial new construction, such as construction of new passenger stations, railyards or rail transit yards, or tunnels, or demolition of existing structures.

2. Construction of new at-grade crossings.

3. Construction of new erosion control, drainage, or stormwater management infrastructure, such as culverts or retaining walls.

Authority: 36 CFR 800.14(e).

Dated: August 21, 2018.

John M. Fowler,

Executive Director.

[FR Doc. 2018–18329 Filed 8–23–18; 8:45 am]

BILLING CODE 4310–K6–P

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

[Docket No. FR–6081–N–10]

Order of Succession for HUD Region VIII

AGENCY: Office of Field Policy and Management, HUD.

ACTION: Notice of Order of Succession.

SUMMARY: In this notice, the Assistant Deputy Secretary for Field Policy and Management, Department of Housing and Urban Development, designates the Order of Succession for the Denver Regional Office and its Field Offices (Region VIII). This Order of Succession supersedes all previous Orders of Succession for HUD Region VIII.

DATES: August 17, 2018.

FOR FURTHER INFORMATION CONTACT: John B. Shumway, Assistant General Counsel, Administrative Law Division, U.S. Department of Housing and Urban Development, 451 7th Street SW, Room 9262, Washington, DC 20410–0500, telephone number 202–402–5190 (this is not a toll-free number). This number may be accessed through TTY by calling the toll-free Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION: The Assistant Deputy Secretary for Field Policy and Management, Department of Housing and Urban Development, is issuing this Order of Succession of officials authorized to perform the

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

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

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

IN REPLY REFER TO:
HWY-P 2.4071

September 18, 2020

Mr. Ralph Rizzo
Division Administrator
U.S. Department of Transportation
Federal Highway Administration
Hawaii Division
300 Ala Moana Boulevard, Room 3-306
Honolulu, Hawaii 96850

Dear Mr. Rizzo:

Subject: Honouliuli Wastewater Treatment Plant

In the enclosed letter dated July 17, 2020, the City and County of Honolulu, Department of Environmental Services (ENV) requests concurrence from the Hawaii Department of Transportation (HDOT) and the Federal Highway Administration (FHWA) that a proposed project is exempt from the National Historic Preservation Act Section 106 and United States Department of Transportation (USDOT) Act Section 4(f) processes pursuant to the "Program Comment to Exempt Consideration of Effects to Rail Properties within Rail Rights-of-Way" issued by the Advisory Council for Historic Preservation in the August 24, 2018 Federal Register (Program Comment).

As described in the enclosed letter, ENV's proposed project includes new buildings located at the Honouliuli Wastewater Treatment Plant in the Honouliuli Ahupuaa of Oahu. To access the new facilities, ENV proposes to cross the historic Oahu Railway and Land Company (OR&L) right-of-way (ROW), which was deeded to HDOT by the United States of America, acting through FHWA (the "Deed"). Conditions of the Deed require HDOT to follow Section106 and Section 4(f) processes for work within the OR&L ROW. In addition to two proposed railroad crossings, ENV proposes to install underground utilities (e.g., sewer, water) at the crossing locations.

In a letter dated November 6, 2018, FHWA notified HDOT in writing of the Program Comment, and stated:

> "If a project or use involves the exempt activities listed in Appendix A of the program comment, HDOT should simply cite which of the activities it falls under (e.g., Appendix A, II. Exempted Activities List, K.1). HDOT should include sufficient relevant information such as plans, photographs, or material specifications to support the opinion. If we concur

> with HDOT's finding, the Section 106 and 4(f) processes will be completed. The usual consulting parties will be notified of the undertaking and our finding."

HDOT has met with ENV regarding the proposed project and concurs that the proposed activities are exempt, with a revision. HDOT and ENV have agreed that an upgraded vehicle crossing at the cell tower access driveway, identified as Crossing 1 in the letter, should be deleted from this request, and therefore only one location, identified as Crossing 2, would have an upgraded vehicle crossing. However, ENV still has a need to install underground utilities at both Crossings 1 and 2. Underground utilities could be installed using trenchless methods, which would have no effect on the historic character of the property. We concur that underground utilities constructed by trenchless methods should be allowed at Crossings 1 and 2, and should be approved along with this request, or otherwise in accordance with the proposed Programmatic Agreement that is currently in process between HDOT and FHWA. At Crossing 2, underground utilities constructed by trenching methods should be allowed only if done concurrently with the upgrading of the vehicle crossing.

With the above revision, HDOT concurs that the proposed upgraded vehicle crossing at Crossing 2 is exempt pursuant to two paragraphs in the Program Comment. ENV's enclosed letter includes the explanation of the proposed activity, including the proposed crossing plans, and the relevant information that supports this opinion. The specific exempted activities include:

> Appendix A, Section II. Exempted Activities List, Paragraph A.1: ENV's proposed project includes track and trackbed replacement and upgrades within the existing footprint. The Program Comment states "These activities must not include alterations to the trackbed that would result in a substantial visual change (i.e., elevation or alignment) in the relationship between the trackbed and the surrounding landscape or built environment." ENV's proposed upgrade work maintains the same elevation and alignment and therefore meets this requirement.
>
> Appendix A, Section II. Exempted Activities List, Paragraph E.2: ENV's proposed project includes replacement of an at-grade railroad crossing.

It is understood that the requested exemption applies to Section 106 and Section 4(f) processes only, and does not exempt ENV's project from other required approvals. For example, the Program Comment does not cover archaeology. ENV is in the process of preparing an Environmental Assessment to comply with Hawaii Revised Statutes (HRS) Chapter 343 requirements, and initiating consultation with the Department of Land and Natural Resources, State Historic Preservation Division to comply with HRS 6E requirements.

Pursuant to the Program Comment and FHWA's letter dated November 6, 2018, this information should allow completion of the 106 and 4(f) processes for this project.

If you have any questions, please contact Ken Tatsuguchi, Engineering Program Manager, Highways Division, Planning Branch at (808) 587-1830 or by email at ken.tatsuguchi@hawaii.gov or Pua Aiu, Cultural Resources Manager at (808) 587-1497 or by email at pua.aiu@hawaii.gov.

Sincerely,

EDWIN H. SNIFFEN
Deputy Director, Highways Division

Enclosure: July 17, 2020 letter from ENV to HDOT

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DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

KIRK CALDWELL
MAYOR

LORI M.K. KAHIKINA, P.E.
DIRECTOR

TIMOTHY A. HOUGHTON
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO
PRO 20-086

September 30, 2020

Alan S. Downer, PhD, Administrator
State of Hawai'i, Department of Land and Natural Resources
State Historic Preservation Division
601 Kamokila Boulevard, Suite 555
Kapolei, Hawai'i 96707

VIA ELECTRONIC SUBMITTAL

Dear Dr. Downer:

SUBJECT: HRS Chapter 6E-08 Review
ENV Support Facilities Access Road Improvements
Honouliuli Ahupua'a, 'Ewa District, O'ahu
F.D. Roosevelt Right-of-Way, OR&L Right-of-Way,
and City Parcel TMK 9-1-126:014

The City and County of Honolulu (City), Department of Environmental Services (ENV) is providing a Hawai'i Revised Statutes (HRS) 6E Submittal Form, included as Attachment 1. With this form ENV requests a determination letter from the State Historic Preservation Division (SHPD) for the ENV Support Facilities Access Road Improvements project. ENV requests initiation of consultation with SHPD regarding the project so that we can answer any questions or concerns, and discuss mitigation measures that may be proposed. We are willing to meet in person or in a teleconference at your earliest convenience.

PROJECT DESCRIPTION AND NEED

The City ENV is currently undertaking a large, multi-phase construction program to upgrade and expand the Honouliuli Wastewater Treatment Plant (WWTP), including related support facilities. The facilities are planned for the 48.18 acre parcel of land to the north and east of the WWTP (TMK 9-1-069:003, "Expansion Property") which was purchased by the City in 2010 for this purpose. Driveway and access road improvements are needed to provide adequate access to the ENV support facilities proposed for the Expansion Property. The project includes the following road, driveway and utility connection improvements:

1. Improvements to an existing driveway providing access from Renton Road, across the historic Oahu Railway and Land Company (OR&L) Right-of-Way (ROW), to an existing cell tower and ENV support facilities (Cell Tower Driveway). Utility connections would be installed under the improved driveway.

2. Improvements to the existing Malio Street and driveway providing access from Renton Road, across the historic OR&L ROW, to ENV support facilities. Utility connections would be installed under the improved driveway and along Malio Street.
3. New driveway for access to ENV's proposed support facilities from Franklin D. Roosevelt Avenue (Roosevelt Driveway), including a new gate in the existing chainlink fence, formerly the boundary fence for the Barbers Point Naval Air Station. Utility connections would also be installed under the proposed driveway.
4. Widening of a segment of Roosevelt Avenue to add an eastbound left turn lane.

Included as Attachment 2 is a map of the affected Right-of-Ways and the City's parcel Tax Map Key (TMK) 9-1-126:014. The project is subject to the HRS 6E-08 process because it is initiated by a public agency and affects two properties listed on the State Inventory of Historic Places (SIHP); the OR&L Right-of-Way (SIHP No. 50-80-12-09714) and the 'Ewa Plain Battlefield (SIHP No. 50-80-12-08025).

Attachment 3 includes a pre-assessment consultation letter that was distributed as part of the HRS 343 Environmental Assessment (EA) process for the project, which provides additional information on the project. SHPD has not yet offered comments on the letter. ENV plans to publish the draft EA for public comment in the coming months.

ENV's planned project includes work on the Honouliuli WWTP property, which includes the original 52.82 acres where the original WWTP is built, and the 48.18 acre Expansion Property, where the secondary treatment expansion is now under construction and where ENV support facilities will be constructed. A letter of determination from your office, dated February 3, 2016, stated that no historic properties are affected and no further archaeological work was required on the WWTP parcels. Because the WWTP parcels have already received this Chapter 6E-8 historic preservation clearance from your office, these parcels should not need re-evaluation, and therefore are not included in this current request.

The upgrades and expansion to the Honouliuli WWTP are necessary to comply with requirements of the 2010 Consent Decree between the City, the U.S. Environmental Protection Agency, and the State Department of Health, requiring the upgrade of both the Honouliuli WWTP and Sand Island WWTP to full secondary treatment. Due to the limited available land at Sand Island WWTP for the secondary treatment upgrade, the City is relocating certain non-process support facilities from the Sand Island WWTP site to the Honouliuli WWTP Expansion Property. In addition to having more space, the inland Honouliuli site is also a more protected site against the threats of coastal storms, flooding, tsunamis, and future climate change impacts, which will be beneficial for the future protection of these critical City facilities.

The planned support facilities at Honouliuli also include a new ENV administration building with an operations center and offices for approximately 300 employees. The new support facilities will generate a significant level of daily commuter traffic, and the two proposed accesses, from Renton Road and Roosevelt Avenue, are needed to provide alternate means of ingress and egress. The traffic studies done for the project for the near-term and long-term conditions show the two driveways will mitigate the peak traffic volume, which would otherwise cause increased congestion and traffic bottlenecks on the surrounding roadways during peak commuting hours.

IDENTIFICATION OF HISTORIC PROPERTIES, PRELIMINARY EVALUATION OF POTENTIAL EFFECTS, AND DISCUSSION OF POTENTIAL MITIGATION

There are several historic properties within and adjacent to the project area for the proposed ENV support facilities access road improvements. These historic properties, associated with the plantation era and World War II (WWII) era, are summarized in the following table:

Historic Property	SIHP No.	NRHP Reference No.	Relation to Project Area
OR&L Right-of-Way (ROW)	50-80-12-09714	75000621	Affected by project, but extends outward from immediate project area
Hawaiian Railway Society ‘Ewa Railroad Yard	50-80-12-07387	N/A	Hawaiian Railway Society ‘Ewa Railroad Yard ≈ 300 ft from project area
Railway Rolling Stock	50-80-08-09761	N/A	Hawaiian Railway Society ‘Ewa Railroad Yard ≈ 300 ft from project area
Waialua Agricultural Company Engine No. 6	50-80-08-09708	74000719	Hawaiian Railway Society ‘Ewa Railroad Yard ≈ 300 ft from project area
‘Ewa Sugar Plantation Villages	50-80-12-09786	N/A	Not affected by project but partially within project area
‘Ewa Plain Battlefield	50-80-12-08025	16000273	Affected by project, adjacent to project area

The effects of the project on these historic properties and discussion of potential mitigation are discussed below. While some mitigation measures are proposed, we request additional guidance and recommendations from SHPD and other interested persons on appropriate mitigation:

<u>OR&L Right-of-Way (ROW)</u>

In the vicinity of the project area, the OR&L ROW includes railroad track, right-of-way, and underground utilities. Two at-grade driveway crossings also are currently existing, but because the driveways do not currently have State Department of Transportation (DOT) approval, ENV is not actively using these driveways. The driveways were used by the previous owners of the Expansion Property, being their only means of access to the property, and the Cell Tower Driveway is occasionally still used by cell tower maintenance crews. Historical aerial photographs show that crossings existed in this same area during former OR&L operations before WW II, and it is believed that the existing Malio Street crossing is from that time period. Attachment 4 includes photographs of the existing conditions at the project location.

ENV proposes to upgrade and use the crossings of the railroad tracks to accommodate the traffic loads and volumes resulting from ENV's project. ENV also proposes to construct underground pipes and other utilities at these driveway crossings. The crossings are shown in

Attachment 3, and Attachment 5 includes drawings showing plans for the crossing improvements.

The project will impact the historic property by replacing existing unimproved driveway crossings with concrete panels and replacement steel rails designed to support anticipated traffic loads. The approaches to the crossings will be paved and new signage installed as required. The proposed underground pipes and utilities may be installed at the same time as the driveway upgrades, or alternatively, may be installed later by trenchless methods below ground so as not to disturb the railroad tracks.

ENV proposes to mitigate the effects on the historic property through the design of the crossings by:

1. Minimizing the footprint of the crossing improvements (as much as possible considering engineering and safety standards).

2. Complying and maintaining consistency with Secretary of the Interior's Standards for the Treatment of Historic Properties similar to other treatment of the same track in other areas.

3. Consulting with DOT, FHWA, the Hawaiian Railway Society, and SHPD on appropriate traffic controls and safety measures for these crossings.

4. Returning any salvage rails, ties or other railroad facilities to the designated location as required by the State Department of Transportation and the deed for the OR&L ROW, dated June 5, 1980, for appropriate storage or reuse.

5. Maintaining the rural character of the existing crossings.

6. Maintaining and/or improving the integrity of the railroad tracks for continued availability of use by museum railroad operations by the Hawaiian Railway Society. We understand that the current museum railroad operations can use this section of the railroad tracks, but that such use rarely occurs.

7. Minimizing the visual change. The effect of the visual change due to the installation of the concrete crossing panels will be minimized by keeping the same railroad track alignment and grade. The size and type of rail infrastructure will remain the same.

ENV is willing to consider other mitigation measures that may be proposed. In early consultations with DOT, it has been suggested that the improvements to the Cell Tower Driveway could be reduced to just the underground utility crossings. The proposed at-grade driveway upgrade would be deleted. The impacts from this change to ENV's project could be minimal. Discussion is welcome among the parties involved on the overall benefit of this change.

Other mitigation could include maintenance and/or preservation work of the OR&L ROW in the vicinity of the ENV property line. ENV is interested in maintaining safety and security, reducing the potential for illegal dumping and other illegal activities, reducing the risk of brush fires, and maintaining an appropriate appearance along the frontage of ENV's property. ENV's goals in these matters may align with the goals of other interested parties, and discussion of these topics may lead to ideas for additional proposed mitigation measures.

'Ewa Plain Battlefield

The 'Ewa Plain Battlefield includes architectural, archaeological, and landscape features significant to the World War II Battle of 'Ewa Plain that occurred on December 7, 1941. In the project area, the proposed project would affect Roosevelt Avenue, a two lane roadway with 2-feet wide shoulders, which is part of the 1941 Road Network and identified as a contributing element of the 'Ewa Plain Battlefield. The current Roosevelt Avenue is an improved roadway which was constructed in the same alignment as the road that existed on December 7, 1941, and previously known as North Hansen Road. The north side of the Roosevelt Avenue ROW contains a perimeter chain link fence originally constructed in the mid-1920s for the 'Ewa Mooring Mast Field and later reconstructed in the early-1940s as part of the Barbers Point Naval Air Station. Attachment 6 includes photographs of the existing conditions at the project location.

ENV proposes to widen Roosevelt Avenue for installation of an eastbound left-turn lane and construct a driveway to the new facilities, as shown in Attachment 3. Attachment 7 shows a possible concept for the new driveway and widened Roosevelt Avenue. This action impacts the historic property by widening the existing Roosevelt Avenue, constructing a new paved driveway in the Roosevelt Avenue ROW, and installing an entrance gate through the existing fence.

ENV proposes to mitigate the effects on the historic property by:

1. Minimizing the footprint of the widened roadway (as much as possible considering engineering and safety standards),

2. Limiting the width of the fence, estimated fifty feet or less, that needs to be removed for the new entrance gate.

3. Improved maintenance of the existing fence. The existing fence is located in the Roosevelt Avenue ROW, and therefore currently under the State Department of Transportation's jurisdiction. ENV intends to request approval from the State to use the existing fence as ENV's perimeter security fence for the new facilities and to keep and maintain the fence in good condition.

4. Minimizing the visual change. ENV plans to construct the entrance gate so it is inset (away from Roosevelt Avenue) by approximately 20 feet. The result is expected to have minimal visual impact to the historic fence line.

'Ewa Sugar Plantation Villages

The 'Ewa Sugar Plantation Villages site is located within the project area; however, the project does not propose any impact to the historic property. The two driveway rail crossings are accessed from Renton Road, which comprises the southern boundary of Varona Village (one of the 'Ewa Sugar Plantation Villages).

At this time ENV intends to improve the driveway accesses from Renton Road but not undertake any Renton Road improvements. It is ENV's understanding that any improvements to Renton Road will be done by others, and will consider the future Varona Villages redevelopment and other planned development in the area. Because the ‘Ewa Sugar Plantation Villages site will not be affected by the project, no mitigation measures are proposed.

Other Historic Properties

The remaining three Historic Properties listed in the table, the Hawaiian Railway Society ‘Ewa Railroad Yard, the Railway Rolling Stock, and the Waialua Agricultural Company Engine No. 6, will not be affected by the project, and no mitigation measures are proposed.

COMPLIANCE WITH SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

The proposed driveway crossing upgrades and underground utilities in the OR&L ROW will require approvals from DOT and the FHWA. This approval would be considered a federal action or undertaking, triggering compliance with Section 106 of the NHPA and Section 4(f) of the U.S. Department of Transportation Act (U.S. DOT Act). The Section 106 process includes consultation with the State Historic Preservation Officer, Native Hawaiian Organizations, and other consulting parties. The Historic Hawai‘i Foundation has already indicated they would like to be a consulting party in the Section 106 process and are an interested person and will participate in the HRS Chapter 6E review.

The Area of Potential Effect (APE) for this undertaking is limited to the portion of the project within the OR&L ROW. The driveway from Roosevelt Avenue to our knowledge would not be subject to FHWA approval nor require Section 106 or Section 4(f) compliance.

On August 24, 2018, the Advisory Council for Historic Preservation (ACHP) issued a “Program Comment to Exempt Consideration of Effects to Rail Properties within Rail Right-of-Way” (ACHP Program Comment). On November 6, 2018, FHWA sent a letter to DOT advising that if a project or use involves the exempt activities listed in Appendix A of the ACHP Program Comment, DOT should simply cite which of the activities it falls under along with sufficient relevant information such as plans, photographs, or material specifications to support the opinion. If FHWA concurs with these findings, then the Section 106 and Section 4(f) processes are complete.

ENV proposes that the driveway crossing upgrades and underground utilities in the OR&L ROW are exempt activities in accordance with the ACHP Program Comment. In early consultation with DOT staff, ENV has drafted a request for DOT to send to the FHWA for Section 106 and Section 4(f) exemptions using the ACHP Program Comment. The applicable exempt activities listed in Appendix A of the ACHP Program Comment include:

1. Appendix A, Section II. Exempted Activities List, Paragraph A.1: ENV’s proposed project includes track and trackbed replacement and upgrades within the existing footprint. The Program Comment states “These activities must not include alterations to the trackbed that would result in a substantial visual change (i.e., elevation or alignment) in the relationship between the trackbed and the surrounding landscape or built environment”. ENV’s proposed upgrade work maintains the same elevation and alignment and therefore meets this requirement.

2. Appendix A, Section II. Exempted Activities List, Paragraph E.2: ENV's proposed project includes replacement of an at-grade railroad crossing.

It appears the ACHP Program Comment is applicable, and it is hoped that the FHWA will concur. If FHWA does not concur, ENV will work with DOT and FHWA to complete what is required for the Section 106 process, as well as the Section 4(f) process.

CONCLUSION

We look forward to working with SHPD, DOT, FHWA, the Hawaiian Railway Society, the Historic Hawaiʻi Foundation, and other interested persons on this project. Because of the physical location of the project and the lack of access to the Expansion Property from public ROWs, the proposed improvements and resulting impacts to the historic properties cannot be completely avoided. ENV welcomes the opportunity to meet with SHPD and the other interested persons copied on this letter to further discuss this project and measures that can be implemented to minimize and mitigate effects to historic properties.

To schedule a meeting or should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov, or alternatively, contact Jack Pobuk, Branch Chief, CIP Program and Planning, at 768-3464 or by email at jpobuk@honolulu.gov.

Sincerely,

Lori M.K. Kahikina, P.E.
Director

Attachments:
1 HRS 6E Submittal Form
2 TMK Parcel Map
3 Environmental Assessment Pre-Assessment Consultation Letter
4 OR&L ROW Photographs
5 Railroad Crossing Plan Sheets
6 ʻEwa Plain Battlefield Photographs
7 Roosevelt Avenue and Driveway Concept

cc: State of Hawaiʻi, Department of Transportation
United States Federal Highway Administration, Hawaii Division

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ATTACHMENT 1

HRS 6E Submittal Form

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State Historic Preservation Division
HRS 6E Submittal Form

Per §6E, Hawai'i Revised Statutes, if the Project requires review by the State Historic Preservation Division (SHPD), please review and fill out this form and submit all requested information to SHPD. Please submit this form and project documentation **electronically** to:

dlnr.intake.shpd@hawaii.gov

If you are unable to submit electronically, please contact SHPD at (808) 692-8015. Mahalo.

The submission date of this form is:

1. APPLICANT (select one)

☐ Property Owner ☑ Government Agency

2. AGENCY (select one)

☐ Planning Department ☐ Department of Public Works ☑ Other (specify): CCH-Dept. of Env. Svcs.

Type of Permit Applied For: HRS 6E-08 Review

3. APPLICANT CONTACT

3.1) Name: Paul Christiansen 3.2) Title: Civil Engineer

3.3) Street Address: 1000 Uluohia Street, Suite 308, Kapolei

3.4) County: Honolulu 3.5) State: HI 3.6) Zip Code: 96707

3.7) Phone: (808) 768-3470 3.8) Email: p.christiansen@honolulu.gov

4. PROJECT DATA

4.1) Permit Number (if applicable):

4.2) TMK [e.g. (3) 1-2-003:004]: 9-1-069:003; 9-1-126:014, OR&L ROW, Roosevelt Avenue ROW

4.3) Street Address: 91-1000 Geiger Road

4.4) County: Honolulu 4.5) State: HI 4.6) Zip Code: 96706

4.7) Total Property Acreage: Portions of multiple properties

4.8) Project Area (acreage, square feet): ≈ 1 acre

4.9) List any previous SHPD correspondence (LOG Number & DOC Number, if applicable):

LOG NO. DOC NO.

5. PROJECT INFORMATION

5.4) Detailed Project Description and Scope of Work:

The project includes improvements to Honouliuli Wastewater Treatment Plant (WWTP) support facility access roads and new utility crossings. See project description in Attachment 3 of cover letter for additional details.

5.5) Description of **previous** ground disturbance (e.g. previous grading and grubbing):

Previous roadway construction, railroad operation, residential, and agricultural uses.

5.6) Description of **proposed** ground disturbance (e.g. # of trenches, Length x Width x Depth):

Estimated areas of disturbance include a section of Roosevelt Ave., about 800 ft long, about 50 ft by 50 ft for the driveway to Roosevelt Ave., and two crossings of the 40 ft wide OR&L ROW, each of which involves a 45 ft. long UOA, with up to 90 ft. long disturbance area. Depth of disturbance for driveways and roads may up to 18 inches. Utilities may be trenched or trenchless, and at depths to 20 ft deep.

5.10) This project is (check all that apply, if applicable):

☐ an activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency;

☐ carried out with Federal financial assistance; and or

☑ requiring a Federal permit, license or approval.

If any of these boxes are checked, then the Project may also be subject to compliance with Section 106 of the National Historic Preservation Act (NHPA).

6.1 HISTORIC PROPERTY INFORMATION

HISTORIC PROPERTY #1 - SIHP # 50-80-12-09714 O'ahu Railway and Land Company (OR&L) Right-of-Way NRHP # 75000621

6.1.1) Does the Project involve a Historic Property? A Historic Property is any building, structure, object, district, area, or site, including heiau and underwater site, **which is over 50 years old** (HRS §6E-2).

☑ Yes ☐ No

6.1.2) The date(s) of construction for the historic property (building, structure, object, district, area, or site, including heiau and underwater site) is OR&L: Built 1889-1906; period of significance 1875-1899

6.1.3) Is the Property listed on the Hawaii and or National Register of Historic Places? To check: http://dlnr.hawaii.gov/shpd/

☑ Yes ☐ No

6.1.4) The Agency shall ensure whether historic properties are present in the project area, and, if so, it shall ensure that these properties are properly identified and inventoried. Identify all known historic properties:

Railway and Land Company (OR&L) Right-of-Way

6.1.5) Once a historic property is identified, then an assessment of significance shall occur.

Integrity (check all that apply):

☑ Location ☑ Design ☐ Setting ☑ Materials ☑ Workmanship ☐ Feeling ☑ Association

Criteria (check all that apply):

☑ a - associated with events that have made an important contribution to the broad patterns of our history

☑ b - associated with the lives of persons important in our past

☑ c - embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value

☐ d - have yielded, or is likely to yield, information important for research on prehistory or history

☐ e - have an important value to the Native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out or still carried out, at the property or due to associationce with traditional beliefs, events, or oral accounts - - these associations being important to the group's history and cultural identity

6.1.6) The effects or impacts of a project on significant historic properties shall be determined by the agency.

Effect Determination (select one):

☐ No Historic Properties Affected
☐ Effect, with Agreed Upon Mitigation Commitments (§6E-42, HRS)
☑ Effect, with Proposed Mitigation Commitments (§6E-8, HRS)

6.2 HISTORIC PROPERTY INFORMATION

HISTORIC PROPERTY #3 - SIHP # 50-80-12-09786 'Ewa Sugar Plantations

6.2.1) Does the Project involve a Historic Property? A Historic Property is any building, structure, object, district, area, or site, including heiau and underwater site, **which is over 50 years old** *(HRS §6E-2).*

☑ Yes ☐ No

6.2.2) The date(s) of construction for the historic property (building, structure, object, district, area, or site, including heiau and underwater site) is

1890-1957

6.2.3) Is the Property listed on the Hawaii and or National Register of Historic Places? To check: http://dlnr.hawaii.gov/shpd/

☑ Yes ☐ No

6.2.4) The Agency shall ensure whether historic properties are present in the project area, and, if so, it shall ensure that these properties are properly identified and inventoried. Identify all known historic properties:

'Ewa Sugar Plantation Villages

6.2.5) Once a historic property is identified, then an assessment of significance shall occur.

Integrity (check all that apply):

☑ Location ☑ Design ☑ Setting ☑ Materials ☑ Workmanship ☑ Feeling ☑ Association

Criteria (check all that apply):

- ☑ a – associated with events that have made an important contribution to the broad patterns of our history
- ☐ b – associated with the lives of persons important in our past
- ☑ c – embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value
- ☐ d – have yielded, or is likely to yield, information important for research on prehistory or history
- ☐ e – have an important value to the Native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out or still carried out, at the property or due to associations with traditional beliefs, events, or oral accounts - - these associations being important to the group's history and cultural identity

6.2.6) The effects or impacts of a project on significant historic properties shall be determined by the agency.

Effect Determination (select one):

☑ No Historic Properties Affected
☐ Effect, with Agreed Upon Mitigation Commitments (§6E-42, HRS)
☐ Effect, with Proposed Mitigation Commitments (§6E-8, HRS)

6.3 HISTORIC PROPERTY INFORMATION

HISTORIC PROPERTY #2 · SIHP # 50-80-12-08025 'Ewa Plain Battlefield
NRHP # 16000273

6.3.1) Does the Project involve a Historic Property? A Historic Property is any building, structure, object, district, area, or site, including heiau and underwater site, **which is over 50 years old** *(HRS §6E-2)*.

☑ Yes ☐ No

6.3.2) The date(s) of construction for the historic property (building, structure, object, district, area, or site, including heiau and underwater site) is Originally mid-1920s, reconstructed early 1940's.

6.3.3) Is the Property listed on the Hawaii and or National Register of Historic Places? To check: http://dlnr.hawaii.gov/shpd/

☑ Yes ☐ No

6.3.4) The Agency shall ensure whether historic properties are present in the project area, and, if so, it shall ensure that these properties are properly identified and inventoried. Identify all known historic properties:

'Ewa Plain Battlefield

6.3.5) Once a historic property is identified, then an assessment of significance shall occur.

Integrity (check all that apply):

☑ Location ☐ Design ☐ Setting ☐ Materials ☐ Workmanship ☐ Feeling ☑ Association

Criteria (check all that apply):

☑ a – associated with events that have made an important contribution to the broad patterns of our history
☐ b – associated with the lives of persons important in our past
☐ c – embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value
☑ d – have yielded, or is likely to yield, information important for research on prehistory or history
☐ e – have an important value to the Native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out or still carried out, at the property or due to associations with traditional beliefs, events, or oral accounts - - these associations being important to the group's history and cultural identity

6.3.6) The effects or impacts of a project on significant historic properties shall be determined by the agency.

Effect Determination (select one):

☐ No Historic Properties Affected
☐ Effect, with Agreed Upon Mitigation Commitments (§6E-42, HRS)
☑ Effect, with Proposed Mitigation Commitments (§6E-8, HRS)

7. PROJECT SUBMITTALS

7.1) Please submit a copy of the Tax Map Key (TMK) map

7.2) Please submit a copy of the property map showing the project area and indicate if the project area is smaller than the property area.

7.3) Please submit a permit set of drawings. A permit set is a set of drawings prepared and signed by a licensed architect or engineer and is at least 65% complete.

7.4) Are you submitting a survey?

☐ Yes ☑ No

Specify Survey:

7.5) Did SHPD request the survey?

Yes ☐ No ✔

If 'Yes', then please provide the date, SHPD LOG NO, and DOC NO:

Date: LOG NO. DOC NO.

7.6) **SURVEY REVIEW FEES**. Fee for Review of Reports and Plans (§§13-275-4 and 284-4). A filing fee will be charged for all reports and plans submitted to our office for review. Please go to:

http://dlnr.hawaii.gov/shpd/about/branches/archaeology/filing-fee-schedule/

A check payable to the Hawaii Historic Preservation Special Fund should accompany all reports or plans submitted.

7.7) Please submit color photos/images of the Historic Property (any building, structure, object, district, area, or site, including heiau and underwater site) that will be affected by the Project.

The following are the minimum number and type of color photographs required:

Quantity	Description
1-	Street view(s) of the resource and surrounding area
1-2	Over view of exterior work area
1	exterior photo of the North elevation (if applicable)
1	exterior photo of the South elevation (if applicable)
1	exterior photo of the East elevation (if applicable)
1	exterior photo of the West elevation (if applicable)
1-2	interior photos(s) of areas affected (if applicable)

CHECKLIST

☑ **SHPD FORM 6E** (this form)

☑ **PROJECT SUBMITTALS** (any requested documentation for items 7.1 - 7.7 of this form)

☐ **FILING FEE FORM** (if applicable)

ATTACHMENT 2

TMK Parcel Map

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Prepared by: Dept. of Environmental Services
City & County of Honolulu
1000 Uluohia Street
Kapolei, Hawaii 96707

ENV Support Facilities Access Road Improvements
Parcel Tax Map Keys

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ATTACHMENT 3

Environmental Assessment Pre-Assessment Consultation Letter

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DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

KIRK CALDWELL
MAYOR

LORI M.K. KAHIKINA, P.E.
DIRECTOR

TIMOTHY A. HOUGHTON
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO
PRO 20-053

May 15, 2020

Dear Interested Party:

SUBJECT: Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and ʻEwa Refuse Convenience Center Relocation Environmental Assessment

The City and County of Honolulu (City), Department of Environmental Services (ENV) is proposing access road improvements for the ENV Support Facilities project and relocation of the existing ʻEwa Refuse Convenience Center at the Honouliuli Wastewater Treatment Plant. ENV is in the process of preparing an Environmental Assessment (EA) for this proposed action and is seeking input from interested parties during this pre-assessment consultation phase.

Note this pre-assessment consultation process does not supersede the formal notification process mandated by provisions of Hawaiʻi Revised Statutes (HRS) Chapter 343 and Hawaiʻi Administrative Rules (HAR) Chapter 11-200.1. The latter will occur in the coming months and will accompany the publication of the Draft EA for your review in the Office of Environmental Quality Control's *The Environmental Notice*. ENV is also coordinating concurrently and separately with the Federal Highway Administration regarding National Environmental Policy Act (NEPA) compliance.

Enclosed for your review is a project description and figures. Note that the figures are in draft form and may be revised during the iterative design and environmental review process.

Please submit any pre-assessment consultation input for the EA via email within 21 days of the date of this letter to the following:

Paul Christiansen, ENV p.christiansen@honolulu.gov

and copy:

Jack Pobuk, ENV jpobuk@honolulu.gov

Aaron Weieneth, AECOM aaron.weieneth@aecom.com

Should you have any questions, please contact Paul Christiansen at (808) 768-3470 or at p.christiansen@honolulu.gov.

Sincerely,

Lori M.K. Kahikina, P.E.
Director

Enclosures:
1. Project Description
2. Draft Project Figures

Environmental Assessment for Honouliuli Environmental Services Support Facilities Access Road Improvements and ʻEwa Refuse Convenience Center Relocation

City and County of Honolulu, Department of Environmental Services

Introduction and Background

The City and County of Honolulu (City) Department of Environmental Services (ENV) is currently undertaking a large, multi-phase construction program to upgrade and expand the Honouliuli Wastewater Treatment Plant (WWTP). The start-up of the initial phases of construction were begun in early 2019. The improvement program includes upgrades to the treatment process, odor control systems, sludge drying for biosolids recycling, development of renewable energy from biogas and solar photovoltaic systems, and other benefits to the environment and the community. Some of this work is necessary to comply with requirements of the 2010 Consent Decree between the City, the U.S. Environmental Protection Agency, and the State Department of Health, as well as with future National Pollutant Discharge Elimination System discharge permits and other regulations. The program includes development of the vacant WWTP expansion land at the existing WWTP, including construction of support facilities for ENV, upgrades to receiving facilities for liquid waste haulers, and relocation of the ʻEwa Refuse Convenience Center. One impact of this development of the site will be a future increase in traffic coming to and from the WWTP site. In consideration of the projected traffic volumes, ENV's plans include adequate access driveways and roadway infrastructure to accommodate the increase in traffic.

The City is required to obtain a Use and Occupancy Agreement (UOA) from the State of Hawaiʻi Department of Transportation (HDOT) for each of two existing driveways and one new driveway needed for the new support facilities to be built on the Honouliuli WWTP expansion land. These driveways cross land which is under HDOT's jurisdiction. The UOAs are also needed for proposed underground water, sewer, and other utilities planned to be located at these driveways. An Environmental Assessment (EA) meeting Hawaiʻi Revised Statutes (HRS) Chapter 343 is a requirement for HDOT approval of the UOAs. In addition, the proposed relocation of the City's existing ʻEwa Refuse Convenience Center (ʻEwa Refuse CC) within the Honouliuli WWTP facility requires an EA. The central common purpose and need for these actions is to provide traffic improvements. The purpose and need for the underground utilities is to provide adequate utility service connections between the Honouliuli WWTP expansion property and Renton Road to the north and Roosevelt Avenue to the south. The EA will assess these proposed actions as a whole to adequately address overall cumulative impacts.

The City purchased 48 acres of land adjacent to the Honouliuli WWTP in 2010 for the purpose of expanding the existing WWTP and for related support facilities. The expansion includes upgrading the Honouliuli WWTP to full secondary treatment by June 1, 2024, in accordance with the requirements of the 2010 Consent Decree. The 2010 Consent Decree requires upgrading both the Honouliuli WWTP and the Sand Island WWTP to full secondary treatment. Due to the limited available land at the Sand Island WWTP site, the City has proposed to relocate certain non-process support facilities currently located at the Sand Island WWTP site to the Honouliuli WWTP expansion property. In addition to the problem of limited land at the Sand Island WWTP, moving these facilities to the inland Honouliuli WWTP site provides better protection against coastal storms, flooding, tsunamis, and future climate change impacts. These support facilities include the central laboratory, central maintenance and storage, administrative offices, and the central SCADA/telemetering/emergency management facilities. The City also plans to construct an Administration Building for ENV on the Honouliuli WWTP expansion property. The "Honouliuli Wastewater Treatment Plant Secondary Treatment and Support Facilities, Final

Environmental Impact Statement", dated March 2017 ("2017 FEIS") evaluated these proposed improvements.

The 2017 FEIS included disclosure of the plans for two of the three driveways crossing HDOT property, but not in specific details necessary for the required UOAs with HDOT. Also, the 2017 FEIS did not include the proposed relocation of the 'Ewa Refuse CC. Subsequent to the 2017 FEIS, the City has done further planning work and development of the projects, including developing more details of the improvements needed for the three driveways. The City has also proposed relocating the existing 'Ewa Refuse CC from its current location on Geiger Road to the west of the main entrance to the Honouliuli WWTP to an expanded site within the Honouliuli WWTP facility. This is expected to result in traffic improvements to Geiger Road and will enhance the solid waste collection and recycling service provided to the community. These additional activities will be included in the EA for the purpose of meeting HRS 343 requirements for the proposed improvements.

Additional detail on the proposed project components are provided below, including a purpose and need statement, proposed action description, and identification of alternatives considered. Figures are also attached that identify the locations of the proposed improvements.

Project Components

1. **Environmental Services Support Facilities Access Road Improvements**

   - **Purpose and need:**

     Two existing driveways connect the Honouliuli WWTP expansion property to Renton Road to the north. These driveways cross the 40-ft wide right-of-way of the former OR&L railroad (OR&L ROW) that is under the jurisdiction of HDOT. Both driveways were used by the previous owner at the time the City purchased the property, and the City plans to retain these driveways and provide upgrades appropriate for continued use into the future. The driveway located at the western end of the WWTP expansion property was originally used for access by various agriculture support activities. Later, when a cell phone communication tower was built on the property, the driveway was allowed to be used as the access driveway to the cell tower for maintenance purposes. The cell tower is currently in active use under a lease agreement with the City, operating under arrangements similar to those with the previous owner. The second driveway, identified as Malio Street, and located approximately in the middle of the WWTP expansion property, has a history going back to before World War II when it served as an important connection between agriculture-related activities on both sides of the railroad tracks during the time of active OR&L railroad operations. Both driveways are currently unimproved gravel roads.

     The continued use of these two driveways is important for the planned development of the WWTP expansion land by the City. The increase in activity on the site resulting from the new ENV facilities will include a significant volume of daily commuter traffic. The driveways are needed for access to the site, for both normal and emergency access purposes, and will mitigate traffic congestion and bottlenecks that would otherwise occur. This access will allow morning traffic coming from Kualaka'i Parkway and Kapolei Parkway to flow directly to the WWTP expansion property, and in the reverse direction in the afternoon, helping to minimize addition of congestion to Geiger Road and Fort Weaver Road. Since the driveways are currently unimproved gravel roads, the City plans to pave the driveways and construct new railroad crossings meeting design requirements of HDOT and the Hawaiian Railway Society. The railroad crossings will be an improvement upon the current condition of the railroad tracks and will include appropriate safety markings, signals and/or gates as required. The proposed future underground utilities to be located at these driveways may include potable water, recycled water, sewer, electrical, and communication lines. Pedestrian and bicycle access will be provided at these two driveways to meet the need for pedestrian and bicycle access between the ENV facilities and the new Leeward Bikeway being constructed by the State in the OR&L ROW, as well as to Renton Road and the surrounding communities. The Leeward Bikeway is a key part of the overall traffic planning for the community, as well as fulfillment of a primary purpose for the HDOT OR&L ROW. The proposed connection to the new ENV facilities at the two existing driveways will be a beneficial addition to both the City's and the State's projects.

A new access driveway from the WWTP expansion property to Roosevelt Avenue is planned for purposes of improved access and mitigation of traffic bottlenecks that would otherwise occur. This access is important for commuters coming from Roosevelt Avenue and Geiger Road. Without this access, traffic would need to traverse through the existing WWTP facilities in order to reach the new support facilities. This would not be acceptable due to the anticipated volume of daily traffic, and the need to limit access to the WWTP facilities for security and public safety reasons. Proposed future underground utilities to be located at this driveway may include potable water, recycled water, sewer, electrical, and communication lines.

- **Proposed Action:**

  a. Improvement, restoration, and maintenance of an existing driveway crossing the HDOT OR&L ROW from Renton Road to maintain dedicated access to the leased telecommunications facility in the northwest corner of the Honouliuli WWTP expansion area property. The proposed improvements include paving the driveway and constructing an upgraded railroad crossing conforming to design requirements of HDOT and the Hawaiian Railway Society. The upgraded railroad crossing is intended for restoration and maintenance of the existing tracks and is not anticipated to have an adverse impact to the Hawaiian Railway Society railroad operations. Since the City's existing fence and gate at this location are in poor condition, the City also plans to replace the fence and gate. An additional new pedestrian gate will also be added by this driveway to facilitate bicycle and pedestrian access for employees to the new Leeward Bikeway being constructed by the State in the OR&L ROW and to provide access to a bus stop on Renton Road.

  b. Improvement, restoration, and maintenance of an existing unpaved road (Malio Street) and access driveway connecting Renton Road to the ENV support facilities, including improvements to the crossing of the HDOT OR&L ROW. The proposed improvements include paving the street and access driveway from the WWTP expansion property to Renton Road and constructing an upgraded railroad crossing conforming to design requirements of HDOT and the Hawaiian Railway Society. The upgraded railroad crossing is intended for restoration and maintenance of the existing tracks and is not anticipated to have an adverse impact to the Hawaiian Railway Society railroad operations. Since the City's existing fence along the property line and the existing vehicle gate for this driveway are in poor condition, the City also plans to replace the fence and the gate. Widening of Renton Road to install a westbound left turn lane will likely be required to manage increased traffic volumes associated with the proposed Malio Street entrance.

  c. A new driveway from Roosevelt Avenue to provide access to the ENV support facilities. The proposed improvements include constructing a new paved access driveway from the WWTP expansion property to connect to Roosevelt Avenue. The work also includes constructing a new gate in the existing fence belonging to HDOT. It is noted that the existing fence, which was part of the perimeter fence of the former Barbers Point Naval Air Station, is mentioned as a contributing element of the historic 'Ewa Battlefield. Approval for installation of the gate in this existing fence from the appropriate authorities will be needed. It is anticipated that the proposed gate will be a minor modification of the fence, with the intention of maintaining preservation of the fence itself, and will not adversely impact or detract from the value of the fence as a historic contributing element. Widening of Roosevelt Avenue to install an eastbound left turn lane will likely be required to manage increased traffic volumes.

- **Alternatives:**

  a. No Action: For this alternative, ENV support facilities access road improvements would not be implemented, and the existing Honouliuli WWTP entrance on Geiger Road would be the only available access to the expansion property and the new ENV facilities. This alternative would require driving through the Honouliuli WWTP. This would not be acceptable because the WWTP's existing internal roads are inadequate for the anticipated volume of daily traffic, and there is limited space to widen or improve these internal roads. Also, because of the need to limit access to the WWTP facilities for security and public safety reasons, only vehicles necessary for WWTP operations and maintenance activities should be allowed to drive within the WWTP site.

2. 'Ewa Refuse Convenience Center Relocation

- **Purpose and need:** The 'Ewa Refuse CC is one of the City's nine public refuse drop-off locations that is used by residents to dispose of household rubbish. It is especially intended for receiving residents' solid waste that is not appropriate to be placed in the residents' curb-side carts for pick-up. This includes bulky waste items and some items that should be recycled, such as white goods, tires, and similar types of recyclable waste. The 'Ewa Refuse CC is currently located on Geiger Road, on the same City property as the Honouliuli WWTP, to the west of the main entrance to the Honouliuli WWTP. On certain collection days (e.g. weekends, holidays), due to the current limited space and capacity for vehicle unloading, high usage of the convenience center results in congestion and backup of traffic on Geiger Road, including blockage of the main Honouliuli WWTP driveway. Relocation of the 'Ewa Refuse CC to an available open area within the Honouliuli WWTP property is proposed to alleviate this traffic congestion on Geiger Road and provide a more efficient facility for the community. The relocated convenience center will have more space to accommodate waiting vehicles on site, minimizing the potential for vehicles to back up on Geiger Road. The larger footprint and additional collection areas of the new facility will provide space for better internal traffic circulation and quicker unloading.

- **Proposed Action:**

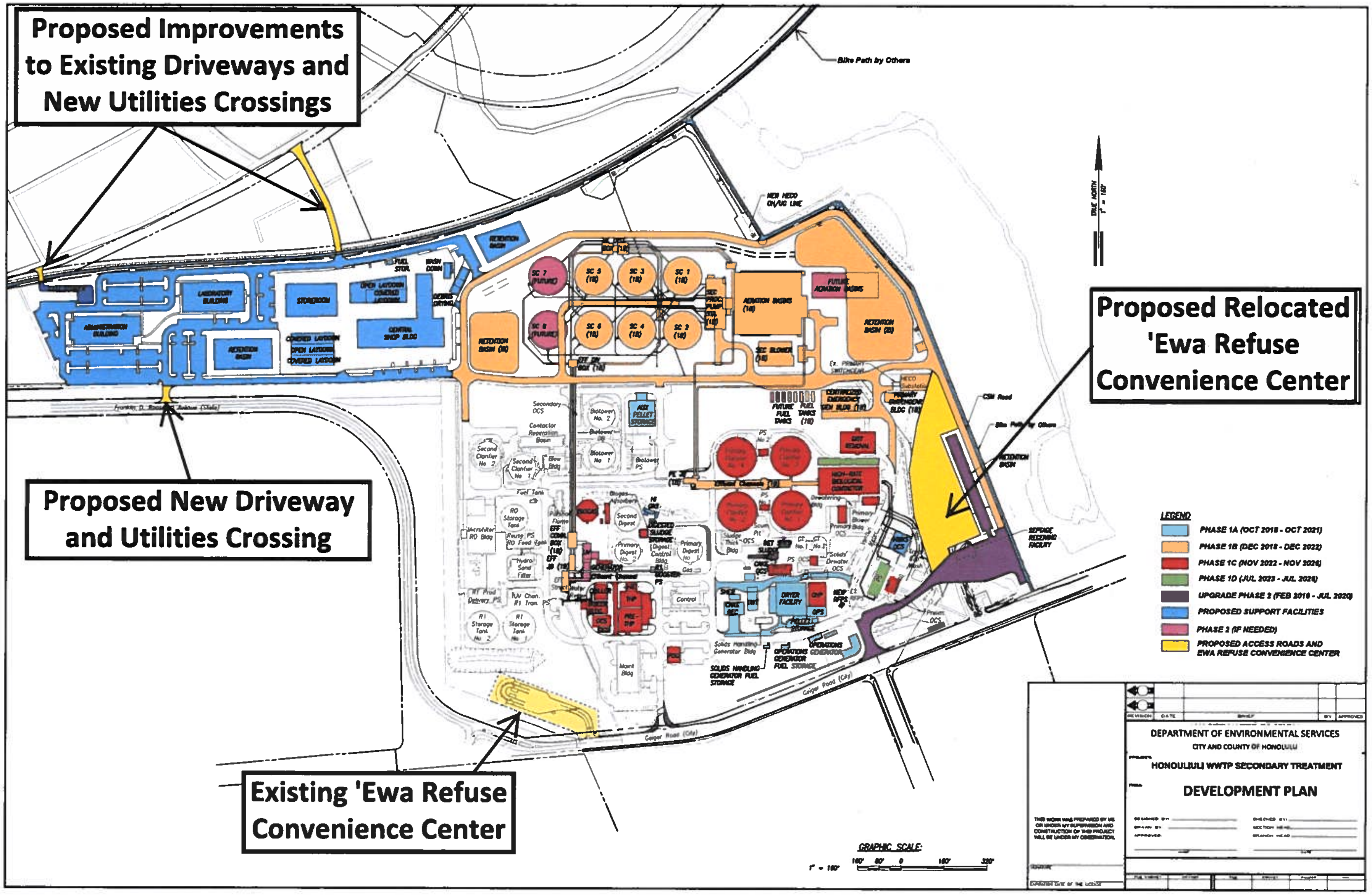
  a. Relocation of the Refuse Division's existing 'Ewa Refuse CC on Geiger Road to within the Honouliuli WWTP site. The improvements will include new paved roads, new paved unloading and storage areas, and associated facilities. The existing Honouliuli WWTP entrance used by septage haulers coming from Geiger Road will be used to provide access to the new relocated 'Ewa Refuse CC.

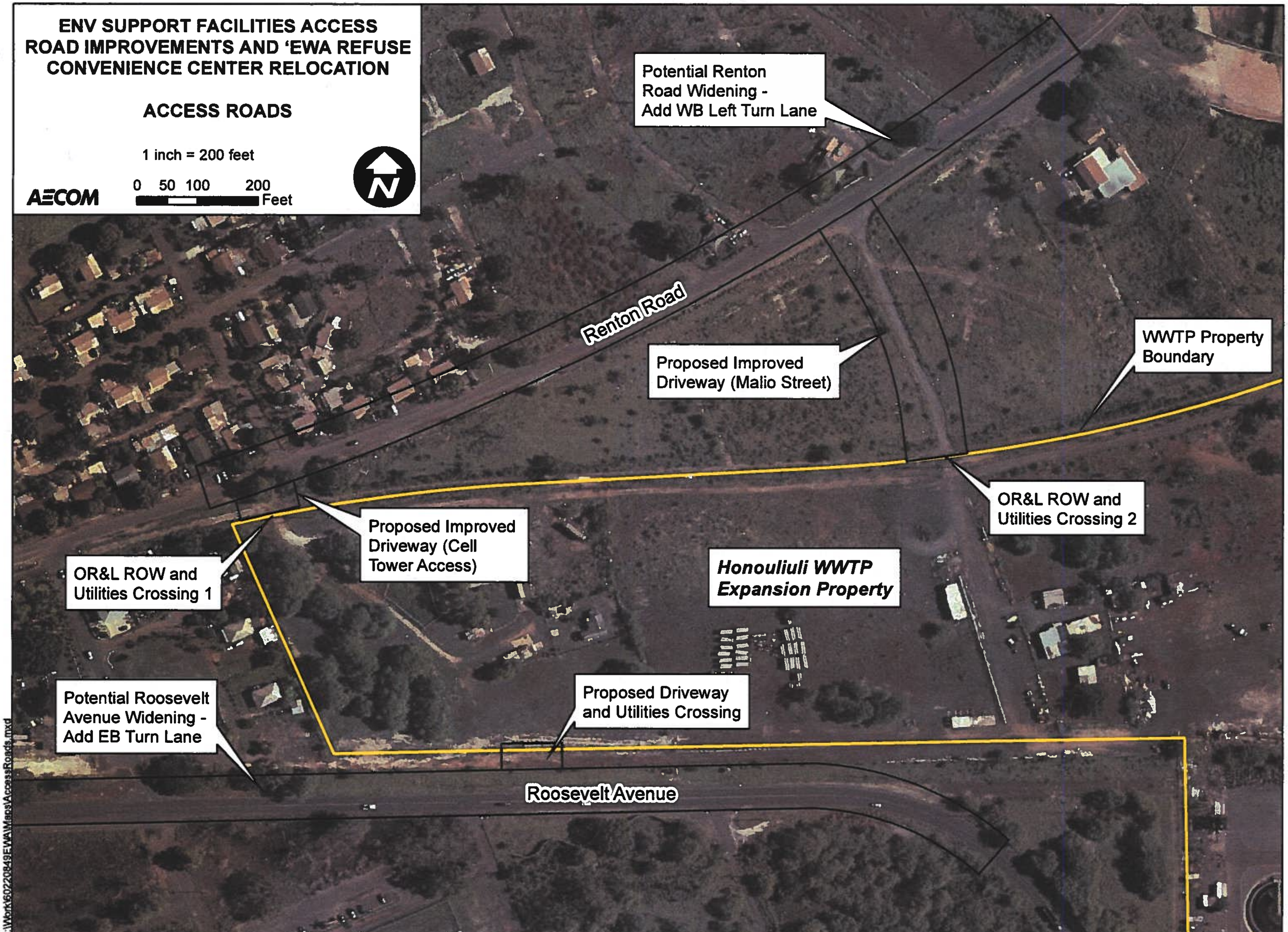
  b. The existing 'Ewa Refuse CC site will be discontinued from its present use, unnecessary facilities will be removed as needed to clean up the site, and the site will be available for future use by ENV. At this time there are no plans for redevelopment of this site. Future use may include uses related to the operation of the 'Ewa Refuse CC, such as an auxiliary storage or staging area, or uses related to the operation and maintenance of the WWTP.

- **Alternatives:**

  a. No Action: The 'Ewa Refuse CC would remain at its existing location. There would continue to be occasional congestion and backup of traffic on Geiger Road, including blockage of the main Honouliuli WWTP driveway.

ENV SUPPORT FACILITIES ACCESS ROAD IMPROVEMENTS AND EWA REFUSE CONVENIENCE CENTER RELOCATION





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ATTACHMENT 4

OR&L ROW Photographs

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Existing Condition Photographs
ENV Support Facilities Access Road Improvements

Photo 1. Existing cell tower driveway crossing over the OR&L ROW.

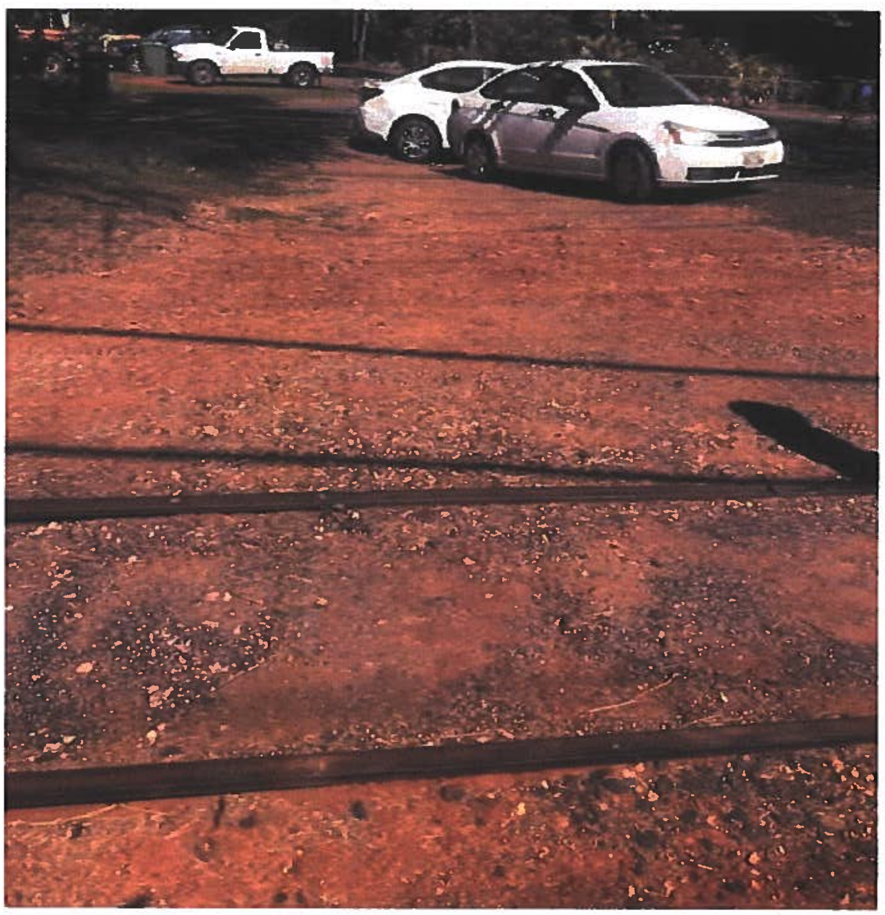

Photo 2. OR&L narrow-gauge tracks at the existing cell tower driveway.

Existing Condition Photographs
ENV Support Facilities Access Road Improvements

Photo 3. Cattle gate and OR&L narrow-gauge tracks near the existing cell tower driveway.

Photo 4. Malio Street near intersection with Renton Road.

Existing Condition Photographs
ENV Support Facilities Access Road Improvements

Photo 5. OR&L narrow-gauge tracks at the existing Mailo Street crossing.

Photo 6. Existing degraded asphalt along Malio Street.

Existing Condition Photographs
ENV Support Facilities Access Road Improvements

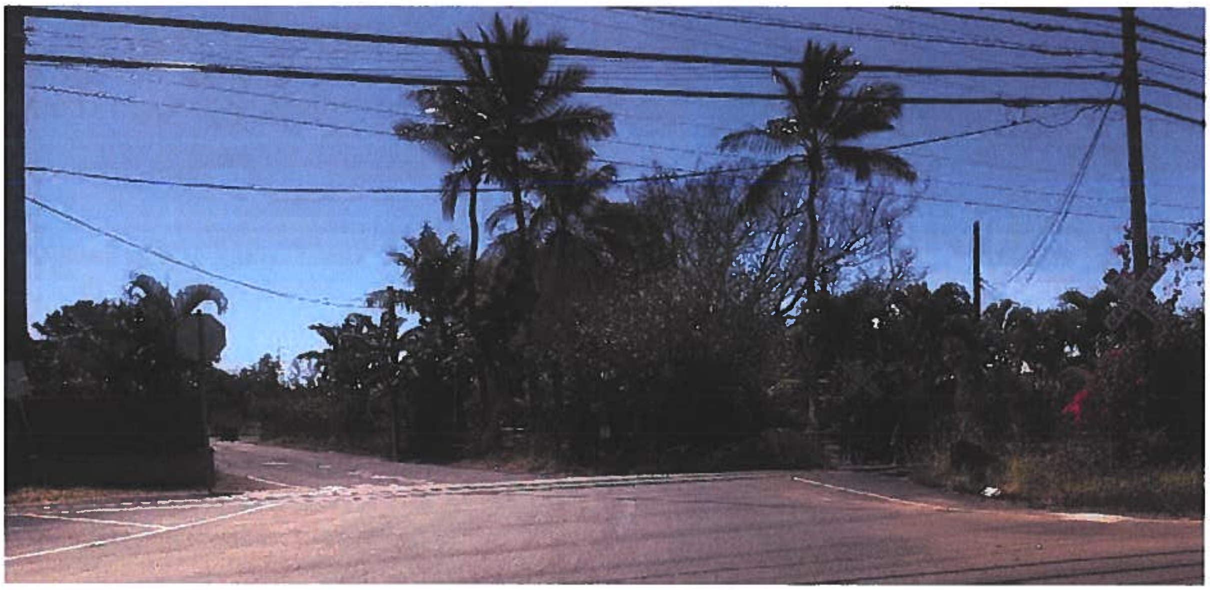

Photo 7. Existing crossing at Philippine Sea.

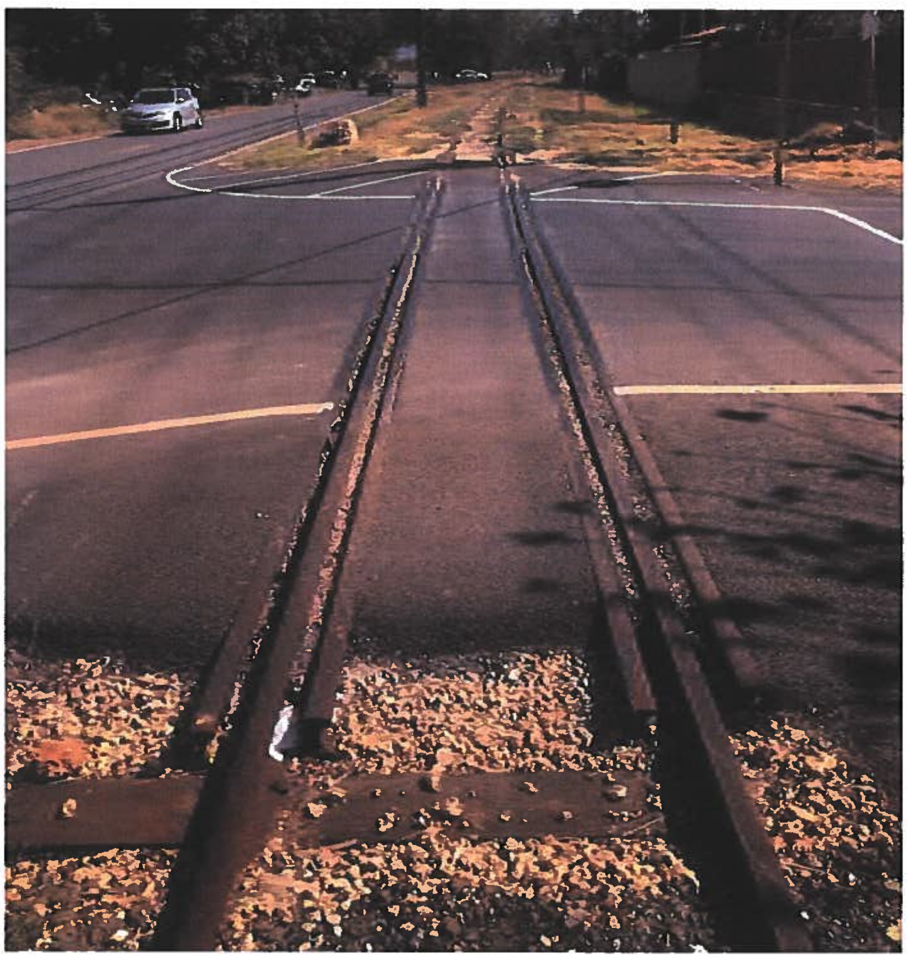

Photo 8. Tracks at existing crossing at Philippine Sea.

Existing Condition Photographs
ENV Support Facilities Access Road Improvements

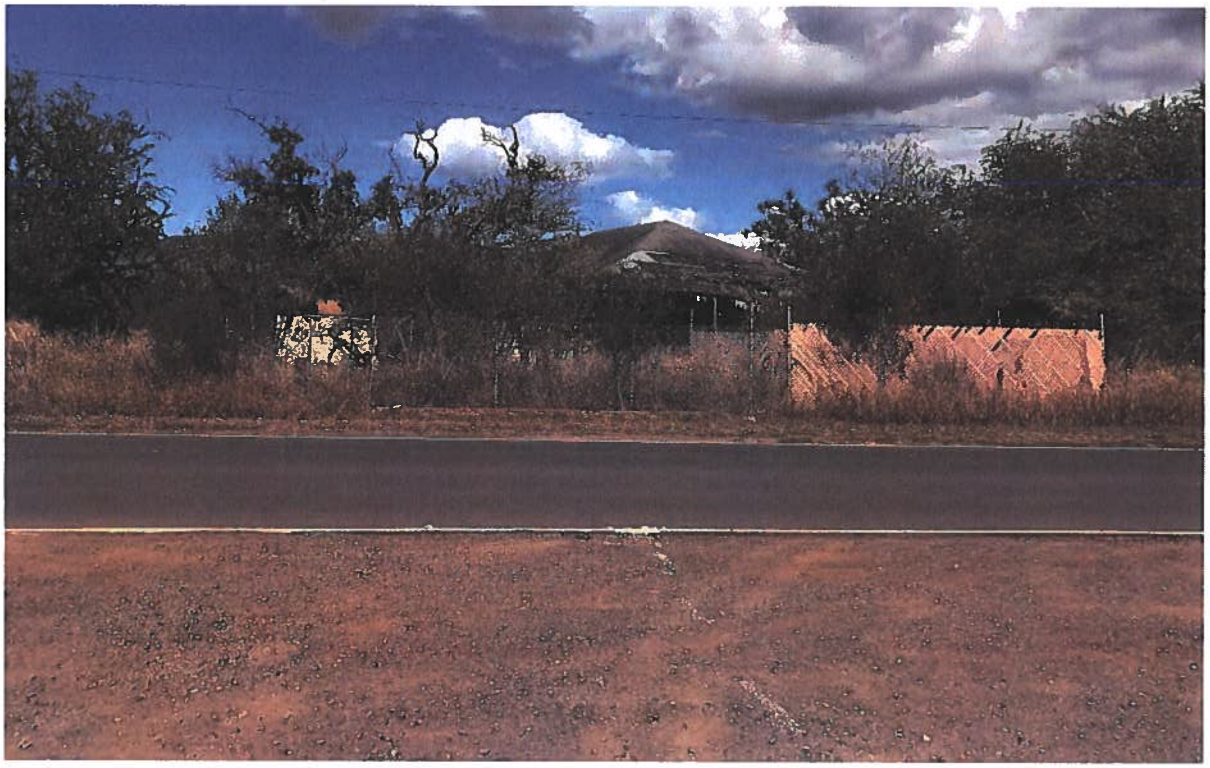

Photo 9. View of Renton Road, deteriorate plantation era home, and chain link fence from Malio Street.

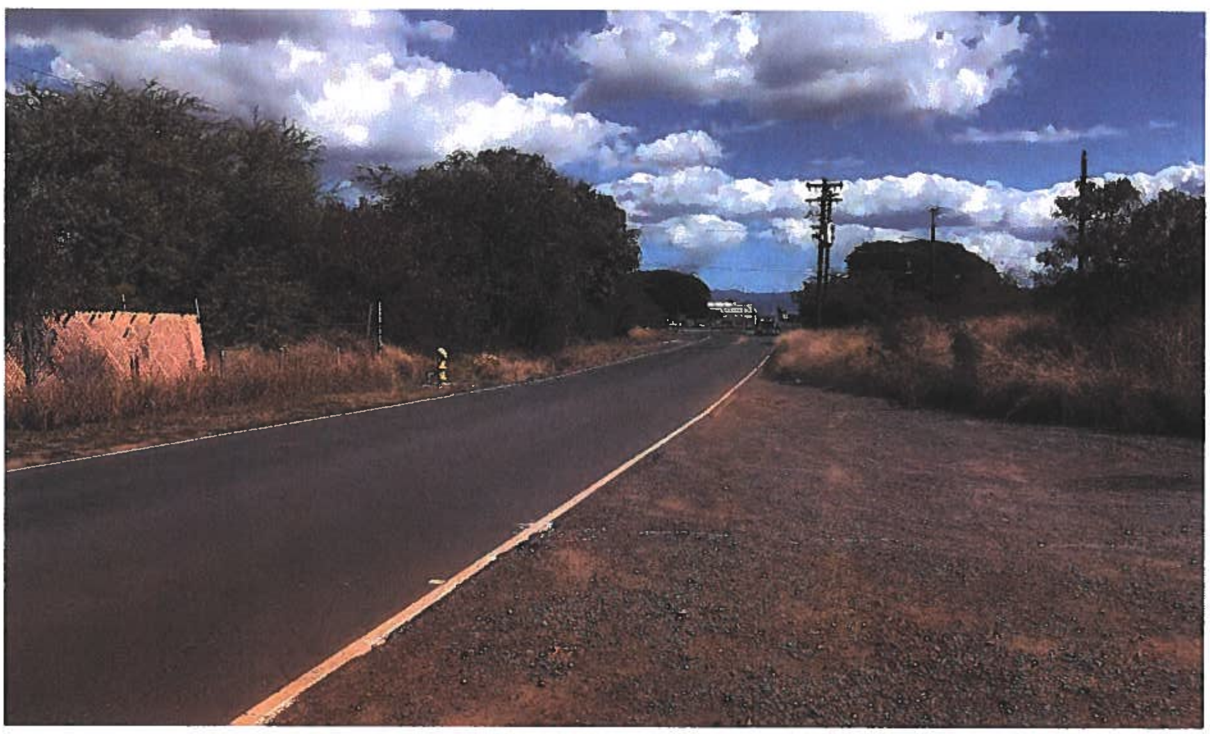

Photo 10. View of Renton Road looking northeast towards Kapolei Parkway from Malio Street.

Existing Condition Photographs
ENV Support Facilities Access Road Improvements

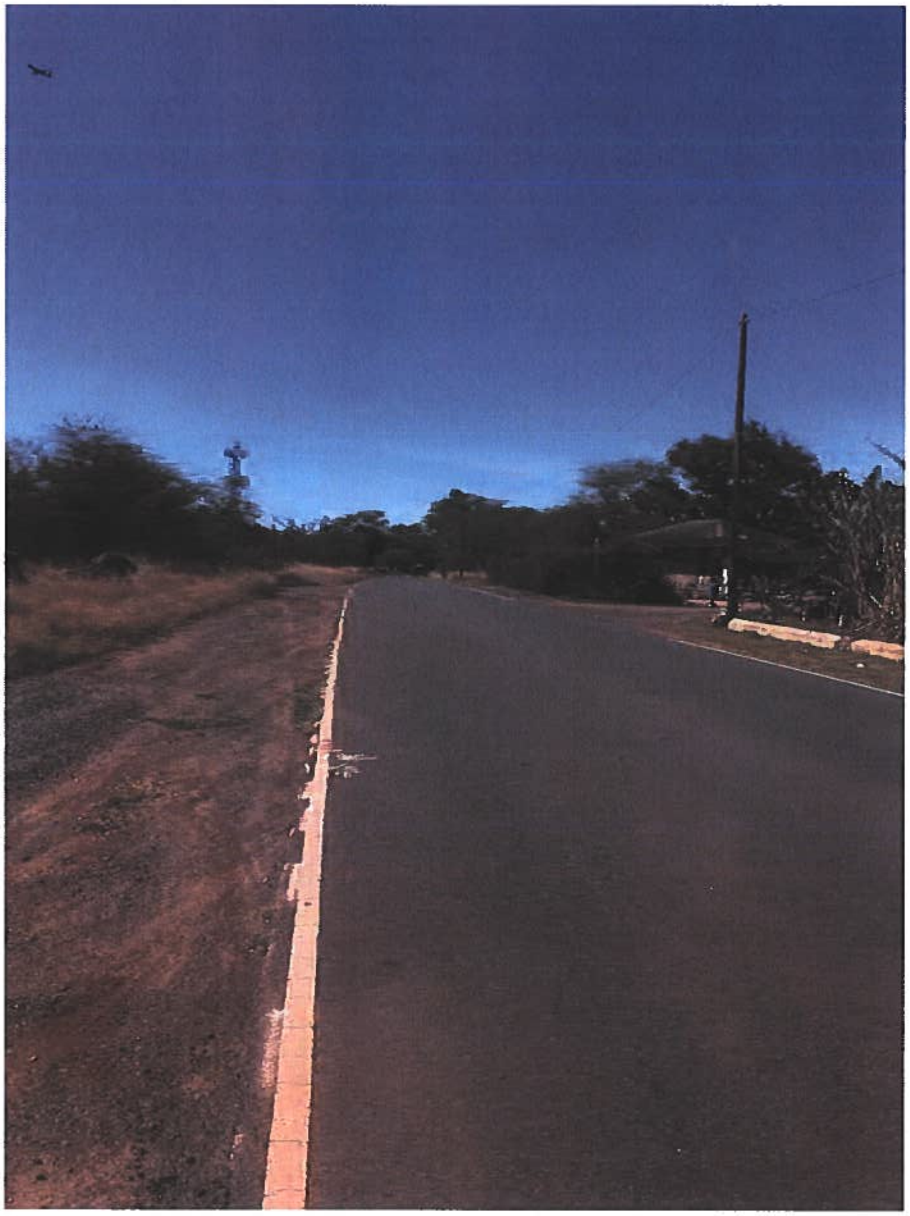

Photo 11. View of Renton Road looking southwest towards Phillipine Sea from Malio Street.

ATTACHMENT 5

Railroad Crossing Plan Sheets

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HONOULIULI WWTP RAILROAD CROSSINGS

HONOULIULI, EWA, OAHU, HAWAII

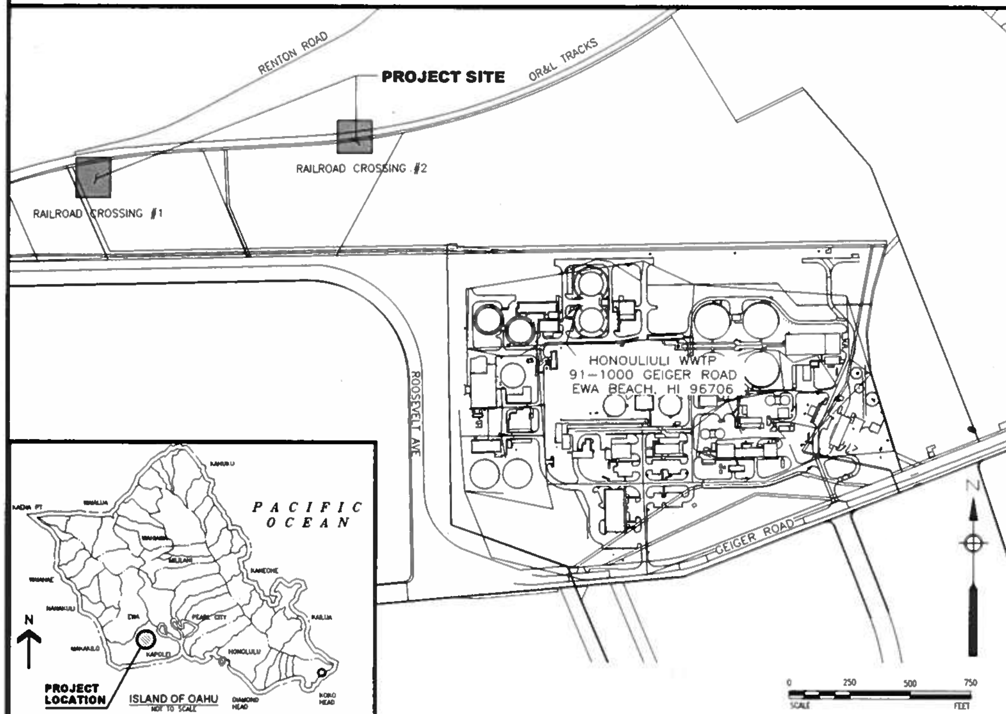
JOB NO. WXX-XX

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY & COUNTY OF HONOLULU

PREPARED BY:

AECOM
1001 BISHOP ST
AMERICAN SAVINGS TOWER, SUITE 1600
HONOLULU, HAWAII 96813

LOCATION MAP



INDEX OF DRAWINGS		
DWG NO.	SHEET NO.	SHEET TITLE
G001	1	TITLE SHEET
G002	2	GENERAL NOTES
C001	3	ALIGNMENT AND CONTROL PLAN
C002	4	TYPICAL SECTIONS 1
C002A	5	TYPICAL SECTIONS 2
C003	6	DEMOLITION PLAN
C004	7	EROSION CONTROL PLAN
C005	8	ROADWAY PLAN
C006	9	SITE GRADING
C007	10	ROADWAY PROFILES
C008	11	CROSS SECTIONS
CS001	12	SIGNING AND STRIPING PLAN
CS002	13	GENERAL TRAFFIC PLAN AND NOTES
CS003	14	TRAFFIC CONTROL PLAN
CS500	15	EROSION CONTROL DETAILS
CS501	16	STRIPING AND MARKING STANDARD PLANS
CS502	17	ROADSIDE SIGNS AND BOLLARD DETAILS
CS503	18	RAILROAD CROSSING DETAILS
CS504	19	TRACK CROSSING PLANS

APPROVED

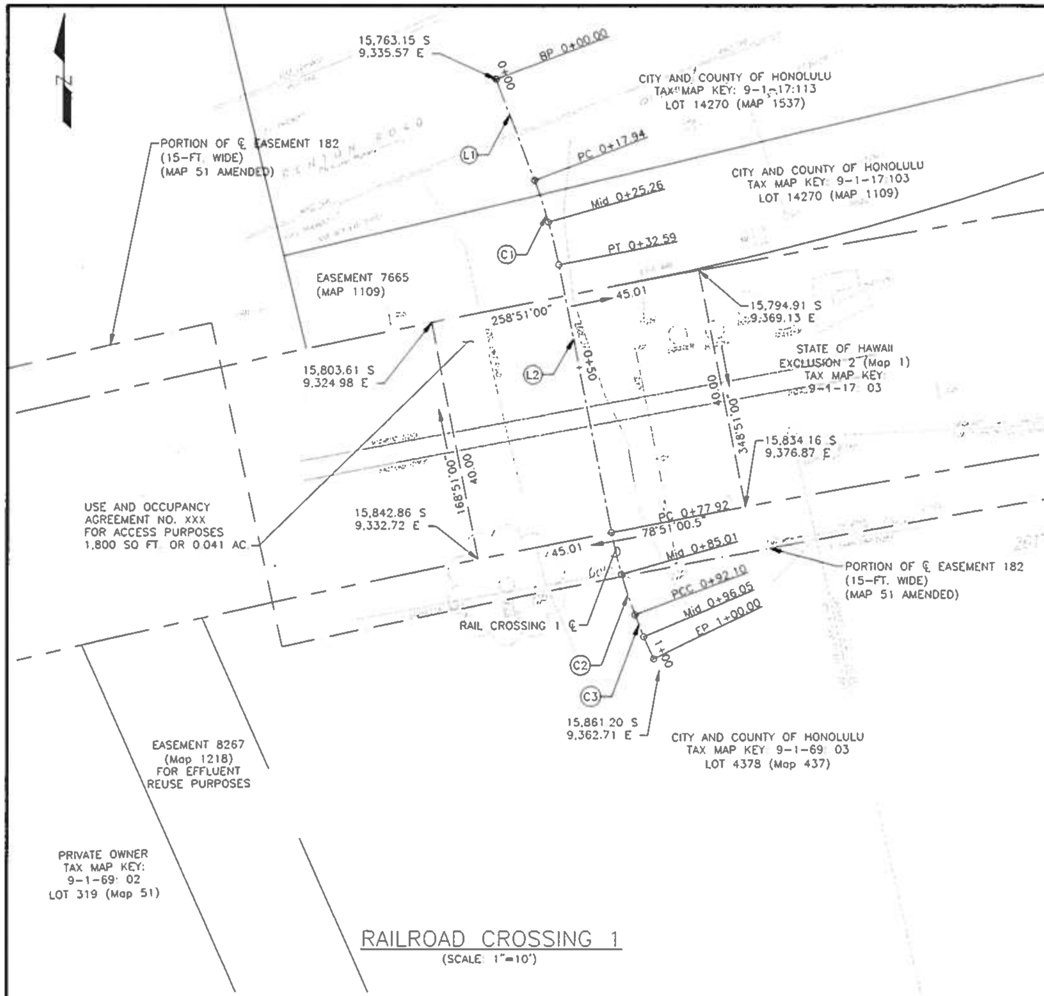
ADMINISTRATOR, HIGHWAYS DIVISION — DATE
STATE DEPARTMENT OF TRANSPORTATION
(APPROVAL GRANTED FOR WORK WITHIN STATE RIGHT-OF-WAY
ONLY. ID NO. ______
LETTER OF APPROVAL NO. HWY-O ______
DATED ______)

DIRECTOR, DEPT OF ENVIRONMENTAL SERVICES — DATE
CITY & COUNTY OF HONOLULU

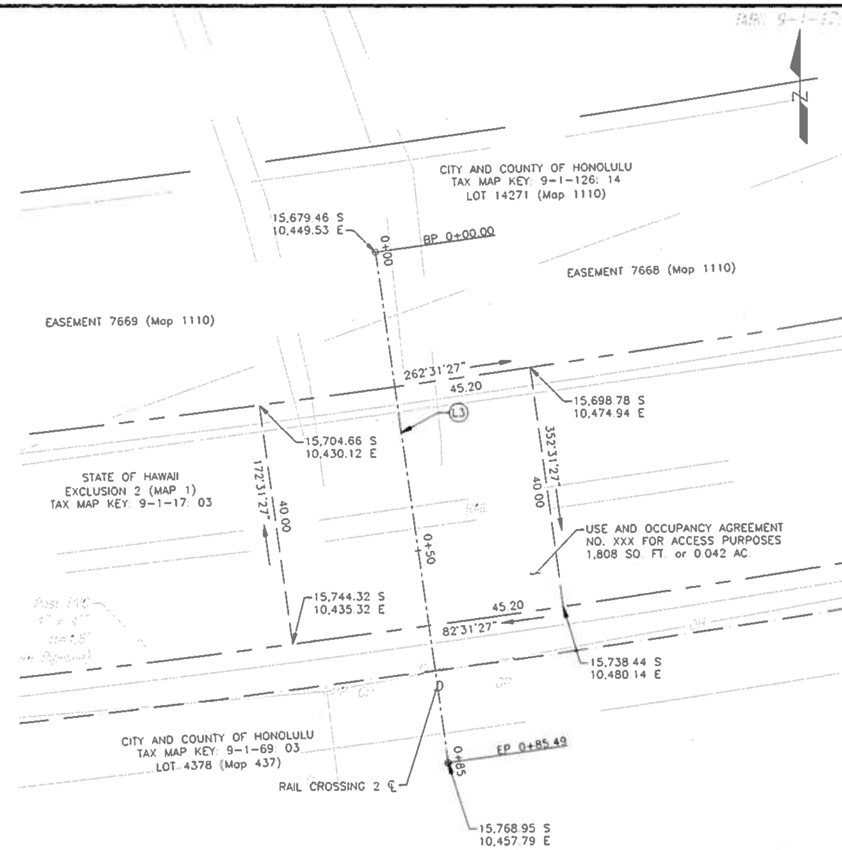
60% DRAFT - HONOULIULI WASTEWATER BASIN ODOR CONTROL PROJECT

100% DESIGN SUBMITTAL

DRAWING G001 SHEET 1 OF 19



RAILROAD CROSSING 1
(SCALE 1"=10')



RAILROAD CROSSING 2
(SCALE 1"=10')

Railroad Crossing 1					
ID	R	Length or Chord	Azimuth	Lc	Δ
L1		17.94'	339°04'50"		
C1	86.00'	14.64'	343°57'40"	14.66'	9°46'00"
L2		45.33'	348°50'40"		
C2	86.00'	14.16'	344°07'20"	14.18'	9°26'40"
C3	86.00'	7.90'	336°46'00"	7.90'	5°16'00"

Railroad Crossing 2					
ID	R	Length or Chord	Azimuth	Lc	Δ
L3		85.49'	352°20'30"		

NOTES:
1. ORIGIN OF AZIMUTH: "KAPUAI NEW" △
2. COORDINATES REFERRED TO "KAPUAI NEW" △
3. UOA NO. XXX FOR ACCESS PURPOSES IN FAVOR OF THE CITY & COUNTY OF HONOLULU = 1,808 SQ. FT.

0 10 20 Feet

REVISION	DATE	BRIEF	BY	APPROVED

JARNETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: ALIGNMENT AND CONTROL PLAN

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:

100% DESIGN SUBMITTAL

DRAWING C001 SHEET 3 OF 19

S:\Projects_Legacy\USG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C001 Alignment and Control Plan.dwg
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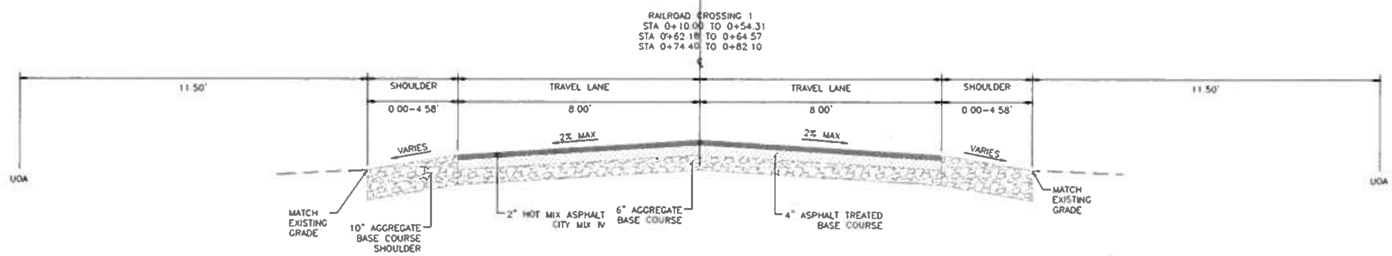
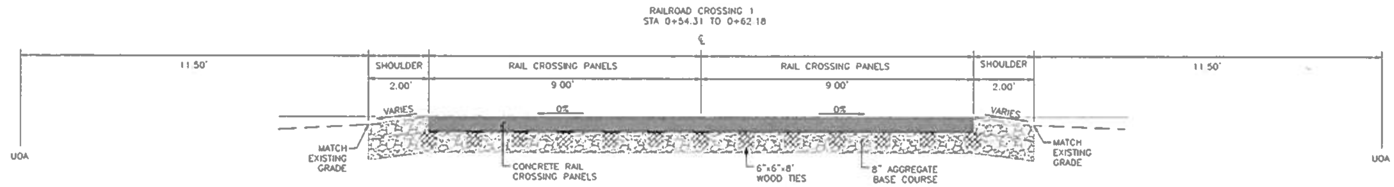
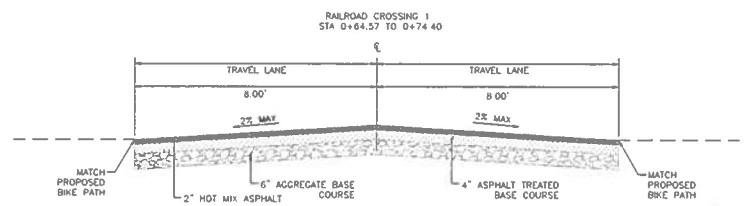


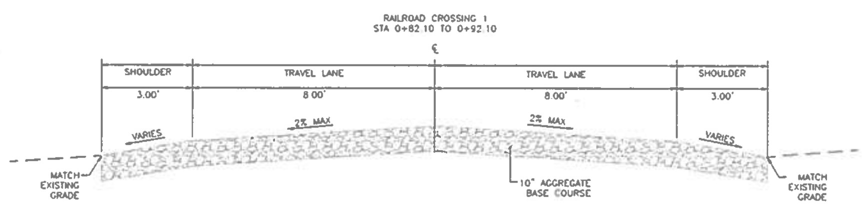
TYPICAL SECTIONS – ROADWAY



TYPICAL SECTIONS – RAIL CROSSING PANELS



TYPICAL SECTIONS – ROADWAY @ BIKE PATH CROSSING



TYPICAL SECTIONS – GRAVEL TRANSITION

NOTES:

1. CREATE SMOOTH TRANSITION FROM ROADWAY CROWN TO RAIL CROSSING PANELS
2. PROPOSED BIKE PATH BY OTHERS. SEE GENERAL NOTES

JARRETT T. BROWN
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No. 17903-C
HAWAII, U.S.A.

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REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT RAILROAD CROSSINGS

ITEM: TYPICAL SECTIONS RAILROAD CROSSING 1

DESIGNED BY: DI
DRAWN BY: DI
APPROVED
CHECKED BY: JH
SECTION HEAD
BRANCH HEAD

100% DESIGN SUBMITTAL

DRAWING C002 SHEET 4 OF 19

S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C002 - Typical Sections.dwg
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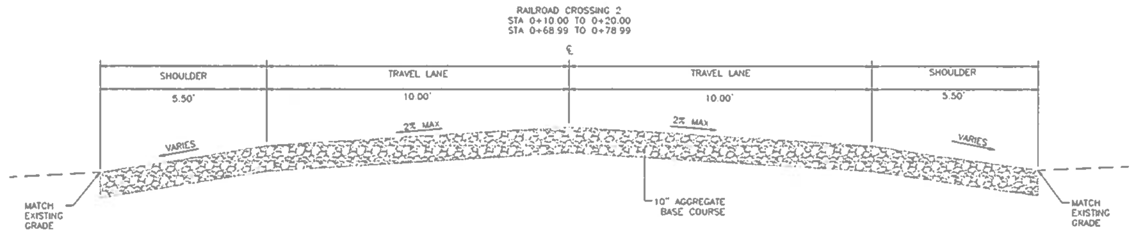
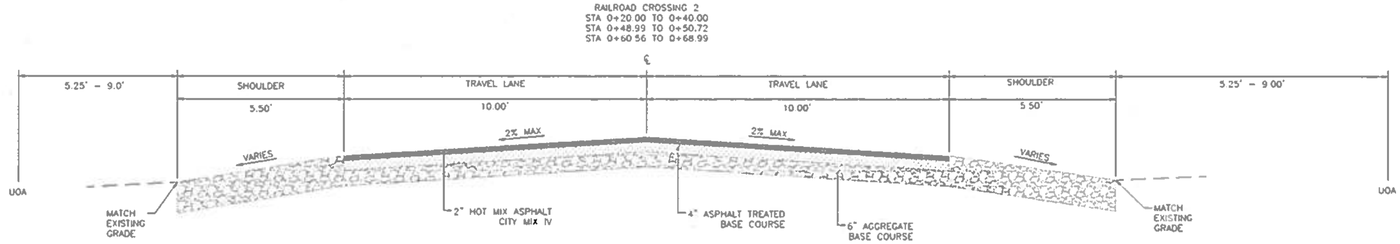
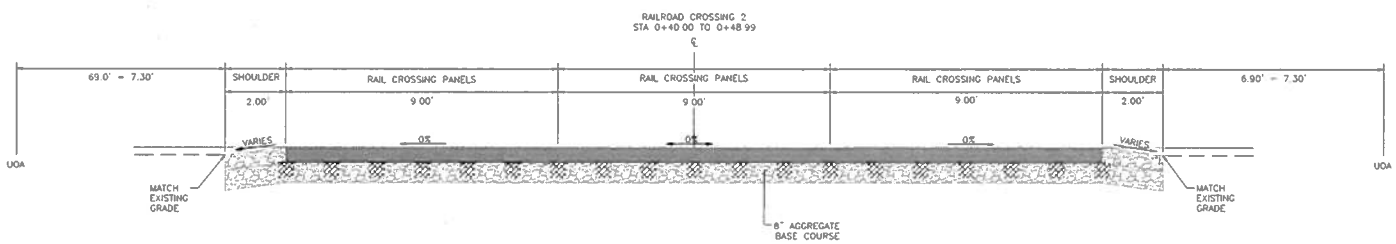


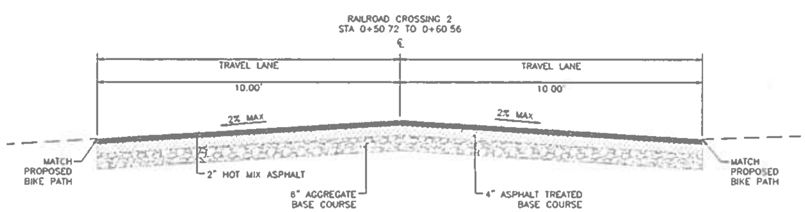
TYPICAL SECTIONS – GRAVEL TRANSITION



TYPICAL SECTIONS – ROADWAY



TYPICAL SECTIONS – RAIL CROSSING PANELS



TYPICAL SECTIONS – ROADWAY @ BIKE PATH CROSSING

NOTES:

1. CREATE SMOOTH TRANSITION FROM ROADWAY CROWN TO RAIL CROSSING PANELS
2. PROPOSED BIKE PATH BY OTHERS. SEE GENERAL NOTES.

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION

REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT RAILROAD CROSSINGS

ITEM: TYPICAL SECTIONS RAILROAD CROSSING 2

DESIGNED BY: DI
DRAWN BY: DI
APPROVED
CHECKED BY: JH
SECTION HEAD
BRANCH HEAD

DRAWING C002A SHEET 5 OF 19

100% DESIGN SUBMITTAL

S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C002 – Typical Sections.dwg

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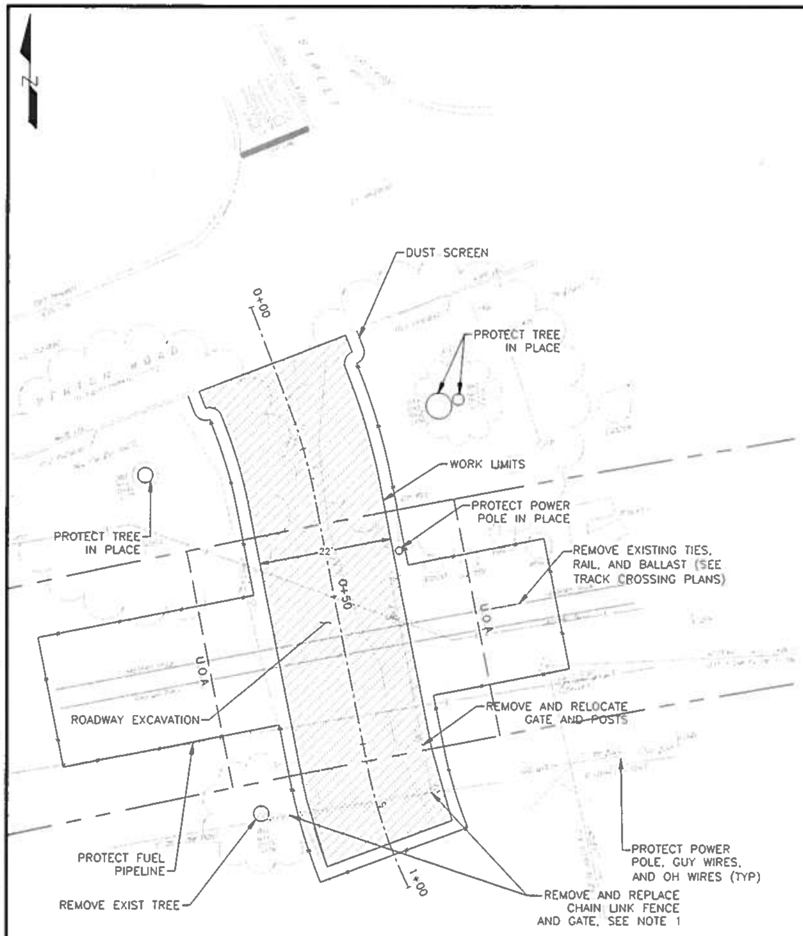
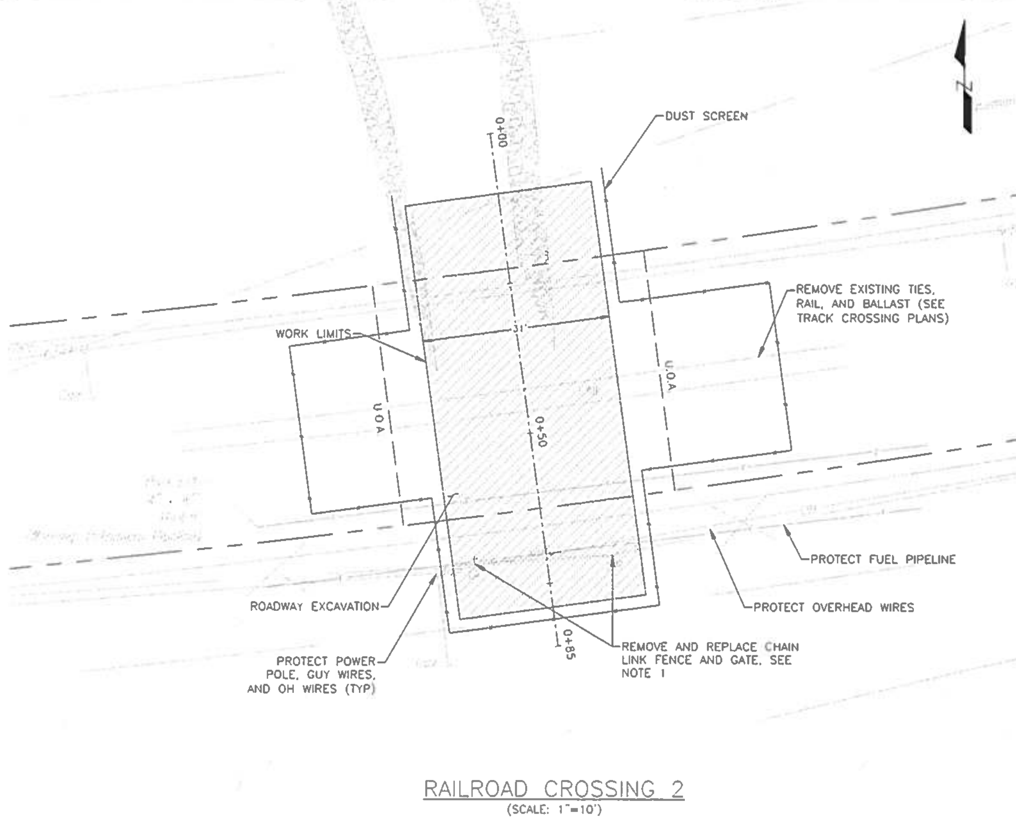


RAILROAD CROSSING 1
(SCALE: 1"=10')



RAILROAD CROSSING 2
(SCALE: 1"=10')

NOTES

1. REMOVE EXISTING CHAIN LINK FENCE AND GATE AS REQUIRED PRIOR TO THE WORK. PROTECT FENCING DURING CONSTRUCTION AND REPLACE THE SAME CHAIN LINK FENCE AND GATE AFTER THE WORK IS COMPLETED.
2. CONTRACTOR TO COORDINATE WITH AND PROVIDE ACESS CELL TOWER OPERATOR AT RAIL CROSSING 1.

0 10 20 Feet

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

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REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: DEMOLITION PLAN

DESIGNED BY: DI
DRAWN BY: DI
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:
APPROVED:

100% DESIGN SUBMITTAL

DRAWING C003 SHEET 6 OF 19

S:\Projects_Legacy\USIC\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C003 Demolition Plan.dwg
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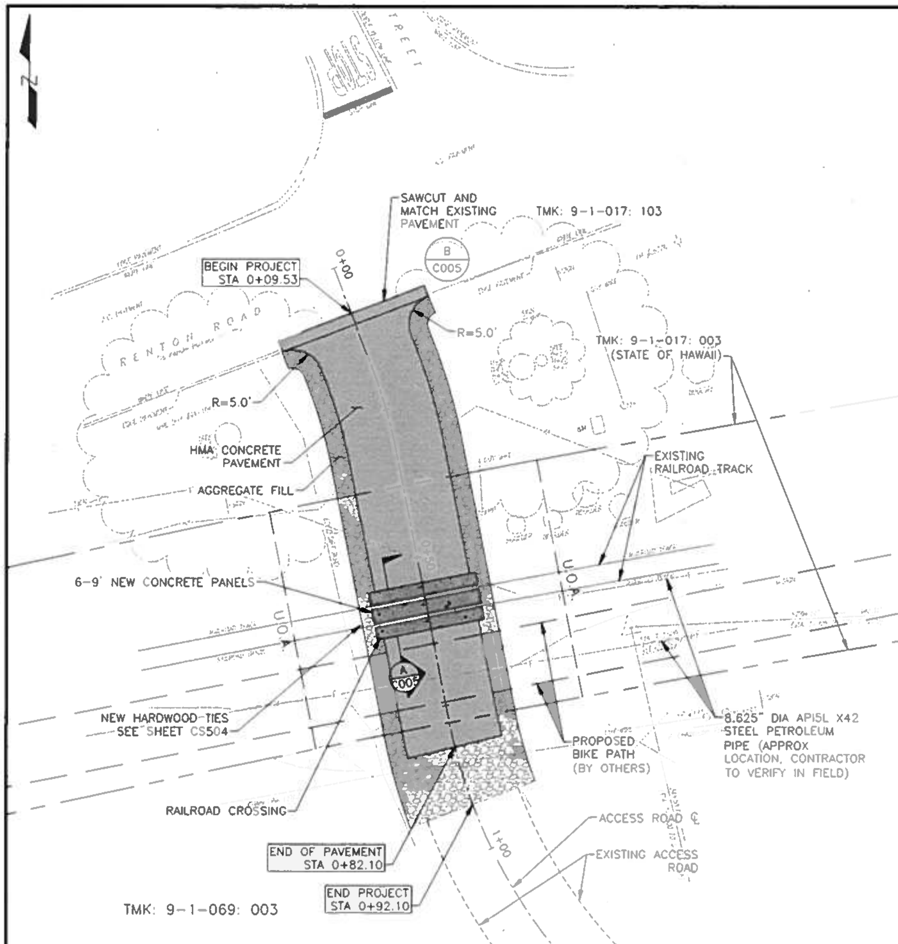
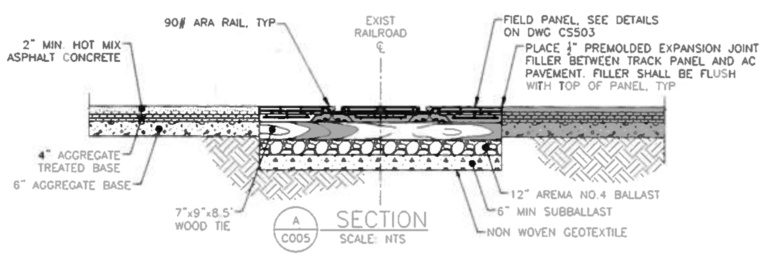
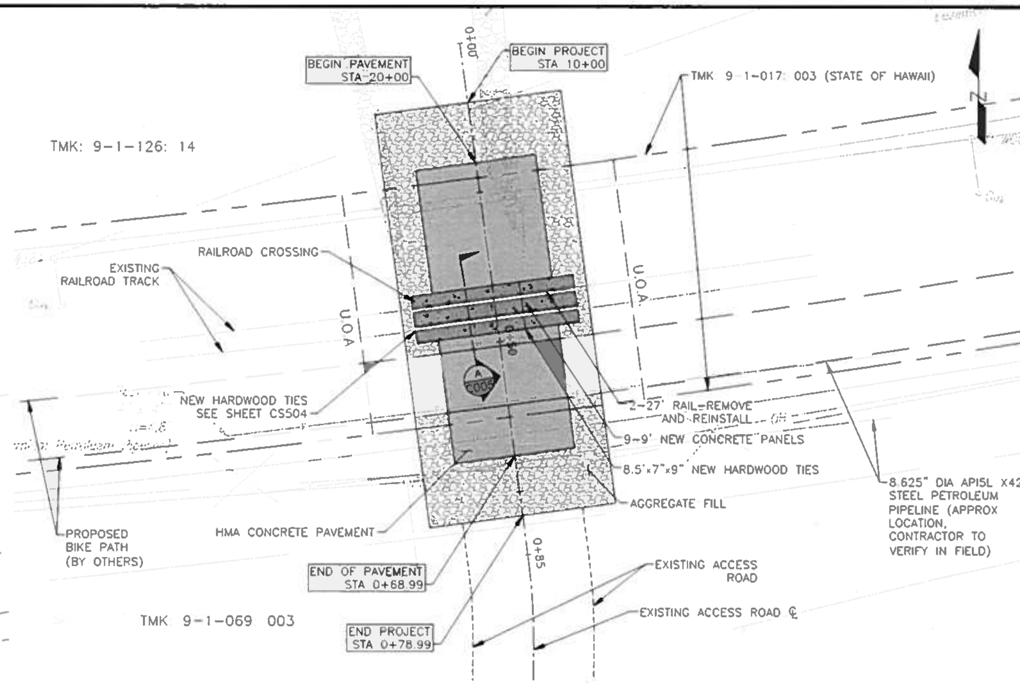


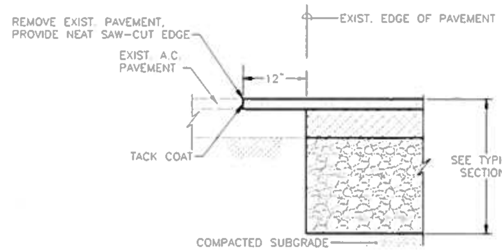
RAILROAD CROSSING 1
(SCALE: 1"=10')



A C005 SECTION
SCALE: NTS



RAILROAD CROSSING 2
(SCALE: 1"=10')



NOTE:

PAVEMENT SLOPE SHALL MATCH EXISTING PAVEMENT SLOPE SO AS TO PROVIDE SMOOTH RIDING CONNECTION.

B C005 TYPICAL A.C. PAVEMENT CONNECTION
SCALE: NTS

0 10 20 Feet

REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: ROADWAY PLANS

DESIGNED BY: DI — CHECKED BY: JH
DRAWN BY: DI — SECTION HEAD:
APPROVED — BRANCH HEAD:

JARRETT T. BROWN, LICENSED PROFESSIONAL ENGINEER No. 17903-C, HAWAII U.S.A.

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DRAWING C005 SHEET 8 OF 19

S:\Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C005 Roadway Plan.dwg
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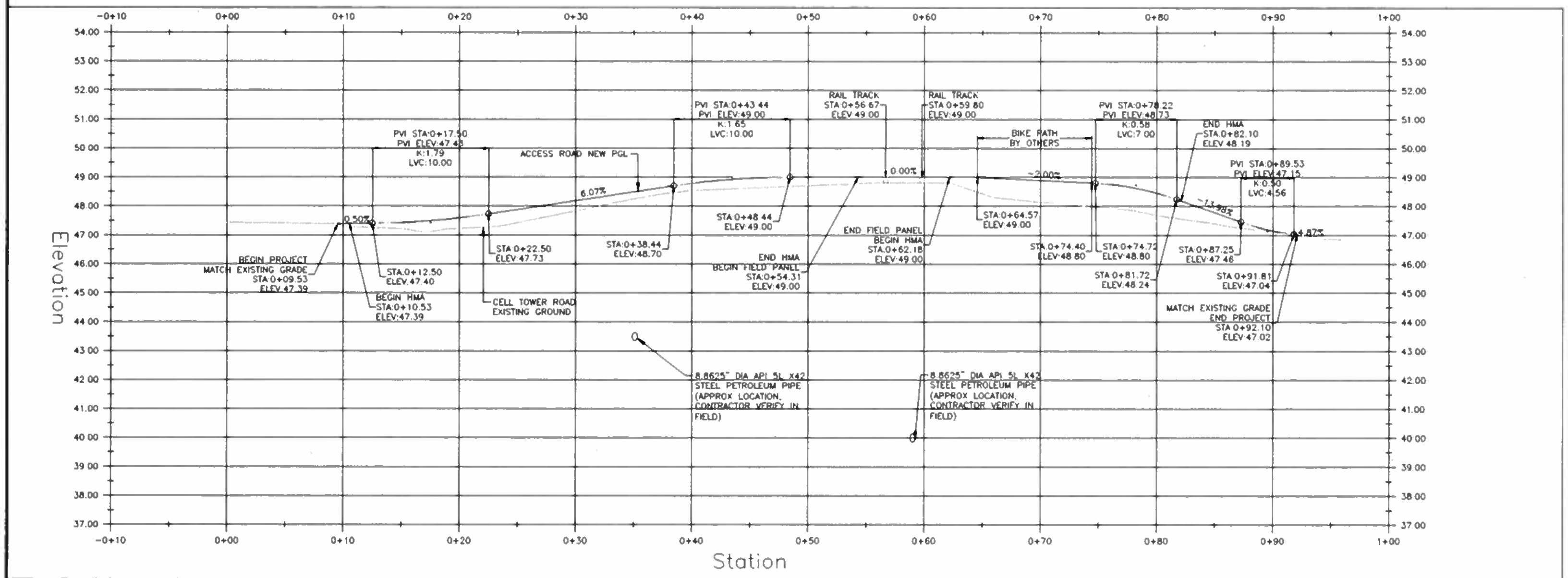
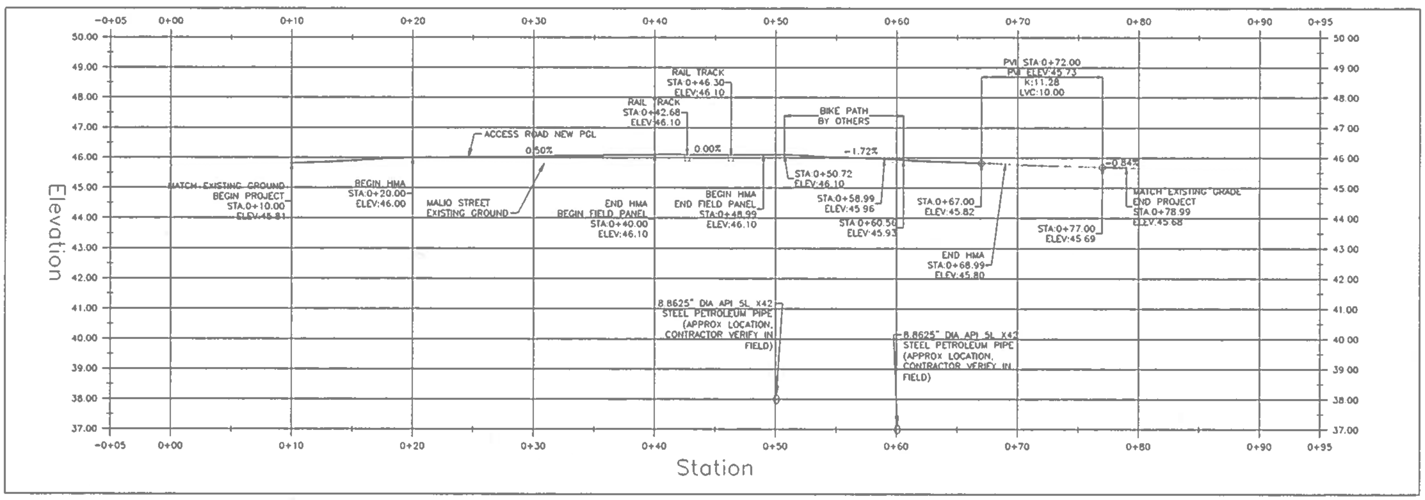


RAILROAD CROSSING 1



RAILROAD CROSSING 2

VERT. SCALE 0 2 4 Feet
HOR. SCALE 0 5 10 Feet

REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: ROADWAY PROFILES

DESIGNED BY: DI
DRAWN BY: DI
APPROVED:
CHECKED BY: JH
SECTION HEAD:
BRANCH HEAD:

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII, U.S.A.

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DRAWING C007 SHEET 10 OF 19

S:\Projects_Legacy\USAG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing\Sheets\C006-C008 Grading, Profile, Typ Sections.dwg

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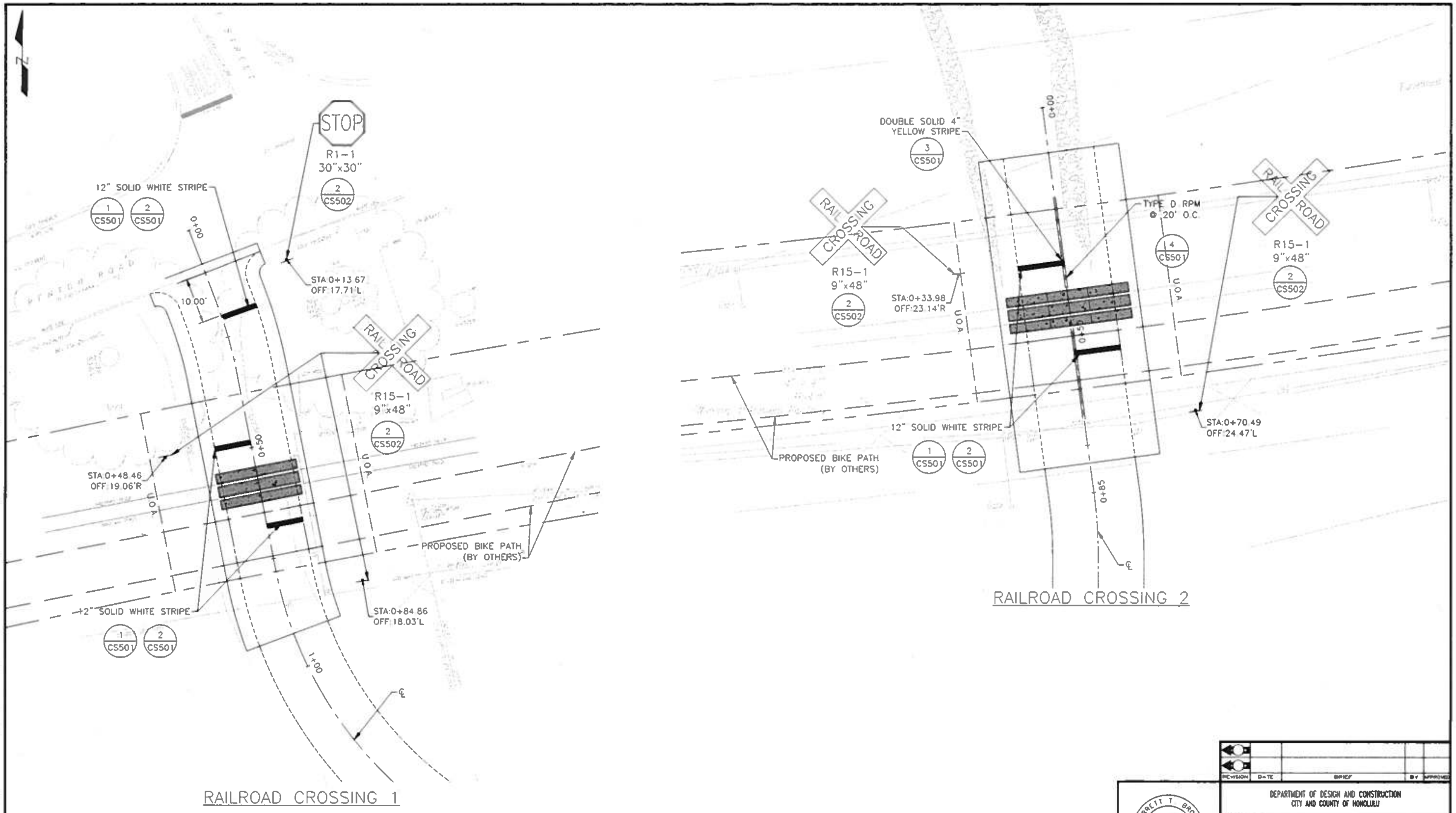

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

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REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: SIGNING AND STRIPING PLAN

DESIGNED BY: DI
DRAWN BY: DI
APPROVED
CHECKED BY: JH
SECTION HEAD
BRANCH HEAD

100% DESIGN SUBMITTAL

DRAWING CS001 SHEET 12 OF 19

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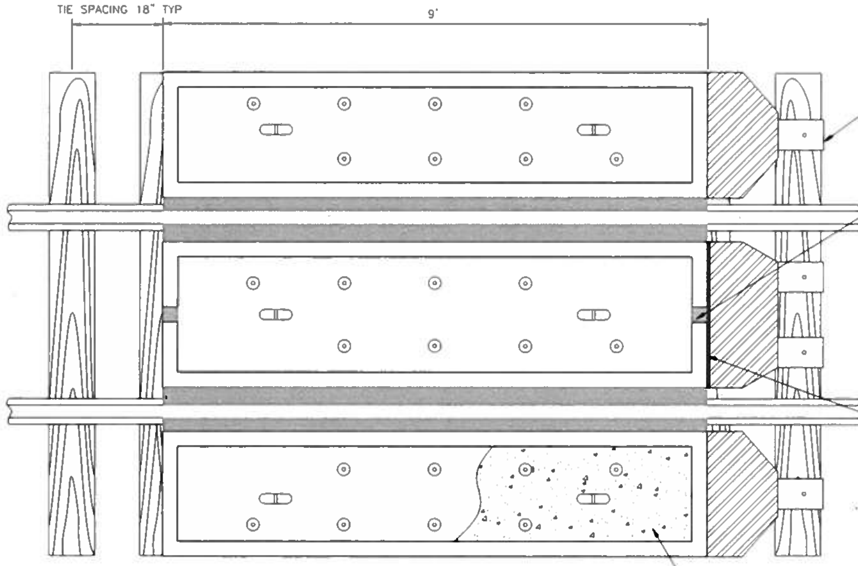
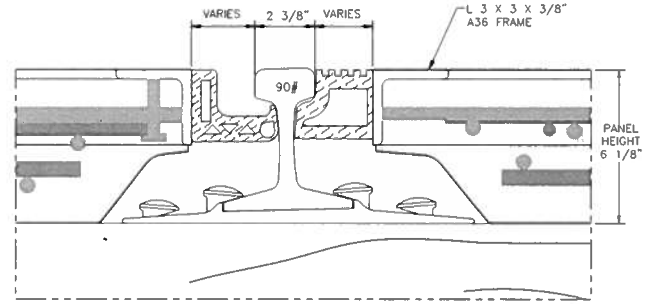
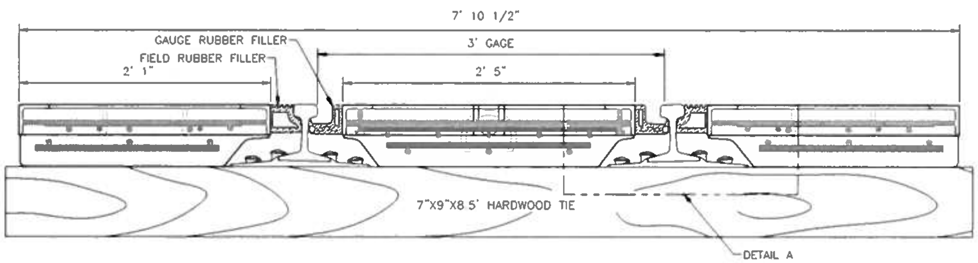


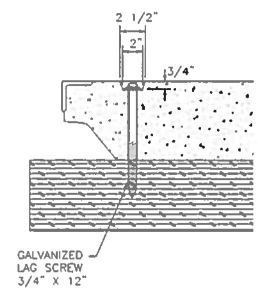
1 / CS503 GAUGE AND FIELD PANEL PLAN
(SCALE 1"=1')



DETAIL A
(SCALE: 1"=1/5')



TYPICAL SECTION
(SCALE 1"=1/2')



TIMBER SPIKE
(SCALE 1"=1/2')

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT: HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM: RAILROAD CROSSING DETAILS

DESIGNED BY: DI
DRAWN BY: DI
APPROVED
CHECKED BY: JM
SECTION HEAD
BRANCH HEAD

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

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DRAWING CS503 SHEET 18 OF 19

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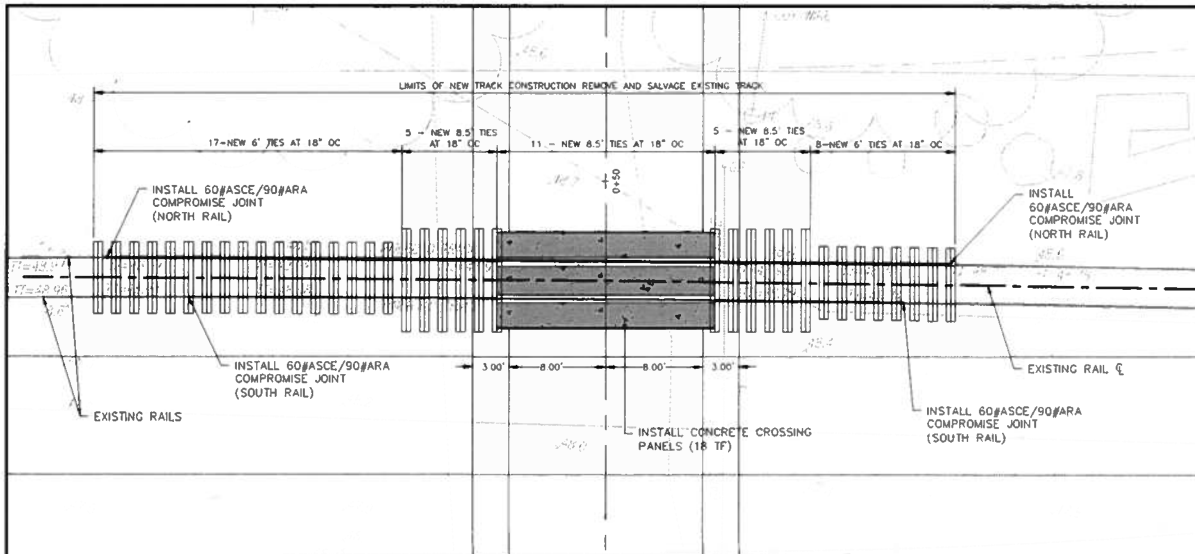
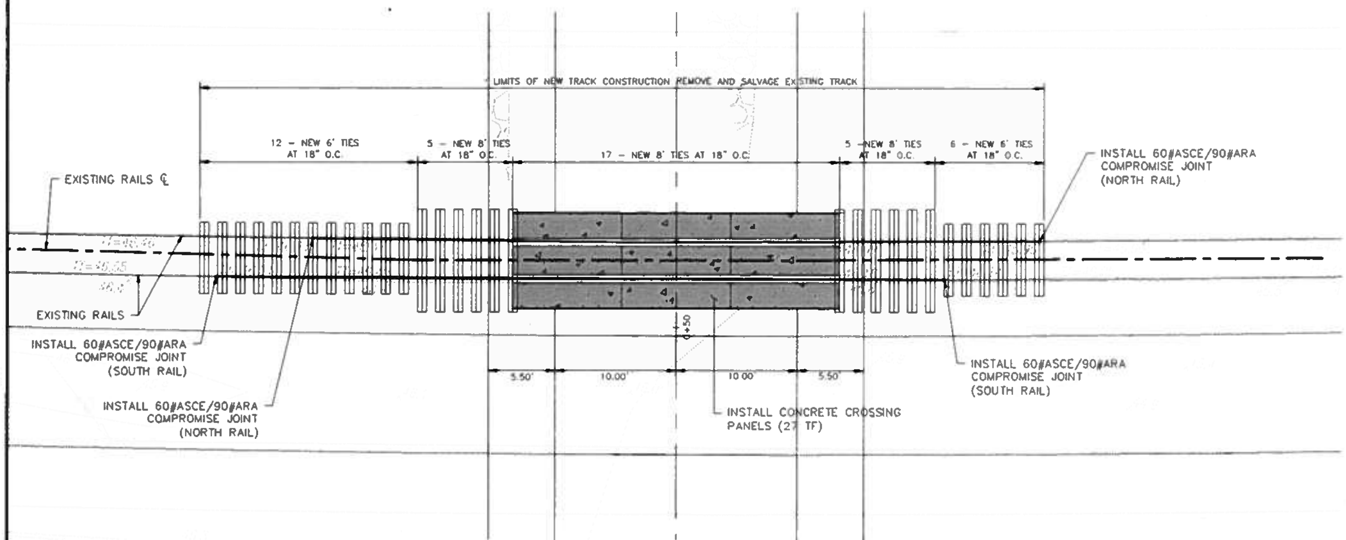
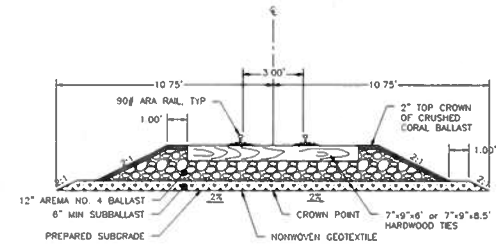


RAILROAD CROS ING 1
(SCALE 1" 5')



RAILROAD CROSSING 2
(SCALE: 1"=5')



OPEN TRACK SECTION
(SCALE NONE)

NOTE:

1. THE CONTRACTOR SHALL PROTECT ALL FOUNDATIONS AND EXISTING UNDERGROUND UTILITIES FROM DAMAGE BY EXCAVATION ACTIVITIES.

2. CONTRACTOR SHALL NOTIFY THE ENGINEER FOR INSPECTION OF CROSSING SUBGRADE. CONTRACTOR SHALL NOT COVER UP THE SUBGRADE UNTIL AFTER INSPECTION AND APPROVAL.

3. IF ALL OR PART OF THE SUBGRADE CANNOT ATTAIN SUITABLE COMPACTION, CONTRACTOR SHALL OVER EXCAVATE AND PLACE AND COMPACT SUITABLE ORDINARY BACKFILL MATERIAL AS DIRECTED BY THE ENGINEER. REMOVED EXISTING BALLAST MAY BE USED AS ORDINARY BACKFILL UNLESS DETERMINED BY THE ENGINEER TO BE UNSUITABLE.

4. ROADWAY SURFACES SHALL NOT ALLOW STORM WATER TO DRAIN INTO THE TRACK.

5. CONTRACTOR IS RESPONSIBLE FOR ORDERING PREMANUFACTURED CONCRETE CROSSING PANELS SPECIFICALLY FOR THE SIZE OF RAIL AND TIE PLATES, AND ANCHORS (IF USED) AT THE CROSSING. CONTRACTOR MUST ENSURE THAT THE PANEL HEIGHT WILL MATCH RAIL HEIGHT AND THAT SUFFICIENT CLEAR SPACE IS AVAILABLE UNDER THE PANELS FOR TIE PLATES AND RAIL FASTENINGS. CONTRACTOR MUST ALSO ENSURE THAT PREMANUFACTURED CROSSING PANELS ARE ORDERED TO MATCH TRACK CURVATURE. TIE LENGTH AND SPACING MUST CONFORM TO THE INSTALLATION REQUIREMENTS PROVIDED BY THE CROSSING MANUFACTURER.

JARRETT T. BROWN
LICENSED PROFESSIONAL ENGINEER
No. 17903-C
HAWAII U.S.A.

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REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

PROJECT
HONOULIULI WASTEWATER TREATMENT PLANT
RAILROAD CROSSINGS

ITEM
TRACK CROSSING PLANS

DESIGNED BY: DI
DRAWN BY: DI
APPROVED
CHECKED BY: JH
SECTION HEAD
BRANCH HEAD

DRAWING CS504 SHEET 19 OF 19

HONOLULU\Honolulu Projects_Legacy\USIG\Wastewater\60182588-Honouliuli Fac Plan\400 Tech Info\436 Task 14\Honouliuli Easements\Railroad Crossing Sheets\CS504 Railroad Track Construction.dwg

9/23/2019 3:11 PM

ATTACHMENT 6

'Ewa Plain Battlefield Photographs

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Existing Condition Photographs
ENV Support Facilities Access Road Improvements

Photo 1: Original 'Ewa Field base fence, north of Roosevelt Avenue.

Photo 2. Location of proposed driveway from Roosevelt Avenue into ENV Support facilities.

Existing Condition Photographs
ENV Support Facilities Access Road Improvements

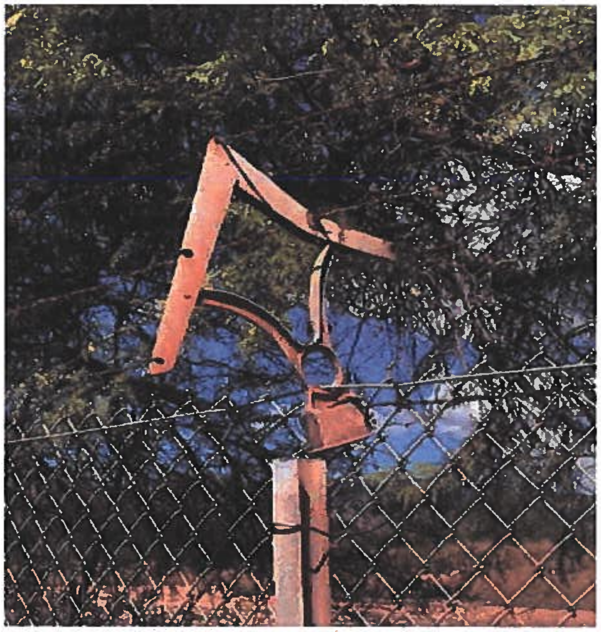

Photo 3. Original fence topper.

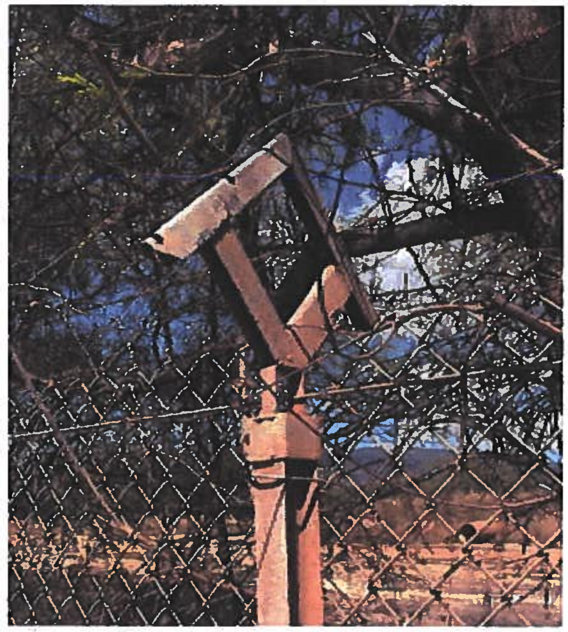

Photo 4. Replacement fence topper.

Photo 5. Identifier "COLO 14-H" on fence topper likely denotes the Colorado Chain Link Fence Company as the manufacturer, with the "H" referring to the post type.

ATTACHMENT 7

Roosevelt Avenue and Driveway Concept

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ENV Support Facilities Access Road Improvements

Roosevelt Avenue Widening and Driveway Concept

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

In Reply Refer To:
01EPIF00-2021-SL-0036

December 8, 2020

Ms. Fawn Y. Yamada
Right-of-Way Manager
State of Hawaii Department of Transportation
Kapolei, Hawaii 96707

Subject: Railroad Crossing Rehabilitation along Renton Road on Oahu Island, Request for Species List

Dear Ms. Yamada:

Thank you for your letter of October 15, 2020 requesting a list of threatened or endangered species and conservation measures for the actions proposed by the City and County of Honolulu's (CCH), Environmental Services Department (ENV) at two existing unimproved driveway crossings over the State of Hawaii, Department of Transportation's (HDOT) right-of-way (ROW), and the former Oahu Railway and Land Company (OR&L) ROW. This activity requires a use and occupancy agreement with HDOT, Highways Division, subject to approval by the Federal Highways Administration and therefore is considered a Federal action. This letter has been prepared under the authority of, and in accordance with, provisions of the Endangered Species Act of 1973 (ESA)(16 U.S.C. 1531 et sequentibus), as amended. A complete record of this consultation is on file at the Service's Pacific Islands Fish and Wildlife Office in Honolulu, Hawaii. The Service's log number for this consultation is 01EPIF00-2021-SL-0036.

DESCRIPTION OF THE PROPOSED ACTION

The proposed work includes improvements at two existing, unimproved railroad crossings, in the town of Ewa. The improvements are to provide access and utility connections from Renton Road to the proposed ENV Support Facilities project, which will include new administration, laboratory, central shops, and storeroom buildings to be built on CCH land that lies just south of OR&L ROW.

The existing driveway crossing at Malio Street will be upgraded. The Malio Street Crossing work will include excavation of the existing roadway, installation of underground utilities, grading, installation of new aggregate and asphalt pavement, new hardwood ties, rails and concrete panels at the rail crossing, striping, and railroad crossing signs.

At both crossing locations some removal of koa haole (*Leucaena leucocephala*), small kiawe trees (*Prosopis pallida*), shower tree saplings (*Cassia fistula*), and understory vegetation including buffel grass (Cenchrus ciliaris), Guinea grass (*Urochloa maxima*), and hair abutilon (*Abutilon grandifolium*) will be required. Construction is expected to occur from 2022 to 2023 subject to change as the design and schedule for associated projects are refined. All work will be performed during daylight hours. No night construction lighting will be required.

We have reviewed the information you provided and pertinent information in our files as it pertains to listed species in accordance with section 7 of the ESA. Our data indicate the federally listed endangered Hawaiian petrel (*Pterodroma sandwichensis*), threatened Newell's shearwater (*Puffinus auricularis newelli*), and endangered Hawaii Distinct Population Segment of the band-rumped storm petrel (*Oceanodroma castro*) collectively referred to as Hawaiian seabirds, and the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), may occur in, or transit through, the vicinity of the proposed action area. There is no designated critical habitat within the proposed action area.

Hawaiian seabirds
Hawaiian seabirds may traverse the project area at night during the breeding, nesting and fledging seasons (March 1 to December 15). Outdoor lighting could result in seabird disorientation, fallout, and injury or mortality. Seabirds are attracted to lights and after circling the lights they may become exhausted and collide with nearby wires, buildings, or other structures or they may land on the ground. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and predation by dogs, cats, and other predators. Young birds (fledglings) traversing the project area between September 15 and December 15, in their first flights from their mountain nests to the sea, are particularly vulnerable to light attraction.

To avoid or minimize potential project impacts to seabirds we recommend you incorporate the following measures into your project description:

- Fully shield all outdoor lights so the bulb can only be seen from below.
- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.
- Avoid nighttime construction during the seabird fledging period, September 15 through December 15.

Hawaiian hoary bat
The Hawaiian hoary bat roosts in woody vegetation across all islands and will leave their young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or taller are cleared during the pupping season, June 1 through September 15, there is a risk that young bats could inadvertently be harmed or killed, since they are too young to fly or move away from disturbance. To avoid or minimize impacts to the endangered Hawaiian hoary bat we recommend you incorporate the following conservation measure into your project description:

- Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).

We appreciate your efforts to conserve endangered species. If you have any questions, please contact me at johnathon_kraska@fws.gov or by telephone at 808-792-9427.

Sincerely,

DARREN LEBLANC
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Date: 2020.12.08 10:38:03 -10'00'

Darren LeBlanc
Planning and Consultation Team Manager

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DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 • FAX: (808) 768-4567 • WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
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WESLEY T. YOKOYAMA, P.E.
DIRECTOR DESIGNATE

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-011

February 12, 2021

VIA ELECTRONIC SUBMITTAL

Alan S. Downer, Ph.D, Administrator
State of Hawai'i, Department of Land and Natural Resources
State Historic Preservation Division
601 Kamokila Boulevard, Suite 555
Kapolei, Hawai'i 96707

Dear Dr. Downer:

SUBJECT: HRS Chapter 6E-8 Historic Preservation Review
ENV Support Facilities Access Road Improvements
Honouliuli Ahupua'a, 'Ewa District, Island of O'ahu
F.D. Roosevelt Avenue Right-of-Way, OR&L Right-of-Way,
and City Parcels TMK 9-1-126:014, TMK 9-1 069:003, TMK 9-1-013:007
SHPD Project Number: 2020PR34403
Legacy SHPD Log No: 2020.02296

On September 30, 2020, the City and County of Honolulu, Department of Environmental Services (ENV) electronically submitted a letter package to the Hawai'i State Historic Preservation Division (SHPD) requesting review of the subject project and a determination letter in accordance with Hawai'i Revised Statutes (HRS) Chapter 6E-8 and Hawai'i Administrative Rules (HAR) §13-275. The submittal was assigned SHPD Log No. 2020.02296, and subsequently assigned SHPD HICRIS Project Number 2020PR34403.

Following this submittal, the scope of the project expanded to include installation of a 16-inch potable water main. The purpose of this letter it to provide supplemental information regarding this proposed water main. All other information presented in the original submittal package remains accurate and unchanged.

DESCRIPTION OF 16-INCH POTABLE WATER MAIN

ENV and the Honolulu Board of Water Supply (BWS) will jointly fund the proposed water main. The purpose of the proposed water main is to connect two dead-end water lines, in Geiger Road and Renton Road, to provide water circulation, redundancy in case of emergencies, and reliable fire flow capacity. ENV will take the lead for the planning, design, and construction. As shown in the enclosed Figure 1, the new water main will run approximately 4,500 linear feet from the existing 16" main at the Geiger Road/Kamakana Street intersection along Geiger Road and Roosevelt Avenue before crossing the western end of City property (TMK 9-1-069:003) to meet an existing 8" water main on Renton Road. The proposed water main will cross the O'ahu Railway and Land Company (OR&L) right-of-way (ROW) at the location of the cell tower access driveway. Where open trench construction for the water line will be performed, the ground disturbance will be to a depth of approximately 5 feet.

EVALUATION OF EFFECTS TO HISTORIC PROPERTIES AND PROPOSED MITIGATION

The previous letter described improvements to an existing driveway providing access from Renton Road across the OR&L ROW to an existing cell tower and City property. The letter noted that utility connections would be installed under the improved driveway; the proposed 16-inch water main is one of these utilities. Effects to the OR&L ROW from the improvements to the driveway and installation of utilities at this crossing location were described in the previous letter along with proposed mitigation.

Installation of the water main will require excavation along Roosevelt Avenue (formerly Hansen Road), either in the shoulder of the road, or just outside the shoulder. The construction will require the water main to cross the former 'Ewa Field base fence, which will require temporary removal of about 20 feet to 40 feet of the fence for construction access. The 'Ewa Plain Battlefield and the perimeter chain link fence were described in the previous letter. The previous letter identified effects to the 'Ewa Field base fence from construction of a new driveway and proposed mitigation for those effects. The installation of the water main would have a temporary effect on the 'Ewa Field base fence. To mitigate for this effect, the chain link fence will be restored to existing conditions once construction of the water main is complete.

Installation of the water line across the OR&L ROW may be done by open trench construction, which would require temporarily removing the existing historic railroad tracks and restoring the tracks after construction to their original condition. This work would ideally be done at the same time as the proposed improvements to the existing driveway at this location. Alternatively, if the driveway improvements are not done, and if the temporary removal of the tracks is considered unacceptable, then as a mitigation measure, the water line could be installed using trenchless technology.

The project area is within an inland, dry coral plain that in pre-Contact times had a thin to absent soil layer. Due to its distance from the coast and Pearl Harbor, and from an adequate source of fresh water, this inland area was little used during the period prior to Western contact. Within or in the vicinity of the project area, there are no Land Commission Awards, indicating that during the division and redistribution of land in 1848 there were no verified claims to lands in the area. From the late 1800s through the late 1900s, a century of commercial sugar cane cultivation was enabled by the drilling of groundwater wells and the diversion of surface water from distant stream systems, as well as by the hydraulic transport of soils from mountain slopes to the plain. The intensive land disturbance associated with the establishment and operation of the sugar cane plantations probably removed most of any evidence of pre-Contact use that may have existed.

Previous archaeological studies have not reported archaeological resources within or in the vicinity of the project area, and the archaeological sensitivity of the area is generally regarded as low. O'Hare (2011) noted that the Honouliuli Wastewater Treatment Plant (WWTP) property has been extensively disturbed by prior infrastructure construction and is of relatively low archaeological concern.[1] In another study, O'Hare et al. (2007) focused on the area in the vicinity of the WWTP expansion property (TMK 9-1-069:003), along the north and east sides of the WWTP but identified no historic properties.[2] This study found evidence of extreme ground disturbance and did not find Hawaiian traditional features on the surface. O'Hare et al. (2007) concluded that it is highly unlikely that there are any subsurface Hawaiian features intact.

On October 24, 2014, Cultural Surveys Hawai'i conducted a reconnaissance survey of the WWTP expansion property north and east of the existing WWTP, overlapping with the majority of the proposed water main alignment. No historic properties were identified. Cultural Surveys Hawai'i recommended no further archeological work for the WWTP expansion property.[3]

---

[1] O'Hare, Constance R. (2011) *Archaeological Literature Review and Field Inspection for the Honouliuli / Waipahu / Pearl City Wastewater Facilities, Honouliuli, Hō'ae'ae, Waikele, Waiawa, Mānana, Waimalu, Hālawa Ahapua'a, 'Ewa Moku (District), O'ahu Island, TMK: [1] 9-1, 9-4, 9-6, 9-7, 9-8, 9-9 (Various Plats and Parcels).* Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

[2] O'Hare, Constance R., David W. Shideler, and Hallett H. Hammatt (2007) *Archaeological Assessment of the 'Ewa Industrial Park Project, Honouliuli Ahupua'a, 'Ewa District, O'ahu Island, TMK: (1) 9-1-069:003.* Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

[3] Yucha, Trevor M. (2015) *Final Archaeological Assessment for the Honouliuli Wastewater Treatment Plant (WWTP) Secondary Treatment and Facilities Project, Honouliuli Ahupua'a, 'Ewa District, O'ahu TMK: [1] 9-1-013:007.* Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

Based on the prior land use and prior archeological assessments and inspections it is unlikely that any subsurface archeological resources will be encountered or affected by the proposed construction of the water main. If human remains or subsurface archaeological resources are encountered during construction, work would immediately stop, and the SHPD would be contacted in accordance with State law and rules. With this mitigation measure, the construction activities would have no effect on archeological features.

CONCLUSION

ENV is requesting SHPD concurrence with our determination of effect, with proposed mitigation commitments. Effects to the OR&L ROW and 'Ewa Plain Battlefield are described in both this letter and the previous letter. No other historic properties would be affected.

Should you have any questions or need additional information please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov, or alternatively, contact Jack Pobuk, Branch Chief, CIP Program and Planning, at 768-3464 or by email at jpobuk@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director Designate

Enclosures:
Figure 1 - Proposed 16-inch Water Main

cc: State of Hawai'i, Department of Transportation
United States Federal Highway Administration, Hawaii Division

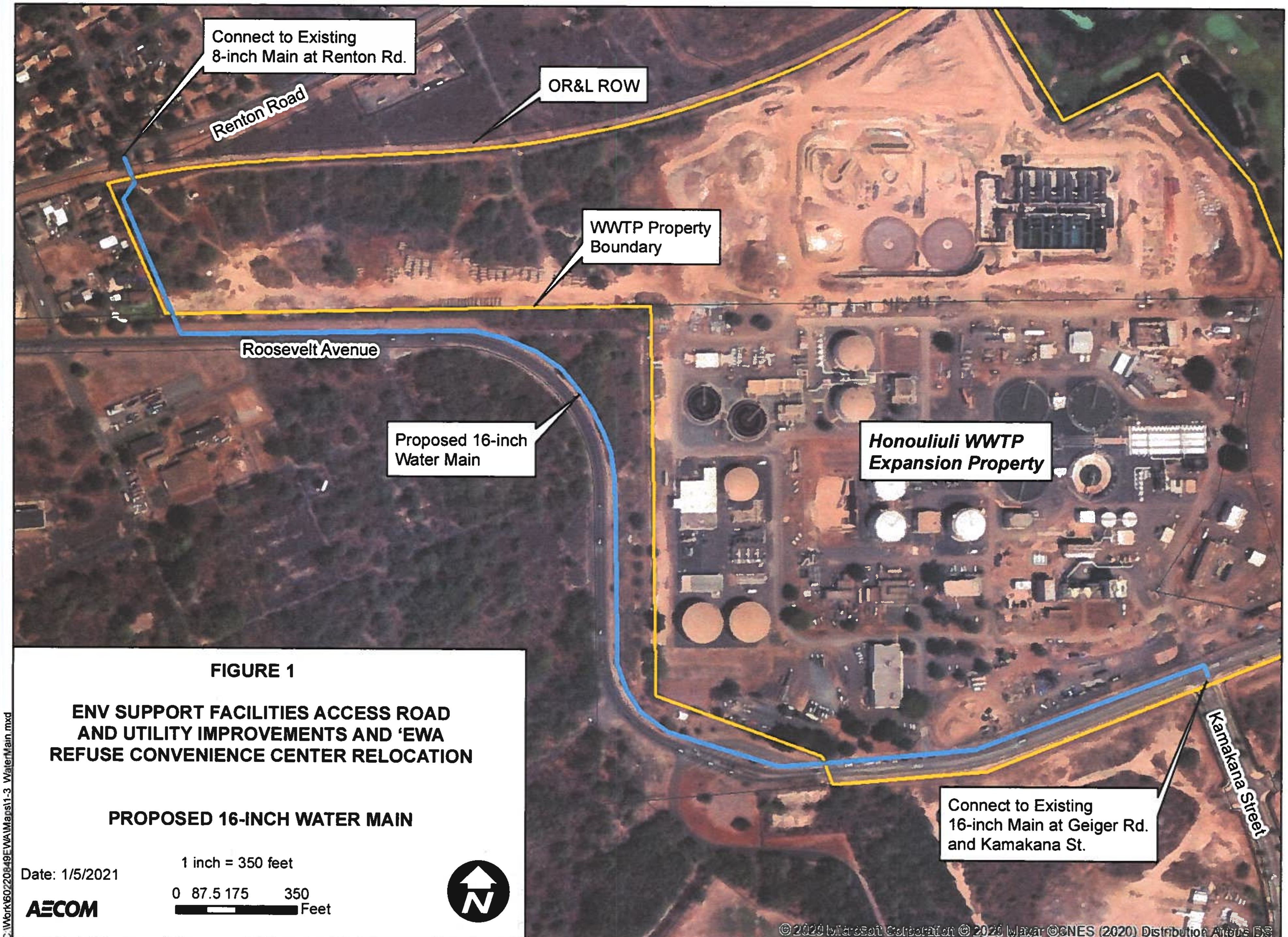

FIGURE 1

ENV SUPPORT FACILITIES ACCESS ROAD AND UTILITY IMPROVEMENTS AND 'EWA REFUSE CONVENIENCE CENTER RELOCATION

PROPOSED 16-INCH WATER MAIN

Date: 1/5/2021

AECOM

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Appendix B:
Transportation Impact Assessment Report

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Water

Submitted to:
City and County of Honolulu
Department of Environmental Services
1000 Uluʻohia Street, Suite 308
Kapolei, Hawaii 96707

Prepared by:
AECOM
1001 Bishop Street, Suite 1600
Honolulu, Hawaii 96813

Honouliuli Wastewater Treatment Plant ESFARI/ERCC Relocation

Transportation Impact Analysis Report

November 2020

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Transportation Impact Analysis Report

Honouliuli Wastewater Treatment Plant

Environmental Support Facilities Access Road Improvements/

Relocated ‘Ewa Refuse Convenience Center

‘Ewa, Hawai‘i

November 2020

Prepared for:

City & County of Honolulu
Department of Environmental Services
1000 Ulu‘ohia Street, Suite 308
Kapolei, Hawai‘i 96707

Prepared by:

AECOM Technical Services, Inc.
1001 Bishop Street, Suite 1600
Honolulu, Hawai‘i 96813
(808) 521-5031

Project Reference: 60220849

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Table of Contents

Table of Figures

Table of Tables

1.0 INTRODUCTION

The City and County of Honolulu Department of Environmental Services (ENV) is in the process of upgrading the Honouliuli Wastewater Treatment Plant (WWTP), located in ‘Ewa on the island of O‘ahu, to handle secondary treatment of sewage. This upgrade also includes a proposal to add Environmental Support Facilities and to relocate the existing ‘Ewa Refuse Convenience Center (ERCC) within the existing WWTP site.

The Honouliuli WWTP parcel is bounded by Geiger Road/Roosevelt Avenue on its south side, the OR&L right-of-way on its north side, other development on its west side, and a portion of the Coral Creek Golf Course on its east side. Figure 1 illustrates the location of the Honouliuli WWTP parcel.

This transportation impact analysis report (TIAR) was conducted in support of an Environmental Assessment (EA) prepared for the Honouliuli WWTP Environmental Support Facilities Access Road Improvements (ESFARI) and ERCC Relocation. This TIAR updates previous TIARs completed in November 2014 and in April 2018 by Austin, Tsutsumi & Associates, Inc. (ATA).

The current TIAR specifically updates the Traffic Impact Analysis Report Honouliuli Wastewater Treatment Plant, April 2018 (referred to in this report as the 2018 TIAR) to acknowledge recent modifications to access to the Environmental Support Facility, the relocation of the ERCC, and recent non-project-related developments in the vicinity of the Honouliuli WWTP site. The current TIAR reevaluates the two new access points, one on Roosevelt Avenue and the other on Renton Road, associated with the Environmental Support Facility. It also evaluates the relocation of ERCC traffic from the existing ERCC driveway, which will be closed, to the Honouliuli WWTP Driveway 2 (Honouliuli WWTP DW2). The relocation of the existing ERCC allows ENV to implement an improved configuration that would increase throughput of customers and provide additional traffic queuing internal to the WWTP site to mitigate current vehicle queuing that occurs on Geiger Road.

Figure 1 Project Location

2.0 EXISTING CONDITIONS

2.1 Site Location

The primary parcel of the Honouliuli WWTP is located adjacent to and north of Geiger Road. Directly adjacent to the WWTP on its east side is a portion of the Coral Creek Golf course, the O‘ahu Rail & Land Company (OR&L) right-of-way borders its north side, and vacant Honouliuli WWTP land is on its west side. This vacant area is the proposed location for the Environmental Support Facilities. South of Geiger Road are residential areas developed by Gentry Homes.

2.2 Roadway Conditions

Key roadways in the vicinity of the Honouliuli WWTP are:

- Geiger Road;
- Roosevelt Avenue;
- Renton Road;
- Kapolei Parkway;
- Philippine Sea;
- Essex Road; and
- Kamakana Street.

2.2.1 Roadway Descriptions

Geiger Road is a major collector roadway providing west-east mobility within the ‘Ewa area. It connects to Roosevelt Avenue on its west end and Iroquois Point Road on its east end. Along with Roosevelt Avenue, it is one of the connecting routes between ‘Ewa Beach and Kapolei. In the vicinity of Honouliuli WWTP, Geiger Road is mostly a four-lane, undivided roadway (two lanes in each direction). It transitions to a two-lane, undivided roadway at the existing entrance to the ERRC Driveway before turning into Roosevelt Avenue. Most of Geiger Road has curb and gutter except for the frontage of the Honouliuli WWTP where it has a paved shoulder. The posted speed limit in the vicinity of Honouliuli WWTP is 30 mph. Geiger Road is under the jurisdiction of the City and County of Honolulu.

Roosevelt Avenue is a major collector roadway that is connected to and continues Geiger Road in the west direction. It is mostly a two-lane, undivided roadway with paved shoulders. It is a west-east-oriented roadway that works with Geiger Road to connect the ‘Ewa Beach area with Kapolei. In the vicinity of Honouliuli WWTP, the posted speed limit is 25 mph. This transitions to 35 mph approximately 165 feet east of Philippine Sea Street. Roosevelt Avenue is currently under the jurisdiction of the State of Hawaii Department of Transportation (HDOT).

Renton Road is a collector roadway that provides west-east circulation in the ‘Ewa Villages area and provides access to Kapolei Parkway and Fort Weaver Road. In the vicinity of Honouliuli WWTP, Renton Road is two-lane, undivided roadway with unpaved shoulders along both sides of the road. Between Kapolei Parkway and Fort Weaver Road, Renton Road is mostly a two-lane, divided roadway with a raised median. Most of this segment has curb and gutters along both sides of the road. The posted speed limit in the vicinity of Honouliuli WWTP is 25 miles per hour (mph). Renton Road is under the jurisdiction of the City and County of Honolulu.

Kapolei Parkway is an arterial roadway that is one of the key connections between ‘Ewa Beach with Kapolei. In the ‘Ewa Beach area, Kapolei Parkway has a north-south orientation that transitions into a west-east orientation in the Kapolei area. It also provides north-south circulation within ‘Ewa and provides access to Kualaka‘i Parkway, which, in turn, provides regional access to H1 Freeway. Between Geiger Road and Renton Road, Kapolei Parkway is a six-lane, divided roadway (three lanes in each direction) with a raised median and curb and gutters. The posted speed limit for this segment is 30 mph. Kapolei Parkway is under the jurisdiction of the City and County of Honolulu.

Philippine Sea is a north-south-oriented roadway that connects Renton Road to Roosevelt Avenue. It begins at Renton Road and terminates south of Roosevelt Avenue. It is a two-lane, undivided roadway (one lane in each direction) with paved shoulders. The posted speed limit is 15 mph. This roadway is privately owned but is open to public traffic.

Essex Road, within the study area, is a north-south-oriented collector roadway. It is a two-lane, undivided roadway, serves primarily access to the Barbers Point Golf Course and White Plains Beach. The posted speed limit is 10 mph. It is part of the Kalaeloa area and is nominally under the jurisdiction of the Hawaii Community Development Authority (HCDA).

Kamakana Street is a north-south-oriented local roadway that serves the residential development by ‘Ewa by Gentry. It is a two-lane, undivided roadway with curb and gutters along both sides of the road. The posted speed limit is 25 mph. Kamakana Street is a private roadway at this time but will eventually be dedicated to the City and County of Honolulu.

2.2.2 Intersection Conditions

The following intersections in the vicinity of the Honouliuli WWTP were analyzed:

- Kapolei Parkway/Renton Road;
- Renton Road/Philippine Sea;
- Roosevelt Avenue/Philippine Sea;
- Geiger Road/Roosevelt Avenue/Essex Road;
- Geiger Road/Existing ERCC Driveway;
- Geiger Road/Honouliuli WWTP Driveway 1 (Honouliuli WWTP DW1);

- Geiger Road/the Honouliuli WWTP Driveway 2 (Honouliuli WWTP DW2)/Kamakana Street;
- Kapolei Parkway/Geiger Road.

The intersection of Kapolei Parkway and Renton Road is a four-legged signalized intersection. The eastbound Renton Road approach is configured with an exclusive left-turn lane and a shared through/right-turn lane. The westbound Renton Road approach is configured with separate right-turn, through, and left-turn lanes. Both the northbound and southbound Kapolei Parkway approaches are configured with an exclusive left-turn lane, two through lanes, and a shared through/right-turn lane. There are marked crosswalks across all legs of the intersection.

The intersection of Renton Road and Philippine Sea is an unsignalized “T”-intersection with a STOP-sign control on the Philippine Sea approach. On the westbound Renton Road, there is a single shared through/left-turn lane, and on the eastbound approach, there is a single shared through/right-turn lane. On the Philippine Sea approach, there is a single shared left-turn/right-turn lane. There are no marked crosswalks at this intersection.

The Roosevelt Avenue and Philippine Sea intersection is an unsignalized four-legged intersection with STOP-sign control on the Philippine Sea approaches. The Roosevelt Avenue approaches are single lane with shared left-turn/through/right-turn movements. The Philippine Sea approaches are also single lane with shared left-turn/through/right-turn movements. There are no marked crosswalks across the legs at this intersection.

The Geiger Road/Roosevelt Avenue and Essex Road intersection is an unsignalized “T”-intersection with STOP-sign control on the Essex Road approach. The westbound Geiger Road approach has a through lane and an exclusive left-turn lane. The eastbound Roosevelt Avenue approach has a single shared through/right-turn lane. The Essex Road approach has a single shared left-turn/right-turn lane. There are no marked crosswalks at this intersection.

The Geiger Road and existing ERCC driveway intersection is an unsignalized “T”-intersection with a STOP-sign control at the ERCC driveway. The westbound Geiger Road approach has an exclusive right-turn lane and a through lane. The eastbound Geiger Road approach has a shared through/left-turn lane. The ERCC driveway has a shared left-turn/right-turn lane. There are no marked crosswalks at this intersection.

The Geiger Road and Honouliuli DW1 intersection is an unsignalized “T”-intersection with an implied STOP-sign control at Honouliuli WWTP DW1. The westbound Geiger Road approach includes two through lanes and an exclusive right-turn lane. The eastbound Geiger Road approach has an exclusive left-turn lane and a single through lane. The Honouliuli WWTP DW1 has a shared left-turn/right-turn lane. There are no marked crosswalks at this intersection.

The Geiger Road and Honouliuli WWTP DW2/Kamakana Street approach is an unsignalized four-legged intersection with STOP-sign control at the Honouliuli DW2 and Kamakana Street approaches. Both Geiger Road approaches have an exclusive left-turn lane, a through lane, and a shared through/right-turn lane. The Honouliuli WWTP DW2 is a single lane approach with shared left-turn/through/right-turn movements. The Kamakana Street approach has an exclusive left-turn lane and a shared through/right-turn lane. There is a marked crosswalk across the Kamakana Street approach.

The Kapolei Parkway and Geiger Road intersection is a four-legged signalized intersection. Both Kapolei Parkway approaches have an exclusive right-turn lane, an exclusive left-turn lane, and two through lanes. Both Geiger Road approaches have an exclusive left-turn lane, a through lane, and a shared through/right-turn lane. There are marked crosswalks across all legs of the intersection.

2.3 Pedestrian and Bicycle Conditions

2.3.1 Pedestrian Facilities

Except for the frontage of the Honouliuli WWTP, there are a combination of detached and attached sidewalks on Geiger road.

There are no sidewalks along Renton Road, west of Kapolei Parkway. There are detached sidewalks along Renton Road, east of Kapolei Parkway.

Kapolei Parkway and Kamakana Street. have sidewalks on both sides of the roadways.

Roosevelt Avenue, Philippine Sea, and Essex Road do not have sidewalks, although Roosevelt Avenue has paved shoulders.

There are marked crosswalks on all legs of the Kapolei Parkway/Renton Road and Kapolei Parkway/Geiger Road intersections. All Geiger Road/Roosevelt Avenue and Renton Road intersections west of Kapolei Parkway do not have crosswalks except for the marked crosswalk across the Kamakana Street approach at the Geiger Road/Kamakana Street intersection.

2.3.2 Bicycle Facilities

There are pedestrian/bike paths along Geiger Road and Kapolei Parkway in the vicinity of the Honouliuli WWTP. The shared bike path along Geiger Road is provided by an extra wide sidewalk located on the south side of Geiger Road between Essex Road and Hoʻomaka Street, where Geiger Road transitions to Iroquois Road. The shared bike path on Kapolei Parkway is an off-road path located east of Kapolei Parkway between Keone’ula Boulevard and Renton Road.

Roosevelt Avenue has paved shoulders that could be utilized by bicycles. There are bike lanes along both sides of Kamakana Street. Renton Road is a bicycle route in which bicycles share the road with vehicles.

2.4 Public Transit Conditions

The City and County of Honolulu Department of Transportation Services (DTS) through Oahu Transit Service (OTS) operates the TheBus. The following describes the bus routes in the vicinity of the Honouliuli WWTP.

Route 41 (Kapolei/‘Ewa Beach) connects Kapolei and ‘Ewa Beach via Roosevelt Avenue and Geiger Road. Route 41 runs from approximately 5:00 AM to 11:00 PM (span of 18 hours).

Route 44 (Waipahū –‘Ewa Beach) connects Waipahū and ‘Ewa Beach via Renton Road, Philippine Sea, Roosevelt Avenue, Geiger Road, and Kapolei Parkway. It runs from approximately 4:00 AM to 12:00 AM (span of 20 hours). Bus stops are provided on Philippine Sea: the northbound bus stop located closer to Renton Road (Stop #1826) and the southbound stop located closer to Roosevelt Avenue (Stop #4392). Along Renton Road, there are four bus stops: two near Ha‘akei Street: Stop #1825 for the westbound buses and Stop #1827 for the eastbound buses and two further east near Malio Street for the buses traveling in the westbound direction (Stop #1824) and the ‘Ewa Hongwanji Mission for the eastbound buses (Stop #1828).

The bus stops on Roosevelt Avenue/Geiger Road are common to both routes. Two bus stops are located near the intersection of Roosevelt Avenue and Essex Road: on the north side of the road (Stop #1775) and on the south side of the road (Stop #1800). On Geiger Road, there are four other bus stops: east of the Coral Creek Golf Course- west direction (Stop #1774) and east direction (Stop #1801) and near the intersection with Kapolei Parkway- westbound direction (Stop #1773) and east direction (Stop #1802).

Along Kapolei Parkway, there are several bus stops in the vicinity of the project. South of the intersection with Kolowaka Drive, there are Stop #1884 for the buses traveling in the north direction and Stop #4390 for the buses traveling in the south direction. North of the intersection with Kahiuka Street, there is a bus stop for the buses traveling in the north direction (Stop #1843). South of the intersection with Kahiuka Street, there is Stop #4391 for the buses traveling in the south direction. Just north of the intersection with Geiger Road, there is Stop #1842 for the buses traveling in the north direction.

2.5 Traffic Conditions

2.5.1 Existing Intersection Traffic Volumes

Manual traffic volumes turning movement counts and observations were conducted by ATA as part of the Traffic Impact Analysis Report for the Honouliuli WWTP, dated April 9, 2018 (2018 TIAR). The traffic turning movement counts were conducted on

September 27, 2017. From these counts, the AM commuter peak hour was determined to occur from 6:45 AM to 7:45 AM, and the PM commuter peak hour was determined to occur from 4:00 PM to 5:00 PM. A copy of the 2018 TIAR is included in Appendix A.

These traffic turning movement volumes were used as a basis for the ESFARI/ERCC Relocation TIAR with adjustments to account for differences in access configurations. The ESFARI/ERCC Relocation TIAR utilized the traffic turning movements collected at the following intersections:

- Renton Road/Kapolei Parkway;
- Renton Road/Philippine Sea;
- Roosevelt Avenue/Philippine Sea;
- Roosevelt Avenue/Geiger Road/Essex Road;
- Geiger Road/existing ERCC Driveway;
- Geiger Road/Honouliuli WWTP DW1;
- Geiger Road/Honouliuli WWTP DW2/Kamakana Street;
- Geiger Road/Kapolei Parkway.

Figure 2 summarizes the Existing AM and PM peak hour turning movement volumes at these intersections.

2.5.2 Existing Intersection Operations

Intersection operational analysis results from the 2018 TIAR are used to document existing conditions.

The intersections were analyzed using the unsignalized and signalized intersection capacity methods described in the 2016 Highway Capacity Manual (HCM) through the Synchro/Sim Traffic software. The results are summarized as vehicle delay (seconds per vehicle) and level of service (LOS). LOS is a qualitative index that references a performance measure such as intersection delay to express the quality of traffic services ranging from A-little or no delay to F-significant delay. Definitions of LOS are included in Appendix B. The Synchro analysis worksheets from the traffic analysis are included in Appendix C.

Table 2-4 summarizes the intersection operational measures for the existing AM and PM peak hour time periods.

As shown, the signalized intersections and most key turning movements of the unsignalized intersections operate well during both peak periods.

The two signalized intersections operate with a level of service (LOS) C or better during the peak periods.

At the unsignalized intersections, most evaluated movements operate with LOS C or better. The Philippine Sea/Roosevelt Ave intersection show a higher level of delay for selected movements.

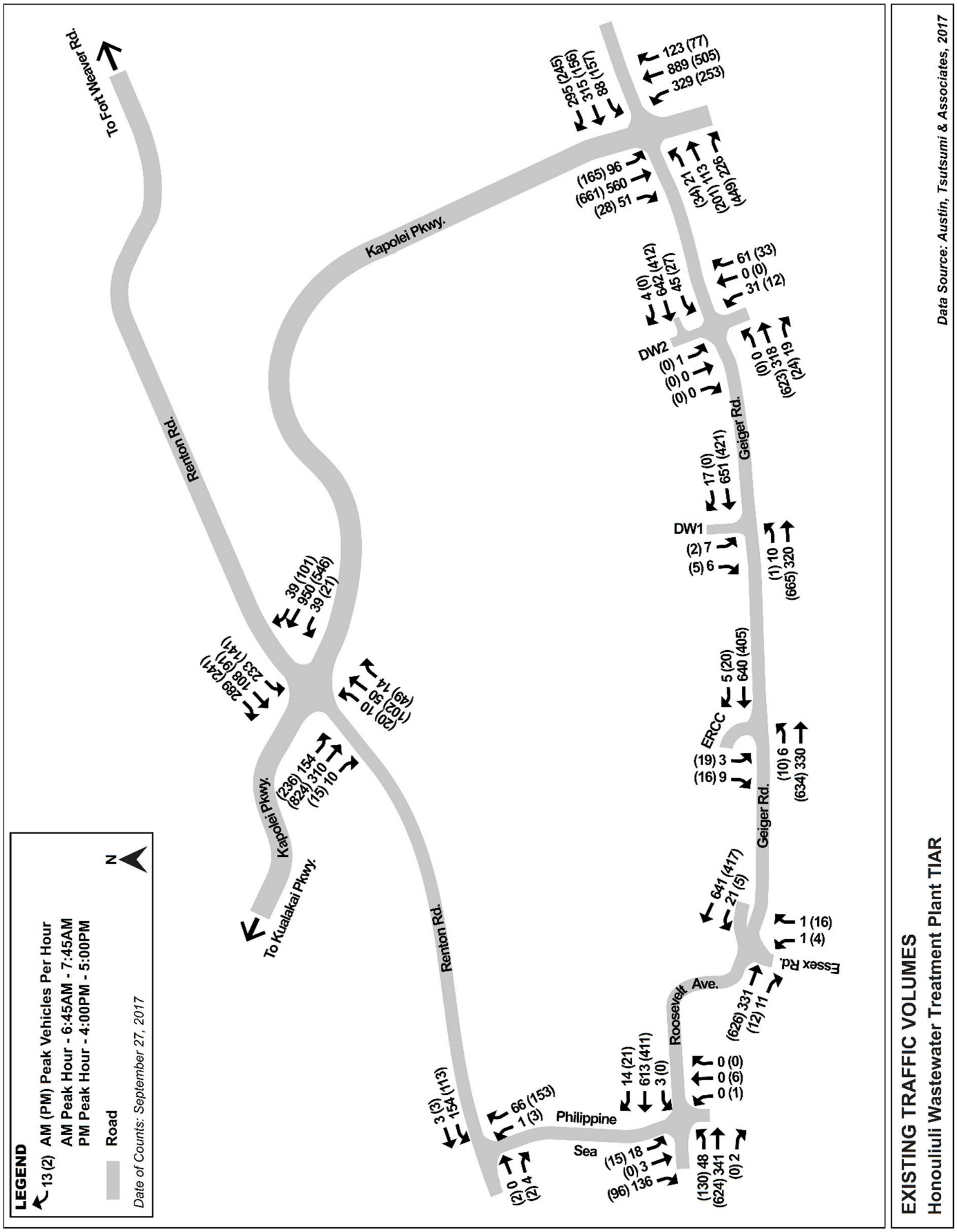

Figure 2 Existing Year 2017 Peak Hour Traffic Volumes

Table 1 Existing Intersection Operations

Intersection	AM Peak Hour Delay (sec/veh)	AM Peak Hour LOS	PM Peak Hour Delay (sec/veh)	PM Peak Hour LOS
Kapolei Pkwy & Renton Rd (signalized)				
Kapolei Pkwy & Renton Rd	22.1	C	18.6	B
Renton Rd & Philippine Sea (unsignalized 2-way STOP)				
Renton Rd WB LT/TH	7.5	A	7.4	A
Philippine Sea LT/RT	8.6	A	9.0	A
Roosevelt Ave & Philippine Sea (unsignalized 2-way STOP)				
Philippine Sea NB LT/TH/RT	0.0	A	43.9	E
Roosevelt Ave WB LT/TH/RT	8.0	A	0.0	A
Philippine Sea SB LT/TH/RT	23.0	C	21.0	C
Roosevelt Ave EB LT/TH/RT	9.2	A	8.8	A
Geiger Rd/Roosevelt Ave & Essex Rd (unsignalized 2-way STOP)				
Essex Rd LT/TR	15.6	C	15.4	C
Geiger Rd WB LT	8.1	A	9.0	A
Geiger Rd & Existing ERCC Dwy (unsignalized 2-way STOP)				
ERCC Dwy LT/RT	15.2	C	18.4	C
Geiger Rd EB LT/TH	9.0	A	8.3	A
Geiger Rd & Honouliuli WWTP DW1 (unsignalized 2-way STOP)				
Honouliuli DW1 LT/RT	16.8	C	13.8	B
Geiger Rd EB LT	9.2	A	8.3	A
Geiger Rd & Honouliuli WWTP DW2/Kamakana St (unsignalized 2-way STOP)				
Kamakana St LT	20.5	C	24.0	C
Kamakana St TH/RT	9.7	A	10.9	B
Geiger Rd WB LT	8.2	A	9.2	A
Honouliuli DW2 LT/TH/RT	24.7	C	0.0	A
Geiger Rd EB LT	0.0	A	0.0	A
Kapolei Parkway/Geiger Road (signalized)				
Kapolei Pkwy & Geiger Rd	32.7	C	34.0	C

Notes: Based on counts on September 27, 2017
Source Austin, Tsutsumi, & Associates, Inc

AM Peak Hour: 6:45-7:45 AM, PM Peak Hour: 4:00-5:00 PM
sec/veh = seconds per vehicle, LOS = Level of Service,
LT = left turn, TH = through, RT = right turn

3.0 FUTURE CONDITIONS

3.1 Proposed Action

In addition to the upgrade of the Honouliuli WWTP to handle secondary treatment, ENV is looking to expand and upgrade its facilities to accommodate non-process facilities.

The upgrade and expansion is expected to be constructed in five phases with the full buildout anticipated by Year 2026. This includes the proposed ENV Support Facilities, which are expected to be completed by Year 2024.

The previous 2018 TIAR evaluated three access alternatives to the ENV Support Facilities:

- An access along Renton Road only;
- An access along Roosevelt Avenue only; and
- Accesses along both Renton Road and Roosevelt Avenue.

Further refinements led to modifications of the ENV Support Facilities plans, and that is what is being evaluated in this updated ESFARI TIAR. Currently, the access alternative with accesses on both Renton Road and Roosevelt Avenue are part of the most recent plans for the ENV Support Facilities. Therefore, the Year 2026 traffic volumes forecasts from that access alternative contained in the 2018 TIAR was used as the basis for the updated ESFARI TIAR intersection operations analyses.

Another recent modification in the Honouliuli WWTP upgrade plans is the relocation of the existing ERCC to a location further east within Honouliuli WWTP site as shown in Figure 3. The relocated ERCC is proposed to be located east of Honouliuli DW2. With this relocation of the ERCC, the existing ERCC driveway will be closed, and access to the relocated ERCC will be through the Honouliuli DW2.

A minor modification from the Honouliuli WWTP plan evaluated by the 2018 TIAR is the closure of a minor driveway east of Honouliuli DW2 to facilitate better internal vehicular circulation for the relocated ERCC. The originally forecasted traffic volumes for this access were very low, so the impact of closing this driveway is minimal.

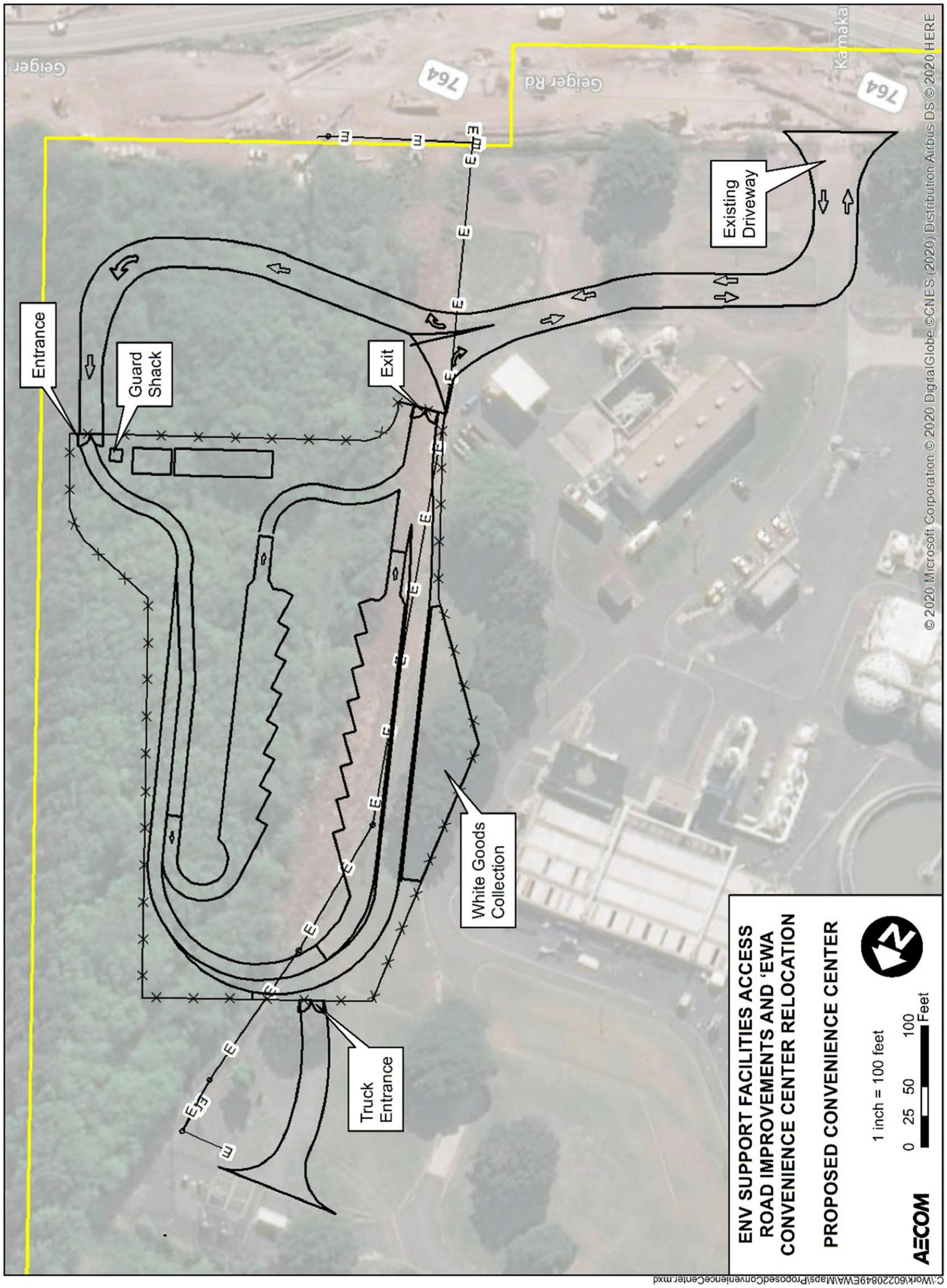

Figure 3 Proposed 'Ewa Refuse Convenience Center Location

3.2 Future Roadway Conditions

3.2.1 Roadways

The ENV Support Facilities are proposed to have two access driveways: one on Roosevelt Avenue between Ticonderoga Street and Essex Street and one on Renton Road via existing Malio Street.

A segment of Roosevelt Avenue would be widened to accommodate a median left-turn lane at the proposed ENV Support Facilities Driveway. This widening of Roosevelt Avenue would occur within the existing roadway right-of-way. Roosevelt Avenue is currently under the jurisdiction of HDOT, and both the new ENV Support Facilities Driveway and the proposed median left-turn lane will require HDOT approval.

Renton Road is proposed to be left in its current configuration, respecting the historic nature of the ‘Ewa plantation area. There may be minor modifications at Malio Street to accommodate proposed improvements to the Malio Street access to the ENV Support Facilities.

An existing minor driveway on Renton Road that leads to a cell phone tower is also proposed to be improved. This driveway is expected to be used only for occasional cell phone tower maintenance. Renton Road is proposed to be left in its current configuration at this at this location as well.

Both Malio Street and the cell phone tower driveway have existing crossings of the OR&L right-of-way. Future plans call for the OR&L ROW to be improved into a combined pedestrian-bike path. The existing crossings of the OR&L ROW by Malio Street and the cell phone tower driveway will be improved according to State of Hawaii Department of Transportation (HDOT) standards.

The relocated ERCC will utilize the Geiger Road/Honouliuli WWTP DW2/ Kamakana Street intersection, and the existing ERCC Driveway will be closed. The Geiger Road/ Honouliuli WWTP DW2/Kamakana Street intersection has existing median left-turn lanes, so no further roadway improvement is proposed.

No other roadway improvements are proposed. Figure 4 illustrates the proposed access to the ENV Support Facilities area.

3.2.2 Intersections

The intersections into the main Honouliuli WWTP are located on Geiger Road. This segment of Geiger Road has already been improved to a four-lane roadway with median left-turn lanes at the Honouliuli WWTP DW1 and DW2 intersections. No further improvements are proposed for these intersections.

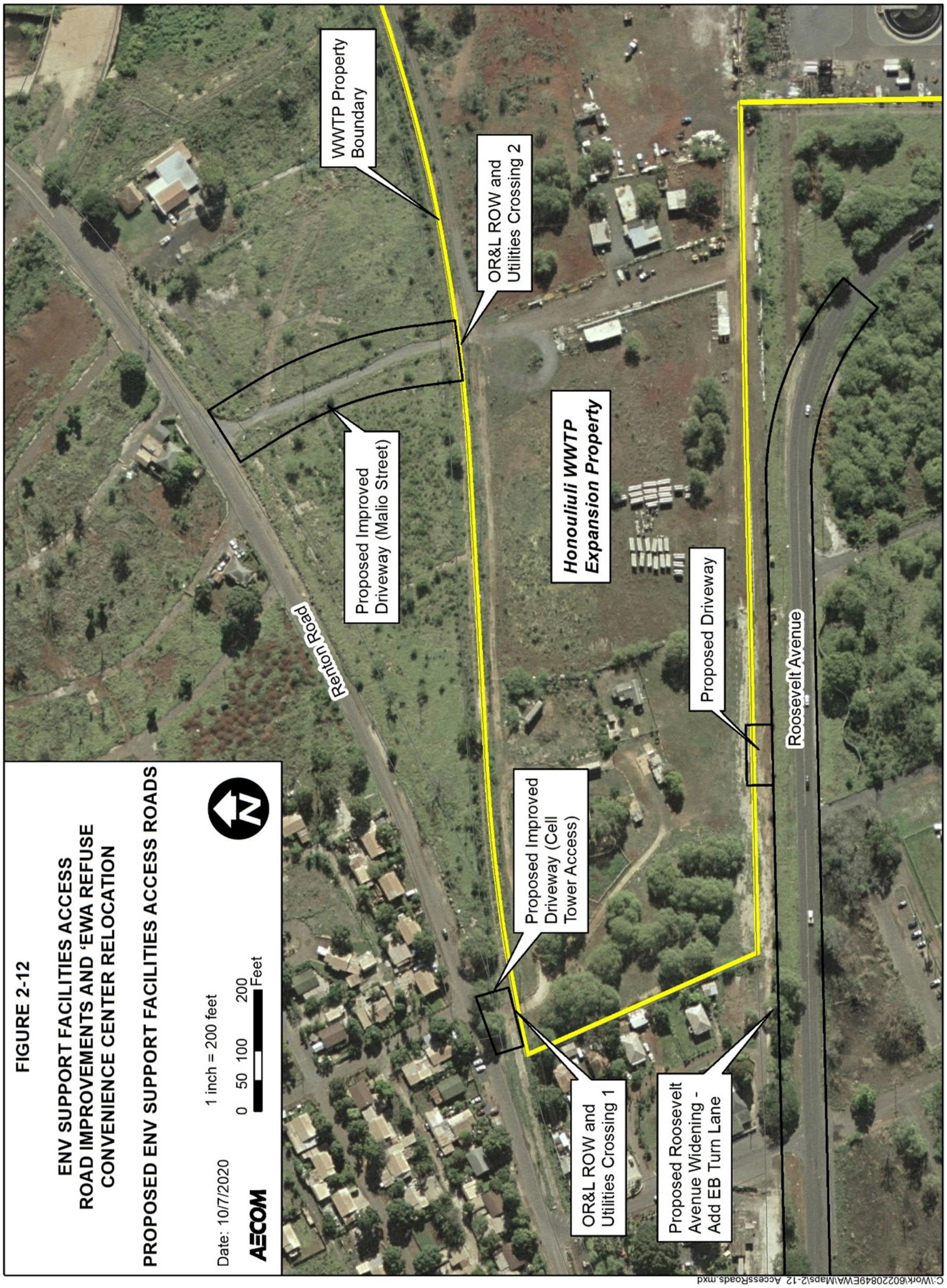

Figure 4 Proposed Honouliuli WWTP Driveway Locations

The existing ERCC driveway will be closed and traffic accessing the relocated ERCC would use Honouliuli WWTP DW2. Therefore, projected ERCC traffic volumes from the 2018 TIAR were moved to the Honouliuli WWTP DW2 intersection. The 2018 TIAR also evaluated a plan that included a Honouliuli WWTP DW3, located east of Honouliuli WWTP DW2. To facilitate better internal traffic circulation for the relocated ERCC, Honouliuli WWTP DW3 was deleted from the plans. Traffic volumes forecasted in the 2018 TIAR for this intersection were reassigned to the Honouliuli WWTP DW2 intersection.

As described previously, the ENV Support Facilities Driveway is proposed to have a median left-turn lane added in Roosevelt Avenue for traffic safety and operational reasons. The conceptual design parameters of this left-turn lane are based on the result of the evaluation of projected traffic volumes and will be described as part of the recommendation section of this report. The configuration of the ENV Support Facilities Driveway is recommended to have separate lanes for left and right-turn traffic movements.

The Malio Street access is proposed to be improved to City standards including its intersection with Renton Road. In keeping with the historic nature of Renton Road, the existing cross-section with shared lane approaches will be retained. This access is referred to as Honouliuli WWTP DW5 and would be located approximately 450 feet from Kapolei Parkway. For the purposes of the analyses in the ESFARI TIAR, it was assumed that primary access into the future Varona Village redevelopment would be located opposite Malio Street.

3.3 Future Pedestrian and Bicycle Conditions

3.3.1 Future Pedestrian Facilities

As noted in Section 2.3.1, there are sidewalks along Kapolei Parkway and most of Geiger Road, Kamakana Street, and along Renton Road east of the intersection with Kapolei Parkway. There are no sidewalks along the other roadway segments described, but there are paved shoulders along Roosevelt Avenue. No changes are assumed in these facilities.

There are marked crosswalks across all legs of the Kapolei Parkway/Renton Road and Kapolei Parkway/Geiger Road intersections. There is also a marked crosswalk across the Kamakana Street leg at the Geiger Road/Honouliuli WWTP DW2/Kamakana Street intersection.

HDOT is implementing the Leeward Bikeway along the OR&L right-of-way. This would be a shared pedestrian/bicycle path that is planned to extend to the Waianae Coast and also link up with the existing Pearl Harbor Bikeway.

The Varona Village re-development north of Renton Road is anticipated to implement pedestrian improvements along Renton Road. Proposed access improvements associated with the ENV Support Facilities would not preclude any of these improvements.

3.3.2 Future Bicycle Facilities

The Hawaii Department of Transportation (HDOT) Bike Plan Hawaii – Master Plan and the City and County of Honolulu Department of Transportation Services (DTS) Oʻahu Bike Plan 2019 Update were both reviewed. The following prioritized proposed bicycle projects in the vicinity of the project site are identified.

Tier 1 (high priority) projects within the vicinity of the Honouliuli WWTP are as follows:

- Kapolei Parkway – Buffered bike lanes within the existing travelway. This would require the reallocation of the curb lanes on both sides of Kapolei Parkway;
- Leeward Bikeway (Phase 1) – shared use path located north side of the OR&L train tracks. Phase 1 is located between Waipio Point Access Road and the Hawaiian Railroad Society Train Station; and
- Renton Road – Shared roadway operation between Kapolei Parkway and Philippine Sea.

Tier 2 (medium priority) projects are as follows:

- Geiger Road – Bike lanes between Fort Weaver Road and Roosevelt Avenue; and
- Roosevelt Avenue – Bike lanes between Geiger Road and Kualakaʻi Parkway

Tier 3 (lower priority) projects are as follows:

- Essex Road – Shared roadway operation between Geiger Road and White Plains Beach.

Proposed roadway improvements for the Honouliuli WWTP would not conflict with the future implementation of any of these proposed bicycle projects.

There is also a proposed bicycle path that is anticipated to be constructed as part of the overall upgrade of the Honouliuli WWTP. This proposed bicycle path will connect Geiger Road to the proposed Leeward Bikeway. This bicycle path is not part of the Environmental Support Facility project.

3.4 Future Public Transit Conditions

The City and County of Honolulu is currently constructing a high-capacity rail transit system. When that system starts operating, it is projected that the two municipal bus routes currently serving the Honouliuli WWTP area will be modified to integrate bus and rail operations.

Route 41 (Kapolei/‘Ewa Beach) connects Kapolei and ‘Ewa Beach via Roosevelt Avenue and Geiger Road and will probably continue to provide this service.

Route 44 (Waipahū –‘Ewa Beach) currently connects Waipahū and ‘Ewa Beach via Renton Road, Philippine Sea, Roosevelt Avenue, Geiger Road, and Kapolei Parkway. It is likely this route would be modified to connect the ‘Ewa Beach area to the Kualaka‘i (East Kapolei) rail station. However, in the vicinity of the Honouliuli WWTP, the route would probably remain similar to its existing configuration.

It is also possible that other routes would be added to provide increased connectivity to the rail station. In any case, transit service in the vicinity of the Honouliuli WWTP is projected to at least remain at the current level of service.

3.5 Future Traffic Conditions

3.5.1 Projected Year 2026 Peak Hour Background Traffic

Background traffic accounts for growth in the traffic unrelated to the proposed improvements to the Honouliuli Wastewater Treatment. The 2018 TIAR included projected background traffic for several analysis years between 2020 and 2026 consistent with the completion of each phase of the Honouliuli WWTP improvements. The full buildout of the upgrades and expansions to the Honouliuli WWTP is anticipated to be complete by year 2026. The future background traffic used in this updated TIAR was based on the projected year 2026 scenario from the 2018 TIAR.

The 2018 TIAR included the regional growth of the traffic based on the Oahu Regional Transportation Plan 2035 (ORTP) projections. These projections implicitly included known developments in the surrounding area anticipated to be completed during the time frame for Honouliuli WWTP improvements.

To these background traffic volume forecasts, traffic generated by the proposed re-development of Varona Village, located north of Renton Road, was also forecasted. The redevelopment will include approximately 133 residential units.

Table 2 summarizes the estimated vehicular trips generated by the Varona Village. The vehicular volume is based on the trip generation rates documented in the Institute of Transportation Engineers (ITE) publication, Trip Generation, 9th Edition. The assumed land use and trip generation equations for Category 221 – Low Rise Apartment were used. Traffic generated during the AM and PM commuter peak hours were estimated. The estimated traffic was added to the background traffic. For the purposes of this update TIAR, the access to the redeveloped Varona Village is assumed to be located opposite Honouliuli WWTP DW5 (Malio Street).The estimated traffic was assumed to be directionally distributed similarly to the existing traffic patterns.

Table 2 Projected Trip Generation by the Varona Village Re-Development

Land Use	Intensity	ITE Category	AM Peak Hour		PM Peak Hour	
			In	Out	In	Out
Low-Rise Apartment	133 dwelling units	221	14	55	57	30

Notes: AM and PM Peak Hour traffic volumes are in vehicles per hour.
Trip Generation is the estimation of vehicular traffic based on equations documented in the Institute of Transportation Engineers' publication, Trip Generation, 9th Edition.

For Category 221 – Low Rise Apartment, the trip generation equations are:

AM Peak Hour: T = 0.82 (X) + 0.23, 21% inbound/79% outbound
PM Peak Hour: Ln(T) = 0.88*Ln(X) + 0.16, 65% inbound/35% outbound

where T = traffic volume (vehicles per hour), and X number of occupied dwelling units

Ln = natural logarithm

3.5.2 Projected Year 2026 Traffic Volumes

The projected total traffic for year 2026 is based on the background traffic combined with forecasted increases in traffic due to the proposed Honouliuli WWTP improvements. The magnitude of traffic generated by the Honouliuli WWTP improvements are documented in the 2018 TIAR. Additionally, traffic from the existing ERCC was reassigned from the existing ERCC Driveway to the Honouliuli WWTP DW2 to reflect the relocation of the ERCC. The relocated ERCC is projected to maintain the existing magnitude of trips. As part of the ERCC relocation, previously proposed Honouliuli WWTP DW3 would be eliminated and its traffic reassigned to DW2.

The resulting AM and PM peak hour traffic volumes forecasted for the Year 2026 time periods are shown in Figure 5.

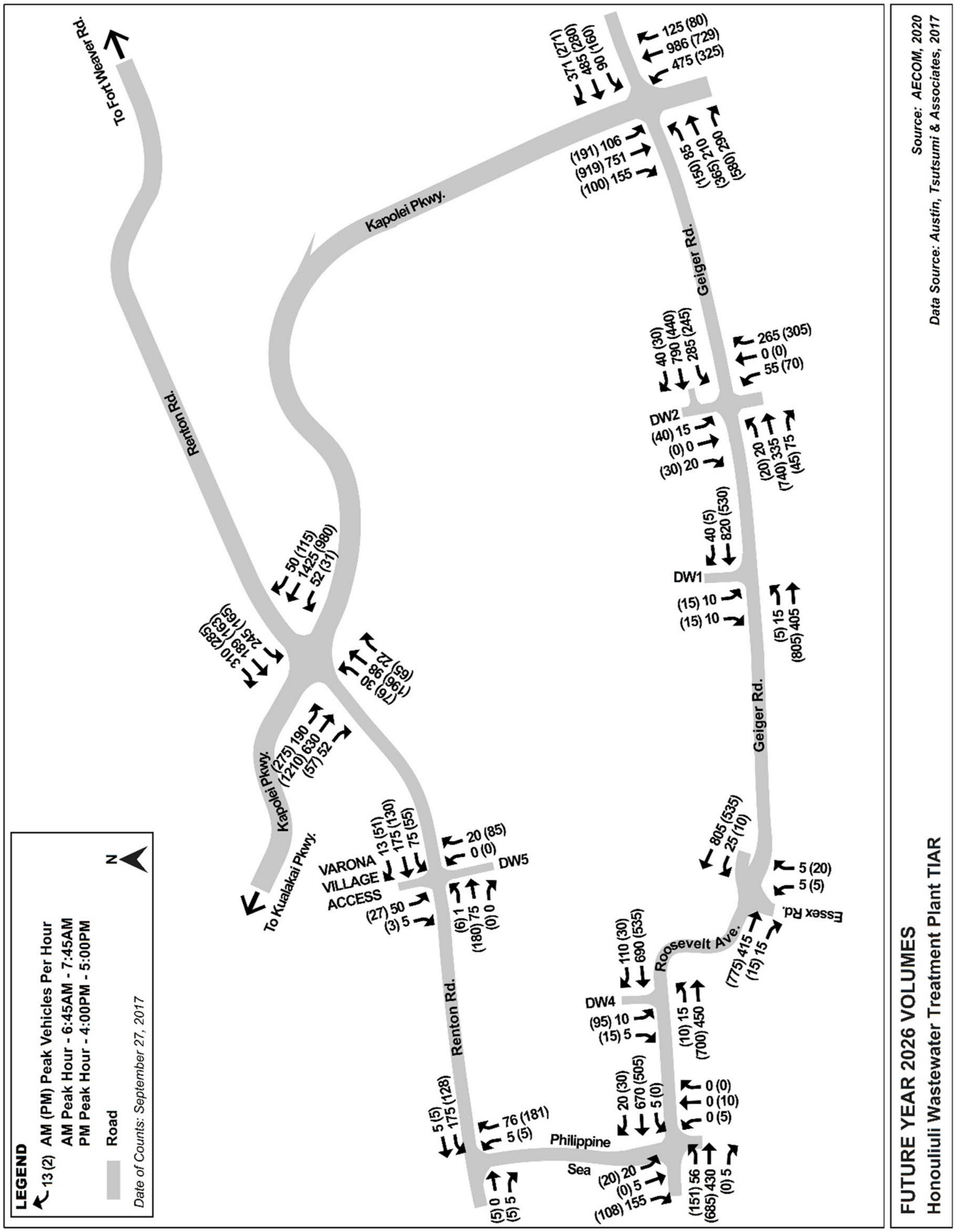

Figure 5 Future Year 2026 Peak Hour Traffic Volumes

3.5.3 Projected Year 2026 Peak Hour Intersection Operations

The projected Year 2026 AM and PM peak hour traffic volumes were evaluated using the unsignalized and signalized Highway Capacity Manual method as implemented by the Synchro analysis software. The results of the analysis were compared to the results of the analysis in the 2018 TIAR to identify differences associated with the updated ESFARI TIAR.

The Synchro analysis worksheets are located in Appendix C of this report.

Table 3 and Table 4 summarize and compare intersection operations for the AM peak hour conditions and Table 5 and Table 6 summarize and compare intersection operations for the PM peak hour conditions for the projected Year 2026 traffic volumes between the TIAR for the Honouliuli WWTP conducted previously in 2018 and this current TIAR for the ESFARI and ERCC Relocation Project.

As shown, the most calculated delays and LOS for the key turning movements at the intersections analyzed are similar between the scenario evaluated in the 2018 TIAR and the scenario for the modified ESFARI/relocated ERCC, even when accounting for the additional traffic from the future Varona Village redevelopment.

The relocation of the ERCC operations to the DW2 Driveway does result in increases in delay to vehicles exiting Honouliuli DW2 and Kamakana Street. It does not change the operational LOS for these movements.

The implementation of the ENV Support Facility at the Honouliuli WWTP would result in the construction of two new intersections: Honouliuli WWTP and DW4 on Roosevelt Avenue and DW5 (Malio Street) on Renton Road. As shown in the tables, these two ENV Support Facilities driveways are projected to operate acceptably during both peak hours.

Table 3 Projected Year 2026 AM Peak Hour Intersection Operations Comparison Part 1

Intersection	2018 TIAR		2020 ESFARI/ERCC TIAR	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Kapolei Pkwy & Renton Rd (signalized)				
Kapolei Pkwy & Renton Rd	29.1	C	30.2	C
Renton Rd & Honouliuli WWTP DW5/Varona Village (Unsignalized, 2-way Stop)				
Honouliuli WWTP DW5 NB LT/TH/RT	8.8	A	8.8	A
Renton Rd WB LT	7.5	A	7.5	A
Varona Village Access LT/TH/RT	-	-	13.1	B
Renton Rd EB LT	-	-	7.6	A
Renton Rd & Philippine Sea (Unsignalized, 2-way STOP)				
Renton Rd WB LT/TH	7.5	A	7.5	A
Philippine Sea LT/RT	8.9	A	8.9	A
Roosevelt Ave & Philippine Sea (Unsignalized, 2-way STOP)				
Philippine Sea NB LT/TH/RT	0.0	A	0.0	A
Roosevelt Ave WB LT/TH/RT	8.3	A	8.3	A
Philippine Sea SB LT/TH/RT	33.2	D	34.1	D
Roosevelt Ave EB LT/TH/RT	9.5	A	9.5	A
Roosevelt Ave & Honouliuli WWTP DW4 (Unsignalized, 2-way STOP)				
Roosevelt Ave EB LT	9.7	A	9.7	A
Honouliuli WWTP DW4 LT/RT	24.2	C	24.2	C
Geiger Rd/Roosevelt Ave & Essex Rd (Unsignalized, 2-way STOP)				
Essex Rd LT/TR	20.4	C	20.4	C
Geiger Rd WB LT	8.4	A	8.4	A

Notes:

sec/veh = seconds per vehicle, LOS = Level of Service,
LT = left turn, TH = through, RT = right turn

Table 4 Projected Year 2026 AM Peak Hour Intersection Operations Comparison Part 2

Intersection	2018 TIAR		2020 ESFARI/ERCC TIAR	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Geiger Rd & Existing ERCC Dwy (Unsignalized, 2-way STOP)				
Existing ERCC Dwy LT/RT	20.1	C	-	-
Geiger Rd EB LT/TH	9.8	A	-	-
Geiger Rd & Honouliuli DW1 (Unsignalized, 2-way STOP)				
Honouliuli WWTP DW1 LT/RT	21.7	C	22.0	C
Geiger Rd EB LT	10.0	B	10.0	B
Geiger Rd & Honouliuli Dwy 2/Kamakana St (Unsignalized, 2-way STOP)				
Kamakana St LT	183.4	F	213.9	F
Kamakana St TH/RT	12.4	B	12.3	B
Geiger Rd WB LT	9.6	A	9.5	A
Honouliuli WWTP DW2 LT/TH/RT	85.9	F	133.4	F
Geiger Rd EB LT	9.8	A	9.9	A
Geiger Rd & Honouliuli Dwy 3 (Unsignalized, 2-way STOP)				
Honouliuli WWTP DW3 LT/RT	38.3	E	-	-
Geiger Rd EB LT	11.3	B	-	-
Kapolei Pkwy & Geiger Rd (Signalized)				
Kapolei Pkwy & Geiger Rd	49.5	D	49.5	D

Notes:

sec/veh = seconds per vehicle, LOS = Level of Service
LT = left turn, TH = through, RT = right turn

Table 5 Projected Year 2026 PM Peak Hour Intersection Operations Comparison Part 1

Intersection	2018 TIAR Delay (sec/veh)	2018 TIAR LOS	2020 ESFARI/ERCC TIAR Delay (sec/veh)	2020 ESFARI/ERCC TIAR LOS
Kapolei Pkwy & Renton Rd (Signalized)				
Kapolei Pkwy & Renton Rd	27.6	C	28.4	C
Renton Rd & Honouliuli WWTP DW5/Varona Village (Unsignalized, 2-way STOP)				
Honouliuli WWTP DW5 NB LT/TH/RT	9.8	A	9.8	A
Renton Rd WB LT	7.7	A	7.7	A
Varona Village Access LT/TH/RT	-	-	14.6	B
Renton Rd EB LT	-	-	7.6	A
Renton Rd & Philippine Sea (Unsignalized, 2-way STOP)				
Renton Rd WB LT/TH	7.4	A	7.4	A
Philippine Sea LT/RT	9.2	A	9.2	A
Roosevelt Ave & Philippine Sea (Unsignalized, 2-way STOP)				
Philippine Sea NB LT/TH/RT	84.3	F	89.8	F
Roosevelt Ave WB LT/TH/RT	0.0	A	0.0	A
Philippine Sea SB LT/TH/RT	42.0	E	43.9	E
Roosevelt Ave EB LT/TH/RT	9.3	A	9.3	A
Roosevelt Ave & Honouliuli WWTP DW4 (Unsignalized, 2-way STOP)				
Roosevelt Ave EB LT	8.8	A	8.8	A
Honouliuli WWTP DW4 LT/RT	62.6	F	62.6	F
Geiger Rd/Roosevelt Ave & Essex Rd (Unsignalized, 2-way STOP)				
Essex Rd LT/TR	19.5	C	19.5	C
Geiger Rd WB LT	9.7	A	9.7	A

Notes:

sec/veh = seconds per vehicle, LOS = Level of Service,
LT = left turn, TH = through, RT = right turn

Table 6 Projected Year 2026 PM Peak Hour Intersection Operations Comparison Part 2

Intersection	2018 TIAR		2020 ESFARI/ERCC TIAR	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Geiger Rd & Existing ERCC Dwy (Unsignalized, 2-way STOP)				
Existing ERCC Dwy LT/RT	24.8	C	-	-
Geiger Rd EB LT/TH	8.7	A	-	-
Geiger Rd & Honouliuli Dwy 1 (Unsignalized, 2-way STOP)				
Honouliuli WWTP DW1 LT/RT	24.7	C	24.4	C
Geiger Rd EB LT	8.7	A	8.7	A
Geiger Rd & Honouliuli WWTP DW2/Kamakana St (Unsignalized, 2-way STOP)				
Kamakana St LT	495.0	F	513.1	F
Kamakana St TH/RT	20.1	C	19.4	C
Geiger Rd WB LT	12.3	B	12.0	B
Honouliuli DW2 LT/TH/RT	146.8	F	513.1	F
Geiger Rd EB LT	8.4	A	8.5	A
Geiger Rd & Honouliuli WWTP DW3 (Unsignalized, 2-way STOP)				
Honouliuli WWTP DW3 LT/RT	53.6	F	-	-
Geiger Rd EB LT	9.3	A	-	-
Kapolei Pkwy & Geiger Rd (Signalized)				
Kapolei Pkwy & Geiger Rd	52.9	D	54.6	D

Notes:

sec/veh = seconds per vehicle, LOS = Level of Service
LT = left turn, TH = through, RT = right turn

3.6 Conceptual Design Considerations

3.6.1 Left-Turn Lanes and Intersection Configuration

The appropriateness for median left-turn lanes at the two proposed ENV Support Facilities driveways (Honouliuli WWTP DW4 and DW5) were evaluated. Safety and operational issues guide recommendations to construct median left-turn lanes at these driveways.

The Synchro software was used to quantify the 95th percentile left-turn queue length. Table 7 summarizes the projected 95th percentile queue lengths for both the AM and PM peak hour periods.

Table 7 Approximated 95 Percentile Vehicle Queues for Left-Turns into Honouliuli WWTP

Intersection	AM Peak Hour Queue		PM Peak Hour Queue	
	Vehicles	Length	Vehicles	Length
Geiger Rd/Honouliuli WWTP DW1 (KKHD-bound)	2	50	0	25
Geiger Rd/Honouliuli WWTP DW2/Kamakana (KKHD-bound)	2	50	2	50
Roosevelt Ave & Honouliuli WWTP DW4 (KKHD-bound)	2	50	1	25

Notes: 95th Percentile left-turn vehicle queues calculated using Synchro 9 software
Length is expressed in feet; minimum length is 25 feet.
Honouliuli WWTP DW3 was deleted from the plan
Honouliuli WWPT DW5 is not recommended to implement a left-turn lane

The eastbound left-turn lanes at Honouliuli WWTP DW1 and DW2 serving the primary WWTP are recommended to be at least 50 feet long. Recent roadway widening improvements to Geiger Road included median left-turn lanes at both DW1 and DW2 these eastbound left-turn lanes meet or exceed the recommended lengths. No further improvements are needed.

Of the two ENV Support Facilities Driveways, a median left-turn lane is not recommended for DW5 on Renton Road in order to maintain the historic character of Renton Road. Renton Road at the DW5 intersection would have a shared through/left/right lane configuration. Due to relatively low traffic volumes projected for Renton Road and low posted speed limits, this shared lane configuration is deemed appropriate from operational and safety perspectives.

DW4 on Roosevelt Avenue is a new driveway to the ENV Support Facilities. Because of a slightly higher posted speed limit (35 mph) on Roosevelt Avenue at this location, a median left-turn lane in Roosevelt Avenue is recommended to safely accommodate traffic turning into DW4. This will allow left-turning vehicles a protected area out of the flow of through traffic in Roosevelt Avenue while waiting for a safe gap in traffic to execute their turn.

Figure 6 conceptually illustrates a potential median left-turn lane configuration in Roosevelt Avenue at DW4. Roosevelt Avenue would need to be widened to accommodate the median left-turn lane requiring redirection of the Roosevelt Avenue through lanes. This widening can be implemented within the existing Roosevelt

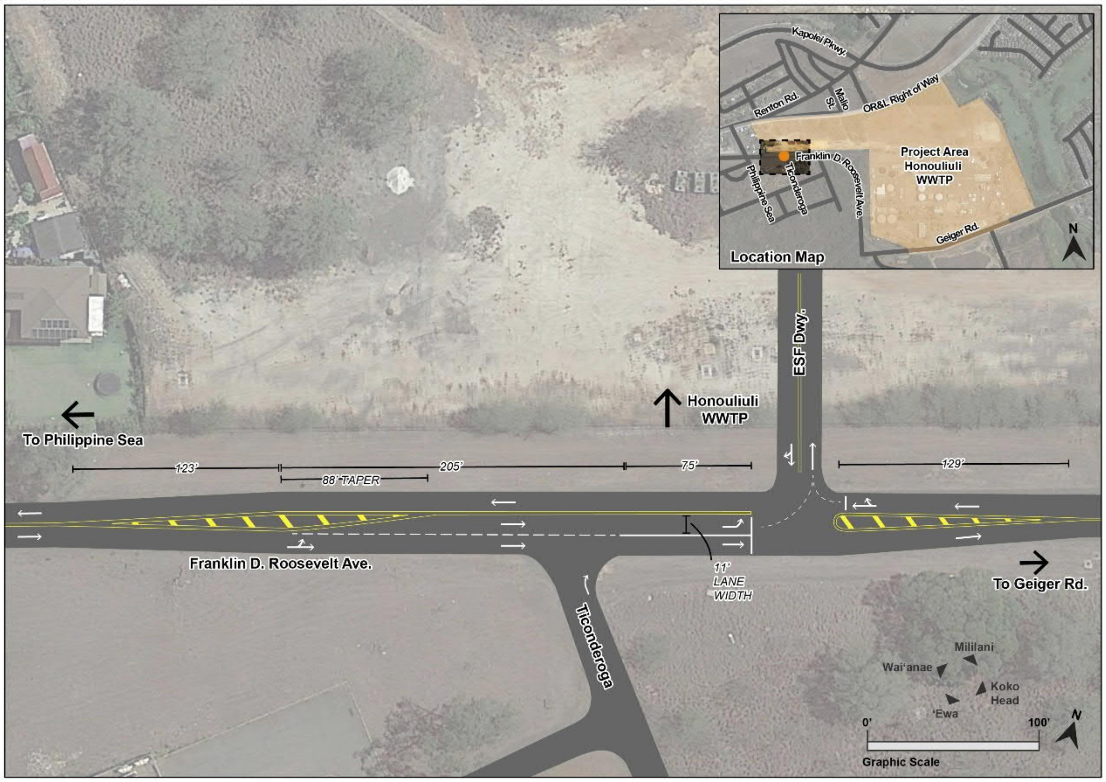

Figure 6 Conceptual ENV Support Facility Driveway (DW4) Intersection Configuration

Avenue ROW. Table 8 summarizes the lengths for the lane redirects and the components of the left-turn lane.

Table 8 Left Turn Lane Components

Left Turn Lane Component	KKHD-bound Roosevelt Ave LT at DW4 Length (ft)
Storage	75
Taper	88
Total Left-turn Length	280
Lane Redirect	123
Opposing Lane Redirect	129

Notes: 95th Percentile storage lengths from the Synchro evaluation.
Taper length calculated using an 8:1 ratio based on an assumed 11 ft left-turn lane width at DW4.
Posted Speed Limit is 35 mph for Roosevelt Ave
Left-turn lane length per AASHTO Green Book, 2018.
Roadway lane redirect for widening distributed evenly on both sides of centerline.

3.6.2 Intersection Sight Distance

It was verified that adequate intersection sight distance was available at the Honouliuli WWTP DW4 and DW5.

Honouliuli WWTP DW4 is located along Roosevelt Avenue posted at 35 mph and Honouliuli WWTP DW5 is located along Renton Road posted at 25 mph.

Table 9 summarizes the intersection sight distance available for drivers exiting Honouliuli WWTP DW4 and DW5 and compares them with the AASHTO Green Book 2018 guidelines.

As shown in Table 9, both proposed driveways have more than adequate sight distance available to drivers exiting from the Honouliuli WWTP ENV Support Facilities driveways. It is recommended to keep landscaping and signage from obstructing the line of sight of the drivers on the driveways along the sight triangle line.

Table 9 Intersection Sight Distance at ESF Driveways

Driveway Name	Direction	AASHTO Guideline (ft)	Available Distance (ft)
Honouliuli WWTP DW4 (Roosevelt Avenue)	Left of Driveway	390	>400
	Right of Driveway	335	> 400
Honouliuli WWTP DW5 (Renton Road)	Left of Driveway	280	Approximately 400
	Right of Driveway	240	Approximately 450
Notes: Design speed: 35 mph for DW4 and 25 mph for DW5. Sight distances estimated based on measurements from Google Earth ft = feet, mph = miles per hour			

4.0 SUMMARY AND RECOMMENDATIONS

4.1 Summary

This ESFARI/ERCC Relocation TIAR is an update to the Traffic Impact Analysis Report Honouliuli Wastewater Treatment Plant completed in 2018 by ATA (2018 TIAR).

The ESFARI/ERCC Relocation TIAR evaluates proposed modifications to Honouliuli WWTP Facility Plan that includes revised access the proposed ENV Support Facilities and the relocation of the existing ‘Ewa Refuse Convenience Center within the WWTP site. It also acknowledges the future redevelopment of Varona Village along Renton Road in the vicinity of one the ENV Support Facilities driveways. The TIAR evaluation focuses on the Year 2026 time frame which when the improvements are currently anticipated to be complete.

The ESFARI/ERCC Relocation TIAR found the minimal differences in traffic impacts at key intersections operations compared to results from the 2018 TIAR. Relocating the existing ERCC to a location east of its current location within the WWTP creates slightly higher delay for vehicles exiting at Honouliuli WWTP Driveway 2 (DW2) on Geiger Road, but has minimal impact on traffic on Geiger Road.

The implementation of the ENV Support Facilities will involve the construction of two new access points into the proposed Honouliuli WWTP: one along Roosevelt Avenue (Honouliuli WWTP DW4) and one along Renton Road (Honouliuli WWTP DW5). The DW4 driveway intersection will include the construction of a median left-turn lane for vehicles turning into the ENV Support Facilities from Roosevelt Avenue. This will involve widening of a segment of Roosevelt Avenue. Both the access and median left-turn lanes improvements will require the approval of HDOT. No median left-turn lane or widening is proposed on Renton Road. The proposed roadway improvements at both DW4 and DW5 would not preclude planned pedestrian, bicycle, or public transit projects

4.2 Recommendations

ENV Support Facilities:

- Provide a median left-turn lane for eastbound left turns into DW4 per the conceptual sketch in Figure 6 of this report. Widen a segment of Roosevelt Avenue to create the median for this left-turn lane. Due to the length of the left-turn lane and proximity of Ticonderoga Street, restrict traffic movements at Ticonderoga Street to right-in/right-out movements.
- Provide separate right and left-turn lanes at both DW4 and DW5 approaches.
- Use appropriate landscaping and signage at DW4 and DW5 to maintain intersection sight distance.

- Implement a shared left/though/right configuration on westbound Renton Road at DW5 to maintain the historic nature of Renton Road adjacent to Varona Village.
- Provide a crossing of the OR&L right-of-way for DW5 (Malio Street) and the cell phone tower access acceptable to HDOT and FHWA.

Re-location of the ‘Ewa Refuse Convenience Center (ERCC):

- Create separate right-turn and left/though lanes for the DW2 driveway.
- To facilitate internal traffic circulation for the ERCC, delete DW3 from the Honouliuli WWTP Facility Plan. The amount of forecasting traffic reroute from DW3 to DW2 is very small that the effects of the reroute are minimal.
- Geiger Road was recently widened to four lanes in the vicinity of the WWTP. As part of this widening, median left-turn lanes were provided at DW1 and DW2. These newly installed left-turn lanes are sufficient to handle projected left-turns into the WWTP.

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Appendix A

<u>Traffic Impact Analysis Report Honouliuli Wastewater Treatment Plant</u> by Austin, Tsutsumi, & Associates, Inc (2018)

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TRAFFIC IMPACT ANALYSIS REPORT HONOULIULI WASTEWATER TREATMENT PLANT
Kapolei, Oahu, Hawaii

DRAFT FINAL

April 9, 2018

Prepared for:
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TRAFFIC IMPACT ANALYSIS REPORT
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TABLE OF CONTENTS

TABLE OF CONTENTS
Cont'd

TABLE OF CONTENTS
Cont'd

TABLE OF CONTENTS
Cont'd

TABLES

TABLE OF CONTENTS
Cont'd

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

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TRAFFIC IMPACT ANALYSIS REPORT

HONOULIULI WASTEWATER TREATMENT PLANT

Kapolei, Oahu, Hawaii

1. INTRODUCTION

This report documents the findings of a traffic study conducted by Austin, Tsutsumi & Associates, Inc. (ATA) to evaluate the potential traffic impacts resulting from the proposed improvements to the Honouliuli Wastewater Treatment Plant (hereinafter referred to as the "Project").

1.1 Location

The Project is located in Kapolei on the island of Oahu on a parcel of land more specifically identified as TMK: 9-1-069:003 and 9-1-013:007. The Project site is bound to the south by Geiger Road with Roosevelt Ave to the west, Kapolei Parkway to the north, and Coral Creek Golf Course to the east. Figure 1.1 shows the Project location.

1.2 Project Description

The Project proposes to upgrade and expand the Honouliuli Wastewater Treatment Plant (WWTP) facility, which will occur in conjunction with the potential relocation of non-process facilities currently located at the Sand Island Wastewater Treatment Plant to the Project site. The relocation of the non-process facilities will occur under the ENV Support Facilities at Honouliuli WWTP project. A TIAR was previously prepared for the Project in November 2014 for AECOM; however, it is our understanding that the City and County of Honolulu Department of Planning and Permitting (DPP) has requested the TIAR be updated to include recent developments and updated traffic volumes. The Project is planned to be constructed in five (5) phases with full buildout anticipated in 2026. The anticipated Project timeline is as follows:

- Upgrade Phase 2: July 2018 – March 2020
- Phase 1A: September 2018 – December 2021
- Phase 1B: January 2019 – July 2022
- Phase 1C: July 2021 – December 2024

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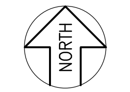
HILO, HAWAII

- Phase 1D: July 2023 – 2026

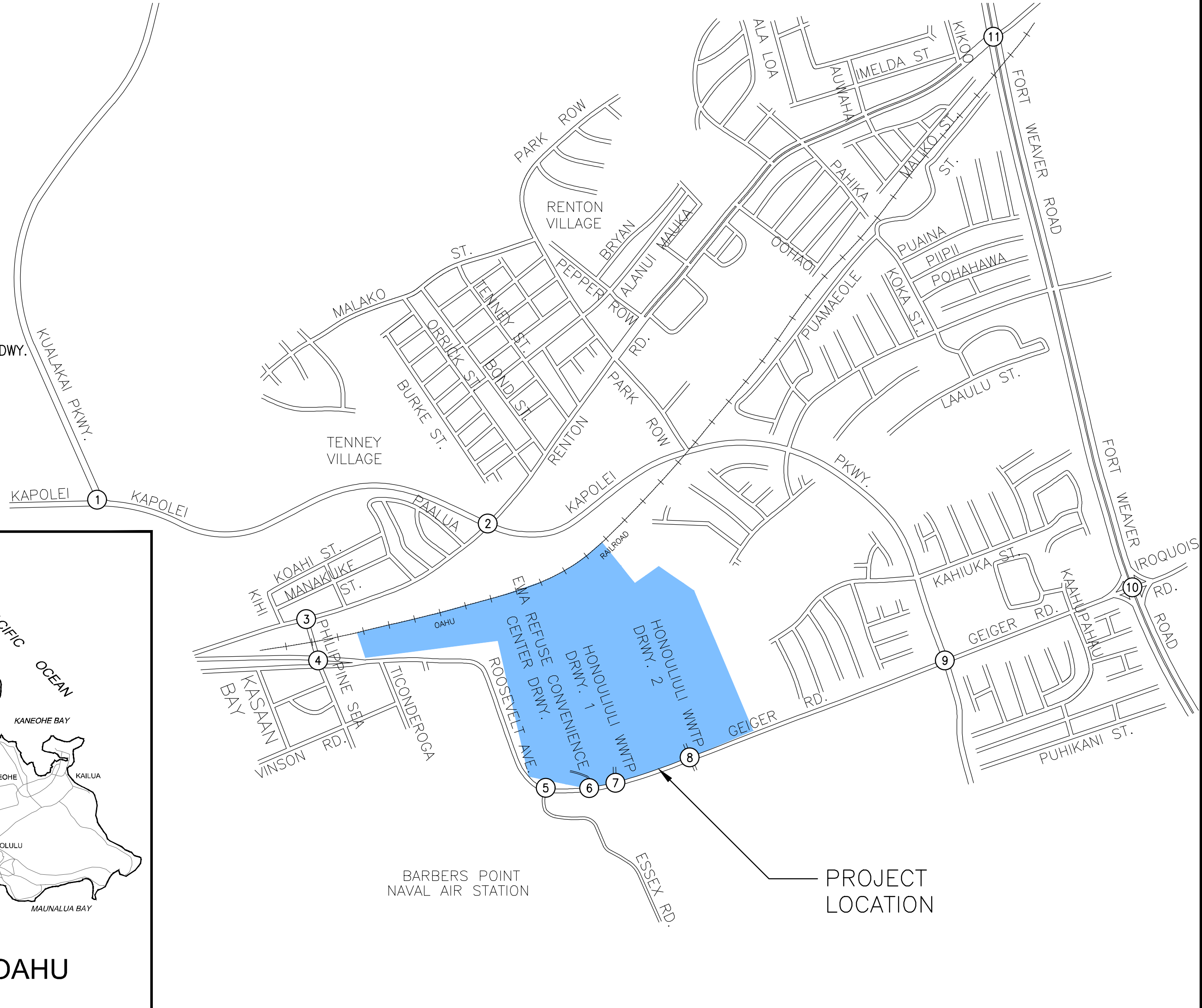
Upon completion of the Project, the number of employees required to operate the WWTP facility is projected to increase from 81 to approximately 120 employees. The employees will be assigned to one of three shifts: the daytime shift from 6:45 AM to 3:15 PM, the evening shift from 3:00 PM to 11:00 PM or the night shift from 11:00 PM to 7:00 AM. Seven (7) additional employees from a third party company will also operate a portion of the plant upon completion of Phase 1A. In addition to employee trips, WWTP client trips are expected to increase to approximately 60 to 80 trips with the expansion. Access to the Project will continue to be provided by the two (2) existing driveways along Geiger Road. Additionally, upon completion of the ENV Support Facilities at Honouliuli WWTP, a new driveway along Geiger Road to the east of Honouliuli Driveway 2 will be available for use by the Project.

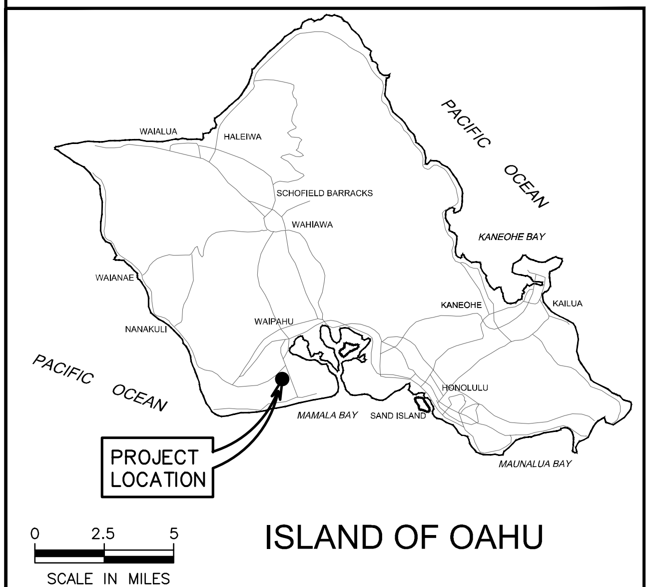
See Figure 1.2 for the proposed Project site plan.



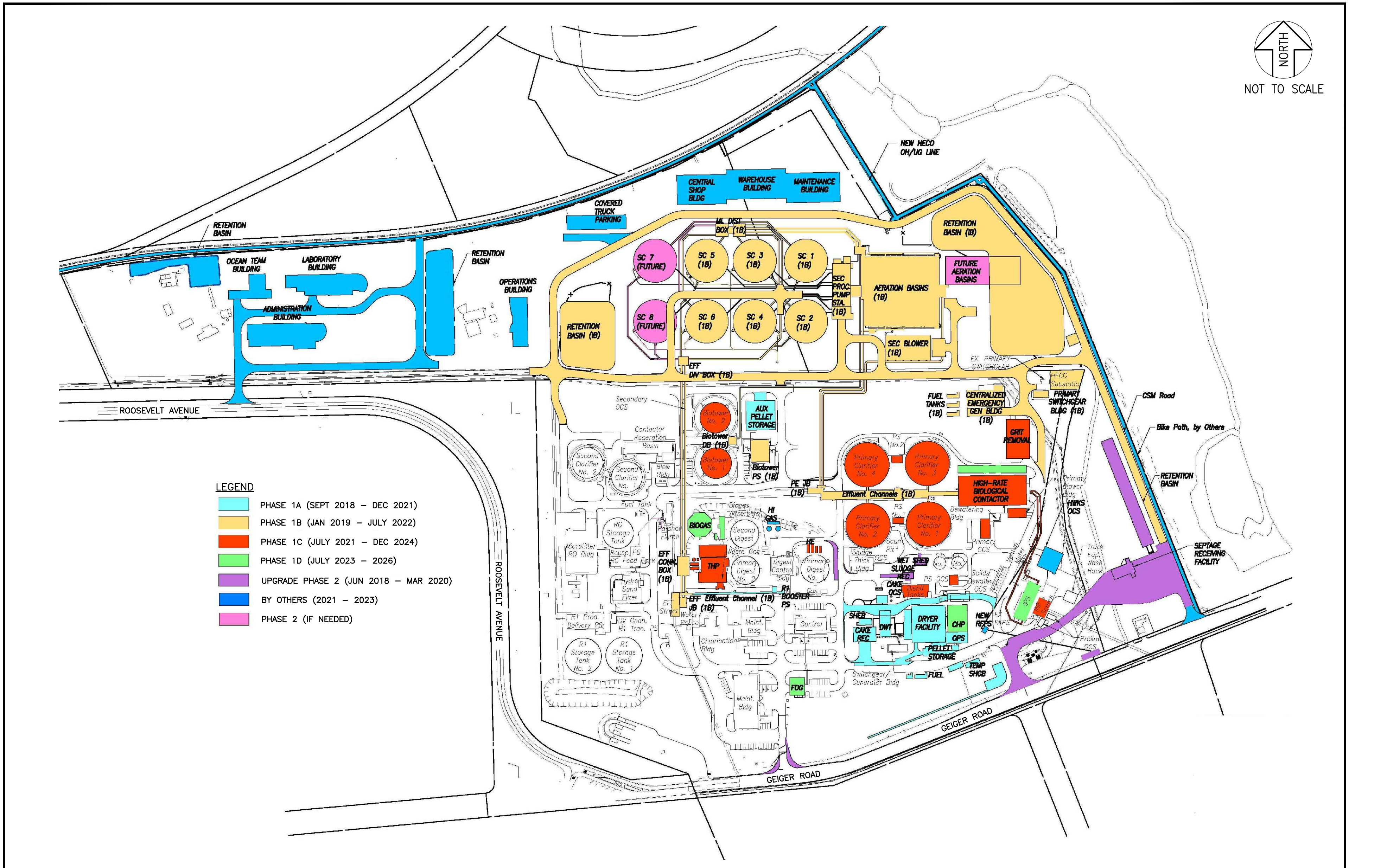
STUDY INTERSECTIONS

1. KUALAKAI PKWY. & KAPOLEI PKWY.
2. RENTON RD. & KAPOLEI PKWY.
3. RENTON RD. & PHILLIPINE SEA
4. ROOSEVELT AVE. & PHILLIPINE SEA
5. ROOSEVELT AVE. & GEIGER RD. & ESSEX RD.
6. GEIGER RD. & EWA REFUSE CONVENIENCE CENTER DWY.
7. GEIGER RD. & HONOULIULI DWY. 1
8. GEIGER RD. & HONOULIULI DWY. 2
9. GEIGER RD. & KAPOLEI PKWY.
10. FORT WEAVER RD. & GEIGER RD. & IROQUOIS RD.
11. RENTON RD. & FORT WEAVER RD.





HONOULIULI WASTEWATER TREATMENT PLANT TIAR	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS, SURVEYORS • HONOLULU, HAWAII	FIGURE
	PROJECT LOCATION	1.1



HONOULIULI WASTEWATER TREATMENT PLANT TIAR

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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PROJECT SITE PLAN

FIGURE 1.2

2. METHODOLOGY

2.1 Study Methodology

This study will address the following:

- Assess existing traffic operations at key intersections within the study area during the weekday morning (AM) and weekday afternoon (PM) peak hours of traffic.
- Traffic projections for Base Years 2020, 2021, 2022, 2023, 2024 and 2026 without the Project including traffic generated by a defacto growth rate as well as traffic generated by other known developments in the vicinity of the Project. 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. Note that a full analysis for Base Years will only be included for critical years that will require roadway improvements.
- Trip generation and assignment for the proposed Project.
- Traffic projections for Future Year 2026 with the Project, which include Base Year traffic volumes in addition to traffic volumes generated by the Project.
- Recommendations for roadway improvements or other traffic mitigative measures, as appropriate, to reduce or eliminate the adverse impacts resulting from traffic generated by the Project upon full buildout in Future Year 2026.
- Timeline for implementation of roadway improvements recommended for Future Year 2026 over Base Years 2020, 2021, 2022, 2023, 2024 and 2026. As noted above, a full analysis will only be included for critical Base Years requiring roadway improvements.

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 B.

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.

3. EXISTING CONDITIONS

3.1 Roadway System

The following are brief descriptions of the existing roadways in the vicinity of the Project.

Kualakai Parkway is generally a north-south, two-way, four to six-lane, divided arterial roadway. This roadway begins to the north as a full diamond interchange with the H-1 Freeway and ends to the south at the Ka Makana Alii Shopping Center at its intersection with Kapolei Parkway. The posted speed limit along Kualakai Parkway is 35 miles per hour (mph).

Renton Road is generally an east-west, two-way, collector roadway that begins at Kihi Street to the west as a two-lane, undivided roadway and extends to the east becoming a four-lane, divided roadway terminating in Asing Community Park. The posted speed limit along Renton Road is 25 mph.

Kapolei Parkway is generally an east-west, two-way, six-lane, divided arterial roadway in the vicinity of the Project. This roadway begins in the west near the Kapolei Target Store and extends east until it crosses Renton Road and turns to the south. Kapolei Parkway continues past its intersection with Papipi Road as Hailipo Street. The posted speed limit along this roadway in the vicinity of the Project is 30 mph.

Roosevelt Avenue is generally an east-west, two-way, two-lane, undivided collector roadway in the vicinity of the Project. This roadway begins in the west near its intersection with Boxer Road and extends east until it terminates at its intersection with Essex Road and continues as Geiger Road. The posted speed limit along this roadway is 25 mph.

Phillipine Sea is generally a north-south, two-way, two-lane, undivided restricted private local roadway. This roadway begins to the north at a T-intersection with Renton Road and terminates to the south at its intersection with Vinson Road. The posted speed limit is 15 mph.

Geiger Road is generally an east-west, two-lane, two-way undivided collector roadway in the vicinity of the Project. This roadway begins in the west where Roosevelt Avenue becomes Geiger Road at the intersection with Essex Road and terminates to the east where Geiger Road becomes Iroquois Road at its intersection with Fort Weaver Road. The posted speed limit in the vicinity of the project is 30 mph.

Fort Weaver Road is generally a north-south, two-way, six-lane, divided arterial roadway in the vicinity of the Project. This roadway begins to the north at the H-1 Freeway interchange and terminates in the south at its intersection with Popoi Place near Ewa Beach Park. The posted speed limit in the vicinity of the Project is 35 mph.

Essex Road is generally a north-south, two-way, two-lane, undivided private local roadway that primarily serves to provide access to Barbers Point Golf Course. This roadway begins in the north at a T-intersection with Geiger Road, becomes a restricted roadway to the south of Barbers Point Golf Course, and terminates to the south at White Plains Beach Park. The posted speed limit along this roadway is 10 mph.

Kamakana Street is generally a north-south, two-way, two-lane, undivided private local roadway that serves as an access to the Ewa by Gentry Makai Development, which is currently still under construction. This roadway begins in the north at its intersection with Geiger Road and terminates in the south within the Ewa by Gentry Makai Development. The posted speed limit along this roadway is 25 mph.

Ewa Refuse Convenience Center (ERCC) Driveway is approximately 450 feet east of the Geiger Road/Essex Road intersection and provides exclusive access to the refuse center.

Honouliuli Driveway 1 is the westernmost Project driveway along Geiger Road and provides direct access to the Honouliuli WWTP.

Honouliuli Driveway 2 is the easternmost Project driveway along Geiger Road and provides direct access to the Honouliuli WWTP.

3.2 Sustainable Transportation

3.2.1 Complete Streets

While transportation planning has traditionally focused on automobile travel, recent "Complete Streets" policies also recognize the numerous benefits of encouraging the use of alternative modes of transportation. "Complete Streets" policies encourage the provision of equitable, accessible and safe transportation for all modes.

Hawaii State Senate Bill 718 (2009) required that the Hawaii Department of Transportation (HDOT) and the City transportation departments:

> *"…adopt a complete streets policy that seeks to reasonably accommodate convenient access and mobility for all users of the public highways within their respective jurisdictions…"*

3.2.2 Pedestrian Accessibility

The Project is located in the city of Kapolei, a master-planned region that serves as West Oahu's hub for business, commerce and government. Minimal pedestrian activity was observed in the immediate vicinity of the Project. However, higher pedestrian activity was observed at study intersections located within high density residential areas.

Sidewalks are provided at the majority of studied roadways with the exception of Roosevelt Avenue, Phillipine Sea and Renton Road west of Kapolei Parkway. In the immediate vicinity of the Project, a sidewalk is provided along the makai side of Geiger Road fronting the Project.

3.2.3 Bicycle Accessibility

In the Project vicinity, bike paths are currently provided along Fort Weaver Road from Keaunui Drive to Farrington Highway, Kapolei Parkway from Keoneula Boulevard to Renton Road and Geiger Road/Iroquois Road from Kapolei Parkway to Keaunui Drive.

The following bicycle facilities are proposed in the study area:

- Kualakai Parkway – Bike lane and bike path
- Kapolei Parkway – Bike lane and bike path
- Renton Road – Bike route

- Fort Weaver Road – Bike route
- Geiger Road – Bike lane
- Oahu Railroad – Bike path

Additionally, a bike path is anticipated to be constructed with the ENV Support Facilities at Honouliuli WWTP along the new proposed driveway along Geiger Road connecting to the proposed bike path along the Oahu Railroad.

3.2.4 Public Transit

Oahu Transit Services (OTS) operates TheBus, which currently operates a fleet of 542 buses servicing the most populated areas of the island. TheBus is the primary form of public transit on Oahu. The cost of service is $2.50 for each 1-way ride, $5.00 for a 1-day pass, $60 for a monthly pass and $660 for an annual pass[1].

The following routes provide service in the immediate vicinity of the Project:

- Route 41 – Kapolei Transit Center to Ewa Beach Transit Center
- Route 44 – Ewa Villages-Ewa Beach to Waipahu Leoku Street

Both routes service the bus stop located at the Roosevelt Avenue/Geiger Road/Essex Road intersection fronting the Project.

3.3 Existing Traffic Volumes

The hourly turning movement data utilized in this report were collected on September 27, 2017. Based on their proximity to the proposed Project, the following intersections were studied in the existing conditions scenario:

- [1] Kualakai Parkway/Kapolei Parkway (signalized)
- [2] Renton Road/Kapolei Parkway (signalized)
- [3] Renton Road/Phillipine Sea (unsignalized)
- [4] Roosevelt Avenue/Phillipine Sea (unsignalized)
- [5] Roosevelt Avenue/Geiger Road/Essex Road (unsignalized)
- [6] Geiger Road/Ewa Refuse Convenience Center (ERCC) Driveway (unsignalized)
- [7] Geiger Road/Honouliuli Driveway 1 (unsignalized)
- [8] Geiger Road/Honouliuli Driveway 2/Kamakana Street (unsignalized)
- [9] Geiger Road/Kapolei Parkway (unsignalized)
- [10] Fort Weaver Road/Geiger Road/Iroquois Road (unsignalized)
- [11] Renton Road/Fort Weaver Road (unsignalized)

[1] Based on 2017 TheBus information.

Based on the count data, it was determined that the AM peak hour of traffic occurs between 6:45 AM and 7:45 AM and the PM peak hour of traffic occurs between 4:00 PM and 5:00 PM. The turning movement count data is included in Appendix A.

3.4 Existing Traffic Conditions Observations and Analysis

The observations and analysis described below are based on prevailing observations during the time at which the data was collected. Hereinafter, observations that are expressed as ongoing and current shall represent the conditions that prevailed at the time at which the data was collected.

3.4.1 Existing Intersection Analysis

Traffic in the Project area was moderate along the majority of roadways in the study area during both peak hours of traffic. However, volumes along Fort Weaver Road were high during both peaks due to the large number of residential areas utilizing the roadway to travel to and from the H-1 Freeway. Although Kualakai Parkway also provides access to the H-1 Freeway, it was not observed to be utilized as highly as Fort Weaver Road. Despite the high volumes creating congestion along Fort Weaver Road, movements were generally able to clear intersections within one cycle due to the long coordinated cycle lengths along the roadway.

The peak hours of traffic generation for the Project were observed to occur from approximately 6:00 AM to 7:00 AM for the AM peak and approximately 3:00 PM to 4:00 PM for the PM peak, which correlate with employee shift changes and are just outside the regional peak hours of traffic summarized in Section 3.3.

The following study intersection movements were observed to operate at LOS F and/or overcapacity during the peak hours of traffic.

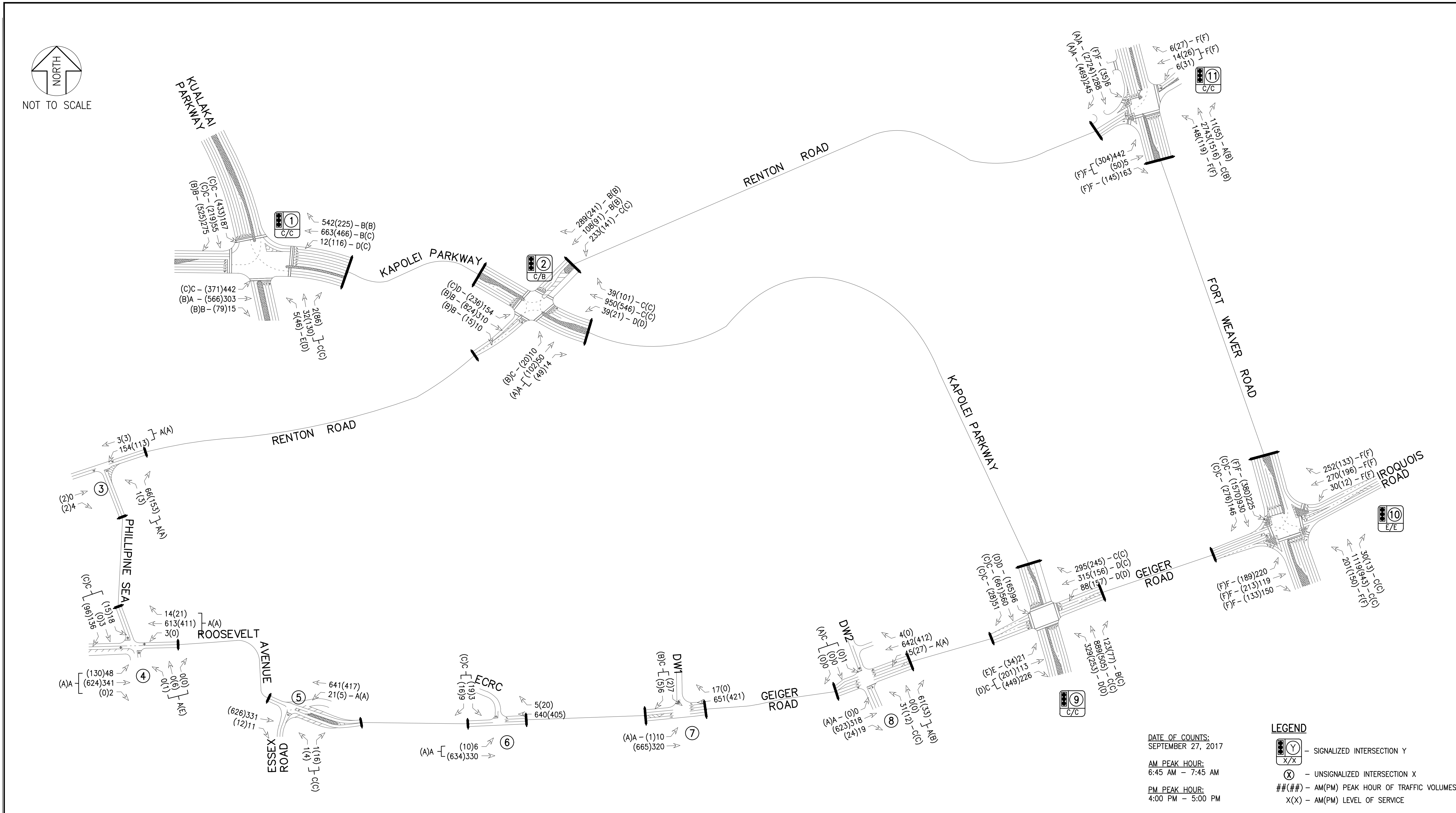
<u>[10] Fort Weaver Road/Geiger Road/Iroquois Road</u>

During both peak hours of traffic, all left-turn and minor street movements operated at LOS F mainly due to long delays as a result of requisite long cycle lengths (approximately four minutes long). This intersection also provides split-phase signal operation on the side streets and long pedestrian crossing times across Fort Weaver Road, which contribute to the long delays. Although the majority of movements operate at LOS F, all movements operated under capacity, and the major through movements operated at LOS C.

<u>[11] Fort Weaver Road/Renton Road</u>

During both peak hours of traffic, all left-turn and minor street movements operated at LOS F. Similar to the Fort Weaver Road/Geiger Road/Iroquois Road intersection, this intersection operates with a long coordinated cycle along Fort Weaver Road with split phasing along Renton Road. Due to the long cycle length, the majority of movements experienced long delays. However, all movements operated under capacity, and the major through movements operated at LOS C or better.

Figure 3.1 illustrates the existing lane configuration, traffic volumes and LOS for the study intersection movements. Table 3.1 summarizes the existing LOS at the study intersections. LOS worksheets are provided in Appendix C.



HONOULIULI WASTEWATER TREATMENT PLANT TIAR

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FIGURE 3.1

EXISTING LANE CONFIGURATION, VOLUMES, AND MOVEMENT LOS

TABLE 3.1: LOS SUMMARY TABLE
EXISTING CONDITIONS

Intersection	Existing 2017 Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Kualakai Pkwy & Kapolei Pkwy						
NB LT	74.1	0.53	E	51.3	0.78	D
NB TH/RT	31.3	0.14	C	30.9	0.43	C
EB LT	28.9	0.75	C	29.6	0.72	C
EB TH	10.0	0.13	A	19.6	0.43	B
EB TH/RT	10.0	0.14	B	19.9	0.44	B
WB LT	38.0	0.29	D	33.9	0.57	C
WB TH	19.5	0.45	B	24.4	0.47	C
WB RT	16.2	0.52	B	14.2	0.23	B
SB LT	32.9	0.64	C	28.8	0.75	C
SB TH	25.6	0.11	C	21.3	0.27	C
SB RT	16.0	0.12	B	13.5	0.22	B
OVERALL	20.6	-	C	23.9	-	C
2: Kapolei Pkwy & Renton Rd						
NB LT	53.5	0.75	D	43.7	0.61	D
NB TH	21.4	0.62	C	20.8	0.56	C
NB TH/RT	21.8	0.62	C	21.5	0.57	C
EB LT	20.4	0.03	C	17.3	0.05	B
EB TH/RT	18.4	0.11	A	16.9	0.29	A
WB LT	24.4	0.54	C	21.3	0.39	C
WB TH	19.1	0.20	B	16.2	0.18	B
WB RT	18.7	0.15	B	15.8	0.10	B
SB LT	37.6	0.78	D	28.2	0.80	C
SB TH	13.4	0.16	B	13.6	0.44	B
SB TH/RT	13.4	0.16	B	13.8	0.44	B
OVERALL	22.1	-	C	18.6	-	B
3: Phillipine Sea & Renton Rd						
NB LT/RT	8.6	0.07	A	9.0	0.16	A
WB LT/TH	7.5	0.10	A	7.4	0.08	A
OVERALL	7.6	-	-	8.1	-	-
4: Phillipine Sea & Roosevelt Ave						
NB LT/TH/RT	0.0	0.00	A	43.9	0.08	E
EB LT/TH/RT	9.2	0.06	A	8.8	0.13	A
WB LT/TH/RT	8.0	0.00	A	0.0	0.00	A
SB LT/TH/RT	23.0	0.46	C	21.0	0.35	C
OVERALL	3.4	-	-	2.9	-	-
5: Essex Rd & Roosevelt Ave/Geiger Rd						
NB LT/RT	15.6	0.01	C	15.4	0.06	C
WB LT	8.1	0.02	A	9.0	0.01	A
OVERALL	0.2	-	-	0.3	-	-

Intersection	Existing 2017 Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
6: Geiger Rd & Ewa Refuse Convenience Center						
EB LT/TH	9.0	0.01	A	8.3	0.01	A
SB LT/RT	15.2	0.04	C	18.4	0.12	C
OVERALL	0.3	-	-	0.6	-	-
7: Geiger Rd & Honouliuli Drwy 1						
EB LT	9.2	0.01	A	8.3	0.00	A
SB LT/RT	16.8	0.04	C	13.8	0.02	B
OVERALL	0.3	-	-	0.1	-	-
8: Geiger Rd & Honouliuli Drwy 2						
NB LT	20.5	0.13	C	24.0	0.07	C
NB TH/RT	9.7	0.08	A	10.9	0.06	B
EB LT	0.0	0.00	A	0.0	0.00	A
WB LT	8.2	0.04	A	9.2	0.03	A
SB LT/TH/RT	24.7	0.01	C	0.0	0.00	A
OVERALL	1.4	-	-	0.8	-	-
9: Kapolei Pkwy & Geiger Rd						
NB LT	45.5	0.89	D	42.4	0.86	D
NB TH	23.4	0.66	C	24.3	0.47	C
NB RT	17.3	0.11	B	20.6	0.04	C
EB LT	67.2	0.67	E	65.9	0.77	E
EB TH/RT	33.0	0.22	C	37.9	0.67	D
WB LT	53.4	0.77	D	46.1	0.82	D
WB TH	36.4	0.76	D	27.8	0.36	C
WB RT	29.1	0.19	C	26.0	0.14	C
SB LT	52.1	0.77	D	45.2	0.81	D
SB TH	32.0	0.65	C	31.0	0.75	C
SB RT	26.1	0.02	C	23.9	0.01	C
OVERALL	32.7	-	C	34.0	-	C
10: Ft Weaver Rd & Geiger Rd/Iroquois Rd						
NB LT	111.8	0.76	F	114.0	0.72	F
NB TH	33.1	0.44	C	32.8	0.38	C
NB RT	26.0	0.02	C	27.0	0.01	C
EB LT	99.9	0.53	F	102.7	0.63	F
EB TH	101.9	0.54	F	101.2	0.65	F
EB RT	98.2	0.36	F	97.5	0.40	F
WB LT	84.1	0.11	F	91.7	0.06	F
WB TH	126.8	0.91	F	130.8	0.88	F
WB RT	86.2	0.23	F	91.8	0.07	F
SB LT	115.1	0.79	F	114.1	0.87	F
SB TH	30.5	0.36	C	28.5	0.55	C
SB RT	26.6	0.09	C	22.8	0.22	C
OVERALL	60.0	-	E	55.3	-	E

Intersection	Existing 2017 Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
11: Ft Weaver Rd & Renton Rd						
NB LT	130.6	0.89	F	134.4	0.87	F
NB TH	22.6	0.80	C	16.1	0.46	B
NB RT	8.9	0.01	A	11.2	0.03	B
EB LT/TH	115.1	0.89	F	104.8	0.76	F
EB RT	92.9	0.37	F	94.8	0.32	F
WB LT/TH	143.9	0.72	F	130.8	0.81	F
WB RT	114.8	0.05	F	108.3	0.01	F
SB LT	118.7	0.24	F	118.3	0.60	F
SB TH	0.4	0.43	A	4.1	0.90	A
SB RT	0.3	0.15	A	0.7	0.29	A
OVERALL	29.6	-	C	20.4	-	C

4. BASE YEAR TRAFFIC CONDITIONS

The Base Years 2020, 2021, 2022, 2024 and 2026 were selected to reflect the completion of Phases 1-5 of the Project. The Base Year 2023 was also analyzed as the anticipated completion of the ENV Support Facilities at Honouliuli WWTP proposed to be located on the Project site. The Base Year scenarios represent the traffic conditions within the study area without the Project. Base Year traffic projections were formulated by applying a defacto growth rate to the existing 2017 traffic count volumes and adding trips generated by known future developments in the vicinity of the Project. Note that a full analysis for Base Years will only be included for critical years that will require roadway improvements.

4.1 Defacto Growth Rate

The Oahu Regional Transportation Plan 2035 (ORTP) was prepared in 2011 and serves as the basis for future traffic projections of future conditions throughout this TIAR. The ORTP uses existing data from 2007 as its baseline before assigning land uses and socioeconomic data to Traffic Analysis Zones (TAZ's) to generate and assign traffic across the roadway network. Although island wide projects are accounted for in the ORTP, the economic environment and housing demand would be the main driver for the pace of development to occur.

The ORTP Model takes into account island wide projects and generates and distributes the generated trips throughout the roadway network. The growth rates derived from 2007 and 2035 traffic projections were applied linearly to existing 2017 traffic volumes to determine Base Year conditions. Growth rates were updated as necessary from the November 2014 TIAR based on a comparison of the 2017 and 2014 collected traffic counts. With the inclusion of other known developments shown below, some growth rates were adjusted to account for the manual inclusion of trips on the roadway network. Calculated defacto growth rates ranging from 0.5-3.2 percent were used to generate Base Year traffic projections.

4.2 Traffic Forecasts for Known Developments

4.2.1 Background Projects

The traffic studies of nearby developments – University of Hawaii at West Oahu (UHWO), Hoopili, East Kapolei and Ewa by Gentry Makai developments – were used to determine turning movement volumes at various study intersections and were reconciled with the ORTP, which does not provide individual turning movement volumes. Trip generation for the ENV Support Facilities at Honouliuli WWTP was determined from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition, which provides trip rates and/or formulae based on graphs that correlate vehicular trips with independent variables. Other projects' trip contributions to the background traffic were assumed to be implicit to the ORTP. Trip generation for the ENV Support Facilities at Honouliuli WWTP is shown in Table 4.1 below, and the location of all included developments is shown in Figure 4.1.

1. UHWO – This project is currently located adjacent and to the west of Kualakai Parkway and south of Farrington Highway. The UHWO currently provides an enrollment for approximately 2,400. Future expansion of the UHWO campus anticipates an enrollment of 7,600 students with residential dwelling units and Village Mixed-Use (VMX) space. This project was assumed to be completed by Year 2021.

2. Hoopili – This project is located north of the Project to the east of Kualakai Parkway and west of Fort Weaver Road. Upon full build-out, Hoopili will include 2,300 single family dwelling units, 9,520 multi-family (MF) dwelling units, over 3 million SF of commercial/retail space, over 800,000 SF of industrial space, over 70 acres of parks, approximately 200 acres of a commercial farm, three elementary schools, one middle school and one high school. Only a percentage of traffic was assumed to be completed for the Base Year scenarios since full buildout is anticipated to occur by Year 2035.

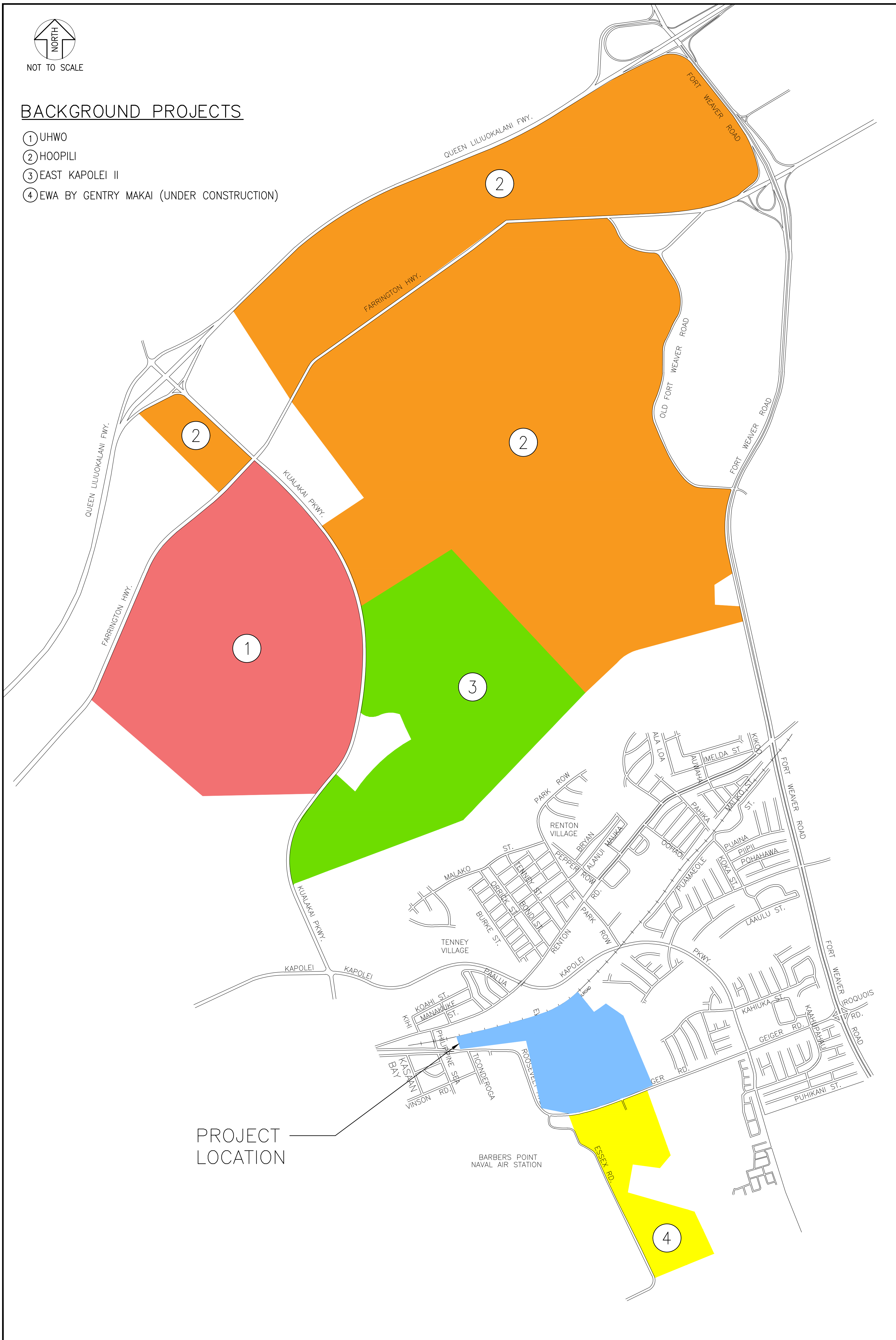
3. East Kapolei II – This project is proposed to be located adjacent and to the west of Kualakai Parkway and will consist of approximately 1,100 single family dwelling units, 1,000 multi-family (MF) dwelling units, four (4) parks, a middle school and an elementary school. This project is anticipated to be completed by Year 2021.

4. Ewa by Gentry Makai – This project is located within the larger Ewa by Gentry Development. Generally, the project is located between Geiger Road to the north, Essex Road to the west and Keaunui Drive to the south and east. The majority of homes within Ewa by Gentry have already been constructed; however, several areas located in the Makai Development have yet to be completed. The new construction is anticipated to include 349 single family units and 40.97 acres of light industrial space. This project is anticipated to be completed by Year 2020.

5. ENV Support Facilities at Honouliuli WWTP – This project is proposed to be located within the Project site but will be developed separately from the WWTP. The project will be developed at the northwest corner of the WWTP and will include several industrial and office buildings. Upon buildout, approximately 370 city workers are expected to be employed at the site, a portion of whom will be relocated from the Sand Island WWTP site. The project will construct a new access along Geiger Road (hereinafter referred to as Honouliuli Driveway 3) to the east of the existing Honouliuli Driveway 2 which will be available for use by the Project. Additionally, the project will construct either a new access along Renton Road via Malio Street (hereinafter referred to as Honouliuli Driveway 4), a new access along Roosevelt Avenue (hereinafter referred to as Honouliuli Driveway 5) or both proposed accesses. Traffic projections for all three driveway scenarios will be analyzed for applicable Base Years and Future Years. This project is anticipated to be completed by Year 2023.

Table 4.1: Background Development Trip Generation

Land Use	Independent Variable	AM Peak Hour			PM Peak Hour		
		Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)
ENV Support Facilities at Honouliuli WWTP	370 Government Employees	201	25	226	91	202	293



HONOULIULI WASTEWATER TREATMENT PLANT TIAR	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS, SURVEYORS • HONOLULU, HAWAII	FIGURE
	BACKGROUND DEVELOPMENTS	4.1

4.3 Base Year 2021 Analysis

It is anticipated that by Base Year 2021, traffic will have increased over existing conditions due to the ongoing development in the Kapolei region. Actual growth within the study region may vary based upon the approval process of the various projects.

4.3.1 Base Year 2021 Intersection Analysis

By Base Year 2021 without the Project, the majority of study intersections are forecast to operate with increased delay over existing conditions. For the purposes of this report, adequate operating conditions will be considered as LOS D or better for the major through movements and LOS E or better for the minor street and left-turn movements. Additionally, LOS F will be considered acceptable for low volume movements defined as having approximately ≤ 100 vehicles. The following intersection movements are anticipated to operate at less than adequate conditions by Base Year 2021.

[8] Geiger Road/Honouliuli Driveway 2/Kamakana Street

The northbound approach is expected to operate at LOS F during the AM peak hour of traffic and LOS F and overcapacity during the PM peak hour of traffic. The intersection is initially expected to operate at LOS F conditions by Base Year 2020 with the completion of the Ewa by Gentry Makai Development. Based on the Manual on Uniform Traffic Control Devices (MUTCD), Federal Highway Administration, dated 2009, Four-Hour Vehicular Volume traffic signal warrant, a signal is not anticipated to be warranted at this intersection. Because improvements have recently been completed along Geiger Road and a signal is not expected to be warranted at this intersection, no additional mitigation is proposed. However, the intersection should be monitored upon buildout of Ewa by Gentry Makai to determine if additional improvements are required. Signal warrants are included in Appendix D.

[9] Kapolei Parkway/Geiger Road

The northbound left-turn is expected to operate at LOS F and overcapacity during both peak hours of traffic by Base Year 2021. Additionally, the eastbound and westbound left-turn movements are expected to operate at LOS F during the PM peak. Mitigation is proposed in Section 4.3.2 below.

[10] Fort Weaver Road/Geiger Road & [11] Fort Weaver Road/Renton Road

Similar to existing conditions, all minor street and left-turn movements are expected to operate at LOS F during both peak hours of traffic. The long delays at this intersection are generally ascribed to requisite long traffic signal cycle lengths, split phase operation and generally long crosswalk lengths across Fort Weaver Road. Further widening of Fort Weaver Road is not prescribed by the ORTP 2035 and is generally considered infeasible due to insufficient right-of-way (ROW). Therefore, no mitigation is proposed at this intersection.

Figure 4.2 illustrates the Base Year 2021 forecast traffic volumes and LOS for the study intersection movements. Table 4.2 summarizes the Base Year 2021 LOS at the study intersections compared to existing conditions. LOS worksheets are provided in Appendix C.

4.3.2 Base Year 2021 with Mitigation Intersection Analysis

The following mitigation is proposed for Base Year 2021. Note that this mitigation is anticipated to be required prior to construction of the Project and is expected to be completed by others.

[9] Kapolei Parkway/Geiger Road

- Widen the northbound approach of Kapolei Parkway to provide dual left-turn lanes.
- Restripe the eastbound approach of Geiger Road to provide one (1) left-turn lane, one (1) through lane and one (1) right-turn lane.

With the proposed mitigation, all movements are anticipated to operate at under capacity conditions with all major through movements operating at LOS D or better and all minor street and left-turn movements operating at LOS E or better.

Figure 4.3 illustrates the Base Year 2021 with mitigation forecast traffic volumes and LOS for the study intersection movements. Table 4.2 summarizes the Base Year 2021 with mitigation LOS at the study intersections compared to Base Year 2021 without mitigation conditions. LOS worksheets are provided in Appendix C. A full summary of recommended roadway improvements is included in Appendix E.

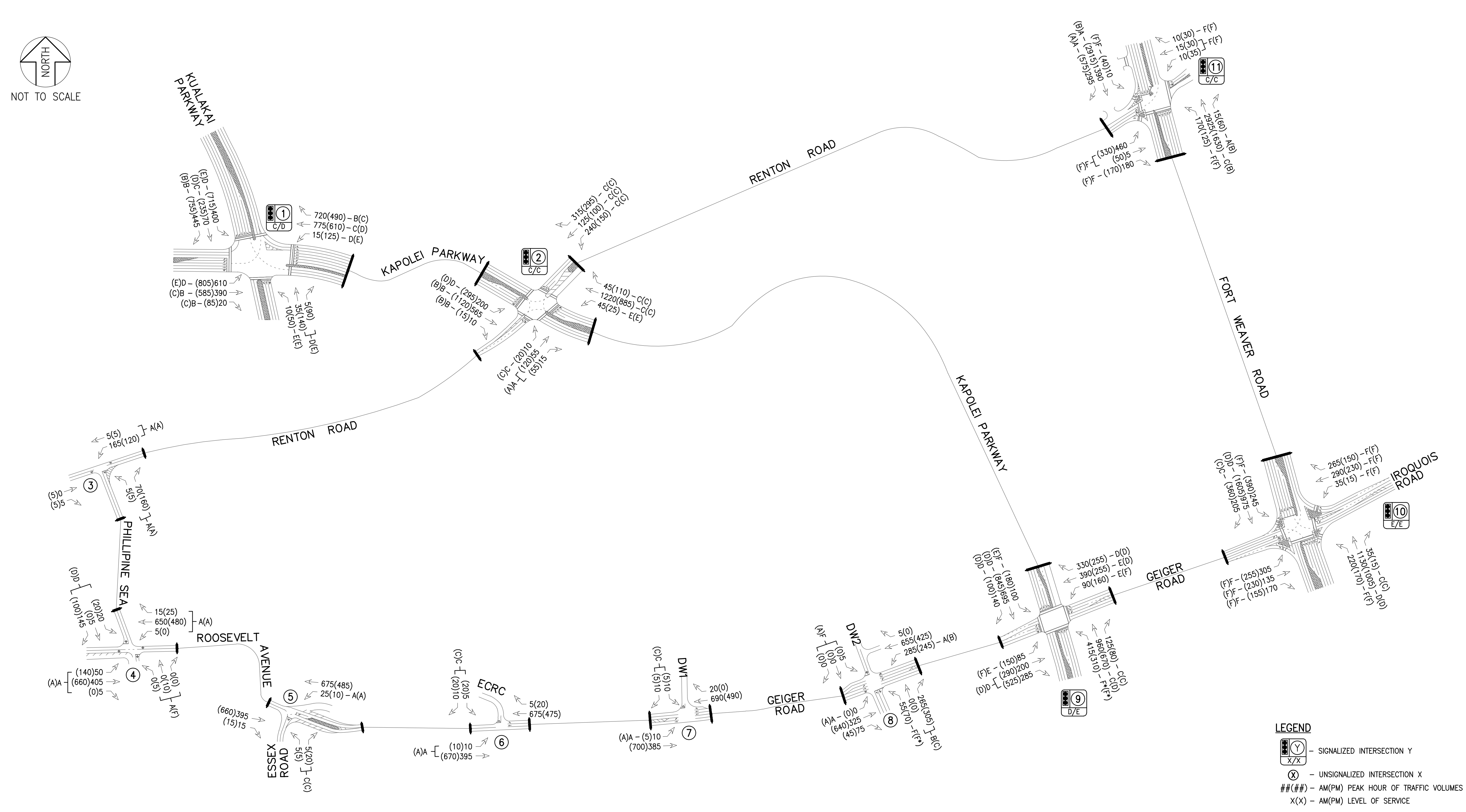


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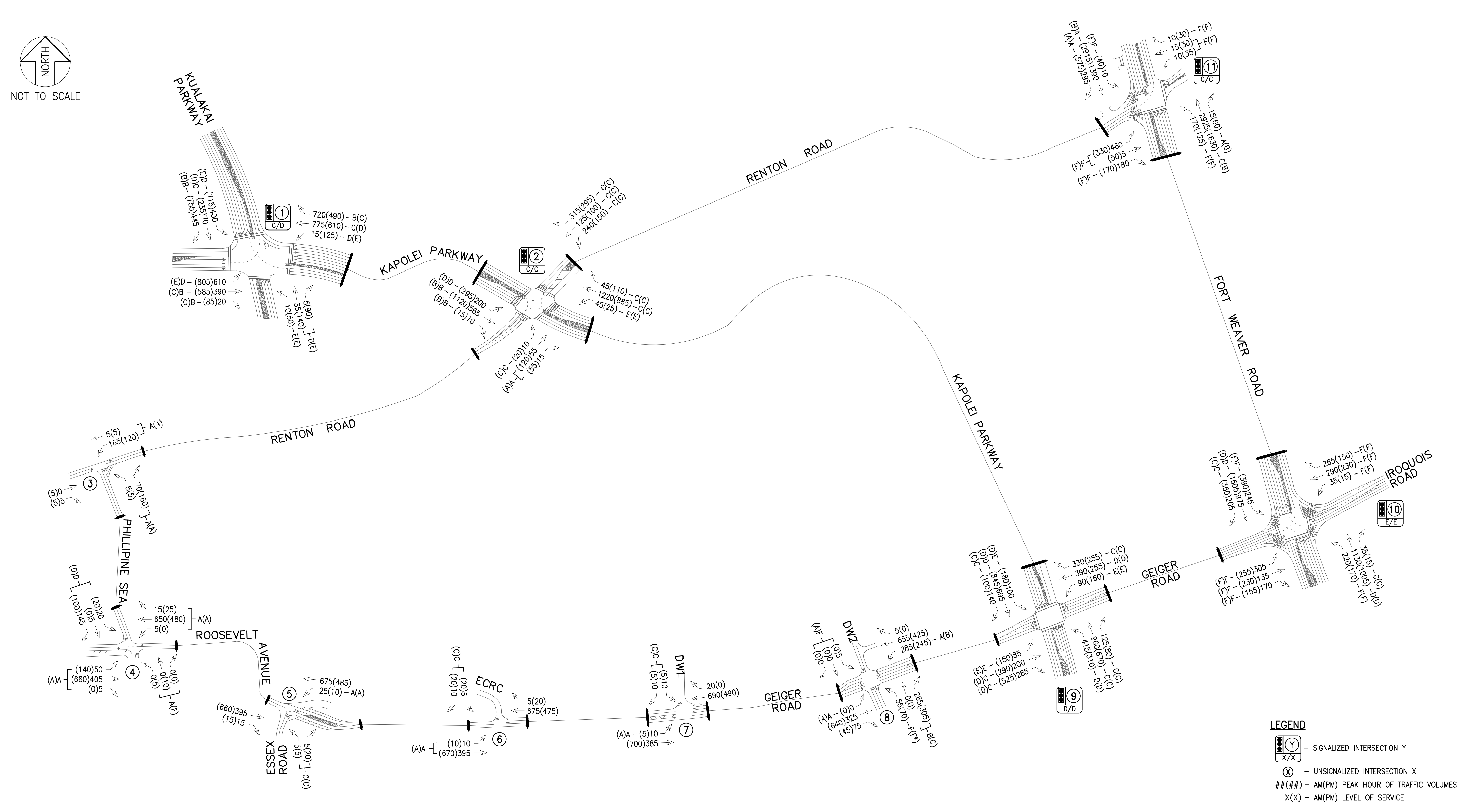
FIGURE 4.2

BASE YEAR 2021 LANE CONFIGURATION, VOLUMES, AND MOVEMENT LOS



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BASE YEAR 2021 WITH MITIGATION LANE CONFIGURATION, VOLUMES, AND MOVEMENT LOS

FIGURE 4.3

TABLE 4.2: LOS SUMMARY TABLE
EXISTING AND BASE YEAR 2021 CONDITIONS

Intersection	Existing 2017 Conditions						Base Year 2021 Conditions						Base Year 2021 with Mitigation Conditions					
	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
1: Kualakai Pkwy & Kapolei Pkwy																		
NB LT	74.1	0.53	E	51.3	0.78	D	73.3	0.58	E	79.4	0.76	E						
NB TH/RT	31.3	0.14	C	30.9	0.43	C	45.0	0.20	D	62.1	0.57	E						
EB LT	28.9	0.75	C	29.6	0.72	C	38.2	0.84	D	59.2	0.92	E						
EB TH	10.0	0.13	A	19.6	0.43	B	11.7	0.16	B	25.5	0.32	C						
EB TH/RT	10.0	0.14	B	19.9	0.44	B	11.7	0.16	B	25.6	0.33	C						
WB LT	38.0	0.29	D	33.9	0.57	C	51.0	0.32	D	66.7	0.70	E	**Same as Base Year 2021**					
WB TH	19.5	0.45	B	24.4	0.47	C	27.3	0.52	C	48.6	0.61	D						
WB RT	16.2	0.52	B	14.2	0.23	B	19.4	0.60	B	24.7	0.42	C						
SB LT	32.9	0.64	C	28.8	0.75	C	44.3	0.82	D	60.5	0.91	E						
SB TH	25.6	0.11	C	21.3	0.27	C	32.1	0.11	C	36.1	0.24	D						
SB RT	16.0	0.12	B	13.5	0.22	B	17.9	0.23	B	15.5	0.34	B						
OVERALL	20.6	-	C	23.9	-	C	27.6	-	C	43.3	-	D						
2: Kapolei Pkwy & Renton Rd																		
NB LT	53.5	0.75	D	43.7	0.61	D	63.5	0.77	E	58.7	0.68	E						
NB TH	21.4	0.62	C	20.8	0.56	C	25.5	0.68	C	26.6	0.69	C						
NB TH/RT	21.8	0.62	C	21.5	0.57	C	26.1	0.68	C	27.4	0.69	C						
EB LT	20.4	0.03	C	17.3	0.05	B	28.9	0.03	C	24.8	0.06	C						
EB TH/RT	18.4	0.11	A	16.9	0.29	A	25.7	0.13	A	24.3	0.35	A						
WB LT	24.4	0.54	C	21.3	0.39	C	35.0	0.63	C	31.8	0.49	C	**Same as Base Year 2021**					
WB TH	19.1	0.20	B	16.2	0.18	B	26.8	0.25	C	23.1	0.21	C						
WB RT	18.7	0.15	B	15.8	0.10	B	26.4	0.21	C	22.4	0.11	C						
SB LT	37.6	0.78	D	28.2	0.80	C	47.6	0.84	D	43.7	0.88	D						
SB TH	13.4	0.16	B	13.6	0.44	B	14.2	0.24	B	14.8	0.49	B						
SB TH/RT	13.4	0.16	B	13.8	0.44	B	14.3	0.24	B	15.0	0.49	B						
OVERALL	22.1	-	C	18.6	-	B	26.5	-	C	24.1	-	C						
3: Phillipine Sea & Renton Rd																		
NB LT/RT	8.6	0.07	A	9.0	0.16	A	8.8	0.08	A	9.1	0.17	A	**Same as Base Year 2021**					
WB LT/TH	7.5	0.10	A	7.4	0.08	A	7.5	0.11	A	7.4	0.08	A						
OVERALL	7.6	-	-	8.1	-	-	7.6	-	-	8.0	-	-						
4: Phillipine Sea & Roosevelt Ave																		
NB LT/TH/RT	0.0	0.00	A	43.9	0.08	E	0.0	0.00	A	71.4	0.23	F						
EB LT/TH/RT	9.2	0.06	A	8.8	0.13	A	9.4	0.06	A	9.1	0.15	A	**Same as Base Year 2021**					
WB LT/TH/RT	8.0	0.00	A	0.0	0.00	A	8.2	0.01	A	0.0	0.00	A						
SB LT/TH/RT	23.0	0.46	C	21.0	0.35	C	29.6	0.57	D	34.3	0.52	D						
OVERALL	3.4	-	-	2.9	-	-	4.3	-	-	4.5	-	-						

Intersection	Existing 2017 Conditions						Base Year 2021 Conditions						Base Year 2021 with Mitigation Conditions					
	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
5: Essex Rd & Roosevelt Ave/Geiger Rd																		
NB LT/RT	15.6	0.01	C	15.4	0.06	C	17.7	0.04	C	16.7	0.08	C	**Same as Base Year 2021**					
WB LT	8.1	0.02	A	9.0	0.01	A	8.3	0.02	A	9.2	0.01	A						
OVERALL	0.2	-	-	0.3	-	-	0.3	-	-	0.4	-	-						
6: Geiger Rd & Ewa Refuse Convenience Center																		
EB LT/TH	9.0	0.01	A	8.3	0.01	A	9.2	0.01	A	8.5	0.01	A	**Same as Base Year 2021**					
SB LT/RT	15.2	0.04	C	18.4	0.12	C	17.2	0.05	C	20.4	0.16	C						
OVERALL	0.3	-	-	0.6	-	-	0.3	-	-	0.7	-	-						
7: Geiger Rd & Honouliuli Drwy 1																		
EB LT	9.2	0.01	A	8.3	0.00	A	9.3	0.01	A	8.5	0.01	A	**Same as Base Year 2021**					
SB LT/RT	16.8	0.04	C	13.8	0.02	B	18.4	0.08	C	19.1	0.04	C						
OVERALL	0.3	-	-	0.1	-	-	0.4	-	-	0.2	-	-						
8: Geiger Rd & Honouliuli Drwy 2																		
NB LT	20.5	0.13	C	24.0	0.07	C	119.7	0.72	F	273.8	1.17	F*	**Same as Base Year 2021**					
NB TH/RT	9.7	0.08	A	10.9	0.06	B	12.2	0.37	B	17.2	0.53	C						
EB LT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A						
WB LT	8.2	0.04	A	9.2	0.03	A	9.4	0.28	A	11.1	0.31	B						
SB LT/TH/RT	24.7	0.01	C	0.0	0.00	A	105.8	0.13	F	0.0	0.00	A						
OVERALL	1.4	-	-	0.8	-	-	7.8	-	-	15.7	-	-						
9: Kapolei Pkwy & Geiger Rd																		
NB LT	45.5	0.89	D	42.4	0.86	D	95.6	1.01	F*	120.0	1.05	F*	51.5	0.84	D	50.1	0.80	D
NB TH	23.4	0.66	C	24.3	0.47	C	32.4	0.69	C	37.6	0.59	D	32.4	0.80	C	33.3	0.66	C
NB RT	17.3	0.11	B	20.6	0.04	C	23.4	0.11	C	29.8	0.04	C	23.2	0.12	C	26.3	0.04	C
EB LT	67.2	0.67	E	65.9	0.77	E	74.8	0.80	E	85.2	0.87	F	61.7	0.79	E	59.8	0.84	E
EB TH	-	-	-	-	-	-	-	-	-	-	-	-	33.9	0.43	C	41.9	0.75	D
EB TH/RT	33.0	0.22	C	37.9	0.67	D	42.6	0.39	D	52.3	0.73	D	-	-	-	-	-	-
EB RT	-	-	-	-	-	-	-	-	-	-	-	-	31.1	0.17	C	45.2	0.83	D
WB LT	53.4	0.77	D	46.1	0.82	D	76.9	0.81	E	87.3	0.88	F	61.2	0.79	E	61.5	0.85	E
WB TH	36.4	0.76	D	27.8	0.36	C	60.6	0.88	E	47.3	0.60	D	43.0	0.83	D	39.3	0.64	D
WB RT	29.1	0.19	C	26.0	0.14	C	42.7	0.42	D	40.7	0.13	D	33.3	0.40	C	33.4	0.14	C
SB LT	52.1	0.77	D	45.2	0.81	D	80.3	0.82	F	78.7	0.88	E	60.4	0.80	E	55.0	0.85	D
SB TH	32.0	0.65	C	31.0	0.75	C	52.9	0.85	D	53.9	0.88	D	36.4	0.73	D	36.8	0.82	D
SB RT	26.1	0.02	C	23.9	0.01	C	39.0	0.09	D	35.2	0.06	D	28.7	0.10	C	26.0	0.06	C
OVERALL	32.7	-	C	34.0	-	C	53.1	-	D	61.1	-	E	39.3	-	D	41.8	-	D

Intersection	Existing 2017 Conditions						Base Year 2021 Conditions						Base Year 2021 with Mitigation Conditions					
	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
10: Ft Weaver Rd & Geiger Rd/Iroquois Rd																		
NB LT	111.8	0.76	F	114.0	0.72	F	111.0	0.77	F	113.3	0.74	F						
NB TH	33.1	0.44	C	32.8	0.38	C	37.6	0.47	D	39.8	0.43	D						
NB RT	26.0	0.02	C	27.0	0.01	C	29.4	0.02	C	32.0	0.01	C						
EB LT	99.9	0.53	F	102.7	0.63	F	101.8	0.68	F	96.2	0.55	F						
EB TH	101.9	0.54	F	101.2	0.65	F	100.9	0.57	F	110.7	0.81	F						
EB RT	98.2	0.36	F	97.5	0.40	F	98.5	0.46	F	95.4	0.45	F	**Same as Base Year 2021**					
WB LT	84.1	0.11	F	91.7	0.06	F	81.7	0.12	F	87.5	0.06	F						
WB TH	126.8	0.91	F	130.8	0.88	F	122.9	0.91	F	126.4	0.89	F						
WB RT	86.2	0.23	F	91.8	0.07	F	83.9	0.24	F	88.2	0.11	F						
SB LT	115.1	0.79	F	114.1	0.87	F	116.2	0.81	F	114.7	0.87	F						
SB TH	30.5	0.36	C	28.5	0.55	C	35.1	0.40	D	36.1	0.61	D						
SB RT	26.6	0.09	C	22.8	0.22	C	30.9	0.14	C	29.9	0.31	C						
OVERALL	60.0	-	E	55.3	-	E	64.2	-	E	61.1	-	E						
11: Ft Weaver Rd & Renton Rd																		
NB LT	130.6	0.89	F	134.4	0.87	F	128.0	0.90	F	134.6	0.88	F						
NB TH	22.6	0.80	C	16.1	0.46	B	27.3	0.86	C	18.2	0.50	B						
NB RT	8.9	0.01	A	11.2	0.03	B	9.6	0.01	A	12.2	0.04	B						
EB LT/TH	115.1	0.89	F	104.8	0.76	F	117.9	0.91	F	106.4	0.79	F						
EB RT	92.9	0.37	F	94.8	0.32	F	94.0	0.45	F	96.4	0.44	F	**Same as Base Year 2021**					
WB LT/TH	143.9	0.72	F	130.8	0.81	F	142.7	0.75	F	129.7	0.82	F						
WB RT	114.8	0.05	F	108.3	0.01	F	113.6	0.02	F	107.1	0.01	F						
SB LT	118.7	0.24	F	118.3	0.60	F	118.8	0.32	F	117.5	0.63	F						
SB TH	0.4	0.43	A	4.1	0.90	A	0.5	0.48	A	11.3	0.98	B						
SB RT	0.3	0.15	A	0.7	0.29	A	0.4	0.18	A	0.9	0.35	A						
OVERALL	29.6	-	C	20.4	-	C	32.6	-	C	25.2	-	C						

* Denotes overcapacity conditions, v/c ≥ 1.

4.4 Base Year 2023 Analysis

It is anticipated that by Base Year 2023, traffic will have increased over Base Year 2021 conditions due to the ongoing development in the Kapolei region. Actual growth within the study region may vary based upon the approval process of the various projects. Base Year 2023 traffic projections were analyzed for three (3) different access scenarios that are proposed for the ENV Support Facilities at Honouliuli WWTP located on the Project site.

4.4.1 Base Year 2023 Intersection Analysis

By Base Year 2023 without the Project, the majority of study intersections are forecast to operate similar to Base Year 2021 with mitigation conditions. However, the following intersection movements are anticipated to worsen to less than adequate conditions by Base Year 2023 from Base Year 2021.

[1] Kualakai Parkway/Kapolei Parkway

During the PM peak hour of traffic, the eastbound left-turn is expected to operate at LOS F and overcapacity conditions and the southbound left-turn is expected to operate near overcapacity conditions. Because both the eastbound and southbound approaches currently operate with dual left-turn lanes, additional mitigation at this intersection is generally considered infeasible, and no mitigation is proposed.

[11] Fort Weaver Road/Renton Road

During the PM peak hour of traffic, the southbound through movement is expected to operate at LOS F and overcapacity conditions. However, as described in Section 4.3.1, further widening of Fort Weaver Road is generally considered infeasible due to insufficient ROW, and no mitigation is proposed.

The new accesses for the ENV Support Facilities at Honouliuli WWTP are discussed further below. The Roosevelt Avenue Access Only scenario, the Renton Road Access Only scenario and the Renton Road and Roosevelt Avenue Accesses scenario are analyzed in Section 4.4.2, Section 4.4.3 and Section 4.4.4, respectively.

4.4.2 Roosevelt Avenue Access Only Intersection Analysis

A Policy on Geometric Design of Highways and Streets, prepared by the American Association of State Highway and Transportation Officials (AASHTO), hereinafter referred to as the "AASHTO Green Book," provides guidance on the implementation of left-turn lanes. Based on the AASHTO Green Book, left-turn lanes should be removed from through lanes wherever practical, and ideally, left-turn lanes should be provided at driveways along collector roads. Therefore, left-turn lanes are recommended at all new driveways that are proposed with the ENV Support Facilities at Honouliuli WWTP. All left-turn lanes are anticipated to be completed by the ENV Support Facilities at Honouliuli WWTP.

Left-turn storage lane lengths are recommended based on SimTraffic (see Appendix C) and are summarized in Table 4.3.

[12] Geiger Road/Honouliuli Driveway 3

With the proposed left-turn lane, the left-turn into Honouliuli Driveway 3 is expected to operate at LOS B or better during both peak hours. The southbound approach is expected to operate at LOS E(F) during the AM(PM) peak hour. However, volumes exiting the driveway are anticipated to be low with no more than 20 vehicles in either peak hour.

[13] Roosevelt Avenue/Honouliuli Driveway 4

With the proposed left-turn lane, the left-turn into Honouliuli Driveway 4 is expected to operate adequately at LOS B or better during both peak hours. However, the southbound approach is expected to operate at overcapacity conditions due to the large number of left-turns out of the driveway during the PM peak hour. Because traffic is expected to queue into the project site and not affect any external roadways, no mitigation is proposed at the intersection. However, the driveway should be monitored upon full buildout of the project to determine if additional improvements will be required to facilitate project circulation.

Figure 4.4 illustrates the Base Year 2023 forecast traffic volumes and LOS for the study intersection movements for the Roosevelt Avenue Access Only scenario. Table 4.6 summarizes the Base Year 2023 LOS at the study intersections compared to Base Year 2021 with mitigation. LOS worksheets are provided in Appendix C.

4.4.3 Renton Road Access Only Intersection Analysis

Left-turn storage lane lengths are recommended based on SimTraffic (see Appendix C) and are summarized in Table 4.4.

[12] Geiger Road/Honouliuli Driveway 3

With the proposed left-turn lane, all movements at the new intersection are expected to operate adequately at LOS D or better during both peak hours of traffic.

[14] Renton Road/Honouliuli Driveway 5

With the proposed left-turn lane, all movements at the new intersection are expected to operate adequately at LOS B or better during both peak hours of traffic.

Figure 4.5 illustrates the Base Year 2023 forecast traffic volumes and LOS for the study intersection movements for the Renton Road Access Only scenario. Table 4.6 summarizes the Base Year 2023 LOS at the study intersections compared to Base Year 2021 with mitigation. LOS worksheets are provided in Appendix C.

4.4.4 Renton Road and Roosevelt Avenue Accesses Intersection Analysis

Left-turn storage lane lengths are recommended based on SimTraffic (see Appendix C) and are summarized in Table 4.5.

[12] Geiger Road/Honouliuli Driveway 3

With the proposed left-turn lane, the left-turn into Honouliuli Driveway 3 is expected to operate at LOS B or better during both peak hours. The southbound approach is expected to operate at

LOS E during both peak hours. However, volumes exiting the driveway are anticipated to be low with no more than 15 vehicles in either peak hour.

[13] Roosevelt Avenue/Honouliuli Driveway 4

With the proposed left-turn lane, the left-turn into Honouliuli Driveway 4 is expected to operate adequately at LOS A or better during both peak hours. However, the southbound approach is expected to operate at LOS F due to the higher proportion of left-turns out of the driveway during the PM peak hour. Because traffic is expected to queue into the project site and not affect any external roadways, no mitigation is proposed at the intersection.

[14] Renton Road/Honouliuli Driveway 5

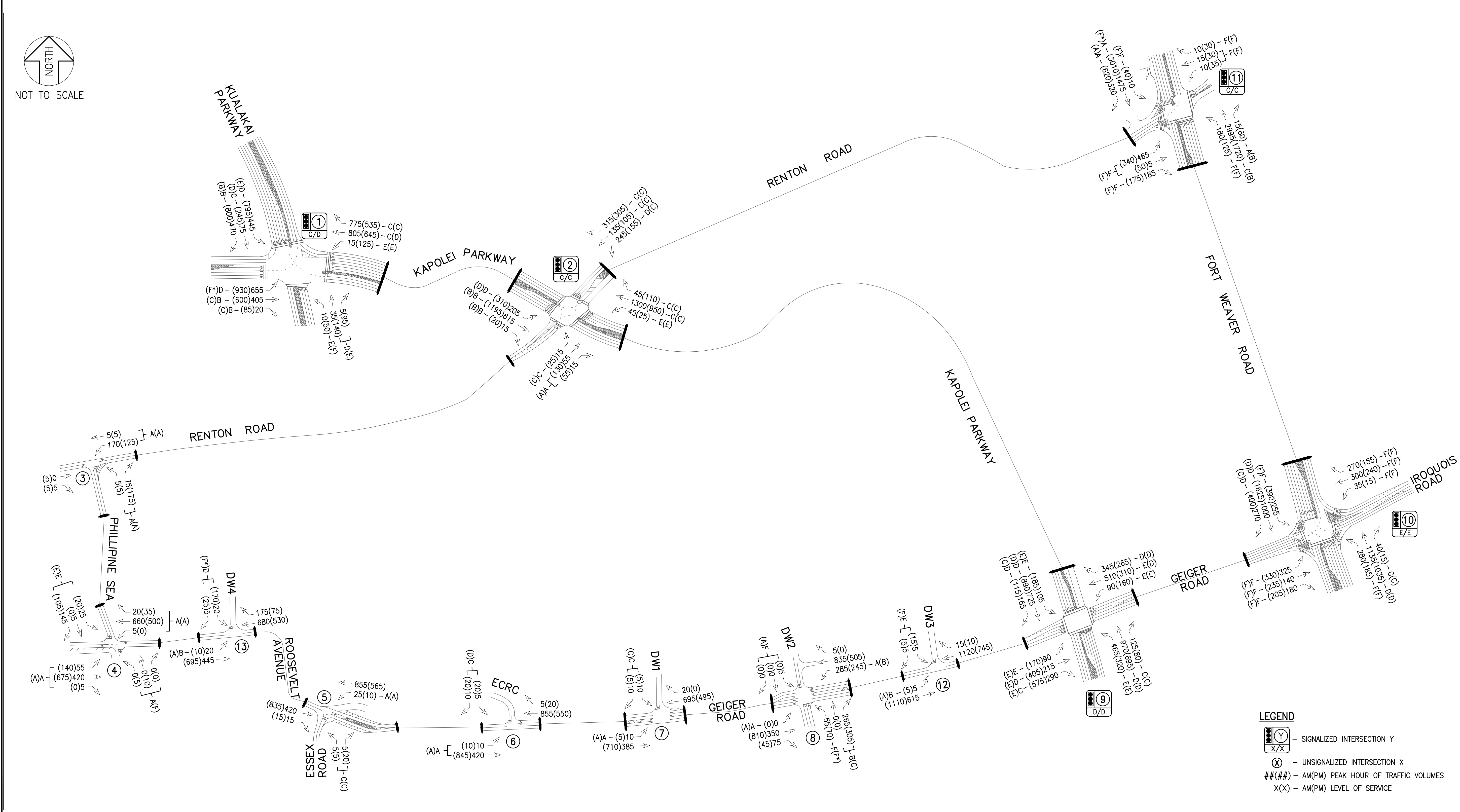
With the proposed left-turn lane, all movements at the new intersection are expected to operate adequately at LOS A or better during both peak hours of traffic.

Figure 4.6 illustrates the Base Year 2023 forecast traffic volumes and LOS for the study intersection movements for the Renton Road and Roosevelt Avenue Accesses scenario. Table 4.6 summarizes the Base Year 2023 LOS at the study intersections compared to Base Year 2021 with mitigation. LOS worksheets are provided in Appendix C. A full summary of recommended roadway improvements is included in Appendix E.

Table 4.3: Base Year 2023 (Roosevelt Avenue Access Only) Left-Turn Storage Lane Length Calculations				
Movement	Peak Hour	Design Volume per lane (veh)	95th Percentile Queue Lengths (ft) [1]	Recommended storage length [2]
Geiger Road & Honouliuli Driveway 3 Intersection				
Eastbound Left-turn lane	AM	5	**19**	Minimum 25 ft storage recommended
	PM	5	17	
Roosevelt Avenue & Honouliuli Driveway 4 Intersection				
Eastbound Left-turn lane	AM	20	**38**	Minimum 50 ft storage recommended
	PM	10	23	

Notes:

1. 95th percentile queue lengths are based on SimTraffic Results.
2. Recommended storage length is exclusive of taper length or deceleration length.
   To be verified upon design.



HONOULIULI WASTEWATER
TREATMENT PLANT TIAR

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FIGURE 4.4

BASE YEAR 2023 ROOSEVELT AVENUE ACCESS ONLY
LANE CONFIGURATION, VOLUMES, AND MOVEMENT LOS

Table 4.4: Base Year 2023 (Renton Road Access Only) Left-Turn Storage Lane Length Calculations				
Movement	Peak Hour	Design Volume per lane (veh)	95th Percentile Queue Lengths (ft) [1]	Recommended storage length [2]
Geiger Road & Honouliuli Driveway 3 Intersection				
Eastbound Left-turn lane	AM	5	15	Minimum 25 ft storage recommended.
	PM	5	**17**	
Renton Road & Honouliuli Driveway 5 Intersection				
Westbound Left-turn lane	AM	185	**44**	Minimum 50 ft storage recommended
	PM	85	44	

Notes:

1. 95th percentile queue lengths are based on SimTraffic Results.
2. Recommended storage length is exclusive of taper length or deceleration length. To be verified upon design.

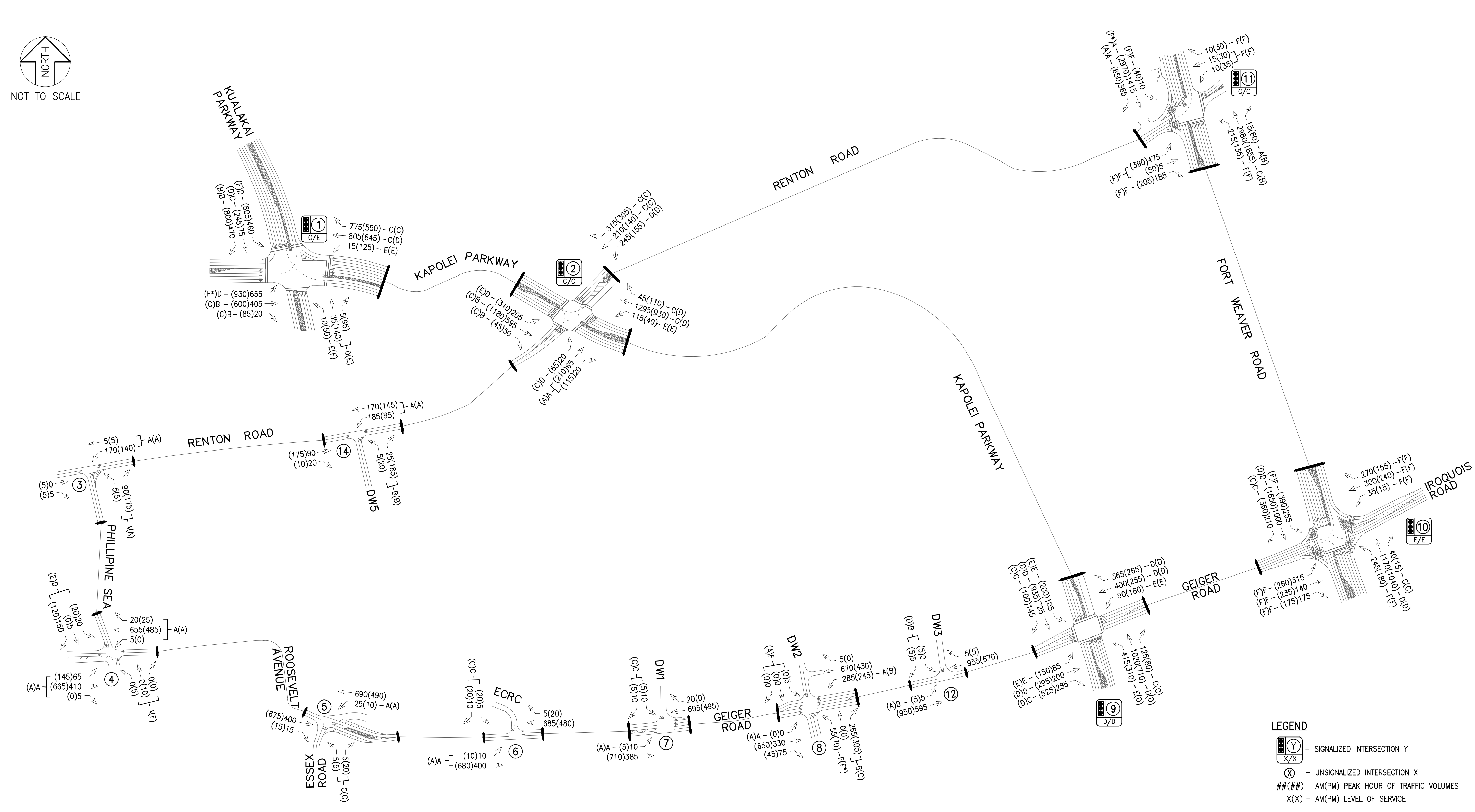

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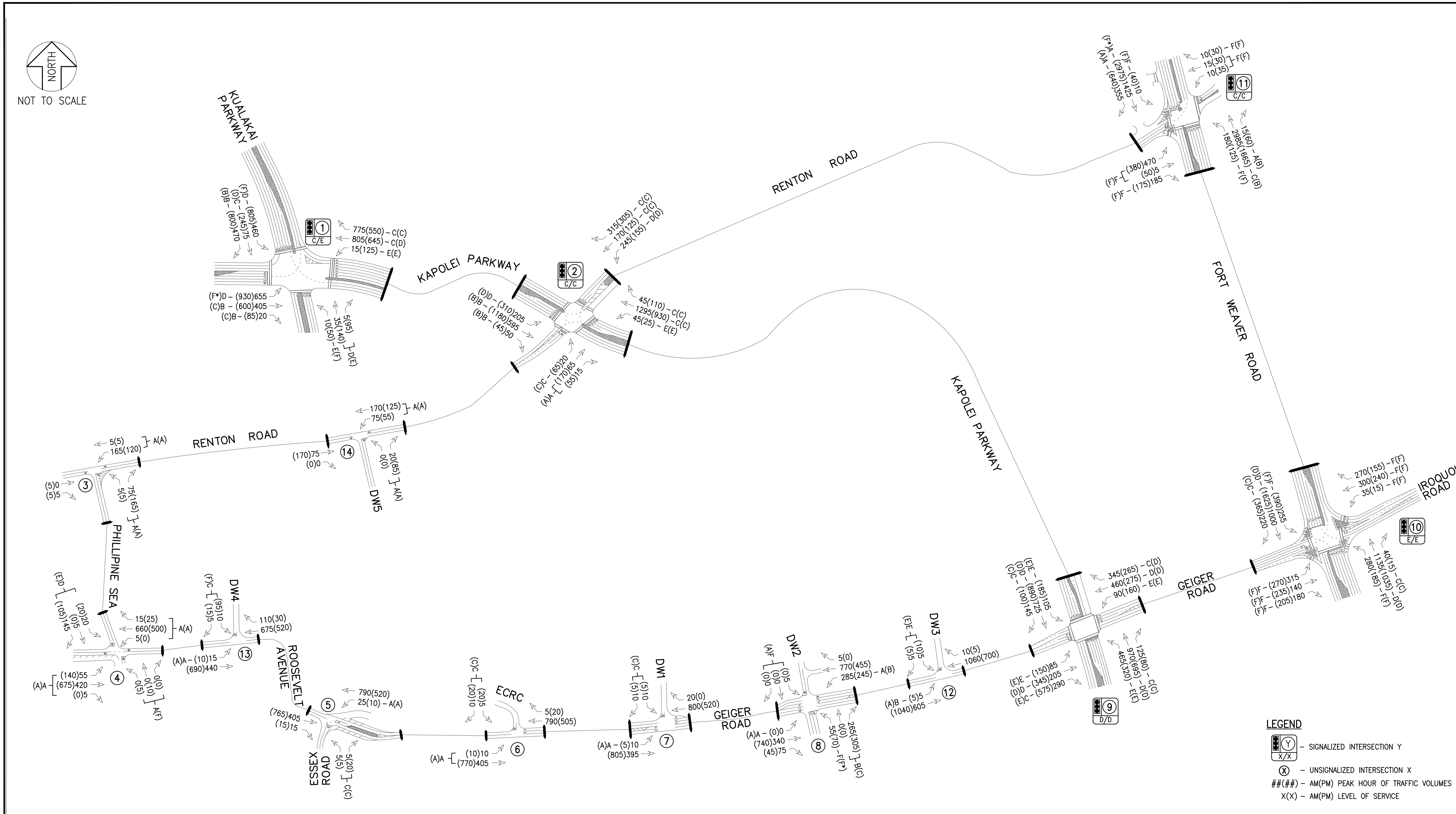
FIGURE 4.5

BASE YEAR 2023 RENTON ROAD ACCESS ONLY
LANE CONFIGURATION, VOLUMES, AND MOVEMENT LOS

Table 4.5: Base Year 2023 (Renton Road and Roosevelt Avenue Accesses) Left-Turn Storage Lane Length Calculations				
Movement	Peak Hour	Design Volume per lane (veh)	95th Percentile Queue Lengths (ft) [1]	Recommended storage length [2]
Geiger Road & Honouliuli Driveway 3 Intersection				
Eastbound Left-turn lane	AM	5	**19**	Minimum 25 ft storage recommended
	PM	5	19	
Roosevelt Avenue & Honouliuli Driveway 4 Intersection				
Eastbound Left-turn lane	AM	15	**31**	Minimum 50 ft storage recommended
	PM	10	18	
Renton Road & Honouliuli Driveway 5 Intersection				
Westbound Left-turn lane	AM	75	30	Minimum 50 ft storage recommended
	PM	55	**34**	

Notes:

1. 95th percentile queue lengths are based on SimTraffic Results.
2. Recommended storage length is exclusive of taper length or deceleration length.
   To be verified upon design.



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BASE YEAR 2023 RENTON ROAD AND ROOSEVELT AVENUE ACCESSES
LANE CONFIGURATION, VOLUMES, AND MOVEMENT LOS

FIGURE
4.6

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TABLE 4.6: LOS SUMMARY TABLE
EXISTING CONDITIONS AND BASE YEAR 2023 CONDITIONS

Intersection	Base Year 2021 with Mitigation Conditions						Base Year 2023 Roosevelt Avenue Access Only Conditions						Base Year 2023 Renton Road Access Only Conditions						Base Year 2023 Renton Road and Roosevelt Avenue Accesses Conditions					
	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: Kualakai Pkwy & Kapolei Pkwy																								
NB LT	73.3	0.58	E	79.4	0.76	E	78.2	0.59	E	85.6	0.77	F	78.6	0.59	E	86.0	0.77	F	78.6	0.59	E	86.0	0.77	F
NB TH/RT	45.0	0.20	D	62.1	0.57	E	49.1	0.21	D	68.2	0.58	E	49.5	0.21	D	68.6	0.58	E	49.5	0.21	D	68.6	0.58	E
EB LT	38.2	0.84	D	59.2	0.92	E	42.3	0.86	D	95.3	1.05	F*	42.7	0.86	D	97.2	1.05	F*	42.7	0.86	D	97.2	1.05	F*
EB TH	11.7	0.16	B	25.5	0.32	C	12.1	0.16	B	27.1	0.32	C	12.3	0.16	B	27.0	0.32	C	12.3	0.16	B	27.0	0.32	C
EB TH/RT	11.7	0.16	B	25.6	0.33	C	12.1	0.16	B	27.3	0.33	C	12.3	0.16	B	27.2	0.33	C	12.3	0.16	B	27.2	0.33	C
WB LT	51.0	0.32	D	66.7	0.70	E	55.1	0.33	E	73.1	0.71	E	55.5	0.33	E	73.5	0.71	E	55.5	0.33	E	73.5	0.71	E
WB TH	27.3	0.52	C	48.6	0.61	D	29.9	0.54	C	53.1	0.64	D	30.2	0.54	C	52.9	0.63	D	30.2	0.54	C	52.9	0.63	D
WB RT	19.4	0.60	B	24.7	0.42	C	21.0	0.63	C	26.1	0.44	C	20.9	0.62	C	26.2	0.45	C	20.9	0.62	C	26.2	0.45	C
SB LT	44.3	0.82	D	60.5	0.91	E	50.6	0.85	D	76.0	0.97	E	51.5	0.86	D	80.4	0.98	F	51.5	0.86	D	80.4	0.98	F
SB TH	32.1	0.11	C	36.1	0.24	D	34.1	0.11	C	38.6	0.25	D	34.1	0.11	C	39.0	0.25	D	34.1	0.11	C	39.0	0.25	D
SB RT	17.9	0.23	B	15.5	0.34	B	18.4	0.25	B	16.3	0.36	B	18.3	0.25	B	16.6	0.36	B	18.3	0.25	B	16.6	0.36	B
OVERALL	27.6	-	C	43.3	-	D	30.3	-	C	55.0	-	D	30.7	-	C	56.1	-	E	30.7	-	C	56.1	-	E
2: Kapolei Pkwy & Renton Rd																								
NB LT	63.5	0.77	E	58.7	0.68	E	66.6	0.77	E	63.4	0.69	E	55.7	0.80	E	69.4	0.77	E	67.1	0.77	E	65.9	0.70	E
NB TH	25.5	0.68	C	26.6	0.69	C	26.6	0.70	C	28.7	0.72	C	27.3	0.70	C	35.2	0.75	D	27.1	0.70	C	30.5	0.73	C
NB TH/RT	26.1	0.68	C	27.4	0.69	C	27.1	0.70	C	29.6	0.72	C	27.8	0.70	C	36.8	0.76	D	27.6	0.70	C	31.5	0.73	C
EB LT	28.9	0.03	C	24.8	0.06	C	32.0	0.05	C	26.9	0.07	C	35.5	0.08	D	29.2	0.19	C	33.6	0.07	C	28.5	0.19	C
EB TH/RT	25.7	0.13	A	24.3	0.35	A	27.9	0.13	A	26.2	0.37	A	28.1	0.17	A	29.7	0.57	A	28.1	0.16	A	26.8	0.43	A
WB LT	35.0	0.63	C	31.8	0.49	C	39.1	0.66	D	34.9	0.53	C	40.5	0.67	D	48.2	0.67	D	40.2	0.67	D	37.0	0.56	D
WB TH	26.8	0.25	C	23.1	0.21	C	29.3	0.28	C	24.8	0.22	C	30.9	0.42	C	25.1	0.25	C	30.0	0.35	C	24.9	0.24	C
WB RT	26.4	0.21	C	22.4	0.11	C	28.7	0.22	C	24.1	0.12	C	28.9	0.24	C	24.3	0.15	C	28.7	0.22	C	23.8	0.12	C
SB LT	47.6	0.84	D	43.7	0.88	D	50.9	0.86	D	50.4	0.89	D	51.7	0.86	D	62.1	0.91	E	51.5	0.86	D	53.4	0.90	D
SB TH	14.2	0.24	B	14.8	0.49	B	14.4	0.26	B	15.5	0.51	B	18.2	0.29	B	20.3	0.55	C	14.8	0.26	B	16.8	0.52	B
SB TH/RT	14.3	0.24	B	15.0	0.49	B	14.5	0.26	B	15.7	0.51	B	18.3	0.30	B	20.7	0.55	C	14.9	0.26	B	17.1	0.52	B
OVERALL	26.5	-	C	24.1	-	C	27.7	-	C	26.0	-	C	29.7	-	C	32.2	-	C	28.2	-	C	27.6	-	C
3: Phillipine Sea & Renton Rd																								
NB LT/RT	8.8	0.08	A	9.1	0.17	A	8.9	0.09	A	9.2	0.19	A	8.9	0.10	A	9.2	0.19	A	8.9	0.09	A	9.1	0.18	A
WB LT/TH	7.5	0.11	A	7.4	0.08	A	7.5	0.11	A	7.4	0.08	A	7.5	0.11	A	7.5	0.10	A	7.5	0.11	A	7.4	0.08	A
OVERALL	7.6	-	-	8.0	-	-	7.7	-	-	8.1	-	-	7.7	-	-	8.1	-	-	7.7	-	-	8.0	-	-
4: Phillipine Sea & Roosevelt Ave																								
NB LT/TH/RT	0.0	0.00	A	71.4	0.23	F	0.0	0.00	A	79.5	0.26	F	0.0	0.00	A	78.0	0.25	F	0.0	0.00	A	78.0	0.25	F
EB LT/TH/RT	9.4	0.06	A	9.1	0.15	A	9.5	0.07	A	9.3	0.15	A	9.5	0.08	A	9.2	0.16	A	9.4	0.07	A	9.2	0.15	A
WB LT/TH/RT	8.2	0.01	A	0.0	0.00	A	8.3	0.01	A	0.0	0.00	A	8.3	0.01	A	0.0	0.00	A	8.3	0.01	A	0.0	0.00	A
SB LT/TH/RT	29.6	0.57	D	34.3	0.52	D	35.2	0.63	E	38.8	0.57	E	32.2	0.60	D	36.9	0.59	E	31.3	0.59	D	38.8	0.57	E
OVERALL	4.3	-	-	4.5	-	-	5.0	-	-	4.9	-	-	4.7	-	-	5.2	-	-	4.4	-	-	4.9	-	-
5: Essex Rd & Roosevelt Ave/Geiger Rd																								
NB LT/RT	17.7	0.04	C	16.7	0.08	C	21.6	0.05	C	21.4	0.11	C	18.0	0.04	C	17.0	0.08	C	19.9	0.04	C	19.1	0.10	C
WB LT	8.3	0.02	A	9.2	0.01	A	8.4	0.03	A	9.9	0.02	A	8.3	0.03	A	9.2	0.01	A	8.3	0.03	A	9.6	0.01	A
OVERALL	0.3	-	-	0.4	-	-	0.3	-	-	0.4	-	-	0.3	-	-	0.4	-	-	0.4	-	-	0.4	-	-
6: Geiger Rd & Ewa Refuse Convenience Center																								
EB LT/TH	9.2	0.01	A	8.5	0.01	A	10.0	0.02	A	8.8	0.01	A	9.2	0.01	A	8.6	0.01	A	9.7	0.01	A	8.6	0.01	A
SB LT/RT	17.2	0.05	C	20.4	0.16	C	21.5	0.07	C	28.1	0.22	D	17.4	0.05	C	20.8	0.16	C	19.7	0.06	C	23.9	0.19	C
OVERALL	0.3	-	-	0.7	-	-	0.3	-	-	0.8	-	-	0.3	-	-	0.7	-	-	0.3	-	-	0.8	-	-
7: Geiger Rd & Honouliuli Drwy 1																								
EB LT	9.3	0.01	A	8.5	0.01	A	9.4	0.01	A	8.5	0.01	A	9.4	0.01	A	8.5	0.01	A	9.8	0.01	A	8.6	0.01	A
SB LT/RT	18.4	0.08	C	19.1	0.04	C	18.4	0.08	C	19.4	0.04	C	18.4	0.08	C	19.4	0.04	C	21.0	0.09	C	22.1	0.05	C
OVERALL	0.4	-	-	0.2	-	-	0.4	-	-	0.2	-	-	0.4	-	-	0.2	-	-	0.4	-	-	0.2	-	-

Intersection	Base Year 2021 with Mitigation Conditions						Base Year 2023 Roosevelt Avenue Access Only Conditions						Base Year 2023 Renton Road Access Only Conditions						Base Year 2023 Renton Road and Roosevelt Avenue Accesses Conditions					
	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
8: Geiger Rd & Honouliuli Drwy 2																								
NB LT	119.7	0.72	F	273.8	1.17	F*	189.0	0.91	F	594.6	1.81	F*	125.5	0.74	F	282.3	1.19	F*	158.7	0.83	F	430.5	1.49	F*
NB TH/RT	12.2	0.37	B	17.2	0.53	C	12.4	0.37	B	21.5	0.61	C	12.2	0.37	B	17.4	0.54	C	12.3	0.37	B	19.4	0.58	C
EB LT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
WB LT	9.4	0.28	A	11.1	0.31	B	9.6	0.28	A	12.7	0.37	B	9.5	0.28	A	11.2	0.31	B	9.5	0.28	A	12.0	0.34	B
SB LT/TH/RT	105.8	0.13	F	0.0	0.00	A	162.3	0.19	F	0.0	0.00	A	108.7	0.14	F	0.0	0.00	A	134.5	0.17	F	0.0	0.00	A
OVERALL	7.8	-	-	15.7	-	-	9.2	-	-	25.9	-	-	7.9	-	-	15.9	-	-	8.6	-	-	21.0	-	-
9: Kapolei Pkwy & Geiger Rd																								
NB LT	51.5	0.84	D	50.1	0.80	D	68.2	0.89	E	60.6	0.83	E	57.1	0.86	E	54.0	0.81	D	61.1	0.88	E	59.2	0.83	E
NB TH	32.4	0.80	C	33.3	0.66	C	41.5	0.83	D	41.0	0.70	D	35.0	0.82	D	35.8	0.69	D	37.3	0.82	D	39.4	0.69	D
NB RT	23.2	0.12	C	26.3	0.04	C	28.6	0.12	C	31.6	0.04	C	23.9	0.12	C	27.7	0.04	C	26.1	0.12	C	30.6	0.04	C
EB LT	61.7	0.79	E	59.8	0.84	E	73.5	0.81	E	75.8	0.87	E	66.1	0.79	E	66.5	0.85	E	67.8	0.79	E	74.3	0.86	E
EB TH	33.9	0.43	C	41.9	0.75	D	35.6	0.40	D	56.8	0.88	E	36.5	0.43	D	45.4	0.77	D	35.0	0.41	D	47.8	0.77	D
EB RT	31.1	0.17	C	45.2	0.83	D	32.9	0.19	C	59.2	0.88	E	33.6	0.18	C	49.7	0.84	D	32.5	0.19	C	57.7	0.88	E
WB LT	61.2	0.79	E	61.5	0.85	E	73.5	0.81	E	74.0	0.86	E	65.6	0.80	E	68.3	0.86	E	67.3	0.80	E	76.3	0.87	E
WB TH	43.0	0.83	D	39.3	0.64	D	65.0	0.94	E	44.9	0.69	D	48.6	0.85	D	42.2	0.64	D	54.2	0.90	D	41.7	0.60	D
WB RT	33.3	0.40	C	33.4	0.14	C	35.7	0.40	D	36.4	0.14	D	37.1	0.49	D	36.0	0.14	D	34.9	0.42	C	35.5	0.14	D
SB LT	60.4	0.80	E	55.0	0.85	D	78.2	0.82	E	71.0	0.88	E	67.4	0.81	E	63.6	0.87	E	70.3	0.82	E	69.1	0.87	E
SB TH	36.4	0.73	D	36.8	0.82	D	47.3	0.82	D	48.4	0.88	D	37.5	0.72	D	40.4	0.85	D	43.0	0.81	D	45.7	0.86	D
SB RT	28.7	0.10	C	26.0	0.06	C	36.4	0.13	D	31.4	0.09	C	29.5	0.11	C	26.3	0.06	C	33.3	0.11	C	30.1	0.06	C
OVERALL	39.3	-	D	41.8	-	D	51.1	-	D	52.9	-	D	42.3	-	D	45.6	-	D	45.8	-	D	50.3	-	D
10: Ft Weaver Rd & Geiger Rd/Iroquois Rd																								
NB LT	111.0	0.77	F	113.3	0.74	F	110.3	0.81	F	112.8	0.75	F	110.0	0.79	F	112.9	0.75	F	110.3	0.81	F	112.8	0.75	F
NB TH	37.6	0.47	D	39.8	0.43	D	39.1	0.48	D	43.1	0.46	D	39.4	0.49	D	41.4	0.46	D	39.0	0.48	D	42.0	0.46	D
NB RT	29.4	0.02	C	32.0	0.01	C	30.6	0.02	C	34.3	0.01	C	30.5	0.02	C	33.0	0.01	C	30.5	0.02	C	33.4	0.01	C
EB LT	101.8	0.68	F	96.2	0.55	F	102.3	0.71	F	95.2	0.62	F	102.0	0.70	F	95.7	0.56	F	102.0	0.70	F	94.9	0.55	F
EB TH	100.9	0.57	F	110.7	0.81	F	100.7	0.58	F	109.1	0.84	F	101.1	0.59	F	110.2	0.82	F	101.1	0.59	F	109.8	0.82	F
EB RT	98.5	0.46	F	95.4	0.45	F	99.4	0.51	F	98.0	0.64	F	99.0	0.49	F	97.0	0.54	F	99.8	0.51	F	101.0	0.67	F
WB LT	81.7	0.12	F	87.5	0.06	F	80.9	0.11	F	86.5	0.06	F	80.9	0.11	F	86.5	0.06	F	80.9	0.11	F	86.5	0.06	F
WB TH	122.9	0.91	F	126.4	0.89	F	124.7	0.92	F	127.6	0.90	F	124.7	0.92	F	127.6	0.90	F	124.7	0.92	F	127.6	0.90	F
WB RT	83.9	0.24	F	88.2	0.11	F	83.4	0.26	F	87.4	0.12	F	83.4	0.26	F	87.5	0.12	F	83.4	0.26	F	87.4	0.12	F
SB LT	116.2	0.81	F	114.7	0.87	F	116.8	0.82	F	114.7	0.87	F	116.8	0.82	F	114.7	0.87	F	116.8	0.82	F	114.7	0.87	F
SB TH	35.1	0.40	D	36.1	0.61	D	39.2	0.43	D	40.3	0.64	D	37.3	0.42	D	38.5	0.64	D	39.1	0.43	D	39.0	0.63	D
SB RT	30.9	0.14	C	29.9	0.31	C	35.2	0.19	D	33.9	0.36	C	32.7	0.15	C	31.4	0.32	C	34.3	0.15	C	32.1	0.32	C
OVERALL	64.2	-	E	61.1	-	E	66.9	-	E	64.6	-	E	65.8	-	E	62.6	-	E	66.9	-	E	63.5	-	E
11: Ft Weaver Rd & Renton Rd																								
NB LT	128.0	0.90	F	134.6	0.88	F	128.0	0.90	F	134.6	0.88	F	128.1	0.91	F	133.8	0.89	F	128.0	0.90	F	134.6	0.88	F
NB TH	27.3	0.86	C	18.2	0.50	B	29.1	0.88	C	19.0	0.53	B	29.3	0.88	C	19.4	0.52	B	29.2	0.88	C	19.3	0.52	B
NB RT	9.6	0.01	A	12.2	0.04	B	9.6	0.01	A	12.4	0.04	B	9.8	0.01	A	12.9	0.04	B	9.7	0.01	A	12.8	0.04	B
EB LT/TH	117.9	0.91	F	106.4	0.79	F	118.1	0.92	F	107.1	0.81	F	118.8	0.92	F	112.0	0.87	F	118.4	0.92	F	111.0	0.86	F
EB RT	94.0	0.45	F	96.4	0.44	F	94.2	0.47	F	96.5	0.46	F	93.6	0.46	F	98.5	0.58	F	93.9	0.46	F	95.1	0.44	F
WB LT/TH	142.7	0.75	F	129.7	0.82	F	142.7	0.75	F	129.7	0.82	F	142.7	0.75	F	129.7	0.82	F	142.7	0.75	F	129.7	0.82	F
WB RT	113.6	0.02	F	107.1	0.01	F	113.6	0.02	F	107.1	0.01	F	113.6	0.02	F	107.1	0.01	F	113.6	0.02	F	107.1	0.01	F
SB LT	118.8	0.32	F	117.5	0.63	F	118.8	0.32	F	117.5	0.63	F	118.8	0.32	F	117.5	0.63	F	118.8	0.32	F	117.5	0.63	F
SB TH	0.5	0.48	A	11.3	0.98	B	0.6	0.51	A	19.1	1.01	F*	0.6	0.51	A	21.7	1.02	F*	0.5	0.50	A	18.4	1.01	F*
SB RT	0.4	0.18	A	0.9	0.35	A	0.4	0.19	A	1.1	0.39	A	0.5	0.22	A	1.2	0.41	A	0.5	0.21	A	1.2	0.40	A
OVERALL	32.6	-	C	25.2	-	C	33.3	-	C	29.2	-	C	34.5	-	C	32.4	-	C	33.7	-	C	29.9	-	C
12: Geiger Rd & Honouliuli Drwy 3																								
EB LT	-	-	-	-	-	-	11.5	0.01	B	9.5	0.01	A	10.5	0.01	B	9.2	0.01	A	11.1	0.01	B	9.3	0.01	A
SB LT/RT	-	-	-	-	-	-	39.2	0.09	E	75.3	0.30	F	12.3	0.01	B	31.8	0.08	D	35.5	0.08	E	49.5	0.17	E
OVERALL	0.0	-	-	0.0	-	-	0.3	-	-	0.8	-	-	0.1	-	-	0.2	-	-	0.2	-	-	0.4	-	-

Intersection	Base Year 2021 with Mitigation Conditions						Base Year 2023 Roosevelt Avenue Access Only Conditions						Base Year 2023 Renton Road Access Only Conditions						Base Year 2023 Renton Road and Roosevelt Avenue Accesses Conditions					
	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
13: Roosevelt Ave & Honouliuli Drwy 4																								
EB LT	-	-	-	-	-	-	10.0	0.03	B	8.9	0.01	A	-	-	-	-	-	-	9.7	0.02	A	8.7	0.01	A
SB LT/RT	-	-	-	-	-	-	28.8	0.15	D	207.2	1.25	F*	-	-	-	-	-	-	23.4	0.08	C	57.6	0.66	F
OVERALL	0.0	-	-	0.0	-	-	0.7	-	-	26.9	-	-	0.0	-	-	0.0	-	-	0.4	-	-	4.7	-	-
14: Honouliuli Drwy 5 & Renton Rd																								
NB LT/RT	-	-	-	-	-	-	-	-	-	-	-	-	10.1	0.04	B	11.4	0.28	B	8.8	0.02	A	9.7	0.11	A
WB LT	-	-	-	-	-	-	-	-	-	-	-	-	7.8	0.14	A	7.8	0.07	A	7.5	0.05	A	7.7	0.04	A
OVERALL	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-	-	3.6	-	-	4.8	-	-	2.2	-	-	2.9	-	-

5. FUTURE YEAR TRAFFIC CONDITIONS

5.1 Background

The Project proposes to upgrade and expand the Honouliuli Wastewater Treatment Plant (WWTP) facility, which will occur in conjunction with the ENV Support Facilities at Honouliuli WWTP project. The Project is planned to be constructed in five (5) phases with full buildout anticipated in 2026. The anticipated Project timeline is as follows:

- Upgrade Phase 2: July 2018 – March 2020
- Phase 1A: September 2018 – December 2021
- Phase 1B: January 2019 – July 2022
- Phase 1C: July 2021 – December 2024
- Phase 1D: July 2023 – 2026

Upon completion of the Project, the number of employees required to operate the WWTP facility is projected to increase from 81 to approximately 120 employees. The employees will be assigned to one of three shifts: the daytime shift from 6:45 AM to 3:15 PM, the evening shift from 3:00 PM to 11:00 PM or the night shift from 11:00 PM to 7:00 AM. Seven (7) additional employees from a third party company will also operate a portion of the plant upon completion of Phase 1A. In addition to employee trips, WWTP client trips are expected to increase to approximately 60 to 80 trips with the expansion. Access to the Project will continue to be provided by the two (2) existing driveways along Geiger Road. Additionally, upon completion of the ENV Support Facilities at Honouliuli WWTP, a new driveway along Geiger Road to the east of Honouliuli Driveway 2 will be available for use by the Project.

Note that a full analysis for Future Years will only be included for full buildout of the Project and for critical years that will require roadway improvements.

5.2 Travel Demand Estimations

5.2.1 Trip Generation

Note that the WWTP employee start and end times were not observed to coincide with the regional peak hours of traffic; however, trip generation rates were derived from volumes observed during the peak hours of WWTP traffic and were conservatively assumed to occur during the regional peak hours.

WWTP employees are projected to increase from 81 to approximately 120 employees. For these 39 new anticipated WWTP employees, only a portion were assumed to enter or exit during the peak hours based on the existing allocation of employees between the three work shifts. These employee trips were distributed over the five Project phases based on the assumed buildout years.

The seven (7) third party employees are anticipated to begin working at the WWTP upon completion of Phase 1A in 2021. All third party employee trips were assumed to enter or exit during the peak hours of traffic.

In addition to employee trips, 60 to 80 total WWTP client trips entering and exiting the Project are expected daily upon full buildout. 10 percent of the daily trips were assumed to occur during each of the peak hours of traffic.

See Tables 5.1 and 5.2 for Trip Generation rates and projections for the Project.

5.2.2 Trip Distribution and Assignment

Trips generated by the Project were assigned throughout the study area generally based upon existing travel patterns. The traffic generated by the Project was added to the forecast Base Year traffic volumes to constitute the traffic volumes for Future Year traffic conditions. Project trips were distributed to access the Project at the existing Honouliuli Driveway 1 and Honouliuli Driveway 2. For Future Year 2024 and 2026, trips were redistributed to access the Project at the existing Project driveways in addition to the new Honouliuli Driveway 3 proposed to be constructed by 2023 with the ENV Support Facilities at Honouliuli WWTP. Figure 5.1 illustrates the Project-generated trip distribution.

Table 5.1: Trip Generation Rates

Land Use	Independent Variable	AM Peak Hour		PM Peak Hour	
		Trip Rate	% Enter	Trip Rate	% Enter
Wastewater Treatment Plant (WWTP)	Employees	0.75	96%	0.63	7%
Wastewater Treatment Plant (WWTP)	Clients (per day)	0.10	50%	0.10	50%

Table 5.2: Project-Generated Trips

Land Use	Size	AM Peak Hour			PM Peak Hour		
		Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)
WWTP Employees	39 New Employees	25	1	26	1	21	22
Third Party Employees	7 New Employees	5	0	5	0	4	4
WWTP Clients	80 Clients (per day)	4	4	8	4	4	8
Total		**34**	**5**	**39**	**5**	**29**	**34**

5.3 Future Year 2026 Analysis

By Future Year 2026, the Project is projected to generate a total of 39(34) net external trips during the AM(PM) peak hours of traffic. Traffic projections for Future Year 2026 will depend on the access scenario selected for the ENV Support Facilities at Honouliuli WWTP project. All three (3) access scenarios were analyzed for Future Year 2026. The anticipated traffic growth due to the Project is expected along major roadways in the study area.

5.3.1 Future Year 2026 Intersection Analysis

For all three (3) ENV Support Facilities at Honouliuli WWTP access scenarios, the majority of study intersection movements are forecast to operate similar to Base Year 2023, although some movements will experience an increase in delay due to increases in traffic along major roadways from the continued development in the Kapolei region. All movements operating at LOS E/F and/or overcapacity during Base Year 2023 are anticipated to continue operating with those conditions in Future Year 2026.

5.3.2 Roosevelt Avenue Access Only Intersection Analysis

Left-turn storage lengths at the Project accesses are recommended based on SimTraffic (see Appendix C) and are summarized in Table 5.3.

[7] Geiger Road/Honouliuli Driveway 1

This intersection is expected to continue operating adequately during both peak hours with all movements at LOS D or better by Future Year 2026 with the Project.

[8] Geiger Road/Honouliuli Driveway 2/Kamakana Street

The southbound approach is expected to operate at LOS F with long delays during both peak hours of traffic. However, volumes exiting the driveway are anticipated to be low with no more than 15 vehicles in either peak hour, and minimal queuing is expected for vehicles exiting the Project.

[12] Geiger Road/Honouliuli Driveway 3

The southbound approach is expected to continue operating at LOS E(F) during the AM(PM) peak hour. However, as in Base Year 2023, volumes exiting the driveway are anticipated to be low with no more than 20 vehicles in either peak hour, and minimal queuing is expected.

Figure 5.2 illustrates the Future Year 2026 forecast traffic volumes and LOS for the study intersection movements for the Roosevelt Avenue Access Only scenario. Table 5.4 summarizes the Future Year 2026 LOS at the study intersections compared to Base Year 2023. LOS worksheets are provided in Appendix C.

5.3.3 Renton Road Access Only Intersection Analysis

Left-turn storage lengths at the Project accesses are recommended based on SimTraffic (see Appendix C) and are summarized in Table 5.5.

[7] Geiger Road/Honouliuli Driveway 1

This intersection is expected to continue operating adequately during both peak hours with all movements at LOS C or better by Future Year 2026 with the Project.

[8] Geiger Road/Honouliuli Driveway 2/Kamakana Street

The southbound approach is expected to operate at LOS F with long delays during both peak hours of traffic. However, volumes exiting the driveway are anticipated to be low with no more than 15 vehicles in either peak hour, and minimal queuing is expected for vehicles exiting the Project.

[12] Geiger Road/Honouliuli Driveway 3

This intersection is expected to continue operating adequately during both peak hours with all movements at LOS D or better by Future Year 2026 with the Project.

Figure 5.3 illustrates the Future Year 2026 forecast traffic volumes and LOS for the study intersection movements for the Renton Road Access Only scenario. Table 5.6 summarizes the Future Year 2026 LOS at the study intersections compared to Base Year 2023. LOS worksheets are provided in Appendix C.

5.3.4 Renton Road and Roosevelt Avenue Accesses Intersection Analysis

Left-turn storage lengths at the Project accesses are recommended based on SimTraffic (see Appendix C) and are summarized in Table 5.7.

[7] Geiger Road/Honouliuli Driveway 1

This intersection is expected to continue operating adequately during both peak hours with all movements at LOS C or better by Future Year 2026 with the Project.

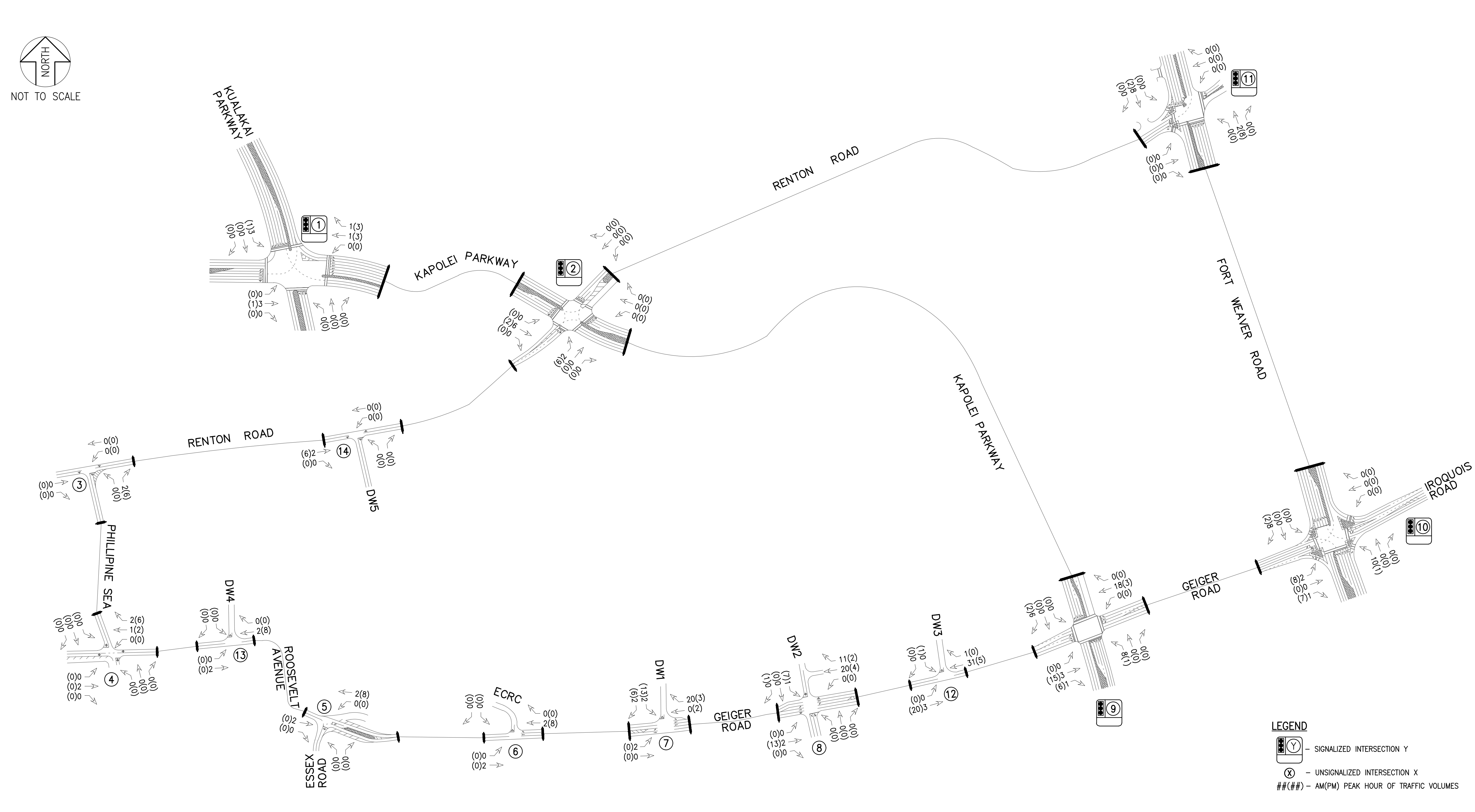
[8] Geiger Road/Honouliuli Driveway 2/Kamakana Street

The southbound approach is expected to operate at LOS F with long delays during both peak hours of traffic. However, volumes exiting the driveway are anticipated to be low with no more than 15 vehicles in either peak hour, and minimal queuing is expected for vehicles exiting the Project.

[12] Geiger Road/Honouliuli Driveway 3

The southbound approach is expected to continue operating at LOS E(F) during the AM(PM) peak hour. However, as in Base Year 2023, volumes exiting the driveway are anticipated to be low with no more than 15 vehicles in either peak hour, and minimal queuing is expected.

Figure 5.4 illustrates the Future Year 2026 forecast traffic volumes and LOS for the study intersection movements for the Renton Road and Roosevelt Avenue Accesses scenario. Table 5.8 summarizes the Future Year 2026 LOS at the study intersections compared to Base Year 2023. LOS worksheets are provided in Appendix C. A full summary of roadway improvements recommended by Future Year 2026 is included in Appendix E.



HONOULIULI WASTEWATER TREATMENT PLANT TIAR

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

YEAR 2026 PROJECT-GENERATED TRAFFIC

FIGURE 5.1

Table 5.3: Future Year 2026 (Roosevelt Avenue Access Only) Left-Turn Storage Lane Length Calculations				
Movement	Peak Hour	Passenger Car Volume (veh)	95th Percentile Queue Lengths (ft) [1]	Recommended storage length [2]
Geiger Road & Honouliuli Driveway 1 Intersection				
Eastbound Left-turn lane	AM	15	**32**	Minimum 50 ft storage recommended
	PM	5	15	
Geiger Road & Honouliuli Driveway 2 Intersection				
Eastbound Left-turn lane	AM	5	7	Minimum 25 ft storage recommended
	PM	5	**13**	
Geiger Road & Honouliuli Driveway 3 Intersection				
Eastbound Left-turn lane	AM	5	**17**	Minimum 25 ft storage recommended
	PM	5	14	

Notes:

1. 95th percentile queue lengths are based on SimTraffic Results.
2. Recommended storage length is exclusive of taper length or deceleration length.
   To be verified upon design.

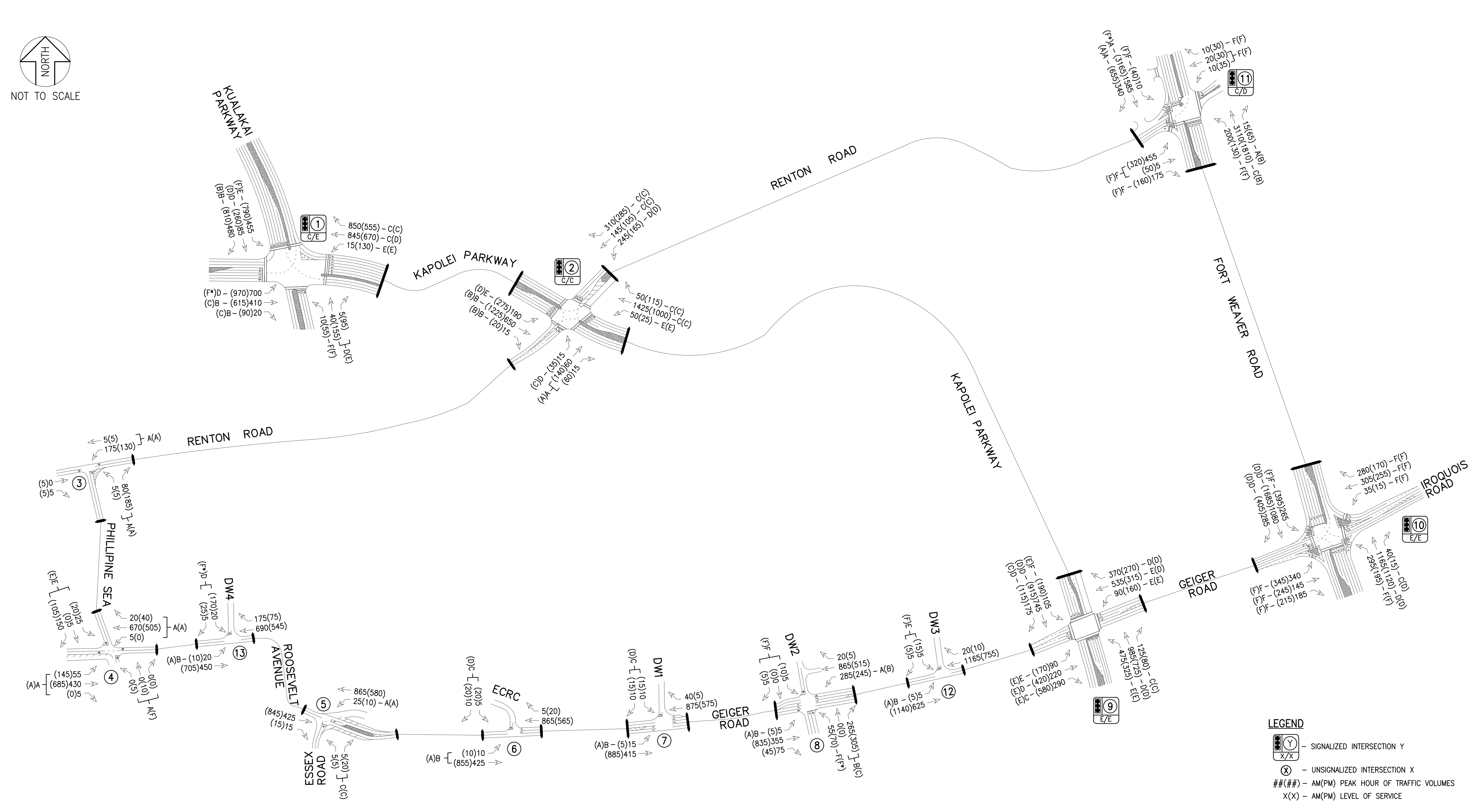


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FIGURE 5.2

FUTURE YEAR 2026 ROOSEVELT AVENUE ACCESS ONLY
LANE CONFIGURATION, VOLUMES, AND MOVEMENT LOS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

TABLE 5.4 LOS SUMMARY TABLE
BASE YEAR 2023 WITH MITIGATION CONDITIONS AND FUTURE YEAR 2026 CONDITIONS
(ROOSEVELT AVENUE ACCESS ONLY)

Intersection	Base Year 2023 with Mitigation (Roosevelt Access Only)						Future Year 2026 (Roosevelt Access Only)					
	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: Kualakai Pkwy & Kapolei Pkwy												
NB LT	78.2	0.59	E	85.6	0.77	F	82.3	0.60	F	85.7	0.77	F
NB TH/RT	49.1	0.21	D	68.2	0.58	E	52.1	0.25	D	69.0	0.62	E
EB LT	42.3	0.86	D	95.3	1.05	F*	46.2	0.88	D	121.1	1.12	F*
EB TH	12.1	0.16	B	27.1	0.32	C	12.0	0.16	B	28.1	0.33	C
EB TH/RT	12.1	0.16	B	27.3	0.33	C	12.0	0.16	B	28.3	0.34	C
WB LT	55.1	0.33	E	73.1	0.71	E	58.6	0.33	E	74.6	0.72	E
WB TH	29.9	0.54	C	53.1	0.64	D	31.8	0.56	C	54.0	0.65	D
WB RT	21.0	0.63	C	26.1	0.44	C	23.4	0.68	C	27.0	0.46	C
SB LT	50.6	0.85	D	76.0	0.97	E	55.9	0.87	E	81.5	0.98	F
SB TH	34.1	0.11	C	38.6	0.25	D	36.7	0.13	D	39.6	0.26	D
SB RT	18.4	0.25	B	16.3	0.36	B	19.0	0.26	B	17.2	0.37	B
OVERALL	30.3	-	C	55.0	-	D	32.8	-	C	61.6	-	E
2: Kapolei Pkwy & Renton Rd												
NB LT	66.6	0.77	E	63.4	0.69	E	68.3	0.76	E	64.2	0.70	E
NB TH	26.6	0.70	C	28.7	0.72	C	26.9	0.72	C	28.8	0.73	C
NB TH/RT	27.1	0.70	C	29.6	0.72	C	27.5	0.72	C	30.0	0.73	C
EB LT	32.0	0.05	C	26.9	0.07	C	35.3	0.05	D	26.6	0.10	C
EB TH/RT	27.9	0.13	A	26.2	0.37	A	30.5	0.15	A	25.9	0.38	A
WB LT	39.1	0.66	D	34.9	0.53	C	44.2	0.69	D	35.5	0.56	D
WB TH	29.3	0.28	C	24.8	0.22	C	32.1	0.31	C	24.2	0.21	C
WB RT	28.7	0.22	C	24.1	0.12	C	31.2	0.21	C	23.5	0.12	C
SB LT	50.9	0.86	D	50.4	0.89	D	55.3	0.86	E	48.9	0.88	D
SB TH	14.4	0.26	B	15.5	0.51	B	14.7	0.26	B	16.5	0.53	B
SB TH/RT	14.5	0.26	B	15.7	0.51	B	14.8	0.26	B	16.8	0.53	B
OVERALL	27.7	-	C	26.0	-	C	28.8	-	C	26.1	-	C

Intersection	Base Year 2023 with Mitigation (Roosevelt Access Only)						Future Year 2026 (Roosevelt Access Only)					
	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
3: Phillipine Sea & Renton Rd												
NB LT/RT	8.9	0.09	A	9.2	0.19	A	8.9	0.09	A	9.2	0.20	A
WB LT/TH	7.5	0.11	A	7.4	0.08	A	7.5	0.12	A	7.5	0.09	A
OVERALL	7.7	-	-	8.1	-	-	7.7	-	-	8.1	-	-
4: Phillipine Sea & Roosevelt Ave												
NB LT/TH/RT	0.0	0.00	A	79.5	0.26	F	0.0	0.00	A	86.0	0.27	F
EB LT/TH/RT	9.5	0.07	A	9.3	0.15	A	9.5	0.07	A	9.4	0.16	A
WB LT/TH/RT	8.3	0.01	A	0.0	0.00	A	8.3	0.01	A	0.0	0.00	A
SB LT/TH/RT	35.2	0.63	E	38.8	0.57	E	37.5	0.66	E	43.1	0.61	E
OVERALL	5.0	-	-	4.9	-	-	5.4	-	-	5.3	-	-
5: Essex Rd & Roosevelt Ave/Geiger Rd												
NB LT/RT	21.6	0.05	C	21.4	0.11	C	22.0	0.05	C	21.8	0.11	C
WB LT	8.4	0.03	A	9.9	0.02	A	8.4	0.03	A	10.0	0.02	A
OVERALL	0.3	-	-	0.4	-	-	0.3	-	-	0.4	-	-
6: Geiger Rd & Ewa Refuse Convenience Center												
EB LT/TH	10.0	0.02	A	8.8	0.01	A	10.0	0.02	B	8.8	0.01	A
SB LT/RT	21.5	0.07	C	28.1	0.22	D	21.8	0.07	C	29.0	0.23	D
OVERALL	0.3	-	-	0.8	-	-	0.3	-	-	0.8	-	-
7: Geiger Rd & Honouliuli Drwy 1												
EB LT	9.4	0.01	A	8.5	0.01	A	10.3	0.02	B	8.8	0.01	A
SB LT/RT	18.4	0.08	C	19.4	0.04	C	23.8	0.10	C	28.7	0.18	D
OVERALL	0.4	-	-	0.2	-	-	0.5	-	-	0.6	-	-
8: Geiger Rd & Honouliuli Drwy 2												
NB LT	189.0	0.91	F	594.6	1.81	F*	220.9	0.98	F	694.3	2.00	F*
NB TH/RT	12.4	0.37	B	21.5	0.61	C	12.5	0.38	B	22.3	0.62	C
EB LT	0.0	0.00	A	0.0	0.00	A	10.1	0.01	B	8.6	0.01	A
WB LT	9.6	0.28	A	12.7	0.37	B	9.6	0.28	A	13.0	0.37	B
SB LT/TH/RT	162.3	0.19	F	0.0	0.00	A	100.7	0.23	F	222.0	0.54	F
OVERALL	9.2	-	-	25.9	-	-	9.9	-	-	30.4	-	-

Intersection	Base Year 2023 with Mitigation (Roosevelt Access Only)						Future Year 2026 (Roosevelt Access Only)					
	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
9: Kapolei Pkwy & Geiger Rd												
NB LT	68.2	0.89	E	60.6	0.83	E	75.6	0.91	E	63.9	0.84	E
NB TH	41.5	0.83	D	41.0	0.70	D	45.3	0.84	D	43.7	0.73	D
NB RT	28.6	0.12	C	31.6	0.04	C	30.3	0.12	C	32.9	0.04	C
EB LT	73.5	0.81	E	75.8	0.87	E	77.5	0.81	E	79.9	0.88	E
EB TH	35.6	0.40	D	56.8	0.88	E	36.8	0.39	D	61.1	0.89	E
EB RT	32.9	0.19	C	59.2	0.88	E	34.0	0.20	C	63.8	0.90	E
WB LT	73.5	0.81	E	74.0	0.86	E	76.3	0.81	E	78.1	0.87	E
WB TH	65.0	0.94	E	44.9	0.69	D	70.3	0.95	E	46.3	0.68	D
WB RT	35.7	0.40	D	36.4	0.14	D	37.4	0.43	D	37.3	0.14	D
SB LT	78.2	0.82	E	71.0	0.88	E	85.4	0.83	F	75.7	0.88	E
SB TH	47.3	0.82	D	48.4	0.88	D	52.3	0.84	D	52.3	0.90	D
SB RT	36.4	0.13	D	31.4	0.09	C	39.0	0.15	D	32.5	0.09	C
OVERALL	51.1	-	D	52.9	-	D	55.4	-	E	56.3	-	E
10: Ft Weaver Rd & Geiger Rd/Iroquois Rd												
NB LT	110.3	0.81	F	112.8	0.75	F	110.7	0.82	F	112.4	0.76	F
NB TH	39.1	0.48	D	43.1	0.46	D	40.6	0.50	D	46.3	0.51	D
NB RT	30.6	0.02	C	34.3	0.01	C	31.4	0.02	C	35.9	0.01	D
EB LT	102.3	0.71	F	95.2	0.62	F	102.8	0.74	F	94.8	0.63	F
EB TH	100.7	0.58	F	109.1	0.84	F	100.8	0.60	F	109.4	0.86	F
EB RT	99.4	0.51	F	98.0	0.64	F	99.5	0.53	F	98.3	0.67	F
WB LT	80.9	0.11	F	86.5	0.06	F	80.5	0.11	F	85.1	0.06	F
WB TH	124.7	0.92	F	127.6	0.90	F	126.0	0.93	F	130.0	0.91	F
WB RT	83.4	0.26	F	87.4	0.12	F	83.3	0.27	F	86.5	0.14	F
SB LT	116.8	0.82	F	114.7	0.87	F	117.5	0.82	F	114.9	0.87	F
SB TH	39.2	0.43	D	40.3	0.64	D	41.6	0.47	D	43.8	0.68	D
SB RT	35.2	0.19	D	33.9	0.36	C	37.0	0.21	D	36.2	0.37	D
OVERALL	66.9	-	E	64.6	-	E	68.0	-	E	66.8	-	E

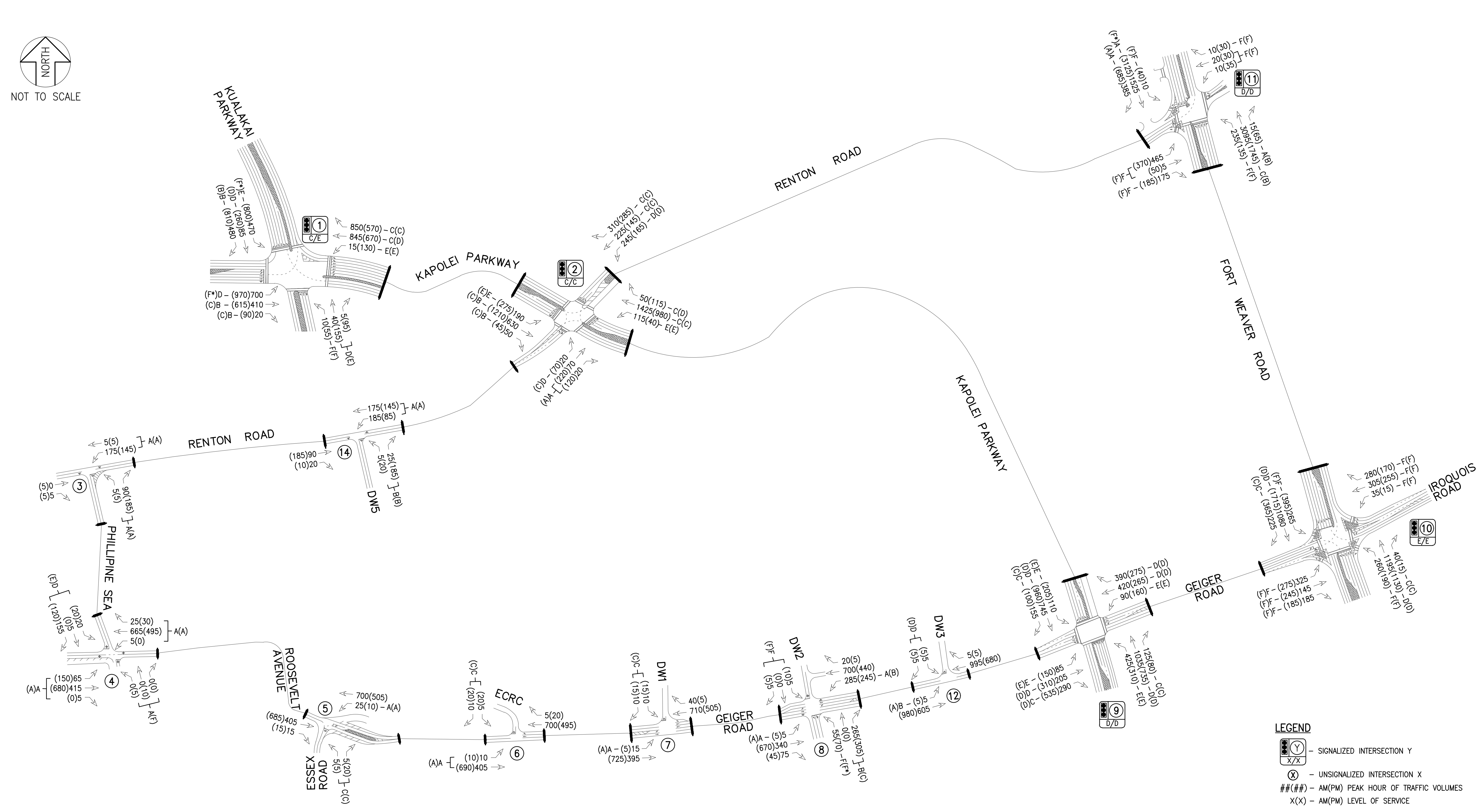
Intersection	Base Year 2023 with Mitigation (Roosevelt Access Only)						Future Year 2026 (Roosevelt Access Only)					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
11: Ft Weaver Rd & Renton Rd												
NB LT	128.0	0.90	F	134.6	0.88	F	128.1	0.91	F	134.1	0.88	F
NB TH	29.1	0.88	C	19.0	0.53	B	32.8	0.92	C	19.2	0.56	B
NB RT	9.6	0.01	A	12.4	0.04	B	9.8	0.01	A	12.2	0.04	B
EB LT/TH	118.1	0.92	F	107.1	0.81	F	117.4	0.91	F	105.8	0.78	F
EB RT	94.2	0.47	F	96.5	0.46	F	93.6	0.42	F	95.7	0.39	F
WB LT/TH	142.7	0.75	F	129.7	0.82	F	138.7	0.75	F	129.7	0.82	F
WB RT	113.6	0.02	F	107.1	0.01	F	112.6	0.02	F	107.1	0.01	F
SB LT	118.8	0.32	F	117.5	0.63	F	118.8	0.32	F	117.5	0.63	F
SB TH	0.6	0.51	A	19.1	1.01	F*	0.7	0.57	A	36.6	1.07	F*
SB RT	0.4	0.19	A	1.1	0.39	A	0.5	0.21	A	1.3	0.43	A
OVERALL	33.3	-	C	29.2	-	C	34.7	-	C	37.5	-	D
12: Geiger Rd & Honouliuli Drwy 3												
EB LT	11.5	0.01	B	9.5	0.01	A	11.8	0.01	B	9.5	0.01	A
SB LT/RT	39.2	0.09	E	75.3	0.30	F	42.8	0.10	E	82.7	0.32	F
OVERALL	0.3	-	-	0.8	-	-	0.3	-	-	0.9	-	-
13: Roosevelt Ave & Honouliuli Drwy 4												
EB LT	10.0	0.03	B	8.9	0.01	A	10.1	0.03	B	9.0	0.01	A
SB LT/RT	28.8	0.15	D	207.2	1.25	F*	29.3	0.16	D	230.4	1.31	F*
OVERALL	0.7	-	-	26.9	-	-	0.7	-	-	29.4	-	-

* Denotes overcapacity conditions, v/c ≥ 1.

Table 5.5: Future Year 2026 (Renton Road Access Only) Left-Turn Storage Lane Length Calculations				
Movement	Peak Hour	Design Volume per lane (veh)	95th Percentile Queue Lengths (ft) [1]	Recommended storage length [2]
Geiger Road & Honouliuli Driveway 1 Intersection				
Eastbound Left-turn lane	AM	15	**33**	Minimum 50 ft storage recommended
	PM	5	15	
Geiger Road & Honouliuli Driveway 2 Intersection				
Eastbound Left-turn lane	AM	5	**15**	Minimum 25 ft storage recommended
	PM	5	10	
Geiger Road & Honouliuli Driveway 3 Intersection				
Eastbound Left-turn lane	AM	5	**18**	Minimum 25 ft storage recommended
	PM	5	12	

Notes:

1. 95th percentile queue lengths are based on SimTraffic Results.
2. Recommended storage length is exclusive of taper length or deceleration length.
   To be verified upon design.



HONOULIULI WASTEWATER TREATMENT PLANT TIAR

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FIGURE 5.3

FUTURE YEAR 2026 RENTON ROAD ACCESS ONLY
LANE CONFIGURATION, VOLUMES, AND MOVEMENT LOS

TABLE 5.6: LOS SUMMARY TABLE
BASE YEAR 2023 WITH MITIGATION CONDITIONS AND FUTURE YEAR 2026 CONDITIONS
(RENTON ROAD ACCESS ONLY)

Intersection	Base Year 2023 with Mitigation (Renton Access Only)						Future Year 2026 (Renton Access Only)					
	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: Kualakai Pkwy & Kapolei Pkwy												
NB LT	78.6	0.59	E	86.0	0.77	F	82.8	0.60	F	86.1	0.77	F
NB TH/RT	49.5	0.21	D	68.6	0.58	E	52.5	0.25	D	69.3	0.62	E
EB LT	42.7	0.86	D	97.2	1.05	F*	46.6	0.88	D	123.5	1.12	F*
EB TH	12.3	0.16	B	27.0	0.32	C	12.2	0.16	B	28.0	0.33	C
EB TH/RT	12.3	0.16	B	27.2	0.33	C	12.2	0.16	B	28.2	0.34	C
WB LT	55.5	0.33	E	73.5	0.71	E	59.0	0.33	E	75.0	0.72	E
WB TH	30.2	0.54	C	52.9	0.63	D	32.2	0.56	C	53.8	0.64	D
WB RT	20.9	0.62	C	26.2	0.45	C	23.3	0.68	C	27.1	0.47	C
SB LT	51.5	0.86	D	80.4	0.98	F	57.1	0.88	E	86.5	1.00	F*
SB TH	34.1	0.11	C	39.0	0.25	D	36.6	0.13	D	39.9	0.26	D
SB RT	18.3	0.25	B	16.6	0.36	B	18.9	0.25	B	17.5	0.37	B
OVERALL	30.7	-	C	56.1	-	E	33.2	-	C	62.9	-	E
2: Kapolei Pkwy & Renton Rd												
NB LT	55.7	0.80	E	69.4	0.77	E	59.7	0.80	E	68.9	0.78	E
NB TH	27.3	0.70	C	35.2	0.75	D	27.5	0.72	C	34.2	0.76	C
NB TH/RT	27.8	0.70	C	36.8	0.76	D	28.1	0.72	C	35.9	0.76	D
EB LT	35.5	0.08	D	29.2	0.19	C	39.7	0.09	D	28.8	0.20	C
EB TH/RT	28.1	0.17	A	29.7	0.57	A	30.9	0.18	A	29.5	0.59	A
WB LT	40.5	0.67	D	48.2	0.67	D	46.0	0.71	D	52.4	0.73	D
WB TH	30.9	0.42	C	25.1	0.25	C	34.2	0.47	C	24.6	0.25	C
WB RT	28.9	0.24	C	24.3	0.15	C	31.9	0.27	C	23.6	0.15	C
SB LT	51.7	0.86	D	62.1	0.91	E	56.2	0.86	E	57.9	0.89	E
SB TH	18.2	0.29	B	20.3	0.55	C	18.3	0.30	B	20.8	0.57	C
SB TH/RT	18.3	0.30	B	20.7	0.55	C	18.4	0.30	B	21.2	0.57	C
OVERALL	29.7	-	C	32.2	-	C	30.8	-	C	31.5	-	C

Intersection	Base Year 2023 with Mitigation (Renton Access Only)						Future Year 2026 (Renton Access Only)					
	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
3: Phillipine Sea & Renton Rd												
NB LT/RT	8.9	0.10	A	9.2	0.19	A	8.9	0.10	A	9.3	0.20	A
WB LT/TH	7.5	0.11	A	7.5	0.10	A	7.5	0.12	A	7.5	0.10	A
OVERALL	7.7	-	-	8.1	-	-	7.7	-	-	8.1	-	-
4: Phillipine Sea & Roosevelt Ave												
NB LT/TH/RT	0.0	0.00	A	78.0	0.25	F	0.0	0.00	A	86.0	0.27	F
EB LT/TH/RT	9.5	0.08	A	9.2	0.16	A	9.6	0.08	A	9.3	0.16	A
WB LT/TH/RT	8.3	0.01	A	0.0	0.00	A	8.3	0.01	A	0.0	0.00	A
SB LT/TH/RT	32.2	0.60	D	36.9	0.59	E	34.3	0.63	D	41.8	0.63	E
OVERALL	4.7	-	-	5.2	-	-	5.1	-	-	5.7	-	-
5: Essex Rd & Roosevelt Ave/Geiger Rd												
NB LT/RT	18.0	0.04	C	17.0	0.08	C	18.3	0.04	C	17.3	0.09	C
WB LT	8.3	0.03	A	9.2	0.01	A	8.3	0.03	A	9.3	0.01	A
OVERALL	0.3	-	-	0.4	-	-	0.3	-	-	0.4	-	-
6: Geiger Rd & Ewa Refuse Convenience Center												
EB LT/TH	9.2	0.01	A	8.6	0.01	A	9.3	0.01	A	8.6	0.01	A
SB LT/RT	17.4	0.05	C	20.8	0.16	C	17.8	0.06	C	21.5	0.17	C
OVERALL	0.3	-	-	0.7	-	-	0.3	-	-	0.7	-	-
7: Geiger Rd & Honouliuli Drwy 1												
EB LT	9.4	0.01	A	8.5	0.01	A	9.5	0.02	A	8.6	0.01	A
SB LT/RT	18.4	0.08	C	19.4	0.04	C	19.2	0.08	C	21.3	0.13	C
OVERALL	0.4	-	-	0.2	-	-	0.4	-	-	0.6	-	-
8: Geiger Rd & Honouliuli Drwy 2												
NB LT	125.5	0.74	F	282.3	1.19	F*	150.3	0.81	F	330.3	1.29	F*
NB TH/RT	12.2	0.37	B	17.4	0.54	C	12.3	0.37	B	17.8	0.55	C
EB LT	0.0	0.00	A	0.0	0.00	A	9.4	0.01	A	8.4	0.01	A
WB LT	9.5	0.28	A	11.2	0.31	B	9.5	0.28	A	11.3	0.32	B
SB LT/TH/RT	108.7	0.14	F	0.0	0.00	A	67.8	0.16	F	105.8	0.32	F
OVERALL	7.9	-	-	15.9	-	-	8.5	-	-	18.3	-	-

Intersection	Base Year 2023 with Mitigation (Renton Access Only)						Future Year 2026 (Renton Access Only)					
	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
9: Kapolei Pkwy & Geiger Rd												
NB LT	57.1	0.86	E	54.0	0.81	D	61.3	0.87	E	55.6	0.82	E
NB TH	35.0	0.82	D	35.8	0.69	D	37.8	0.83	D	37.7	0.71	D
NB RT	23.9	0.12	C	27.7	0.04	C	25.1	0.12	C	28.6	0.04	C
EB LT	66.1	0.79	E	66.5	0.85	E	71.9	0.80	E	67.2	0.85	E
EB TH	36.5	0.43	D	45.4	0.77	D	37.5	0.43	D	47.1	0.79	D
EB RT	33.6	0.18	C	49.7	0.84	D	34.3	0.17	C	51.8	0.85	D
WB LT	65.6	0.80	E	68.3	0.86	E	68.3	0.80	E	69.0	0.86	E
WB TH	48.6	0.85	D	42.2	0.64	D	51.0	0.87	D	43.1	0.66	D
WB RT	37.1	0.49	D	36.0	0.14	D	39.2	0.56	D	36.5	0.15	D
SB LT	67.4	0.81	E	63.6	0.87	E	73.7	0.82	E	66.8	0.88	E
SB TH	37.5	0.72	D	40.4	0.85	D	40.0	0.74	D	42.9	0.87	D
SB RT	29.5	0.11	C	26.3	0.06	C	31.1	0.12	C	26.9	0.06	C
OVERALL	42.3	-	D	45.6	-	D	45.1	-	D	47.4	-	D
10: Ft Weaver Rd & Geiger Rd/Iroquois Rd												
NB LT	110.0	0.79	F	112.9	0.75	F	109.9	0.80	F	112.6	0.76	F
NB TH	39.4	0.49	D	41.4	0.46	D	40.7	0.51	D	44.9	0.51	D
NB RT	30.5	0.02	C	33.0	0.01	C	31.2	0.02	C	34.7	0.01	C
EB LT	102.0	0.70	F	95.7	0.56	F	102.2	0.71	F	94.8	0.56	F
EB TH	101.1	0.59	F	110.2	0.82	F	101.3	0.61	F	110.3	0.83	F
EB RT	99.0	0.49	F	97.0	0.54	F	100.1	0.53	F	96.6	0.57	F
WB LT	80.9	0.11	F	86.5	0.06	F	80.5	0.11	F	85.1	0.06	F
WB TH	124.7	0.92	F	127.6	0.90	F	126.0	0.93	F	130.0	0.91	F
WB RT	83.4	0.26	F	87.5	0.12	F	83.3	0.27	F	86.5	0.14	F
SB LT	116.8	0.82	F	114.7	0.87	F	117.5	0.82	F	114.9	0.87	F
SB TH	37.3	0.42	D	38.5	0.64	D	39.5	0.46	D	42.3	0.68	D
SB RT	32.7	0.15	C	31.4	0.32	C	34.3	0.17	C	33.8	0.33	C
OVERALL	65.8	-	E	62.6	-	E	66.9	-	E	65.0	-	E

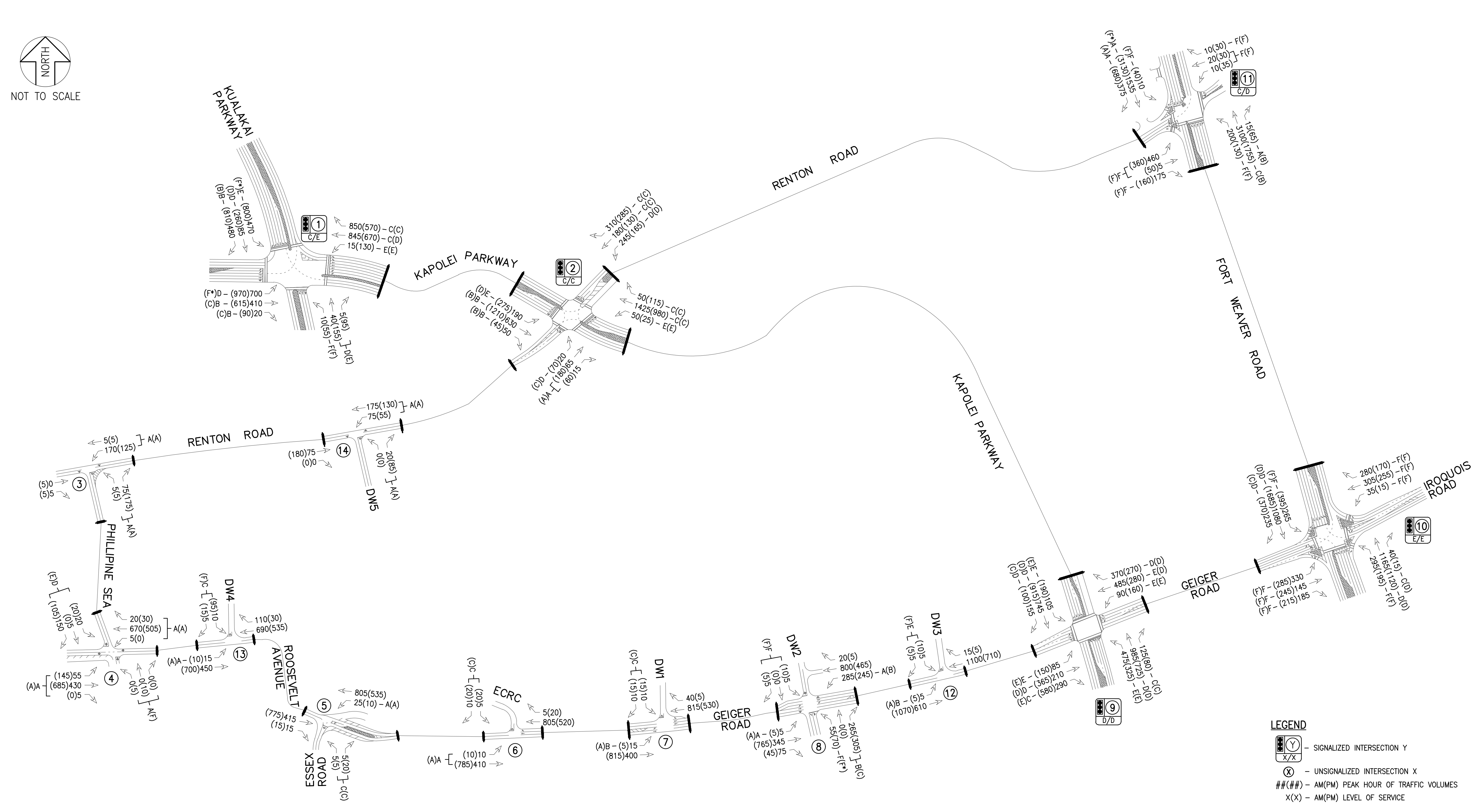
Intersection	Base Year 2023 with Mitigation (Renton Access Only)						Future Year 2026 (Renton Access Only)					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
11: Ft Weaver Rd & Renton Rd												
NB LT	128.1	0.91	F	133.8	0.89	F	128.1	0.92	F	133.8	0.89	F
NB TH	29.3	0.88	C	19.4	0.52	B	32.9	0.92	C	19.7	0.54	B
NB RT	9.8	0.01	A	12.9	0.04	B	9.9	0.01	A	12.7	0.04	B
EB LT/TH	118.8	0.92	F	112.0	0.87	F	118.2	0.92	F	109.8	0.84	F
EB RT	93.6	0.46	F	98.5	0.58	F	93.2	0.42	F	96.6	0.50	F
WB LT/TH	142.7	0.75	F	129.7	0.82	F	138.7	0.75	F	129.7	0.82	F
WB RT	113.6	0.02	F	107.1	0.01	F	112.6	0.02	F	107.1	0.01	F
SB LT	118.8	0.32	F	117.5	0.63	F	118.8	0.32	F	117.5	0.63	F
SB TH	0.6	0.51	A	21.7	1.02	F*	0.7	0.57	A	38.7	1.07	F*
SB RT	0.5	0.22	A	1.2	0.41	A	0.6	0.23	A	1.4	0.44	A
OVERALL	34.5	-	C	32.4	-	C	35.8	-	D	40.0	-	D
12: Geiger Rd & Honouliuli Drwy 3												
EB LT	10.5	0.01	B	9.2	0.01	A	10.7	0.01	B	9.2	0.01	A
SB LT/RT	12.3	0.01	B	31.8	0.08	D	32.2	0.08	D	33.5	0.08	D
OVERALL	0.1	-	-	0.2	-	-	0.2	-	-	0.2	-	-
14: Honouliuli Drwy 5 & Renton Rd												
NB LT/RT	10.1	0.04	B	11.4	0.28	B	10.1	0.04	B	11.5	0.29	B
WB LT	7.8	0.14	A	7.8	0.07	A	7.8	0.14	A	7.8	0.07	A
OVERALL	3.6	-	-	4.8	-	-	3.5	-	-	4.8	-	-

* Denotes overcapacity conditions, v/c ≥ 1.

Table 5.7: Future Year 2026 (Renton Road and Roosevelt Avenue Accesses) Left-Turn Storage Lane Length Calculations				
Movement	Peak Hour	Design Volume per lane (veh)	95th Percentile Queue Lengths (ft) [1]	Recommended storage length [2]
Geiger Road & Honouliuli Driveway 1 Intersection				
Eastbound Left-turn lane	AM	15	**33**	Minimum 50 ft storage recommended
	PM	5	16	
Geiger Road & Honouliuli Driveway 2 Intersection				
Eastbound Left-turn lane	AM	5	**13**	Minimum 25 ft storage recommended
	PM	5	11	
Geiger Road & Honouliuli Driveway 3 Intersection				
Eastbound Left-turn lane	AM	5	16	Minimum 25 ft storage recommended
	PM	5	**19**	

Notes:

1. 95th percentile queue lengths are based on SimTraffic Results.
2. Recommended storage length is exclusive of taper length or deceleration length. To be verified upon design.



HONOULIULI WASTEWATER TREATMENT PLANT TIAR

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FIGURE 5.4

FUTURE YEAR 2026 RENTON ROAD AND ROOSEVELT AVENUE ACCESSES LANE CONFIGURATION, VOLUMES, AND MOVEMENT LOS

TABLE 5.8: LOS SUMMARY TABLE
BASE YEAR 2023 WITH MITIGATION CONDITIONS AND FUTURE YEAR 2026 CONDITIONS
(RENTON ROAD AND ROOSEVELT AVENUE ACCESSES)

Intersection	Base Year 2023 with Mitigation (Renton & Roosevelt Acceses)						Future Year 2026 (Renton & Roosevelt Accesses)					
	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: Kualakai Pkwy & Kapolei Pkwy												
NB LT	78.6	0.59	E	86.0	0.77	F	82.8	0.60	F	86.1	0.77	F
NB TH/RT	49.5	0.21	D	68.6	0.58	E	53.3	0.25	D	69.3	0.62	E
EB LT	42.7	0.86	D	97.2	1.05	F*	46.6	0.88	D	123.5	1.12	F*
EB TH	12.3	0.16	B	27.0	0.32	C	12.2	0.16	B	28.0	0.33	C
EB TH/RT	12.3	0.16	B	27.2	0.33	C	12.2	0.16	B	28.2	0.34	C
WB LT	55.5	0.33	E	73.5	0.71	E	59.0	0.33	E	75.0	0.72	E
WB TH	30.2	0.54	C	52.9	0.63	D	32.2	0.56	C	53.8	0.64	D
WB RT	20.9	0.62	C	26.2	0.45	C	23.3	0.68	C	27.1	0.47	C
SB LT	51.5	0.86	D	80.4	0.98	F	57.1	0.88	E	86.5	1.00	F*
SB TH	34.1	0.11	C	39.0	0.25	D	36.6	0.13	D	39.9	0.26	D
SB RT	18.3	0.25	B	16.6	0.36	B	18.9	0.25	B	17.5	0.37	B
OVERALL	30.7	-	C	56.1	-	E	33.2	-	C	62.9	-	E
2: Kapolei Pkwy & Renton Rd												
NB LT	67.1	0.77	E	65.9	0.70	E	68.6	0.76	E	66.7	0.70	E
NB TH	27.1	0.70	C	30.5	0.73	C	27.2	0.72	C	30.6	0.74	C
NB TH/RT	27.6	0.70	C	31.5	0.73	C	27.8	0.72	C	31.9	0.74	C
EB LT	33.6	0.07	C	28.5	0.19	C	37.3	0.08	D	28.2	0.20	C
EB TH/RT	28.1	0.16	A	26.8	0.43	A	30.7	0.16	A	26.5	0.44	A
WB LT	40.2	0.67	D	37.0	0.56	D	45.0	0.70	D	37.6	0.59	D
WB TH	30.0	0.35	C	24.9	0.24	C	33.0	0.38	C	24.3	0.24	C
WB RT	28.7	0.22	C	23.8	0.12	C	31.2	0.21	C	23.3	0.12	C
SB LT	51.5	0.86	D	53.4	0.90	D	55.7	0.86	E	51.8	0.88	D
SB TH	14.8	0.26	B	16.8	0.52	B	15.0	0.27	B	17.9	0.55	B
SB TH/RT	14.9	0.26	B	17.1	0.52	B	15.1	0.27	B	18.2	0.55	B
OVERALL	28.2	-	C	27.6	-	C	29.1	-	C	27.6	-	C

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Intersection	Base Year 2023 with Mitigation (Renton & Roosevelt Acceses)						Future Year 2026 (Renton & Roosevelt Accesses)					
	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
3: Phillipine Sea & Renton Rd												
NB LT/RT	8.9	0.09	A	9.1	0.18	A	8.9	0.09	A	9.2	0.19	A
WB LT/TH	7.5	0.11	A	7.4	0.08	A	7.5	0.11	A	7.4	0.08	A
OVERALL	7.7	-	-	8.0	-	-	7.7	-	-	8.1	-	-
4: Phillipine Sea & Roosevelt Ave												
NB LT/TH/RT	0.0	0.00	A	78.0	0.25	F	0.0	0.00	A	84.3	0.27	F
EB LT/TH/RT	9.4	0.07	A	9.2	0.15	A	9.5	0.07	A	9.3	0.16	A
WB LT/TH/RT	8.3	0.01	A	0.0	0.00	A	8.3	0.01	A	0.0	0.00	A
SB LT/TH/RT	31.3	0.59	D	38.8	0.57	E	33.2	0.61	D	42.0	0.60	E
OVERALL	4.4	-	-	4.9	-	-	4.7	-	-	5.2	-	-
5: Essex Rd & Roosevelt Ave/Geiger Rd												
NB LT/RT	19.9	0.04	C	19.1	0.10	C	20.4	0.05	C	19.5	0.10	C
WB LT	8.3	0.03	A	9.6	0.01	A	8.4	0.03	A	9.7	0.01	A
OVERALL	0.4	-	-	0.4	-	-	0.4	-	-	0.4	-	-
6: Geiger Rd & Ewa Refuse Convenience Center												
EB LT/TH	9.7	0.01	A	8.6	0.01	A	9.8	0.01	A	8.7	0.01	A
SB LT/RT	19.7	0.06	C	23.9	0.19	C	20.1	0.06	C	24.8	0.19	C
OVERALL	0.3	-	-	0.8	-	-	0.3	-	-	0.8	-	-
7: Geiger Rd & Honouliuli Drwy 1												
EB LT	9.8	0.01	A	8.6	0.01	A	10.0	0.02	B	8.7	0.01	A
SB LT/RT	21.0	0.09	C	22.1	0.05	C	21.7	0.09	C	24.7	0.15	C
OVERALL	0.4	-	-	0.2	-	-	0.5	-	-	0.6	-	-
8: Geiger Rd & Honouliuli Drwy 2												
NB LT	158.7	0.83	F	430.5	1.49	F*	183.4	0.89	F	495.0	1.62	F*
NB TH/RT	12.3	0.37	B	19.4	0.58	C	12.4	0.37	B	20.1	0.59	C
EB LT	0.0	0.00	A	0.0	0.00	A	9.8	0.01	A	8.4	0.01	A
WB LT	9.5	0.28	A	12.0	0.34	B	9.6	0.28	A	12.3	0.35	B
SB LT/TH/RT	134.5	0.17	F	0.0	0.00	A	85.9	0.20	F	146.8	0.41	F
OVERALL	8.6	-	-	21.0	-	-	9.2	-	-	24.0	-	-

Intersection	Base Year 2023 with Mitigation (Renton & Roosevelt Acceses)						Future Year 2026 (Renton & Roosevelt Accesses)					
	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
9: Kapolei Pkwy & Geiger Rd												
NB LT	61.1	0.88	E	59.2	0.83	E	67.2	0.90	E	62.0	0.84	E
NB TH	37.3	0.82	D	39.4	0.69	D	39.6	0.82	D	41.5	0.72	D
NB RT	26.1	0.12	C	30.6	0.04	C	27.3	0.12	C	31.5	0.04	C
EB LT	67.8	0.79	E	74.3	0.86	E	71.7	0.80	E	77.9	0.86	E
EB TH	35.0	0.41	D	47.8	0.77	D	36.4	0.40	D	51.7	0.81	D
EB RT	32.5	0.19	C	57.7	0.88	E	33.7	0.19	C	60.9	0.89	E
WB LT	67.3	0.80	E	76.3	0.87	E	72.0	0.81	E	79.9	0.87	E
WB TH	54.2	0.90	D	41.7	0.60	D	61.3	0.92	E	42.8	0.61	D
WB RT	34.9	0.42	C	35.5	0.14	D	37.0	0.46	D	36.4	0.14	D
SB LT	70.3	0.82	E	69.1	0.87	E	76.6	0.82	E	73.3	0.88	E
SB TH	43.0	0.81	D	45.7	0.86	D	46.2	0.82	D	48.4	0.88	D
SB RT	33.3	0.11	C	30.1	0.06	C	35.2	0.13	D	30.8	0.06	C
OVERALL	45.8	-	D	50.3	-	D	49.5	-	D	52.9	-	D
10: Ft Weaver Rd & Geiger Rd/Iroquois Rd												
NB LT	110.3	0.81	F	112.8	0.75	F	110.7	0.82	F	112.4	0.76	F
NB TH	39.0	0.48	D	42.0	0.46	D	40.4	0.49	D	45.3	0.51	D
NB RT	30.5	0.02	C	33.4	0.01	C	31.3	0.02	C	35.1	0.01	D
EB LT	102.0	0.70	F	94.9	0.55	F	102.4	0.72	F	94.2	0.56	F
EB TH	101.1	0.59	F	109.8	0.82	F	101.2	0.60	F	110.0	0.84	F
EB RT	99.8	0.51	F	101.0	0.67	F	99.9	0.53	F	101.2	0.69	F
WB LT	80.9	0.11	F	86.5	0.06	F	80.5	0.11	F	85.1	0.06	F
WB TH	124.7	0.92	F	127.6	0.90	F	126.0	0.93	F	130.0	0.91	F
WB RT	83.4	0.26	F	87.4	0.12	F	83.3	0.27	F	86.5	0.14	F
SB LT	116.8	0.82	F	114.7	0.87	F	117.5	0.82	F	114.9	0.87	F
SB TH	39.1	0.43	D	39.0	0.63	D	41.4	0.47	D	42.7	0.68	D
SB RT	34.3	0.15	C	32.1	0.32	C	36.0	0.18	D	34.5	0.34	C
OVERALL	66.9	-	E	63.5	-	E	68.0	-	E	65.9	-	E

Intersection	Base Year 2023 with Mitigation (Renton & Roosevelt Acceses)						Future Year 2026 (Renton & Roosevelt Accesses)					
	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
11: Ft Weaver Rd & Renton Rd												
NB LT	128.0	0.90	F	134.6	0.88	F	128.1	0.91	F	134.1	0.88	F
NB TH	29.2	0.88	C	19.3	0.52	B	32.7	0.92	C	19.6	0.55	B
NB RT	9.7	0.01	A	12.8	0.04	B	9.8	0.01	A	12.6	0.04	B
EB LT/TH	118.4	0.92	F	111.0	0.86	F	117.9	0.91	F	108.9	0.83	F
EB RT	93.9	0.46	F	95.1	0.44	F	93.4	0.42	F	94.3	0.38	F
WB LT/TH	142.7	0.75	F	129.7	0.82	F	138.7	0.75	F	129.7	0.82	F
WB RT	113.6	0.02	F	107.1	0.01	F	112.6	0.02	F	107.1	0.01	F
SB LT	118.8	0.32	F	117.5	0.63	F	118.8	0.32	F	117.5	0.63	F
SB TH	0.5	0.50	A	18.4	1.01	F*	0.7	0.55	A	35.9	1.06	F*
SB RT	0.5	0.21	A	1.2	0.40	A	0.5	0.23	A	1.4	0.44	A
OVERALL	33.7	-	C	29.9	-	C	35.0	-	C	38.0	-	D
12: Geiger Rd & Honouliuli Drwy 3												
EB LT	11.1	0.01	B	9.3	0.01	A	11.3	0.01	B	9.3	0.01	A
SB LT/RT	35.5	0.08	E	49.5	0.17	E	38.3	0.09	E	53.6	0.18	F
OVERALL	0.2	-	-	0.4	-	-	0.3	-	-	0.4	-	-
13: Roosevelt Ave & Honouliuli Drwy 4												
EB LT	9.7	0.02	A	8.7	0.01	A	9.7	0.02	A	8.8	0.01	A
SB LT/RT	23.4	0.08	C	57.6	0.66	F	24.2	0.08	C	62.6	0.69	F
OVERALL	0.4	-	-	4.7	-	-	0.4	-	-	5.0	-	-
14: Honouliuli Drwy 5 & Renton Rd												
NB LT/RT	8.8	0.02	A	9.7	0.11	A	8.8	0.02	A	9.8	0.11	A
WB LT	7.5	0.05	A	7.7	0.04	A	7.5	0.05	A	7.7	0.04	A
OVERALL	2.2	-	-	2.9	-	-	2.2	-	-	2.8	-	-

* Denotes overcapacity conditions, v/c ≥ 1.

6. CONCLUSIONS

The Project proposes to upgrade and expand the Honouliuli Wastewater Treatment Plant (WWTP) facility, which will occur in conjunction with the ENV Support Facilities at Honouliuli WWTP project. The Project is planned to be constructed in five (5) phases with full buildout anticipated in 2026. The anticipated Project timeline is as follows:

- Upgrade Phase 2: July 2018 – March 2020
- Phase 1A: September 2018 – December 2021
- Phase 1B: January 2019 – July 2022
- Phase 1C: July 2021 – December 2024
- Phase 1D: July 2023 – 2026

Upon completion of the Project, the number of employees required to operate the WWTP facility is projected to increase from 81 to approximately 120 employees. The employees will be assigned to one of three shifts: the daytime shift from 6:45 AM to 3:15 PM, the evening shift from 3:00 PM to 11:00 PM or the night shift from 11:00 PM to 7:00 AM. Seven (7) additional employees from a third party company will also operate a portion of the plant upon completion of Phase 1A. In addition to employee trips, WWTP client trips are expected to increase to approximately 60 to 80 trips with the expansion. Access to the Project will continue to be provided by the two (2) existing driveways along Geiger Road. Additionally, upon completion of the ENV Support Facilities at Honouliuli WWTP, a new driveway along Geiger Road to the east of Honouliuli Driveway 2 will be available for use by the Project.

At full build-out, the Project is projected to generate a total of 39(34) net external trips during the AM(PM) peak hours of traffic.

6.1 Existing Conditions

Traffic in the Project area was moderate along the majority of roadways in the study area during both peak hours of traffic. However, volumes along Fort Weaver Road were high during both peaks due to the large number of residential areas utilizing the roadway to travel to and from the H-1 Freeway. Although Kualakai Parkway also provides access to the H-1 Freeway, it was not observed to be utilized as highly as Fort Weaver Road. Despite the high volumes creating congestion along Fort Weaver Road, movements were generally able to clear intersections within one cycle due to the long coordinated cycle lengths along the roadway. Delay to the minor street approaches and left-turn movements along Fort Weaver Road were the result of the long cycle length and split phasing along the minor streets.

6.2 Base Year 2021

It is anticipated that by Base Year 2021, traffic will have increased over existing conditions due to the ongoing development in the Kapolei region. Traffic projections for Base Year 2021 were determined based on growth rates derived from the Oahu Regional Transportation Plan 2035 (ORTP) and known background developments.

Intersections along Fort Weaver Road are anticipated to continue operating poorly during both peak hours of traffic due to requisite long traffic signal cycle lengths, split phase operation and generally long crosswalk lengths across Fort Weaver Road. Further widening of Fort Weaver

Road is not prescribed by the ORTP 2035 and is generally considered infeasible due to insufficient right-of-way (ROW). Therefore, no mitigation is proposed for Base Year 2021 or any following Base Years or Future Years.

Several movements are anticipated to operate at overcapacity conditions by Base Year 2021 including the northbound approach at Geiger Road/Honouliuli Driveway 2/Kamakana Street and the northbound left-turn at Kapolei Parkway/Geiger Road. Improvements at the Kapolei Parkway/Geiger Road intersection are proposed to mitigate overcapacity conditions. However, because a traffic signal is not anticipated to be warranted at the Geiger Road/Honouliuli Driveway 2/Kamakana Street intersection, no mitigation is proposed. The intersection should be monitored upon buildout of Ewa by Gentry Makai to determine if additional improvements are required.

6.3 Base Year 2021 with Mitigation

The following mitigation is proposed for Base Year 2021 to be completed by others.

[9] Kapolei Parkway/Geiger Road

- Widen Kapolei Parkway to provide dual northbound left-turn lanes.
- Restripe the eastbound approach of Geiger Road to provide one (1) left-turn lane, one (1) through lane and one (1) right-turn lane.

With the proposed mitigation, all movements are anticipated to operate at under capacity conditions with all major through movements operating at LOS D or better and all minor street and left-turn movements operating at LOS E or better.

6.4 Base Year 2023

It is anticipated that by Base Year 2023, traffic will have increased over Base Year 2021 conditions due to the ongoing development in the Kapolei region. Base Year 2023 traffic projections were analyzed for three (3) different access scenarios that are proposed for the ENV Support Facilities at Honouliuli WWTP located on the Project site.

For all three (3) scenarios, the Kualakai Parkway/Kapolei Parkway and Fort Weaver Road/Renton Road intersections are expected to have movements operating at or near overcapacity conditions. However, because mitigation at these intersections is generally considered infeasible, no mitigation is proposed.

6.4.1 Roosevelt Avenue Access Only Intersection Analysis

Based on SimTraffic, exclusive left-turn lanes into the Honouliuli WWTP are recommended:

- Honouliuli Driveway 3 – Minimum 25 feet storage recommended
- Honouliuli Driveway 4 – Minimum 50 feet storage recommended

For the Roosevelt Avenue Access Only scenario, Honouliuli Driveway 3 is expected to operate at LOS E(F) along the southbound approach during the AM(PM) peak hours. However, volumes exiting the driveway are anticipated to be low with no more than 20 vehicles in either peak hour. Honouliuli Driveway 4 is expected to operate at overcapacity conditions along the southbound approach due to the large number of left-turns out of the driveway during the PM peak hour.

Because traffic is expected to queue into the project site and not affect any external roadways, no mitigation is proposed at the intersection. However, the driveway should be monitored upon full buildout of the ENV Support Facilities at Honouliuli WWTP to determine if additional improvements will be required to facilitate circulation.

6.4.2 Renton Road Access Only Intersection Analysis

Based on SimTraffic, exclusive left-turn lanes into the Honouliuli WWTP are recommended:

- Honouliuli Driveway 3 – Minimum 25 feet storage recommended
- Honouliuli Driveway 5 – Minimum 50 feet storage recommended

For the Renton Road Access Only scenario, both Honouliuli Driveway 3 and Honouliuli Driveway 5 are expected to operate adequately at LOS D or better during both peak hours of traffic.

6.4.3 Renton Road and Roosevelt Avenue Accesses Intersection Analysis

Based on SimTraffic, exclusive left-turn lanes into the Honouliuli WWTP are recommended:

- Honouliuli Driveway 3 – Minimum 25 feet storage recommended
- Honouliuli Driveway 4 – Minimum 50 feet storage recommended
- Honouliuli Driveway 5 – Minimum 50 feet storage recommended

For the Renton Road and Roosevelt Avenue Accesses scenario, Honouliuli Driveway 3 and Honouliuli Driveway 4 are expected to operate at LOS E/F during various peak hours. However, any potential queuing at the driveways is expected to queue into the project site and not affect any external roadways, and no mitigation is proposed at either intersection. Honouliuli Driveway 5 is expected to operate adequately at LOS A during both peak hours.

6.5 Future Year 2026

By Future Year 2026, the Project is projected to generate a total of 39(34) net external trips during the AM(PM) peak hours of traffic. Traffic projections for Future Year 2026 will depend on the access scenario selected for the ENV Support Facilities at Honouliuli WWTP project.

For all three (3) ENV Support Facilities at Honouliuli WWTP access scenarios, the majority of study intersection movements are forecast to operate similar to Base Year 2023, although some movements will experience an increase in delay due to increases in traffic along major roadways from the continued development in the Kapolei region. All movements operating at LOS E/F and/or overcapacity during Base Year 2023 are anticipated to continue operating with those conditions in Future Year 2026.

6.5.1 Roosevelt Avenue Access Only Intersection Analysis

Based on SimTraffic, the following left-turn lane lengths at the Project accesses are recommended:

- Honouliuli Driveway 1 – Minimum 50 feet storage recommended
- Honouliuli Driveway 2 – Minimum 25 feet storage recommended

- Honouliuli Driveway 3 – Minimum 25 feet storage recommended

For the Roosevelt Avenue Access Only scenario, both Honouliuli Driveway 2 and Honouliuli Driveway 3 are expected to operate at LOS E/F during various peak hours. However, volumes exiting the driveways are anticipated to be low with no more than 20 vehicles in either peak hour for each driveway. Honouliuli Driveway 1 is expected to operate adequately at LOS D or better during both peak hours.

6.5.2 Renton Road Access Only Intersection Analysis

Based on SimTraffic, the following left-turn lane lengths at the Project accesses are recommended:

- Honouliuli Driveway 1 – Minimum 50 feet storage recommended
- Honouliuli Driveway 2 – Minimum 25 feet storage recommended
- Honouliuli Driveway 3 – Minimum 25 feet storage recommended

For the Renton Road Access Only scenario, Honouliuli Driveway 2 is expected to operate at LOS F during both peak hours. However, volumes exiting the driveways are anticipated to be low with no more than 15 vehicles in either peak hour. Both Honouliuli Driveway 1 and Honouliuli Driveway 3 are expected to operate adequately at LOS D or better during both peak hours.

6.5.3 Renton Road and Roosevelt Avenue Accesses Intersection Analysis

Based on SimTraffic, the following left-turn lane lengths at the Project accesses are recommended:

- Honouliuli Driveway 1 – Minimum 50 feet storage recommended
- Honouliuli Driveway 2 – Minimum 25 feet storage recommended
- Honouliuli Driveway 3 – Minimum 25 feet storage recommended

For the Renton Road and Roosevelt Avenue Accesses scenario, both Honouliuli Driveway 2 and Honouliuli Driveway 3 are expected to operate at LOS E/F during various peak hours. However, volumes exiting the driveways are anticipated to be low with no more than 15 vehicles in either peak hour for each driveway. Honouliuli Driveway 1 is expected to operate adequately at LOS C or better during both peak hours.

7. RECOMMENDATIONS

A full summary of recommended roadway improvements is included in Appendix E.

7.1 Base Year 2021

The following mitigation is proposed for Base Year 2021 to be completed by others.

[9] Kapolei Parkway/Geiger Road

- Widen the northbound approach of Kapolei Parkway to provide dual left-turn lanes.
- Restripe the eastbound approach of Geiger Road to provide one (1) left-turn lane, one (1) through lane and one (1) right-turn lane.

7.2 Base Year 2023

The following mitigation is proposed for Base Year 2023 to be completed by the ENV Support Facilities at Honouliuli WWTP.

7.2.1 Roosevelt Avenue Access Only

[12] Geiger Road/Honouliuli Driveway 3

- Provide an eastbound left-turn lane with minimum storage length of 25 feet.

[13] Roosevelt Avenue/Honouliuli Driveway 4

- Provide an eastbound left-turn lane with minimum storage length of 50 feet.

7.2.2 Renton Road Access Only

[12] Geiger Road/Honouliuli Driveway 3

- Provide an eastbound left-turn lane with minimum storage length of 25 feet.

[14] Renton Road/Honouliuli Driveway 5

- Provide a westbound left-turn lane with minimum storage length of 50 feet.

7.2.3 Renton Road and Roosevelt Avenue Accesses

[12] Geiger Road/Honouliuli Driveway 3

- Provide an eastbound left-turn lane with minimum storage length of 25 feet.

[13] Roosevelt Avenue/Honouliuli Driveway 4

- Provide an eastbound left-turn lane with minimum storage length of 50 feet.

[14] Renton Road/Honouliuli Driveway 5

- Provide a westbound left-turn lane with minimum storage length of 50 feet.

7.3 Future Year 2026

The following mitigation is proposed for Future Year 2026.

7.3.1 Roosevelt Avenue Access Only

[7] Geiger Road/Honouliuli Driveway 1

- Extend the eastbound left-turn storage lane length to a minimum of 50 feet.

[8] Geiger Road/Honouliuli Driveway 2

- Extend the eastbound left-turn storage lane length to a minimum of 25 feet.

7.3.2 Renton Road Access Only

[7] Geiger Road/Honouliuli Driveway 1

- Extend the eastbound left-turn storage lane length to a minimum of 50 feet.

[8] Geiger Road/Honouliuli Driveway 2

- Extend the eastbound left-turn storage lane length to a minimum of 25 feet.

7.3.3 Renton Road and Roosevelt Avenue Accesses

[7] Geiger Road/Honouliuli Driveway 1

- Extend the eastbound left-turn storage lane length to a minimum of 50 feet.

[8] Geiger Road/Honouliuli Driveway 2

- Extend the eastbound left-turn storage lane length to a minimum of 25 feet.

8. REFERENCES

1. American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 2011.
2. Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2009.
3. Institute of Transportation Engineers, Trip Generation, 9th Edition, 2012.
4. Transportation Research Board, Highway Capacity Manual, 6th Edition, 2016.

APPENDIX A

TRAFFIC COUNT DATA

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File Name : Kualakai Pkwy - Kapolei Pkwy
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KUALAKAI PKWY SOUTHBOUND				KAPOLEI PKWY WESTBOUND				KUALAKAI PKWY NORTHBOUND				KAPOLEI PKWY EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30 AM	49	15	30	0	171	108	1	0	2	4	1	2	0	60	114	0	557
06:45 AM	40	17	40	0	155	145	1	0	1	7	0	0	3	68	88	0	565
Total	89	32	70	0	326	253	2	0	3	11	1	2	3	128	202	0	1122
07:00 AM	63	12	35	0	130	133	1	1	0	10	0	0	2	70	107	0	564
07:15 AM	78	12	64	0	136	192	4	0	1	7	2	1	6	82	122	0	707
07:30 AM	94	14	48	0	121	193	6	0	0	8	3	1	4	83	125	0	700
07:45 AM	78	16	44	0	138	184	10	0	2	11	3	0	9	69	119	0	683
Total	313	54	191	0	525	702	21	1	3	36	8	2	21	304	473	0	2654
08:00 AM	78	9	36	0	84	108	1	0	3	9	0	0	5	79	98	0	510
08:15 AM	62	15	31	1	70	104	5	1	3	5	2	0	3	46	77	0	425
Grand Total	542	110	328	1	1005	1167	29	2	12	61	11	4	32	557	850	0	4711
Apprch %	55.2	11.2	33.4	0.1	45.6	53	1.3	0.1	13.6	69.3	12.5	4.5	2.2	38.7	59.1	0	
Total %	11.5	2.3	7	0	21.3	24.8	0.6	0	0.3	1.3	0.2	0.1	0.7	11.8	18	0	
Motorcycles	1	1	0	0	0	3	0	0	0	1	0	0	0	4	0	0	10
% Motorcycles	0.2	0.9	0	0	0	0.3	0	0	0	1.6	0	0	0	0.7	0	0	0.2
Cars	431	78	271	0	961	985	27	0	11	49	5	0	28	454	747	0	4047
% Cars	79.5	70.9	82.6	0	95.6	84.4	93.1	0	91.7	80.3	45.5	0	87.5	81.5	87.9	0	85.9
Light Goods Vehicles	94	26	55	0	29	166	2	0	1	9	3	0	2	81	85	0	553
% Light Goods Vehicles	17.3	23.6	16.8	0	2.9	14.2	6.9	0	8.3	14.8	27.3	0	6.2	14.5	10	0	11.7
Buses	8	0	1	0	5	3	0	0	0	0	0	0	0	6	11	0	34
% Buses	1.5	0	0.3	0	0.5	0.3	0	0	0	0	0	0	0	1.1	1.3	0	0.7
Single-Unit Trucks	6	4	1	0	7	8	0	0	0	2	2	0	2	9	5	0	46
% Single-Unit Trucks	1.1	3.6	0.3	0	0.7	0.7	0	0	0	3.3	18.2	0	6.2	1.6	0.6	0	1
Articulated Trucks	2	1	0	0	0	1	0	0	0	0	1	0	0	3	2	0	10
% Articulated Trucks	0.4	0.9	0	0	0	0.1	0	0	0	0	9.1	0	0	0.5	0.2	0	0.2
Bicycles on Road	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	4
% Bicycles on Road	0	0	0	0	0.3	0.1	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	3
% Bicycles on Crosswalk	0	0	0	0	0	0	0	50	0	0	0	50	0	0	0	0	0.1
Pedestrians	0	0	0	1	0	0	0	1	0	0	0	2	0	0	0	0	4
% Pedestrians	0	0	0	100	0	0	0	50	0	0	0	50	0	0	0	0	0.1

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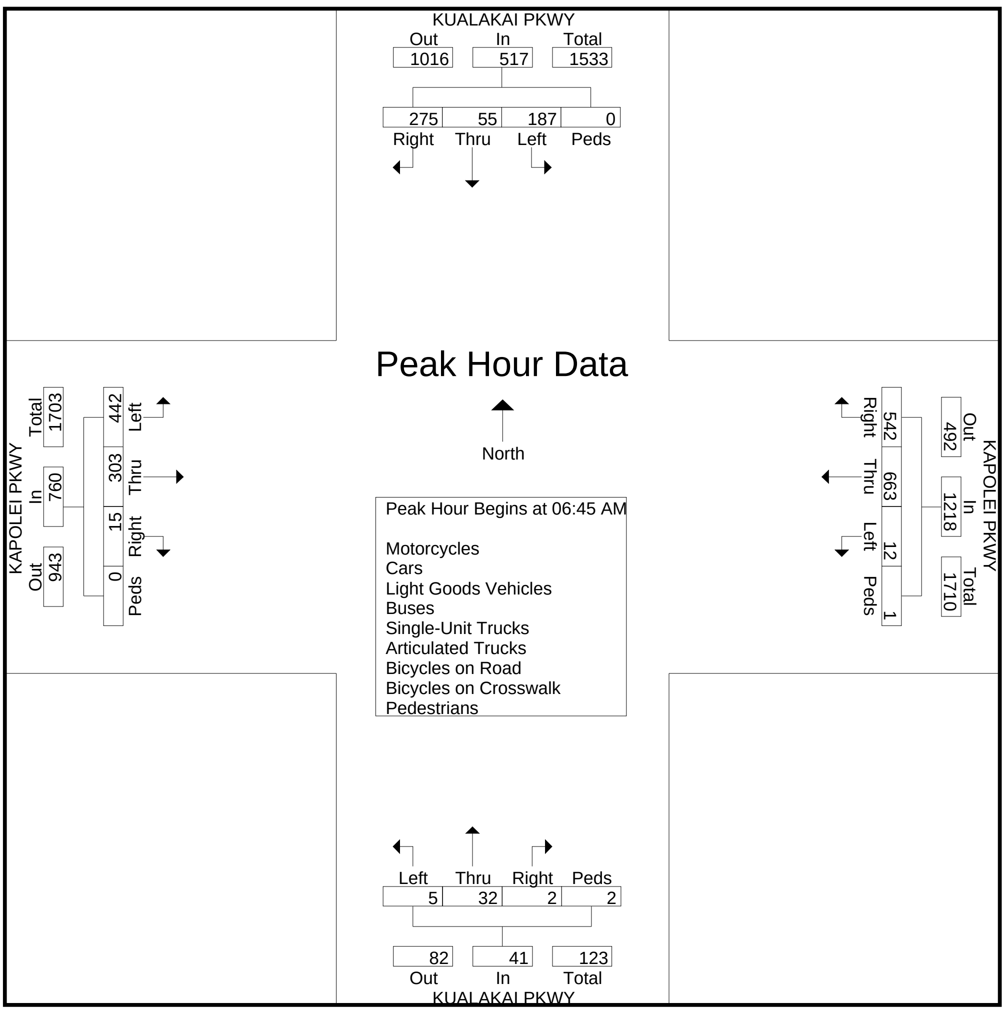
File Name : Kualakai Pkwy - Kapolei Pkwy
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 2

	KUALAKAI PKWY SOUTHBOUND					KAPOLEI PKWY WESTBOUND					KUALAKAI PKWY NORTHBOUND					KAPOLEI PKWY EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 07:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:45 AM																					
06:45 AM	40	**17**	40	0	97	**155**	145	1	0	301	**1**	7	0	0	8	3	68	88	0	159	565
07:00 AM	63	12	35	0	110	130	133	1	**1**	265	0	**10**	0	0	10	2	70	107	0	179	564
07:15 AM	78	12	**64**	0	154	136	192	4	0	**332**	1	7	2	**1**	11	**6**	82	122	0	210	**707**
07:30 AM	**94**	14	48	0	**156**	121	**193**	**6**	0	320	0	8	**3**	1	**12**	4	**83**	**125**	0	**212**	700
Total Volume	275	55	187	0	517	542	663	12	1	1218	2	32	5	2	41	15	303	442	0	760	2536
% App. Total	53.2	10.6	36.2	0		44.5	54.4	1	0.1		4.9	78	12.2	4.9		2	39.9	58.2	0		
PHF	.731	.809	.730	.000	.829	.874	.859	.500	.250	.917	.500	.800	.417	.500	.854	.625	.913	.884	.000	.896	.897



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File Name : Renton Rd - Kapolei Pkwy
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	RENTON RD SOUTHBOUND				KAPOLEI PKWY WESTBOUND				RENTON RD NORTHBOUND				KAPOLEI PKWY EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30 AM	62	18	15	1	56	224	6	1	3	11	2	3	10	65	18	0	495
06:45 AM	62	23	30	7	61	238	11	0	1	6	1	0	3	68	34	0	545
Total	124	41	45	8	117	462	17	1	4	17	3	3	13	133	52	0	1040
07:00 AM	55	21	51	1	51	194	10	0	3	9	1	0	3	74	29	0	502
07:15 AM	88	30	75	4	92	243	6	0	2	18	4	0	1	101	39	0	703
07:30 AM	84	34	77	4	85	275	12	0	8	17	4	1	3	67	52	0	723
07:45 AM	84	40	63	2	60	200	8	0	3	18	4	0	1	76	47	0	606
Total	311	125	266	11	288	912	36	0	16	62	13	1	8	318	167	0	2534
08:00 AM	54	13	27	2	31	128	6	0	0	13	6	0	2	84	27	0	393
08:15 AM	44	9	15	5	18	140	5	0	3	12	3	0	1	60	21	0	336
Grand Total	533	188	353	26	454	1642	64	1	23	104	25	4	24	595	267	0	4303
Apprch %	48.5	17.1	32.1	2.4	21	76	3	0	14.7	66.7	16	2.6	2.7	67.2	30.1	0	
Total %	12.4	4.4	8.2	0.6	10.6	38.2	1.5	0	0.5	2.4	0.6	0.1	0.6	13.8	6.2	0	
Motorcycles	1	0	1	0	0	10	0	0	0	0	0	0	0	3	0	0	15
% Motorcycles	0.2	0	0.3	0	0	0.6	0	0	0	0	0	0	0	0.5	0	0	0.3
Cars	424	140	273	0	450	1325	52	0	20	72	10	0	21	468	222	0	3477
% Cars	79.5	74.5	77.3	0	99.1	80.7	81.2	0	87	69.2	40	0	87.5	78.7	83.1	0	80.8
Light Goods Vehicles	101	45	73	0	0	289	12	0	3	27	10	0	2	109	41	0	712
% Light Goods Vehicles	18.9	23.9	20.7	0	0	17.6	18.8	0	13	26	40	0	8.3	18.3	15.4	0	16.5
Buses	6	3	4	0	3	4	0	0	0	3	0	0	0	3	4	0	30
% Buses	1.1	1.6	1.1	0	0.7	0.2	0	0	0	2.9	0	0	0	0.5	1.5	0	0.7
Single-Unit Trucks	1	0	2	0	1	10	0	0	0	1	5	0	1	9	0	0	30
% Single-Unit Trucks	0.2	0	0.6	0	0.2	0.6	0	0	0	1	20	0	4.2	1.5	0	0	0.7
Articulated Trucks	0	0	0	0	0	1	0	0	0	1	0	0	0	3	0	0	5
% Articulated Trucks	0	0	0	0	0	0.1	0	0	0	1	0	0	0	0.5	0	0	0.1
Bicycles on Road	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
% Bicycles on Road	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	15
% Bicycles on Crosswalk	0	0	0	57.7	0	0	0	0	0	0	0	0	0	0	0	0	0.3
Pedestrians	0	0	0	11	0	0	0	1	0	0	0	4	0	0	0	0	16
% Pedestrians	0	0	0	42.3	0	0	0	100	0	0	0	100	0	0	0	0	0.4

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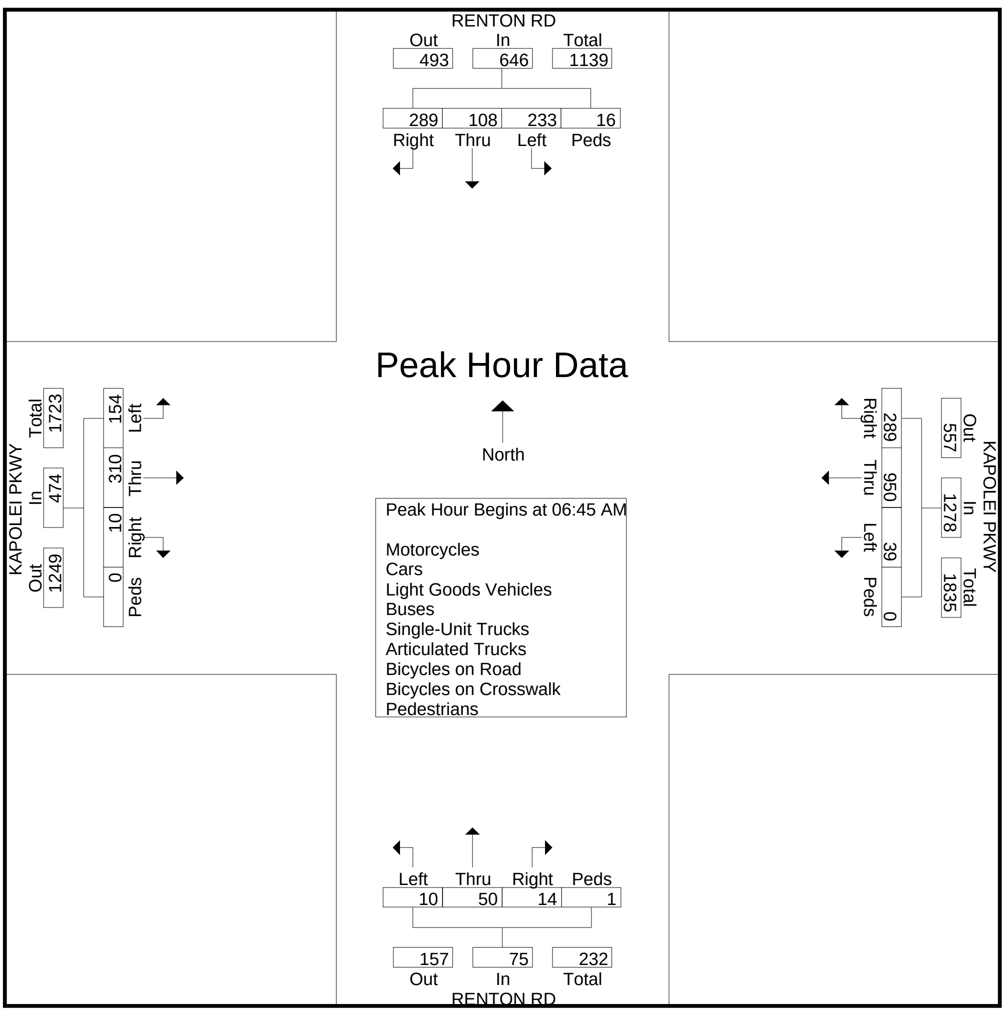
File Name : Renton Rd - Kapolei Pkwy
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 2

	RENTON RD SOUTHBOUND					KAPOLEI PKWY WESTBOUND					RENTON RD NORTHBOUND					KAPOLEI PKWY EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 07:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:45 AM																					
06:45 AM	62	23	30	**7**	122	61	238	11	0	310	1	6	1	0	8	**3**	68	34	0	105	545
07:00 AM	55	21	51	1	128	51	194	10	0	255	3	9	1	0	13	3	74	29	0	106	502
07:15 AM	**88**	30	75	4	197	**92**	243	6	0	341	2	**18**	**4**	0	24	1	**101**	39	0	**141**	703
07:30 AM	84	**34**	**77**	4	**199**	85	**275**	**12**	0	**372**	**8**	17	4	**1**	**30**	3	67	**52**	0	122	**723**
Total Volume	289	108	233	16	646	289	950	39	0	1278	14	50	10	1	75	10	310	154	0	474	2473
% App. Total	44.7	16.7	36.1	2.5		22.6	74.3	3.1	0		18.7	66.7	13.3	1.3		2.1	65.4	32.5	0		
PHF	.821	.794	.756	.571	.812	.785	.864	.813	.000	.859	.438	.694	.625	.250	.625	.833	.767	.740	.000	.840	.855



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File Name : Phillipine Sea - Renton Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	Southbound St. SOUTHBOUND				PHILLIPINE SEA WESTBOUND				RENTON RD NORTHBOUND				PHILLIPINE SEA EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30 AM	0	0	0	0	0	0	30	0	11	0	1	0	1	0	0	0	43
06:45 AM	0	0	0	0	0	1	34	0	6	0	0	1	0	0	0	0	42
Total	0	0	0	0	0	1	64	0	17	0	1	1	1	0	0	0	85
07:00 AM	0	0	0	1	0	2	35	0	16	0	1	0	0	2	0	0	57
07:15 AM	0	0	0	0	0	0	36	0	18	0	0	0	0	1	0	0	55
07:30 AM	0	0	0	0	0	0	49	0	26	0	0	0	1	1	0	0	77
07:45 AM	0	0	0	0	0	0	45	0	23	0	1	0	0	0	0	0	69
Total	0	0	0	1	0	2	165	0	83	0	2	0	1	4	0	0	258
08:00 AM	0	0	0	0	0	0	22	0	16	0	1	0	0	1	0	0	40
08:15 AM	0	0	0	0	0	1	11	0	16	0	0	0	1	0	0	0	29
Grand Total	0	0	0	1	0	4	262	0	132	0	4	1	3	5	0	0	412
Apprch %	0	0	0	100	0	1.5	98.5	0	96.4	0	2.9	0.7	37.5	62.5	0	0	
Total %	0	0	0	0.2	0	1	63.6	0	32	0	1	0.2	0.7	1.2	0	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	0	0	0	0	0	3	191	0	83	0	4	0	3	4	0	0	288
% Cars	0	0	0	0	0	75	72.9	0	62.9	0	100	0	100	80	0	0	69.9
Light Goods Vehicles	0	0	0	0	0	1	68	0	41	0	0	0	0	1	0	0	111
% Light Goods Vehicles	0	0	0	0	0	25	26	0	31.1	0	0	0	0	20	0	0	26.9
Buses	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	6
% Buses	0	0	0	0	0	0	1.1	0	2.3	0	0	0	0	0	0	0	1.5
Single-Unit Trucks	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
% Single-Unit Trucks	0	0	0	0	0	0	0	0	2.3	0	0	0	0	0	0	0	0.7
Articulated Trucks	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0.2
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	0.8	0	0	0	0	0	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	1	0	0	0	0	0	0	0	1	0	0	0	0	2
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	100	0	0	0	0	0.5

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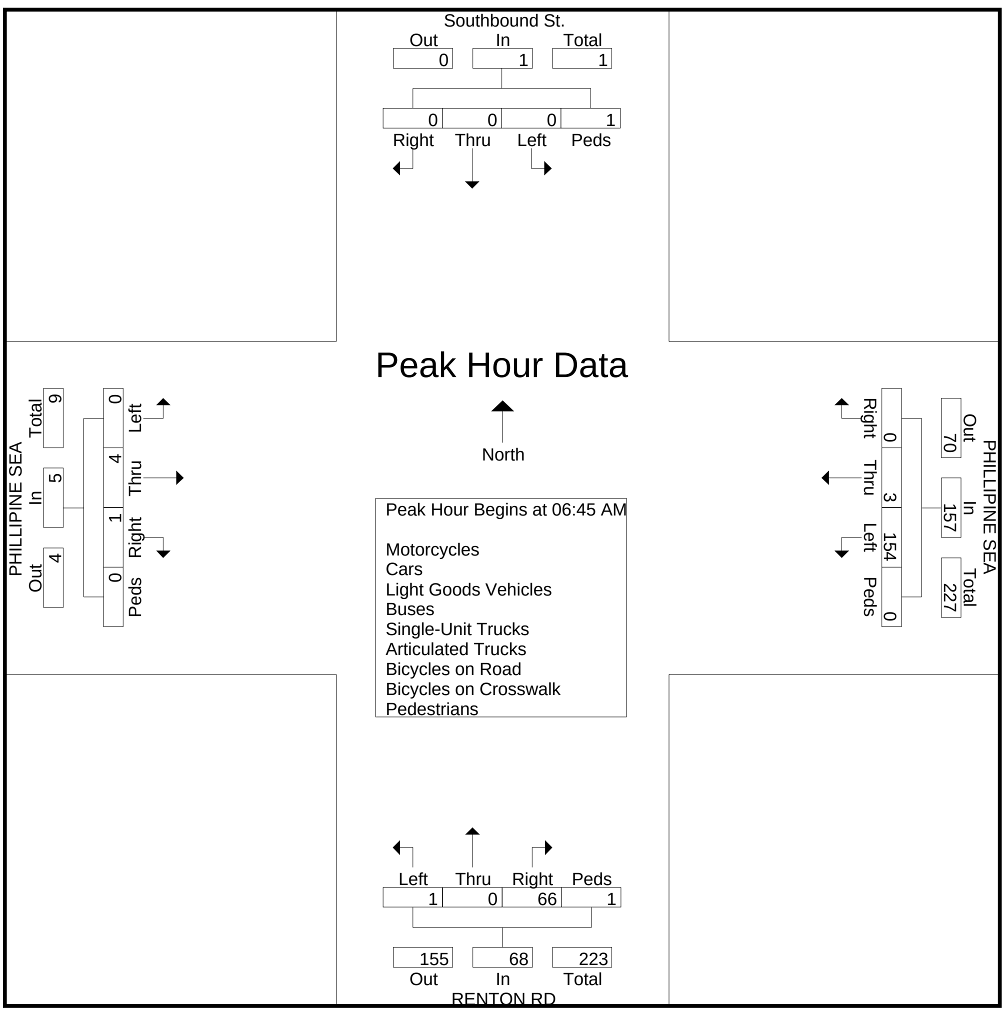
File Name : Phillipine Sea - Renton Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

	Southbound St. SOUTHBOUND					PHILLIPINE SEA WESTBOUND					RENTON RD NORTHBOUND					PHILLIPINE SEA EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 07:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:45 AM																					
06:45 AM	0	0	0	0	0	0	1	34	0	35	6	0	0	**1**	7	0	0	0	0	0	42
07:00 AM	0	0	0	**1**	**1**	0	**2**	35	0	37	16	0	**1**	0	17	0	**2**	0	0	**2**	57
07:15 AM	0	0	0	0	0	0	0	36	0	36	18	0	0	0	18	0	1	0	0	1	55
07:30 AM	0	0	0	0	0	0	0	**49**	0	**49**	**26**	0	0	0	**26**	**1**	1	0	0	2	**77**
Total Volume	0	0	0	1	1	0	3	154	0	157	66	0	1	1	68	1	4	0	0	5	231
% App. Total	0	0	0	100		0	1.9	98.1	0		97.1	0	1.5	1.5		20	80	0	0		
PHF	.000	.000	.000	.250	.250	.000	.375	.786	.000	.801	.635	.000	.250	.250	.654	.250	.500	.000	.000	.625	.750



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File Name : Philipine Sea - Roosevelt Ave
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	PHILLIPINE SEA SOUTHBOUND				ROOSEVELT AVE WESTBOUND				PHILLIPINE SEA NORTHBOUND				ROOSEVELT AVE EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30 AM	23	0	8	0	4	98	0	0	0	1	1	0	0	73	7	0	215
06:45 AM	27	2	5	0	4	141	1	0	0	0	0	0	2	70	0	0	252
Total	50	2	13	0	8	239	1	0	0	1	1	0	2	143	7	0	467
07:00 AM	31	1	3	0	4	148	0	0	0	0	0	0	0	92	12	0	291
07:15 AM	36	0	3	0	3	166	1	0	0	0	0	0	0	100	15	0	324
07:30 AM	42	0	7	1	3	158	1	0	0	0	0	0	0	79	21	0	312
07:45 AM	38	0	2	0	6	140	0	0	0	0	0	0	1	71	19	0	277
Total	147	1	15	1	16	612	2	0	0	0	0	0	1	342	67	0	1204
08:00 AM	19	0	5	0	5	95	0	0	0	1	0	0	0	69	11	0	205
08:15 AM	10	0	1	0	1	88	0	0	0	0	0	0	1	61	13	0	175
Grand Total	226	3	34	1	30	1034	3	0	0	2	1	0	4	615	98	0	2051
Apprch %	85.6	1.1	12.9	0.4	2.8	96.9	0.3	0	0	66.7	33.3	0	0.6	85.8	13.7	0	
Total %	11	0.1	1.7	0	1.5	50.4	0.1	0	0	0.1	0	0	0.2	30	4.8	0	
Motorcycles	0	0	0	0	0	8	0	0	0	0	0	0	0	2	0	0	10
% Motorcycles	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0.3	0	0	0.5
Cars	171	2	20	0	14	767	2	0	0	1	1	0	3	426	67	0	1474
% Cars	75.7	66.7	58.8	0	46.7	74.2	66.7	0	0	50	100	0	75	69.3	68.4	0	71.9
Light Goods Vehicles	55	1	11	0	13	228	1	0	0	0	0	0	1	156	28	0	494
% Light Goods Vehicles	24.3	33.3	32.4	0	43.3	22.1	33.3	0	0	0	0	0	25	25.4	28.6	0	24.1
Buses	0	0	3	0	3	5	0	0	0	0	0	0	0	5	0	0	16
% Buses	0	0	8.8	0	10	0.5	0	0	0	0	0	0	0	0.8	0	0	0.8
Single-Unit Trucks	0	0	0	0	0	21	0	0	0	1	0	0	0	22	2	0	46
% Single-Unit Trucks	0	0	0	0	0	2	0	0	0	50	0	0	0	3.6	2	0	2.2
Articulated Trucks	0	0	0	0	0	5	0	0	0	0	0	0	0	4	1	0	10
% Articulated Trucks	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.7	1	0	0.5
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0

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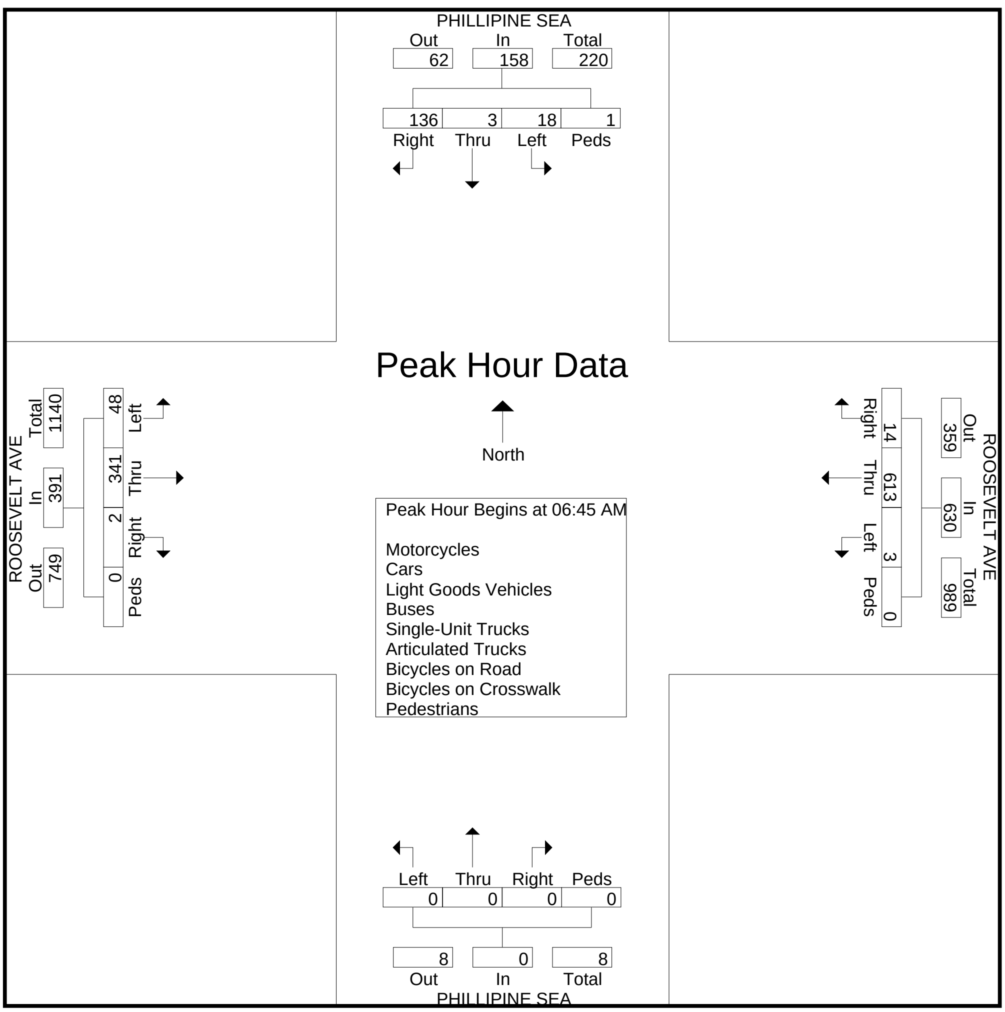
File Name : Philipine Sea - Roosevelt Ave
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

	PHILLIPINE SEA SOUTHBOUND					ROOSEVELT AVE WESTBOUND					PHILLIPINE SEA NORTHBOUND					ROOSEVELT AVE EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 07:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:45 AM																					
06:45 AM	27	**2**	5	0	34	**4**	141	**1**	0	146	0	0	0	0	0	**2**	70	0	0	72	252
07:00 AM	31	1	3	0	35	4	148	0	0	152	0	0	0	0	0	0	92	12	0	104	291
07:15 AM	36	0	3	0	39	3	**166**	1	0	**170**	0	0	0	0	0	0	**100**	15	0	**115**	**324**
07:30 AM	**42**	0	**7**	**1**	**50**	3	158	1	0	162	0	0	0	0	0	0	79	**21**	0	100	312
Total Volume	136	3	18	1	158	14	613	3	0	630	0	0	0	0	0	2	341	48	0	391	1179
% App. Total	86.1	1.9	11.4	0.6		2.2	97.3	0.5	0		0	0	0	0		0.5	87.2	12.3	0		
PHF	.810	.375	.643	.250	.790	.875	.923	.750	.000	.926	.000	.000	.000	.000	.000	.250	.853	.571	.000	.850	.910



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File Name : Essex Rd - Roosevelt Ave_Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	GEIGER RD WESTBOUND			ESSEX RD NORTHBOUND			ROOSEVELT AVE EASTBOUND			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
06:30 AM	92	7	0	2	0	0	1	80	0	182
06:45 AM	147	6	0	1	0	0	0	74	0	228
Total	239	13	0	3	0	0	1	154	0	410
07:00 AM	147	6	0	0	1	0	2	86	0	242
07:15 AM	176	4	0	0	0	0	3	97	0	280
07:30 AM	171	5	0	0	0	0	6	74	0	256
07:45 AM	139	7	0	1	1	0	2	78	0	228
Total	633	22	0	1	2	0	13	335	0	1006
08:00 AM	91	6	0	3	2	0	3	67	0	172
08:15 AM	82	4	0	0	1	0	1	59	0	147
Grand Total	1045	45	0	7	5	0	18	615	0	1735
Apprch %	95.9	4.1	0	58.3	41.7	0	2.8	97.2	0	
Total %	60.2	2.6	0	0.4	0.3	0	1	35.4	0	
Motorcycles	9	0	0	0	0	0	0	2	0	11
% Motorcycles	0.9	0	0	0	0	0	0	0.3	0	0.6
Cars	760	38	0	7	5	0	11	428	0	1249
% Cars	72.7	84.4	0	100	100	0	61.1	69.6	0	72
Light Goods Vehicles	243	7	0	0	0	0	7	151	0	408
% Light Goods Vehicles	23.3	15.6	0	0	0	0	38.9	24.6	0	23.5
Buses	8	0	0	0	0	0	0	9	0	17
% Buses	0.8	0	0	0	0	0	0	1.5	0	1
Single-Unit Trucks	21	0	0	0	0	0	0	21	0	42
% Single-Unit Trucks	2	0	0	0	0	0	0	3.4	0	2.4
Articulated Trucks	4	0	0	0	0	0	0	4	0	8
% Articulated Trucks	0.4	0	0	0	0	0	0	0.7	0	0.5
Bicycles on Road	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0

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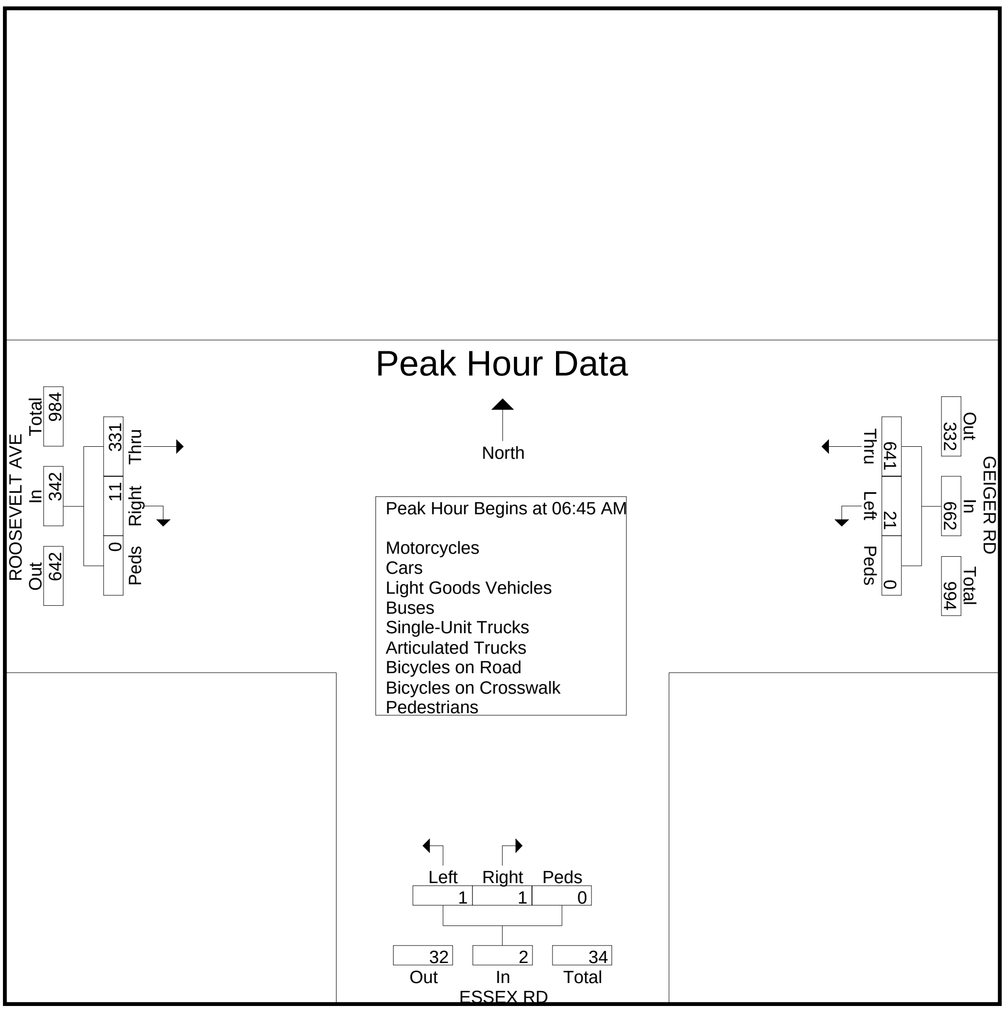
File Name : Essex Rd - Roosevelt Ave_Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

	GEIGER RD WESTBOUND				ESSEX RD NORTHBOUND				ROOSEVELT AVE EASTBOUND				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	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 06:45 AM													
06:45 AM	147	**6**	0	153	**1**	0	0	**1**	0	74	0	74	228
07:00 AM	147	6	0	153	0	**1**	0	1	2	86	0	88	242
07:15 AM	**176**	4	0	**180**	0	0	0	0	3	**97**	0	**100**	**280**
07:30 AM	171	5	0	176	0	0	0	0	**6**	74	0	80	256
Total Volume	641	21	0	662	1	1	0	2	11	331	0	342	1006
% App. Total	96.8	3.2	0		50	50	0		3.2	96.8	0		
PHF	.911	.875	.000	.919	.250	.250	.000	.500	.458	.853	.000	.855	.898



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File Name : ERCC Driveway - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	ERCC DRIVEWAY SOUTHBOUND			GEIGER RD WESTBOUND			GEIGER RD EASTBOUND			
Start Time	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	Int. Total
06:30 AM	0	0	0	2	113	0	83	0	0	198
06:45 AM	1	1	0	1	141	0	75	1	0	220
Total	1	1	0	3	254	0	158	1	0	418
07:00 AM	3	0	0	1	154	0	85	0	0	243
07:15 AM	1	0	0	0	173	0	97	1	0	272
07:30 AM	4	2	0	3	172	0	73	4	0	258
07:45 AM	1	1	1	3	145	0	74	1	0	226
Total	9	3	1	7	644	0	329	6	0	999
08:00 AM	2	3	0	3	105	0	69	1	0	183
08:15 AM	4	2	0	3	78	0	57	4	0	148
Grand Total	16	9	1	16	1081	0	613	12	0	1748
Apprch %	61.5	34.6	3.8	1.5	98.5	0	98.1	1.9	0	
Total %	0.9	0.5	0.1	0.9	61.8	0	35.1	0.7	0	
Motorcycles	0	0	0	0	9	0	2	0	0	11
% Motorcycles	0	0	0	0	0.8	0	0.3	0	0	0.6
Cars	3	3	0	6	803	0	429	0	0	1244
% Cars	18.8	33.3	0	37.5	74.3	0	70	0	0	71.2
Light Goods Vehicles	10	6	0	7	238	0	149	11	0	421
% Light Goods Vehicles	62.5	66.7	0	43.8	22	0	24.3	91.7	0	24.1
Buses	0	0	0	0	8	0	9	0	0	17
% Buses	0	0	0	0	0.7	0	1.5	0	0	1
Single-Unit Trucks	3	0	0	3	19	0	20	1	0	46
% Single-Unit Trucks	18.8	0	0	18.8	1.8	0	3.3	8.3	0	2.6
Articulated Trucks	0	0	0	0	4	0	4	0	0	8
% Articulated Trucks	0	0	0	0	0.4	0	0.7	0	0	0.5
Bicycles on Road	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	1	0	0	0	0	0	0	1
% Pedestrians	0	0	100	0	0	0	0	0	0	0.1

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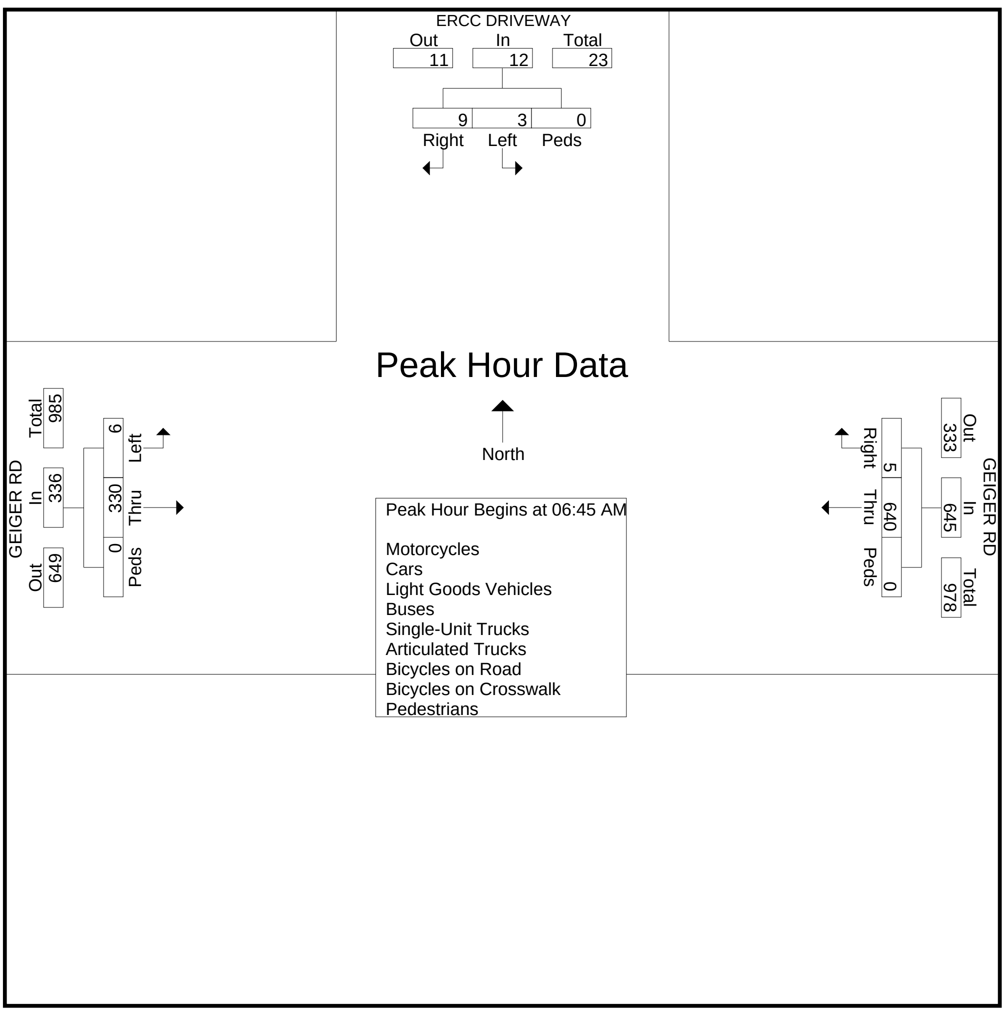
File Name : ERCC Driveway - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

	ERCC DRIVEWAY SOUTHBOUND				GEIGER RD WESTBOUND				GEIGER RD EASTBOUND				
Start Time	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 07:30 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 06:45 AM													
06:45 AM	1	1	0	2	1	141	0	142	75	1	0	76	220
07:00 AM	3	0	0	3	1	154	0	155	85	0	0	85	243
07:15 AM	1	0	0	1	0	**173**	0	173	**97**	1	0	**98**	**272**
07:30 AM	**4**	**2**	0	**6**	**3**	172	0	**175**	73	**4**	0	77	258
Total Volume	9	3	0	12	5	640	0	645	330	6	0	336	993
% App. Total	75	25	0		0.8	99.2	0		98.2	1.8	0		
PHF	.563	.375	.000	.500	.417	.925	.000	.921	.851	.375	.000	.857	.913



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File Name : Honouliuli WWTR Dwy 1 - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOULIULI WWTP DRIVEWAY 1 SOUTHBOUND			GEIGER RD WESTBOUND			GEIGER RD EASTBOUND			
Start Time	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	Int. Total
06:30 AM	0	0	0	10	104	0	75	9	0	198
06:45 AM	2	0	0	8	149	0	71	6	0	236
Total	2	0	0	18	253	0	146	15	0	434
07:00 AM	2	3	0	3	152	0	87	2	0	249
07:15 AM	1	1	0	2	176	0	95	0	0	275
07:30 AM	1	3	0	4	174	0	67	2	0	251
07:45 AM	1	2	0	3	147	0	77	4	0	234
Total	5	9	0	12	649	0	326	8	0	1009
08:00 AM	0	1	0	6	102	0	70	2	0	181
08:15 AM	1	2	0	0	80	0	56	0	0	139
Grand Total	8	12	0	36	1084	0	598	25	0	1763
Apprch %	40	60	0	3.2	96.8	0	96	4	0	
Total %	0.5	0.7	0	2	61.5	0	33.9	1.4	0	
Motorcycles	0	0	0	1	9	0	2	0	0	12
% Motorcycles	0	0	0	2.8	0.8	0	0.3	0	0	0.7
Cars	3	2	0	28	806	0	429	12	0	1280
% Cars	37.5	16.7	0	77.8	74.4	0	71.7	48	0	72.6
Light Goods Vehicles	3	7	0	7	237	0	139	10	0	403
% Light Goods Vehicles	37.5	58.3	0	19.4	21.9	0	23.2	40	0	22.9
Buses	0	0	0	0	8	0	9	0	0	17
% Buses	0	0	0	0	0.7	0	1.5	0	0	1
Single-Unit Trucks	2	3	0	0	20	0	17	2	0	44
% Single-Unit Trucks	25	25	0	0	1.8	0	2.8	8	0	2.5
Articulated Trucks	0	0	0	0	4	0	2	1	0	7
% Articulated Trucks	0	0	0	0	0.4	0	0.3	4	0	0.4
Bicycles on Road	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0

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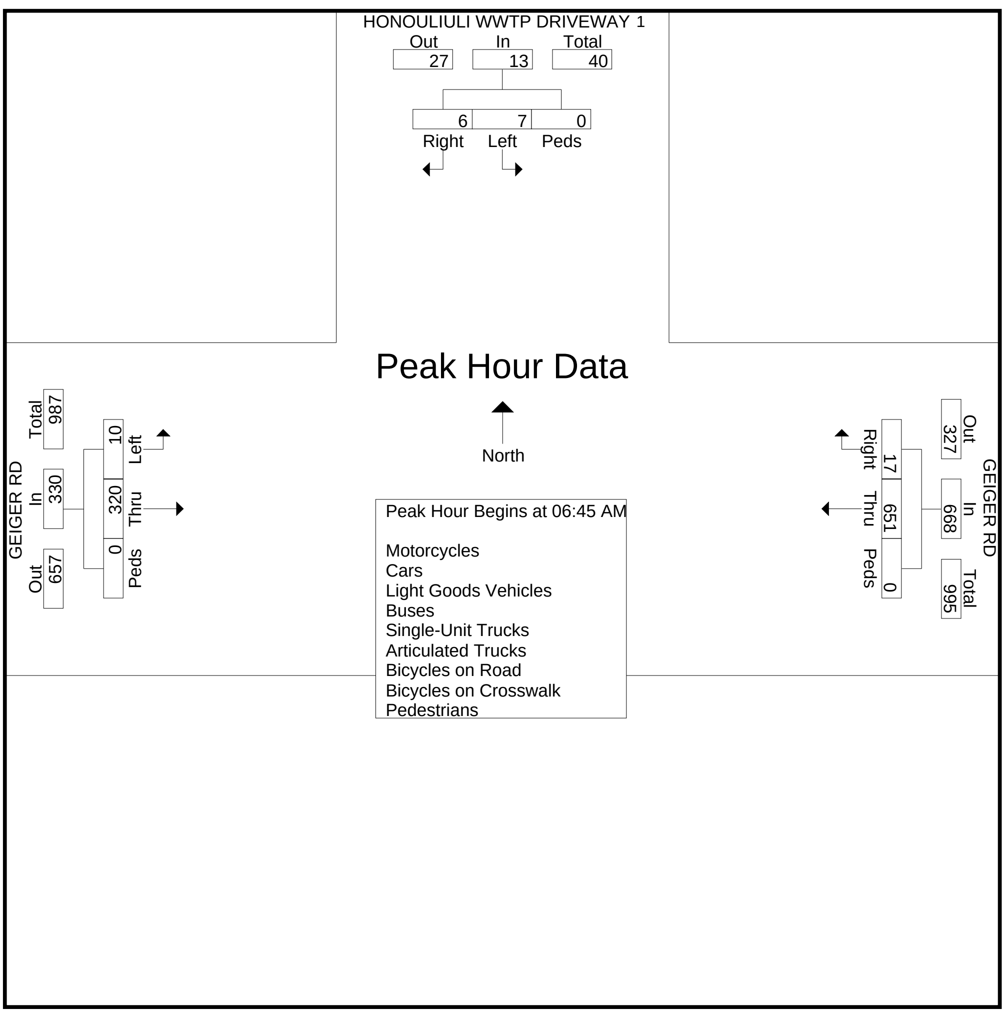
File Name : Honouliuli WWTR Dwy 1 - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 2

	HONOULIULI WWTP DRIVEWAY 1 SOUTHBOUND				GEIGER RD WESTBOUND				GEIGER RD EASTBOUND				
Start Time	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	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 06:45 AM													
06:45 AM	**2**	0	0	2	**8**	149	0	157	71	**6**	0	77	236
07:00 AM	2	**3**	0	**5**	3	152	0	155	87	2	0	89	249
07:15 AM	1	1	0	2	2	**176**	0	**178**	**95**	0	0	**95**	**275**
07:30 AM	1	3	0	4	4	174	0	178	67	2	0	69	251
Total Volume	6	7	0	13	17	651	0	668	320	10	0	330	1011
% App. Total	46.2	53.8	0		2.5	97.5	0		97	3	0		
PHF	.750	.583	.000	.650	.531	.925	.000	.938	.842	.417	.000	.868	.919



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File Name : Honouliuli WWTR Dwy 2 - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOULIULI WWTP DRIVEWAY 2 SOUTHBOUND				GEIGER RD WESTBOUND				KAMAKANA ST NORTHBOUND				GEIGER RD EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30 AM	0	0	0	0	6	127	25	0	3	0	2	0	7	68	0	0	238
06:45 AM	0	0	0	0	4	146	14	0	12	0	12	0	4	71	0	0	263
Total	0	0	0	0	10	273	39	0	15	0	14	0	11	139	0	0	501
07:00 AM	0	0	0	0	0	159	8	0	20	0	6	0	4	81	0	0	278
07:15 AM	0	0	1	0	0	174	8	0	19	0	7	0	5	89	0	0	303
07:30 AM	0	0	0	0	0	163	15	0	10	0	6	0	6	77	0	0	277
07:45 AM	0	0	2	0	0	130	10	0	11	0	3	0	4	65	0	0	225
Total	0	0	3	0	0	626	41	0	60	0	22	0	19	312	0	0	1083
08:00 AM	1	0	0	0	1	100	11	0	14	0	5	0	5	67	0	0	204
08:15 AM	0	0	0	0	2	85	5	0	4	0	1	0	2	59	0	0	158
Grand Total	1	0	3	0	13	1084	96	0	93	0	42	0	37	577	0	0	1946
Apprch %	25	0	75	0	1.1	90.9	8	0	68.9	0	31.1	0	6	94	0	0	
Total %	0.1	0	0.2	0	0.7	55.7	4.9	0	4.8	0	2.2	0	1.9	29.7	0	0	
Motorcycles	0	0	0	0	0	9	0	0	0	0	0	0	0	2	0	0	11
% Motorcycles	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0.3	0	0	0.6
Cars	0	0	0	0	8	810	29	0	50	0	27	0	19	417	0	0	1360
% Cars	0	0	0	0	61.5	74.7	30.2	0	53.8	0	64.3	0	51.4	72.3	0	0	69.9
Light Goods Vehicles	0	0	3	0	5	237	56	0	37	0	13	0	16	129	0	0	496
% Light Goods Vehicles	0	0	100	0	38.5	21.9	58.3	0	39.8	0	31	0	43.2	22.4	0	0	25.5
Buses	0	0	0	0	0	8	0	0	0	0	0	0	0	8	0	0	16
% Buses	0	0	0	0	0	0.7	0	0	0	0	0	0	0	1.4	0	0	0.8
Single-Unit Trucks	0	0	0	0	0	17	11	0	6	0	2	0	2	20	0	0	58
% Single-Unit Trucks	0	0	0	0	0	1.6	11.5	0	6.5	0	4.8	0	5.4	3.5	0	0	3
Articulated Trucks	1	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	4
% Articulated Trucks	100	0	0	0	0	0.2	0	0	0	0	0	0	0	0.2	0	0	0.2
Bicycles on Road	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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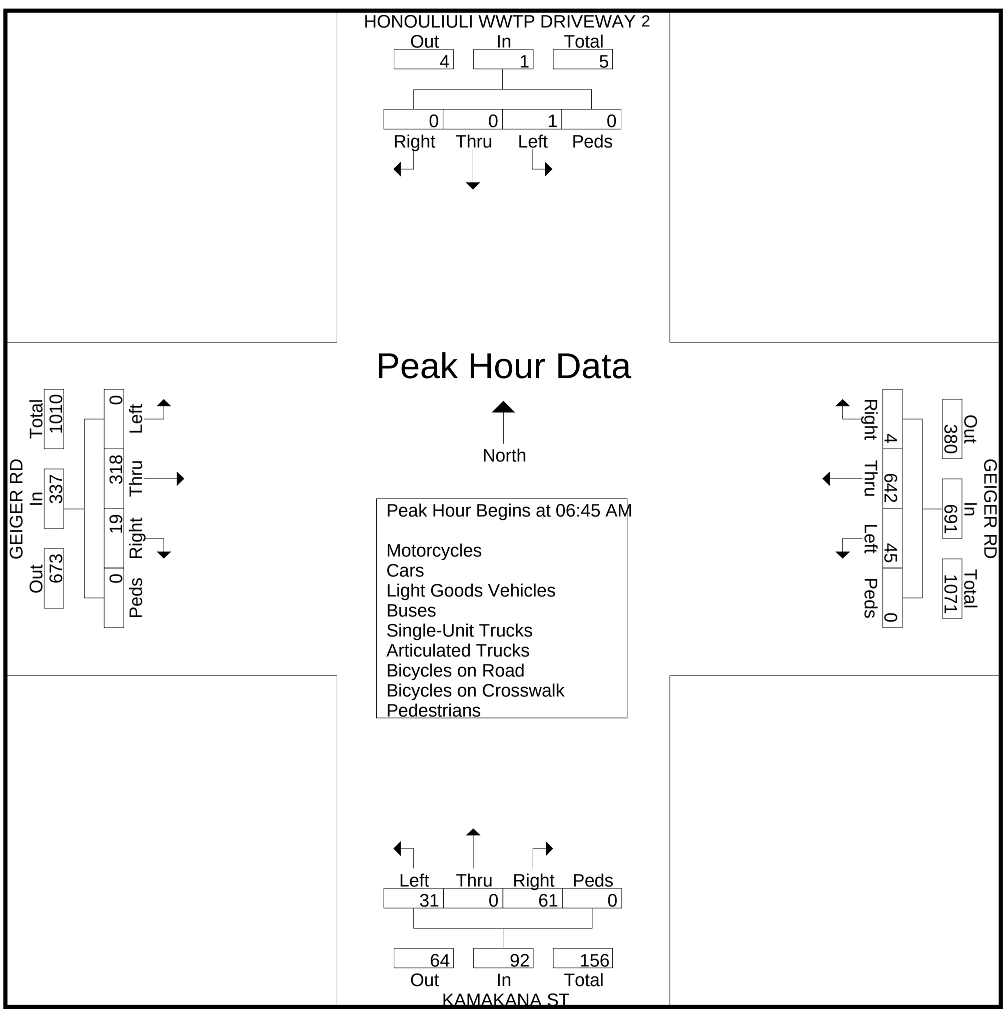
File Name : Honouliuli WWTR Dwy 2 - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

	HONOULIULI WWTP DRIVEWAY 2 SOUTHBOUND					GEIGER RD WESTBOUND					KAMAKANA ST NORTHBOUND					GEIGER RD EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	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 06:45 AM																					
06:45 AM	0	0	0	0	0	**4**	146	14	0	164	12	0	**12**	0	24	4	71	0	0	75	263
07:00 AM	0	0	0	0	0	0	159	8	0	167	**20**	0	6	0	**26**	4	81	0	0	85	278
07:15 AM	0	0	**1**	0	**1**	0	**174**	8	0	**182**	19	0	7	0	26	5	**89**	0	0	**94**	**303**
07:30 AM	0	0	0	0	0	0	163	**15**	0	178	10	0	6	0	16	**6**	77	0	0	83	277
Total Volume	0	0	1	0	1	4	642	45	0	691	61	0	31	0	92	19	318	0	0	337	1121
% App. Total	0	0	100	0		0.6	92.9	6.5	0		66.3	0	33.7	0		5.6	94.4	0	0		
PHF	.000	.000	.250	.000	.250	.250	.922	.750	.000	.949	.763	.000	.646	.000	.885	.792	.893	.000	.000	.896	.925



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File Name : Kapolei Pkwy - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KAPOLEI PKWY SOUTHBOUND				GEIGER RD WESTBOUND				KAPOLEI PKWY NORTHBOUND				GEIGER RD EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30 AM	17	62	23	3	48	72	11	6	17	265	79	2	39	29	3	5	681
06:45 AM	10	121	17	0	77	73	12	12	29	222	82	1	49	13	1	4	723
Total	27	183	40	3	125	145	23	18	46	487	161	3	88	42	4	9	1404
07:00 AM	15	103	24	2	53	79	12	25	26	198	82	3	65	41	10	5	743
07:15 AM	14	192	33	0	76	77	27	21	28	226	82	5	67	30	3	6	887
07:30 AM	12	144	22	0	89	86	37	9	40	243	83	1	45	29	7	3	850
07:45 AM	10	116	20	0	60	62	19	3	40	210	70	0	53	19	4	0	686
Total	51	555	99	2	278	304	95	58	134	877	317	9	230	119	24	14	3166
08:00 AM	10	85	26	0	44	48	11	5	27	131	65	1	53	28	1	2	537
08:15 AM	7	62	20	0	45	34	10	6	26	116	53	0	30	26	5	0	440
Grand Total	95	885	185	5	492	531	139	87	233	1611	596	13	401	215	34	25	5547
Apprch %	8.1	75.6	15.8	0.4	39.4	42.5	11.1	7	9.5	65.7	24.3	0.5	59.4	31.9	5	3.7	
Total %	1.7	16	3.3	0.1	8.9	9.6	2.5	1.6	4.2	29	10.7	0.2	7.2	3.9	0.6	0.5	
Motorcycles	1	4	0	0	1	3	1	0	0	6	3	0	2	0	0	0	21
% Motorcycles	1.1	0.5	0	0	0.2	0.6	0.7	0	0	0.4	0.5	0	0.5	0	0	0	0.4
Cars	67	705	143	0	413	396	107	0	211	1337	436	0	297	145	15	0	4272
% Cars	70.5	79.7	77.3	0	83.9	74.6	77	0	90.6	83	73.2	0	74.1	67.4	44.1	0	77
Light Goods Vehicles	22	164	36	0	71	113	25	0	17	253	143	0	91	55	12	0	1002
% Light Goods Vehicles	23.2	18.5	19.5	0	14.4	21.3	18	0	7.3	15.7	24	0	22.7	25.6	35.3	0	18.1
Buses	3	6	3	0	3	3	1	0	0	6	2	0	1	4	4	0	36
% Buses	3.2	0.7	1.6	0	0.6	0.6	0.7	0	0	0.4	0.3	0	0.2	1.9	11.8	0	0.6
Single-Unit Trucks	2	5	2	0	3	13	5	0	1	6	12	0	10	10	3	0	72
% Single-Unit Trucks	2.1	0.6	1.1	0	0.6	2.4	3.6	0	0.4	0.4	2	0	2.5	4.7	8.8	0	1.3
Articulated Trucks	0	1	1	0	0	3	0	0	4	1	0	0	0	1	0	0	11
% Articulated Trucks	0	0.1	0.5	0	0	0.6	0	0	1.7	0.1	0	0	0	0.5	0	0	0.2
Bicycles on Road	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	3
% Bicycles on Road	0	0	0	0	0.2	0	0	0	0	0.1	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	10	0	0	0	2	0	0	0	3	15
% Bicycles on Crosswalk	0	0	0	0	0	0	0	11.5	0	0	0	15.4	0	0	0	12	0.3
Pedestrians	0	0	0	5	0	0	0	77	0	0	0	11	0	0	0	22	115
% Pedestrians	0	0	0	100	0	0	0	88.5	0	0	0	84.6	0	0	0	88	2.1

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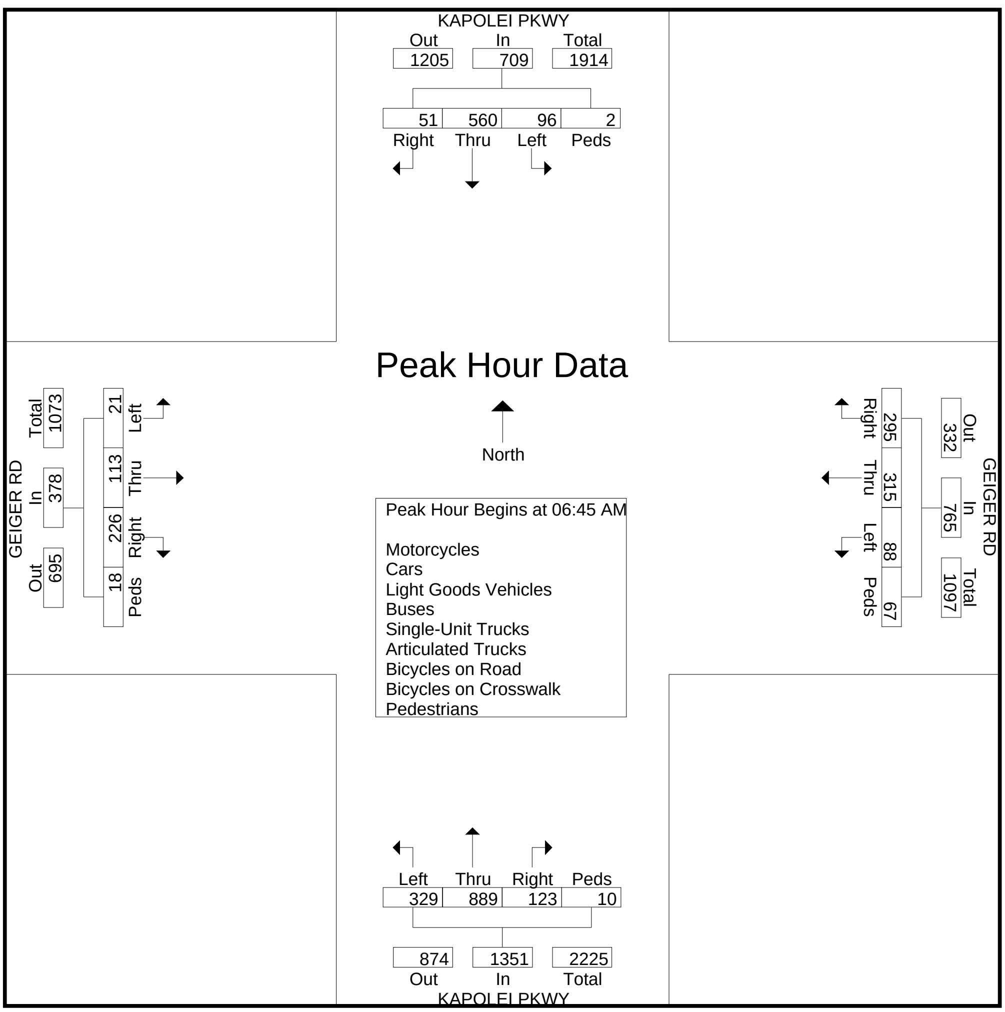
File Name : Kapolei Pkwy - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

	KAPOLEI PKWY SOUTHBOUND					GEIGER RD WESTBOUND					KAPOLEI PKWY NORTHBOUND					GEIGER RD EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	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 06:45 AM																					
06:45 AM	10	121	17	0	148	77	73	12	12	174	29	222	82	1	334	49	13	1	4	67	723
07:00 AM	**15**	103	24	**2**	144	53	79	12	**25**	169	26	198	82	3	309	65	**41**	**10**	5	**121**	743
07:15 AM	14	**192**	**33**	0	**239**	76	77	27	21	201	28	226	82	**5**	341	**67**	30	3	**6**	106	**887**
07:30 AM	12	144	22	0	178	**89**	**86**	**37**	9	**221**	**40**	**243**	**83**	1	**367**	45	29	7	3	84	850
Total Volume	51	560	96	2	709	295	315	88	67	765	123	889	329	10	1351	226	113	21	18	378	3203
% App. Total	7.2	79	13.5	0.3		38.6	41.2	11.5	8.8		9.1	65.8	24.4	0.7		59.8	29.9	5.6	4.8		
PHF	.850	.729	.727	.250	.742	.829	.916	.595	.670	.865	.769	.915	.991	.500	.920	.843	.689	.525	.750	.781	.903



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File Name : Fort Weaver Rd - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	FORT WEAVER RD SOUTHBOUND				GEIGER RD WESTBOUND				FORT WEAVER RD NORTHBOUND				IROQUOIS RD EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30 AM	23	223	39	2	35	30	45	2	48	159	44	0	52	48	3	5	758
06:45 AM	13	212	38	6	17	19	44	2	47	184	32	0	60	65	4	3	746
Total	36	435	77	8	52	49	89	4	95	343	76	0	112	113	7	8	1504
07:00 AM	3	274	37	17	40	31	63	4	27	283	46	0	62	52	11	5	955
07:15 AM	6	337	50	5	58	28	43	6	39	287	73	0	60	69	8	5	1074
07:30 AM	8	296	76	3	35	41	70	4	33	176	74	0	70	84	7	4	981
07:45 AM	7	321	62	4	16	22	85	3	30	137	40	0	54	65	3	1	850
Total	24	1228	225	29	149	122	261	17	129	883	233	0	246	270	29	15	3860
08:00 AM	0	377	32	3	21	26	65	2	27	194	49	0	56	33	6	4	895
08:15 AM	1	313	27	3	23	11	59	1	20	157	37	0	57	34	1	2	746
Grand Total	61	2353	361	43	245	208	474	24	271	1577	395	0	471	450	43	29	7005
Apprch %	2.2	83.5	12.8	1.5	25.8	21.9	49.8	2.5	12.1	70.3	17.6	0	47.4	45.3	4.3	2.9	
Total %	0.9	33.6	5.2	0.6	3.5	3	6.8	0.3	3.9	22.5	5.6	0	6.7	6.4	0.6	0.4	
Motorcycles	0	12	2	0	0	1	1	0	0	2	9	0	5	3	0	0	35
% Motorcycles	0	0.5	0.6	0	0	0.5	0.2	0	0	0.1	2.3	0	1.1	0.7	0	0	0.5
Cars	52	1954	286	0	219	144	384	0	169	1234	300	0	409	382	35	0	5568
% Cars	85.2	83	79.2	0	89.4	69.2	81	0	62.4	78.2	75.9	0	86.8	84.9	81.4	0	79.5
Light Goods Vehicles	9	337	64	0	16	58	83	0	88	267	75	0	46	60	4	0	1107
% Light Goods Vehicles	14.8	14.3	17.7	0	6.5	27.9	17.5	0	32.5	16.9	19	0	9.8	13.3	9.3	0	15.8
Buses	0	35	3	0	6	2	1	0	3	33	5	0	4	0	4	0	96
% Buses	0	1.5	0.8	0	2.4	1	0.2	0	1.1	2.1	1.3	0	0.8	0	9.3	0	1.4
Single-Unit Trucks	0	15	6	0	3	1	5	0	11	22	4	0	6	3	0	0	76
% Single-Unit Trucks	0	0.6	1.7	0	1.2	0.5	1.1	0	4.1	1.4	1	0	1.3	0.7	0	0	1.1
Articulated Trucks	0	0	0	0	1	2	0	0	0	7	2	0	0	2	0	0	14
% Articulated Trucks	0	0	0	0	0.4	1	0	0	0	0.4	0.5	0	0	0.4	0	0	0.2
Bicycles on Road	0	0	0	0	0	0	0	0	0	12	0	0	1	0	0	0	13
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0.8	0	0	0.2	0	0	0	0.2
Bicycles on Crosswalk	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	18	19
% Bicycles on Crosswalk	0	0	0	0	0	0	0	4.2	0	0	0	0	0	0	0	62.1	0.3
Pedestrians	0	0	0	43	0	0	0	23	0	0	0	0	0	0	0	11	77
% Pedestrians	0	0	0	100	0	0	0	95.8	0	0	0	0	0	0	0	37.9	1.1

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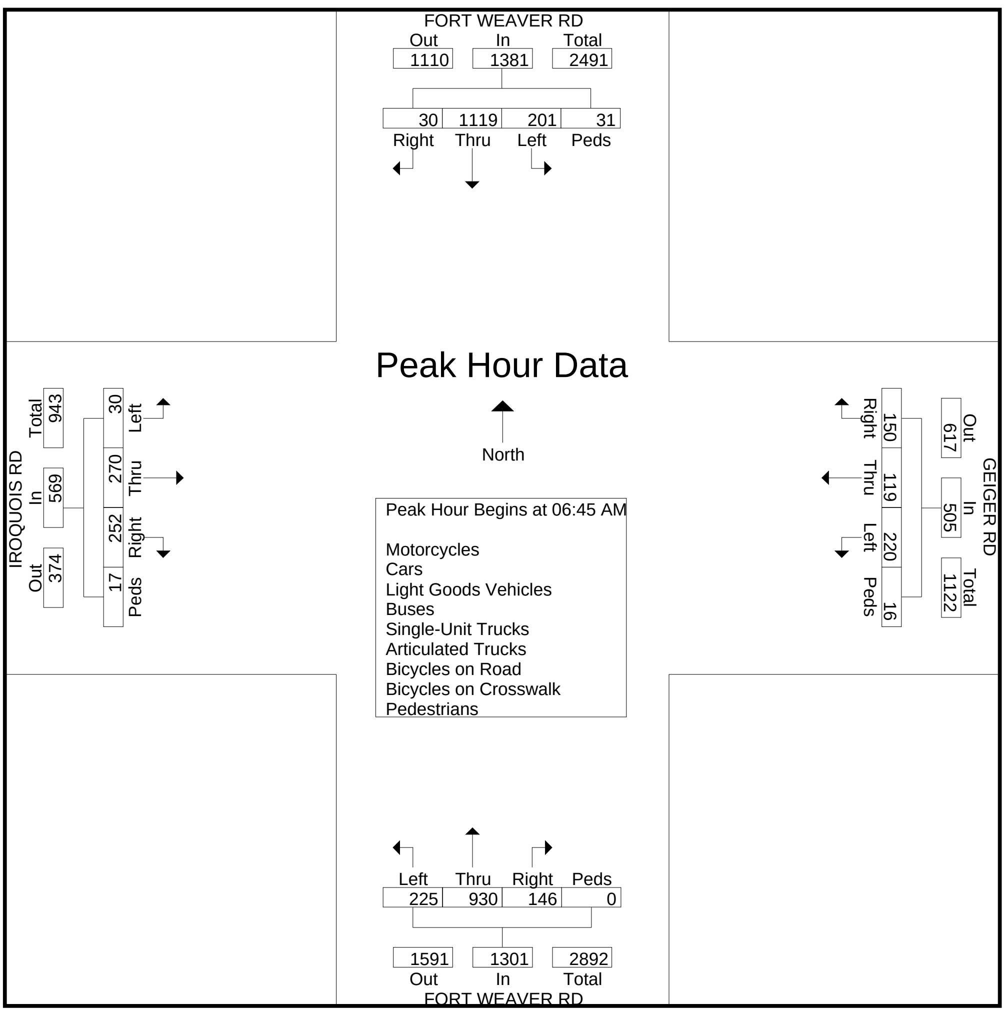
File Name : Fort Weaver Rd - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 2

	FORT WEAVER RD SOUTHBOUND					GEIGER RD WESTBOUND					FORT WEAVER RD NORTHBOUND					IROQUOIS RD EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 07:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:45 AM																					
06:45 AM	**13**	212	38	6	269	17	19	44	2	82	**47**	184	32	0	263	60	65	4	3	132	746
07:00 AM	3	274	37	**17**	331	40	31	63	4	138	27	283	46	0	356	62	52	**11**	**5**	130	955
07:15 AM	6	**337**	50	5	**398**	**58**	28	43	**6**	135	39	**287**	73	0	**399**	60	69	8	5	142	**1074**
07:30 AM	8	296	**76**	3	383	35	**41**	**70**	4	**150**	33	176	**74**	0	283	**70**	**84**	7	4	**165**	981
Total Volume	30	1119	201	31	1381	150	119	220	16	505	146	930	225	0	1301	252	270	30	17	569	3756
% App. Total	2.2	81	14.6	2.2		29.7	23.6	43.6	3.2		11.2	71.5	17.3	0		44.3	47.5	5.3	3		
PHF	.577	.830	.661	.456	.867	.647	.726	.786	.667	.842	.777	.810	.760	.000	.815	.900	.804	.682	.850	.862	.874



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File Name : Fort Weaver Rd - Renton Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	FORT WEAVER RD SOUTHBOUND				RENTON RD WESTBOUND				FORT WEAVER RD NORTHBOUND				RENTON RD EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30 AM	57	294	3	1	4	6	3	8	2	747	7	16	22	2	110	9	1291
06:45 AM	58	296	1	0	4	4	0	1	3	810	13	5	32	0	134	7	1368
Total	115	590	4	1	8	10	3	9	5	1557	20	21	54	2	244	16	2659
07:00 AM	63	390	2	0	0	3	4	1	0	703	30	1	35	4	116	5	1357
07:15 AM	61	366	2	0	0	2	2	3	4	623	55	9	45	1	101	5	1279
07:30 AM	63	236	1	0	2	5	0	0	4	607	50	6	51	0	91	3	1119
07:45 AM	54	287	1	0	3	1	3	0	3	656	36	6	39	1	107	4	1201
Total	241	1279	6	0	5	11	9	4	11	2589	171	22	170	6	415	17	4956
08:00 AM	42	285	4	0	1	4	2	1	2	634	41	8	22	1	104	3	1154
08:15 AM	28	233	2	0	4	1	1	4	4	626	18	10	14	2	86	4	1037
Grand Total	426	2387	16	1	18	26	15	18	22	5406	250	61	260	11	849	40	9806
Apprch %	15.1	84.3	0.6	0	23.4	33.8	19.5	23.4	0.4	94.2	4.4	1.1	22.4	0.9	73.2	3.4	
Total %	4.3	24.3	0.2	0	0.2	0.3	0.2	0.2	0.2	55.1	2.5	0.6	2.7	0.1	8.7	0.4	
Motorcycles	0	9	0	0	0	0	0	0	0	34	1	0	1	0	5	0	50
% Motorcycles	0	0.4	0	0	0	0	0	0	0	0.6	0.4	0	0.4	0	0.6	0	0.5
Cars	326	1839	12	0	15	24	14	0	16	4400	197	0	213	10	687	0	7753
% Cars	76.5	77	75	0	83.3	92.3	93.3	0	72.7	81.4	78.8	0	81.9	90.9	80.9	0	79.1
Light Goods Vehicles	87	454	3	0	0	2	1	0	5	898	46	0	37	1	148	0	1682
% Light Goods Vehicles	20.4	19	18.8	0	0	7.7	6.7	0	22.7	16.6	18.4	0	14.2	9.1	17.4	0	17.2
Buses	10	39	0	0	3	0	0	0	1	39	6	0	8	0	6	0	112
% Buses	2.3	1.6	0	0	16.7	0	0	0	4.5	0.7	2.4	0	3.1	0	0.7	0	1.1
Single-Unit Trucks	3	42	1	0	0	0	0	0	0	31	0	0	1	0	2	0	80
% Single-Unit Trucks	0.7	1.8	6.2	0	0	0	0	0	0	0.6	0	0	0.4	0	0.2	0	0.8
Articulated Trucks	0	4	0	0	0	0	0	0	0	1	0	0	0	0	1	0	6
% Articulated Trucks	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1
Bicycles on Road	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	6	0	0	0	5	0	0	0	3	14
% Bicycles on Crosswalk	0	0	0	0	0	0	0	33.3	0	0	0	8.2	0	0	0	7.5	0.1
Pedestrians	0	0	0	1	0	0	0	12	0	0	0	56	0	0	0	37	106
% Pedestrians	0	0	0	100	0	0	0	66.7	0	0	0	91.8	0	0	0	92.5	1.1

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Site Code : 17-099 Honouliuli WWTP
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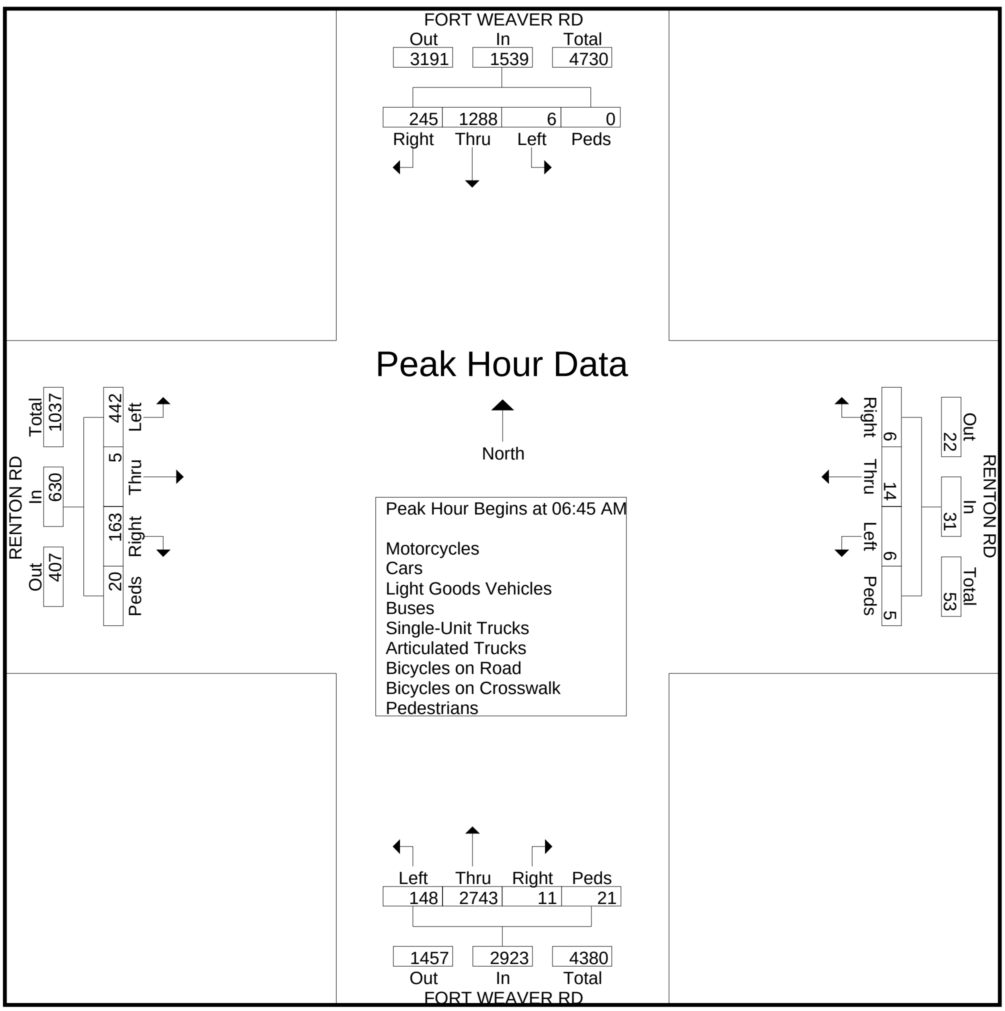
Page No : 2

	FORT WEAVER RD SOUTHBOUND					RENTON RD WESTBOUND					FORT WEAVER RD NORTHBOUND					RENTON RD EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 07:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:45 AM																					
06:45 AM	58	296	1	0	355	**4**	4	0	1	**9**	3	**810**	13	5	**831**	32	0	**134**	**7**	**173**	**1368**
07:00 AM	**63**	**390**	**2**	0	**455**	0	3	**4**	1	8	0	703	30	1	734	35	**4**	116	5	160	1357
07:15 AM	61	366	2	0	429	0	2	2	**3**	7	**4**	623	**55**	**9**	691	45	1	101	5	152	1279
07:30 AM	63	236	1	0	300	2	**5**	0	0	7	4	607	50	6	667	**51**	0	91	3	145	1119
Total Volume	245	1288	6	0	1539	6	14	6	5	31	11	2743	148	21	2923	163	5	442	20	630	5123
% App. Total	15.9	83.7	0.4	0		19.4	45.2	19.4	16.1		0.4	93.8	5.1	0.7		25.9	0.8	70.2	3.2		
PHF	.972	.826	.750	.000	.846	.375	.700	.375	.417	.861	.688	.847	.673	.583	.879	.799	.313	.825	.714	.910	.936



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File Name : Kualakai Pkwy - Kapolei Pkwy
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KUALAKAI PKWY SOUTHBOUND				KAPOLEI PKWY WESTBOUND				KUALAKAI PKWY NORTHBOUND				KAPOLEI PKWY EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	113	53	104	0	61	107	25	0	30	30	6	0	6	135	94	0	764
03:45 PM	123	58	93	0	49	115	25	0	19	28	10	0	18	141	88	0	767
Total	236	111	197	0	110	222	50	0	49	58	16	0	24	276	182	0	1531
04:00 PM	135	43	94	5	50	115	30	0	23	33	8	0	20	130	74	1	761
04:15 PM	120	57	118	0	47	102	24	0	19	38	12	0	18	127	104	0	786
04:30 PM	117	60	114	0	65	131	27	0	26	31	14	0	23	162	92	0	862
04:45 PM	153	59	107	0	63	118	35	0	18	28	12	2	18	147	101	3	864
Total	525	219	433	5	225	466	116	0	86	130	46	2	79	566	371	4	3273
05:00 PM	112	29	136	0	47	90	37	0	27	30	14	0	11	142	86	0	761
05:15 PM	118	52	107	0	50	97	28	1	33	43	17	1	24	136	88	3	798
Grand Total	991	411	873	5	432	875	231	1	195	261	93	3	138	1120	727	7	6363
Apprch %	43.5	18	38.3	0.2	28.1	56.9	15	0.1	35.3	47.3	16.8	0.5	6.9	56.2	36.5	0.4	
Total %	15.6	6.5	13.7	0.1	6.8	13.8	3.6	0	3.1	4.1	1.5	0	2.2	17.6	11.4	0.1	
Motorcycles	7	0	12	0	3	3	0	0	1	2	2	0	0	2	4	0	36
% Motorcycles	0.7	0	1.4	0	0.7	0.3	0	0	0.5	0.8	2.2	0	0	0.2	0.6	0	0.6
Cars	735	356	695	0	399	730	214	0	176	234	79	0	136	918	663	0	5335
% Cars	74.2	86.6	79.6	0	92.4	83.4	92.6	0	90.3	89.7	84.9	0	98.6	82	91.2	0	83.8
Light Goods Vehicles	234	54	162	0	27	131	17	0	18	23	12	0	2	193	48	0	921
% Light Goods Vehicles	23.6	13.1	18.6	0	6.2	15	7.4	0	9.2	8.8	12.9	0	1.4	17.2	6.6	0	14.5
Buses	5	0	1	0	1	4	0	0	0	0	0	0	0	2	8	0	21
% Buses	0.5	0	0.1	0	0.2	0.5	0	0	0	0	0	0	0	0.2	1.1	0	0.3
Single-Unit Trucks	8	1	3	0	1	6	0	0	0	2	0	0	0	5	4	0	30
% Single-Unit Trucks	0.8	0.2	0.3	0	0.2	0.7	0	0	0	0.8	0	0	0	0.4	0.6	0	0.5
Articulated Trucks	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Articulated Trucks	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	3
% Bicycles on Road	0.1	0	0	0	0.2	0.1	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	3
% Bicycles on Crosswalk	0	0	0	20	0	0	0	0	0	0	0	33.3	0	0	0	14.3	0
Pedestrians	0	0	0	4	0	0	0	1	0	0	0	2	0	0	0	6	13
% Pedestrians	0	0	0	80	0	0	0	100	0	0	0	66.7	0	0	0	85.7	0.2

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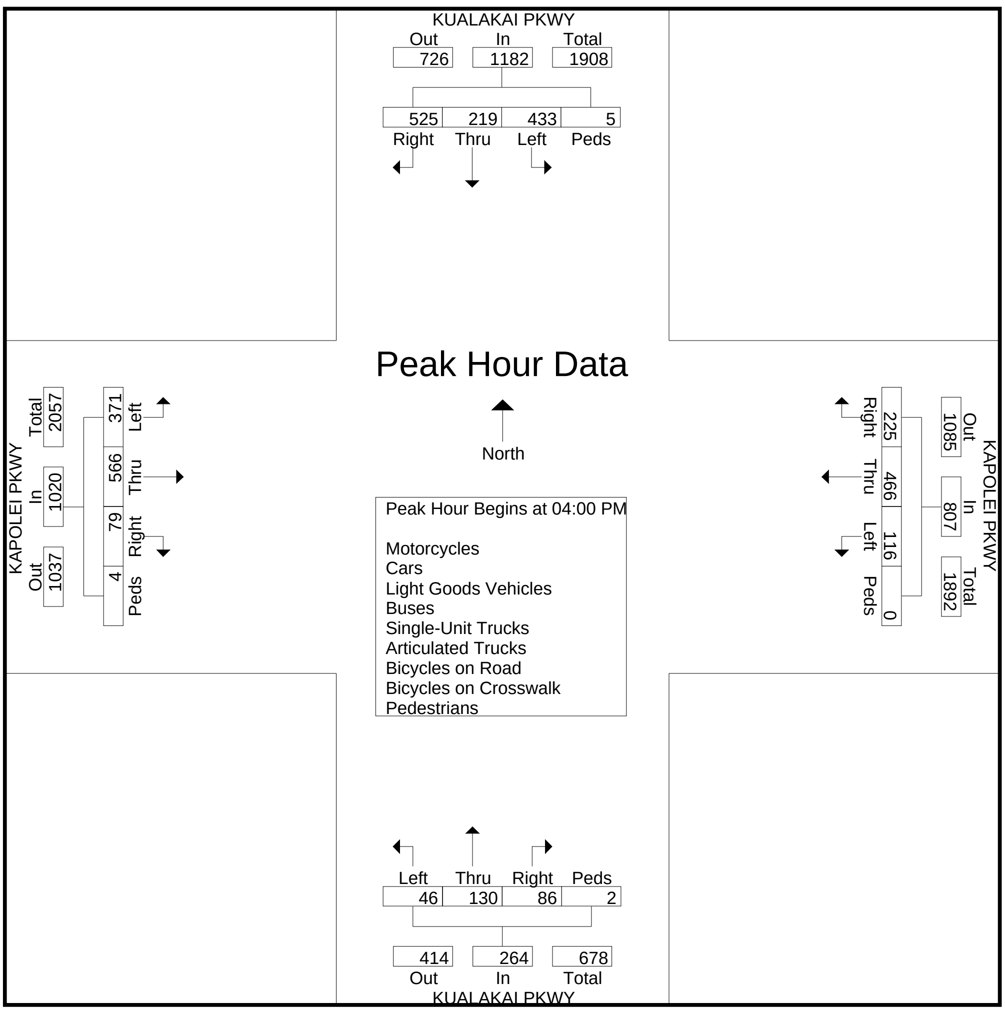
File Name : Kualakai Pkwy - Kapolei Pkwy
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 2

	KUALAKAI PKWY SOUTHBOUND					KAPOLEI PKWY WESTBOUND					KUALAKAI PKWY NORTHBOUND					KAPOLEI PKWY EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	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	135	43	94	**5**	277	50	115	30	0	195	23	33	8	0	64	20	130	74	1	225	761
04:15 PM	120	57	**118**	0	295	47	102	24	0	173	19	**38**	12	0	69	18	127	**104**	0	249	786
04:30 PM	117	**60**	114	0	291	**65**	**131**	27	0	**223**	**26**	31	**14**	0	**71**	**23**	**162**	92	0	**277**	862
04:45 PM	**153**	59	107	0	**319**	63	118	**35**	0	216	18	28	12	**2**	60	18	147	101	**3**	269	**864**
Total Volume	525	219	433	5	1182	225	466	116	0	807	86	130	46	2	264	79	566	371	4	1020	3273
% App. Total	44.4	18.5	36.6	0.4		27.9	57.7	14.4	0		32.6	49.2	17.4	0.8		7.7	55.5	36.4	0.4		
PHF	.858	.913	.917	.250	.926	.865	.889	.829	.000	.905	.827	.855	.821	.250	.930	.859	.873	.892	.333	.921	.947



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File Name : Renton Rd - Kapolei Pkwy
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	RENTON RD SOUTHBOUND				KAPOLEI PKWY WESTBOUND				RENTON RD NORTHBOUND				KAPOLEI PKWY EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	50	19	22	2	25	168	2	0	7	26	5	0	4	195	59	0	584
03:45 PM	54	21	29	2	35	117	7	0	7	30	3	0	2	190	72	0	569
Total	104	40	51	4	60	285	9	0	14	56	8	0	6	385	131	0	1153
04:00 PM	65	23	42	2	26	129	8	0	8	21	8	1	4	179	54	0	570
04:15 PM	57	30	35	0	27	132	9	0	11	31	3	0	4	205	53	0	597
04:30 PM	65	16	28	6	24	133	1	0	15	24	4	0	1	203	74	0	594
04:45 PM	54	22	36	3	24	152	3	0	15	26	5	0	6	237	55	0	638
Total	241	91	141	11	101	546	21	0	49	102	20	1	15	824	236	0	2399
05:00 PM	41	12	42	1	24	143	4	0	8	15	1	0	3	211	58	0	563
05:15 PM	44	17	34	4	25	126	6	0	5	23	2	0	3	244	64	0	597
Grand Total	430	160	268	20	210	1100	40	0	76	196	31	1	27	1664	489	0	4712
Apprch %	49	18.2	30.5	2.3	15.6	81.5	3	0	25	64.5	10.2	0.3	1.2	76.3	22.4	0	
Total %	9.1	3.4	5.7	0.4	4.5	23.3	0.8	0	1.6	4.2	0.7	0	0.6	35.3	10.4	0	
Motorcycles	2	2	1	0	0	5	0	0	0	1	0	0	0	16	0	0	27
% Motorcycles	0.5	1.2	0.4	0	0	0.5	0	0	0	0.5	0	0	0	1	0	0	0.6
Cars	359	119	213	0	205	883	29	0	62	151	20	0	20	1294	386	0	3741
% Cars	83.5	74.4	79.5	0	97.6	80.3	72.5	0	81.6	77	64.5	0	74.1	77.8	78.9	0	79.4
Light Goods Vehicles	67	36	51	0	5	202	11	0	14	41	11	0	7	345	99	0	889
% Light Goods Vehicles	15.6	22.5	19	0	2.4	18.4	27.5	0	18.4	20.9	35.5	0	25.9	20.7	20.2	0	18.9
Buses	1	1	2	0	0	4	0	0	0	2	0	0	0	2	1	0	13
% Buses	0.2	0.6	0.7	0	0	0.4	0	0	0	1	0	0	0	0.1	0.2	0	0.3
Single-Unit Trucks	1	0	1	0	0	6	0	0	0	1	0	0	0	6	3	0	18
% Single-Unit Trucks	0.2	0	0.4	0	0	0.5	0	0	0	0.5	0	0	0	0.4	0.6	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	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3
% Bicycles on Road	0	1.2	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1
Bicycles on Crosswalk	0	0	0	16	0	0	0	0	0	0	0	1	0	0	0	0	17
% Bicycles on Crosswalk	0	0	0	80	0	0	0	0	0	0	0	100	0	0	0	0	0.4
Pedestrians	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
% Pedestrians	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0.1

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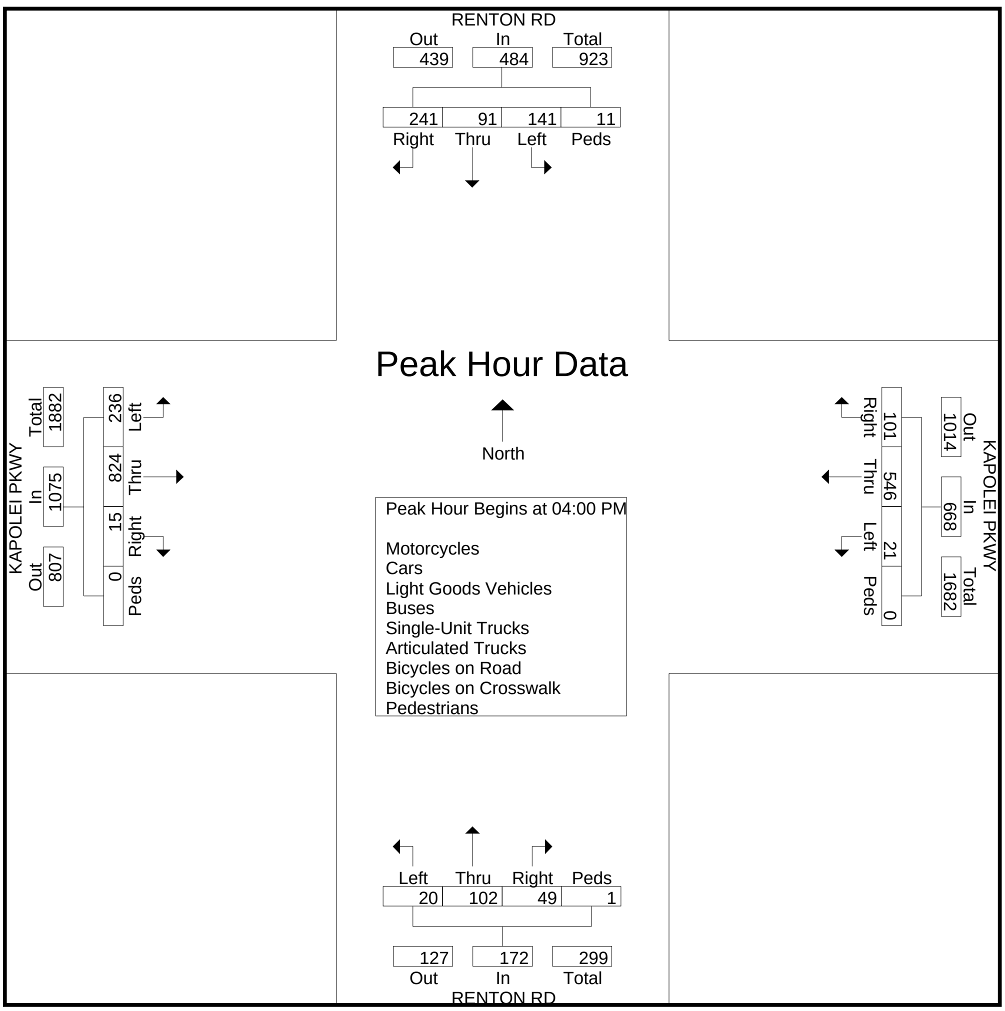
File Name : Renton Rd - Kapolei Pkwy
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 2

	RENTON RD SOUTHBOUND					KAPOLEI PKWY WESTBOUND					RENTON RD NORTHBOUND					KAPOLEI PKWY EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	**65**	23	**42**	2	**132**	26	129	8	0	163	8	21	**8**	**1**	38	4	179	54	0	237	570
04:15 PM	57	**30**	35	0	122	**27**	132	**9**	0	168	11	**31**	3	0	45	4	205	53	0	262	597
04:30 PM	65	16	28	**6**	115	24	133	1	0	158	**15**	24	4	0	43	1	203	**74**	0	278	594
04:45 PM	54	22	36	3	115	24	**152**	3	0	**179**	15	26	5	0	**46**	**6**	**237**	55	0	**298**	**638**
Total Volume	241	91	141	11	484	101	546	21	0	668	49	102	20	1	172	15	824	236	0	1075	2399
% App. Total	49.8	18.8	29.1	2.3		15.1	81.7	3.1	0		28.5	59.3	11.6	0.6		1.4	76.7	22	0		
PHF	.927	.758	.839	.458	.917	.935	.898	.583	.000	.933	.817	.823	.625	.250	.935	.625	.869	.797	.000	.902	.940



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File Name : Phillipine Sea - Renton Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	Southbound St. SOUTHBOUND				PHILLIPINE SEA WESTBOUND				RENTON RD NORTHBOUND				PHILLIPINE SEA EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	0	0	0	0	0	1	21	0	36	0	0	0	1	1	0	0	60
03:45 PM	0	0	0	0	0	0	30	0	41	0	1	0	0	1	0	0	73
Total	0	0	0	0	0	1	51	0	77	0	1	0	1	2	0	0	133
04:00 PM	0	0	0	0	0	1	29	0	32	0	1	0	1	0	0	0	64
04:15 PM	0	0	0	0	0	1	38	0	45	0	0	0	0	0	0	0	84
04:30 PM	0	0	0	0	0	0	18	0	36	0	1	0	0	1	0	0	56
04:45 PM	0	0	0	0	0	1	28	0	40	0	1	0	1	1	0	0	72
Total	0	0	0	0	0	3	113	0	153	0	3	0	2	2	0	0	276
05:00 PM	0	0	0	0	0	0	16	0	24	0	0	0	0	1	0	0	41
05:15 PM	0	0	0	0	0	5	20	0	33	0	2	0	1	1	0	2	64
Grand Total	0	0	0	0	0	9	200	0	287	0	6	0	4	6	0	2	514
Apprch %	0	0	0	0	0	4.3	95.7	0	98	0	2	0	33.3	50	0	16.7	
Total %	0	0	0	0	0	1.8	38.9	0	55.8	0	1.2	0	0.8	1.2	0	0.4	
Motorcycles	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	3
% Motorcycles	0	0	0	0	0	0	1	0	0.3	0	0	0	0	0	0	0	0.6
Cars	0	0	0	0	0	8	140	0	210	0	6	0	4	5	0	0	373
% Cars	0	0	0	0	0	88.9	70	0	73.2	0	100	0	100	83.3	0	0	72.6
Light Goods Vehicles	0	0	0	0	0	0	55	0	73	0	0	0	0	1	0	0	129
% Light Goods Vehicles	0	0	0	0	0	0	27.5	0	25.4	0	0	0	0	16.7	0	0	25.1
Buses	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	3
% Buses	0	0	0	0	0	0	0.5	0	0.7	0	0	0	0	0	0	0	0.6
Single-Unit Trucks	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.2
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	1	2	0	0	0	0	0	0	0	0	0	3
% Bicycles on Road	0	0	0	0	0	11.1	1	0	0	0	0	0	0	0	0	0	0.6
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	2	2
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0.4

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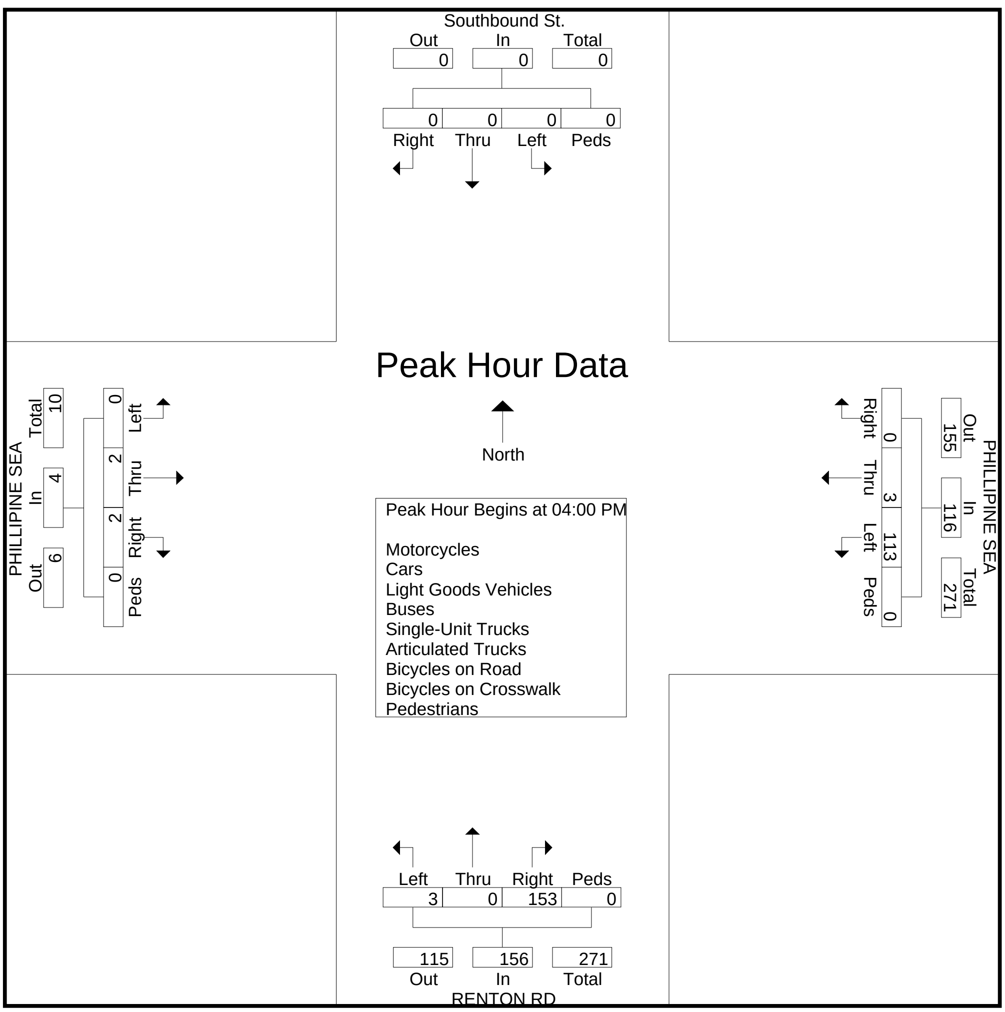
File Name : Phillipine Sea - Renton Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

	Southbound St. SOUTHBOUND					PHILLIPINE SEA WESTBOUND					RENTON RD NORTHBOUND					PHILLIPINE SEA EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	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	0	**1**	29	0	30	32	0	**1**	0	33	**1**	0	0	0	1	64
04:15 PM	0	0	0	0	0	0	1	**38**	0	**39**	**45**	0	0	0	**45**	0	0	0	0	0	**84**
04:30 PM	0	0	0	0	0	0	0	18	0	18	36	0	1	0	37	0	**1**	0	0	1	56
04:45 PM	0	0	0	0	0	0	1	28	0	29	40	0	1	0	41	1	1	0	0	**2**	72
Total Volume	0	0	0	0	0	0	3	113	0	116	153	0	3	0	156	2	2	0	0	4	276
% App. Total	0	0	0	0		0	2.6	97.4	0		98.1	0	1.9	0		50	50	0	0		
PHF	.000	.000	.000	.000	.000	.000	.750	.743	.000	.744	.850	.000	.750	.000	.867	.500	.500	.000	.000	.500	.821



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File Name : Philipine Sea - Roosevelt Ave
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	PHILLIPINE SEA SOUTHBOUND				ROOSEVELT AVE WESTBOUND				PHILLIPINE SEA NORTHBOUND				ROOSEVELT AVE EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	17	0	4	0	12	103	0	0	0	0	1	0	0	154	25	0	316
03:45 PM	29	0	3	0	4	109	0	0	1	0	0	0	1	181	37	0	365
Total	46	0	7	0	16	212	0	0	1	0	1	0	1	335	62	0	681
04:00 PM	26	0	3	0	11	84	0	0	0	1	0	0	0	150	23	0	298
04:15 PM	31	0	5	0	3	117	0	0	0	2	1	0	0	162	38	0	359
04:30 PM	16	0	3	0	3	108	0	0	0	1	0	0	0	133	32	1	297
04:45 PM	23	0	4	0	4	102	0	0	0	2	0	0	0	179	37	0	351
Total	96	0	15	0	21	411	0	0	0	6	1	0	0	624	130	1	1305
05:00 PM	17	0	3	0	4	89	0	0	0	0	0	0	0	188	22	0	323
05:15 PM	15	0	6	0	2	101	0	0	0	0	0	0	0	172	29	0	325
Grand Total	174	0	31	0	43	813	0	0	1	6	2	0	1	1319	243	1	2634
Apprch %	84.9	0	15.1	0	5	95	0	0	11.1	66.7	22.2	0	0.1	84.3	15.5	0.1	
Total %	6.6	0	1.2	0	1.6	30.9	0	0	0	0.2	0.1	0	0	50.1	9.2	0	
Motorcycles	2	0	0	0	0	6	0	0	0	0	0	0	0	13	1	0	22
% Motorcycles	1.1	0	0	0	0	0.7	0	0	0	0	0	0	0	1	0.4	0	0.8
Cars	129	0	19	0	30	620	0	0	1	4	0	0	1	1015	184	0	2003
% Cars	74.1	0	61.3	0	69.8	76.3	0	0	100	66.7	0	0	100	77	75.7	0	76
Light Goods Vehicles	42	0	11	0	11	174	0	0	0	2	2	0	0	281	56	0	579
% Light Goods Vehicles	24.1	0	35.5	0	25.6	21.4	0	0	0	33.3	100	0	0	21.3	23	0	22
Buses	0	0	1	0	2	3	0	0	0	0	0	0	0	3	0	0	9
% Buses	0	0	3.2	0	4.7	0.4	0	0	0	0	0	0	0	0.2	0	0	0.3
Single-Unit Trucks	1	0	0	0	0	9	0	0	0	0	0	0	0	5	2	0	17
% Single-Unit Trucks	0.6	0	0	0	0	1.1	0	0	0	0	0	0	0	0.4	0.8	0	0.6
Articulated Trucks	0	0	0	0	0	1	0	0	0	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	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.1
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

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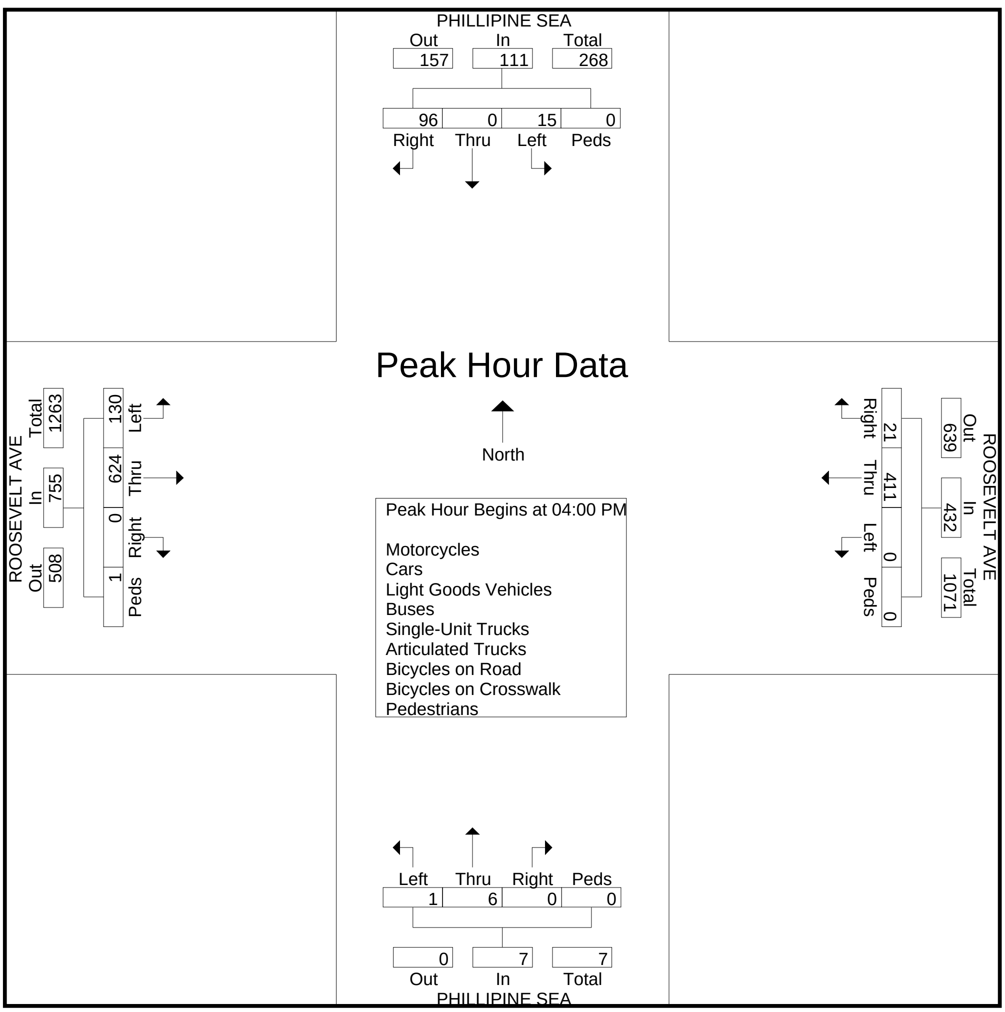
File Name : Philipine Sea - Roosevelt Ave
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 2

	PHILLIPINE SEA SOUTHBOUND					ROOSEVELT AVE WESTBOUND					PHILLIPINE SEA NORTHBOUND					ROOSEVELT AVE EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	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	26	0	3	0	29	**11**	84	0	0	95	0	1	0	0	1	0	150	23	0	173	298
04:15 PM	**31**	0	**5**	0	**36**	3	**117**	0	0	**120**	0	**2**	**1**	0	**3**	0	162	**38**	0	200	**359**
04:30 PM	16	0	3	0	19	3	108	0	0	111	0	1	0	0	1	0	133	32	**1**	166	297
04:45 PM	23	0	4	0	27	4	102	0	0	106	0	2	0	0	2	0	**179**	37	0	**216**	351
Total Volume	96	0	15	0	111	21	411	0	0	432	0	6	1	0	7	0	624	130	1	755	1305
% App. Total	86.5	0	13.5	0		4.9	95.1	0	0		0	85.7	14.3	0		0	82.6	17.2	0.1		
PHF	.774	.000	.750	.000	.771	.477	.878	.000	.000	.900	.000	.750	.250	.000	.583	.000	.872	.855	.250	.874	.909



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File Name : Essex Rd - Roosevelt Ave_Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	GEIGER RD WESTBOUND			ESSEX RD NORTHBOUND			ROOSEVELT AVE EASTBOUND			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
03:30 PM	108	5	0	6	1	0	3	156	0	279
03:45 PM	106	0	0	13	1	0	2	178	0	300
Total	214	5	0	19	2	0	5	334	0	579
04:00 PM	99	3	0	5	1	0	2	150	0	260
04:15 PM	116	0	0	0	1	0	3	167	0	287
04:30 PM	98	1	0	6	1	0	3	126	0	235
04:45 PM	104	1	0	5	1	0	4	183	0	298
Total	417	5	0	16	4	0	12	626	0	1080
05:00 PM	98	5	0	6	4	0	2	187	0	302
05:15 PM	104	3	0	4	0	0	1	176	0	288
Grand Total	833	18	0	45	10	0	20	1323	0	2249
Apprch %	97.9	2.1	0	81.8	18.2	0	1.5	98.5	0	
Total %	37	0.8	0	2	0.4	0	0.9	58.8	0	
Motorcycles	6	0	0	0	0	0	0	12	0	18
% Motorcycles	0.7	0	0	0	0	0	0	0.9	0	0.8
Cars	635	15	0	34	8	0	15	1004	0	1711
% Cars	76.2	83.3	0	75.6	80	0	75	75.9	0	76.1
Light Goods Vehicles	182	3	0	11	2	0	5	295	0	498
% Light Goods Vehicles	21.8	16.7	0	24.4	20	0	25	22.3	0	22.1
Buses	4	0	0	0	0	0	0	4	0	8
% Buses	0.5	0	0	0	0	0	0	0.3	0	0.4
Single-Unit Trucks	5	0	0	0	0	0	0	8	0	13
% Single-Unit Trucks	0.6	0	0	0	0	0	0	0.6	0	0.6
Articulated Trucks	1	0	0	0	0	0	0	0	0	1
% Articulated Trucks	0.1	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0

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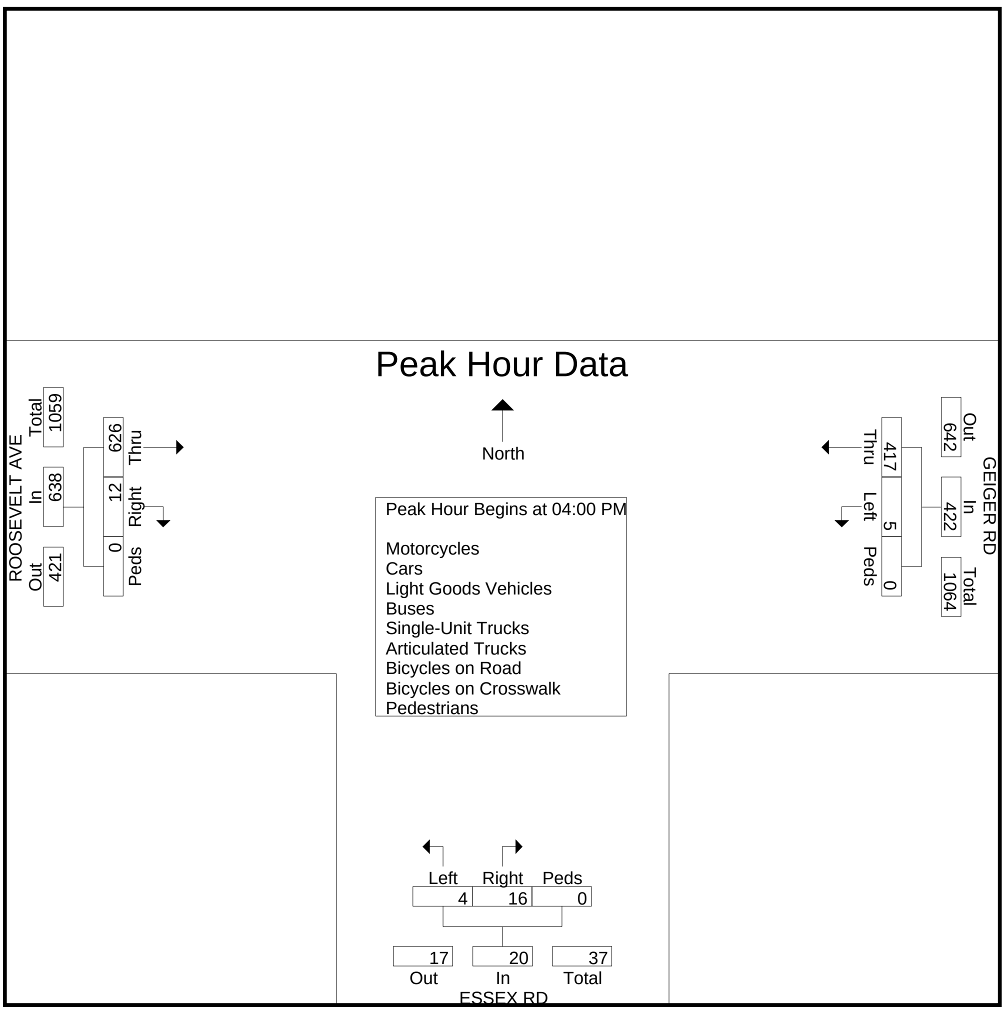
File Name : Essex Rd - Roosevelt Ave_Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017

	GEIGER RD WESTBOUND				ESSEX RD NORTHBOUND				ROOSEVELT AVE EASTBOUND				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	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	99	**3**	0	102	5	**1**	0	6	2	150	0	152	260
04:15 PM	**116**	0	0	**116**	0	1	0	1	3	167	0	170	287
04:30 PM	98	1	0	99	**6**	1	0	**7**	3	126	0	129	235
04:45 PM	104	1	0	105	5	1	0	6	**4**	**183**	0	**187**	**298**
Total Volume	417	5	0	422	16	4	0	20	12	626	0	638	1080
% App. Total	98.8	1.2	0		80	20	0		1.9	98.1	0		
PHF	.899	.417	.000	.909	.667	1.00	.000	.714	.750	.855	.000	.853	.906



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File Name : ERCC Driveway - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	ERCC DRIVEWAY SOUTHBOUND			GEIGER RD WESTBOUND			GEIGER RD EASTBOUND			
Start Time	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	Int. Total
03:30 PM	2	3	0	6	111	0	155	5	0	282
03:45 PM	6	4	1	6	104	0	189	3	0	313
Total	8	7	1	12	215	0	344	8	0	595
04:00 PM	8	8	0	4	102	0	151	3	0	276
04:15 PM	3	3	0	4	104	0	164	1	0	279
04:30 PM	1	5	0	6	102	0	132	2	0	248
04:45 PM	4	3	0	6	97	0	187	4	0	301
Total	16	19	0	20	405	0	634	10	0	1104
05:00 PM	3	3	0	3	106	0	192	3	0	310
05:15 PM	5	6	0	5	94	0	177	2	0	289
Grand Total	32	35	1	40	820	0	1347	23	0	2298
Apprch %	47.1	51.5	1.5	4.7	95.3	0	98.3	1.7	0	
Total %	1.4	1.5	0	1.7	35.7	0	58.6	1	0	
Motorcycles	0	0	0	0	6	0	12	0	0	18
% Motorcycles	0	0	0	0	0.7	0	0.9	0	0	0.8
Cars	14	10	0	13	634	0	1028	9	0	1708
% Cars	43.8	28.6	0	32.5	77.3	0	76.3	39.1	0	74.3
Light Goods Vehicles	18	24	0	27	170	0	295	14	0	548
% Light Goods Vehicles	56.2	68.6	0	67.5	20.7	0	21.9	60.9	0	23.8
Buses	0	0	0	0	4	0	4	0	0	8
% Buses	0	0	0	0	0.5	0	0.3	0	0	0.3
Single-Unit Trucks	0	1	0	0	5	0	7	0	0	13
% Single-Unit Trucks	0	2.9	0	0	0.6	0	0.5	0	0	0.6
Articulated Trucks	0	0	0	0	1	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0.1	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	1	0	0	1
% Bicycles on Road	0	0	0	0	0	0	0.1	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	1	0	0	0	0	0	0	1
% Pedestrians	0	0	100	0	0	0	0	0	0	0

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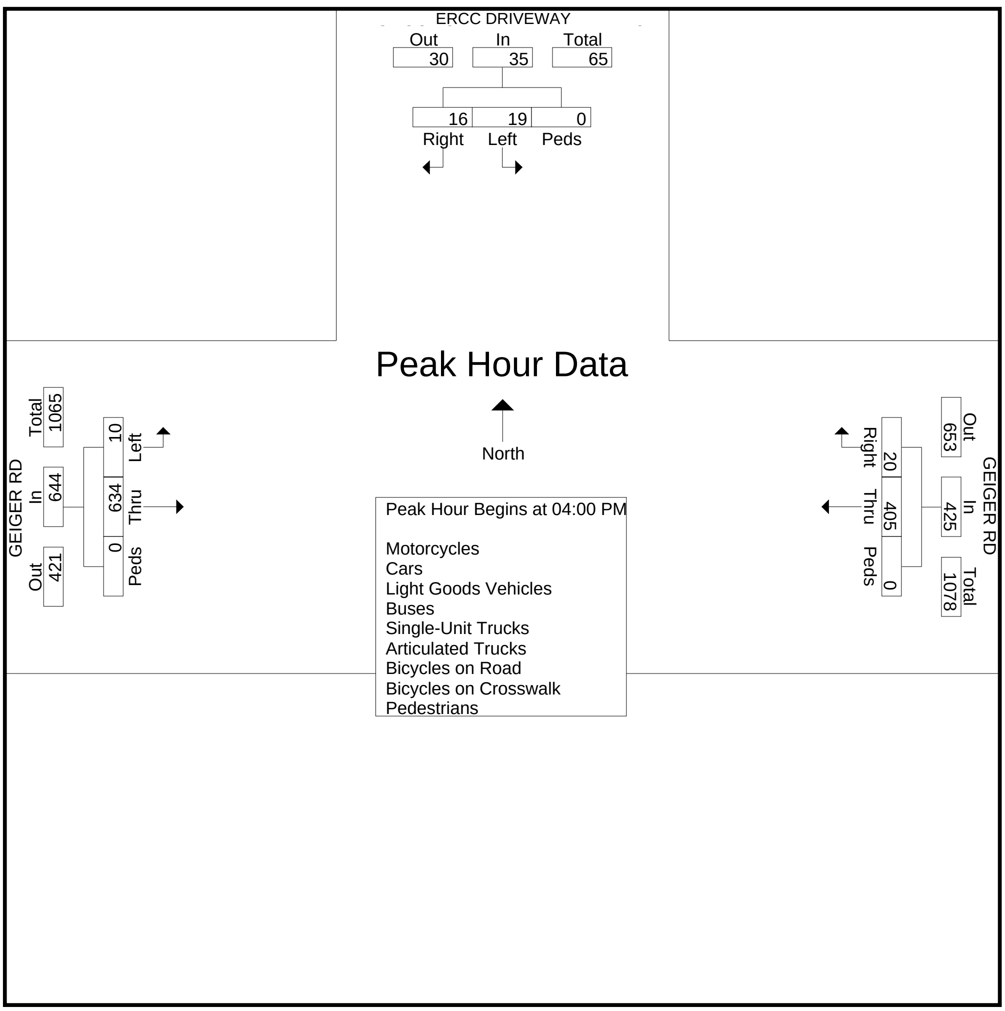
File Name : ERCC Driveway - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 2

	ERCC DRIVEWAY SOUTHBOUND				GEIGER RD WESTBOUND				GEIGER RD EASTBOUND				
Start Time	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	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	**8**	**8**	0	**16**	4	102	0	106	151	3	0	154	276
04:15 PM	3	3	0	6	4	**104**	0	**108**	164	1	0	165	279
04:30 PM	1	5	0	6	**6**	102	0	108	132	2	0	134	248
04:45 PM	4	3	0	7	6	97	0	103	**187**	**4**	0	**191**	**301**
Total Volume	16	19	0	35	20	405	0	425	634	10	0	644	1104
% App. Total	45.7	54.3	0		4.7	95.3	0		98.4	1.6	0		
PHF	.500	.594	.000	.547	.833	.974	.000	.984	.848	.625	.000	.843	.917



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File Name : Honouliuli WWTR Dwy 1 - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOULIULI WWTP DRIVEWAY 1 SOUTHBOUND			GEIGER RD WESTBOUND			GEIGER RD EASTBOUND			
Start Time	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	Int. Total
03:30 PM	4	2	0	0	115	0	158	0	0	279
03:45 PM	4	3	0	0	101	0	197	0	0	305
Total	8	5	0	0	216	0	355	0	0	584
04:00 PM	1	1	0	0	102	0	159	0	0	263
04:15 PM	2	0	0	0	111	0	170	0	0	283
04:30 PM	1	1	0	0	102	0	139	0	0	243
04:45 PM	1	0	0	0	106	0	197	1	0	305
Total	5	2	0	0	421	0	665	1	0	1094
05:00 PM	0	0	0	0	105	0	194	0	0	299
05:15 PM	0	0	0	0	105	0	183	0	0	288
Grand Total	13	7	0	0	847	0	1397	1	0	2265
Apprch %	65	35	0	0	100	0	99.9	0.1	0	
Total %	0.6	0.3	0	0	37.4	0	61.7	0	0	
Motorcycles	0	0	0	0	6	0	12	0	0	18
% Motorcycles	0	0	0	0	0.7	0	0.9	0	0	0.8
Cars	9	5	0	0	642	0	1057	0	0	1713
% Cars	69.2	71.4	0	0	75.8	0	75.7	0	0	75.6
Light Goods Vehicles	4	2	0	0	189	0	312	1	0	508
% Light Goods Vehicles	30.8	28.6	0	0	22.3	0	22.3	100	0	22.4
Buses	0	0	0	0	4	0	5	0	0	9
% Buses	0	0	0	0	0.5	0	0.4	0	0	0.4
Single-Unit Trucks	0	0	0	0	5	0	9	0	0	14
% Single-Unit Trucks	0	0	0	0	0.6	0	0.6	0	0	0.6
Articulated Trucks	0	0	0	0	1	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0.1	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	2	0	0	2
% Bicycles on Road	0	0	0	0	0	0	0.1	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0

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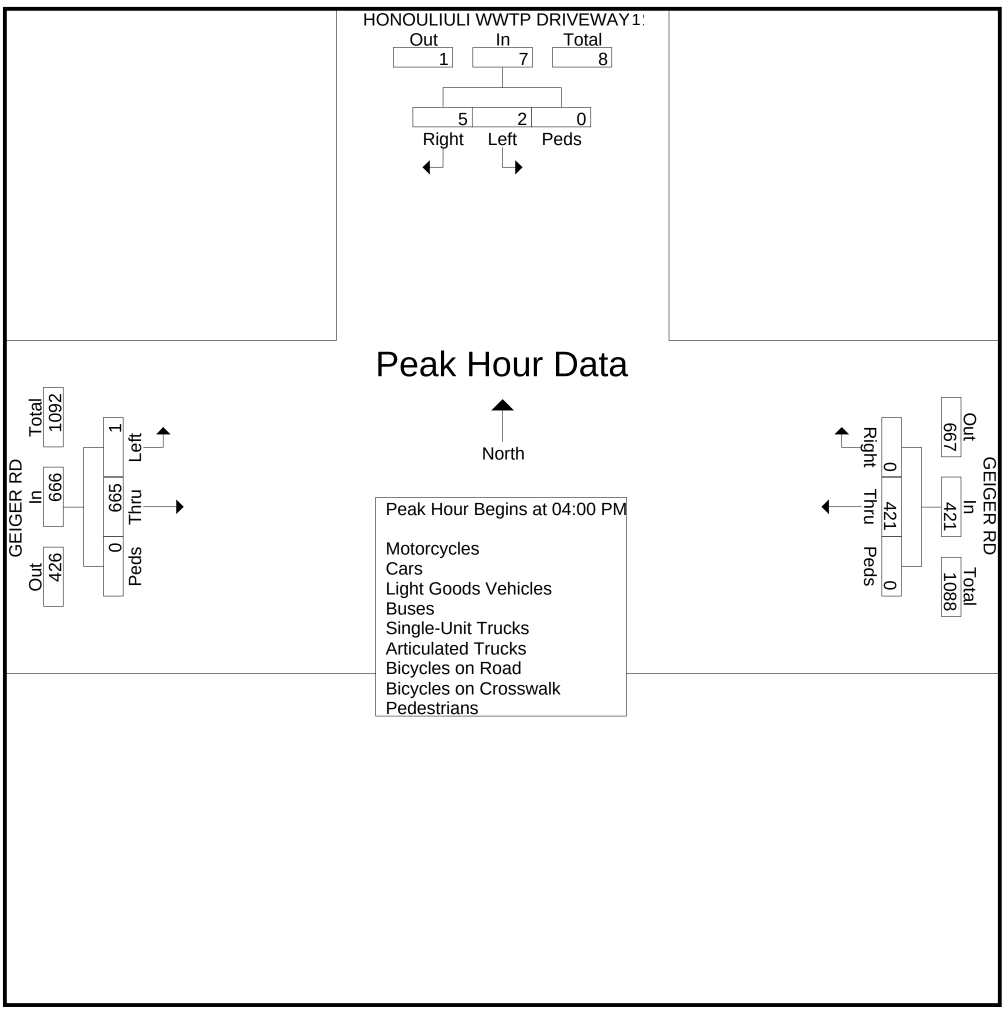
File Name : Honouliuli WWTR Dwy1 - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 2

	HONOULIULI WWTP DRIVEWAY 1 SOUTHBOUND				GEIGER RD WESTBOUND				GEIGER RD EASTBOUND				
Start Time	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	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	**1**	0	**2**	0	102	0	102	159	0	0	159	263
04:15 PM	**2**	0	0	2	0	**111**	0	**111**	170	0	0	170	283
04:30 PM	1	1	0	2	0	102	0	102	139	0	0	139	243
04:45 PM	1	0	0	1	0	106	0	106	**197**	**1**	0	**198**	**305**
Total Volume	5	2	0	7	0	421	0	421	665	1	0	666	1094
% App. Total	71.4	28.6	0		0	100	0		99.8	0.2	0		
PHF	.625	.500	.000	.875	.000	.948	.000	.948	.844	.250	.000	.841	.897



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File Name : Honouliuli WWTR Dwy 2 - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOULIULI WWTP DRIVEWAY 2 SOUTHBOUND				GEIGER RD WESTBOUND				KAMAKANA ST NORTHBOUND				GEIGER RD EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	0	0	1	2	0	109	7	0	30	0	8	0	6	154	0	0	317
03:45 PM	0	0	0	0	0	83	6	0	12	0	5	0	3	198	0	0	307
Total	0	0	1	2	0	192	13	0	42	0	13	0	9	352	0	0	624
04:00 PM	0	0	0	0	0	97	8	0	7	0	5	0	2	157	0	0	276
04:15 PM	0	0	0	0	0	113	8	0	11	0	3	0	8	153	0	0	296
04:30 PM	0	0	0	0	0	112	4	0	8	0	3	0	6	137	0	0	270
04:45 PM	0	0	0	0	0	90	7	0	7	0	1	1	8	176	0	0	290
Total	0	0	0	0	0	412	27	0	33	0	12	1	24	623	0	0	1132
05:00 PM	0	0	0	0	0	103	9	0	5	0	2	0	1	192	0	0	312
05:15 PM	0	0	0	0	0	111	14	0	2	0	2	0	6	182	0	0	317
Grand Total	0	0	1	2	0	818	63	0	82	0	29	1	40	1349	0	0	2385
Apprch %	0	0	33.3	66.7	0	92.8	7.2	0	73.2	0	25.9	0.9	2.9	97.1	0	0	
Total %	0	0	0	0.1	0	34.3	2.6	0	3.4	0	1.2	0	1.7	56.6	0	0	
Motorcycles	0	0	0	0	0	5	0	0	1	0	0	0	0	12	0	0	18
% Motorcycles	0	0	0	0	0	0.6	0	0	1.2	0	0	0	0	0.9	0	0	0.8
Cars	0	0	1	0	0	644	51	0	39	0	17	0	28	1013	0	0	1793
% Cars	0	0	100	0	0	78.7	81	0	47.6	0	58.6	0	70	75.1	0	0	75.2
Light Goods Vehicles	0	0	0	0	0	159	12	0	42	0	12	0	11	312	0	0	548
% Light Goods Vehicles	0	0	0	0	0	19.4	19	0	51.2	0	41.4	0	27.5	23.1	0	0	23
Buses	0	0	0	0	0	3	0	0	0	0	0	0	0	4	0	0	7
% Buses	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.3	0	0	0.3
Single-Unit Trucks	0	0	0	0	0	5	0	0	0	0	0	0	1	6	0	0	12
% Single-Unit Trucks	0	0	0	0	0	0.6	0	0	0	0	0	0	2.5	0.4	0	0	0.5
Articulated Trucks	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
% Articulated Trucks	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1
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	2	0	0	0	0	0	0	0	1	0	0	0	0	3
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	100	0	0	0	0	0.1

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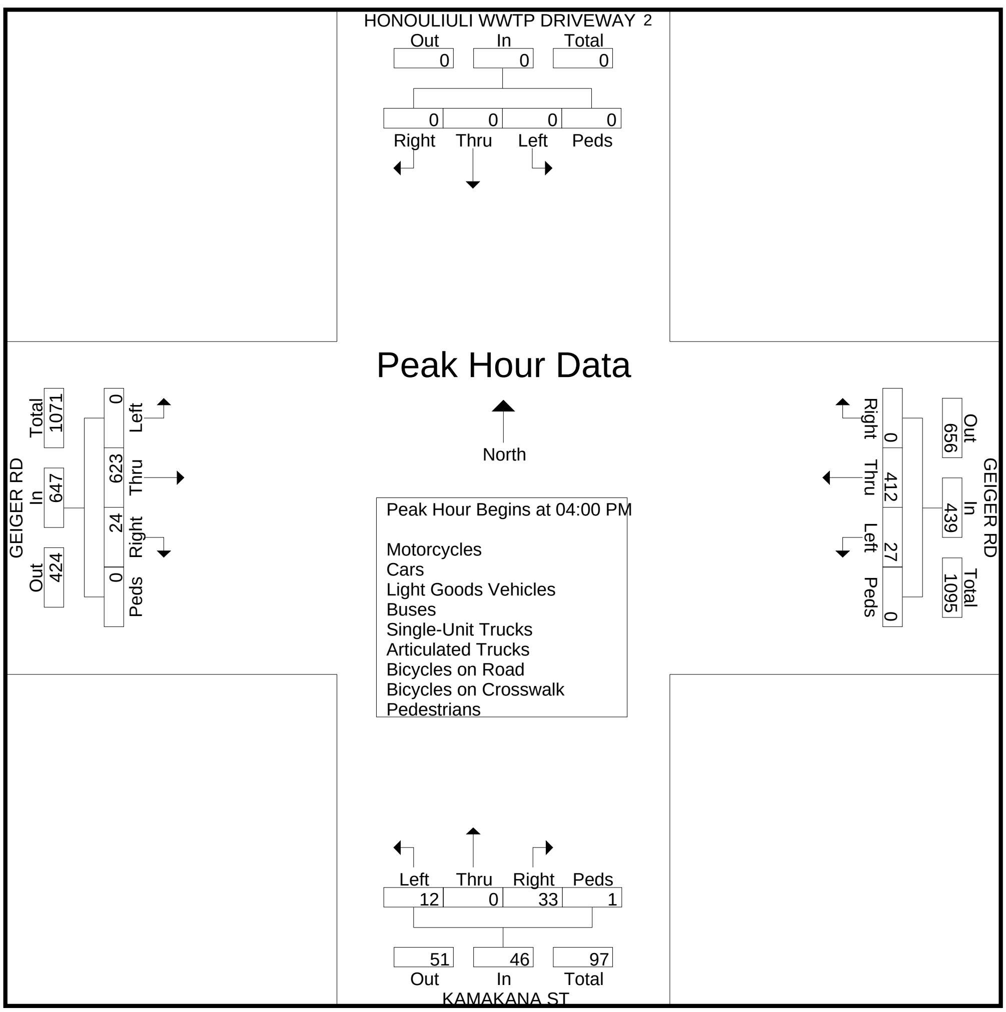
File Name : Honouliuli WWTR Dwy 2 - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 2

	HONOULIULI WWTP DRIVEWAY 2 SOUTHBOUND					GEIGER RD WESTBOUND					KAMAKANA ST NORTHBOUND					GEIGER RD EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	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	0	97	**8**	0	105	7	0	**5**	0	12	2	157	0	0	159	276
04:15 PM	0	0	0	0	0	0	**113**	8	0	**121**	**11**	0	3	0	**14**	**8**	153	0	0	161	**296**
04:30 PM	0	0	0	0	0	0	112	4	0	116	8	0	3	0	11	6	137	0	0	143	270
04:45 PM	0	0	0	0	0	0	90	7	0	97	7	0	1	**1**	9	8	**176**	0	0	**184**	290
Total Volume	0	0	0	0	0	0	412	27	0	439	33	0	12	1	46	24	623	0	0	647	1132
% App. Total	0	0	0	0		0	93.8	6.2	0		71.7	0	26.1	2.2		3.7	96.3	0	0		
PHF	.000	.000	.000	.000	.000	.000	.912	.844	.000	.907	.750	.000	.600	.250	.821	.750	.885	.000	.000	.879	.956



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File Name : Kapolei Pkwy - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KAPOLEI PKWY SOUTHBOUND				GEIGER RD WESTBOUND				KAPOLEI PKWY NORTHBOUND				GEIGER RD EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	6	142	41	2	58	34	27	0	17	112	77	0	113	68	8	2	707
03:45 PM	4	167	36	0	43	29	40	0	12	129	59	0	103	74	5	1	702
Total	10	309	77	2	101	63	67	0	29	241	136	0	216	142	13	3	1409
04:00 PM	8	155	35	1	48	34	37	0	18	127	56	0	118	59	11	0	707
04:15 PM	5	156	40	0	74	50	34	1	22	130	67	0	123	53	8	9	772
04:30 PM	8	165	47	0	55	36	42	1	21	117	75	0	91	37	9	3	707
04:45 PM	7	185	43	0	68	36	44	2	16	131	55	0	117	52	6	1	763
Total	28	661	165	1	245	156	157	4	77	505	253	0	449	201	34	13	2949
05:00 PM	7	166	51	1	49	44	36	4	17	116	57	1	116	65	6	3	739
05:15 PM	8	166	32	1	70	54	34	3	21	110	61	0	112	97	12	2	783
Grand Total	53	1302	325	5	465	317	294	11	144	972	507	1	893	505	65	21	5880
Apprch %	3.1	77.3	19.3	0.3	42.8	29.2	27	1	8.9	59.9	31.2	0.1	60.2	34	4.4	1.4	
Total %	0.9	22.1	5.5	0.1	7.9	5.4	5	0.2	2.4	16.5	8.6	0	15.2	8.6	1.1	0.4	
Motorcycles	0	12	4	0	4	3	2	0	1	3	3	0	7	6	0	0	45
% Motorcycles	0	0.9	1.2	0	0.9	0.9	0.7	0	0.7	0.3	0.6	0	0.8	1.2	0	0	0.8
Cars	44	1064	256	0	366	257	243	0	119	818	401	0	667	366	46	0	4647
% Cars	83	81.7	78.8	0	78.7	81.1	82.7	0	82.6	84.2	79.1	0	74.7	72.5	70.8	0	79
Light Goods Vehicles	6	219	59	0	93	52	48	0	24	141	100	0	214	127	16	0	1099
% Light Goods Vehicles	11.3	16.8	18.2	0	20	16.4	16.3	0	16.7	14.5	19.7	0	24	25.1	24.6	0	18.7
Buses	1	4	3	0	1	3	0	0	0	3	0	0	0	2	2	0	19
% Buses	1.9	0.3	0.9	0	0.2	0.9	0	0	0	0.3	0	0	0	0.4	3.1	0	0.3
Single-Unit Trucks	2	3	3	0	1	2	1	0	0	6	2	0	3	4	1	0	28
% Single-Unit Trucks	3.8	0.2	0.9	0	0.2	0.6	0.3	0	0	0.6	0.4	0	0.3	0.8	1.5	0	0.5
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	3
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0.1	0	0	0.2	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	3	5
% Bicycles on Crosswalk	0	0	0	0	0	0	0	18.2	0	0	0	0	0	0	0	14.3	0.1
Pedestrians	0	0	0	5	0	0	0	9	0	0	0	1	0	0	0	18	33
% Pedestrians	0	0	0	100	0	0	0	81.8	0	0	0	100	0	0	0	85.7	0.6

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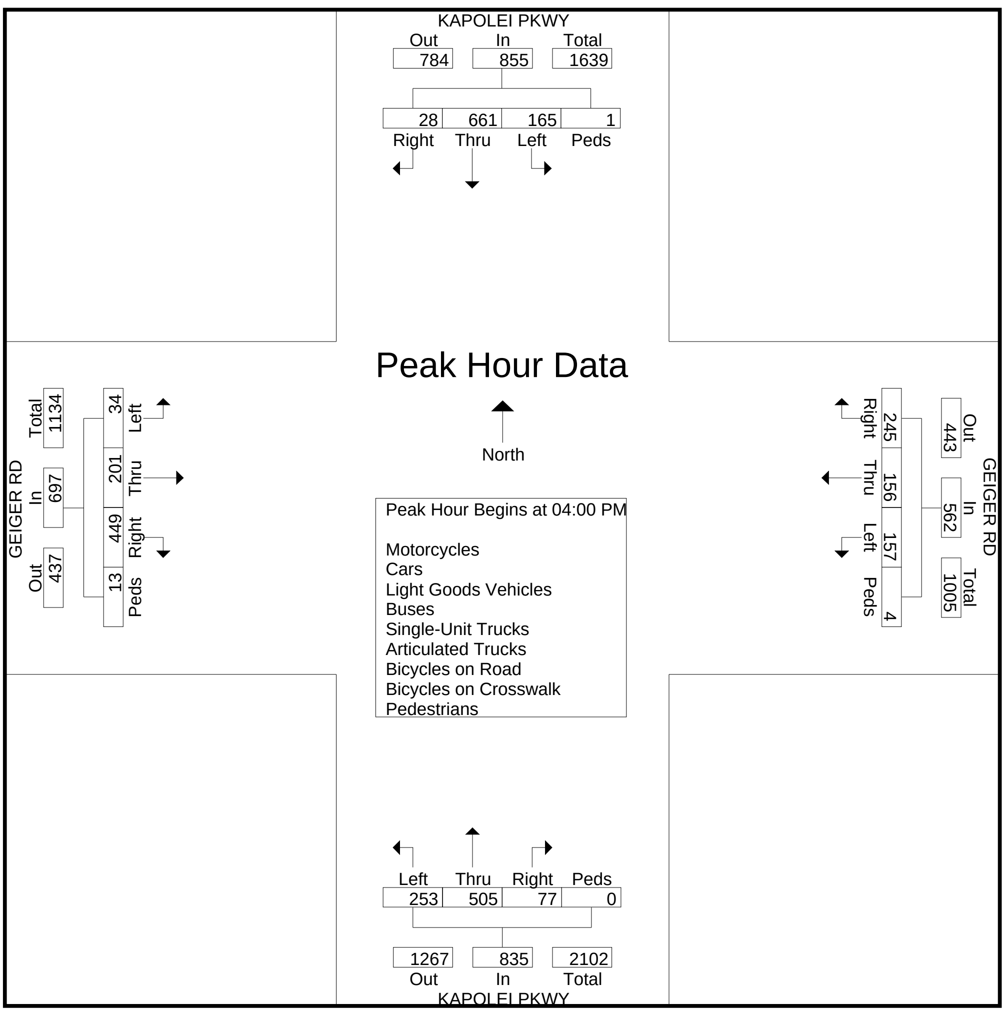
Start Date : 9/27/2017
Page No : 2

	KAPOLEI PKWY SOUTHBOUND					GEIGER RD WESTBOUND					KAPOLEI PKWY NORTHBOUND					GEIGER RD EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	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	**8**	155	35	**1**	199	48	34	37	0	119	18	127	56	0	201	118	**59**	**11**	0	188	707
04:15 PM	5	156	40	0	201	**74**	**50**	34	1	**159**	**22**	130	67	0	**219**	**123**	53	8	**9**	**193**	**772**
04:30 PM	8	165	**47**	0	220	55	36	42	1	134	21	117	**75**	0	213	91	37	9	3	140	707
04:45 PM	7	**185**	43	0	**235**	68	36	**44**	**2**	150	16	**131**	55	0	202	117	52	6	1	176	763
Total Volume	28	661	165	1	855	245	156	157	4	562	77	505	253	0	835	449	201	34	13	697	2949
% App. Total	3.3	77.3	19.3	0.1		43.6	27.8	27.9	0.7		9.2	60.5	30.3	0		64.4	28.8	4.9	1.9		
PHF	.875	.893	.878	.250	.910	.828	.780	.892	.500	.884	.875	.964	.843	.000	.953	.913	.852	.773	.361	.903	.955



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File Name : Fort Weaver Rd - Geiger Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	FORT WEAVER RD SOUTHBOUND				GEIGER RD WESTBOUND				FORT WEAVER RD NORTHBOUND				IROQUOIS RD EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	5	233	39	5	30	42	71	6	61	359	95	0	25	45	6	2	1024
03:45 PM	5	219	43	6	36	63	49	7	59	341	74	0	19	30	3	1	955
Total	10	452	82	11	66	105	120	13	120	700	169	0	44	75	9	3	1979
04:00 PM	4	267	35	9	32	62	53	7	67	405	91	0	36	35	4	0	1107
04:15 PM	6	262	41	1	31	35	34	2	73	444	101	0	36	59	2	2	1129
04:30 PM	2	225	33	5	31	54	53	5	61	353	105	0	33	47	4	0	1011
04:45 PM	1	189	41	9	39	62	49	7	75	368	83	0	28	55	2	5	1013
Total	13	943	150	24	133	213	189	21	276	1570	380	0	133	196	12	7	4260
05:00 PM	7	203	33	1	29	79	61	5	71	418	109	0	34	41	5	1	1097
05:15 PM	2	213	42	8	39	59	57	11	69	449	95	0	31	59	1	2	1137
Grand Total	32	1811	307	44	267	456	427	50	536	3137	753	0	242	371	27	13	8473
Apprch %	1.5	82.5	14	2	22.2	38	35.6	4.2	12.1	70.9	17	0	37.1	56.8	4.1	2	
Total %	0.4	21.4	3.6	0.5	3.2	5.4	5	0.6	6.3	37	8.9	0	2.9	4.4	0.3	0.2	
Motorcycles	0	8	0	0	1	5	0	0	2	20	11	0	2	2	1	0	52
% Motorcycles	0	0.4	0	0	0.4	1.1	0	0	0.4	0.6	1.5	0	0.8	0.5	3.7	0	0.6
Cars	24	1549	253	0	230	377	371	0	415	2413	607	0	211	318	21	0	6789
% Cars	75	85.5	82.4	0	86.1	82.7	86.9	0	77.4	76.9	80.6	0	87.2	85.7	77.8	0	80.1
Light Goods Vehicles	8	216	50	0	30	71	49	0	116	670	133	0	26	51	5	0	1425
% Light Goods Vehicles	25	11.9	16.3	0	11.2	15.6	11.5	0	21.6	21.4	17.7	0	10.7	13.7	18.5	0	16.8
Buses	0	24	3	0	5	1	0	0	0	20	0	0	1	0	0	0	54
% Buses	0	1.3	1	0	1.9	0.2	0	0	0	0.6	0	0	0.4	0	0	0	0.6
Single-Unit Trucks	0	13	1	0	1	1	6	0	3	9	2	0	1	0	0	0	37
% Single-Unit Trucks	0	0.7	0.3	0	0.4	0.2	1.4	0	0.6	0.3	0.3	0	0.4	0	0	0	0.4
Articulated Trucks	0	1	0	0	0	0	1	0	0	2	0	0	0	0	0	0	4
% Articulated Trucks	0	0.1	0	0	0	0	0.2	0	0	0.1	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	1	0	0	0	3	0	0	1	0	0	0	5
% Bicycles on Road	0	0	0	0	0	0.2	0	0	0	0.1	0	0	0.4	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	6	0	0	0	6	0	0	0	0	0	0	0	8	20
% Bicycles on Crosswalk	0	0	0	13.6	0	0	0	12	0	0	0	0	0	0	0	61.5	0.2
Pedestrians	0	0	0	38	0	0	0	44	0	0	0	0	0	0	0	5	87
% Pedestrians	0	0	0	86.4	0	0	0	88	0	0	0	0	0	0	0	38.5	1

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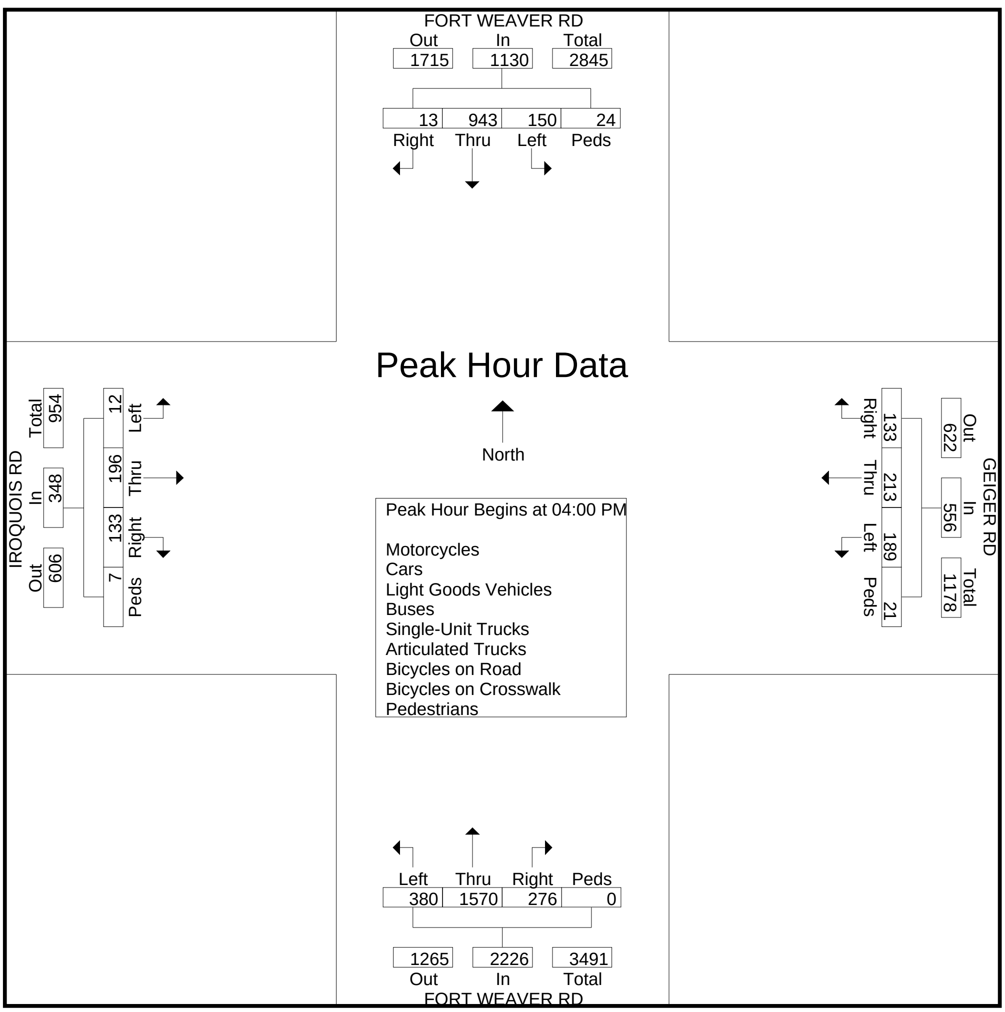
Start Date : 9/27/2017

	FORT WEAVER RD SOUTHBOUND					GEIGER RD WESTBOUND					FORT WEAVER RD NORTHBOUND					IROQUOIS RD EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	4	**267**	35	**9**	**315**	32	**62**	**53**	**7**	154	67	405	91	0	563	**36**	35	**4**	0	75	1107
04:15 PM	**6**	262	**41**	1	310	31	35	34	2	102	73	**444**	101	0	**618**	36	**59**	2	2	**99**	**1129**
04:30 PM	2	225	33	5	265	31	54	53	5	143	61	353	**105**	0	519	33	47	4	0	84	1011
04:45 PM	1	189	41	9	240	**39**	62	49	7	**157**	**75**	368	83	0	526	28	55	2	**5**	90	1013
Total Volume	13	943	150	24	1130	133	213	189	21	556	276	1570	380	0	2226	133	196	12	7	348	4260
% App. Total	1.2	83.5	13.3	2.1		23.9	38.3	34	3.8		12.4	70.5	17.1	0		38.2	56.3	3.4	2		
PHF	.542	.883	.915	.667	.897	.853	.859	.892	.750	.885	.920	.884	.905	.000	.900	.924	.831	.750	.350	.879	.943



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File Name : Fort Weaver Rd - Renton Rd
Site Code : 17-099 Honouliuli WWTP
Start Date : 9/27/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	FORT WEAVER RD SOUTHBOUND				RENTON RD WESTBOUND				FORT WEAVER RD NORTHBOUND				RENTON RD EASTBOUND				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	102	667	3	0	0	3	2	1	3	409	24	2	28	9	87	6	1346
03:45 PM	95	687	1	0	0	2	1	3	9	371	25	10	38	2	85	9	1338
Total	197	1354	4	0	0	5	3	4	12	780	49	12	66	11	172	15	2684
04:00 PM	121	658	11	0	7	7	3	0	16	361	29	10	27	10	79	3	1342
04:15 PM	120	622	15	0	10	7	14	0	28	408	33	3	39	22	72	3	1396
04:30 PM	116	719	5	0	8	7	11	3	9	388	26	7	41	10	75	5	1430
04:45 PM	112	725	4	0	2	5	3	3	2	359	31	2	38	8	78	6	1378
Total	469	2724	35	0	27	26	31	6	55	1516	119	22	145	50	304	17	5546
05:00 PM	112	712	2	0	1	1	4	4	5	307	30	0	29	2	80	2	1291
05:15 PM	100	655	1	0	5	3	4	1	8	390	35	5	49	1	78	7	1342
Grand Total	878	5445	42	0	33	35	42	15	80	2993	233	39	289	64	634	41	10863
Apprch %	13.8	85.5	0.7	0	26.4	28	33.6	12	2.4	89.5	7	1.2	28.1	6.2	61.7	4	
Total %	8.1	50.1	0.4	0	0.3	0.3	0.4	0.1	0.7	27.6	2.1	0.4	2.7	0.6	5.8	0.4	
Motorcycles	3	28	0	0	0	0	0	0	0	12	5	0	3	0	3	0	54
% Motorcycles	0.3	0.5	0	0	0	0	0	0	0	0.4	2.1	0	1	0	0.5	0	0.5
Cars	632	4370	29	0	33	24	29	0	56	2300	176	0	236	40	506	0	8431
% Cars	72	80.3	69	0	100	68.6	69	0	70	76.8	75.5	0	81.7	62.5	79.8	0	77.6
Light Goods Vehicles	235	1005	12	0	0	10	10	0	22	631	47	0	48	20	116	0	2156
% Light Goods Vehicles	26.8	18.5	28.6	0	0	28.6	23.8	0	27.5	21.1	20.2	0	16.6	31.2	18.3	0	19.8
Buses	4	22	1	0	0	1	2	0	0	24	4	0	2	1	7	0	68
% Buses	0.5	0.4	2.4	0	0	2.9	4.8	0	0	0.8	1.7	0	0.7	1.6	1.1	0	0.6
Single-Unit Trucks	1	14	0	0	0	0	1	0	1	24	1	0	0	0	2	0	44
% Single-Unit Trucks	0.1	0.3	0	0	0	0	2.4	0	1.2	0.8	0.4	0	0	0	0.3	0	0.4
Articulated Trucks	0	3	0	0	0	0	0	0	0	2	0	0	0	0	0	0	5
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Bicycles on Road	3	3	0	0	0	0	0	0	1	0	0	0	0	3	0	0	10
% Bicycles on Road	0.3	0.1	0	0	0	0	0	0	1.2	0	0	0	0	4.7	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	2	0	0	0	5	0	0	0	6	13
% Bicycles on Crosswalk	0	0	0	0	0	0	0	13.3	0	0	0	12.8	0	0	0	14.6	0.1
Pedestrians	0	0	0	0	0	0	0	13	0	0	0	34	0	0	0	35	82
% Pedestrians	0	0	0	0	0	0	0	86.7	0	0	0	87.2	0	0	0	85.4	0.8

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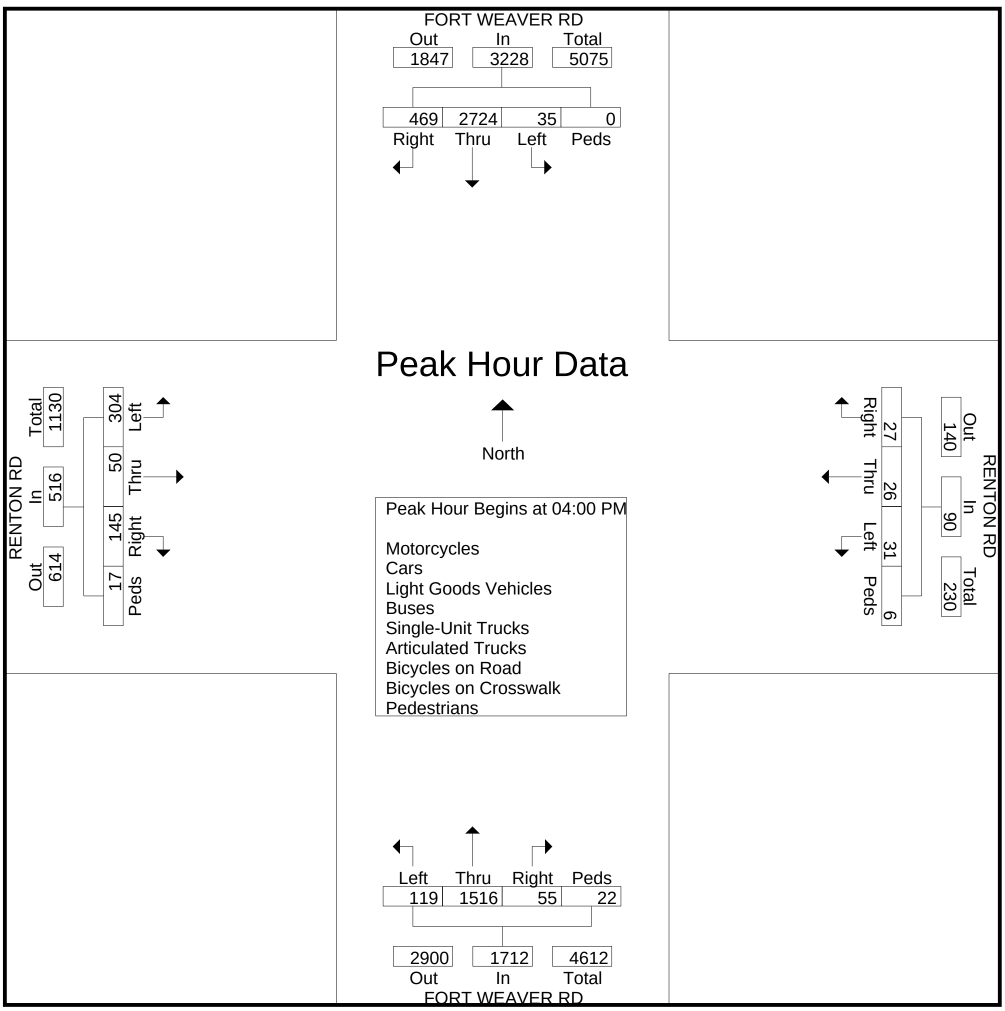
Page No : 2

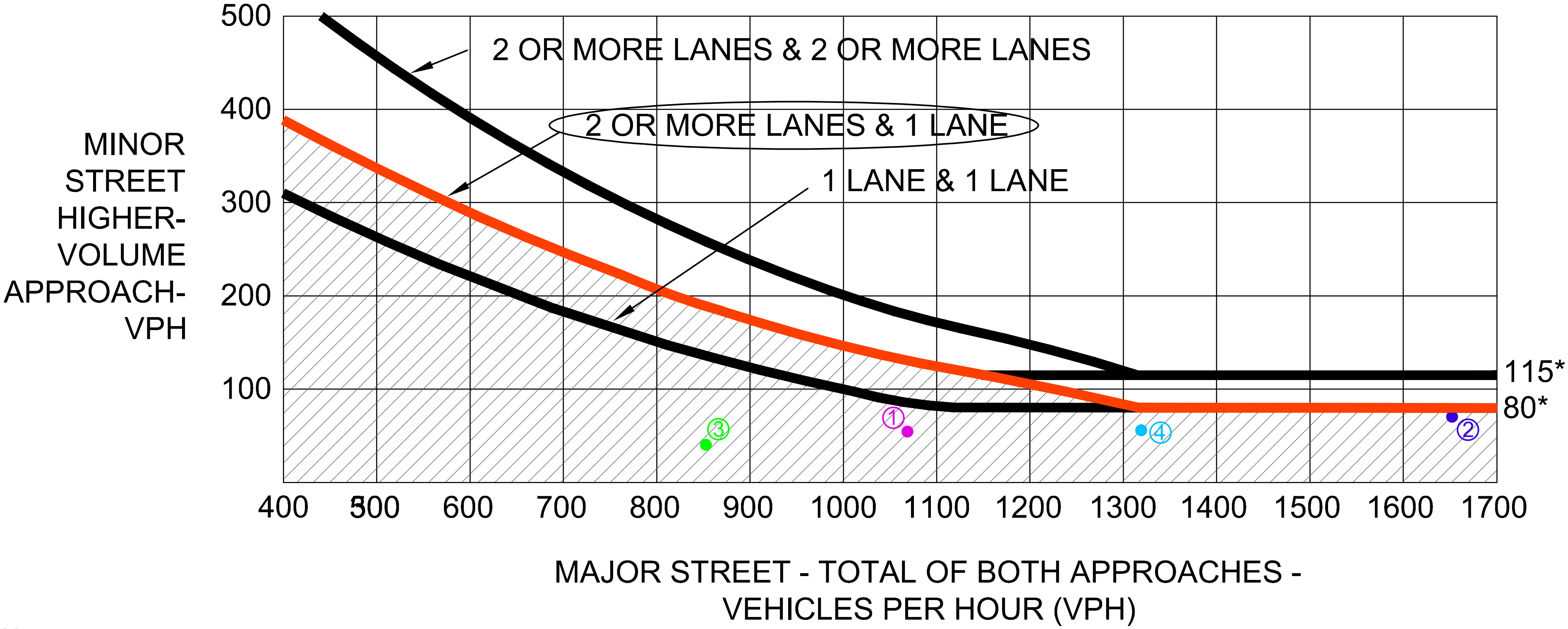
	FORT WEAVER RD SOUTHBOUND					RENTON RD WESTBOUND					FORT WEAVER RD NORTHBOUND					RENTON RD EASTBOUND					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	**121**	658	11	0	790	7	**7**	3	0	17	16	361	29	**10**	416	27	10	**79**	3	119	1342
04:15 PM	120	622	**15**	0	757	**10**	7	**14**	0	**31**	**28**	**408**	**33**	3	**472**	39	**22**	72	3	**136**	1396
04:30 PM	116	719	5	0	840	8	7	11	**3**	29	9	388	26	7	430	**41**	10	75	5	131	**1430**
04:45 PM	112	**725**	4	0	**841**	2	5	3	3	13	2	359	31	2	394	38	8	78	**6**	130	1378
Total Volume	469	2724	35	0	3228	27	26	31	6	90	55	1516	119	22	1712	145	50	304	17	516	5546
% App. Total	14.5	84.4	1.1	0		30	28.9	34.4	6.7		3.2	88.6	7	1.3		28.1	9.7	58.9	3.3		
PHF	.969	.939	.583	.000	.960	.675	.929	.554	.500	.726	.491	.929	.902	.550	.907	.884	.568	.962	.708	.949	.970



APPENDIX D

FOUR-HOUR TRAFFIC SIGNAL WARRANTS

Warrant 2, Four-Hour Vehicular Volume



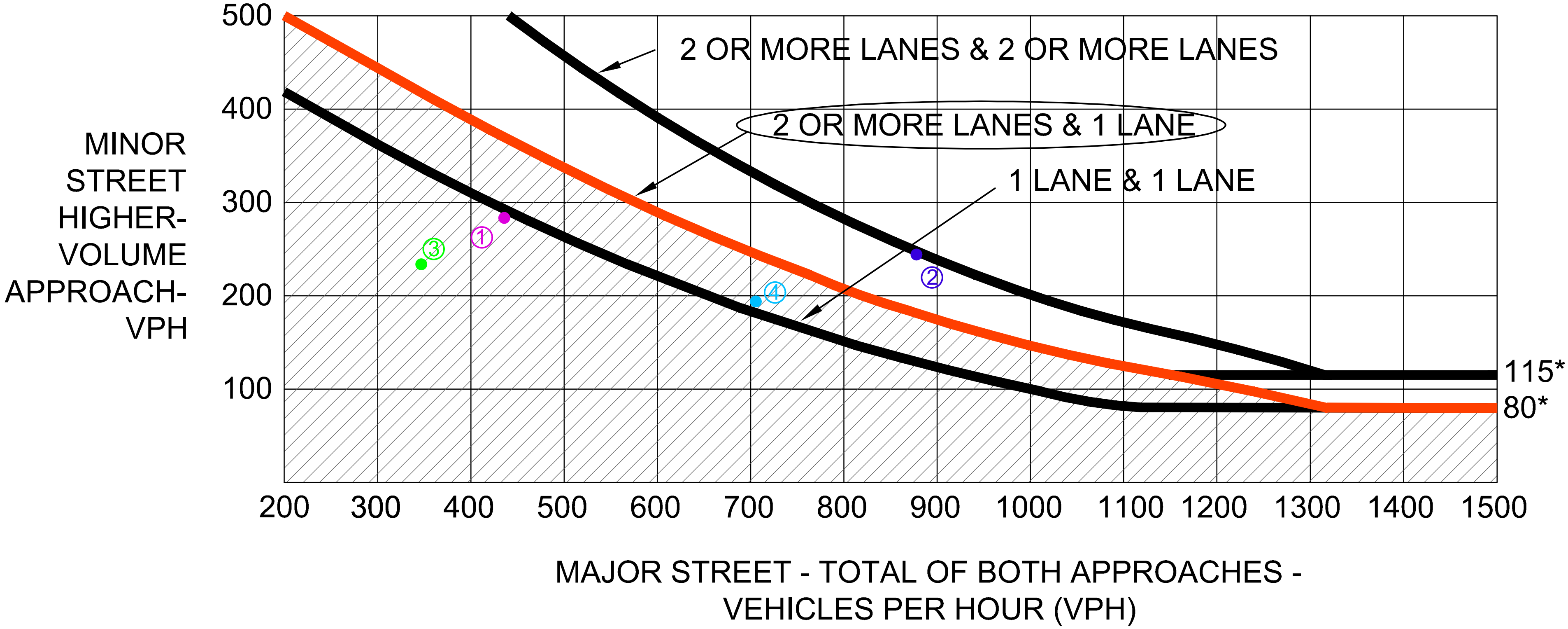
① AM PEAK, (1065, 55)
② PM PEAK, (1650, 70)
③ 80% AM PEAK, (852, 44)
④ 80% PM PEAK, (1320, 56)

*Notes:

1. 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.
2. Volumes based on the highest volume scenario for the non-process facility accesses.

HONOULIULI WASTEWATER TREATMENT PLANT TIAR	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS, SURVEYORS • HONOLULU, HAWAII FOUR HOUR TRAFFIC SIGNAL WARRANT FOR FUTURE YEAR 2026 GEIGER RD/HONOULIULI DW 2/KAMAKANA ST NORTHBOUND LEFT-TURN	FIGURE D1

Warrant 2, Four-Hour Vehicular Volume



*Notes:

1. 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.
2. Volumes based on the highest volume scenario for the non-process facility accesses.

① AM PEAK, (430, 285)
② PM PEAK, (880, 245)
③ 80% AM PEAK, (344, 228)
④ 80% PM PEAK, (704, 196)

HONOULIULI WASTEWATER TREATMENT PLANT TIAR	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS, SURVEYORS • HONOLULU, HAWAII	FIGURE
	FOUR HOUR TRAFFIC SIGNAL WARRANT FOR FUTURE YEAR 2026 GEIGER RD/HONOULIULI DW 2/KAMAKANA ST WESTBOUND LEFT-TURN	D2

APPENDIX E

ROADWAY PHASING IMRPOVEMENT PLAN

Appendix E: Roadway Phasing Improvement Plan

ID	Intersection	Existing 2017	Base Year 2021 w/ Mitigation	Base Year 2023 w/ Mitigation [1]	Future Year 2026 w/ All Mitigation [1]	Future Year 2030 w/ Mitigation (2014 TIAR)
Kapolei Parkway @						
1	**Kapolei Parkway** – **Kualakai Parkway**	#1 N Kualakai Pkwy. Kapolei Pkwy.	#1 N Kualakai Pkwy. Kapolei Pkwy.	#1 N Kualakai Pkwy. Kapolei Pkwy.	#1 N Kualakai Pkwy. Kapolei Pkwy.	#1 N Kualakai Pkwy. Kapolei Pkwy.
2	**Kapolei Parkway** – **Renton Road**	#2 N Kapolei Pkwy. Renton Rd.	#2 N Kapolei Pkwy. Renton Rd.	#2 N Kapolei Pkwy. Renton Rd.	#2 N Kapolei Pkwy. Renton Rd.	#2 N Kapolei Pkwy. Renton Rd.
Renton Road @						
14	**Renton Road** – **Malio Street (Honouliuli Driveway 5)**			#14 N Malio St. Renton Rd.	#14 N Malio St. Renton Rd.	#14 N Malio St. Renton Rd.
3	**Renton Road** – **Phillipine Sea**	#3 N Phillipine Sea Renton Rd.	#3 N Phillipine Sea Renton Rd.	#3 N Phillipine Sea Renton Rd.	#3 N Phillipine Sea Renton Rd.	#3 N Phillipine Sea Renton Rd.
Roosevelt Avenue @						
4	**Roosevelt Avenue** – **Phillipine Sea**	#4 N Phillipine Sea Roosevelt Ave.	#4 N Phillipine Sea Roosevelt Ave.	#4 N Phillipine Sea Roosevelt Ave.	#4 N Phillipine Sea Roosevelt Ave.	#4 N Phillipine Sea Roosevelt Ave.
13	**Roosevelt Avenue** – **Honouliuli Driveway 4**			#13 N Honouliuli Dwy. 4 Renton Rd.	#13 N Honouliuli Dwy. 4 Renton Rd.	#13 N Honouliuli Dwy. 4 Renton Rd.
Geiger Road @						
5	**Geiger Road** – **Essex Road**	#5 N Essex Rd. Geiger Rd./Roosevelt Ave.	#5 N Essex Rd. Geiger Rd./Roosevelt Ave.	#5 N Essex Rd. Geiger Rd./Roosevelt Ave.	#5 N Essex Rd. Geiger Rd./Roosevelt Ave.	#5 N Essex Rd. Geiger Rd./Roosevelt Ave.
6	**Geiger Road** – **Ewa Refuse Convenience Center (ERCC) Driveway**	#6 N ERCC Dwy. Geiger Rd.	#6 N ERCC Dwy. Geiger Rd.	#6 N ERCC Dwy. Geiger Rd.	#6 N ERCC Dwy. Geiger Rd.	#6 N ERCC Dwy. Geiger Rd.
7	**Geiger Road** – **Honouliuli Driveway 1**	#7 N Honouliuli Dwy. 1 Geiger Rd.	#7 N Honouliuli Dwy. 1 Geiger Rd.	#7 N Honouliuli Dwy. 1 Geiger Rd.	#7 N Honouliuli Dwy. 1 Geiger Rd.	#7 N Honouliuli Dwy. 1 Geiger Rd.
8	**Geiger Road** – **Honouliuli Driveway 2/ Kamakana Street**	#8 N Honouliuli Dwy. 2/ Kamakana St. Geiger Rd.	#8 N Honouliuli Dwy. 2/ Kamakana St. Geiger Rd.	#8 N Honouliuli Dwy. 2/ Kamakana St. Geiger Rd.	#8 N Honouliuli Dwy. 2/ Kamakana St. Geiger Rd.	#8 N Honouliuli Dwy. 2/ Kamakana St. Geiger Rd.
12	**Geiger Road** – **Honouliuli Driveway 3**			#12 N Honouliuli Dwy. 3 Geiger Rd.	#12 N Honouliuli Dwy. 3 Geiger Rd.	#12 N Honouliuli Dwy. 3 Geiger Rd.
9	**Geiger Road** – **Kapolei Parkway**	#9 N Kapolei Pkwy. Geiger Rd.	#9 N Kapolei Pkwy. Geiger Rd.	#9 N Kapolei Pkwy. Geiger Rd.	#9 N Kapolei Pkwy. Geiger Rd.	#9 N Kapolei Pkwy. Geiger Rd.
Fort Weaver Road @						
10	**Fort Weaver Road** – **Geiger Road/Iroquois Road**	#10 N Fort Weaver Rd. Geiger Rd./ Iroquois Rd.	#10 N Fort Weaver Rd. Geiger Rd./ Iroquois Rd.	#10 N Fort Weaver Rd. Geiger Rd./ Iroquois Rd.	#10 N Fort Weaver Rd. Geiger Rd./ Iroquois Rd.	#10 N Fort Weaver Rd. Geiger Rd./ Iroquois Rd.
11	**Fort Weaver Road** – **Renton Road**	#11 N Fort Weaver Rd. Renton Rd.	#11 N Fort Weaver Rd. Renton Rd.	#11 N Fort Weaver Rd. Renton Rd.	#11 N Fort Weaver Rd. Renton Rd.	#11 N Fort Weaver Rd. Renton Rd.

Notes:
1. For Base Year 2023 and Future Year 2026, recommendations are based on the construction of both the Renton Road and Roosevelt Avenue accesses with the Honouliuli Non-Process Facilities because the scenario represents the worst-case scenario for roadway improvements.

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Appendix B

Intersection Level of Service Definitions

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Highway Capacity Manual 2010

Signalized intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual 2010* (Transportation Research Board, 2010).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F[1]	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Unsignalized intersection LOS criteria can be further reduced into three intersection types: all-way stop, two-way stop, and roundabout control. All-way stop and roundabout control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F[1]	>50

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

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Appendix C

Intersection Operations Analysis - Synchro Worksheets

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Intersection	
Int Delay, s/veh	7.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	5	175	5	5	76
Future Vol, veh/h	0	5	175	5	5	76
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	5	190	5	5	83

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	5	0	388	3
Stage 1	-	-	-	-	3	-
Stage 2	-	-	-	-	385	-
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	-	-	1616	-	616	1081
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	688	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1616	-	543	1081
Mov Cap-2 Maneuver	-	-	-	-	543	-
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	607	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1019	-	-	1616	-
HCM Lane V/C Ratio	0.086	-	-	0.118	-
HCM Control Delay (s)	8.9	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	56	430	5	5	670	20	0	0	0	20	5	155
Future Vol, veh/h	56	430	5	5	670	20	0	0	0	20	5	155
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	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	61	467	5	5	728	22	0	0	0	22	5	168

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	750	0	0	472	0	0	1428	1352	470	1341	1343	739
Stage 1	-	-	-	-	-	-	592	592	-	749	749	-
Stage 2	-	-	-	-	-	-	836	760	-	592	594	-
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	859	-	-	1090	-	-	113	150	594	129	152	417
Stage 1	-	-	-	-	-	-	493	494	-	404	419	-
Stage 2	-	-	-	-	-	-	362	414	-	493	493	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	859	-	-	1090	-	-	60	135	594	119	136	417
Mov Cap-2 Maneuver	-	-	-	-	-	-	60	135	-	119	136	-
Stage 1	-	-	-	-	-	-	446	447	-	365	416	-
Stage 2	-	-	-	-	-	-	211	411	-	446	446	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.1	0	34.1
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	859	-	-	1090	-	-	312
HCM Lane V/C Ratio	-	0.071	-	-	0.005	-	-	0.627
HCM Control Delay (s)	0	9.5	0	-	8.3	0	-	34.1
HCM Lane LOS	A	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	-	0.2	-	-	0	-	-	4

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	75	0	75	175	13	0	0	20	50	0	5
Future Vol, veh/h	1	75	0	75	175	13	0	0	20	50	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	50	-	-	-	-	-	-	-	-
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	1	82	0	82	190	14	0	0	22	54	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	204	0	0	82	0	0	448	452	82	456	445	197
Stage 1	-	-	-	-	-	-	84	84	-	361	361	-
Stage 2	-	-	-	-	-	-	364	368	-	95	84	-
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	1368	-	-	1515	-	-	521	503	978	515	508	844
Stage 1	-	-	-	-	-	-	924	825	-	657	626	-
Stage 2	-	-	-	-	-	-	655	621	-	912	825	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1368	-	-	1515	-	-	496	475	978	483	480	844
Mov Cap-2 Maneuver	-	-	-	-	-	-	496	475	-	483	480	-
Stage 1	-	-	-	-	-	-	923	824	-	656	592	-
Stage 2	-	-	-	-	-	-	616	587	-	891	824	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.1	8.8	13.1
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	978	1368	-	-	1515	-	-	503
HCM Lane V/C Ratio	0.022	0.001	-	-	0.054	-	-	0.119
HCM Control Delay (s)	8.8	7.6	-	-	7.5	-	-	13.1
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.2	-	-	0.4

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	450	690	110	10	5
Future Vol, veh/h	15	450	690	110	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	489	750	120	11	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	870	0	-	0	1331	810
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	521	-
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	775	-	-	-	170	380
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	596	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	775	-	-	-	166	380
Mov Cap-2 Maneuver	-	-	-	-	166	-
Stage 1	-	-	-	-	429	-
Stage 2	-	-	-	-	596	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	24.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	775	-	-	-	204
HCM Lane V/C Ratio	0.021	-	-	-	0.08
HCM Control Delay (s)	9.7	-	-	-	24.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	415	15	25	805	5	5
Future Vol, veh/h	415	15	25	805	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	451	16	27	875	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	467	0	1388	459
Stage 1	-	-	-	-	459	-
Stage 2	-	-	-	-	929	-
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	-	-	1094	-	157	602
Stage 1	-	-	-	-	636	-
Stage 2	-	-	-	-	385	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1094	-	153	602
Mov Cap-2 Maneuver	-	-	-	-	153	-
Stage 1	-	-	-	-	636	-
Stage 2	-	-	-	-	375	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	20.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	244	-	-	1094	-
HCM Lane V/C Ratio	0.045	-	-	0.025	-
HCM Control Delay (s)	20.4	-	-	8.4	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	405	820	40	10	10
Future Vol, veh/h	15	405	820	40	10	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	50	-	-	100	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	440	891	43	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	934	0	-	0	1363	446
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	472	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	731	-	-	-	150	561
Stage 1	-	-	-	-	362	-
Stage 2	-	-	-	-	627	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	731	-	-	-	147	561
Mov Cap-2 Maneuver	-	-	-	-	147	-
Stage 1	-	-	-	-	354	-
Stage 2	-	-	-	-	627	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	22
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	731	-	-	-	233
HCM Lane V/C Ratio	0.022	-	-	-	0.093
HCM Control Delay (s)	10	-	-	-	22
HCM Lane LOS	B	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	11.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	335	75	285	790	40	55	0	265	15	0	20
Future Vol, veh/h	20	335	75	285	790	40	55	0	265	15	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	400	-	-	150	-	-	-	-	-
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	22	364	82	310	859	43	60	0	288	16	0	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	902	0	0	446	0	0	1499	1971	223	1727	1991	451
Stage 1	-	-	-	-	-	-	449	449	-	1501	1501	-
Stage 2	-	-	-	-	-	-	1050	1522	-	226	490	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	749	-	-	1111	-	-	84	62	780	57	60	556
Stage 1	-	-	-	-	-	-	559	571	-	128	183	-
Stage 2	-	-	-	-	-	-	243	179	-	756	547	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	749	-	-	1111	-	-	62	43	780	28	42	556
Mov Cap-2 Maneuver	-	-	-	-	-	-	62	43	-	28	42	-
Stage 1	-	-	-	-	-	-	543	554	-	124	132	-
Stage 2	-	-	-	-	-	-	168	129	-	463	531	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	2.4	47	133.4
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	62	780	749	-	-	1111	-	-	61
HCM Lane V/C Ratio	0.964	0.369	0.029	-	-	0.279	-	-	0.624
HCM Control Delay (s)	213.9	12.3	10	-	-	9.5	-	-	133.4
HCM Lane LOS	F	B	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	4.6	1.7	0.1	-	-	1.1	-	-	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	98	22	245	189	310	52	1425	50	190	630	52
Future Volume (vph)	30	98	22	245	189	310	52	1425	50	190	630	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1812		1770	1863	1583	1770	5060		1770	5027	
Flt Permitted	0.56	1.00		0.67	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1038	1812		1254	1863	1583	1770	5060		1770	5027	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	107	24	266	205	337	57	1549	54	207	685	57
RTOR Reduction (vph)	0	9	0	0	0	0	0	4	0	0	10	0
Lane Group Flow (vph)	33	122	0	266	205	337	57	1599	0	207	732	0
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	27.0	27.0		27.0	27.0	27.0	7.0	33.0		15.0	41.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0	27.0	7.0	33.0		15.0	41.0	
Actuated g/C Ratio	0.30	0.30		0.30	0.30	0.30	0.08	0.37		0.17	0.46	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	311	543		376	558	474	137	1855		295	2290	
v/s Ratio Prot		0.07			0.11		0.03	c0.32		c0.12	0.15	
v/s Ratio Perm	0.03			0.21		c0.21						
v/c Ratio	0.11	0.22		0.71	0.37	0.71	0.42	0.86		0.70	0.32	
Uniform Delay, d1	22.8	23.6		28.0	24.8	28.0	39.6	26.4		35.4	15.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	1.0		10.7	1.9	8.8	9.0	5.6		13.1	0.4	
Delay (s)	23.5	24.6		38.7	26.6	36.8	48.6	32.0		48.5	16.0	
Level of Service	C	C		D	C	D	D	C		D	B	
Approach Delay (s)		24.4			34.8			32.5			23.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	75.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	210	290	90	485	371	475	986	125	106	751	155
Future Volume (vph)	85	210	290	90	485	371	475	986	125	106	751	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	228	315	98	527	403	516	1072	136	115	816	168
RTOR Reduction (vph)	0	0	223	0	0	175	0	0	80	0	0	125
Lane Group Flow (vph)	92	228	92	98	527	228	516	1072	56	115	816	43
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	9.0	35.0	35.0	13.0	39.0	39.0	21.0	41.0	41.0	11.0	31.0	31.0
Effective Green, g (s)	9.0	35.0	35.0	13.0	39.0	39.0	21.0	41.0	41.0	11.0	31.0	31.0
Actuated g/C Ratio	0.08	0.29	0.29	0.11	0.32	0.32	0.18	0.34	0.34	0.09	0.26	0.26
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	132	543	461	191	605	514	600	1209	540	162	914	408
v/s Ratio Prot	c0.05	0.12		0.06	c0.28		c0.15	c0.30		0.06	0.23	
v/s Ratio Perm			0.06			0.14			0.04			0.03
v/c Ratio	0.70	0.42	0.20	0.51	0.87	0.44	0.86	0.89	0.10	0.71	0.89	0.11
Uniform Delay, d1	54.2	34.3	32.0	50.5	38.1	31.9	48.1	37.3	27.0	52.9	42.9	33.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	26.3	2.4	1.0	9.5	15.8	2.8	14.9	9.8	0.4	23.1	12.9	0.5
Delay (s)	80.5	36.7	32.9	60.0	53.9	34.7	63.0	47.1	27.4	76.0	55.8	34.5
Level of Service	F	D	C	E	D	C	E	D	C	E	E	C
Approach Delay (s)		41.2			47.0			50.3			54.7	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	49.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Intersection	
Int Delay, s/veh	8.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	5	5	128	5	5	181
Future Vol, veh/h	5	5	128	5	5	181
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	5	5	139	5	5	197

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	10	0	291	8
Stage 1	-	-	-	-	8	-
Stage 2	-	-	-	-	283	-
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	-	-	1610	-	700	1074
Stage 1	-	-	-	-	1015	-
Stage 2	-	-	-	-	765	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1610	-	639	1074
Mov Cap-2 Maneuver	-	-	-	-	639	-
Stage 1	-	-	-	-	1015	-
Stage 2	-	-	-	-	698	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1055	-	-	1610	-
HCM Lane V/C Ratio	0.192	-	-	0.086	-
HCM Control Delay (s)	9.2	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.3	-

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	151	685	0	0	505	30	5	10	0	20	0	108
Future Vol, veh/h	151	685	0	0	505	30	5	10	0	20	0	108
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	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	164	745	0	0	549	33	5	11	0	22	0	117

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	582	0	0	745	0	0	1697	1655	745	1645	1639	566
Stage 1	-	-	-	-	-	-	1073	1073	-	566	566	-
Stage 2	-	-	-	-	-	-	624	582	-	1079	1073	-
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	992	-	-	863	-	-	73	98	414	79	100	524
Stage 1	-	-	-	-	-	-	267	297	-	509	507	-
Stage 2	-	-	-	-	-	-	473	499	-	264	297	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	992	-	-	863	-	-	44	70	414	55	72	524
Mov Cap-2 Maneuver	-	-	-	-	-	-	44	70	-	55	72	-
Stage 1	-	-	-	-	-	-	192	213	-	365	507	-
Stage 2	-	-	-	-	-	-	367	499	-	180	213	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	0	89.8	43.9
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	58	992	-	-	863	-	-	225
HCM Lane V/C Ratio	0.281	0.165	-	-	-	-	-	0.618
HCM Control Delay (s)	89.8	9.3	0	-	0	-	-	43.9
HCM Lane LOS	F	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	1	0.6	-	-	0	-	-	3.6

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	180	0	55	130	51	0	0	85	27	0	3
Future Vol, veh/h	6	180	0	55	130	51	0	0	85	27	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	50	-	-	-	-	-	-	-	-
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	7	196	0	60	141	55	0	0	92	29	0	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	196	0	0	196	0	0	500	526	196	545	499	169
Stage 1	-	-	-	-	-	-	210	210	-	289	289	-
Stage 2	-	-	-	-	-	-	290	316	-	256	210	-
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	1377	-	-	1377	-	-	481	457	845	449	473	875
Stage 1	-	-	-	-	-	-	792	728	-	719	673	-
Stage 2	-	-	-	-	-	-	718	655	-	749	728	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1377	-	-	1377	-	-	461	435	845	385	450	875
Mov Cap-2 Maneuver	-	-	-	-	-	-	461	435	-	385	450	-
Stage 1	-	-	-	-	-	-	788	724	-	715	643	-
Stage 2	-	-	-	-	-	-	684	626	-	664	724	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	1.8	9.8	14.6
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	845	1377	-	-	1377	-	-	408
HCM Lane V/C Ratio	0.109	0.005	-	-	0.043	-	-	0.08
HCM Control Delay (s)	9.8	7.6	-	-	7.7	-	-	14.6
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	0.3

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	700	535	30	95	15
Future Vol, veh/h	10	700	535	30	95	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	50	-	-	-	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	761	582	33	103	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	615	0	-	0	1382	599
Stage 1	-	-	-	-	599	-
Stage 2	-	-	-	-	783	-
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	965	-	-	-	159	502
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	450	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	965	-	-	-	157	502
Mov Cap-2 Maneuver	-	-	-	-	157	-
Stage 1	-	-	-	-	543	-
Stage 2	-	-	-	-	450	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	62.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	965	-	-	-	173
HCM Lane V/C Ratio	0.011	-	-	-	0.691
HCM Control Delay (s)	8.8	-	-	-	62.6
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	4.1

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	775	15	10	535	5	20
Future Vol, veh/h	775	15	10	535	5	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	-	-	50	-	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	842	16	11	582	5	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	858	0	1454	850
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	604	-
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	-	-	783	-	143	360
Stage 1	-	-	-	-	419	-
Stage 2	-	-	-	-	546	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	783	-	141	360
Mov Cap-2 Maneuver	-	-	-	-	141	-
Stage 1	-	-	-	-	419	-
Stage 2	-	-	-	-	538	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	19.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	275	-	-	783	-
HCM Lane V/C Ratio	0.099	-	-	0.014	-
HCM Control Delay (s)	19.5	-	-	9.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	805	530	5	15	15
Future Vol, veh/h	5	805	530	5	15	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	50	-	-	100	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	5	875	576	5	16	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	581	0	-	0	1461	288
Stage 1	-	-	-	-	576	-
Stage 2	-	-	-	-	885	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	991	-	-	-	130	709
Stage 1	-	-	-	-	526	-
Stage 2	-	-	-	-	402	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	991	-	-	-	129	709
Mov Cap-2 Maneuver	-	-	-	-	129	-
Stage 1	-	-	-	-	523	-
Stage 2	-	-	-	-	402	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	24.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	991	-	-	-	218
HCM Lane V/C Ratio	0.005	-	-	-	0.15
HCM Control Delay (s)	8.7	-	-	-	24.4
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Intersection	
Int Delay, s/veh	41.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	740	45	245	440	30	70	0	305	40	0	30
Future Vol, veh/h	20	740	45	245	440	30	70	0	305	40	0	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	400	-	-	150	-	-	-	-	-
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	22	804	49	266	478	33	76	0	332	43	0	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	511	0	0	853	0	0	1644	1916	427	1473	1924	256
Stage 1	-	-	-	-	-	-	873	873	-	1027	1027	-
Stage 2	-	-	-	-	-	-	771	1043	-	446	897	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1050	-	-	782	-	-	~ 66	67	576	88	66	743
Stage 1	-	-	-	-	-	-	311	366	-	251	310	-
Stage 2	-	-	-	-	-	-	359	305	-	561	357	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1050	-	-	782	-	-	~ 46	43	576	~ 27	43	743
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 46	43	-	~ 27	43	-
Stage 1	-	-	-	-	-	-	304	358	-	246	205	-
Stage 2	-	-	-	-	-	-	226	201	-	233	350	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	4.1	111.6	$ 513.1
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	46	576	1050	-	-	782	-	-	46
HCM Lane V/C Ratio	1.654	0.576	0.021	-	-	0.341	-	-	1.654
HCM Control Delay (s)	$ 513.1	19.4	8.5	-	-	12	-	-	$ 513.1
HCM Lane LOS	F	C	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	7.5	3.6	0.1	-	-	1.5	-	-	7.5

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	196	65	165	163	285	31	980	115	275	1210	57
Future Volume (vph)	76	196	65	165	163	285	31	980	115	275	1210	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1793		1770	1863	1583	1770	5005		1770	5051	
Flt Permitted	0.60	1.00		0.40	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1110	1793		750	1863	1583	1770	5005		1770	5051	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	213	71	179	177	310	34	1065	125	299	1315	62
RTOR Reduction (vph)	0	15	0	0	0	0	0	18	0	0	6	0
Lane Group Flow (vph)	83	269	0	179	177	310	34	1172	0	299	1371	0
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	20.0	20.0		20.0	20.0	20.0	6.0	30.0		15.0	39.0	
Effective Green, g (s)	20.0	20.0		20.0	20.0	20.0	6.0	30.0		15.0	39.0	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.08	0.38		0.19	0.49	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	277	448		187	465	395	132	1876		331	2462	
v/s Ratio Prot		0.15			0.10		0.02	c0.23		c0.17	0.27	
v/s Ratio Perm	0.07			c0.24		0.20						
v/c Ratio	0.30	0.60		0.96	0.38	0.78	0.26	0.62		0.90	0.56	
Uniform Delay, d1	24.3	26.5		29.6	24.9	28.0	34.9	20.4		31.8	14.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.8	5.8		55.5	2.4	14.5	4.7	1.6		30.1	0.9	
Delay (s)	27.1	32.3		85.1	27.2	42.5	39.6	22.0		61.8	15.3	
Level of Service	C	C		F	C	D	D	C		E	B	
Approach Delay (s)		31.1			49.9			22.5			23.6	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	365	580	160	280	271	325	729	80	191	919	100
Future Volume (vph)	150	365	580	160	280	271	325	729	80	191	919	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	397	630	174	304	295	353	792	87	208	999	109
RTOR Reduction (vph)	0	0	226	0	0	211	0	0	63	0	0	75
Lane Group Flow (vph)	163	397	404	174	304	84	353	792	24	208	999	34
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	13.0	34.0	34.0	13.0	34.0	34.0	16.0	33.0	33.0	20.0	37.0	37.0
Effective Green, g (s)	13.0	34.0	34.0	13.0	34.0	34.0	16.0	33.0	33.0	20.0	37.0	37.0
Actuated g/C Ratio	0.11	0.28	0.28	0.11	0.28	0.28	0.13	0.28	0.28	0.17	0.31	0.31
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	191	527	448	191	527	448	457	973	435	295	1091	488
v/s Ratio Prot	0.09	0.21		c0.10	0.16		0.10	0.22		c0.12	c0.28	
v/s Ratio Perm			c0.25			0.05			0.02			0.02
v/c Ratio	0.85	0.75	0.90	0.91	0.58	0.19	0.77	0.81	0.05	0.71	0.92	0.07
Uniform Delay, d1	52.6	39.2	41.4	52.9	36.8	32.5	50.2	40.6	32.0	47.2	40.0	29.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	35.6	9.6	23.8	45.3	4.5	0.9	12.0	7.4	0.2	13.3	13.3	0.3
Delay (s)	88.2	48.8	65.2	98.2	41.4	33.5	62.2	48.1	32.3	60.5	53.3	29.6
Level of Service	F	D	E	F	D	C	E	D	C	E	D	C
Approach Delay (s)		62.9			51.1			51.0			52.4	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	54.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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APPENDICES

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Existing AM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	442	303	15	12	663	542	5	32	2	187	55	275
Future Volume (veh/h)	442	303	15	12	663	542	5	32	2	187	55	275
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	480	329	14	13	721	589	5	35	1	203	60	113
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	640	2438	103	44	1597	1128	9	242	7	317	550	945
Arrive On Green	0.19	0.49	0.49	0.01	0.31	0.31	0.01	0.07	0.07	0.09	0.15	0.15
Sat Flow, veh/h	3456	5024	212	3456	5106	2790	1781	3528	100	3456	3554	2768
Grp Volume(v), veh/h	480	222	121	13	721	589	5	18	18	203	60	113
Grp Sat Flow(s),veh/h/ln	1728	1702	1832	1728	1702	1395	1781	1777	1852	1728	1777	1384
Q Serve(g_s), s	9.2	2.5	2.6	0.3	7.9	11.2	0.2	0.7	0.7	4.0	1.0	2.0
Cycle Q Clear(g_c), s	9.2	2.5	2.6	0.3	7.9	11.2	0.2	0.7	0.7	4.0	1.0	2.0
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.05	1.00		1.00
Lane Grp Cap(c), veh/h	640	1652	889	44	1597	1128	9	122	127	317	550	945
V/C Ratio(X)	0.75	0.13	0.14	0.29	0.45	0.52	0.53	0.14	0.15	0.64	0.11	0.12
Avail Cap(c_a), veh/h	1870	1842	991	1870	2763	1765	304	962	1002	1083	2429	2409
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.1	10.0	10.0	34.3	19.3	15.8	34.8	30.8	30.8	30.8	25.5	15.9
Incr Delay (d2), s/veh	1.8	0.0	0.1	3.6	0.2	0.4	39.3	0.5	0.5	2.2	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.8	0.9	0.9	0.1	3.0	3.3	0.2	0.3	0.3	1.7	0.4	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.9	10.0	10.0	38.0	19.5	16.2	74.1	31.3	31.3	32.9	25.6	16.0
LnGrp LOS	C	A	B	D	B	B	E	C	C	C	C	B
Approach Vol, veh/h		823			1323			41			376	
Approach Delay, s/veh		21.0			18.2			36.5			26.7	
Approach LOS		C			B			D			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.4	10.8	6.9	40.1	6.4	16.9	19.0	28.0				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	22.0	38.0	38.0	38.0	12.0	48.0	38.0	38.0				
Max Q Clear Time (g_c+I1), s	6.0	2.7	2.3	4.6	2.2	4.0	11.2	13.2				
Green Ext Time (p_c), s	0.6	0.1	0.0	2.3	0.0	0.8	1.8	8.4				
Intersection Summary												
HCM 6th Ctrl Delay			20.6									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	50	14	233	108	289	39	950	39	154	310	10
Future Volume (veh/h)	10	50	14	233	108	289	39	950	39	154	310	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	54	8	253	117	72	42	1033	39	167	337	9
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	405	486	72	470	572	478	56	1662	63	214	2136	57
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.03	0.33	0.33	0.12	0.42	0.42
Sat Flow, veh/h	1181	1588	235	1322	1870	1560	1781	5050	190	1781	5114	136
Grp Volume(v), veh/h	11	0	62	253	117	72	42	696	376	167	224	122
Grp Sat Flow(s),veh/h/ln	1181	0	1824	1322	1870	1560	1781	1702	1836	1781	1702	1846
Q Serve(g_s), s	0.5	0.0	1.8	12.5	3.4	2.5	1.7	12.7	12.7	6.7	3.0	3.0
Cycle Q Clear(g_c), s	3.9	0.0	1.8	14.3	3.4	2.5	1.7	12.7	12.7	6.7	3.0	3.0
Prop In Lane	1.00		0.13	1.00		1.00	1.00		0.10	1.00		0.07
Lane Grp Cap(c), veh/h	405	0	558	470	572	478	56	1120	604	214	1422	771
V/C Ratio(X)	0.03	0.00	0.11	0.54	0.20	0.15	0.75	0.62	0.62	0.78	0.16	0.16
Avail Cap(c_a), veh/h	590	0	844	677	865	722	703	3659	1974	703	3659	1984
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.3	0.0	18.3	23.5	18.9	18.6	35.3	20.8	20.8	31.4	13.3	13.3
Incr Delay (d2), s/veh	0.0	0.0	0.1	1.0	0.2	0.1	18.2	0.6	1.1	6.1	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.8	3.9	1.5	0.9	1.0	4.8	5.3	3.1	1.1	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.4	0.0	18.4	24.4	19.1	18.7	53.5	21.4	21.8	37.6	13.4	13.4
LnGrp LOS	C	A	B	C	B	B	D	C	C	D	B	B
Approach Vol, veh/h		73			442			1114			513	
Approach Delay, s/veh		18.7			22.1			22.7			21.3	
Approach LOS		B			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.8	30.2		28.5	8.3	36.7		28.5				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	29.0	79.0		34.0	29.0	79.0		34.0				
Max Q Clear Time (g_c+I1), s	8.7	14.7		16.3	3.7	5.0		5.9				
Green Ext Time (p_c), s	0.4	9.5		1.7	0.1	2.4		0.3				
Intersection Summary												
HCM 6th Ctrl Delay			22.1									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	7.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	4	154	3	1	66
Future Vol, veh/h	0	4	154	3	1	66
Conflicting Peds, #/hr	0	1	1	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	4	167	3	1	72

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	5	0	340	3
Stage 1	-	-	-	-	3	-
Stage 2	-	-	-	-	337	-
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	-	-	1616	-	656	1081
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	723	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1615	-	587	1080
Mov Cap-2 Maneuver	-	-	-	-	587	-
Stage 1	-	-	-	-	913	-
Stage 2	-	-	-	-	723	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1067	-	-	1615	-
HCM Lane V/C Ratio	0.068	-	-	0.104	-
HCM Control Delay (s)	8.6	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.3	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	48	341	2	3	613	14	0	0	0	18	3	136
Future Vol, veh/h	48	341	2	3	613	14	0	0	0	18	3	136
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	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	52	371	2	3	666	15	0	0	0	20	3	148

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	682	0	0	373	0	0	1231	1164	372	1157	1158	675
Stage 1	-	-	-	-	-	-	476	476	-	681	681	-
Stage 2	-	-	-	-	-	-	755	688	-	476	477	-
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	911	-	-	1185	-	-	154	194	674	173	196	454
Stage 1	-	-	-	-	-	-	570	557	-	440	450	-
Stage 2	-	-	-	-	-	-	401	447	-	570	556	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	910	-	-	1185	-	-	97	179	674	163	181	454
Mov Cap-2 Maneuver	-	-	-	-	-	-	97	179	-	163	181	-
Stage 1	-	-	-	-	-	-	529	517	-	408	448	-
Stage 2	-	-	-	-	-	-	267	445	-	529	516	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0	0	23
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	910	-	-	1185	-	-	368
HCM Lane V/C Ratio	-	0.057	-	-	0.003	-	-	0.464
HCM Control Delay (s)	0	9.2	0	-	8	0	-	23
HCM Lane LOS	A	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	-	0.2	-	-	0	-	-	2.4

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	331	11	21	641	1	1
Future Vol, veh/h	331	11	21	641	1	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	-	-	50	-	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	360	12	23	697	1	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	372	0	1109	366
Stage 1	-	-	-	-	366	-
Stage 2	-	-	-	-	743	-
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	-	-	1186	-	232	679
Stage 1	-	-	-	-	702	-
Stage 2	-	-	-	-	470	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1186	-	228	679
Mov Cap-2 Maneuver	-	-	-	-	228	-
Stage 1	-	-	-	-	689	-
Stage 2	-	-	-	-	470	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	15.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	341	-	-	1186	-
HCM Lane V/C Ratio	0.006	-	-	0.019	-
HCM Control Delay (s)	15.6	-	-	8.1	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	6	330	640	5	3	9
Future Vol, veh/h	6	330	640	5	3	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	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	7	359	696	5	3	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	701	0	-	0	1069	696
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	373	-
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	896	-	-	-	245	442
Stage 1	-	-	-	-	495	-
Stage 2	-	-	-	-	696	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	896	-	-	-	243	442
Mov Cap-2 Maneuver	-	-	-	-	243	-
Stage 1	-	-	-	-	490	-
Stage 2	-	-	-	-	696	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	15.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	896	-	-	-	367
HCM Lane V/C Ratio	0.007	-	-	-	0.036
HCM Control Delay (s)	9	0	-	-	15.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection						
Int Delay, s/veh	0.3					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	320	651	17	7	6
Future Vol, veh/h	10	320	651	17	7	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	50	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	348	708	18	8	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	726	0	-	0	1078	354
Stage 1	-	-	-	-	708	-
Stage 2	-	-	-	-	370	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	875	-	-	-	227	643
Stage 1	-	-	-	-	450	-
Stage 2	-	-	-	-	698	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	875	-	-	-	224	643
Mov Cap-2 Maneuver	-	-	-	-	224	-
Stage 1	-	-	-	-	444	-
Stage 2	-	-	-	-	698	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	16.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	875	-	-	-	320
HCM Lane V/C Ratio	0.012	-	-	-	0.044
HCM Control Delay (s)	9.2	-	-	-	16.8
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	318	19	45	642	4	31	0	61	1	0	0
Future Vol, veh/h	0	318	19	45	642	4	31	0	61	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	346	21	49	698	4	34	0	66	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	702	0	0	367	0	0	804	1157	184	971	1165	351
Stage 1	-	-	-	-	-	-	357	357	-	798	798	-
Stage 2	-	-	-	-	-	-	447	800	-	173	367	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	891	-	-	1188	-	-	274	195	827	207	193	645
Stage 1	-	-	-	-	-	-	633	627	-	346	396	-
Stage 2	-	-	-	-	-	-	560	395	-	812	621	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	891	-	-	1188	-	-	266	187	827	184	185	645
Mov Cap-2 Maneuver	-	-	-	-	-	-	266	187	-	184	185	-
Stage 1	-	-	-	-	-	-	633	627	-	346	380	-
Stage 2	-	-	-	-	-	-	537	379	-	747	621	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	13.3	24.7
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	266	827	891	-	-	1188	-	-	184
HCM Lane V/C Ratio	0.127	0.08	-	-	-	0.041	-	-	0.006
HCM Control Delay (s)	20.5	9.7	0	-	-	8.2	-	-	24.7
HCM Lane LOS	C	A	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.4	0.3	0	-	-	0.1	-	-	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	113	226	88	315	295	329	889	123	96	560	51
Future Volume (veh/h)	21	113	226	88	315	295	329	889	123	96	560	51
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		1.00	1.00		0.95	1.00		0.98
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	23	123	29	96	342	73	358	966	67	104	609	9
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	34	544	124	124	450	380	402	1468	623	135	936	409
Arrive On Green	0.02	0.19	0.19	0.07	0.24	0.24	0.23	0.41	0.41	0.08	0.26	0.26
Sat Flow, veh/h	1781	2863	654	1781	1870	1581	1781	3554	1508	1781	3554	1553
Grp Volume(v), veh/h	23	75	77	96	342	73	358	966	67	104	609	9
Grp Sat Flow(s),veh/h/ln	1781	1777	1740	1781	1870	1581	1781	1777	1508	1781	1777	1553
Q Serve(g_s), s	1.2	3.4	3.6	5.1	16.2	3.5	18.6	20.9	2.6	5.5	14.5	0.4
Cycle Q Clear(g_c), s	1.2	3.4	3.6	5.1	16.2	3.5	18.6	20.9	2.6	5.5	14.5	0.4
Prop In Lane	1.00		0.38	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	34	338	331	124	450	380	402	1468	623	135	936	409
V/C Ratio(X)	0.67	0.22	0.23	0.77	0.76	0.19	0.89	0.66	0.11	0.77	0.65	0.02
Avail Cap(c_a), veh/h	355	726	711	355	765	646	635	1639	696	635	1639	716
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.5	32.7	32.7	43.6	33.7	28.8	35.8	22.6	17.2	43.3	31.2	26.0
Incr Delay (d2), s/veh	20.7	0.3	0.4	9.8	2.7	0.2	9.7	0.8	0.1	8.9	0.8	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	0.7	1.5	1.5	2.5	7.5	1.3	9.0	8.6	0.9	2.7	6.2	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.2	33.0	33.1	53.4	36.4	29.1	45.5	23.4	17.3	52.1	32.0	26.1
LnGrp LOS	E	C	C	D	D	C	D	C	B	D	C	C
Approach Vol, veh/h		175			511			1391			722	
Approach Delay, s/veh		37.5			38.5			28.8			34.8	
Approach LOS		D			D			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.2	45.4	12.6	24.1	27.5	31.1	7.8	28.9
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	34.0	44.0	19.0	39.0	34.0	44.0	19.0	39.0
Max Q Clear Time (g_c+I1), s	7.5	22.9	7.1	5.6	20.6	16.5	3.2	18.2
Green Ext Time (p_c), s	0.3	7.4	0.2	0.9	0.9	4.5	0.0	2.2

Intersection Summary		
HCM 6th Ctrl Delay		32.7
HCM 6th LOS		C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	220	119	150	30	270	252	201	1119	30	225	930	146
Future Volume (veh/h)	220	119	150	30	270	252	201	1119	30	225	930	146
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	239	129	68	33	293	112	218	1216	15	245	1011	80
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	452	237	186	306	322	480	287	2783	843	309	2815	853
Arrive On Green	0.13	0.13	0.13	0.17	0.17	0.17	0.08	0.55	0.54	0.09	0.55	0.54
Sat Flow, veh/h	3563	1870	1469	1781	1870	2790	3456	5106	1570	3456	5106	1571
Grp Volume(v), veh/h	239	129	68	33	293	112	218	1216	15	245	1011	80
Grp Sat Flow(s),veh/h/ln	1781	1870	1469	1781	1870	1395	1728	1702	1570	1728	1702	1571
Q Serve(g_s), s	15.1	15.5	10.2	3.8	36.9	8.3	14.8	34.1	1.1	16.7	26.6	5.9
Cycle Q Clear(g_c), s	15.1	15.5	10.2	3.8	36.9	8.3	14.8	34.1	1.1	16.7	26.6	5.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	452	237	186	306	322	480	287	2783	843	309	2815	853
V/C Ratio(X)	0.53	0.54	0.36	0.11	0.91	0.23	0.76	0.44	0.02	0.79	0.36	0.09
Avail Cap(c_a), veh/h	787	413	324	312	327	488	547	2783	843	403	2815	853
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)	0.89	0.89	0.89	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	98.1	98.3	95.9	83.8	97.5	85.7	107.7	32.6	26.0	107.1	30.1	26.4
Incr Delay (d2), s/veh	1.8	3.7	2.3	0.3	29.3	0.5	4.1	0.5	0.0	8.0	0.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.2	7.9	4.1	1.8	20.8	3.1	6.9	14.6	0.4	7.9	11.4	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	99.9	101.9	98.2	84.1	126.8	86.2	111.8	33.1	26.0	115.1	30.5	26.6
LnGrp LOS	F	F	F	F	F	F	F	C	C	F	C	C
Approach Vol, veh/h		436			438			1449			1336	
Approach Delay, s/veh		100.2			113.2			44.9			45.8	
Approach LOS		F			F			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	25.4	134.8		34.5	24.0	136.3		45.3
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	26.0	98.0		51.0	36.0	88.0		40.0
Max Q Clear Time (g_c+I1), s	18.7	36.1		17.5	16.8	28.6		38.9
Green Ext Time (p_c), s	0.8	46.2		4.3	1.1	39.6		0.4

Intersection Summary		
HCM 6th Ctrl Delay		60.0
HCM 6th LOS		E

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)	442	5	163	6	14	6	148	2743	11	6	1288	245
Future Volume (veh/h)	442	5	163	6	14	6	148	2743	11	6	1288	245
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.98
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	484	0	86	7	15	2	161	2982	8	7	1400	146
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	541	0	231	10	21	40	182	3738	1150	29	3257	982
Arrive On Green	0.15	0.00	0.15	0.02	0.02	0.02	0.10	0.73	0.73	0.03	1.00	1.00
Sat Flow, veh/h	3563	0	1519	586	1255	1585	1781	5106	1580	1781	5106	1560
Grp Volume(v), veh/h	484	0	86	22	0	2	161	2982	8	7	1400	146
Grp Sat Flow(s),veh/h/ln	1781	0	1519	1841	0	1585	1781	1702	1580	1781	1702	1560
Q Serve(g_s), s	32.0	0.0	12.2	2.9	0.0	0.3	21.4	90.3	0.3	0.9	0.0	0.0
Cycle Q Clear(g_c), s	32.0	0.0	12.2	2.9	0.0	0.3	21.4	90.3	0.3	0.9	0.0	0.0
Prop In Lane	1.00		1.00	0.32		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	541	0	231	31	0	40	182	3738	1150	29	3257	982
V/C Ratio(X)	0.89	0.00	0.37	0.72	0.00	0.05	0.89	0.80	0.01	0.24	0.43	0.15
Avail Cap(c_a), veh/h	609	0	260	199	0	185	371	3738	1150	163	3257	982
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.9	0.0	91.5	117.1	0.0	114.2	106.4	20.7	8.9	114.7	0.0	0.0
Incr Delay (d2), s/veh	15.3	0.0	1.4	26.8	0.0	0.5	24.2	1.9	0.0	4.0	0.4	0.3
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	16.2	0.0	5.0	1.6	0.0	0.1	11.3	35.9	0.1	0.5	0.1	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	115.1	0.0	92.9	143.9	0.0	114.8	130.6	22.6	8.9	118.7	0.4	0.3
LnGrp LOS	F	A	F	F	A	F	F	C	A	F	A	A
Approach Vol, veh/h		570			24			3151			1553	
Approach Delay, s/veh		111.8			141.5			28.1			0.9	
Approach LOS		F			F			C			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.9	180.7		41.5	30.5	158.1		10.0				
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	20.0	129.0		41.0	50.0	99.0		26.0				
Max Q Clear Time (g_c+I1), s	2.9	92.3		34.0	23.4	2.0		4.9				
Green Ext Time (p_c), s	0.0	36.2		1.9	1.1	43.2		0.1				
Intersection Summary												
HCM 6th Ctrl Delay			29.6									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Existing PM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	371	566	79	116	466	225	46	130	86	433	219	525
Future Volume (veh/h)	371	566	79	116	466	225	46	130	86	433	219	525
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	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	403	615	77	126	507	245	50	141	17	471	238	250
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	556	1413	175	222	1074	1087	64	327	39	628	882	1138
Arrive On Green	0.16	0.31	0.31	0.06	0.21	0.21	0.04	0.10	0.10	0.18	0.25	0.25
Sat Flow, veh/h	3456	4601	570	3456	5106	2757	1781	3199	380	3456	3554	2776
Grp Volume(v), veh/h	403	453	239	126	507	245	50	77	81	471	238	250
Grp Sat Flow(s),veh/h/ln	1728	1702	1767	1728	1702	1378	1781	1777	1802	1728	1777	1388
Q Serve(g_s), s	7.7	7.4	7.5	2.5	6.1	4.1	1.9	2.8	2.9	9.0	3.8	4.1
Cycle Q Clear(g_c), s	7.7	7.4	7.5	2.5	6.1	4.1	1.9	2.8	2.9	9.0	3.8	4.1
Prop In Lane	1.00		0.32	1.00		1.00	1.00		0.21	1.00		1.00
Lane Grp Cap(c), veh/h	556	1045	542	222	1074	1087	64	182	184	628	882	1138
V/C Ratio(X)	0.72	0.43	0.44	0.57	0.47	0.23	0.78	0.43	0.44	0.75	0.27	0.22
Avail Cap(c_a), veh/h	2184	1858	964	2184	2787	2012	972	1327	1346	1588	2348	2283
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.7	19.3	19.3	31.6	24.1	14.1	33.3	29.3	29.4	27.0	21.1	13.4
Incr Delay (d2), s/veh	1.8	0.3	0.6	2.3	0.3	0.1	18.0	1.6	1.6	1.8	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	2.8	3.0	1.1	2.4	1.2	1.1	1.3	1.3	3.7	1.5	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.6	19.6	19.9	33.9	24.4	14.2	51.3	30.9	31.0	28.8	21.3	13.5
LnGrp LOS	C	B	B	C	C	B	D	C	C	C	C	B
Approach Vol, veh/h		1095			878			208			959	
Approach Delay, s/veh		23.3			22.9			35.8			22.9	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.7	13.1	10.5	27.4	8.5	23.3	17.2	20.6
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	32.0	52.0	44.0	38.0	38.0	46.0	44.0	38.0
Max Q Clear Time (g_c+I1), s	11.0	4.9	4.5	9.5	3.9	6.1	9.7	8.1
Green Ext Time (p_c), s	1.7	1.0	0.4	5.0	0.1	2.7	1.5	4.9

Intersection Summary	
HCM 6th Ctrl Delay	23.9
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	102	49	141	91	241	21	546	101	236	824	15
Future Volume (veh/h)	20	102	49	141	91	241	21	546	101	236	824	15
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	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	22	111	36	153	99	45	23	593	84	257	896	15
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	424	386	125	394	535	448	38	1054	147	320	2023	34
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.02	0.23	0.23	0.18	0.39	0.39
Sat Flow, veh/h	1233	1348	437	1230	1870	1567	1781	4528	633	1781	5172	87
Grp Volume(v), veh/h	22	0	147	153	99	45	23	444	233	257	589	322
Grp Sat Flow(s),veh/h/ln	1233	0	1786	1230	1870	1567	1781	1702	1756	1781	1702	1855
Q Serve(g_s), s	0.8	0.0	3.8	6.6	2.4	1.3	0.8	6.9	7.0	8.3	7.6	7.6
Cycle Q Clear(g_c), s	3.2	0.0	3.8	10.4	2.4	1.3	0.8	6.9	7.0	8.3	7.6	7.6
Prop In Lane	1.00		0.24	1.00		1.00	1.00		0.36	1.00		0.05
Lane Grp Cap(c), veh/h	424	0	511	394	535	448	38	792	409	320	1331	725
V/C Ratio(X)	0.05	0.00	0.29	0.39	0.18	0.10	0.61	0.56	0.57	0.80	0.44	0.44
Avail Cap(c_a), veh/h	774	0	1017	742	1065	892	716	2223	1147	716	2223	1211
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.3	0.0	16.6	20.6	16.1	15.7	29.0	20.2	20.3	23.5	13.4	13.4
Incr Delay (d2), s/veh	0.1	0.0	0.3	0.6	0.2	0.1	14.7	0.6	1.3	4.7	0.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	1.5	1.9	1.0	0.4	0.5	2.6	2.8	3.6	2.6	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.3	0.0	16.9	21.3	16.2	15.8	43.7	20.8	21.5	28.2	13.6	13.8
LnGrp LOS	B	A	B	C	B	B	D	C	C	C	B	B
Approach Vol, veh/h		169			297			700			1168	
Approach Delay, s/veh		16.9			18.7			21.8			16.9	
Approach LOS		B			B			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	16.7	19.9		23.1	7.3	29.4		23.1				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	24.0	39.0		34.0	24.0	39.0		34.0				
Max Q Clear Time (g_c+I1), s	10.3	9.0		12.4	2.8	9.6		5.8				
Green Ext Time (p_c), s	0.6	4.9		1.2	0.0	6.9		1.0				
Intersection Summary												
HCM 6th Ctrl Delay			18.6									
HCM 6th LOS			B									

Intersection						
Int Delay, s/veh	8.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	2	2	113	3	3	153
Future Vol, veh/h	2	2	113	3	3	153
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	2	123	3	3	166

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	4	0	252	3
Stage 1	-	-	-	-	3	-
Stage 2	-	-	-	-	249	-
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	-	-	1618	-	737	1081
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	792	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1618	-	681	1081
Mov Cap-2 Maneuver	-	-	-	-	681	-
Stage 1	-	-	-	-	942	-
Stage 2	-	-	-	-	792	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1069	-	-	1618	-
HCM Lane V/C Ratio	0.159	-	-	0.076	-
HCM Control Delay (s)	9	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.2	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	130	624	0	0	411	21	1	6	0	15	0	96
Future Vol, veh/h	130	624	0	0	411	21	1	6	0	15	0	96
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	141	678	0	0	447	23	1	7	0	16	0	104

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	470	0	0	678	0	0	1472	1430	678	1423	1419	460
Stage 1	-	-	-	-	-	-	960	960	-	459	459	-
Stage 2	-	-	-	-	-	-	512	470	-	964	960	-
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	1092	-	-	914	-	-	105	135	452	114	137	601
Stage 1	-	-	-	-	-	-	308	335	-	582	566	-
Stage 2	-	-	-	-	-	-	545	560	-	307	335	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1092	-	-	914	-	-	73	107	452	92	109	600
Mov Cap-2 Maneuver	-	-	-	-	-	-	73	107	-	92	109	-
Stage 1	-	-	-	-	-	-	244	266	-	462	566	-
Stage 2	-	-	-	-	-	-	450	560	-	237	266	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.5	0	43.9	21
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	100	1092	-	-	914	-	-	344
HCM Lane V/C Ratio	0.076	0.129	-	-	-	-	-	0.351
HCM Control Delay (s)	43.9	8.8	0	-	0	-	-	21
HCM Lane LOS	E	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0.4	-	-	0	-	-	1.5

Intersection						
Int Delay, s/veh	0.3					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	626	12	5	417	4	16
Future Vol, veh/h	626	12	5	417	4	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	680	13	5	453	4	17

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	693	0	1150	687
Stage 1	-	-	-	-	687	-
Stage 2	-	-	-	-	463	-
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	-	-	902	-	219	447
Stage 1	-	-	-	-	499	-
Stage 2	-	-	-	-	634	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	902	-	218	447
Mov Cap-2 Maneuver	-	-	-	-	218	-
Stage 1	-	-	-	-	496	-
Stage 2	-	-	-	-	634	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	15.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	369	-	-	902	-
HCM Lane V/C Ratio	0.059	-	-	0.006	-
HCM Control Delay (s)	15.4	-	-	9	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	634	405	20	19	16
Future Vol, veh/h	10	634	405	20	19	16
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	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	689	440	22	21	17

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	462	0	-	0	1151	440
Stage 1	-	-	-	-	440	-
Stage 2	-	-	-	-	711	-
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	1099	-	-	-	219	617
Stage 1	-	-	-	-	649	-
Stage 2	-	-	-	-	487	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1099	-	-	-	215	617
Mov Cap-2 Maneuver	-	-	-	-	215	-
Stage 1	-	-	-	-	639	-
Stage 2	-	-	-	-	487	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	18.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1099	-	-	-	306
HCM Lane V/C Ratio	0.01	-	-	-	0.124
HCM Control Delay (s)	8.3	0	-	-	18.4
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection						
Int Delay, s/veh	0.1					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	665	421	0	2	5
Future Vol, veh/h	1	665	421	0	2	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	50	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	1	723	458	0	2	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	458	0	-	0	1183	229
Stage 1	-	-	-	-	458	-
Stage 2	-	-	-	-	725	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1101	-	-	-	195	774
Stage 1	-	-	-	-	604	-
Stage 2	-	-	-	-	478	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1101	-	-	-	195	774
Mov Cap-2 Maneuver	-	-	-	-	195	-
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	478	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1101	-	-	-	419
HCM Lane V/C Ratio	0.001	-	-	-	0.018
HCM Control Delay (s)	8.3	-	-	-	13.8
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	623	24	27	412	0	12	0	33	0	0	0
Future Vol, veh/h	0	623	24	27	412	0	12	0	33	0	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	677	26	29	448	0	13	0	36	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	448	0	0	704	0	0	973	1197	353	845	1210	224
Stage 1	-	-	-	-	-	-	691	691	-	506	506	-
Stage 2	-	-	-	-	-	-	282	506	-	339	704	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1109	-	-	890	-	-	207	185	643	256	181	779
Stage 1	-	-	-	-	-	-	401	444	-	517	538	-
Stage 2	-	-	-	-	-	-	701	538	-	649	438	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1109	-	-	889	-	-	202	179	642	236	175	779
Mov Cap-2 Maneuver	-	-	-	-	-	-	202	179	-	236	175	-
Stage 1	-	-	-	-	-	-	401	444	-	517	520	-
Stage 2	-	-	-	-	-	-	678	520	-	613	438	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	14.4	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	202	642	1109	-	-	889	-	-	-
HCM Lane V/C Ratio	0.065	0.056	-	-	-	0.033	-	-	-
HCM Control Delay (s)	24	10.9	0	-	-	9.2	-	-	0
HCM Lane LOS	C	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.2	0.2	0	-	-	0.1	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	201	449	157	156	245	253	505	77	165	661	28
Future Volume (veh/h)	34	201	449	157	156	245	253	505	77	165	661	28
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	37	218	167	171	170	58	275	549	21	179	718	6
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	48	322	235	209	477	403	320	1160	515	220	962	423
Arrive On Green	0.03	0.16	0.16	0.12	0.25	0.25	0.18	0.33	0.33	0.12	0.27	0.27
Sat Flow, veh/h	1781	1958	1431	1781	1870	1583	1781	3554	1579	1781	3554	1562
Grp Volume(v), veh/h	37	197	188	171	170	58	275	549	21	179	718	6
Grp Sat Flow(s),veh/h/ln	1781	1777	1613	1781	1870	1583	1781	1777	1579	1781	1777	1562
Q Serve(g_s), s	1.8	9.3	9.9	8.4	6.7	2.5	13.4	11.0	0.8	8.8	16.5	0.3
Cycle Q Clear(g_c), s	1.8	9.3	9.9	8.4	6.7	2.5	13.4	11.0	0.8	8.8	16.5	0.3
Prop In Lane	1.00		0.89	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	48	292	265	209	477	403	320	1160	515	220	962	423
V/C Ratio(X)	0.77	0.67	0.71	0.82	0.36	0.14	0.86	0.47	0.04	0.81	0.75	0.01
Avail Cap(c_a), veh/h	378	874	793	378	920	778	577	1549	688	577	1549	681
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.3	35.2	35.4	38.6	27.3	25.8	35.6	24.0	20.6	38.2	29.8	23.9
Incr Delay (d2), s/veh	22.6	2.7	3.5	7.6	0.5	0.2	6.8	0.3	0.0	7.0	1.2	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	4.2	4.1	4.0	3.0	1.0	6.3	4.5	0.3	4.2	7.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.9	37.9	38.9	46.1	27.8	26.0	42.4	24.3	20.6	45.2	31.0	23.9
LnGrp LOS	E	D	D	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		422			399			845			903	
Approach Delay, s/veh		40.8			35.4			30.1			33.8	
Approach LOS		D			D			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	17.1	35.2	16.5	20.7	22.1	30.2	8.4	28.8
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	29.0	39.0	19.0	44.0	29.0	39.0	19.0	44.0
Max Q Clear Time (g_c+I1), s	10.8	13.0	10.4	11.9	15.4	18.5	3.8	8.7
Green Ext Time (p_c), s	0.4	4.0	0.3	2.5	0.7	5.0	0.0	1.2

Intersection Summary	
HCM 6th Ctrl Delay	34.0
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	189	213	133	12	196	133	150	943	13	380	1570	276
Future Volume (veh/h)	189	213	133	12	196	133	150	943	13	380	1570	276
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	146	315	77	13	213	24	163	1025	6	413	1707	209
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	231	486	195	232	243	363	228	2733	832	477	3102	940
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.07	0.54	0.53	0.14	0.61	0.60
Sat Flow, veh/h	1781	3741	1497	1781	1870	2790	3456	5106	1579	3456	5106	1568
Grp Volume(v), veh/h	146	315	77	13	213	24	163	1025	6	413	1707	209
Grp Sat Flow(s),veh/h/ln	1781	1870	1497	1781	1870	1395	1728	1702	1579	1728	1702	1568
Q Serve(g_s), s	18.6	19.2	11.3	1.5	26.8	1.8	11.1	28.0	0.4	28.1	47.3	14.8
Cycle Q Clear(g_c), s	18.6	19.2	11.3	1.5	26.8	1.8	11.1	28.0	0.4	28.1	47.3	14.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	231	486	195	232	243	363	228	2733	832	477	3102	940
V/C Ratio(X)	0.63	0.65	0.40	0.06	0.88	0.07	0.72	0.38	0.01	0.87	0.55	0.22
Avail Cap(c_a), veh/h	312	655	262	245	257	384	446	2733	832	533	3102	940
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)	0.63	0.63	0.63	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	99.0	99.2	95.8	91.5	102.5	91.6	109.9	32.4	27.0	101.2	27.8	22.2
Incr Delay (d2), s/veh	3.8	2.0	1.8	0.2	28.3	0.2	4.1	0.4	0.0	12.9	0.7	0.5
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	9.0	9.6	4.6	0.7	15.2	0.7	5.2	12.0	0.2	13.6	19.9	5.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	102.7	101.2	97.5	91.7	130.8	91.8	114.0	32.8	27.0	114.1	28.5	22.8
LnGrp LOS	F	F	F	F	F	F	F	C	C	F	C	C
Approach Vol, veh/h		538			250			1194			2329	
Approach Delay, s/veh		101.1			125.0			43.9			43.2	
Approach LOS		F			F			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	37.2	132.5		35.2	19.8	149.8		35.2
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	35.0	109.0		40.0	29.0	115.0		31.0
Max Q Clear Time (g_c+I1), s	30.1	30.0		21.2	13.1	49.3		28.8
Green Ext Time (p_c), s	1.1	45.1		4.4	0.7	62.0		0.4

Intersection Summary	
HCM 6th Ctrl Delay	55.3
HCM 6th LOS	E

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)	304	50	145	31	26	27	119	1516	55	35	2724	469
Future Volume (veh/h)	304	50	145	31	26	27	119	1516	55	35	2724	469
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	369	0	66	34	28	1	129	1648	38	38	2961	292
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	487	0	206	42	35	80	149	3587	1102	63	3299	997
Arrive On Green	0.14	0.00	0.14	0.05	0.04	0.05	0.08	0.70	0.70	0.07	1.00	1.00
Sat Flow, veh/h	3563	0	1508	998	822	1585	1781	5106	1578	1781	5106	1564
Grp Volume(v), veh/h	369	0	66	62	0	1	129	1648	38	38	2961	292
Grp Sat Flow(s),veh/h/ln	1781	0	1508	1820	0	1585	1781	1702	1578	1781	1702	1564
Q Serve(g_s), s	23.9	0.0	9.5	8.1	0.0	0.1	17.2	34.0	1.8	5.0	0.0	0.0
Cycle Q Clear(g_c), s	23.9	0.0	9.5	8.1	0.0	0.1	17.2	34.0	1.8	5.0	0.0	0.0
Prop In Lane	1.00		1.00	0.55		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	487	0	206	77	0	80	149	3587	1102	63	3299	997
V/C Ratio(X)	0.76	0.00	0.32	0.81	0.00	0.01	0.87	0.46	0.03	0.60	0.90	0.29
Avail Cap(c_a), veh/h	609	0	258	197	0	185	371	3587	1102	163	3299	997
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.8	0.0	93.5	113.4	0.0	108.2	108.7	15.7	11.2	109.9	0.0	0.0
Incr Delay (d2), s/veh	5.0	0.0	1.3	17.4	0.0	0.1	25.7	0.4	0.1	8.4	4.1	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.6	0.0	3.9	4.3	0.0	0.1	9.1	13.7	0.7	2.4	1.2	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	104.8	0.0	94.8	130.8	0.0	108.3	134.4	16.1	11.2	118.3	4.1	0.7
LnGrp LOS	F	A	F	F	A	F	F	B	B	F	A	A
Approach Vol, veh/h		435			63			1815			3291	
Approach Delay, s/veh		103.3			130.5			24.4			5.1	
Approach LOS		F			F			C			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	12.5	173.6		37.8	26.0	160.0		16.1
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	20.0	129.0		41.0	50.0	99.0		26.0
Max Q Clear Time (g_c+I1), s	17.0	36.0		25.9	19.2	2.0		10.1
Green Ext Time (p_c), s	0.1	51.1		2.2	0.9	94.9		0.2

Intersection Summary	
HCM 6th Ctrl Delay	20.4
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2021 AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	610	390	20	15	775	720	10	35	5	400	70	445
Future Volume (veh/h)	610	390	20	15	775	720	10	35	5	400	70	445
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		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	663	424	19	16	842	783	11	38	1	435	76	276
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	790	2663	118	50	1621	1313	19	189	5	530	698	1182
Arrive On Green	0.23	0.53	0.53	0.01	0.32	0.32	0.01	0.05	0.05	0.15	0.20	0.20
Sat Flow, veh/h	3456	5011	223	3456	5106	2790	1781	3537	93	3456	3554	2773
Grp Volume(v), veh/h	663	287	156	16	842	783	11	19	20	435	76	276
Grp Sat Flow(s),veh/h/ln	1728	1702	1830	1728	1702	1395	1781	1777	1853	1728	1777	1386
Q Serve(g_s), s	17.8	4.2	4.2	0.4	13.1	20.1	0.6	1.0	1.0	11.8	1.7	6.2
Cycle Q Clear(g_c), s	17.8	4.2	4.2	0.4	13.1	20.1	0.6	1.0	1.0	11.8	1.7	6.2
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.05	1.00		1.00
Lane Grp Cap(c), veh/h	790	1809	973	50	1621	1313	19	95	99	530	698	1182
V/C Ratio(X)	0.84	0.16	0.16	0.32	0.52	0.60	0.58	0.20	0.20	0.82	0.11	0.23
Avail Cap(c_a), veh/h	1353	1809	973	1353	1998	1520	220	695	725	783	1757	2008
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.7	11.6	11.6	47.4	27.1	18.9	47.8	44.0	44.0	39.8	32.0	17.8
Incr Delay (d2), s/veh	2.5	0.0	0.1	3.6	0.3	0.5	25.5	1.0	1.0	4.5	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	1.5	1.7	0.2	5.3	6.3	0.4	0.5	0.5	5.3	0.7	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.2	11.7	11.7	51.0	27.3	19.4	73.3	45.0	44.9	44.3	32.1	17.9
LnGrp LOS	D	B	B	D	C	B	E	D	D	D	C	B
Approach Vol, veh/h		1106			1641			50			787	
Approach Delay, s/veh		27.6			23.8			51.2			33.9	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.9	11.2	7.4	57.6	7.0	25.1	28.2	36.8
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	22.0	38.0	38.0	38.0	12.0	48.0	38.0	38.0
Max Q Clear Time (g_c+I1), s	13.8	3.0	2.4	6.2	2.6	8.2	19.8	22.1
Green Ext Time (p_c), s	1.1	0.2	0.0	3.0	0.0	1.7	2.4	8.6

Intersection Summary	
HCM 6th Ctrl Delay	27.6
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	55	15	240	125	315	45	1220	45	200	565	10
Future Volume (veh/h)	10	55	15	240	125	315	45	1220	45	200	565	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	60	9	261	136	93	49	1326	46	217	614	10
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	337	453	68	413	535	446	64	1940	67	257	2544	41
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.04	0.38	0.38	0.14	0.49	0.49
Sat Flow, veh/h	1139	1585	238	1312	1870	1558	1781	5067	176	1781	5175	84
Grp Volume(v), veh/h	11	0	69	261	136	93	49	891	481	217	404	220
Grp Sat Flow(s),veh/h/ln	1139	0	1823	1312	1870	1558	1781	1702	1839	1781	1702	1855
Q Serve(g_s), s	0.7	0.0	2.7	17.8	5.4	4.4	2.6	21.1	21.1	11.4	6.6	6.6
Cycle Q Clear(g_c), s	6.1	0.0	2.7	20.5	5.4	4.4	2.6	21.1	21.1	11.4	6.6	6.6
Prop In Lane	1.00		0.13	1.00		1.00	1.00		0.10	1.00		0.05
Lane Grp Cap(c), veh/h	337	0	521	413	535	446	64	1303	704	257	1673	912
V/C Ratio(X)	0.03	0.00	0.13	0.63	0.25	0.21	0.77	0.68	0.68	0.84	0.24	0.24
Avail Cap(c_a), veh/h	412	0	642	500	659	549	536	2788	1506	536	2788	1519
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.9	0.0	25.6	33.2	26.5	26.1	46.1	24.9	24.9	40.2	14.1	14.1
Incr Delay (d2), s/veh	0.0	0.0	0.1	1.8	0.2	0.2	17.4	0.6	1.2	7.4	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	1.2	5.8	2.5	1.7	1.5	8.4	9.1	5.5	2.5	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.9	0.0	25.7	35.0	26.8	26.4	63.5	25.5	26.1	47.6	14.2	14.3
LnGrp LOS	C	A	C	C	C	C	E	C	C	D	B	B
Approach Vol, veh/h		80			490			1421			841	
Approach Delay, s/veh		26.1			31.1			27.0			22.8	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.9	42.9		33.6	9.5	53.4		33.6				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	29.0	79.0		34.0	29.0	79.0		34.0				
Max Q Clear Time (g_c+I1), s	13.4	23.1		22.5	4.6	8.6		8.1				
Green Ext Time (p_c), s	0.5	13.8		1.6	0.1	4.6		0.4				
Intersection Summary												
HCM 6th Ctrl Delay			26.5									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	7.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	5	165	5	5	70
Future Vol, veh/h	0	5	165	5	5	70
Conflicting Peds, #/hr	0	1	1	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	5	179	5	5	76

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	6	0	367	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	363	-
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	-	-	1615	-	633	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	704	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1614	-	562	1079
Mov Cap-2 Maneuver	-	-	-	-	562	-
Stage 1	-	-	-	-	905	-
Stage 2	-	-	-	-	704	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1017	-	-	1614	-
HCM Lane V/C Ratio	0.08	-	-	0.111	-
HCM Control Delay (s)	8.8	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	50	405	5	5	650	15	0	0	0	20	5	145
Future Vol, veh/h	50	405	5	5	650	15	0	0	0	20	5	145
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	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	54	440	5	5	707	16	0	0	0	22	5	158

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	724	0	0	445	0	0	1358	1285	443	1277	1279	716
Stage 1	-	-	-	-	-	-	551	551	-	726	726	-
Stage 2	-	-	-	-	-	-	807	734	-	551	553	-
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	879	-	-	1115	-	-	126	165	615	143	166	430
Stage 1	-	-	-	-	-	-	519	515	-	416	430	-
Stage 2	-	-	-	-	-	-	375	426	-	519	514	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	878	-	-	1115	-	-	72	150	615	133	151	430
Mov Cap-2 Maneuver	-	-	-	-	-	-	72	150	-	133	151	-
Stage 1	-	-	-	-	-	-	476	473	-	381	426	-
Stage 2	-	-	-	-	-	-	233	422	-	476	472	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0.1	0	29.6
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	878	-	-	1115	-	-	326
HCM Lane V/C Ratio	-	0.062	-	-	0.005	-	-	0.567
HCM Control Delay (s)	0	9.4	0	-	8.2	0	-	29.6
HCM Lane LOS	A	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	-	0.2	-	-	0	-	-	3.3

Intersection						
Int Delay, s/veh	0.3					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	395	15	25	675	5	5
Future Vol, veh/h	395	15	25	675	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	429	16	27	734	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	445	0	1225	437
Stage 1	-	-	-	-	437	-
Stage 2	-	-	-	-	788	-
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	-	-	1115	-	198	620
Stage 1	-	-	-	-	651	-
Stage 2	-	-	-	-	448	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1115	-	193	620
Mov Cap-2 Maneuver	-	-	-	-	193	-
Stage 1	-	-	-	-	635	-
Stage 2	-	-	-	-	448	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	17.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	294	-	-	1115	-
HCM Lane V/C Ratio	0.037	-	-	0.024	-
HCM Control Delay (s)	17.7	-	-	8.3	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	395	675	5	5	10
Future Vol, veh/h	10	395	675	5	5	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	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	429	734	5	5	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	739	0	-	0	1185	734
Stage 1	-	-	-	-	734	-
Stage 2	-	-	-	-	451	-
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	867	-	-	-	209	420
Stage 1	-	-	-	-	475	-
Stage 2	-	-	-	-	642	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	867	-	-	-	205	420
Mov Cap-2 Maneuver	-	-	-	-	205	-
Stage 1	-	-	-	-	467	-
Stage 2	-	-	-	-	642	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	17.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	867	-	-	-	311
HCM Lane V/C Ratio	0.013	-	-	-	0.052
HCM Control Delay (s)	9.2	0	-	-	17.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	385	690	20	10	10
Future Vol, veh/h	10	385	690	20	10	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	50	-	-	50	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	418	750	22	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	772	0	-	0	1190	375
Stage 1	-	-	-	-	750	-
Stage 2	-	-	-	-	440	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	841	-	-	-	193	623
Stage 1	-	-	-	-	428	-
Stage 2	-	-	-	-	648	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	841	-	-	-	190	623
Mov Cap-2 Maneuver	-	-	-	-	190	-
Stage 1	-	-	-	-	422	-
Stage 2	-	-	-	-	648	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	18.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	841	-	-	-	291
HCM Lane V/C Ratio	0.013	-	-	-	0.075
HCM Control Delay (s)	9.3	-	-	-	18.4
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	7.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	325	75	285	655	5	55	0	265	5	0	0
Future Vol, veh/h	0	325	75	285	655	5	55	0	265	5	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	353	82	310	712	5	60	0	288	5	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	717	0	0	435	0	0	1370	1731	218	1512	1770	359
Stage 1	-	-	-	-	-	-	394	394	-	1335	1335	-
Stage 2	-	-	-	-	-	-	976	1337	-	177	435	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	880	-	-	1121	-	-	105	87	786	83	82	638
Stage 1	-	-	-	-	-	-	602	604	-	162	221	-
Stage 2	-	-	-	-	-	-	270	220	-	808	579	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	880	-	-	1121	-	-	83	63	786	41	59	638
Mov Cap-2 Maneuver	-	-	-	-	-	-	83	63	-	41	59	-
Stage 1	-	-	-	-	-	-	602	604	-	162	160	-
Stage 2	-	-	-	-	-	-	195	159	-	512	579	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.8	30.7	105.8
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	83	786	880	-	-	1121	-	-	41
HCM Lane V/C Ratio	0.72	0.366	-	-	-	0.276	-	-	0.133
HCM Control Delay (s)	119.7	12.2	0	-	-	9.4	-	-	105.8
HCM Lane LOS	F	B	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	3.5	1.7	0	-	-	1.1	-	-	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	200	285	90	390	330	415	960	125	100	695	140
Future Volume (veh/h)	85	200	285	90	390	330	415	960	125	100	695	140
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		1.00	1.00		0.95	1.00		0.98
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	92	217	130	98	424	170	451	1043	71	109	755	37
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	114	548	314	121	480	406	447	1520	646	133	893	390
Arrive On Green	0.06	0.25	0.25	0.07	0.26	0.26	0.25	0.43	0.43	0.07	0.25	0.25
Sat Flow, veh/h	1781	2166	1241	1781	1870	1581	1781	3554	1511	1781	3554	1551
Grp Volume(v), veh/h	92	176	171	98	424	170	451	1043	71	109	755	37
Grp Sat Flow(s),veh/h/ln	1781	1777	1629	1781	1870	1581	1781	1777	1511	1781	1777	1551
Q Serve(g_s), s	6.9	11.2	11.9	7.4	29.5	12.1	34.0	32.2	3.8	8.2	27.4	2.5
Cycle Q Clear(g_c), s	6.9	11.2	11.9	7.4	29.5	12.1	34.0	32.2	3.8	8.2	27.4	2.5
Prop In Lane	1.00		0.76	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	114	449	412	121	480	406	447	1520	646	133	893	390
V/C Ratio(X)	0.80	0.39	0.41	0.81	0.88	0.42	1.01	0.69	0.11	0.82	0.85	0.09
Avail Cap(c_a), veh/h	184	577	529	184	607	513	447	1678	713	184	1154	504
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	62.6	42.0	42.3	62.3	48.4	42.0	50.8	31.4	23.3	61.8	48.2	38.9
Incr Delay (d2), s/veh	12.3	0.6	0.7	14.6	12.2	0.7	44.9	1.0	0.1	18.4	4.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	5.0	4.9	3.8	15.4	4.9	20.7	14.0	1.4	4.4	12.7	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.8	42.6	42.9	76.9	60.6	42.7	95.6	32.4	23.4	80.3	52.9	39.0
LnGrp LOS	E	D	D	E	E	D	F	C	C	F	D	D
Approach Vol, veh/h		439			692			1565			901	
Approach Delay, s/veh		49.5			58.5			50.2			55.7	
Approach LOS		D			E			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	16.1	64.0	15.2	40.3	40.0	40.1	14.7	40.8				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	14.0	64.0	14.0	44.0	34.0	44.0	14.0	44.0				
Max Q Clear Time (g_c+I1), s	10.2	34.2	9.4	13.9	36.0	29.4	8.9	31.5				
Green Ext Time (p_c), s	0.1	9.3	0.1	2.2	0.0	4.7	0.1	2.6				
Intersection Summary												
HCM 6th Ctrl Delay			53.1									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	305	135	170	35	290	265	220	1130	35	245	975	205
Future Volume (veh/h)	305	135	170	35	290	265	220	1130	35	245	975	205
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	332	147	93	38	315	126	239	1228	16	266	1060	112
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	487	256	202	330	347	517	309	2635	797	329	2664	806
Arrive On Green	0.14	0.14	0.14	0.19	0.19	0.19	0.09	0.52	0.51	0.10	0.52	0.51
Sat Flow, veh/h	3563	1870	1477	1781	1870	2790	3456	5106	1569	3456	5106	1570
Grp Volume(v), veh/h	332	147	93	38	315	126	239	1228	16	266	1060	112
Grp Sat Flow(s),veh/h/ln	1781	1870	1477	1781	1870	1395	1728	1702	1569	1728	1702	1570
Q Serve(g_s), s	21.3	17.7	13.9	4.3	39.6	9.2	16.2	36.8	1.2	18.1	30.1	9.0
Cycle Q Clear(g_c), s	21.3	17.7	13.9	4.3	39.6	9.2	16.2	36.8	1.2	18.1	30.1	9.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	487	256	202	330	347	517	309	2635	797	329	2664	806
V/C Ratio(X)	0.68	0.57	0.46	0.12	0.91	0.24	0.77	0.47	0.02	0.81	0.40	0.14
Avail Cap(c_a), veh/h	727	382	302	341	358	535	547	2635	797	403	2664	806
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)	0.86	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	98.6	97.0	95.4	81.4	95.8	83.4	106.9	37.0	29.4	106.5	34.6	30.6
Incr Delay (d2), s/veh	3.1	3.7	3.0	0.3	27.1	0.5	4.1	0.6	0.0	9.7	0.4	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.2	9.0	5.6	2.0	22.1	3.4	7.6	15.9	0.5	8.7	12.9	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	101.7	100.8	98.4	81.7	122.9	83.9	111.0	37.6	29.4	116.2	35.1	30.9
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		572			479			1483			1438	
Approach Delay, s/veh		100.9			109.4			49.3			49.8	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	26.8	127.9		36.8	25.5	129.2		48.5				
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	26.0	98.0		47.0	36.0	88.0		44.0				
Max Q Clear Time (g_c+I1), s	20.1	38.8		23.3	18.2	32.1		41.6				
Green Ext Time (p_c), s	0.7	45.0		5.3	1.2	40.1		0.9				

Intersection Summary	
HCM 6th Ctrl Delay	64.2
HCM 6th LOS	E

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)	460	5	180	10	15	10	170	2925	15	10	1390	295
Future Volume (veh/h)	460	5	180	10	15	10	170	2925	15	10	1390	295
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.98
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	504	0	105	11	16	1	185	3179	11	11	1511	170
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	551	0	235	15	21	44	206	3692	1135	34	3156	951
Arrive On Green	0.15	0.00	0.15	0.03	0.02	0.03	0.12	0.72	0.72	0.04	1.00	1.00
Sat Flow, veh/h	3563	0	1521	747	1086	1585	1781	5106	1580	1781	5106	1559
Grp Volume(v), veh/h	504	0	105	27	0	1	185	3179	11	11	1511	170
Grp Sat Flow(s),veh/h/ln	1781	0	1521	1833	0	1585	1781	1702	1580	1781	1702	1559
Q Serve(g_s), s	33.4	0.0	15.0	3.5	0.0	0.1	24.6	109.7	0.5	1.4	0.0	0.0
Cycle Q Clear(g_c), s	33.4	0.0	15.0	3.5	0.0	0.1	24.6	109.7	0.5	1.4	0.0	0.0
Prop In Lane	1.00		1.00	0.41		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	551	0	235	36	0	44	206	3692	1135	34	3156	951
V/C Ratio(X)	0.91	0.00	0.45	0.75	0.00	0.02	0.90	0.86	0.01	0.32	0.48	0.18
Avail Cap(c_a), veh/h	609	0	260	199	0	185	371	3692	1135	163	3156	951
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.8	0.0	92.1	116.6	0.0	113.4	104.7	24.4	9.6	113.9	0.0	0.0
Incr Delay (d2), s/veh	18.0	0.0	1.9	26.1	0.0	0.2	23.3	2.9	0.0	5.0	0.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	17.1	0.0	6.2	2.0	0.0	0.1	12.9	44.1	0.2	0.7	0.1	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	117.9	0.0	94.0	142.7	0.0	113.6	128.0	27.3	9.6	118.8	0.5	0.4
LnGrp LOS	F	A	F	F	A	F	F	C	A	F	A	A
Approach Vol, veh/h		609			28			3375			1692	
Approach Delay, s/veh		113.7			141.7			32.7			1.2	
Approach LOS		F			F			C			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.6	178.5		42.2	33.8	153.3		10.7				
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	20.0	129.0		41.0	50.0	99.0		26.0				
Max Q Clear Time (g_c+I1), s	13.4	111.7		35.4	26.6	2.0		5.5				
Green Ext Time (p_c), s	0.0	17.3		1.7	1.2	50.0		0.1				
Intersection Summary												
HCM 6th Ctrl Delay			32.6									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	595	945	0	0	0
Future Vol, veh/h	0	595	945	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	50	-	-	-	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	647	1027	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1027	0	-	0	1674	514
Stage 1	-	-	-	-	1027	-
Stage 2	-	-	-	-	647	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	674	-	-	-	95	506
Stage 1	-	-	-	-	307	-
Stage 2	-	-	-	-	520	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	674	-	-	-	95	506
Mov Cap-2 Maneuver	-	-	-	-	95	-
Stage 1	-	-	-	-	307	-
Stage 2	-	-	-	-	520	-

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)	674	-	-	-	-
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	0					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	425	670	0	0	0
Future Vol, veh/h	0	425	670	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	50	-	-	-	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	462	728	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	728	0	-	0	1190	728
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	462	-
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	876	-	-	-	207	423
Stage 1	-	-	-	-	478	-
Stage 2	-	-	-	-	634	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	876	-	-	-	207	423
Mov Cap-2 Maneuver	-	-	-	-	207	-
Stage 1	-	-	-	-	478	-
Stage 2	-	-	-	-	634	-

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)	876	-	-	-	-
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	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	70	0	0	165	0	0
Future Vol, veh/h	70	0	0	165	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	-	-	150	-	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	76	0	0	179	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	76	0	255	76
Stage 1	-	-	-	-	76	-
Stage 2	-	-	-	-	179	-
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	-	-	1523	-	734	985
Stage 1	-	-	-	-	947	-
Stage 2	-	-	-	-	852	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1523	-	734	985
Mov Cap-2 Maneuver	-	-	-	-	734	-
Stage 1	-	-	-	-	947	-
Stage 2	-	-	-	-	852	-

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)	-	-	-	1523	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2021 PM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	805	585	85	125	610	490	50	140	90	715	235	755
Future Volume (veh/h)	805	585	85	125	610	490	50	140	90	715	235	755
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	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	875	636	83	136	663	533	54	152	28	777	255	533
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	951	1968	254	195	1079	1272	71	264	48	854	1049	1588
Arrive On Green	0.28	0.43	0.43	0.06	0.21	0.21	0.04	0.09	0.09	0.25	0.30	0.30
Sat Flow, veh/h	3456	4576	591	3456	5106	2757	1781	3007	543	3456	3554	2778
Grp Volume(v), veh/h	875	471	248	136	663	533	54	89	91	777	255	533
Grp Sat Flow(s),veh/h/ln	1728	1702	1763	1728	1702	1378	1781	1777	1773	1728	1777	1389
Q Serve(g_s), s	33.0	12.3	12.5	5.2	15.8	17.4	4.0	6.4	6.7	29.4	7.3	13.7
Cycle Q Clear(g_c), s	33.0	12.3	12.5	5.2	15.8	17.4	4.0	6.4	6.7	29.4	7.3	13.7
Prop In Lane	1.00		0.34	1.00		1.00	1.00		0.31	1.00		1.00
Lane Grp Cap(c), veh/h	951	1464	758	195	1079	1272	71	156	156	854	1049	1588
V/C Ratio(X)	0.92	0.32	0.33	0.70	0.61	0.42	0.76	0.57	0.59	0.91	0.24	0.34
Avail Cap(c_a), veh/h	1054	1464	758	1054	1672	1592	504	569	567	977	1137	1657
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.3	25.3	25.4	62.3	48.0	24.4	63.9	58.8	58.9	49.1	36.0	15.4
Incr Delay (d2), s/veh	12.0	0.1	0.2	4.4	0.6	0.2	15.5	3.2	3.5	11.3	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.7	5.1	5.4	2.4	6.8	5.8	2.1	3.0	3.2	14.0	3.2	4.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.2	25.5	25.6	66.7	48.6	24.7	79.4	62.1	62.4	60.5	36.1	15.5
LnGrp LOS	E	C	C	E	D	C	E	E	E	E	D	B
Approach Vol, veh/h		1594			1332			234			1565	
Approach Delay, s/veh		44.0			40.9			66.2			41.2	
Approach LOS		D			D			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	39.2	17.8	13.6	63.8	11.3	45.7	43.0	34.4
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	38.0	43.0	41.0	44.0	38.0	43.0	41.0	44.0
Max Q Clear Time (g_c+I1), s	31.4	8.7	7.2	14.5	6.0	15.7	35.0	19.4
Green Ext Time (p_c), s	1.8	1.1	0.5	5.2	0.1	4.2	2.0	7.6

Intersection Summary	
HCM 6th Ctrl Delay	43.3
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	120	55	150	100	295	25	885	110	295	1120	15
Future Volume (veh/h)	20	120	55	150	100	295	25	885	110	295	1120	15
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	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	22	130	43	163	109	49	27	962	105	321	1217	15
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	373	375	124	329	523	438	40	1394	152	367	2504	31
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.02	0.30	0.30	0.21	0.48	0.48
Sat Flow, veh/h	1218	1341	443	1202	1870	1566	1781	4674	509	1781	5199	64
Grp Volume(v), veh/h	22	0	173	163	109	49	27	700	367	321	797	435
Grp Sat Flow(s),veh/h/ln	1218	0	1784	1202	1870	1566	1781	1702	1779	1781	1702	1859
Q Serve(g_s), s	1.2	0.0	6.4	10.4	3.7	1.9	1.3	15.1	15.2	14.5	13.2	13.2
Cycle Q Clear(g_c), s	4.9	0.0	6.4	16.8	3.7	1.9	1.3	15.1	15.2	14.5	13.2	13.2
Prop In Lane	1.00		0.25	1.00		1.00	1.00		0.29	1.00		0.03
Lane Grp Cap(c), veh/h	373	0	499	329	523	438	40	1015	531	367	1640	895
V/C Ratio(X)	0.06	0.00	0.35	0.49	0.21	0.11	0.68	0.69	0.69	0.88	0.49	0.49
Avail Cap(c_a), veh/h	530	0	730	485	765	641	514	1597	835	514	1640	895
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.8	0.0	23.9	30.6	22.9	22.3	40.3	25.8	25.8	32.0	14.6	14.6
Incr Delay (d2), s/veh	0.1	0.0	0.4	1.1	0.2	0.1	18.4	0.8	1.6	11.7	0.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	2.7	3.1	1.6	0.7	0.7	6.0	6.4	7.3	4.8	5.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.8	0.0	24.3	31.8	23.1	22.4	58.7	26.6	27.4	43.7	14.8	15.0
LnGrp LOS	C	A	C	C	C	C	E	C	C	D	B	B
Approach Vol, veh/h		195			321			1094			1553	
Approach Delay, s/veh		24.4			27.4			27.7			20.8	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	23.1	30.8		29.2	7.9	46.0		29.2
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0
Max Green Setting (Gmax), s	24.0	39.0		34.0	24.0	39.0		34.0
Max Q Clear Time (g_c+I1), s	16.5	17.2		18.8	3.3	15.2		8.4
Green Ext Time (p_c), s	0.6	7.6		1.2	0.0	9.3		1.1

Intersection Summary			
HCM 6th Ctrl Delay			24.1
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	5	5	120	5	5	160
Future Vol, veh/h	5	5	120	5	5	160
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	5	5	130	5	5	174

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	10	0	273	8
Stage 1	-	-	-	-	8	-
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	-	-	1610	-	716	1074
Stage 1	-	-	-	-	1015	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1610	-	658	1074
Mov Cap-2 Maneuver	-	-	-	-	658	-
Stage 1	-	-	-	-	933	-
Stage 2	-	-	-	-	779	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.1	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1054	-	-	1610	-
HCM Lane V/C Ratio	0.17	-	-	0.081	-
HCM Control Delay (s)	9.1	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.3	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	140	660	0	0	480	25	5	10	0	20	0	100
Future Vol, veh/h	140	660	0	0	480	25	5	10	0	20	0	100
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	152	717	0	0	522	27	5	11	0	22	0	109

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	549	0	0	717	0	0	1612	1570	717	1563	1557	537
Stage 1	-	-	-	-	-	-	1021	1021	-	536	536	-
Stage 2	-	-	-	-	-	-	591	549	-	1027	1021	-
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	1021	-	-	884	-	-	84	111	430	91	113	544
Stage 1	-	-	-	-	-	-	285	314	-	529	523	-
Stage 2	-	-	-	-	-	-	493	516	-	283	314	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1021	-	-	884	-	-	54	83	430	67	85	544
Mov Cap-2 Maneuver	-	-	-	-	-	-	54	83	-	67	85	-
Stage 1	-	-	-	-	-	-	214	236	-	398	523	-
Stage 2	-	-	-	-	-	-	394	516	-	203	236	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	0	71.4	34.3
HCM LOS			F	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	70	1021	-	-	884	-	-	249
HCM Lane V/C Ratio	0.233	0.149	-	-	-	-	-	0.524
HCM Control Delay (s)	71.4	9.1	0	-	0	-	-	34.3
HCM Lane LOS	F	A	A	-	A	-	-	D
HCM 95th %tile Q(veh)	0.8	0.5	-	-	0	-	-	2.8

Intersection						
Int Delay, s/veh	0.4					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	660	15	10	485	5	20
Future Vol, veh/h	660	15	10	485	5	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	-	-	50	-	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	717	16	11	527	5	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	733	0	1274	725
Stage 1	-	-	-	-	725	-
Stage 2	-	-	-	-	549	-
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	-	-	872	-	184	425
Stage 1	-	-	-	-	479	-
Stage 2	-	-	-	-	579	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	872	-	182	425
Mov Cap-2 Maneuver	-	-	-	-	182	-
Stage 1	-	-	-	-	473	-
Stage 2	-	-	-	-	579	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	16.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	335	-	-	872	-
HCM Lane V/C Ratio	0.081	-	-	0.012	-
HCM Control Delay (s)	16.7	-	-	9.2	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	670	475	20	20	20
Future Vol, veh/h	10	670	475	20	20	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	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	728	516	22	22	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	538	0	-	0	1266	516
Stage 1	-	-	-	-	516	-
Stage 2	-	-	-	-	750	-
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	1030	-	-	-	187	559
Stage 1	-	-	-	-	599	-
Stage 2	-	-	-	-	467	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1030	-	-	-	184	559
Mov Cap-2 Maneuver	-	-	-	-	184	-
Stage 1	-	-	-	-	588	-
Stage 2	-	-	-	-	467	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	20.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1030	-	-	-	277
HCM Lane V/C Ratio	0.011	-	-	-	0.157
HCM Control Delay (s)	8.5	0	-	-	20.4
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Intersection						
Int Delay, s/veh	0.2					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	700	490	0	5	5
Future Vol, veh/h	5	700	490	0	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	50	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	5	761	533	0	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	533	0	-	0	1304	267
Stage 1	-	-	-	-	533	-
Stage 2	-	-	-	-	771	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1033	-	-	-	164	732
Stage 1	-	-	-	-	554	-
Stage 2	-	-	-	-	455	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1033	-	-	-	163	732
Mov Cap-2 Maneuver	-	-	-	-	163	-
Stage 1	-	-	-	-	551	-
Stage 2	-	-	-	-	455	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	19.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1033	-	-	-	267
HCM Lane V/C Ratio	0.005	-	-	-	0.041
HCM Control Delay (s)	8.5	-	-	-	19.1
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	15.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	640	45	245	425	0	70	0	305	0	0	0
Future Vol, veh/h	0	640	45	245	425	0	70	0	305	0	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	696	49	266	462	0	76	0	332	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	462	0	0	746	0	0	1485	1716	374	1342	1740	231
Stage 1	-	-	-	-	-	-	722	722	-	994	994	-
Stage 2	-	-	-	-	-	-	763	994	-	348	746	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1095	-	-	858	-	-	86	89	623	110	86	771
Stage 1	-	-	-	-	-	-	384	429	-	263	321	-
Stage 2	-	-	-	-	-	-	363	321	-	641	419	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1095	-	-	857	-	-	~ 65	61	622	39	59	771
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 65	61	-	39	59	-
Stage 1	-	-	-	-	-	-	384	429	-	263	221	-
Stage 2	-	-	-	-	-	-	250	221	-	299	419	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	4.1	65.1	0
HCM LOS			F	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	65	622	1095	-	-	857	-	-	-
HCM Lane V/C Ratio	1.171	0.533	-	-	-	0.311	-	-	-
HCM Control Delay (s)	273.8	17.2	0	-	-	11.1	-	-	0
HCM Lane LOS	F	C	A	-	-	B	-	-	A
HCM 95th %tile Q(veh)	6.1	3.2	0	-	-	1.3	-	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	150	290	525	160	255	255	310	670	80	180	845	100
Future Volume (veh/h)	150	290	525	160	255	255	310	670	80	180	845	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	163	315	334	174	277	52	337	728	24	196	918	27
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	188	429	383	198	463	392	322	1241	551	222	1042	459
Arrive On Green	0.11	0.24	0.24	0.11	0.25	0.25	0.18	0.35	0.35	0.12	0.29	0.29
Sat Flow, veh/h	1781	1777	1585	1781	1870	1583	1781	3554	1580	1781	3554	1564
Grp Volume(v), veh/h	163	315	334	174	277	52	337	728	24	196	918	27
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1870	1583	1781	1777	1580	1781	1777	1564
Q Serve(g_s), s	12.5	22.6	28.0	13.3	18.1	3.5	25.0	23.2	1.4	15.0	34.1	1.7
Cycle Q Clear(g_c), s	12.5	22.6	28.0	13.3	18.1	3.5	25.0	23.2	1.4	15.0	34.1	1.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	188	429	383	198	463	392	322	1241	551	222	1042	459
V/C Ratio(X)	0.87	0.73	0.87	0.88	0.60	0.13	1.05	0.59	0.04	0.88	0.88	0.06
Avail Cap(c_a), veh/h	232	539	481	232	567	480	322	1241	551	309	1181	520
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.0	48.4	50.5	60.6	46.0	40.5	56.7	36.9	29.8	59.6	46.6	35.2
Incr Delay (d2), s/veh	24.2	3.9	13.6	26.7	1.2	0.2	63.3	0.7	0.0	19.1	7.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.9	10.5	12.6	7.5	8.6	1.4	16.9	10.3	0.5	8.0	16.1	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	85.2	52.3	64.0	87.3	47.3	40.7	120.0	37.6	29.8	78.7	53.9	35.2
LnGrp LOS	F	D	E	F	D	D	F	D	C	E	D	D
Approach Vol, veh/h		812			503			1089			1141	
Approach Delay, s/veh		63.7			60.4			62.9			57.7	
Approach LOS		E			E			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	23.3	54.3	21.4	39.4	31.0	46.6	20.6	40.3
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	24.0	47.0	18.0	42.0	25.0	46.0	18.0	42.0
Max Q Clear Time (g_c+I1), s	17.0	25.2	15.3	30.0	27.0	36.1	14.5	20.1
Green Ext Time (p_c), s	0.3	5.3	0.1	3.3	0.0	4.5	0.1	1.8

Intersection Summary	
HCM 6th Ctrl Delay	61.1
HCM 6th LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	255	230	155	15	230	150	170	1005	15	390	1605	360
Future Volume (veh/h)	255	230	155	15	230	150	170	1005	15	390	1605	360
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	294	226	101	16	250	46	185	1092	6	424	1745	269
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	530	278	224	269	282	421	251	2517	765	487	2866	866
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.07	0.49	0.48	0.14	0.56	0.55
Sat Flow, veh/h	3563	1870	1508	1781	1870	2790	3456	5106	1578	3456	5106	1567
Grp Volume(v), veh/h	294	226	101	16	250	46	185	1092	6	424	1745	269
Grp Sat Flow(s),veh/h/ln	1781	1870	1508	1781	1870	1395	1728	1702	1578	1728	1702	1567
Q Serve(g_s), s	18.4	28.1	14.7	1.8	31.4	3.4	12.6	33.1	0.5	28.8	54.7	22.2
Cycle Q Clear(g_c), s	18.4	28.1	14.7	1.8	31.4	3.4	12.6	33.1	0.5	28.8	54.7	22.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	530	278	224	269	282	421	251	2517	765	487	2866	866
V/C Ratio(X)	0.55	0.81	0.45	0.06	0.89	0.11	0.74	0.43	0.01	0.87	0.61	0.31
Avail Cap(c_a), veh/h	623	327	264	289	304	453	446	2517	765	533	2866	866
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)	0.48	0.48	0.48	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	94.8	98.9	93.2	87.3	99.9	88.0	109.1	39.2	32.0	101.0	35.1	29.0
Incr Delay (d2), s/veh	0.9	8.2	1.4	0.2	26.5	0.2	4.2	0.5	0.0	13.7	1.0	0.9
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	8.7	14.5	5.9	0.9	17.6	1.3	5.9	14.3	0.2	14.0	23.3	8.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	95.7	107.1	94.6	87.5	126.4	88.2	113.3	39.8	32.0	114.7	36.1	29.9
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		621			312			1283			2438	
Approach Delay, s/veh		99.7			118.8			50.4			49.1	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	37.8	122.3		39.7	21.4	138.7		40.2				
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	35.0	103.0		40.0	29.0	109.0		37.0				
Max Q Clear Time (g_c+I1), s	30.8	35.1		30.1	14.6	56.7		33.4				
Green Ext Time (p_c), s	1.0	44.3		3.6	0.8	50.3		0.7				
Intersection Summary												
HCM 6th Ctrl Delay			60.8									
HCM 6th LOS			E									

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)	330	50	170	35	30	30	125	1630	60	40	2915	575
Future Volume (veh/h)	330	50	170	35	30	30	125	1630	60	40	2915	575
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	398	0	93	38	33	1	136	1772	40	43	3168	346
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	502	0	213	46	40	89	155	3522	1082	69	3232	977
Arrive On Green	0.14	0.00	0.14	0.06	0.05	0.06	0.09	0.69	0.69	0.08	1.00	1.00
Sat Flow, veh/h	3563	0	1511	975	847	1585	1781	5106	1578	1781	5106	1563
Grp Volume(v), veh/h	398	0	93	71	0	1	136	1772	40	43	3168	346
Grp Sat Flow(s),veh/h/ln	1781	0	1511	1822	0	1585	1781	1702	1578	1781	1702	1563
Q Serve(g_s), s	25.9	0.0	13.5	9.3	0.0	0.1	18.1	39.6	2.0	5.6	0.0	0.0
Cycle Q Clear(g_c), s	25.9	0.0	13.5	9.3	0.0	0.1	18.1	39.6	2.0	5.6	0.0	0.0
Prop In Lane	1.00		1.00	0.54		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	502	0	213	87	0	89	155	3522	1082	69	3232	977
V/C Ratio(X)	0.79	0.00	0.44	0.82	0.00	0.01	0.88	0.50	0.04	0.63	0.98	0.35
Avail Cap(c_a), veh/h	609	0	258	197	0	185	289	3522	1082	163	3232	977
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.7	0.0	94.4	112.7	0.0	107.0	108.3	17.7	12.2	109.1	0.0	0.0
Incr Delay (d2), s/veh	6.7	0.0	2.0	16.9	0.0	0.1	26.3	0.5	0.1	8.4	11.3	0.9
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	12.7	0.0	5.5	4.9	0.0	0.1	9.6	16.1	0.8	2.7	3.4	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	106.4	0.0	96.4	129.7	0.0	107.1	134.6	18.2	12.2	117.5	11.3	0.9
LnGrp LOS	F	A	F	F	A	F	F	B	B	F	B	A
Approach Vol, veh/h		491			72			1948			3557	
Approach Delay, s/veh		104.5			129.4			26.2			11.6	
Approach LOS		F			F			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.2	170.5		38.8	26.9	156.9		17.4				
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	20.0	129.0		41.0	39.0	110.0		26.0				
Max Q Clear Time (g_c+I1), s	7.6	41.6		27.9	20.1	2.0		11.3				
Green Ext Time (p_c), s	0.1	55.3		2.3	0.7	106.7		0.2				
Intersection Summary												
HCM 6th Ctrl Delay			25.2									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	945	670	0	0	0
Future Vol, veh/h	0	945	670	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	50	-	-	-	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	1027	728	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	728	0	-	0	1755	364
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	1027	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	873	-	-	-	84	634
Stage 1	-	-	-	-	440	-
Stage 2	-	-	-	-	344	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	873	-	-	-	84	634
Mov Cap-2 Maneuver	-	-	-	-	84	-
Stage 1	-	-	-	-	440	-
Stage 2	-	-	-	-	344	-

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)	873	-	-	-	-
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	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	675	500	0	0	0
Future Vol, veh/h	0	675	500	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	50	-	-	-	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	734	543	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	543	0	-	0	1277	543
Stage 1	-	-	-	-	543	-
Stage 2	-	-	-	-	734	-
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	1026	-	-	-	184	540
Stage 1	-	-	-	-	582	-
Stage 2	-	-	-	-	475	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1026	-	-	-	184	540
Mov Cap-2 Maneuver	-	-	-	-	184	-
Stage 1	-	-	-	-	582	-
Stage 2	-	-	-	-	475	-

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)	1026	-	-	-	-
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	0					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	165	0	0	125	0	0
Future Vol, veh/h	165	0	0	125	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	-	-	150	-	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	179	0	0	136	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	179	0	315	179
Stage 1	-	-	-	-	179	-
Stage 2	-	-	-	-	136	-
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	-	-	1397	-	678	864
Stage 1	-	-	-	-	852	-
Stage 2	-	-	-	-	890	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1397	-	678	864
Mov Cap-2 Maneuver	-	-	-	-	678	-
Stage 1	-	-	-	-	852	-
Stage 2	-	-	-	-	890	-

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)	-	-	-	1397	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2021 with Mitigation AM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	610	390	20	15	775	720	10	35	5	400	70	445
Future Volume (veh/h)	610	390	20	15	775	720	10	35	5	400	70	445
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		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	663	424	19	16	842	783	11	38	1	435	76	276
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	790	2663	118	50	1621	1313	19	189	5	530	698	1182
Arrive On Green	0.23	0.53	0.53	0.01	0.32	0.32	0.01	0.05	0.05	0.15	0.20	0.20
Sat Flow, veh/h	3456	5011	223	3456	5106	2790	1781	3537	93	3456	3554	2773
Grp Volume(v), veh/h	663	287	156	16	842	783	11	19	20	435	76	276
Grp Sat Flow(s),veh/h/ln	1728	1702	1830	1728	1702	1395	1781	1777	1853	1728	1777	1386
Q Serve(g_s), s	17.8	4.2	4.2	0.4	13.1	20.1	0.6	1.0	1.0	11.8	1.7	6.2
Cycle Q Clear(g_c), s	17.8	4.2	4.2	0.4	13.1	20.1	0.6	1.0	1.0	11.8	1.7	6.2
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.05	1.00		1.00
Lane Grp Cap(c), veh/h	790	1809	973	50	1621	1313	19	95	99	530	698	1182
V/C Ratio(X)	0.84	0.16	0.16	0.32	0.52	0.60	0.58	0.20	0.20	0.82	0.11	0.23
Avail Cap(c_a), veh/h	1353	1809	973	1353	1998	1520	220	695	725	783	1757	2008
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.7	11.6	11.6	47.4	27.1	18.9	47.8	44.0	44.0	39.8	32.0	17.8
Incr Delay (d2), s/veh	2.5	0.0	0.1	3.6	0.3	0.5	25.5	1.0	1.0	4.5	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	1.5	1.7	0.2	5.3	6.3	0.4	0.5	0.5	5.3	0.7	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.2	11.7	11.7	51.0	27.3	19.4	73.3	45.0	44.9	44.3	32.1	17.9
LnGrp LOS	D	B	B	D	C	B	E	D	D	D	C	B
Approach Vol, veh/h		1106			1641			50			787	
Approach Delay, s/veh		27.6			23.8			51.2			33.9	
Approach LOS		C			C			D			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	20.9	11.2	7.4	57.6	7.0	25.1	28.2	36.8				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	22.0	38.0	38.0	38.0	12.0	48.0	38.0	38.0				
Max Q Clear Time (g_c+I1), s	13.8	3.0	2.4	6.2	2.6	8.2	19.8	22.1				
Green Ext Time (p_c), s	1.1	0.2	0.0	3.0	0.0	1.7	2.4	8.6				
Intersection Summary												
HCM 6th Ctrl Delay			27.6									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	55	15	240	125	315	45	1220	45	200	565	10
Future Volume (veh/h)	10	55	15	240	125	315	45	1220	45	200	565	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	60	9	261	136	93	49	1326	46	217	614	10
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	337	453	68	413	535	446	64	1940	67	257	2544	41
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.04	0.38	0.38	0.14	0.49	0.49
Sat Flow, veh/h	1139	1585	238	1312	1870	1558	1781	5067	176	1781	5175	84
Grp Volume(v), veh/h	11	0	69	261	136	93	49	891	481	217	404	220
Grp Sat Flow(s),veh/h/ln	1139	0	1823	1312	1870	1558	1781	1702	1839	1781	1702	1855
Q Serve(g_s), s	0.7	0.0	2.7	17.8	5.4	4.4	2.6	21.1	21.1	11.4	6.6	6.6
Cycle Q Clear(g_c), s	6.1	0.0	2.7	20.5	5.4	4.4	2.6	21.1	21.1	11.4	6.6	6.6
Prop In Lane	1.00		0.13	1.00		1.00	1.00		0.10	1.00		0.05
Lane Grp Cap(c), veh/h	337	0	521	413	535	446	64	1303	704	257	1673	912
V/C Ratio(X)	0.03	0.00	0.13	0.63	0.25	0.21	0.77	0.68	0.68	0.84	0.24	0.24
Avail Cap(c_a), veh/h	412	0	642	500	659	549	536	2788	1506	536	2788	1519
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.9	0.0	25.6	33.2	26.5	26.1	46.1	24.9	24.9	40.2	14.1	14.1
Incr Delay (d2), s/veh	0.0	0.0	0.1	1.8	0.2	0.2	17.4	0.6	1.2	7.4	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	1.2	5.8	2.5	1.7	1.5	8.4	9.1	5.5	2.5	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.9	0.0	25.7	35.0	26.8	26.4	63.5	25.5	26.1	47.6	14.2	14.3
LnGrp LOS	C	A	C	C	C	C	E	C	C	D	B	B
Approach Vol, veh/h		80			490			1421			841	
Approach Delay, s/veh		26.1			31.1			27.0			22.8	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.9	42.9		33.6	9.5	53.4		33.6				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	29.0	79.0		34.0	29.0	79.0		34.0				
Max Q Clear Time (g_c+I1), s	13.4	23.1		22.5	4.6	8.6		8.1				
Green Ext Time (p_c), s	0.5	13.8		1.6	0.1	4.6		0.4				
Intersection Summary												
HCM 6th Ctrl Delay			26.5									
HCM 6th LOS			C									

Intersection						
Int Delay, s/veh	7.6					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	5	165	5	5	70
Future Vol, veh/h	0	5	165	5	5	70
Conflicting Peds, #/hr	0	1	1	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	5	179	5	5	76

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	6	0	367	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	363	-
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	-	-	1615	-	633	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	704	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1614	-	562	1079
Mov Cap-2 Maneuver	-	-	-	-	562	-
Stage 1	-	-	-	-	905	-
Stage 2	-	-	-	-	704	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1017	-	-	1614	-
HCM Lane V/C Ratio	0.08	-	-	0.111	-
HCM Control Delay (s)	8.8	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	50	405	5	5	650	15	0	0	0	20	5	145
Future Vol, veh/h	50	405	5	5	650	15	0	0	0	20	5	145
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	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	54	440	5	5	707	16	0	0	0	22	5	158

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	724	0	0	445	0	0	1358	1285	443	1277	1279	716
Stage 1	-	-	-	-	-	-	551	551	-	726	726	-
Stage 2	-	-	-	-	-	-	807	734	-	551	553	-
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	879	-	-	1115	-	-	126	165	615	143	166	430
Stage 1	-	-	-	-	-	-	519	515	-	416	430	-
Stage 2	-	-	-	-	-	-	375	426	-	519	514	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	878	-	-	1115	-	-	72	150	615	133	151	430
Mov Cap-2 Maneuver	-	-	-	-	-	-	72	150	-	133	151	-
Stage 1	-	-	-	-	-	-	476	473	-	381	426	-
Stage 2	-	-	-	-	-	-	233	422	-	476	472	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0.1	0	29.6
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	878	-	-	1115	-	-	326
HCM Lane V/C Ratio	-	0.062	-	-	0.005	-	-	0.567
HCM Control Delay (s)	0	9.4	0	-	8.2	0	-	29.6
HCM Lane LOS	A	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	-	0.2	-	-	0	-	-	3.3

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	395	15	25	675	5	5
Future Vol, veh/h	395	15	25	675	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	429	16	27	734	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	445	0	1225	437
Stage 1	-	-	-	-	437	-
Stage 2	-	-	-	-	788	-
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	-	-	1115	-	198	620
Stage 1	-	-	-	-	651	-
Stage 2	-	-	-	-	448	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1115	-	193	620
Mov Cap-2 Maneuver	-	-	-	-	193	-
Stage 1	-	-	-	-	635	-
Stage 2	-	-	-	-	448	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	17.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	294	-	-	1115	-
HCM Lane V/C Ratio	0.037	-	-	0.024	-
HCM Control Delay (s)	17.7	-	-	8.3	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	395	675	5	5	10
Future Vol, veh/h	10	395	675	5	5	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	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	429	734	5	5	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	739	0	-	0	1185	734
Stage 1	-	-	-	-	734	-
Stage 2	-	-	-	-	451	-
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	867	-	-	-	209	420
Stage 1	-	-	-	-	475	-
Stage 2	-	-	-	-	642	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	867	-	-	-	205	420
Mov Cap-2 Maneuver	-	-	-	-	205	-
Stage 1	-	-	-	-	467	-
Stage 2	-	-	-	-	642	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	17.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	867	-	-	-	311
HCM Lane V/C Ratio	0.013	-	-	-	0.052
HCM Control Delay (s)	9.2	0	-	-	17.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	385	690	20	10	10
Future Vol, veh/h	10	385	690	20	10	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	50	-	-	50	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	418	750	22	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	772	0	-	0	1190	375
Stage 1	-	-	-	-	750	-
Stage 2	-	-	-	-	440	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	841	-	-	-	193	623
Stage 1	-	-	-	-	428	-
Stage 2	-	-	-	-	648	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	841	-	-	-	190	623
Mov Cap-2 Maneuver	-	-	-	-	190	-
Stage 1	-	-	-	-	422	-
Stage 2	-	-	-	-	648	-

Approach	EB		WB		SB	
HCM Control Delay, s	0.2		0		18.4	
HCM LOS					C	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	841	-	-	-	291
HCM Lane V/C Ratio	0.013	-	-	-	0.075
HCM Control Delay (s)	9.3	-	-	-	18.4
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	7.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	325	75	285	655	5	55	0	265	5	0	0
Future Vol, veh/h	0	325	75	285	655	5	55	0	265	5	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	353	82	310	712	5	60	0	288	5	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	717	0	0	435	0	0	1370	1731	218	1512	1770	359
Stage 1	-	-	-	-	-	-	394	394	-	1335	1335	-
Stage 2	-	-	-	-	-	-	976	1337	-	177	435	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	880	-	-	1121	-	-	105	87	786	83	82	638
Stage 1	-	-	-	-	-	-	602	604	-	162	221	-
Stage 2	-	-	-	-	-	-	270	220	-	808	579	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	880	-	-	1121	-	-	83	63	786	41	59	638
Mov Cap-2 Maneuver	-	-	-	-	-	-	83	63	-	41	59	-
Stage 1	-	-	-	-	-	-	602	604	-	162	160	-
Stage 2	-	-	-	-	-	-	195	159	-	512	579	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.8	30.7	105.8
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	83	786	880	-	-	1121	-	-	41
HCM Lane V/C Ratio	0.72	0.366	-	-	-	0.276	-	-	0.133
HCM Control Delay (s)	119.7	12.2	0	-	-	9.4	-	-	105.8
HCM Lane LOS	F	B	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	3.5	1.7	0	-	-	1.1	-	-	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	200	285	90	390	330	415	960	125	100	695	140
Future Volume (veh/h)	85	200	285	90	390	330	415	960	125	100	695	140
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		1.00	1.00		0.95	1.00		0.98
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	92	217	73	98	424	172	451	1043	66	109	755	43
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	117	503	421	124	510	431	535	1307	551	136	1028	450
Arrive On Green	0.07	0.27	0.27	0.07	0.27	0.27	0.15	0.37	0.37	0.08	0.29	0.29
Sat Flow, veh/h	1781	1870	1567	1781	1870	1582	3456	3554	1498	1781	3554	1555
Grp Volume(v), veh/h	92	217	73	98	424	172	451	1043	66	109	755	43
Grp Sat Flow(s),veh/h/ln	1781	1870	1567	1781	1870	1582	1728	1777	1498	1781	1777	1555
Q Serve(g_s), s	5.6	10.6	3.9	6.0	23.5	9.8	14.0	29.0	3.2	6.6	21.1	2.2
Cycle Q Clear(g_c), s	5.6	10.6	3.9	6.0	23.5	9.8	14.0	29.0	3.2	6.6	21.1	2.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	117	503	421	124	510	431	535	1307	551	136	1028	450
V/C Ratio(X)	0.79	0.43	0.17	0.79	0.83	0.40	0.84	0.80	0.12	0.80	0.73	0.10
Avail Cap(c_a), veh/h	226	746	625	226	746	631	752	2063	870	226	1740	762
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.7	33.4	30.9	50.5	37.7	32.7	45.3	31.2	23.1	50.1	35.4	28.6
Incr Delay (d2), s/veh	11.0	0.6	0.2	10.7	5.3	0.6	6.2	1.2	0.1	10.3	1.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	4.9	1.5	3.0	11.4	3.8	6.4	12.4	1.2	3.3	9.2	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.7	33.9	31.1	61.2	43.0	33.3	51.5	32.4	23.2	60.4	36.4	28.7
LnGrp LOS	E	C	C	E	D	C	D	C	C	E	D	C
Approach Vol, veh/h		382			694			1560			907	
Approach Delay, s/veh		40.1			43.2			37.5			38.9	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.4	46.5	13.7	35.6	23.1	37.9	13.2	36.1
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	64.0	14.0	44.0	24.0	54.0	14.0	44.0
Max Q Clear Time (g_c+I1), s	8.6	31.0	8.0	12.6	16.0	23.1	7.6	25.5
Green Ext Time (p_c), s	0.1	9.6	0.1	1.5	1.1	6.1	0.1	3.1

Intersection Summary	
HCM 6th Ctrl Delay	39.3
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	305	135	170	35	290	265	220	1130	35	245	975	205
Future Volume (veh/h)	305	135	170	35	290	265	220	1130	35	245	975	205
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	332	147	93	38	315	126	239	1228	16	266	1060	112
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	487	256	202	330	347	517	309	2635	797	329	2664	806
Arrive On Green	0.14	0.14	0.14	0.19	0.19	0.19	0.09	0.52	0.51	0.10	0.52	0.51
Sat Flow, veh/h	3563	1870	1477	1781	1870	2790	3456	5106	1569	3456	5106	1570
Grp Volume(v), veh/h	332	147	93	38	315	126	239	1228	16	266	1060	112
Grp Sat Flow(s),veh/h/ln	1781	1870	1477	1781	1870	1395	1728	1702	1569	1728	1702	1570
Q Serve(g_s), s	21.3	17.7	13.9	4.3	39.6	9.2	16.2	36.8	1.2	18.1	30.1	9.0
Cycle Q Clear(g_c), s	21.3	17.7	13.9	4.3	39.6	9.2	16.2	36.8	1.2	18.1	30.1	9.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	487	256	202	330	347	517	309	2635	797	329	2664	806
V/C Ratio(X)	0.68	0.57	0.46	0.12	0.91	0.24	0.77	0.47	0.02	0.81	0.40	0.14
Avail Cap(c_a), veh/h	727	382	302	341	358	535	547	2635	797	403	2664	806
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)	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	98.6	97.0	95.4	81.4	95.8	83.4	106.9	37.0	29.4	106.5	34.6	30.6
Incr Delay (d2), s/veh	3.2	3.9	3.1	0.3	27.1	0.5	4.1	0.6	0.0	9.7	0.4	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.2	9.0	5.6	2.0	22.1	3.4	7.6	15.9	0.5	8.7	12.9	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	101.8	100.9	98.5	81.7	122.9	83.9	111.0	37.6	29.4	116.2	35.1	30.9
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		572			479			1483			1438	
Approach Delay, s/veh		101.1			109.4			49.3			49.8	
Approach LOS		F			F			D			D	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	26.8	127.9	36.8	25.5	129.2	48.5
Change Period (Y+Rc), s	6.0	7.0	6.0	6.0	7.0	6.0
Max Green Setting (Gmax), s	26.0	98.0	47.0	36.0	88.0	44.0
Max Q Clear Time (g_c+I1), s	20.1	38.8	23.3	18.2	32.1	41.6
Green Ext Time (p_c), s	0.7	45.0	5.3	1.2	40.1	0.9

Intersection Summary	
HCM 6th Ctrl Delay	64.2
HCM 6th LOS	E

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)	460	5	180	10	15	10	170	2925	15	10	1390	295
Future Volume (veh/h)	460	5	180	10	15	10	170	2925	15	10	1390	295
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.98
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	504	0	105	11	16	1	185	3179	11	11	1511	170
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	551	0	235	15	21	44	206	3692	1135	34	3156	951
Arrive On Green	0.15	0.00	0.15	0.03	0.02	0.03	0.12	0.72	0.72	0.04	1.00	1.00
Sat Flow, veh/h	3563	0	1521	747	1086	1585	1781	5106	1580	1781	5106	1559
Grp Volume(v), veh/h	504	0	105	27	0	1	185	3179	11	11	1511	170
Grp Sat Flow(s),veh/h/ln	1781	0	1521	1833	0	1585	1781	1702	1580	1781	1702	1559
Q Serve(g_s), s	33.4	0.0	15.0	3.5	0.0	0.1	24.6	109.7	0.5	1.4	0.0	0.0
Cycle Q Clear(g_c), s	33.4	0.0	15.0	3.5	0.0	0.1	24.6	109.7	0.5	1.4	0.0	0.0
Prop In Lane	1.00		1.00	0.41		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	551	0	235	36	0	44	206	3692	1135	34	3156	951
V/C Ratio(X)	0.91	0.00	0.45	0.75	0.00	0.02	0.90	0.86	0.01	0.32	0.48	0.18
Avail Cap(c_a), veh/h	609	0	260	199	0	185	371	3692	1135	163	3156	951
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.8	0.0	92.1	116.6	0.0	113.4	104.7	24.4	9.6	113.9	0.0	0.0
Incr Delay (d2), s/veh	18.0	0.0	1.9	26.1	0.0	0.2	23.3	2.9	0.0	5.0	0.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	17.1	0.0	6.2	2.0	0.0	0.1	12.9	44.1	0.2	0.7	0.1	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	117.9	0.0	94.0	142.7	0.0	113.6	128.0	27.3	9.6	118.8	0.5	0.4
LnGrp LOS	F	A	F	F	A	F	F	C	A	F	A	A
Approach Vol, veh/h		609			28			3375			1692	
Approach Delay, s/veh		113.7			141.7			32.7			1.2	
Approach LOS		F			F			C			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	178.5		42.2	33.8	153.3		10.7
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	20.0	129.0		41.0	50.0	99.0		26.0
Max Q Clear Time (g_c+I1), s	3.4	111.7		35.4	26.6	2.0		5.5
Green Ext Time (p_c), s	0.0	17.3		1.7	1.2	50.0		0.1

Intersection Summary	
HCM 6th Ctrl Delay	32.6
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	595	945	0	0	0
Future Vol, veh/h	0	595	945	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	50	-	-	-	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	647	1027	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1027	0	-	0	1674	514
Stage 1	-	-	-	-	1027	-
Stage 2	-	-	-	-	647	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	674	-	-	-	95	506
Stage 1	-	-	-	-	307	-
Stage 2	-	-	-	-	520	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	674	-	-	-	95	506
Mov Cap-2 Maneuver	-	-	-	-	95	-
Stage 1	-	-	-	-	307	-
Stage 2	-	-	-	-	520	-

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)	674	-	-	-	-
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	0					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	425	670	0	0	0
Future Vol, veh/h	0	425	670	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	50	-	-	-	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	462	728	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	728	0	-	0	1190	728
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	462	-
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	876	-	-	-	207	423
Stage 1	-	-	-	-	478	-
Stage 2	-	-	-	-	634	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	876	-	-	-	207	423
Mov Cap-2 Maneuver	-	-	-	-	207	-
Stage 1	-	-	-	-	478	-
Stage 2	-	-	-	-	634	-

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)	876	-	-	-	-
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	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	70	0	0	165	0	0
Future Vol, veh/h	70	0	0	165	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	-	-	150	-	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	76	0	0	179	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	76	0	255	76
Stage 1	-	-	-	-	76	-
Stage 2	-	-	-	-	179	-
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	-	-	1523	-	734	985
Stage 1	-	-	-	-	947	-
Stage 2	-	-	-	-	852	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1523	-	734	985
Mov Cap-2 Maneuver	-	-	-	-	734	-
Stage 1	-	-	-	-	947	-
Stage 2	-	-	-	-	852	-

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)	-	-	-	1523	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2021 with Mitigation PM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	805	585	85	125	610	490	50	140	90	715	235	755
Future Volume (veh/h)	805	585	85	125	610	490	50	140	90	715	235	755
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	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	875	636	83	136	663	533	54	152	28	777	255	533
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	951	1968	254	195	1079	1272	71	264	48	854	1049	1588
Arrive On Green	0.28	0.43	0.43	0.06	0.21	0.21	0.04	0.09	0.09	0.25	0.30	0.30
Sat Flow, veh/h	3456	4576	591	3456	5106	2757	1781	3007	543	3456	3554	2778
Grp Volume(v), veh/h	875	471	248	136	663	533	54	89	91	777	255	533
Grp Sat Flow(s),veh/h/ln	1728	1702	1763	1728	1702	1378	1781	1777	1773	1728	1777	1389
Q Serve(g_s), s	33.0	12.3	12.5	5.2	15.8	17.4	4.0	6.4	6.7	29.4	7.3	13.7
Cycle Q Clear(g_c), s	33.0	12.3	12.5	5.2	15.8	17.4	4.0	6.4	6.7	29.4	7.3	13.7
Prop In Lane	1.00		0.34	1.00		1.00	1.00		0.31	1.00		1.00
Lane Grp Cap(c), veh/h	951	1464	758	195	1079	1272	71	156	156	854	1049	1588
V/C Ratio(X)	0.92	0.32	0.33	0.70	0.61	0.42	0.76	0.57	0.59	0.91	0.24	0.34
Avail Cap(c_a), veh/h	1054	1464	758	1054	1672	1592	504	569	567	977	1137	1657
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.3	25.3	25.4	62.3	48.0	24.4	63.9	58.8	58.9	49.1	36.0	15.4
Incr Delay (d2), s/veh	12.0	0.1	0.2	4.4	0.6	0.2	15.5	3.2	3.5	11.3	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.7	5.1	5.4	2.4	6.8	5.8	2.1	3.0	3.2	14.0	3.2	4.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.2	25.5	25.6	66.7	48.6	24.7	79.4	62.1	62.4	60.5	36.1	15.5
LnGrp LOS	E	C	C	E	D	C	E	E	E	E	D	B
Approach Vol, veh/h		1594			1332			234			1565	
Approach Delay, s/veh		44.0			40.9			66.2			41.2	
Approach LOS		D			D			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	39.2	17.8	13.6	63.8	11.3	45.7	43.0	34.4
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	38.0	43.0	41.0	44.0	38.0	43.0	41.0	44.0
Max Q Clear Time (g_c+I1), s	31.4	8.7	7.2	14.5	6.0	15.7	35.0	19.4
Green Ext Time (p_c), s	1.8	1.1	0.5	5.2	0.1	4.2	2.0	7.6

Intersection Summary	
HCM 6th Ctrl Delay	43.3
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	120	55	150	100	295	25	885	110	295	1120	15
Future Volume (veh/h)	20	120	55	150	100	295	25	885	110	295	1120	15
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	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	22	130	43	163	109	49	27	962	105	321	1217	15
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	373	375	124	329	523	438	40	1394	152	367	2504	31
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.02	0.30	0.30	0.21	0.48	0.48
Sat Flow, veh/h	1218	1341	443	1202	1870	1566	1781	4674	509	1781	5199	64
Grp Volume(v), veh/h	22	0	173	163	109	49	27	700	367	321	797	435
Grp Sat Flow(s),veh/h/ln	1218	0	1784	1202	1870	1566	1781	1702	1779	1781	1702	1859
Q Serve(g_s), s	1.2	0.0	6.4	10.4	3.7	1.9	1.3	15.1	15.2	14.5	13.2	13.2
Cycle Q Clear(g_c), s	4.9	0.0	6.4	16.8	3.7	1.9	1.3	15.1	15.2	14.5	13.2	13.2
Prop In Lane	1.00		0.25	1.00		1.00	1.00		0.29	1.00		0.03
Lane Grp Cap(c), veh/h	373	0	499	329	523	438	40	1015	531	367	1640	895
V/C Ratio(X)	0.06	0.00	0.35	0.49	0.21	0.11	0.68	0.69	0.69	0.88	0.49	0.49
Avail Cap(c_a), veh/h	530	0	730	485	765	641	514	1597	835	514	1640	895
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.8	0.0	23.9	30.6	22.9	22.3	40.3	25.8	25.8	32.0	14.6	14.6
Incr Delay (d2), s/veh	0.1	0.0	0.4	1.1	0.2	0.1	18.4	0.8	1.6	11.7	0.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	2.7	3.1	1.6	0.7	0.7	6.0	6.4	7.3	4.8	5.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.8	0.0	24.3	31.8	23.1	22.4	58.7	26.6	27.4	43.7	14.8	15.0
LnGrp LOS	C	A	C	C	C	C	E	C	C	D	B	B
Approach Vol, veh/h		195			321			1094			1553	
Approach Delay, s/veh		24.4			27.4			27.7			20.8	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.1	30.8		29.2	7.9	46.0		29.2				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	24.0	39.0		34.0	24.0	39.0		34.0				
Max Q Clear Time (g_c+I1), s	16.5	17.2		18.8	3.3	15.2		8.4				
Green Ext Time (p_c), s	0.6	7.6		1.2	0.0	9.3		1.1				
Intersection Summary												
HCM 6th Ctrl Delay			24.1									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	5	5	120	5	5	160
Future Vol, veh/h	5	5	120	5	5	160
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	5	5	130	5	5	174

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	10	0	273	8
Stage 1	-	-	-	-	8	-
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	-	-	1610	-	716	1074
Stage 1	-	-	-	-	1015	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1610	-	658	1074
Mov Cap-2 Maneuver	-	-	-	-	658	-
Stage 1	-	-	-	-	933	-
Stage 2	-	-	-	-	779	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		7.1		9.1	
HCM LOS					A	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1054	-	-	1610	-
HCM Lane V/C Ratio	0.17	-	-	0.081	-
HCM Control Delay (s)	9.1	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.3	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	140	660	0	0	480	25	5	10	0	20	0	100
Future Vol, veh/h	140	660	0	0	480	25	5	10	0	20	0	100
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	152	717	0	0	522	27	5	11	0	22	0	109

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	549	0	0	717	0	0	1612	1570	717	1563	1557	537
Stage 1	-	-	-	-	-	-	1021	1021	-	536	536	-
Stage 2	-	-	-	-	-	-	591	549	-	1027	1021	-
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	1021	-	-	884	-	-	84	111	430	91	113	544
Stage 1	-	-	-	-	-	-	285	314	-	529	523	-
Stage 2	-	-	-	-	-	-	493	516	-	283	314	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1021	-	-	884	-	-	54	83	430	67	85	544
Mov Cap-2 Maneuver	-	-	-	-	-	-	54	83	-	67	85	-
Stage 1	-	-	-	-	-	-	214	236	-	398	523	-
Stage 2	-	-	-	-	-	-	394	516	-	203	236	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	0	71.4	34.3
HCM LOS			F	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	70	1021	-	-	884	-	-	249
HCM Lane V/C Ratio	0.233	0.149	-	-	-	-	-	0.524
HCM Control Delay (s)	71.4	9.1	0	-	0	-	-	34.3
HCM Lane LOS	F	A	A	-	A	-	-	D
HCM 95th %tile Q(veh)	0.8	0.5	-	-	0	-	-	2.8

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	660	15	10	485	5	20
Future Vol, veh/h	660	15	10	485	5	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	-	-	50	-	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	717	16	11	527	5	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	733	0	1274	725
Stage 1	-	-	-	-	725	-
Stage 2	-	-	-	-	549	-
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	-	-	872	-	184	425
Stage 1	-	-	-	-	479	-
Stage 2	-	-	-	-	579	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	872	-	182	425
Mov Cap-2 Maneuver	-	-	-	-	182	-
Stage 1	-	-	-	-	473	-
Stage 2	-	-	-	-	579	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	16.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	335	-	-	872	-
HCM Lane V/C Ratio	0.081	-	-	0.012	-
HCM Control Delay (s)	16.7	-	-	9.2	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	670	475	20	20	20
Future Vol, veh/h	10	670	475	20	20	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	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	728	516	22	22	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	538	0	-	0	1266	516
Stage 1	-	-	-	-	516	-
Stage 2	-	-	-	-	750	-
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	1030	-	-	-	187	559
Stage 1	-	-	-	-	599	-
Stage 2	-	-	-	-	467	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1030	-	-	-	184	559
Mov Cap-2 Maneuver	-	-	-	-	184	-
Stage 1	-	-	-	-	588	-
Stage 2	-	-	-	-	467	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	20.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1030	-	-	-	277
HCM Lane V/C Ratio	0.011	-	-	-	0.157
HCM Control Delay (s)	8.5	0	-	-	20.4
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Intersection						
Int Delay, s/veh	0.2					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	700	490	0	5	5
Future Vol, veh/h	5	700	490	0	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	50	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	5	761	533	0	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	533	0	-	0	1304	267
Stage 1	-	-	-	-	533	-
Stage 2	-	-	-	-	771	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1033	-	-	-	164	732
Stage 1	-	-	-	-	554	-
Stage 2	-	-	-	-	455	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1033	-	-	-	163	732
Mov Cap-2 Maneuver	-	-	-	-	163	-
Stage 1	-	-	-	-	551	-
Stage 2	-	-	-	-	455	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	19.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1033	-	-	-	267
HCM Lane V/C Ratio	0.005	-	-	-	0.041
HCM Control Delay (s)	8.5	-	-	-	19.1
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	15.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	640	45	245	425	0	70	0	305	0	0	0
Future Vol, veh/h	0	640	45	245	425	0	70	0	305	0	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	696	49	266	462	0	76	0	332	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	462	0	0	746	0	0	1485	1716	374	1342	1740	231
Stage 1	-	-	-	-	-	-	722	722	-	994	994	-
Stage 2	-	-	-	-	-	-	763	994	-	348	746	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1095	-	-	858	-	-	86	89	623	110	86	771
Stage 1	-	-	-	-	-	-	384	429	-	263	321	-
Stage 2	-	-	-	-	-	-	363	321	-	641	419	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1095	-	-	857	-	-	~ 65	61	622	39	59	771
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 65	61	-	39	59	-
Stage 1	-	-	-	-	-	-	384	429	-	263	221	-
Stage 2	-	-	-	-	-	-	250	221	-	299	419	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	4.1	65.1	0
HCM LOS			F	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	65	622	1095	-	-	857	-	-	-
HCM Lane V/C Ratio	1.171	0.533	-	-	-	0.311	-	-	-
HCM Control Delay (s)	273.8	17.2	0	-	-	11.1	-	-	0
HCM Lane LOS	F	C	A	-	-	B	-	-	A
HCM 95th %tile Q(veh)	6.1	3.2	0	-	-	1.3	-	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Traffic Volume (veh/h)	150	290	525	160	255	255	310	670	80	180	845	100
Future Volume (veh/h)	150	290	525	160	255	255	310	670	80	180	845	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	163	315	297	174	277	51	337	728	21	196	918	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	195	422	357	206	433	367	421	1100	489	230	1126	496
Arrive On Green	0.11	0.23	0.23	0.12	0.23	0.23	0.12	0.31	0.31	0.13	0.32	0.32
Sat Flow, veh/h	1781	1870	1585	1781	1870	1583	3456	3554	1579	1781	3554	1566
Grp Volume(v), veh/h	163	315	297	174	277	51	337	728	21	196	918	30
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1583	1728	1777	1579	1781	1777	1566
Q Serve(g_s), s	9.8	17.1	19.4	10.4	14.5	2.8	10.3	19.4	1.0	11.7	25.9	1.5
Cycle Q Clear(g_c), s	9.8	17.1	19.4	10.4	14.5	2.8	10.3	19.4	1.0	11.7	25.9	1.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	195	422	357	206	433	367	421	1100	489	230	1126	496
V/C Ratio(X)	0.84	0.75	0.83	0.85	0.64	0.14	0.80	0.66	0.04	0.85	0.82	0.06
Avail Cap(c_a), veh/h	295	722	612	295	722	611	762	1534	682	393	1534	676
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.5	39.3	40.2	47.2	37.7	33.2	46.5	32.6	26.3	46.4	34.3	25.9
Incr Delay (d2), s/veh	12.3	2.7	5.0	14.3	1.6	0.2	3.6	0.7	0.0	8.6	2.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	8.1	8.0	5.4	6.8	1.1	4.6	8.3	0.4	5.7	11.4	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.8	41.9	45.2	61.5	39.3	33.4	50.1	33.3	26.3	55.0	36.8	26.0
LnGrp LOS	E	D	D	E	D	C	D	C	C	D	D	C
Approach Vol, veh/h		775			502			1086			1144	
Approach Delay, s/veh		46.9			46.4			38.4			39.6	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.1	39.7	18.6	30.5	19.3	40.5	17.9	31.2
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	24.0	47.0	18.0	42.0	24.0	47.0	18.0	42.0
Max Q Clear Time (g_c+I1), s	13.7	21.4	12.4	21.4	12.3	27.9	11.8	16.5
Green Ext Time (p_c), s	0.4	5.5	0.2	2.9	0.9	6.6	0.2	1.8

Intersection Summary	
HCM 6th Ctrl Delay	41.8
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	255	230	155	15	230	150	170	1005	15	390	1605	360
Future Volume (veh/h)	255	230	155	15	230	150	170	1005	15	390	1605	360
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	294	226	101	16	250	46	185	1092	6	424	1745	269
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	530	278	224	269	282	421	251	2517	765	487	2866	866
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.07	0.49	0.48	0.14	0.56	0.55
Sat Flow, veh/h	3563	1870	1508	1781	1870	2790	3456	5106	1578	3456	5106	1567
Grp Volume(v), veh/h	294	226	101	16	250	46	185	1092	6	424	1745	269
Grp Sat Flow(s),veh/h/ln	1781	1870	1508	1781	1870	1395	1728	1702	1578	1728	1702	1567
Q Serve(g_s), s	18.4	28.1	14.7	1.8	31.4	3.4	12.6	33.1	0.5	28.8	54.7	22.2
Cycle Q Clear(g_c), s	18.4	28.1	14.7	1.8	31.4	3.4	12.6	33.1	0.5	28.8	54.7	22.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	530	278	224	269	282	421	251	2517	765	487	2866	866
V/C Ratio(X)	0.55	0.81	0.45	0.06	0.89	0.11	0.74	0.43	0.01	0.87	0.61	0.31
Avail Cap(c_a), veh/h	623	327	264	289	304	453	446	2517	765	533	2866	866
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)	0.72	0.72	0.72	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	94.8	98.9	93.2	87.3	99.9	88.0	109.1	39.2	32.0	101.0	35.1	29.0
Incr Delay (d2), s/veh	1.4	11.8	2.2	0.2	26.5	0.2	4.2	0.5	0.0	13.7	1.0	0.9
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	8.7	14.8	6.0	0.9	17.6	1.3	5.9	14.3	0.2	14.0	23.3	8.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	96.2	110.7	95.4	87.5	126.4	88.2	113.3	39.8	32.0	114.7	36.1	29.9
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		621			312			1283			2438	
Approach Delay, s/veh		101.3			118.8			50.4			49.1	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	37.8	122.3		39.7	21.4	138.7		40.2				
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	35.0	103.0		40.0	29.0	109.0		37.0				
Max Q Clear Time (g_c+I1), s	30.8	35.1		30.1	14.6	56.7		33.4				
Green Ext Time (p_c), s	1.0	44.3		3.6	0.8	50.3		0.7				
Intersection Summary												
HCM 6th Ctrl Delay			61.1									
HCM 6th LOS			E									

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)	330	50	170	35	30	30	125	1630	60	40	2915	575
Future Volume (veh/h)	330	50	170	35	30	30	125	1630	60	40	2915	575
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	398	0	93	38	33	1	136	1772	40	43	3168	346
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	502	0	213	46	40	89	155	3522	1082	69	3232	977
Arrive On Green	0.14	0.00	0.14	0.06	0.05	0.06	0.09	0.69	0.69	0.08	1.00	1.00
Sat Flow, veh/h	3563	0	1511	975	847	1585	1781	5106	1578	1781	5106	1563
Grp Volume(v), veh/h	398	0	93	71	0	1	136	1772	40	43	3168	346
Grp Sat Flow(s),veh/h/ln	1781	0	1511	1822	0	1585	1781	1702	1578	1781	1702	1563
Q Serve(g_s), s	25.9	0.0	13.5	9.3	0.0	0.1	18.1	39.6	2.0	5.6	0.0	0.0
Cycle Q Clear(g_c), s	25.9	0.0	13.5	9.3	0.0	0.1	18.1	39.6	2.0	5.6	0.0	0.0
Prop In Lane	1.00		1.00	0.54		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	502	0	213	87	0	89	155	3522	1082	69	3232	977
V/C Ratio(X)	0.79	0.00	0.44	0.82	0.00	0.01	0.88	0.50	0.04	0.63	0.98	0.35
Avail Cap(c_a), veh/h	609	0	258	197	0	185	289	3522	1082	163	3232	977
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.7	0.0	94.4	112.7	0.0	107.0	108.3	17.7	12.2	109.1	0.0	0.0
Incr Delay (d2), s/veh	6.7	0.0	2.0	16.9	0.0	0.1	26.3	0.5	0.1	8.4	11.3	0.9
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	12.7	0.0	5.5	4.9	0.0	0.1	9.6	16.1	0.8	2.7	3.4	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	106.4	0.0	96.4	129.7	0.0	107.1	134.6	18.2	12.2	117.5	11.3	0.9
LnGrp LOS	F	A	F	F	A	F	F	B	B	F	B	A
Approach Vol, veh/h		491			72			1948			3557	
Approach Delay, s/veh		104.5			129.4			26.2			11.6	
Approach LOS		F			F			C			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.2	170.5		38.8	26.9	156.9		17.4
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	20.0	129.0		41.0	39.0	110.0		26.0
Max Q Clear Time (g_c+I1), s	7.6	41.6		27.9	20.1	2.0		11.3
Green Ext Time (p_c), s	0.1	55.3		2.3	0.7	106.7		0.2

Intersection Summary		
HCM 6th Ctrl Delay		25.2
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	945	670	0	0	0
Future Vol, veh/h	0	945	670	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	50	-	-	-	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	1027	728	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	728	0	-	0	1755	364
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	1027	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	873	-	-	-	84	634
Stage 1	-	-	-	-	440	-
Stage 2	-	-	-	-	344	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	873	-	-	-	84	634
Mov Cap-2 Maneuver	-	-	-	-	84	-
Stage 1	-	-	-	-	440	-
Stage 2	-	-	-	-	344	-

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)	873	-	-	-	-
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	0					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	675	500	0	0	0
Future Vol, veh/h	0	675	500	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	50	-	-	-	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	734	543	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	543	0	-	0	1277	543
Stage 1	-	-	-	-	543	-
Stage 2	-	-	-	-	734	-
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	1026	-	-	-	184	540
Stage 1	-	-	-	-	582	-
Stage 2	-	-	-	-	475	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1026	-	-	-	184	540
Mov Cap-2 Maneuver	-	-	-	-	184	-
Stage 1	-	-	-	-	582	-
Stage 2	-	-	-	-	475	-

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)	1026	-	-	-	-
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	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	165	0	0	125	0	0
Future Vol, veh/h	165	0	0	125	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	-	-	150	-	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	179	0	0	136	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	179	0	315	179
Stage 1	-	-	-	-	179	-
Stage 2	-	-	-	-	136	-
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	-	-	1397	-	678	864
Stage 1	-	-	-	-	852	-
Stage 2	-	-	-	-	890	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1397	-	678	864
Mov Cap-2 Maneuver	-	-	-	-	678	-
Stage 1	-	-	-	-	852	-
Stage 2	-	-	-	-	890	-

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)	-	-	-	1397	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Roosevelt Avenue Access Only AM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	655	405	20	15	805	775	10	35	5	445	75	470
Future Volume (veh/h)	655	405	20	15	805	775	10	35	5	445	75	470
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		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	712	440	20	16	875	842	11	38	1	484	82	310
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	829	2719	123	49	1620	1343	19	178	5	567	725	1235
Arrive On Green	0.24	0.54	0.54	0.01	0.32	0.32	0.01	0.05	0.05	0.16	0.20	0.20
Sat Flow, veh/h	3456	5007	226	3456	5106	2790	1781	3537	93	3456	3554	2773
Grp Volume(v), veh/h	712	298	162	16	875	842	11	19	20	484	82	310
Grp Sat Flow(s),veh/h/ln	1728	1702	1829	1728	1702	1395	1781	1777	1853	1728	1777	1387
Q Serve(g_s), s	20.7	4.6	4.7	0.5	14.8	23.6	0.6	1.1	1.1	14.3	2.0	7.4
Cycle Q Clear(g_c), s	20.7	4.6	4.7	0.5	14.8	23.6	0.6	1.1	1.1	14.3	2.0	7.4
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.05	1.00		1.00
Lane Grp Cap(c), veh/h	829	1848	993	49	1620	1343	19	89	93	567	725	1235
V/C Ratio(X)	0.86	0.16	0.16	0.33	0.54	0.63	0.59	0.21	0.21	0.85	0.11	0.25
Avail Cap(c_a), veh/h	1249	1848	993	1249	1846	1467	203	642	670	723	1623	1936
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.2	12.0	12.0	51.3	29.6	20.2	51.8	47.9	47.9	42.7	34.1	18.3
Incr Delay (d2), s/veh	4.0	0.0	0.1	3.8	0.3	0.7	26.4	1.2	1.1	7.9	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.1	1.7	1.9	0.2	6.0	7.5	0.4	0.5	0.5	6.7	0.9	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.3	12.1	12.1	55.1	29.9	21.0	78.2	49.1	49.1	50.6	34.1	18.4
LnGrp LOS	D	B	B	E	C	C	E	D	D	D	C	B
Approach Vol, veh/h		1172			1733			50			876	
Approach Delay, s/veh		30.4			25.8			55.5			37.7	
Approach LOS		C			C			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	23.3	11.3	7.5	63.1	7.1	27.5	31.2	39.3
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	22.0	38.0	38.0	38.0	12.0	48.0	38.0	38.0
Max Q Clear Time (g_c+I1), s	16.3	3.1	2.5	6.7	2.6	9.4	22.7	25.6
Green Ext Time (p_c), s	1.0	0.2	0.0	3.1	0.0	1.9	2.5	7.6

Intersection Summary	
HCM 6th Ctrl Delay	30.3
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	55	15	245	135	315	45	1300	45	205	615	15
Future Volume (veh/h)	15	55	15	245	135	315	45	1300	45	205	615	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	16	60	9	266	147	95	49	1413	47	223	668	15
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	317	445	67	401	526	438	64	2023	67	261	2616	59
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.04	0.40	0.40	0.15	0.51	0.51
Sat Flow, veh/h	1126	1585	238	1312	1870	1558	1781	5075	169	1781	5139	115
Grp Volume(v), veh/h	16	0	69	266	147	95	49	948	512	223	442	241
Grp Sat Flow(s),veh/h/ln	1126	0	1823	1312	1870	1558	1781	1702	1840	1781	1702	1850
Q Serve(g_s), s	1.2	0.0	2.9	19.6	6.3	4.8	2.8	24.0	24.0	12.6	7.6	7.6
Cycle Q Clear(g_c), s	7.5	0.0	2.9	22.6	6.3	4.8	2.8	24.0	24.0	12.6	7.6	7.6
Prop In Lane	1.00		0.13	1.00		1.00	1.00		0.09	1.00		0.06
Lane Grp Cap(c), veh/h	317	0	512	401	526	438	64	1357	733	261	1733	941
V/C Ratio(X)	0.05	0.00	0.13	0.66	0.28	0.22	0.77	0.70	0.70	0.86	0.26	0.26
Avail Cap(c_a), veh/h	371	0	599	464	615	512	500	2601	1406	500	2601	1414
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.9	0.0	27.8	36.2	29.0	28.5	49.4	25.9	25.9	43.1	14.3	14.3
Incr Delay (d2), s/veh	0.1	0.0	0.1	2.9	0.3	0.2	17.2	0.7	1.2	7.9	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	1.3	6.6	2.9	1.8	1.6	9.6	10.5	6.1	2.9	3.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.0	0.0	27.9	39.1	29.3	28.7	66.6	26.6	27.1	50.9	14.4	14.5
LnGrp LOS	C	A	C	D	C	C	E	C	C	D	B	B
Approach Vol, veh/h		85			508			1509			906	
Approach Delay, s/veh		28.7			34.3			28.1			23.4	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	21.1	47.2		35.0	9.7	58.6		35.0
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0
Max Green Setting (Gmax), s	29.0	79.0		34.0	29.0	79.0		34.0
Max Q Clear Time (g_c+I1), s	14.6	26.0		24.6	4.8	9.6		9.5
Green Ext Time (p_c), s	0.5	15.2		1.5	0.1	5.2		0.4

Intersection Summary	
HCM 6th Ctrl Delay	27.7
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	7.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	5	170	5	5	75
Future Vol, veh/h	0	5	170	5	5	75
Conflicting Peds, #/hr	0	1	1	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	5	185	5	5	82

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	6	0	379	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	375	-
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	-	-	1615	-	623	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	695	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1614	-	551	1079
Mov Cap-2 Maneuver	-	-	-	-	551	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	695	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1018	-	-	1614	-
HCM Lane V/C Ratio	0.085	-	-	0.114	-
HCM Control Delay (s)	8.9	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	55	420	5	5	660	20	0	0	0	25	5	145
Future Vol, veh/h	55	420	5	5	660	20	0	0	0	25	5	145
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	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	60	457	5	5	717	22	0	0	0	27	5	158

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	740	0	0	462	0	0	1400	1330	460	1319	1321	729
Stage 1	-	-	-	-	-	-	580	580	-	739	739	-
Stage 2	-	-	-	-	-	-	820	750	-	580	582	-
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	867	-	-	1099	-	-	118	155	601	134	157	423
Stage 1	-	-	-	-	-	-	500	500	-	409	424	-
Stage 2	-	-	-	-	-	-	369	419	-	500	499	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	866	-	-	1099	-	-	66	139	601	124	141	423
Mov Cap-2 Maneuver	-	-	-	-	-	-	66	139	-	124	141	-
Stage 1	-	-	-	-	-	-	454	454	-	371	420	-
Stage 2	-	-	-	-	-	-	227	415	-	454	453	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.1	0	35.2
HCM LOS			A	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	866	-	-	1099	-	-	302
HCM Lane V/C Ratio	-	0.069	-	-	0.005	-	-	0.63
HCM Control Delay (s)	0	9.5	0	-	8.3	0	-	35.2
HCM Lane LOS	A	A	A	-	A	A	-	E
HCM 95th %tile Q(veh)	-	0.2	-	-	0	-	-	4

Intersection						
Int Delay, s/veh	0.3					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	420	15	25	855	5	5
Future Vol, veh/h	420	15	25	855	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	457	16	27	929	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	473	0	1448	465
Stage 1	-	-	-	-	465	-
Stage 2	-	-	-	-	983	-
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	-	-	1089	-	145	597
Stage 1	-	-	-	-	632	-
Stage 2	-	-	-	-	362	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1089	-	141	597
Mov Cap-2 Maneuver	-	-	-	-	141	-
Stage 1	-	-	-	-	616	-
Stage 2	-	-	-	-	362	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	21.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	228	-	-	1089	-
HCM Lane V/C Ratio	0.048	-	-	0.025	-
HCM Control Delay (s)	21.6	-	-	8.4	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	420	855	5	5	10
Future Vol, veh/h	10	420	855	5	5	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	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	457	929	5	5	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	934	0	-	0	1408	929
Stage 1	-	-	-	-	929	-
Stage 2	-	-	-	-	479	-
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	733	-	-	-	153	324
Stage 1	-	-	-	-	385	-
Stage 2	-	-	-	-	623	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	733	-	-	-	150	324
Mov Cap-2 Maneuver	-	-	-	-	150	-
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	623	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	21.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	733	-	-	-	234
HCM Lane V/C Ratio	0.015	-	-	-	0.07
HCM Control Delay (s)	10	0	-	-	21.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	385	695	20	10	10
Future Vol, veh/h	10	385	695	20	10	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	50	-	-	50	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	418	755	22	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	777	0	-	0	1195	378
Stage 1	-	-	-	-	755	-
Stage 2	-	-	-	-	440	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	837	-	-	-	192	621
Stage 1	-	-	-	-	426	-
Stage 2	-	-	-	-	648	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	837	-	-	-	190	621
Mov Cap-2 Maneuver	-	-	-	-	190	-
Stage 1	-	-	-	-	420	-
Stage 2	-	-	-	-	648	-

Approach	EB		WB		SB
HCM Control Delay, s	0.2		0		18.4
HCM LOS					C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	837	-	-	-	291
HCM Lane V/C Ratio	0.013	-	-	-	0.075
HCM Control Delay (s)	9.4	-	-	-	18.4
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	350	75	285	835	5	55	0	265	5	0	0
Future Vol, veh/h	0	350	75	285	835	5	55	0	265	5	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	380	82	310	908	5	60	0	288	5	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	913	0	0	462	0	0	1495	1954	231	1721	1993	457
Stage 1	-	-	-	-	-	-	421	421	-	1531	1531	-
Stage 2	-	-	-	-	-	-	1074	1533	-	190	462	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	742	-	-	1095	-	-	85	63	771	57	60	551
Stage 1	-	-	-	-	-	-	581	587	-	122	177	-
Stage 2	-	-	-	-	-	-	235	177	-	794	563	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	742	-	-	1095	-	-	66	45	771	28	43	551
Mov Cap-2 Maneuver	-	-	-	-	-	-	66	45	-	28	43	-
Stage 1	-	-	-	-	-	-	581	587	-	122	127	-
Stage 2	-	-	-	-	-	-	168	127	-	497	563	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.4	42.8	162.3
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	66	771	742	-	-	1095	-	-	28
HCM Lane V/C Ratio	0.906	0.374	-	-	-	0.283	-	-	0.194
HCM Control Delay (s)	189	12.4	0	-	-	9.6	-	-	162.3
HCM Lane LOS	F	B	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	4.4	1.7	0	-	-	1.2	-	-	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	90	215	290	90	510	345	465	970	125	105	725	165
Future Volume (veh/h)	90	215	290	90	510	345	465	970	125	105	725	165
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		1.00	1.00		0.94	1.00		0.98
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	98	234	93	98	554	200	505	1054	65	114	788	54
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	121	591	496	121	591	500	564	1264	532	138	960	419
Arrive On Green	0.07	0.32	0.32	0.07	0.32	0.32	0.16	0.36	0.36	0.08	0.27	0.27
Sat Flow, veh/h	1781	1870	1570	1781	1870	1582	3456	3554	1495	1781	3554	1553
Grp Volume(v), veh/h	98	234	93	98	554	200	505	1054	65	114	788	54
Grp Sat Flow(s),veh/h/ln	1781	1870	1570	1781	1870	1582	1728	1777	1495	1781	1777	1553
Q Serve(g_s), s	7.1	12.9	5.7	7.1	37.8	13.0	18.8	35.7	3.8	8.3	27.3	3.5
Cycle Q Clear(g_c), s	7.1	12.9	5.7	7.1	37.8	13.0	18.8	35.7	3.8	8.3	27.3	3.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	121	591	496	121	591	500	564	1264	532	138	960	419
V/C Ratio(X)	0.81	0.40	0.19	0.81	0.94	0.40	0.89	0.83	0.12	0.82	0.82	0.13
Avail Cap(c_a), veh/h	190	626	526	190	626	530	631	1730	728	190	1460	638
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	60.4	35.2	32.7	60.4	43.7	35.2	53.9	38.8	28.5	59.7	45.0	36.3
Incr Delay (d2), s/veh	13.1	0.4	0.2	13.1	21.3	0.5	14.3	2.7	0.1	18.5	2.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	6.0	2.2	3.7	20.9	5.1	9.3	15.9	1.4	4.5	12.3	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.5	35.6	32.9	73.5	65.0	35.7	68.2	41.5	28.6	78.2	47.3	36.4
LnGrp LOS	E	D	C	E	E	D	E	D	C	E	D	D
Approach Vol, veh/h		425			852			1624			956	
Approach Delay, s/veh		43.7			59.1			49.3			50.4	
Approach LOS		D			E			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.2	52.8	15.0	47.5	27.5	41.5	15.0	47.5
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	64.0	14.0	44.0	24.0	54.0	14.0	44.0
Max Q Clear Time (g_c+I1), s	10.3	37.7	9.1	14.9	20.8	29.3	9.1	39.8
Green Ext Time (p_c), s	0.1	9.0	0.1	1.7	0.6	6.2	0.1	1.7

Intersection Summary		
HCM 6th Ctrl Delay		51.1
HCM 6th LOS		D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	325	140	180	35	300	270	280	1135	40	255	1000	270
Future Volume (veh/h)	325	140	180	35	300	270	280	1135	40	255	1000	270
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	353	152	105	38	326	135	304	1234	18	277	1087	144
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	496	260	206	337	354	528	375	2587	782	339	2533	766
Arrive On Green	0.14	0.14	0.14	0.19	0.19	0.19	0.11	0.51	0.50	0.10	0.50	0.49
Sat Flow, veh/h	3563	1870	1479	1781	1870	2790	3456	5106	1569	3456	5106	1569
Grp Volume(v), veh/h	353	152	105	38	326	135	304	1234	18	277	1087	144
Grp Sat Flow(s),veh/h/ln	1781	1870	1479	1781	1870	1395	1728	1702	1569	1728	1702	1569
Q Serve(g_s), s	22.7	18.3	15.8	4.2	41.1	9.9	20.6	37.7	1.4	18.9	32.7	12.4
Cycle Q Clear(g_c), s	22.7	18.3	15.8	4.2	41.1	9.9	20.6	37.7	1.4	18.9	32.7	12.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	496	260	206	337	354	528	375	2587	782	339	2533	766
V/C Ratio(X)	0.71	0.58	0.51	0.11	0.92	0.26	0.81	0.48	0.02	0.82	0.43	0.19
Avail Cap(c_a), veh/h	727	382	302	341	358	535	547	2587	782	403	2533	766
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)	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	98.7	96.8	95.7	80.6	95.5	82.9	104.5	38.5	30.6	106.1	38.7	34.7
Incr Delay (d2), s/veh	3.6	3.9	3.7	0.3	29.2	0.5	5.8	0.6	0.1	10.7	0.5	0.5
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	10.9	9.3	6.4	2.0	23.1	3.7	9.7	16.3	0.6	9.1	14.2	5.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	102.3	100.7	99.4	80.9	124.7	83.4	110.3	39.1	30.6	116.8	39.2	35.2
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	D
Approach Vol, veh/h		610			499			1556			1508	
Approach Delay, s/veh		101.4			110.2			53.0			53.1	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	27.5	125.6		37.4	30.1	123.1		49.4				
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	26.0	98.0		47.0	36.0	88.0		44.0				
Max Q Clear Time (g_c+I1), s	20.9	39.7		24.7	22.6	34.7		43.1				
Green Ext Time (p_c), s	0.7	44.7		5.6	1.4	39.9		0.4				

Intersection Summary		
HCM 6th Ctrl Delay		66.9
HCM 6th LOS		E

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)	465	5	185	10	15	10	180	2995	15	10	1475	320
Future Volume (veh/h)	465	5	185	10	15	10	180	2995	15	10	1475	320
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.98
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	509	0	111	11	16	1	196	3255	11	11	1603	182
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	556	0	237	15	21	44	218	3686	1134	34	3117	939
Arrive On Green	0.16	0.00	0.16	0.03	0.02	0.03	0.12	0.72	0.72	0.04	1.00	1.00
Sat Flow, veh/h	3563	0	1521	747	1086	1585	1781	5106	1580	1781	5106	1559
Grp Volume(v), veh/h	509	0	111	27	0	1	196	3255	11	11	1603	182
Grp Sat Flow(s),veh/h/ln	1781	0	1521	1833	0	1585	1781	1702	1580	1781	1702	1559
Q Serve(g_s), s	33.8	0.0	15.9	3.5	0.0	0.1	26.0	117.4	0.5	1.4	0.0	0.0
Cycle Q Clear(g_c), s	33.8	0.0	15.9	3.5	0.0	0.1	26.0	117.4	0.5	1.4	0.0	0.0
Prop In Lane	1.00		1.00	0.41		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	556	0	237	36	0	44	218	3686	1134	34	3117	939
V/C Ratio(X)	0.92	0.00	0.47	0.75	0.00	0.02	0.90	0.88	0.01	0.32	0.51	0.19
Avail Cap(c_a), veh/h	609	0	260	199	0	185	371	3686	1134	163	3117	939
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.7	0.0	92.2	116.6	0.0	113.4	103.9	25.6	9.6	113.9	0.0	0.0
Incr Delay (d2), s/veh	18.4	0.0	2.0	26.1	0.0	0.2	24.1	3.5	0.0	5.0	0.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	17.3	0.0	6.5	2.0	0.0	0.1	13.7	47.4	0.2	0.7	0.2	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	118.1	0.0	94.2	142.7	0.0	113.6	128.0	29.1	9.6	118.8	0.6	0.4
LnGrp LOS	F	A	F	F	A	F	F	C	A	F	A	A
Approach Vol, veh/h		620			28			3462			1796	
Approach Delay, s/veh		113.8			141.7			34.6			1.3	
Approach LOS		F			F			C			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	178.2		42.4	35.3	151.5		10.7
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	20.0	129.0		41.0	50.0	99.0		26.0
Max Q Clear Time (g_c+I1), s	3.4	119.4		35.8	28.0	2.0		5.5
Green Ext Time (p_c), s	0.0	9.6		1.7	1.3	55.2		0.1

Intersection Summary		
HCM 6th Ctrl Delay		33.3
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	615	1120	15	5	5
Future Vol, veh/h	5	615	1120	15	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	668	1217	16	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1233	0	-	0	1903	617
Stage 1	-	-	-	-	1225	-
Stage 2	-	-	-	-	678	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	563	-	-	-	68	434
Stage 1	-	-	-	-	241	-
Stage 2	-	-	-	-	503	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	563	-	-	-	67	434
Mov Cap-2 Maneuver	-	-	-	-	67	-
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	503	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	39.2
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	563	-	-	-	116
HCM Lane V/C Ratio	0.01	-	-	-	0.094
HCM Control Delay (s)	11.5	-	-	-	39.2
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	20	445	680	175	20	5
Future Vol, veh/h	20	445	680	175	20	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	22	484	739	190	22	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	929	0	-	0	1362	834
Stage 1	-	-	-	-	834	-
Stage 2	-	-	-	-	528	-
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	736	-	-	-	163	368
Stage 1	-	-	-	-	426	-
Stage 2	-	-	-	-	592	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	736	-	-	-	158	368
Mov Cap-2 Maneuver	-	-	-	-	158	-
Stage 1	-	-	-	-	413	-
Stage 2	-	-	-	-	592	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	28.8
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	736	-	-	-	178
HCM Lane V/C Ratio	0.03	-	-	-	0.153
HCM Control Delay (s)	10	-	-	-	28.8
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	0.5

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	75	0	0	175	0	0
Future Vol, veh/h	75	0	0	175	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	-	-	150	-	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	82	0	0	190	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	82	0	272	82
Stage 1	-	-	-	-	82	-
Stage 2	-	-	-	-	190	-
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	-	-	1515	-	717	978
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	842	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1515	-	717	978
Mov Cap-2 Maneuver	-	-	-	-	717	-
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	842	-

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)	-	-	-	1515	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Roosevelt Avenue Access Only AM Peak Queuing Analysis

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Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	WB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	31	157	125	41
Average Queue (ft)	4	23	28	11
95th Queue (ft)	19	88	90	33
Link Distance (ft)		859	859	237
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	0			
Queuing Penalty (veh)	0			

Intersection: 13: Roosevelt Ave & Honouliuli Drwy 4

Movement	EB	WB	SB
Directions Served	L	TR	LR
Maximum Queue (ft)	39	8	60
Average Queue (ft)	13	0	19
95th Queue (ft)	38	4	48
Link Distance (ft)		3003	327
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	50		
Storage Blk Time (%)	0		
Queuing Penalty (veh)	1		

Network Summary

Network wide Queuing Penalty: 1

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Roosevelt Avenue Access Only PM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	930	600	85	125	645	535	50	140	95	795	245	800
Future Volume (veh/h)	930	600	85	125	645	535	50	140	95	795	245	800
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	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	1011	652	83	136	701	582	54	152	24	864	266	581
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	965	2013	254	191	1096	1313	70	259	40	894	1078	1622
Arrive On Green	0.28	0.44	0.44	0.06	0.21	0.21	0.04	0.08	0.08	0.26	0.30	0.30
Sat Flow, veh/h	3456	4591	578	3456	5106	2757	1781	3083	478	3456	3554	2779
Grp Volume(v), veh/h	1011	482	253	136	701	582	54	86	90	864	266	581
Grp Sat Flow(s),veh/h/ln	1728	1702	1765	1728	1702	1379	1781	1777	1784	1728	1777	1389
Q Serve(g_s), s	41.0	13.6	13.8	5.7	18.4	20.7	4.4	6.9	7.1	36.3	8.3	16.2
Cycle Q Clear(g_c), s	41.0	13.6	13.8	5.7	18.4	20.7	4.4	6.9	7.1	36.3	8.3	16.2
Prop In Lane	1.00		0.33	1.00		1.00	1.00		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	965	1493	774	191	1096	1313	70	150	150	894	1078	1622
V/C Ratio(X)	1.05	0.32	0.33	0.71	0.64	0.44	0.77	0.58	0.60	0.97	0.25	0.36
Avail Cap(c_a), veh/h	965	1493	774	965	1530	1548	461	520	522	894	1078	1622
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.9	27.0	27.0	68.2	52.5	25.8	69.9	64.7	64.9	53.8	38.5	16.2
Incr Delay (d2), s/veh	42.4	0.1	0.2	4.9	0.6	0.2	15.8	3.5	3.8	22.2	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	23.4	5.6	6.0	2.7	8.0	6.9	2.3	3.3	3.4	18.5	3.7	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	95.3	27.1	27.3	73.1	53.1	26.1	85.6	68.2	68.6	76.0	38.6	16.3
LnGrp LOS	F	C	C	E	D	C	F	E	E	E	D	B
Approach Vol, veh/h		1746			1419			230			1711	
Approach Delay, s/veh		66.6			43.9			72.5			49.9	
Approach LOS		E			D			E			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	44.0	18.4	14.1	70.4	11.8	50.6	47.0	37.5				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	38.0	43.0	41.0	44.0	38.0	43.0	41.0	44.0				
Max Q Clear Time (g_c+I1), s	38.3	9.1	7.7	15.8	6.4	18.2	43.0	22.7				
Green Ext Time (p_c), s	0.0	1.0	0.5	5.3	0.1	4.4	0.0	7.8				
Intersection Summary												
HCM 6th Ctrl Delay			55.0									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	130	55	155	105	305	25	950	110	310	1195	20
Future Volume (veh/h)	25	130	55	155	105	305	25	950	110	310	1195	20
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	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	27	141	44	168	114	54	27	1033	107	337	1299	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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	364	384	120	317	527	441	39	1436	149	378	2565	41
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.02	0.31	0.31	0.21	0.50	0.50
Sat Flow, veh/h	1207	1363	425	1189	1870	1566	1781	4701	486	1781	5176	84
Grp Volume(v), veh/h	27	0	185	168	114	54	27	748	392	337	854	466
Grp Sat Flow(s),veh/h/ln	1207	0	1788	1189	1870	1566	1781	1702	1783	1781	1702	1855
Q Serve(g_s), s	1.6	0.0	7.4	11.8	4.2	2.3	1.3	17.5	17.6	16.5	15.1	15.1
Cycle Q Clear(g_c), s	5.7	0.0	7.4	19.2	4.2	2.3	1.3	17.5	17.6	16.5	15.1	15.1
Prop In Lane	1.00		0.24	1.00		1.00	1.00		0.27	1.00		0.05
Lane Grp Cap(c), veh/h	364	0	504	317	527	441	39	1040	545	378	1687	920
V/C Ratio(X)	0.07	0.00	0.37	0.53	0.22	0.12	0.69	0.72	0.72	0.89	0.51	0.51
Avail Cap(c_a), veh/h	482	0	678	433	709	594	477	1481	776	477	1687	920
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.8	0.0	25.8	33.5	24.6	23.9	43.5	27.7	27.7	34.3	15.2	15.2
Incr Delay (d2), s/veh	0.1	0.0	0.4	1.4	0.2	0.1	19.8	1.0	1.9	16.0	0.2	0.5
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	0.5	0.0	3.2	3.5	1.9	0.9	0.8	7.0	7.5	8.6	5.6	6.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.9	0.0	26.2	34.9	24.8	24.1	63.4	28.7	29.6	50.4	15.5	15.7
LnGrp LOS	C	A	C	C	C	C	E	C	C	D	B	B
Approach Vol, veh/h		212			336			1167			1657	
Approach Delay, s/veh		26.3			29.7			29.8			22.6	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	25.0	33.4		31.2	8.0	50.4		31.2
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0
Max Green Setting (Gmax), s	24.0	39.0		34.0	24.0	39.0		34.0
Max Q Clear Time (g_c+I1), s	18.5	19.6		21.2	3.3	17.1		9.4
Green Ext Time (p_c), s	0.5	7.8		1.2	0.0	9.7		1.2

Intersection Summary			
HCM 6th Ctrl Delay			26.0
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	8.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	5	5	125	5	5	175
Future Vol, veh/h	5	5	125	5	5	175
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	5	5	136	5	5	190

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	10	0	285	8
Stage 1	-	-	-	-	8	-
Stage 2	-	-	-	-	277	-
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	-	-	1610	-	705	1074
Stage 1	-	-	-	-	1015	-
Stage 2	-	-	-	-	770	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1610	-	645	1074
Mov Cap-2 Maneuver	-	-	-	-	645	-
Stage 1	-	-	-	-	929	-
Stage 2	-	-	-	-	770	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		7.2		9.2	
HCM LOS					A	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1055	-	-	1610	-
HCM Lane V/C Ratio	0.185	-	-	0.084	-
HCM Control Delay (s)	9.2	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.3	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	140	675	0	0	500	35	5	10	0	20	0	105
Future Vol, veh/h	140	675	0	0	500	35	5	10	0	20	0	105
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	152	734	0	0	543	38	5	11	0	22	0	114

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	581	0	0	734	0	0	1658	1619	734	1606	1600	563
Stage 1	-	-	-	-	-	-	1038	1038	-	562	562	-
Stage 2	-	-	-	-	-	-	620	581	-	1044	1038	-
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	993	-	-	871	-	-	78	103	420	85	106	526
Stage 1	-	-	-	-	-	-	279	308	-	512	510	-
Stage 2	-	-	-	-	-	-	476	500	-	277	308	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	993	-	-	871	-	-	49	76	420	61	79	526
Mov Cap-2 Maneuver	-	-	-	-	-	-	49	76	-	61	79	-
Stage 1	-	-	-	-	-	-	207	229	-	380	510	-
Stage 2	-	-	-	-	-	-	372	500	-	196	229	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	0	79.5	38.8
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	64	993	-	-	871	-	-	237
HCM Lane V/C Ratio	0.255	0.153	-	-	-	-	-	0.573
HCM Control Delay (s)	79.5	9.3	0	-	0	-	-	38.8
HCM Lane LOS	F	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0.9	0.5	-	-	0	-	-	3.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	835	15	10	565	5	20
Future Vol, veh/h	835	15	10	565	5	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	-	-	50	-	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	908	16	11	614	5	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	924	0	1552	916
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	636	-
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	-	-	739	-	125	330
Stage 1	-	-	-	-	390	-
Stage 2	-	-	-	-	527	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	739	-	123	330
Mov Cap-2 Maneuver	-	-	-	-	123	-
Stage 1	-	-	-	-	384	-
Stage 2	-	-	-	-	527	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	21.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	247	-	-	739	-
HCM Lane V/C Ratio	0.11	-	-	0.015	-
HCM Control Delay (s)	21.4	-	-	9.9	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.4	-	-	0	-

Intersection						
Int Delay, s/veh	0.8					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	845	550	20	20	20
Future Vol, veh/h	10	845	550	20	20	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	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	918	598	22	22	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	620	0	-	0	1538	598
Stage 1	-	-	-	-	598	-
Stage 2	-	-	-	-	940	-
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	960	-	-	-	127	502
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	380	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	960	-	-	-	124	502
Mov Cap-2 Maneuver	-	-	-	-	124	-
Stage 1	-	-	-	-	536	-
Stage 2	-	-	-	-	380	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	28.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	960	-	-	-	199
HCM Lane V/C Ratio	0.011	-	-	-	0.218
HCM Control Delay (s)	8.8	0	-	-	28.1
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.8

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	710	495	0	5	5
Future Vol, veh/h	5	710	495	0	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	50	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	5	772	538	0	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	538	0	-	0	1320	269
Stage 1	-	-	-	-	538	-
Stage 2	-	-	-	-	782	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1028	-	-	-	160	730
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	450	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1028	-	-	-	159	730
Mov Cap-2 Maneuver	-	-	-	-	159	-
Stage 1	-	-	-	-	547	-
Stage 2	-	-	-	-	450	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	19.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1028	-	-	-	261
HCM Lane V/C Ratio	0.005	-	-	-	0.042
HCM Control Delay (s)	8.5	-	-	-	19.4
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	25.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	810	45	245	505	0	70	0	305	0	0	0
Future Vol, veh/h	0	810	45	245	505	0	70	0	305	0	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	880	49	266	549	0	76	0	332	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	549	0	0	930	0	0	1713	1987	466	1521	2011	275
Stage 1	-	-	-	-	-	-	906	906	-	1081	1081	-
Stage 2	-	-	-	-	-	-	807	1081	-	440	930	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1017	-	-	731	-	-	~ 58	60	543	81	58	722
Stage 1	-	-	-	-	-	-	297	353	-	232	292	-
Stage 2	-	-	-	-	-	-	341	292	-	566	344	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1017	-	-	730	-	-	~ 42	38	543	23	37	722
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 42	38	-	23	37	-
Stage 1	-	-	-	-	-	-	297	353	-	232	186	-
Stage 2	-	-	-	-	-	-	217	186	-	220	344	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	4.2	128.5	0
HCM LOS			F	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	42	543	1017	-	-	730	-	-	-
HCM Lane V/C Ratio	1.812	0.611	-	-	-	0.365	-	-	-
HCM Control Delay (s)	$ 594.6	21.5	0	-	-	12.7	-	-	0
HCM Lane LOS	F	C	A	-	-	B	-	-	A
HCM 95th %tile Q(veh)	7.9	4.1	0	-	-	1.7	-	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	405	575	160	310	265	320	695	80	185	890	115
Future Volume (veh/h)	170	405	575	160	310	265	320	695	80	185	890	115
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	440	375	174	337	60	348	755	21	201	967	45
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	212	501	425	201	490	415	417	1076	478	230	1105	487
Arrive On Green	0.12	0.27	0.27	0.11	0.26	0.26	0.12	0.30	0.30	0.13	0.31	0.31
Sat Flow, veh/h	1781	1870	1585	1781	1870	1583	3456	3554	1579	1781	3554	1565
Grp Volume(v), veh/h	185	440	375	174	337	60	348	755	21	201	967	45
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1583	1728	1777	1579	1781	1777	1565
Q Serve(g_s), s	13.1	28.9	29.1	12.3	20.8	3.7	12.6	24.1	1.2	14.2	33.0	2.6
Cycle Q Clear(g_c), s	13.1	28.9	29.1	12.3	20.8	3.7	12.6	24.1	1.2	14.2	33.0	2.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	212	501	425	201	490	415	417	1076	478	230	1105	487
V/C Ratio(X)	0.87	0.88	0.88	0.86	0.69	0.14	0.83	0.70	0.04	0.88	0.88	0.09
Avail Cap(c_a), veh/h	278	613	519	278	613	519	647	1248	554	334	1248	550
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.5	44.9	45.0	55.9	42.6	36.3	55.1	39.5	31.6	54.8	41.8	31.3
Incr Delay (d2), s/veh	20.3	11.8	14.2	18.1	2.3	0.2	5.5	1.5	0.0	16.1	6.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.1	15.0	13.1	6.5	9.9	1.5	5.8	10.7	0.5	7.4	15.4	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.8	56.8	59.2	74.0	44.9	36.4	60.6	41.0	31.6	71.0	48.4	31.4
LnGrp LOS	E	E	E	E	D	D	E	D	C	E	D	C
Approach Vol, veh/h		1000			571			1124			1213	
Approach Delay, s/veh		61.2			52.9			46.9			51.5	
Approach LOS		E			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	22.5	44.8	20.5	40.3	21.5	45.8	21.3	39.6
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	24.0	45.0	20.0	42.0	24.0	45.0	20.0	42.0
Max Q Clear Time (g_c+I1), s	16.2	26.1	14.3	31.1	14.6	35.0	15.1	22.8
Green Ext Time (p_c), s	0.3	5.2	0.2	3.2	0.9	4.8	0.2	2.1

Intersection Summary			
HCM 6th Ctrl Delay			52.9
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	330	235	205	15	240	155	185	1035	15	390	1625	400
Future Volume (veh/h)	330	235	205	15	240	155	185	1035	15	390	1625	400
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	359	255	157	16	261	52	201	1125	6	424	1766	297
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	578	303	246	277	291	434	267	2424	736	487	2748	830
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.08	0.47	0.47	0.14	0.54	0.53
Sat Flow, veh/h	3563	1870	1515	1781	1870	2790	3456	5106	1578	3456	5106	1566
Grp Volume(v), veh/h	359	255	157	16	261	52	201	1125	6	424	1766	297
Grp Sat Flow(s),veh/h/ln	1781	1870	1515	1781	1870	1395	1728	1702	1578	1728	1702	1566
Q Serve(g_s), s	22.5	31.7	23.3	1.8	32.9	3.8	13.7	35.6	0.5	28.8	58.6	26.4
Cycle Q Clear(g_c), s	22.5	31.7	23.3	1.8	32.9	3.8	13.7	35.6	0.5	28.8	58.6	26.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	578	303	246	277	291	434	267	2424	736	487	2748	830
V/C Ratio(X)	0.62	0.84	0.64	0.06	0.90	0.12	0.75	0.46	0.01	0.87	0.64	0.36
Avail Cap(c_a), veh/h	623	327	265	289	304	453	446	2424	736	533	2748	830
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)	0.56	0.56	0.56	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	93.7	97.5	94.0	86.3	99.4	87.2	108.5	42.5	34.3	101.0	39.1	32.7
Incr Delay (d2), s/veh	1.5	11.5	4.0	0.2	28.2	0.3	4.3	0.6	0.0	13.7	1.2	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.7	16.6	9.5	0.9	18.5	1.4	6.4	15.5	0.2	14.0	25.2	10.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	95.2	109.1	98.0	86.5	127.6	87.4	112.8	43.1	34.3	114.7	40.3	33.9
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		771			329			1332			2487	
Approach Delay, s/veh		100.4			119.3			53.6			52.2	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	37.8	117.9		42.9	22.5	133.2		41.4				
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	35.0	103.0		40.0	29.0	109.0		37.0				
Max Q Clear Time (g_c+I1), s	30.8	37.6		33.7	15.7	60.6		34.9				
Green Ext Time (p_c), s	1.0	44.5		3.2	0.9	46.9		0.5				

Intersection Summary			
HCM 6th Ctrl Delay			64.6
HCM 6th LOS			E

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)	340	50	175	35	30	30	125	1720	60	40	3010	620
Future Volume (veh/h)	340	50	175	35	30	30	125	1720	60	40	3010	620
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	409	0	98	38	33	1	136	1870	40	43	3272	382
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	507	0	215	46	40	89	155	3514	1080	69	3225	974
Arrive On Green	0.14	0.00	0.14	0.06	0.05	0.06	0.09	0.69	0.68	0.08	1.00	1.00
Sat Flow, veh/h	3563	0	1512	975	847	1585	1781	5106	1578	1781	5106	1563
Grp Volume(v), veh/h	409	0	98	71	0	1	136	1870	40	43	3272	382
Grp Sat Flow(s),veh/h/ln	1781	0	1512	1822	0	1585	1781	1702	1578	1781	1702	1563
Q Serve(g_s), s	26.7	0.0	14.3	9.3	0.0	0.1	18.1	43.2	2.0	5.6	151.6	0.0
Cycle Q Clear(g_c), s	26.7	0.0	14.3	9.3	0.0	0.1	18.1	43.2	2.0	5.6	151.6	0.0
Prop In Lane	1.00		1.00	0.54		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	507	0	215	87	0	89	155	3514	1080	69	3225	974
V/C Ratio(X)	0.81	0.00	0.46	0.82	0.00	0.01	0.88	0.53	0.04	0.63	1.01	0.39
Avail Cap(c_a), veh/h	609	0	258	197	0	185	289	3514	1080	163	3225	974
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.7	0.0	94.4	112.7	0.0	107.0	108.3	18.4	12.3	109.1	0.0	0.0
Incr Delay (d2), s/veh	7.4	0.0	2.1	16.9	0.0	0.1	26.3	0.6	0.1	8.4	19.1	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.1	0.0	5.8	4.9	0.0	0.1	9.6	17.6	0.8	2.7	5.7	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	107.1	0.0	96.5	129.7	0.0	107.1	134.6	19.0	12.4	117.5	19.1	1.1
LnGrp LOS	F	A	F	F	A	F	F	B	B	F	F	A
Approach Vol, veh/h		507			72			2046			3697	
Approach Delay, s/veh		105.1			129.4			26.5			18.3	
Approach LOS		F			F			C			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.2	170.2		39.2	26.9	156.6		17.4				
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	20.0	129.0		41.0	39.0	110.0		26.0				
Max Q Clear Time (g_c+I1), s	17.6	45.2		28.7	20.1	153.6		11.3				
Green Ext Time (p_c), s	0.1	57.9		2.3	0.7	0.0		0.2				

Intersection Summary			
HCM 6th Ctrl Delay			29.2
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1110	745	10	15	5
Future Vol, veh/h	5	1110	745	10	15	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	1207	810	11	16	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	821	0	-	0	2033	411
Stage 1	-	-	-	-	816	-
Stage 2	-	-	-	-	1217	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	806	-	-	-	56	591
Stage 1	-	-	-	-	396	-
Stage 2	-	-	-	-	279	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	806	-	-	-	56	591
Mov Cap-2 Maneuver	-	-	-	-	56	-
Stage 1	-	-	-	-	394	-
Stage 2	-	-	-	-	279	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	75.3
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	806	-	-	-	72
HCM Lane V/C Ratio	0.007	-	-	-	0.302
HCM Control Delay (s)	9.5	-	-	-	75.3
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	1.1

Intersection	
Int Delay, s/veh	26.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	695	530	75	170	25
Future Vol, veh/h	10	695	530	75	170	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	755	576	82	185	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	658	0	-	0	1394	617
Stage 1	-	-	-	-	617	-
Stage 2	-	-	-	-	777	-
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	930	-	-	-	~ 156	490
Stage 1	-	-	-	-	538	-
Stage 2	-	-	-	-	453	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	930	-	-	-	~ 154	490
Mov Cap-2 Maneuver	-	-	-	-	~ 154	-
Stage 1	-	-	-	-	532	-
Stage 2	-	-	-	-	453	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	207.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	930	-	-	-	169
HCM Lane V/C Ratio	0.012	-	-	-	1.254
HCM Control Delay (s)	8.9	-	-	-	207.2
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	12

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection						
Int Delay, s/veh	0					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	175	0	0	130	0	0
Future Vol, veh/h	175	0	0	130	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	-	-	150	-	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	190	0	0	141	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	190	0	331	190
Stage 1	-	-	-	-	190	-
Stage 2	-	-	-	-	141	-
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	-	-	1384	-	664	852
Stage 1	-	-	-	-	842	-
Stage 2	-	-	-	-	886	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1384	-	664	852
Mov Cap-2 Maneuver	-	-	-	-	664	-
Stage 1	-	-	-	-	842	-
Stage 2	-	-	-	-	886	-

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)	-	-	-	1384	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Roosevelt Avenue Access Only PM Peak Queuing Analysis

Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	WB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	31	38	40	64
Average Queue (ft)	3	2	3	18
95th Queue (ft)	17	16	19	50
Link Distance (ft)		859	859	237
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	0			
Queuing Penalty (veh)	0			

Intersection: 13: Roosevelt Ave & Honouliuli Drwy 4

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	31	293
Average Queue (ft)	5	124
95th Queue (ft)	23	243
Link Distance (ft)		327
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Network Summary

Network wide Queuing Penalty: 0

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Renton Road Access Only AM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	655	405	20	15	805	775	10	35	5	460	75	470
Future Volume (veh/h)	655	405	20	15	805	775	10	35	5	460	75	470
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		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	712	440	20	16	875	842	11	38	1	500	82	310
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	828	2708	122	49	1610	1349	19	177	5	582	739	1245
Arrive On Green	0.24	0.54	0.54	0.01	0.32	0.32	0.01	0.05	0.05	0.17	0.21	0.21
Sat Flow, veh/h	3456	5007	226	3456	5106	2790	1781	3537	93	3456	3554	2774
Grp Volume(v), veh/h	712	298	162	16	875	842	11	19	20	500	82	310
Grp Sat Flow(s),veh/h/ln	1728	1702	1829	1728	1702	1395	1781	1777	1853	1728	1777	1387
Q Serve(g_s), s	20.9	4.7	4.7	0.5	15.0	23.6	0.7	1.1	1.1	14.9	2.0	7.4
Cycle Q Clear(g_c), s	20.9	4.7	4.7	0.5	15.0	23.6	0.7	1.1	1.1	14.9	2.0	7.4
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.05	1.00		1.00
Lane Grp Cap(c), veh/h	828	1841	989	49	1610	1349	19	89	93	582	739	1245
V/C Ratio(X)	0.86	0.16	0.16	0.33	0.54	0.62	0.59	0.21	0.22	0.86	0.11	0.25
Avail Cap(c_a), veh/h	1240	1841	989	1240	1833	1471	202	638	665	718	1611	1926
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.5	12.2	12.2	51.7	29.9	20.2	52.2	48.3	48.3	42.8	34.0	18.2
Incr Delay (d2), s/veh	4.2	0.0	0.1	3.8	0.3	0.7	26.5	1.2	1.1	8.7	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.2	1.7	1.9	0.2	6.1	7.5	0.4	0.5	0.5	7.0	0.9	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.7	12.3	12.3	55.5	30.2	20.9	78.6	49.5	49.4	51.5	34.1	18.3
LnGrp LOS	D	B	B	E	C	C	E	D	D	D	C	B
Approach Vol, veh/h		1172			1733			50			892	
Approach Delay, s/veh		30.8			26.0			55.9			38.4	
Approach LOS		C			C			E			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	23.8	11.3	7.5	63.3	7.1	28.0	31.4	39.4				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	22.0	38.0	38.0	38.0	12.0	48.0	38.0	38.0				
Max Q Clear Time (g_c+I1), s	16.9	3.1	2.5	6.7	2.7	9.4	22.9	25.6				
Green Ext Time (p_c), s	0.9	0.2	0.0	3.1	0.0	1.9	2.5	7.6				
Intersection Summary												
HCM 6th Ctrl Delay			30.7									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	65	20	245	210	315	115	1295	45	205	595	50
Future Volume (veh/h)	20	65	20	245	210	315	115	1295	45	205	595	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	22	71	15	266	228	107	125	1408	47	223	647	46
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	264	429	91	394	538	448	157	2005	67	260	2205	156
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.09	0.40	0.40	0.15	0.45	0.45
Sat Flow, veh/h	1036	1492	315	1293	1870	1559	1781	5075	169	1781	4869	344
Grp Volume(v), veh/h	22	0	86	266	228	107	125	945	510	223	451	242
Grp Sat Flow(s),veh/h/ln	1036	0	1807	1293	1870	1559	1781	1702	1840	1781	1702	1808
Q Serve(g_s), s	1.8	0.0	3.7	20.3	10.4	5.5	7.2	24.4	24.4	12.8	8.8	8.9
Cycle Q Clear(g_c), s	12.2	0.0	3.7	24.1	10.4	5.5	7.2	24.4	24.4	12.8	8.8	8.9
Prop In Lane	1.00		0.17	1.00		1.00	1.00		0.09	1.00		0.19
Lane Grp Cap(c), veh/h	264	0	519	394	538	448	157	1345	727	260	1542	819
V/C Ratio(X)	0.08	0.00	0.17	0.67	0.42	0.24	0.80	0.70	0.70	0.86	0.29	0.30
Avail Cap(c_a), veh/h	302	0	585	441	606	505	492	2561	1384	492	2561	1361
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.3	0.0	28.0	37.0	30.4	28.6	46.9	26.6	26.6	43.8	18.1	18.1
Incr Delay (d2), s/veh	0.1	0.0	0.1	3.5	0.5	0.3	8.8	0.7	1.2	8.0	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.7	6.8	4.8	0.0	3.6	9.8	10.7	6.2	3.4	3.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.5	0.0	28.1	40.5	30.9	28.9	55.7	27.3	27.8	51.7	18.2	18.3
LnGrp LOS	D	A	C	D	C	C	E	C	C	D	B	B
Approach Vol, veh/h		108			601			1580			916	
Approach Delay, s/veh		29.6			34.8			29.7			26.4	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	21.3	47.5		36.2	15.3	53.6		36.2
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0
Max Green Setting (Gmax), s	29.0	79.0		34.0	29.0	79.0		34.0
Max Q Clear Time (g_c+I1), s	14.8	26.4		26.1	9.2	10.9		14.2
Green Ext Time (p_c), s	0.5	15.1		1.8	0.3	5.3		0.5

Intersection Summary		
HCM 6th Ctrl Delay		29.7
HCM 6th LOS		C

Intersection	
Int Delay, s/veh	7.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	5	170	5	5	90
Future Vol, veh/h	0	5	170	5	5	90
Conflicting Peds, #/hr	0	1	1	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	5	185	5	5	98

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	6	0	379	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	375	-
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	-	-	1615	-	623	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	695	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1614	-	551	1079
Mov Cap-2 Maneuver	-	-	-	-	551	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	695	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		7.3		8.9	
HCM LOS					A	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1027	-	-	1614	-
HCM Lane V/C Ratio	0.101	-	-	0.114	-
HCM Control Delay (s)	8.9	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	65	410	5	5	655	20	0	0	0	20	5	150
Future Vol, veh/h	65	410	5	5	655	20	0	0	0	20	5	150
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	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	71	446	5	5	712	22	0	0	0	22	5	163

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	735	0	0	451	0	0	1408	1336	449	1325	1327	724
Stage 1	-	-	-	-	-	-	591	591	-	734	734	-
Stage 2	-	-	-	-	-	-	817	745	-	591	593	-
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	870	-	-	1109	-	-	116	153	610	133	155	426
Stage 1	-	-	-	-	-	-	493	494	-	412	426	-
Stage 2	-	-	-	-	-	-	370	421	-	493	493	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	869	-	-	1109	-	-	63	135	610	121	137	426
Mov Cap-2 Maneuver	-	-	-	-	-	-	63	135	-	121	137	-
Stage 1	-	-	-	-	-	-	439	440	-	367	422	-
Stage 2	-	-	-	-	-	-	224	417	-	439	439	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	0.1	0	32.2
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	869	-	-	1109	-	-	316
HCM Lane V/C Ratio	-	0.081	-	-	0.005	-	-	0.602
HCM Control Delay (s)	0	9.5	0	-	8.3	0	-	32.2
HCM Lane LOS	A	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	-	0.3	-	-	0	-	-	3.7

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	400	15	25	690	5	5
Future Vol, veh/h	400	15	25	690	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	435	16	27	750	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	451	0	1247	443
Stage 1	-	-	-	-	443	-
Stage 2	-	-	-	-	804	-
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	-	-	1109	-	192	615
Stage 1	-	-	-	-	647	-
Stage 2	-	-	-	-	440	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1109	-	187	615
Mov Cap-2 Maneuver	-	-	-	-	187	-
Stage 1	-	-	-	-	631	-
Stage 2	-	-	-	-	440	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	18
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	287	-	-	1109	-
HCM Lane V/C Ratio	0.038	-	-	0.025	-
HCM Control Delay (s)	18	-	-	8.3	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	400	685	5	5	10
Future Vol, veh/h	10	400	685	5	5	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	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	435	745	5	5	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	750	0	-	0	1202	745
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	457	-
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	859	-	-	-	204	414
Stage 1	-	-	-	-	469	-
Stage 2	-	-	-	-	638	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	859	-	-	-	201	414
Mov Cap-2 Maneuver	-	-	-	-	201	-
Stage 1	-	-	-	-	461	-
Stage 2	-	-	-	-	638	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	17.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	859	-	-	-	306
HCM Lane V/C Ratio	0.013	-	-	-	0.053
HCM Control Delay (s)	9.2	0	-	-	17.4
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	385	695	20	10	10
Future Vol, veh/h	10	385	695	20	10	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	50	-	-	50	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	418	755	22	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	777	0	-	0	1195	378
Stage 1	-	-	-	-	755	-
Stage 2	-	-	-	-	440	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	837	-	-	-	192	621
Stage 1	-	-	-	-	426	-
Stage 2	-	-	-	-	648	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	837	-	-	-	190	621
Mov Cap-2 Maneuver	-	-	-	-	190	-
Stage 1	-	-	-	-	420	-
Stage 2	-	-	-	-	648	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	18.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	837	-	-	-	291
HCM Lane V/C Ratio	0.013	-	-	-	0.075
HCM Control Delay (s)	9.4	-	-	-	18.4
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection												
Int Delay, s/veh	7.9											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	330	75	285	670	5	55	0	265	5	0	0
Future Vol, veh/h	0	330	75	285	670	5	55	0	265	5	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	359	82	310	728	5	60	0	288	5	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	733	0	0	441	0	0	1384	1753	221	1531	1792	367
Stage 1	-	-	-	-	-	-	400	400	-	1351	1351	-
Stage 2	-	-	-	-	-	-	984	1353	-	180	441	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	868	-	-	1115	-	-	103	84	783	80	80	630
Stage 1	-	-	-	-	-	-	597	600	-	158	217	-
Stage 2	-	-	-	-	-	-	267	216	-	804	575	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	868	-	-	1115	-	-	81	61	783	40	58	630
Mov Cap-2 Maneuver	-	-	-	-	-	-	81	61	-	40	58	-
Stage 1	-	-	-	-	-	-	597	600	-	158	157	-
Stage 2	-	-	-	-	-	-	193	156	-	508	575	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.8	31.7	108.7
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	81	783	868	-	-	1115	-	-	40
HCM Lane V/C Ratio	0.738	0.368	-	-	-	0.278	-	-	0.136
HCM Control Delay (s)	125.5	12.2	0	-	-	9.5	-	-	108.7
HCM Lane LOS	F	B	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	3.6	1.7	0	-	-	1.1	-	-	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	200	285	90	400	365	415	1020	125	105	725	145
Future Volume (veh/h)	85	200	285	90	400	365	415	1020	125	105	725	145
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		1.00	1.00		0.95	1.00		0.98
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	92	217	76	98	435	212	451	1109	68	114	788	51
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	116	503	421	123	510	431	527	1355	572	140	1093	479
Arrive On Green	0.07	0.27	0.27	0.07	0.27	0.27	0.15	0.38	0.38	0.08	0.31	0.31
Sat Flow, veh/h	1781	1870	1567	1781	1870	1582	3456	3554	1501	1781	3554	1557
Grp Volume(v), veh/h	92	217	76	98	435	212	451	1109	68	114	788	51
Grp Sat Flow(s),veh/h/ln	1781	1870	1567	1781	1870	1582	1728	1777	1501	1781	1777	1557
Q Serve(g_s), s	6.0	11.4	4.4	6.4	26.2	13.4	15.1	33.3	3.5	7.5	23.4	2.8
Cycle Q Clear(g_c), s	6.0	11.4	4.4	6.4	26.2	13.4	15.1	33.3	3.5	7.5	23.4	2.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	116	503	421	123	510	431	527	1355	572	140	1093	479
V/C Ratio(X)	0.79	0.43	0.18	0.80	0.85	0.49	0.86	0.82	0.12	0.81	0.72	0.11
Avail Cap(c_a), veh/h	210	693	581	210	693	586	699	1916	809	210	1616	708
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.7	35.9	33.4	54.4	40.9	36.3	49.0	33.0	23.8	53.8	36.6	29.4
Incr Delay (d2), s/veh	11.4	0.6	0.2	11.1	7.6	0.9	8.0	2.0	0.1	13.6	0.9	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	5.3	1.7	3.3	13.0	5.3	7.1	14.5	1.3	3.9	10.2	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.1	36.5	33.6	65.6	48.6	37.1	57.1	35.0	23.9	67.4	37.5	29.5
LnGrp LOS	E	D	C	E	D	D	E	D	C	E	D	C
Approach Vol, veh/h		385			745			1628			953	
Approach Delay, s/veh		43.0			47.6			40.7			40.6	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.3	51.3	14.2	37.9	24.1	42.5	13.7	38.4
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	64.0	14.0	44.0	24.0	54.0	14.0	44.0
Max Q Clear Time (g_c+I1), s	9.5	35.3	8.4	13.4	17.1	25.4	8.0	28.2
Green Ext Time (p_c), s	0.1	9.9	0.1	1.6	1.0	6.4	0.1	3.2

Intersection Summary			
HCM 6th Ctrl Delay			42.3
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	315	140	175	35	300	270	245	1170	40	255	1000	210
Future Volume (veh/h)	315	140	175	35	300	270	245	1170	40	255	1000	210
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	342	152	99	38	326	135	266	1272	18	277	1087	115
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	492	258	204	337	354	528	337	2593	784	339	2596	785
Arrive On Green	0.14	0.14	0.14	0.19	0.19	0.19	0.10	0.51	0.50	0.10	0.51	0.50
Sat Flow, veh/h	3563	1870	1478	1781	1870	2790	3456	5106	1569	3456	5106	1570
Grp Volume(v), veh/h	342	152	99	38	326	135	266	1272	18	277	1087	115
Grp Sat Flow(s),veh/h/ln	1781	1870	1478	1781	1870	1395	1728	1702	1569	1728	1702	1570
Q Serve(g_s), s	22.0	18.3	14.8	4.2	41.1	9.9	18.1	39.2	1.4	18.9	31.9	9.5
Cycle Q Clear(g_c), s	22.0	18.3	14.8	4.2	41.1	9.9	18.1	39.2	1.4	18.9	31.9	9.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	492	258	204	337	354	528	337	2593	784	339	2596	785
V/C Ratio(X)	0.70	0.59	0.49	0.11	0.92	0.26	0.79	0.49	0.02	0.82	0.42	0.15
Avail Cap(c_a), veh/h	727	382	302	341	358	535	547	2593	784	403	2596	785
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)	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	98.6	97.1	95.6	80.6	95.5	82.9	105.9	38.7	30.4	106.1	36.8	32.4
Incr Delay (d2), s/veh	3.4	4.1	3.4	0.3	29.2	0.5	4.1	0.7	0.1	10.7	0.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.6	9.3	6.0	2.0	23.1	3.7	8.4	16.9	0.6	9.1	13.8	3.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	102.0	101.1	99.0	80.9	124.7	83.4	110.0	39.4	30.5	116.8	37.3	32.7
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		593			499			1556			1479	
Approach Delay, s/veh		101.3			110.2			51.3			51.9	
Approach LOS		F			F			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	27.5	125.9		37.1	27.4	126.0		49.4
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	26.0	98.0		47.0	36.0	88.0		44.0
Max Q Clear Time (g_c+I1), s	20.9	41.2		24.0	20.1	33.9		43.1
Green Ext Time (p_c), s	0.7	44.8		5.5	1.3	40.0		0.4

Intersection Summary	
HCM 6th Ctrl Delay	65.8
HCM 6th LOS	E

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)	475	5	185	10	15	10	215	2980	15	10	1415	365
Future Volume (veh/h)	475	5	185	10	15	10	215	2980	15	10	1415	365
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.98
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	520	0	111	11	16	1	234	3239	11	11	1538	198
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	565	0	241	15	21	44	256	3673	1130	34	2995	901
Arrive On Green	0.16	0.00	0.16	0.03	0.02	0.03	0.14	0.72	0.72	0.04	1.00	1.00
Sat Flow, veh/h	3563	0	1522	747	1086	1585	1781	5106	1580	1781	5106	1558
Grp Volume(v), veh/h	520	0	111	27	0	1	234	3239	11	11	1538	198
Grp Sat Flow(s),veh/h/ln	1781	0	1522	1833	0	1585	1781	1702	1580	1781	1702	1558
Q Serve(g_s), s	34.5	0.0	15.9	3.5	0.0	0.1	31.1	116.8	0.5	1.4	0.0	0.0
Cycle Q Clear(g_c), s	34.5	0.0	15.9	3.5	0.0	0.1	31.1	116.8	0.5	1.4	0.0	0.0
Prop In Lane	1.00		1.00	0.41		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	565	0	241	36	0	44	256	3673	1130	34	2995	901
V/C Ratio(X)	0.92	0.00	0.46	0.75	0.00	0.02	0.91	0.88	0.01	0.32	0.51	0.22
Avail Cap(c_a), veh/h	609	0	260	199	0	185	371	3673	1130	163	2995	901
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.5	0.0	91.7	116.6	0.0	113.4	101.3	25.8	9.8	113.9	0.0	0.0
Incr Delay (d2), s/veh	19.3	0.0	1.9	26.1	0.0	0.2	26.7	3.4	0.0	5.0	0.6	0.5
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	17.8	0.0	6.5	2.0	0.0	0.1	16.4	47.2	0.2	0.7	0.2	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	118.8	0.0	93.6	142.7	0.0	113.6	128.1	29.3	9.8	118.8	0.6	0.5
LnGrp LOS	F	A	F	F	A	F	F	C	A	F	A	A
Approach Vol, veh/h		631			28			3484			1747	
Approach Delay, s/veh		114.3			141.7			35.9			1.3	
Approach LOS		F			F			D			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	177.6		43.0	40.5	145.8		10.7
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	20.0	129.0		41.0	50.0	99.0		26.0
Max Q Clear Time (g_c+I1), s	3.4	118.8		36.5	33.1	2.0		5.5
Green Ext Time (p_c), s	0.0	10.1		1.5	1.4	52.5		0.1

Intersection Summary			
HCM 6th Ctrl Delay			34.5
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	0.1					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	595	955	5	0	5
Future Vol, veh/h	5	595	955	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	647	1038	5	0	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1043	0	-	0	1698	522
Stage 1	-	-	-	-	1041	-
Stage 2	-	-	-	-	657	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	665	-	-	-	92	500
Stage 1	-	-	-	-	302	-
Stage 2	-	-	-	-	515	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	665	-	-	-	91	500
Mov Cap-2 Maneuver	-	-	-	-	91	-
Stage 1	-	-	-	-	300	-
Stage 2	-	-	-	-	515	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	12.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	665	-	-	-	500
HCM Lane V/C Ratio	0.008	-	-	-	0.011
HCM Control Delay (s)	10.5	-	-	-	12.3
HCM Lane LOS	B	-	-	-	B
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	430	680	0	0	0
Future Vol, veh/h	0	430	680	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	50	-	-	-	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	467	739	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	739	0	-	0	1206	739
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	467	-
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	867	-	-	-	203	417
Stage 1	-	-	-	-	472	-
Stage 2	-	-	-	-	631	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	867	-	-	-	203	417
Mov Cap-2 Maneuver	-	-	-	-	203	-
Stage 1	-	-	-	-	472	-
Stage 2	-	-	-	-	631	-

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)	867	-	-	-	-
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	3.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	90	20	185	170	5	25
Future Vol, veh/h	90	20	185	170	5	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	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	98	22	201	185	5	27

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	120	0	696	109
Stage 1	-	-	-	-	109	-
Stage 2	-	-	-	-	587	-
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	-	-	1468	-	408	945
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	556	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1468	-	352	945
Mov Cap-2 Maneuver	-	-	-	-	352	-
Stage 1	-	-	-	-	791	-
Stage 2	-	-	-	-	556	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.1	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	738	-	-	1468	-
HCM Lane V/C Ratio	0.044	-	-	0.137	-
HCM Control Delay (s)	10.1	-	-	7.8	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Renton Road Access Only AM Peak Queuing Analysis

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Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	31	34
Average Queue (ft)	2	5
95th Queue (ft)	15	24
Link Distance (ft)		244
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 14: Honouliuli Drwy 5 & Renton Rd

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	49	54
Average Queue (ft)	15	20
95th Queue (ft)	44	47
Link Distance (ft)		378
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Renton Road Access Only PM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	930	600	85	125	645	550	50	140	95	805	245	800
Future Volume (veh/h)	930	600	85	125	645	550	50	140	95	805	245	800
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	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	1011	652	83	136	701	598	54	152	24	875	266	581
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	960	2023	255	190	1112	1319	70	259	40	890	1074	1615
Arrive On Green	0.28	0.44	0.44	0.06	0.22	0.22	0.04	0.08	0.08	0.26	0.30	0.30
Sat Flow, veh/h	3456	4591	578	3456	5106	2758	1781	3083	478	3456	3554	2779
Grp Volume(v), veh/h	1011	482	253	136	701	598	54	86	90	875	266	581
Grp Sat Flow(s),veh/h/ln	1728	1702	1765	1728	1702	1379	1781	1777	1784	1728	1777	1389
Q Serve(g_s), s	41.0	13.6	13.8	5.7	18.4	21.4	4.4	6.9	7.1	37.1	8.3	16.4
Cycle Q Clear(g_c), s	41.0	13.6	13.8	5.7	18.4	21.4	4.4	6.9	7.1	37.1	8.3	16.4
Prop In Lane	1.00		0.33	1.00		1.00	1.00		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	960	1500	778	190	1112	1319	70	149	150	890	1074	1615
V/C Ratio(X)	1.05	0.32	0.33	0.71	0.63	0.45	0.77	0.58	0.60	0.98	0.25	0.36
Avail Cap(c_a), veh/h	960	1500	778	960	1523	1541	459	518	520	890	1074	1615
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.3	26.9	27.0	68.6	52.3	25.9	70.2	65.1	65.2	54.4	38.8	16.5
Incr Delay (d2), s/veh	43.9	0.1	0.2	4.9	0.6	0.2	15.8	3.5	3.8	25.9	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	23.6	5.7	6.0	2.7	8.0	7.1	2.3	3.3	3.4	19.3	3.7	5.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	97.2	27.0	27.2	73.5	52.9	26.2	86.0	68.6	68.9	80.4	39.0	16.6
LnGrp LOS	F	C	C	E	D	C	F	E	E	F	D	B
Approach Vol, veh/h		1746			1435			230			1722	
Approach Delay, s/veh		67.7			43.7			72.8			52.5	
Approach LOS		E			D			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	44.0	18.4	14.1	71.0	11.8	50.6	47.0	38.1
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	38.0	43.0	41.0	44.0	38.0	43.0	41.0	44.0
Max Q Clear Time (g_c+I1), s	39.1	9.1	7.7	15.8	6.4	18.4	43.0	23.4
Green Ext Time (p_c), s	0.0	1.0	0.5	5.3	0.1	4.4	0.0	7.8

Intersection Summary	
HCM 6th Ctrl Delay	56.1
HCM 6th LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	210	115	155	140	305	40	930	110	310	1180	45
Future Volume (veh/h)	65	210	115	155	140	305	40	930	110	310	1180	45
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	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	71	228	107	168	152	79	43	1011	106	337	1283	46
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	381	398	187	252	620	520	55	1340	140	370	2337	84
Arrive On Green	0.33	0.33	0.33	0.33	0.33	0.33	0.03	0.29	0.29	0.21	0.46	0.46
Sat Flow, veh/h	1142	1199	563	1040	1870	1569	1781	4695	491	1781	5060	181
Grp Volume(v), veh/h	71	0	335	168	152	79	43	733	384	337	863	466
Grp Sat Flow(s),veh/h/ln	1142	0	1762	1040	1870	1569	1781	1702	1782	1781	1702	1838
Q Serve(g_s), s	4.9	0.0	16.1	16.3	6.1	3.6	2.5	20.1	20.2	19.0	18.7	18.7
Cycle Q Clear(g_c), s	11.0	0.0	16.1	32.4	6.1	3.6	2.5	20.1	20.2	19.0	18.7	18.7
Prop In Lane	1.00		0.32	1.00		1.00	1.00		0.28	1.00		0.10
Lane Grp Cap(c), veh/h	381	0	584	252	620	520	55	971	509	370	1572	849
V/C Ratio(X)	0.19	0.00	0.57	0.67	0.25	0.15	0.77	0.75	0.76	0.91	0.55	0.55
Avail Cap(c_a), veh/h	381	0	584	252	620	520	417	1294	678	417	1572	849
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.0	0.0	28.3	41.7	24.9	24.1	49.3	33.4	33.4	39.7	19.9	19.9
Incr Delay (d2), s/veh	0.2	0.0	1.4	6.6	0.2	0.1	20.1	1.8	3.4	22.4	0.4	0.8
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	1.4	0.0	7.0	4.6	2.7	1.4	1.4	8.4	9.0	10.5	7.3	7.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.2	0.0	29.7	48.2	25.1	24.3	69.4	35.2	36.8	62.1	20.3	20.7
LnGrp LOS	C	A	C	D	C	C	E	D	D	E	C	C
Approach Vol, veh/h		406			399			1160			1666	
Approach Delay, s/veh		29.6			34.7			37.0			28.9	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	27.3	35.3		40.0	9.2	53.4		40.0
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0
Max Green Setting (Gmax), s	24.0	39.0		34.0	24.0	39.0		34.0
Max Q Clear Time (g_c+I1), s	21.0	22.2		34.4	4.5	20.7		18.1
Green Ext Time (p_c), s	0.3	7.1		0.0	0.1	8.9		2.2

Intersection Summary			
HCM 6th Ctrl Delay			32.2
HCM 6th LOS			C

Intersection						
Int Delay, s/veh	8.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	5	5	140	5	5	175
Future Vol, veh/h	5	5	140	5	5	175
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	5	5	152	5	5	190

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	10	0	317	8
Stage 1	-	-	-	-	8	-
Stage 2	-	-	-	-	309	-
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	-	-	1610	-	676	1074
Stage 1	-	-	-	-	1015	-
Stage 2	-	-	-	-	745	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1610	-	612	1074
Mov Cap-2 Maneuver	-	-	-	-	612	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	745	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1052	-	-	1610	-
HCM Lane V/C Ratio	0.186	-	-	0.095	-
HCM Control Delay (s)	9.2	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.3	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	145	665	0	0	485	25	5	10	0	20	0	120
Future Vol, veh/h	145	665	0	0	485	25	5	10	0	20	0	120
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	158	723	0	0	527	27	5	11	0	22	0	130

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	554	0	0	723	0	0	1646	1593	723	1586	1580	542
Stage 1	-	-	-	-	-	-	1039	1039	-	541	541	-
Stage 2	-	-	-	-	-	-	607	554	-	1045	1039	-
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	1016	-	-	879	-	-	79	107	426	87	109	540
Stage 1	-	-	-	-	-	-	279	308	-	525	521	-
Stage 2	-	-	-	-	-	-	483	514	-	276	308	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1016	-	-	879	-	-	48	79	426	63	81	540
Mov Cap-2 Maneuver	-	-	-	-	-	-	48	79	-	63	81	-
Stage 1	-	-	-	-	-	-	206	228	-	389	521	-
Stage 2	-	-	-	-	-	-	366	514	-	195	228	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	0	78	36.9
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	65	1016	-	-	879	-	-	259
HCM Lane V/C Ratio	0.251	0.155	-	-	-	-	-	0.588
HCM Control Delay (s)	78	9.2	0	-	0	-	-	36.9
HCM Lane LOS	F	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0.9	0.5	-	-	0	-	-	3.4

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	675	15	10	490	5	20
Future Vol, veh/h	675	15	10	490	5	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	-	-	50	-	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	734	16	11	533	5	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	750	0	1297	742
Stage 1	-	-	-	-	742	-
Stage 2	-	-	-	-	555	-
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	-	-	859	-	179	416
Stage 1	-	-	-	-	471	-
Stage 2	-	-	-	-	575	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	859	-	177	416
Mov Cap-2 Maneuver	-	-	-	-	177	-
Stage 1	-	-	-	-	465	-
Stage 2	-	-	-	-	575	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	17
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	328	-	-	859	-
HCM Lane V/C Ratio	0.083	-	-	0.013	-
HCM Control Delay (s)	17	-	-	9.2	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	680	480	20	20	20
Future Vol, veh/h	10	680	480	20	20	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	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	739	522	22	22	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	544	0	-	0	1283	522
Stage 1	-	-	-	-	522	-
Stage 2	-	-	-	-	761	-
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	1025	-	-	-	182	555
Stage 1	-	-	-	-	595	-
Stage 2	-	-	-	-	461	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1025	-	-	-	179	555
Mov Cap-2 Maneuver	-	-	-	-	179	-
Stage 1	-	-	-	-	584	-
Stage 2	-	-	-	-	461	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	20.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1025	-	-	-	271
HCM Lane V/C Ratio	0.011	-	-	-	0.16
HCM Control Delay (s)	8.6	0	-	-	20.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	710	495	0	5	5
Future Vol, veh/h	5	710	495	0	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	50	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	5	772	538	0	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	538	0	-	0	1320	269
Stage 1	-	-	-	-	538	-
Stage 2	-	-	-	-	782	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1028	-	-	-	160	730
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	450	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1028	-	-	-	159	730
Mov Cap-2 Maneuver	-	-	-	-	159	-
Stage 1	-	-	-	-	547	-
Stage 2	-	-	-	-	450	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	19.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1028	-	-	-	261
HCM Lane V/C Ratio	0.005	-	-	-	0.042
HCM Control Delay (s)	8.5	-	-	-	19.4
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	15.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	650	45	245	430	0	70	0	305	0	0	0
Future Vol, veh/h	0	650	45	245	430	0	70	0	305	0	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	707	49	266	467	0	76	0	332	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	467	0	0	757	0	0	1499	1732	379	1353	1756	234
Stage 1	-	-	-	-	-	-	733	733	-	999	999	-
Stage 2	-	-	-	-	-	-	766	999	-	354	757	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1091	-	-	850	-	-	84	87	619	108	84	768
Stage 1	-	-	-	-	-	-	378	424	-	261	319	-
Stage 2	-	-	-	-	-	-	361	319	-	636	414	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1091	-	-	849	-	-	~ 64	60	618	38	58	768
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 64	60	-	38	58	-
Stage 1	-	-	-	-	-	-	378	424	-	261	219	-
Stage 2	-	-	-	-	-	-	248	219	-	295	414	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	4.1	66.8	0
HCM LOS			F	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	64	618	1091	-	-	849	-	-	-
HCM Lane V/C Ratio	1.189	0.536	-	-	-	0.314	-	-	-
HCM Control Delay (s)	282.3	17.4	0	-	-	11.2	-	-	0
HCM Lane LOS	F	C	A	-	-	B	-	-	A
HCM 95th %tile Q(veh)	6.2	3.2	0	-	-	1.3	-	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	150	295	525	160	255	265	310	710	80	200	935	100
Future Volume (veh/h)	150	295	525	160	255	265	310	710	80	200	935	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	163	321	299	174	277	52	337	772	22	217	1016	31
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	192	419	355	203	430	364	414	1126	500	249	1195	527
Arrive On Green	0.11	0.22	0.22	0.11	0.23	0.23	0.12	0.32	0.32	0.14	0.34	0.34
Sat Flow, veh/h	1781	1870	1585	1781	1870	1583	3456	3554	1579	1781	3554	1567
Grp Volume(v), veh/h	163	321	299	174	277	52	337	772	22	217	1016	31
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1583	1728	1777	1579	1781	1777	1567
Q Serve(g_s), s	10.5	18.8	21.1	11.2	15.6	3.1	11.1	22.1	1.1	13.9	31.0	1.6
Cycle Q Clear(g_c), s	10.5	18.8	21.1	11.2	15.6	3.1	11.1	22.1	1.1	13.9	31.0	1.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	192	419	355	203	430	364	414	1126	500	249	1195	527
V/C Ratio(X)	0.85	0.77	0.84	0.86	0.64	0.14	0.81	0.69	0.04	0.87	0.85	0.06
Avail Cap(c_a), veh/h	275	673	570	275	673	569	710	1431	636	366	1431	631
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	51.1	42.4	43.3	50.8	40.6	35.8	50.1	34.8	27.6	49.2	36.0	26.2
Incr Delay (d2), s/veh	15.3	3.0	6.3	17.5	1.6	0.2	3.9	1.0	0.0	14.4	4.4	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	5.5	9.0	8.8	6.0	7.4	1.2	5.0	9.7	0.4	7.2	14.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.5	45.4	49.7	68.3	42.2	36.0	54.0	35.8	27.7	63.6	40.4	26.3
LnGrp LOS	E	D	D	E	D	D	D	D	C	E	D	C
Approach Vol, veh/h		783			503			1131			1264	
Approach Delay, s/veh		51.4			50.6			41.1			44.0	
Approach LOS		D			D			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	22.3	43.0	19.3	32.1	20.0	45.3	18.6	32.9				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	24.0	47.0	18.0	42.0	24.0	47.0	18.0	42.0				
Max Q Clear Time (g_c+I1), s	15.9	24.1	13.2	23.1	13.1	33.0	12.5	17.6				
Green Ext Time (p_c), s	0.4	5.7	0.2	2.9	0.9	6.3	0.2	1.8				
Intersection Summary												
HCM 6th Ctrl Delay			45.6									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	235	175	15	240	155	180	1040	15	390	1650	360
Future Volume (veh/h)	260	235	175	15	240	155	180	1040	15	390	1650	360
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	300	231	123	16	261	53	196	1130	6	424	1793	270
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	540	283	229	277	291	434	262	2478	753	487	2810	849
Arrive On Green	0.15	0.15	0.15	0.16	0.16	0.16	0.08	0.49	0.48	0.14	0.55	0.54
Sat Flow, veh/h	3563	1870	1510	1781	1870	2790	3456	5106	1578	3456	5106	1567
Grp Volume(v), veh/h	300	231	123	16	261	53	196	1130	6	424	1793	270
Grp Sat Flow(s),veh/h/ln	1781	1870	1510	1781	1870	1395	1728	1702	1578	1728	1702	1567
Q Serve(g_s), s	18.7	28.7	18.1	1.8	32.9	3.9	13.3	35.1	0.5	28.8	58.4	22.9
Cycle Q Clear(g_c), s	18.7	28.7	18.1	1.8	32.9	3.9	13.3	35.1	0.5	28.8	58.4	22.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	540	283	229	277	291	434	262	2478	753	487	2810	849
V/C Ratio(X)	0.56	0.82	0.54	0.06	0.90	0.12	0.75	0.46	0.01	0.87	0.64	0.32
Avail Cap(c_a), veh/h	623	327	264	289	304	453	446	2478	753	533	2810	849
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)	0.69	0.69	0.69	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	94.3	98.6	94.1	86.3	99.4	87.2	108.7	40.8	33.0	101.0	37.4	30.4
Incr Delay (d2), s/veh	1.3	11.6	2.9	0.2	28.2	0.3	4.3	0.6	0.0	13.7	1.1	1.0
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	8.9	15.1	7.4	0.9	18.5	1.5	6.2	15.2	0.2	14.0	25.0	9.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	95.7	110.2	97.0	86.5	127.6	87.5	112.9	41.4	33.0	114.7	38.5	31.4
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		654			330			1332			2487	
Approach Delay, s/veh		101.0			119.2			51.9			50.7	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	37.8	120.5		40.3	22.2	136.1		41.4				
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	35.0	103.0		40.0	29.0	109.0		37.0				
Max Q Clear Time (g_c+I1), s	30.8	37.1		30.7	15.3	60.4		34.9				
Green Ext Time (p_c), s	1.0	45.0		3.7	0.9	47.1		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			62.6									
HCM 6th LOS			E									

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)	390	50	205	35	30	30	135	1655	60	40	2970	650
Future Volume (veh/h)	390	50	205	35	30	30	135	1655	60	40	2970	650
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	463	0	132	38	33	1	147	1799	40	43	3228	386
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	533	0	227	46	40	89	166	3477	1068	69	3155	953
Arrive On Green	0.15	0.00	0.15	0.06	0.05	0.06	0.09	0.68	0.68	0.08	1.00	1.00
Sat Flow, veh/h	3563	0	1515	975	847	1585	1781	5106	1578	1781	5106	1563
Grp Volume(v), veh/h	463	0	132	71	0	1	147	1799	40	43	3228	386
Grp Sat Flow(s),veh/h/ln	1781	0	1515	1822	0	1585	1781	1702	1578	1781	1702	1563
Q Serve(g_s), s	30.5	0.0	19.5	9.3	0.0	0.1	19.6	41.7	2.0	5.6	148.3	0.0
Cycle Q Clear(g_c), s	30.5	0.0	19.5	9.3	0.0	0.1	19.6	41.7	2.0	5.6	148.3	0.0
Prop In Lane	1.00		1.00	0.54		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	533	0	227	87	0	89	166	3477	1068	69	3155	953
V/C Ratio(X)	0.87	0.00	0.58	0.82	0.00	0.01	0.89	0.52	0.04	0.63	1.02	0.41
Avail Cap(c_a), veh/h	609	0	259	197	0	185	289	3477	1068	163	3155	953
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.7	0.0	95.0	112.7	0.0	107.0	107.6	18.9	12.9	109.1	0.0	0.0
Incr Delay (d2), s/veh	12.3	0.0	3.5	16.9	0.0	0.1	26.2	0.6	0.1	8.4	21.7	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.3	0.0	8.0	4.9	0.0	0.1	10.4	17.0	0.8	2.7	6.3	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	112.0	0.0	98.5	129.7	0.0	107.1	133.8	19.4	12.9	117.5	21.7	1.2
LnGrp LOS	F	A	F	F	A	F	F	B	B	F	F	A
Approach Vol, veh/h		595			72			1986			3657	
Approach Delay, s/veh		109.0			129.4			27.8			20.6	
Approach LOS		F			F			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.2	168.4		40.9	28.4	153.3		17.4				
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	20.0	129.0		41.0	39.0	110.0		26.0				
Max Q Clear Time (g_c+I1), s	7.6	43.7		32.5	21.6	150.3		11.3				
Green Ext Time (p_c), s	0.1	55.7		2.3	0.8	0.0		0.2				
Intersection Summary												
HCM 6th Ctrl Delay			32.4									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	0.2					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	950	670	5	5	5
Future Vol, veh/h	5	950	670	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	1033	728	5	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	733	0	-	0	1774	367
Stage 1	-	-	-	-	731	-
Stage 2	-	-	-	-	1043	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	870	-	-	-	82	631
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	338	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	870	-	-	-	82	631
Mov Cap-2 Maneuver	-	-	-	-	82	-
Stage 1	-	-	-	-	435	-
Stage 2	-	-	-	-	338	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	31.8
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	870	-	-	-	145
HCM Lane V/C Ratio	0.006	-	-	-	0.075
HCM Control Delay (s)	9.2	-	-	-	31.8
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	685	510	0	0	0
Future Vol, veh/h	0	685	510	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	50	-	-	-	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	745	554	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	554	0	-	0	1299	554
Stage 1	-	-	-	-	554	-
Stage 2	-	-	-	-	745	-
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	1016	-	-	-	178	532
Stage 1	-	-	-	-	575	-
Stage 2	-	-	-	-	469	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1016	-	-	-	178	532
Mov Cap-2 Maneuver	-	-	-	-	178	-
Stage 1	-	-	-	-	575	-
Stage 2	-	-	-	-	469	-

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)	1016	-	-	-	-
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	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	175	10	85	145	20	185
Future Vol, veh/h	175	10	85	145	20	185
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	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	190	11	92	158	22	201

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	201	0	538	196
Stage 1	-	-	-	-	196	-
Stage 2	-	-	-	-	342	-
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	-	-	1371	-	504	845
Stage 1	-	-	-	-	837	-
Stage 2	-	-	-	-	719	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1371	-	470	845
Mov Cap-2 Maneuver	-	-	-	-	470	-
Stage 1	-	-	-	-	781	-
Stage 2	-	-	-	-	719	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.9	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	784	-	-	1371	-
HCM Lane V/C Ratio	0.284	-	-	0.067	-
HCM Control Delay (s)	11.4	-	-	7.8	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	1.2	-	-	0.2	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Renton Road Access Only PM Peak Queuing Analysis

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Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	30	31
Average Queue (ft)	3	7
95th Queue (ft)	17	27
Link Distance (ft)		244
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 14: Honouliuli Drwy 5 & Renton Rd

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	55	96
Average Queue (ft)	14	48
95th Queue (ft)	44	81
Link Distance (ft)		378
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Renton Road & Roosevelt Avenue Accesses AM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	655	405	20	15	805	775	10	35	5	460	75	470
Future Volume (veh/h)	655	405	20	15	805	775	10	35	5	460	75	470
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		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	712	440	20	16	875	842	11	38	1	500	82	310
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	828	2708	122	49	1610	1349	19	177	5	582	739	1245
Arrive On Green	0.24	0.54	0.54	0.01	0.32	0.32	0.01	0.05	0.05	0.17	0.21	0.21
Sat Flow, veh/h	3456	5007	226	3456	5106	2790	1781	3537	93	3456	3554	2774
Grp Volume(v), veh/h	712	298	162	16	875	842	11	19	20	500	82	310
Grp Sat Flow(s),veh/h/ln	1728	1702	1829	1728	1702	1395	1781	1777	1853	1728	1777	1387
Q Serve(g_s), s	20.9	4.7	4.7	0.5	15.0	23.6	0.7	1.1	1.1	14.9	2.0	7.4
Cycle Q Clear(g_c), s	20.9	4.7	4.7	0.5	15.0	23.6	0.7	1.1	1.1	14.9	2.0	7.4
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.05	1.00		1.00
Lane Grp Cap(c), veh/h	828	1841	989	49	1610	1349	19	89	93	582	739	1245
V/C Ratio(X)	0.86	0.16	0.16	0.33	0.54	0.62	0.59	0.21	0.22	0.86	0.11	0.25
Avail Cap(c_a), veh/h	1240	1841	989	1240	1833	1471	202	638	665	718	1611	1926
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.5	12.2	12.2	51.7	29.9	20.2	52.2	48.3	48.3	42.8	34.0	18.2
Incr Delay (d2), s/veh	4.2	0.0	0.1	3.8	0.3	0.7	26.5	1.2	1.1	8.7	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.2	1.7	1.9	0.2	6.1	7.5	0.4	0.5	0.5	7.0	0.9	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.7	12.3	12.3	55.5	30.2	20.9	78.6	49.5	49.4	51.5	34.1	18.3
LnGrp LOS	D	B	B	E	C	C	E	D	D	D	C	B
Approach Vol, veh/h		1172			1733			50			892	
Approach Delay, s/veh		30.8			26.0			55.9			38.4	
Approach LOS		C			C			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	23.8	11.3	7.5	63.3	7.1	28.0	31.4	39.4
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	22.0	38.0	38.0	38.0	12.0	48.0	38.0	38.0
Max Q Clear Time (g_c+I1), s	16.9	3.1	2.5	6.7	2.7	9.4	22.9	25.6
Green Ext Time (p_c), s	0.9	0.2	0.0	3.1	0.0	1.9	2.5	7.6

Intersection Summary			
HCM 6th Ctrl Delay			30.7
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	65	15	245	170	315	45	1295	45	205	595	50
Future Volume (veh/h)	20	65	15	245	170	315	45	1295	45	205	595	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	22	71	12	266	185	97	49	1408	47	223	647	47
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	294	444	75	395	534	445	64	2008	67	260	2460	178
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.04	0.40	0.40	0.15	0.51	0.51
Sat Flow, veh/h	1086	1555	263	1297	1870	1558	1781	5075	169	1781	4860	351
Grp Volume(v), veh/h	22	0	83	266	185	97	49	945	510	223	452	242
Grp Sat Flow(s),veh/h/ln	1086	0	1818	1297	1870	1558	1781	1702	1840	1781	1702	1807
Q Serve(g_s), s	1.7	0.0	3.6	20.2	8.2	5.0	2.8	24.2	24.2	12.8	7.9	8.0
Cycle Q Clear(g_c), s	9.9	0.0	3.6	23.7	8.2	5.0	2.8	24.2	24.2	12.8	7.9	8.0
Prop In Lane	1.00		0.14	1.00		1.00	1.00		0.09	1.00		0.19
Lane Grp Cap(c), veh/h	294	0	519	395	534	445	64	1347	728	260	1723	915
V/C Ratio(X)	0.07	0.00	0.16	0.67	0.35	0.22	0.77	0.70	0.70	0.86	0.26	0.26
Avail Cap(c_a), veh/h	337	0	592	447	609	507	495	2574	1391	495	2574	1367
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.5	0.0	27.9	36.8	29.6	28.4	49.9	26.4	26.4	43.5	14.7	14.7
Incr Delay (d2), s/veh	0.1	0.0	0.1	3.4	0.4	0.2	17.2	0.7	1.2	7.9	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.6	6.7	3.8	1.9	1.6	9.7	10.6	6.1	3.0	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.6	0.0	28.1	40.2	30.0	28.7	67.1	27.1	27.6	51.5	14.8	14.9
LnGrp LOS	C	A	C	D	C	C	E	C	C	D	B	B
Approach Vol, veh/h		105			548			1504			917	
Approach Delay, s/veh		29.2			34.7			28.6			23.7	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.3	47.3		35.9	9.7	58.9		35.9				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	29.0	79.0		34.0	29.0	79.0		34.0				
Max Q Clear Time (g_c+I1), s	14.8	26.2		25.7	4.8	10.0		11.9				
Green Ext Time (p_c), s	0.5	15.1		1.6	0.1	5.3		0.5				

Intersection Summary			
HCM 6th Ctrl Delay			28.2
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	7.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	5	165	5	5	75
Future Vol, veh/h	0	5	165	5	5	75
Conflicting Peds, #/hr	0	1	1	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	5	179	5	5	82

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	6	0	367	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	363	-
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	-	-	1615	-	633	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	704	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1614	-	562	1079
Mov Cap-2 Maneuver	-	-	-	-	562	-
Stage 1	-	-	-	-	905	-
Stage 2	-	-	-	-	704	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1020	-	-	1614	-
HCM Lane V/C Ratio	0.085	-	-	0.111	-
HCM Control Delay (s)	8.9	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	55	420	5	5	660	15	0	0	0	20	5	145
Future Vol, veh/h	55	420	5	5	660	15	0	0	0	20	5	145
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	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	60	457	5	5	717	16	0	0	0	22	5	158

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	734	0	0	462	0	0	1397	1324	460	1316	1318	726
Stage 1	-	-	-	-	-	-	580	580	-	736	736	-
Stage 2	-	-	-	-	-	-	817	744	-	580	582	-
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	871	-	-	1099	-	-	118	156	601	135	157	425
Stage 1	-	-	-	-	-	-	500	500	-	411	425	-
Stage 2	-	-	-	-	-	-	370	421	-	500	499	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	870	-	-	1099	-	-	67	140	601	124	141	425
Mov Cap-2 Maneuver	-	-	-	-	-	-	67	140	-	124	141	-
Stage 1	-	-	-	-	-	-	454	454	-	372	421	-
Stage 2	-	-	-	-	-	-	228	417	-	454	453	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.1	0	31.3
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	870	-	-	1099	-	-	316
HCM Lane V/C Ratio	-	0.069	-	-	0.005	-	-	0.585
HCM Control Delay (s)	0	9.4	0	-	8.3	0	-	31.3
HCM Lane LOS	A	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	-	0.2	-	-	0	-	-	3.5

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	405	15	25	790	5	5
Future Vol, veh/h	405	15	25	790	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	440	16	27	859	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	456	0	1361	448
Stage 1	-	-	-	-	448	-
Stage 2	-	-	-	-	913	-
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	-	-	1105	-	163	611
Stage 1	-	-	-	-	644	-
Stage 2	-	-	-	-	391	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1105	-	159	611
Mov Cap-2 Maneuver	-	-	-	-	159	-
Stage 1	-	-	-	-	629	-
Stage 2	-	-	-	-	391	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	19.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	252	-	-	1105	-
HCM Lane V/C Ratio	0.043	-	-	0.025	-
HCM Control Delay (s)	19.9	-	-	8.3	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	405	790	5	5	10
Future Vol, veh/h	10	405	790	5	5	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	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	440	859	5	5	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	864	0	-	0	1321	859
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	462	-
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	779	-	-	-	173	356
Stage 1	-	-	-	-	415	-
Stage 2	-	-	-	-	634	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	779	-	-	-	170	356
Mov Cap-2 Maneuver	-	-	-	-	170	-
Stage 1	-	-	-	-	407	-
Stage 2	-	-	-	-	634	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	19.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	779	-	-	-	261
HCM Lane V/C Ratio	0.014	-	-	-	0.062
HCM Control Delay (s)	9.7	0	-	-	19.7
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	395	800	20	10	10
Future Vol, veh/h	10	395	800	20	10	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	50	-	-	50	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	429	870	22	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	892	0	-	0	1321	435
Stage 1	-	-	-	-	870	-
Stage 2	-	-	-	-	451	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	758	-	-	-	160	570
Stage 1	-	-	-	-	371	-
Stage 2	-	-	-	-	641	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	758	-	-	-	158	570
Mov Cap-2 Maneuver	-	-	-	-	158	-
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	641	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	21
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	758	-	-	-	247
HCM Lane V/C Ratio	0.014	-	-	-	0.088
HCM Control Delay (s)	9.8	-	-	-	21
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	8.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	340	75	285	770	5	55	0	265	5	0	0
Future Vol, veh/h	0	340	75	285	770	5	55	0	265	5	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	370	82	310	837	5	60	0	288	5	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	842	0	0	452	0	0	1450	1873	226	1645	1912	421
Stage 1	-	-	-	-	-	-	411	411	-	1460	1460	-
Stage 2	-	-	-	-	-	-	1039	1462	-	185	452	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	789	-	-	1105	-	-	92	71	777	66	67	581
Stage 1	-	-	-	-	-	-	589	593	-	135	192	-
Stage 2	-	-	-	-	-	-	247	192	-	799	569	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	789	-	-	1105	-	-	72	51	777	33	48	581
Mov Cap-2 Maneuver	-	-	-	-	-	-	72	51	-	33	48	-
Stage 1	-	-	-	-	-	-	589	593	-	135	138	-
Stage 2	-	-	-	-	-	-	178	138	-	503	569	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.6	37.5	134.5
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	72	777	789	-	-	1105	-	-	33
HCM Lane V/C Ratio	0.83	0.371	-	-	-	0.28	-	-	0.165
HCM Control Delay (s)	158.7	12.3	0	-	-	9.5	-	-	134.5
HCM Lane LOS	F	B	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	4	1.7	0	-	-	1.2	-	-	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	205	290	90	460	345	465	970	125	105	725	145
Future Volume (veh/h)	85	205	290	90	460	345	465	970	125	105	725	145
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		1.00	1.00		0.94	1.00		0.98
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	92	223	89	98	500	196	505	1054	66	114	788	47
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	116	550	461	122	557	471	574	1287	542	140	975	426
Arrive On Green	0.06	0.29	0.29	0.07	0.30	0.30	0.17	0.36	0.36	0.08	0.27	0.27
Sat Flow, veh/h	1781	1870	1569	1781	1870	1582	3456	3554	1497	1781	3554	1554
Grp Volume(v), veh/h	92	223	89	98	500	196	505	1054	66	114	788	47
Grp Sat Flow(s),veh/h/ln	1781	1870	1569	1781	1870	1582	1728	1777	1497	1781	1777	1554
Q Serve(g_s), s	6.2	11.7	5.2	6.6	31.3	12.1	17.4	32.8	3.6	7.7	25.2	2.8
Cycle Q Clear(g_c), s	6.2	11.7	5.2	6.6	31.3	12.1	17.4	32.8	3.6	7.7	25.2	2.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	116	550	461	122	557	471	574	1287	542	140	975	426
V/C Ratio(X)	0.79	0.41	0.19	0.80	0.90	0.42	0.88	0.82	0.12	0.82	0.81	0.11
Avail Cap(c_a), veh/h	204	674	565	204	674	570	679	1863	785	204	1571	687
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	56.3	34.5	32.3	56.0	41.1	34.4	49.7	35.3	26.0	55.4	41.3	33.1
Incr Delay (d2), s/veh	11.6	0.5	0.2	11.3	13.1	0.6	11.3	2.0	0.1	14.9	1.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	5.4	2.0	3.4	16.3	4.8	8.4	14.4	1.3	4.0	11.2	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.8	35.0	32.5	67.3	54.2	34.9	61.1	37.3	26.1	70.3	43.0	33.3
LnGrp LOS	E	D	C	E	D	C	E	D	C	E	D	C
Approach Vol, veh/h		404			794			1625			949	
Approach Delay, s/veh		41.9			51.1			44.2			45.8	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.6	50.2	14.4	41.9	26.3	39.5	13.9	42.4
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	64.0	14.0	44.0	24.0	54.0	14.0	44.0
Max Q Clear Time (g_c+I1), s	9.7	34.8	8.6	13.7	19.4	27.2	8.2	33.3
Green Ext Time (p_c), s	0.1	9.4	0.1	1.6	0.9	6.3	0.1	2.9

Intersection Summary	
HCM 6th Ctrl Delay	45.8
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	315	140	180	35	300	270	280	1135	40	255	1000	220
Future Volume (veh/h)	315	140	180	35	300	270	280	1135	40	255	1000	220
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	342	152	105	38	326	135	304	1234	18	277	1087	118
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	492	258	204	337	354	528	375	2593	784	339	2539	767
Arrive On Green	0.14	0.14	0.14	0.19	0.19	0.19	0.11	0.51	0.50	0.10	0.50	0.49
Sat Flow, veh/h	3563	1870	1478	1781	1870	2790	3456	5106	1569	3456	5106	1569
Grp Volume(v), veh/h	342	152	105	38	326	135	304	1234	18	277	1087	118
Grp Sat Flow(s),veh/h/ln	1781	1870	1478	1781	1870	1395	1728	1702	1569	1728	1702	1569
Q Serve(g_s), s	22.0	18.3	15.8	4.2	41.1	9.9	20.6	37.6	1.4	18.9	32.6	10.0
Cycle Q Clear(g_c), s	22.0	18.3	15.8	4.2	41.1	9.9	20.6	37.6	1.4	18.9	32.6	10.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	492	258	204	337	354	528	375	2593	784	339	2539	767
V/C Ratio(X)	0.70	0.59	0.51	0.11	0.92	0.26	0.81	0.48	0.02	0.82	0.43	0.15
Avail Cap(c_a), veh/h	727	382	302	341	358	535	547	2593	784	403	2539	767
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)	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	98.6	97.0	96.0	80.6	95.5	82.9	104.5	38.3	30.4	106.1	38.5	33.9
Incr Delay (d2), s/veh	3.4	4.1	3.8	0.3	29.2	0.5	5.8	0.6	0.1	10.7	0.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.6	9.3	6.4	2.0	23.1	3.7	9.7	16.3	0.6	9.1	14.1	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	102.0	101.1	99.8	80.9	124.7	83.4	110.3	39.0	30.5	116.8	39.1	34.3
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		599			499			1556			1482	
Approach Delay, s/veh		101.4			110.2			52.8			53.2	
Approach LOS		F			F			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	27.5	125.9		37.1	30.1	123.3		49.4
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	26.0	98.0		47.0	36.0	88.0		44.0
Max Q Clear Time (g_c+I1), s	24.0	39.6		24.0	22.6	34.6		43.1
Green Ext Time (p_c), s	0.7	44.7		5.6	1.4	39.6		0.4

Intersection Summary	
HCM 6th Ctrl Delay	66.9
HCM 6th LOS	E

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)	470	5	185	10	15	10	180	2985	15	10	1425	355
Future Volume (veh/h)	470	5	185	10	15	10	180	2985	15	10	1425	355
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.98
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	515	0	111	11	16	1	196	3245	11	11	1549	201
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	561	0	239	15	21	44	218	3679	1131	34	3111	937
Arrive On Green	0.16	0.00	0.16	0.03	0.02	0.03	0.12	0.72	0.72	0.04	1.00	1.00
Sat Flow, veh/h	3563	0	1522	747	1086	1585	1781	5106	1580	1781	5106	1559
Grp Volume(v), veh/h	515	0	111	27	0	1	196	3245	11	11	1549	201
Grp Sat Flow(s),veh/h/ln	1781	0	1522	1833	0	1585	1781	1702	1580	1781	1702	1559
Q Serve(g_s), s	34.2	0.0	15.9	3.5	0.0	0.1	26.0	117.0	0.5	1.4	0.0	0.0
Cycle Q Clear(g_c), s	34.2	0.0	15.9	3.5	0.0	0.1	26.0	117.0	0.5	1.4	0.0	0.0
Prop In Lane	1.00		1.00	0.41		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	561	0	239	36	0	44	218	3679	1131	34	3111	937
V/C Ratio(X)	0.92	0.00	0.46	0.75	0.00	0.02	0.90	0.88	0.01	0.32	0.50	0.21
Avail Cap(c_a), veh/h	609	0	260	199	0	185	371	3679	1131	163	3111	937
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.6	0.0	91.9	116.6	0.0	113.4	103.9	25.7	9.7	113.9	0.0	0.0
Incr Delay (d2), s/veh	18.8	0.0	2.0	26.1	0.0	0.2	24.1	3.4	0.0	5.0	0.5	0.5
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	17.6	0.0	6.5	2.0	0.0	0.1	13.7	47.2	0.2	0.7	0.2	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	118.4	0.0	93.9	142.7	0.0	113.6	128.0	29.2	9.7	118.8	0.5	0.5
LnGrp LOS	F	A	F	F	A	F	F	C	A	F	A	A
Approach Vol, veh/h		626			28			3452			1761	
Approach Delay, s/veh		114.1			141.7			34.7			1.3	
Approach LOS		F			F			C			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.6	177.9		42.8	35.3	151.2		10.7				
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	20.0	129.0		41.0	50.0	99.0		26.0				
Max Q Clear Time (g_c+I1), s	3.4	119.0		36.2	28.0	2.0		5.5				
Green Ext Time (p_c), s	0.0	10.0		1.6	1.3	53.2		0.1				
Intersection Summary												
HCM 6th Ctrl Delay			33.7									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	0.2					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	605	1060	10	5	5
Future Vol, veh/h	5	605	1060	10	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	658	1152	11	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1163	0	-	0	1826	582
Stage 1	-	-	-	-	1158	-
Stage 2	-	-	-	-	668	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	599	-	-	-	76	457
Stage 1	-	-	-	-	262	-
Stage 2	-	-	-	-	509	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	599	-	-	-	75	457
Mov Cap-2 Maneuver	-	-	-	-	75	-
Stage 1	-	-	-	-	260	-
Stage 2	-	-	-	-	509	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	35.5
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	599	-	-	-	129
HCM Lane V/C Ratio	0.009	-	-	-	0.084
HCM Control Delay (s)	11.1	-	-	-	35.5
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	440	675	110	10	5
Future Vol, veh/h	15	440	675	110	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	478	734	120	11	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	854	0	-	0	1304	794
Stage 1	-	-	-	-	794	-
Stage 2	-	-	-	-	510	-
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	785	-	-	-	177	388
Stage 1	-	-	-	-	445	-
Stage 2	-	-	-	-	603	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	785	-	-	-	173	388
Mov Cap-2 Maneuver	-	-	-	-	173	-
Stage 1	-	-	-	-	436	-
Stage 2	-	-	-	-	603	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	23.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	785	-	-	-	212
HCM Lane V/C Ratio	0.021	-	-	-	0.077
HCM Control Delay (s)	9.7	-	-	-	23.4
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	75	0	75	170	0	20
Future Vol, veh/h	75	0	75	170	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	-	-	150	-	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	82	0	82	185	0	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	82	0	431	82
Stage 1	-	-	-	-	82	-
Stage 2	-	-	-	-	349	-
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	-	-	1515	-	581	978
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	714	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1515	-	550	978
Mov Cap-2 Maneuver	-	-	-	-	550	-
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	714	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.3	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	978	-	-	1515	-
HCM Lane V/C Ratio	0.022	-	-	0.054	-
HCM Control Delay (s)	8.8	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Renton Road & Roosevelt Avenue Accesses AM Peak Queuing Analysis

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Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	WB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	31	102	100	30
Average Queue (ft)	4	15	18	8
95th Queue (ft)	19	62	64	29
Link Distance (ft)		859	859	237
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	0			
Queuing Penalty (veh)	0			

Intersection: 13: Roosevelt Ave & Honouliuli Drwy 4

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	38	47
Average Queue (ft)	8	13
95th Queue (ft)	31	39
Link Distance (ft)		327
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	1	

Intersection: 14: Honouliuli Drwy 5 & Renton Rd

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	36	40
Average Queue (ft)	7	15
95th Queue (ft)	30	40
Link Distance (ft)		378
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Renton Road & Roosevelt Avenue Accesses PM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	930	600	85	125	645	550	50	140	95	805	245	800
Future Volume (veh/h)	930	600	85	125	645	550	50	140	95	805	245	800
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	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	1011	652	83	136	701	598	54	152	24	875	266	581
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	960	2023	255	190	1112	1319	70	259	40	890	1074	1615
Arrive On Green	0.28	0.44	0.44	0.06	0.22	0.22	0.04	0.08	0.08	0.26	0.30	0.30
Sat Flow, veh/h	3456	4591	578	3456	5106	2758	1781	3083	478	3456	3554	2779
Grp Volume(v), veh/h	1011	482	253	136	701	598	54	86	90	875	266	581
Grp Sat Flow(s),veh/h/ln	1728	1702	1765	1728	1702	1379	1781	1777	1784	1728	1777	1389
Q Serve(g_s), s	41.0	13.6	13.8	5.7	18.4	21.4	4.4	6.9	7.1	37.1	8.3	16.4
Cycle Q Clear(g_c), s	41.0	13.6	13.8	5.7	18.4	21.4	4.4	6.9	7.1	37.1	8.3	16.4
Prop In Lane	1.00		0.33	1.00		1.00	1.00		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	960	1500	778	190	1112	1319	70	149	150	890	1074	1615
V/C Ratio(X)	1.05	0.32	0.33	0.71	0.63	0.45	0.77	0.58	0.60	0.98	0.25	0.36
Avail Cap(c_a), veh/h	960	1500	778	960	1523	1541	459	518	520	890	1074	1615
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.3	26.9	27.0	68.6	52.3	25.9	70.2	65.1	65.2	54.4	38.8	16.5
Incr Delay (d2), s/veh	43.9	0.1	0.2	4.9	0.6	0.2	15.8	3.5	3.8	25.9	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	23.6	5.7	6.0	2.7	8.0	7.1	2.3	3.3	3.4	19.3	3.7	5.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	97.2	27.0	27.2	73.5	52.9	26.2	86.0	68.6	68.9	80.4	39.0	16.6
LnGrp LOS	F	C	C	E	D	C	F	E	E	F	D	B
Approach Vol, veh/h		1746			1435			230			1722	
Approach Delay, s/veh		67.7			43.7			72.8			52.5	
Approach LOS		E			D			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	44.0	18.4	14.1	71.0	11.8	50.6	47.0	38.1
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	38.0	43.0	41.0	44.0	38.0	43.0	41.0	44.0
Max Q Clear Time (g_c+I1), s	39.1	9.1	7.7	15.8	6.4	18.4	43.0	23.4
Green Ext Time (p_c), s	0.0	1.0	0.5	5.3	0.1	4.4	0.0	7.8

Intersection Summary		
HCM 6th Ctrl Delay		56.1
HCM 6th LOS		E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	170	55	155	125	305	25	930	110	310	1180	45
Future Volume (veh/h)	65	170	55	155	125	305	25	930	110	310	1180	45
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	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	71	185	48	168	136	58	27	1011	107	337	1283	47
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	366	428	111	300	560	469	38	1390	147	375	2455	90
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.02	0.30	0.30	0.21	0.49	0.49
Sat Flow, veh/h	1180	1428	371	1140	1870	1568	1781	4690	495	1781	5056	185
Grp Volume(v), veh/h	71	0	233	168	136	58	27	733	385	337	864	466
Grp Sat Flow(s),veh/h/ln	1180	0	1799	1140	1870	1568	1781	1702	1781	1781	1702	1837
Q Serve(g_s), s	4.5	0.0	9.7	13.0	5.1	2.5	1.4	18.0	18.0	17.1	16.3	16.3
Cycle Q Clear(g_c), s	9.6	0.0	9.7	22.7	5.1	2.5	1.4	18.0	18.0	17.1	16.3	16.3
Prop In Lane	1.00		0.21	1.00		1.00	1.00		0.28	1.00		0.10
Lane Grp Cap(c), veh/h	366	0	539	300	560	469	38	1009	528	375	1653	892
V/C Ratio(X)	0.19	0.00	0.43	0.56	0.24	0.12	0.70	0.73	0.73	0.90	0.52	0.52
Avail Cap(c_a), veh/h	444	0	657	375	683	573	459	1426	746	459	1653	892
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.3	0.0	26.2	35.4	24.6	23.7	45.2	29.4	29.4	35.8	16.5	16.5
Incr Delay (d2), s/veh	0.3	0.0	0.5	1.6	0.2	0.1	20.6	1.1	2.2	17.7	0.3	0.6
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	1.3	0.0	4.2	3.7	2.3	0.9	0.8	7.3	7.8	9.1	6.1	6.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.5	0.0	26.8	37.0	24.9	23.8	65.9	30.5	31.5	53.4	16.8	17.1
LnGrp LOS	C	A	C	D	C	C	E	C	C	D	B	B
Approach Vol, veh/h		304			362			1145			1667	
Approach Delay, s/veh		27.2			30.3			31.7			24.3	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	25.6	33.6		33.9	8.0	51.2		33.9
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0
Max Green Setting (Gmax), s	24.0	39.0		34.0	24.0	39.0		34.0
Max Q Clear Time (g_c+I1), s	19.1	20.0		24.7	3.4	18.3		11.7
Green Ext Time (p_c), s	0.5	7.6		1.1	0.0	9.6		1.7

Intersection Summary			
HCM 6th Ctrl Delay			27.6
HCM 6th LOS			C

Intersection						
Int Delay, s/veh	8					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	5	5	120	5	5	165
Future Vol, veh/h	5	5	120	5	5	165
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	5	5	130	5	5	179

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	10	0	273	8
Stage 1	-	-	-	-	8	-
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	-	-	1610	-	716	1074
Stage 1	-	-	-	-	1015	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1610	-	658	1074
Mov Cap-2 Maneuver	-	-	-	-	658	-
Stage 1	-	-	-	-	933	-
Stage 2	-	-	-	-	779	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.1	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1054	-	-	1610	-
HCM Lane V/C Ratio	0.175	-	-	0.081	-
HCM Control Delay (s)	9.1	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.3	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	140	675	0	0	500	25	5	10	0	20	0	105
Future Vol, veh/h	140	675	0	0	500	25	5	10	0	20	0	105
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	152	734	0	0	543	27	5	11	0	22	0	114

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	570	0	0	734	0	0	1653	1608	734	1601	1595	558
Stage 1	-	-	-	-	-	-	1038	1038	-	557	557	-
Stage 2	-	-	-	-	-	-	615	570	-	1044	1038	-
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	1002	-	-	871	-	-	78	105	420	85	107	529
Stage 1	-	-	-	-	-	-	279	308	-	515	512	-
Stage 2	-	-	-	-	-	-	479	505	-	277	308	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1002	-	-	871	-	-	49	78	420	61	80	529
Mov Cap-2 Maneuver	-	-	-	-	-	-	49	78	-	61	80	-
Stage 1	-	-	-	-	-	-	208	229	-	383	512	-
Stage 2	-	-	-	-	-	-	375	505	-	196	229	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	0	78	38.8
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	65	1002	-	-	871	-	-	237
HCM Lane V/C Ratio	0.251	0.152	-	-	-	-	-	0.573
HCM Control Delay (s)	78	9.2	0	-	0	-	-	38.8
HCM Lane LOS	F	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0.9	0.5	-	-	0	-	-	3.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	765	15	10	520	5	20
Future Vol, veh/h	765	15	10	520	5	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	-	-	50	-	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	832	16	11	565	5	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	848	0	1427	840
Stage 1	-	-	-	-	840	-
Stage 2	-	-	-	-	587	-
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	-	-	790	-	149	365
Stage 1	-	-	-	-	424	-
Stage 2	-	-	-	-	556	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	790	-	147	365
Mov Cap-2 Maneuver	-	-	-	-	147	-
Stage 1	-	-	-	-	418	-
Stage 2	-	-	-	-	556	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	19.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	282	-	-	790	-
HCM Lane V/C Ratio	0.096	-	-	0.014	-
HCM Control Delay (s)	19.1	-	-	9.6	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection						
Int Delay, s/veh	0.8					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	770	505	20	20	20
Future Vol, veh/h	10	770	505	20	20	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	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	837	549	22	22	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	571	0	-	0	1408	549
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	859	-
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	1002	-	-	-	153	535
Stage 1	-	-	-	-	579	-
Stage 2	-	-	-	-	415	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1002	-	-	-	150	535
Mov Cap-2 Maneuver	-	-	-	-	150	-
Stage 1	-	-	-	-	567	-
Stage 2	-	-	-	-	415	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	23.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1002	-	-	-	234
HCM Lane V/C Ratio	0.011	-	-	-	0.186
HCM Control Delay (s)	8.6	0	-	-	23.9
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.7

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	805	520	0	5	5
Future Vol, veh/h	5	805	520	0	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	50	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	5	875	565	0	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	565	0	-	0	1450	283
Stage 1	-	-	-	-	565	-
Stage 2	-	-	-	-	885	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1005	-	-	-	132	715
Stage 1	-	-	-	-	533	-
Stage 2	-	-	-	-	402	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1005	-	-	-	131	715
Mov Cap-2 Maneuver	-	-	-	-	131	-
Stage 1	-	-	-	-	530	-
Stage 2	-	-	-	-	402	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	22.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1005	-	-	-	221
HCM Lane V/C Ratio	0.005	-	-	-	0.049
HCM Control Delay (s)	8.6	-	-	-	22.1
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	21

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	740	45	245	455	0	70	0	305	0	0	0
Future Vol, veh/h	0	740	45	245	455	0	70	0	305	0	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	804	49	266	495	0	76	0	332	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	495	0	0	854	0	0	1610	1857	428	1429	1881	248
Stage 1	-	-	-	-	-	-	830	830	-	1027	1027	-
Stage 2	-	-	-	-	-	-	780	1027	-	402	854	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1065	-	-	781	-	-	~ 70	73	575	95	70	752
Stage 1	-	-	-	-	-	-	331	383	-	251	310	-
Stage 2	-	-	-	-	-	-	354	310	-	596	373	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1065	-	-	780	-	-	~ 51	48	575	30	46	752
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 51	48	-	30	46	-
Stage 1	-	-	-	-	-	-	331	383	-	251	204	-
Stage 2	-	-	-	-	-	-	233	204	-	252	373	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	4.2	96.1	0
HCM LOS			F	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	51	575	1065	-	-	780	-	-	-
HCM Lane V/C Ratio	1.492	0.577	-	-	-	0.341	-	-	-
HCM Control Delay (s)	$ 430.5	19.4	0	-	-	12	-	-	0
HCM Lane LOS	F	C	A	-	-	B	-	-	A
HCM 95th %tile Q(veh)	7.1	3.6	0	-	-	1.5	-	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	150	345	575	160	275	265	320	695	80	185	890	100
Future Volume (veh/h)	150	345	575	160	275	265	320	695	80	185	890	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	163	375	361	174	299	60	348	755	21	201	967	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	190	484	410	201	496	420	419	1096	487	230	1124	495
Arrive On Green	0.11	0.26	0.26	0.11	0.27	0.27	0.12	0.31	0.31	0.13	0.32	0.32
Sat Flow, veh/h	1781	1870	1585	1781	1870	1583	3456	3554	1579	1781	3554	1566
Grp Volume(v), veh/h	163	375	361	174	299	60	348	755	21	201	967	30
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1583	1728	1777	1579	1781	1777	1566
Q Serve(g_s), s	11.3	23.4	27.5	12.1	17.6	3.6	12.4	23.5	1.2	13.9	32.2	1.7
Cycle Q Clear(g_c), s	11.3	23.4	27.5	12.1	17.6	3.6	12.4	23.5	1.2	13.9	32.2	1.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	190	484	410	201	496	420	419	1096	487	230	1124	495
V/C Ratio(X)	0.86	0.77	0.88	0.87	0.60	0.14	0.83	0.69	0.04	0.87	0.86	0.06
Avail Cap(c_a), veh/h	255	624	529	255	624	528	659	1326	589	340	1326	584
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.3	43.2	44.8	54.9	40.5	35.3	54.1	38.2	30.5	53.8	40.4	30.0
Incr Delay (d2), s/veh	19.0	4.6	13.0	21.4	1.2	0.2	5.1	1.2	0.0	15.3	5.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.1	11.4	12.2	6.6	8.3	1.4	5.7	10.4	0.5	7.2	14.8	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.3	47.8	57.7	76.3	41.7	35.5	59.2	39.4	30.6	69.1	45.7	30.1
LnGrp LOS	E	D	E	E	D	D	E	D	C	E	D	C
Approach Vol, veh/h		899			533			1124			1198	
Approach Delay, s/veh		56.6			52.3			45.4			49.2	
Approach LOS		E			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	22.3	44.8	20.2	38.6	21.3	45.8	19.4	39.4
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	24.0	47.0	18.0	42.0	24.0	47.0	18.0	42.0
Max Q Clear Time (g_c+I1), s	15.9	25.5	14.1	29.5	14.4	34.2	13.3	19.6
Green Ext Time (p_c), s	0.3	5.5	0.2	3.0	0.9	5.6	0.2	1.9

Intersection Summary	
HCM 6th Ctrl Delay	50.3
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	270	235	205	15	240	155	185	1035	15	390	1625	365
Future Volume (veh/h)	270	235	205	15	240	155	185	1035	15	390	1625	365
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	305	238	156	16	261	52	201	1125	6	424	1766	272
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	552	290	234	277	291	434	267	2460	747	487	2785	841
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.08	0.48	0.47	0.14	0.55	0.54
Sat Flow, veh/h	3563	1870	1511	1781	1870	2790	3456	5106	1578	3456	5106	1566
Grp Volume(v), veh/h	305	238	156	16	261	52	201	1125	6	424	1766	272
Grp Sat Flow(s),veh/h/ln	1781	1870	1511	1781	1870	1395	1728	1702	1578	1728	1702	1566
Q Serve(g_s), s	19.0	29.6	23.3	1.8	32.9	3.8	13.7	35.1	0.5	28.8	57.7	23.3
Cycle Q Clear(g_c), s	19.0	29.6	23.3	1.8	32.9	3.8	13.7	35.1	0.5	28.8	57.7	23.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	552	290	234	277	291	434	267	2460	747	487	2785	841
V/C Ratio(X)	0.55	0.82	0.67	0.06	0.90	0.12	0.75	0.46	0.01	0.87	0.63	0.32
Avail Cap(c_a), veh/h	623	327	264	289	304	453	446	2460	747	533	2785	841
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)	0.66	0.66	0.66	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	93.7	98.2	95.5	86.3	99.4	87.2	108.5	41.3	33.4	101.0	37.9	31.1
Incr Delay (d2), s/veh	1.2	11.6	5.5	0.2	28.2	0.3	4.3	0.6	0.0	13.7	1.1	1.0
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	9.0	15.5	9.6	0.9	18.5	1.4	6.4	15.3	0.2	14.0	24.8	9.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	94.9	109.8	101.0	86.5	127.6	87.4	112.8	42.0	33.4	114.7	39.0	32.1
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		699			329			1332			2462	
Approach Delay, s/veh		101.3			119.3			52.6			51.3	
Approach LOS		F			F			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	37.8	119.6		41.2	22.5	134.9		41.4
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	35.0	103.0		40.0	29.0	109.0		37.0
Max Q Clear Time (g_c+I1), s	30.8	37.1		31.6	15.7	59.7		34.9
Green Ext Time (p_c), s	1.0	44.7		3.6	0.9	47.6		0.5

Intersection Summary	
HCM 6th Ctrl Delay	63.5
HCM 6th LOS	E

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)	380	50	175	35	30	30	125	1665	60	40	2975	640
Future Volume (veh/h)	380	50	175	35	30	30	125	1665	60	40	2975	640
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	452	0	99	38	33	1	136	1810	40	43	3234	386
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	527	0	224	46	40	89	155	3485	1071	69	3196	965
Arrive On Green	0.15	0.00	0.15	0.06	0.05	0.06	0.09	0.68	0.68	0.08	1.00	1.00
Sat Flow, veh/h	3563	0	1514	975	847	1585	1781	5106	1578	1781	5106	1563
Grp Volume(v), veh/h	452	0	99	71	0	1	136	1810	40	43	3234	386
Grp Sat Flow(s),veh/h/ln	1781	0	1514	1822	0	1585	1781	1702	1578	1781	1702	1563
Q Serve(g_s), s	29.7	0.0	14.3	9.3	0.0	0.1	18.1	41.8	2.0	5.6	150.2	0.0
Cycle Q Clear(g_c), s	29.7	0.0	14.3	9.3	0.0	0.1	18.1	41.8	2.0	5.6	150.2	0.0
Prop In Lane	1.00		1.00	0.54		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	527	0	224	87	0	89	155	3485	1071	69	3196	965
V/C Ratio(X)	0.86	0.00	0.44	0.82	0.00	0.01	0.88	0.52	0.04	0.63	1.01	0.40
Avail Cap(c_a), veh/h	609	0	259	197	0	185	289	3485	1071	163	3196	965
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.8	0.0	93.2	112.7	0.0	107.0	108.3	18.7	12.7	109.1	0.0	0.0
Incr Delay (d2), s/veh	11.2	0.0	1.9	16.9	0.0	0.1	26.3	0.6	0.1	8.4	18.4	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.8	0.0	5.9	4.9	0.0	0.1	9.6	17.0	0.8	2.7	5.4	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	111.0	0.0	95.1	129.7	0.0	107.1	134.6	19.3	12.8	117.5	18.4	1.2
LnGrp LOS	F	A	F	F	A	F	F	B	B	F	F	A
Approach Vol, veh/h		551			72			1986			3663	
Approach Delay, s/veh		108.1			129.4			27.1			17.7	
Approach LOS		F			F			C			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.2	168.8		40.5	26.9	155.2		17.4
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	20.0	129.0		41.0	39.0	110.0		26.0
Max Q Clear Time (g_c+I1), s	17.6	43.8		31.7	20.1	152.2		11.3
Green Ext Time (p_c), s	0.1	56.1		2.2	0.7	0.0		0.2

Intersection Summary		
HCM 6th Ctrl Delay		29.9
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1040	700	5	10	5
Future Vol, veh/h	5	1040	700	5	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	1130	761	5	11	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	766	0	-	0	1904	383
Stage 1	-	-	-	-	764	-
Stage 2	-	-	-	-	1140	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	845	-	-	-	68	616
Stage 1	-	-	-	-	421	-
Stage 2	-	-	-	-	304	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	845	-	-	-	68	616
Mov Cap-2 Maneuver	-	-	-	-	68	-
Stage 1	-	-	-	-	418	-
Stage 2	-	-	-	-	304	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	49.5
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	845	-	-	-	97
HCM Lane V/C Ratio	0.006	-	-	-	0.168
HCM Control Delay (s)	9.3	-	-	-	49.5
HCM Lane LOS	A	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	690	520	30	95	15
Future Vol, veh/h	10	690	520	30	95	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	50	-	-	-	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	750	565	33	103	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	598	0	-	0	1354	582
Stage 1	-	-	-	-	582	-
Stage 2	-	-	-	-	772	-
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	979	-	-	-	165	513
Stage 1	-	-	-	-	559	-
Stage 2	-	-	-	-	456	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	979	-	-	-	163	513
Mov Cap-2 Maneuver	-	-	-	-	163	-
Stage 1	-	-	-	-	553	-
Stage 2	-	-	-	-	456	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	57.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	979	-	-	-	180
HCM Lane V/C Ratio	0.011	-	-	-	0.664
HCM Control Delay (s)	8.7	-	-	-	57.6
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	3.9

Intersection	
Int Delay, s/veh	2.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	170	0	55	125	0	85
Future Vol, veh/h	170	0	55	125	0	85
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	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	185	0	60	136	0	92

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	185	0	441	185
Stage 1	-	-	-	-	185	-
Stage 2	-	-	-	-	256	-
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	-	-	1390	-	574	857
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	787	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1390	-	549	857
Mov Cap-2 Maneuver	-	-	-	-	549	-
Stage 1	-	-	-	-	811	-
Stage 2	-	-	-	-	787	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.4	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	857	-	-	1390	-
HCM Lane V/C Ratio	0.108	-	-	0.043	-
HCM Control Delay (s)	9.7	-	-	7.7	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2023 Renton Road & Roosevelt Avenue Accesses PM Peak Queuing Analysis

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Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	WB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	35	27	45	47
Average Queue (ft)	3	1	3	14
95th Queue (ft)	19	11	19	40
Link Distance (ft)		859	859	237
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	0			
Queuing Penalty (veh)	0			

Intersection: 13: Roosevelt Ave & Honouliuli Drwy 4

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	31	128
Average Queue (ft)	3	55
95th Queue (ft)	18	98
Link Distance (ft)		327
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 14: Honouliuli Drwy 5 & Renton Rd

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	38	68
Average Queue (ft)	10	34
95th Queue (ft)	34	57
Link Distance (ft)		379
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Roosevelt Avenue Access Only AM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	700	410	20	15	845	850	10	40	5	455	85	480
Future Volume (veh/h)	700	410	20	15	845	850	10	40	5	455	85	480
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	761	446	20	16	918	924	11	43	0	495	92	324
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	869	2801	125	48	1642	1356	18	170	0	569	719	1263
Arrive On Green	0.25	0.56	0.56	0.01	0.32	0.32	0.01	0.05	0.00	0.16	0.20	0.20
Sat Flow, veh/h	3456	5011	223	3456	5106	2790	1781	3647	0	3456	3554	2773
Grp Volume(v), veh/h	761	302	164	16	918	924	11	43	0	495	92	324
Grp Sat Flow(s),veh/h/ln	1728	1702	1830	1728	1702	1395	1781	1777	0	1728	1777	1387
Q Serve(g_s), s	23.7	4.8	4.9	0.5	16.7	28.5	0.7	1.3	0.0	15.6	2.4	8.1
Cycle Q Clear(g_c), s	23.7	4.8	4.9	0.5	16.7	28.5	0.7	1.3	0.0	15.6	2.4	8.1
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	869	1903	1023	48	1642	1356	18	170	0	569	719	1263
V/C Ratio(X)	0.88	0.16	0.16	0.33	0.56	0.68	0.60	0.25	0.00	0.87	0.13	0.26
Avail Cap(c_a), veh/h	1173	1903	1023	1173	1733	1406	191	1206	0	679	1523	1890
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.2	12.0	12.0	54.7	31.4	22.1	55.2	51.4	0.0	45.6	36.6	18.9
Incr Delay (d2), s/veh	5.9	0.0	0.1	3.9	0.4	1.3	27.1	0.8	0.0	10.3	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.7	1.8	2.0	0.2	6.8	9.3	0.4	0.6	0.0	7.5	1.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.2	12.0	12.0	58.6	31.8	23.4	82.3	52.1	0.0	55.9	36.7	19.0
LnGrp LOS	D	B	B	E	C	C	F	D	A	E	D	B
Approach Vol, veh/h		1227			1858			54			911	
Approach Delay, s/veh		33.2			27.8			58.3			40.8	
Approach LOS		C			C			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	24.4	11.4	7.6	68.6	7.2	28.7	34.2	42.0
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	22.0	38.0	38.0	38.0	12.0	48.0	38.0	38.0
Max Q Clear Time (g_c+I1), s	17.6	3.3	2.5	6.9	2.7	10.1	25.7	30.5
Green Ext Time (p_c), s	0.8	0.2	0.0	3.2	0.0	2.0	2.5	5.4

Intersection Summary	
HCM 6th Ctrl Delay	32.8
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	60	15	245	145	310	50	1425	50	190	650	15
Future Volume (veh/h)	15	60	15	245	145	310	50	1425	50	190	650	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	16	65	11	266	158	90	54	1549	51	207	707	15
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	298	428	72	383	515	429	71	2166	71	242	2689	57
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.04	0.43	0.43	0.14	0.52	0.52
Sat Flow, veh/h	1120	1554	263	1304	1870	1557	1781	5077	167	1781	5146	109
Grp Volume(v), veh/h	16	0	76	266	158	90	54	1038	562	207	467	255
Grp Sat Flow(s),veh/h/ln	1120	0	1818	1304	1870	1557	1781	1702	1840	1781	1702	1851
Q Serve(g_s), s	1.3	0.0	3.5	21.5	7.4	4.9	3.3	27.9	27.9	12.6	8.4	8.5
Cycle Q Clear(g_c), s	8.7	0.0	3.5	25.0	7.4	4.9	3.3	27.9	27.9	12.6	8.4	8.5
Prop In Lane	1.00		0.14	1.00		1.00	1.00		0.09	1.00		0.06
Lane Grp Cap(c), veh/h	298	0	501	383	515	429	71	1452	785	242	1779	967
V/C Ratio(X)	0.05	0.00	0.15	0.69	0.31	0.21	0.76	0.72	0.72	0.86	0.26	0.26
Avail Cap(c_a), veh/h	333	0	557	423	573	477	465	2423	1310	465	2423	1318
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.3	0.0	30.4	39.9	31.8	30.9	52.8	26.3	26.3	46.9	14.7	14.7
Incr Delay (d2), s/veh	0.1	0.0	0.1	4.3	0.3	0.2	15.5	0.7	1.2	8.5	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	1.6	7.4	3.4	1.9	1.8	11.2	12.2	6.1	3.2	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.3	0.0	30.5	44.2	32.1	31.2	68.3	26.9	27.5	55.3	14.7	14.8
LnGrp LOS	D	A	C	D	C	C	E	C	C	E	B	B
Approach Vol, veh/h		92			514			1654			929	
Approach Delay, s/veh		31.4			38.2			28.5			23.8	
Approach LOS		C			D			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	21.1	53.3		36.6	10.4	64.0		36.6				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	29.0	79.0		34.0	29.0	79.0		34.0				
Max Q Clear Time (g_c+I1), s	14.6	29.9		27.0	5.3	10.5		10.7				
Green Ext Time (p_c), s	0.5	17.4		1.3	0.1	5.6		0.4				

Intersection Summary			
HCM 6th Ctrl Delay			28.8
HCM 6th LOS			C

Intersection						
Int Delay, s/veh	7.7					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	5	175	5	5	80
Future Vol, veh/h	0	5	175	5	5	80
Conflicting Peds, #/hr	0	1	1	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	5	190	5	5	87

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	6	0	389	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	385	-
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	-	-	1615	-	615	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	688	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1614	-	542	1079
Mov Cap-2 Maneuver	-	-	-	-	542	-
Stage 1	-	-	-	-	898	-
Stage 2	-	-	-	-	688	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1020	-	-	1614	-
HCM Lane V/C Ratio	0.091	-	-	0.118	-
HCM Control Delay (s)	8.9	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	55	430	5	5	670	20	0	0	0	25	5	150
Future Vol, veh/h	55	430	5	5	670	20	0	0	0	25	5	150
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	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	60	467	5	5	728	22	0	0	0	27	5	163

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	751	0	0	472	0	0	1423	1351	470	1340	1342	740
Stage 1	-	-	-	-	-	-	590	590	-	750	750	-
Stage 2	-	-	-	-	-	-	833	761	-	590	592	-
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	858	-	-	1090	-	-	114	150	594	130	152	417
Stage 1	-	-	-	-	-	-	494	495	-	403	419	-
Stage 2	-	-	-	-	-	-	363	414	-	494	494	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	857	-	-	1090	-	-	62	135	594	120	136	417
Mov Cap-2 Maneuver	-	-	-	-	-	-	62	135	-	120	136	-
Stage 1	-	-	-	-	-	-	447	448	-	364	415	-
Stage 2	-	-	-	-	-	-	216	410	-	447	447	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.1	0	37.5
HCM LOS			A	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	857	-	-	1090	-	-	298
HCM Lane V/C Ratio	-	0.07	-	-	0.005	-	-	0.657
HCM Control Delay (s)	0	9.5	0	-	8.3	0	-	37.5
HCM Lane LOS	A	A	A	-	A	A	-	E
HCM 95th %tile Q(veh)	-	0.2	-	-	0	-	-	4.3

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	425	15	25	865	5	5
Future Vol, veh/h	425	15	25	865	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	462	16	27	940	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	478	0	1464	470
Stage 1	-	-	-	-	470	-
Stage 2	-	-	-	-	994	-
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	-	-	1084	-	141	594
Stage 1	-	-	-	-	629	-
Stage 2	-	-	-	-	358	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1084	-	137	594
Mov Cap-2 Maneuver	-	-	-	-	137	-
Stage 1	-	-	-	-	613	-
Stage 2	-	-	-	-	358	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	22
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	223	-	-	1084	-
HCM Lane V/C Ratio	0.049	-	-	0.025	-
HCM Control Delay (s)	22	-	-	8.4	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	425	865	5	5	10
Future Vol, veh/h	10	425	865	5	5	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	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	462	940	5	5	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	945	0	-	0	1424	940
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	484	-
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	726	-	-	-	150	320
Stage 1	-	-	-	-	380	-
Stage 2	-	-	-	-	620	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	726	-	-	-	147	320
Mov Cap-2 Maneuver	-	-	-	-	147	-
Stage 1	-	-	-	-	372	-
Stage 2	-	-	-	-	620	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	21.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	726	-	-	-	230
HCM Lane V/C Ratio	0.015	-	-	-	0.071
HCM Control Delay (s)	10	0	-	-	21.8
HCM Lane LOS	B	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	415	875	40	10	10
Future Vol, veh/h	15	415	875	40	10	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	50	-	-	50	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	451	951	43	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	994	0	-	0	1434	476
Stage 1	-	-	-	-	951	-
Stage 2	-	-	-	-	483	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	694	-	-	-	136	536
Stage 1	-	-	-	-	337	-
Stage 2	-	-	-	-	619	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	694	-	-	-	133	536
Mov Cap-2 Maneuver	-	-	-	-	133	-
Stage 1	-	-	-	-	329	-
Stage 2	-	-	-	-	619	-

Approach	EB		WB		SB	
HCM Control Delay, s	0.4		0		23.8	
HCM LOS					C	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	694	-	-	-	213
HCM Lane V/C Ratio	0.023	-	-	-	0.102
HCM Control Delay (s)	10.3	-	-	-	23.8
HCM Lane LOS	B	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	9.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	355	75	285	865	20	55	0	265	5	0	5
Future Vol, veh/h	5	355	75	285	865	20	55	0	265	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	386	82	310	940	22	60	0	288	5	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	962	0	0	468	0	0	1527	2019	234	1774	2049	481
Stage 1	-	-	-	-	-	-	437	437	-	1571	1571	-
Stage 2	-	-	-	-	-	-	1090	1582	-	203	478	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	711	-	-	1090	-	-	80	58	768	52	55	531
Stage 1	-	-	-	-	-	-	568	578	-	115	169	-
Stage 2	-	-	-	-	-	-	230	167	-	780	554	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	711	-	-	1090	-	-	61	41	768	25	39	531
Mov Cap-2 Maneuver	-	-	-	-	-	-	61	41	-	25	39	-
Stage 1	-	-	-	-	-	-	564	574	-	114	121	-
Stage 2	-	-	-	-	-	-	163	120	-	484	550	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.3	48.3	100.7
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	61	768	711	-	-	1090	-	-	48
HCM Lane V/C Ratio	0.98	0.375	0.008	-	-	0.284	-	-	0.226
HCM Control Delay (s)	220.9	12.5	10.1	-	-	9.6	-	-	100.7
HCM Lane LOS	F	B	B	-	-	A	-	-	F
HCM 95th %tile Q(veh)	4.7	1.7	0	-	-	1.2	-	-	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	90	220	290	90	535	370	475	985	125	105	745	175
Future Volume (veh/h)	90	220	290	90	535	370	475	985	125	105	745	175
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		1.00	1.00		0.94	1.00		0.98
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	98	239	100	98	582	222	516	1071	65	114	810	65
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	121	611	513	121	611	517	565	1268	534	137	961	420
Arrive On Green	0.07	0.33	0.33	0.07	0.33	0.33	0.16	0.36	0.36	0.08	0.27	0.27
Sat Flow, veh/h	1781	1870	1570	1781	1870	1582	3456	3554	1496	1781	3554	1553
Grp Volume(v), veh/h	98	239	100	98	582	222	516	1071	65	114	810	65
Grp Sat Flow(s),veh/h/ln	1781	1870	1570	1781	1870	1582	1728	1777	1496	1781	1777	1553
Q Serve(g_s), s	7.6	13.8	6.4	7.6	42.5	15.4	20.5	38.8	4.1	8.8	30.1	4.5
Cycle Q Clear(g_c), s	7.6	13.8	6.4	7.6	42.5	15.4	20.5	38.8	4.1	8.8	30.1	4.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	121	611	513	121	611	517	565	1268	534	137	961	420
V/C Ratio(X)	0.81	0.39	0.20	0.81	0.95	0.43	0.91	0.84	0.12	0.83	0.84	0.15
Avail Cap(c_a), veh/h	191	611	513	229	629	532	593	1526	642	178	1271	556
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	64.3	36.3	33.9	64.2	46.0	36.8	57.5	41.4	30.2	63.6	48.2	38.8
Incr Delay (d2), s/veh	13.2	0.4	0.2	12.0	24.3	0.6	18.1	3.9	0.1	21.8	4.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	6.4	2.5	3.9	23.8	6.1	10.4	17.6	1.5	4.8	13.9	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.5	36.8	34.0	76.3	70.3	37.4	75.6	45.3	30.3	85.4	52.3	39.0
LnGrp LOS	E	D	C	E	E	D	E	D	C	F	D	D
Approach Vol, veh/h		437			902			1652			989	
Approach Delay, s/veh		45.3			62.9			54.2			55.2	
Approach LOS		D			E			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.8	55.9	15.5	51.6	28.9	43.8	15.5	51.7
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	60.0	18.0	44.0	24.0	50.0	15.0	47.0
Max Q Clear Time (g_c+I1), s	10.8	40.8	9.6	15.8	22.5	32.1	9.6	44.5
Green Ext Time (p_c), s	0.1	8.0	0.1	1.8	0.3	5.7	0.1	1.2

Intersection Summary	
HCM 6th Ctrl Delay	55.4
HCM 6th LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	340	145	185	35	305	280	295	1165	40	265	1080	285
Future Volume (veh/h)	340	145	185	35	305	280	295	1165	40	265	1080	285
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	370	158	110	38	332	143	321	1266	17	288	1174	161
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	503	264	209	341	358	534	392	2552	771	349	2488	751
Arrive On Green	0.14	0.14	0.14	0.19	0.19	0.19	0.11	0.50	0.49	0.10	0.49	0.48
Sat Flow, veh/h	3563	1870	1481	1781	1870	2790	3456	5106	1569	3456	5106	1569
Grp Volume(v), veh/h	370	158	110	38	332	143	321	1266	17	288	1174	161
Grp Sat Flow(s),veh/h/ln	1781	1870	1481	1781	1870	1395	1728	1702	1569	1728	1702	1569
Q Serve(g_s), s	23.9	19.0	16.5	4.2	41.9	10.5	21.8	39.6	1.3	19.6	36.7	14.3
Cycle Q Clear(g_c), s	23.9	19.0	16.5	4.2	41.9	10.5	21.8	39.6	1.3	19.6	36.7	14.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	503	264	209	341	358	534	392	2552	771	349	2488	751
V/C Ratio(X)	0.74	0.60	0.53	0.11	0.93	0.27	0.82	0.50	0.02	0.82	0.47	0.21
Avail Cap(c_a), veh/h	727	382	302	341	358	535	547	2552	771	403	2488	751
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)	0.89	0.89	0.89	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	98.8	96.7	95.6	80.2	95.4	82.7	104.0	39.9	31.4	105.8	41.0	36.3
Incr Delay (d2), s/veh	4.0	4.1	3.9	0.3	30.6	0.6	6.7	0.7	0.1	11.7	0.6	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.5	9.7	6.7	2.0	23.6	3.9	10.3	17.1	0.5	9.5	15.9	5.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	102.8	100.8	99.5	80.5	126.0	83.3	110.7	40.6	31.4	117.5	41.6	37.0
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	D
Approach Vol, veh/h		638			513			1604			1623	
Approach Delay, s/veh		101.7			110.7			54.5			54.6	
Approach LOS		F			F			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	28.2	123.9		37.9	31.3	120.9		49.9
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	26.0	98.0		47.0	36.0	88.0		44.0
Max Q Clear Time (g_c+I1), s	21.6	41.6		25.9	23.8	38.7		43.9
Green Ext Time (p_c), s	0.6	44.4		5.8	1.5	39.8		0.1

Intersection Summary			
HCM 6th Ctrl Delay			68.0
HCM 6th LOS			E

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)	455	5	175	10	20	10	200	3110	15	10	1585	340
Future Volume (veh/h)	455	5	175	10	20	10	200	3110	15	10	1585	340
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.98
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	499	0	99	11	22	1	217	3380	11	11	1723	188
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	548	0	234	15	29	51	239	3676	1130	34	3046	917
Arrive On Green	0.15	0.00	0.15	0.03	0.02	0.03	0.13	0.72	0.72	0.04	1.00	1.00
Sat Flow, veh/h	3563	0	1520	613	1226	1585	1781	5106	1580	1781	5106	1558
Grp Volume(v), veh/h	499	0	99	33	0	1	217	3380	11	11	1723	188
Grp Sat Flow(s),veh/h/ln	1781	0	1520	1840	0	1585	1781	1702	1580	1781	1702	1558
Q Serve(g_s), s	33.1	0.0	14.1	4.3	0.0	0.1	28.8	131.7	0.5	1.4	0.0	0.0
Cycle Q Clear(g_c), s	33.1	0.0	14.1	4.3	0.0	0.1	28.8	131.7	0.5	1.4	0.0	0.0
Prop In Lane	1.00		1.00	0.33		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	548	0	234	44	0	51	239	3676	1130	34	3046	917
V/C Ratio(X)	0.91	0.00	0.42	0.75	0.00	0.02	0.91	0.92	0.01	0.32	0.57	0.21
Avail Cap(c_a), veh/h	609	0	260	199	0	185	371	3676	1130	163	3046	917
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.9	0.0	91.9	116.1	0.0	112.5	102.5	27.9	9.8	113.9	0.0	0.0
Incr Delay (d2), s/veh	17.5	0.0	1.7	22.6	0.0	0.2	25.6	4.9	0.0	5.0	0.7	0.5
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	16.9	0.0	5.8	2.4	0.0	0.1	15.2	53.6	0.2	0.7	0.2	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	117.4	0.0	93.6	138.7	0.0	112.6	128.1	32.8	9.8	118.8	0.7	0.5
LnGrp LOS	F	A	F	F	A	F	F	C	A	F	A	A
Approach Vol, veh/h		598			34			3608			1922	
Approach Delay, s/veh		113.4			137.9			38.4			1.4	
Approach LOS		F			F			D			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.6	177.8		41.9	38.2	148.2		11.7				
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	20.0	129.0		41.0	50.0	99.0		26.0				
Max Q Clear Time (g_c+I1), s	13.4	133.7		35.1	30.8	2.0		6.3				
Green Ext Time (p_c), s	0.0	0.0		1.8	1.3	61.6		0.1				

Intersection Summary	
HCM 6th Ctrl Delay	34.7
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	625	1165	20	5	5
Future Vol, veh/h	5	625	1165	20	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	679	1266	22	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1288	0	-	0	1966	644
Stage 1	-	-	-	-	1277	-
Stage 2	-	-	-	-	689	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	536	-	-	-	62	416
Stage 1	-	-	-	-	226	-
Stage 2	-	-	-	-	497	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	536	-	-	-	61	416
Mov Cap-2 Maneuver	-	-	-	-	61	-
Stage 1	-	-	-	-	224	-
Stage 2	-	-	-	-	497	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	42.8
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	536	-	-	-	106
HCM Lane V/C Ratio	0.01	-	-	-	0.103
HCM Control Delay (s)	11.8	-	-	-	42.8
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	20	450	690	175	20	5
Future Vol, veh/h	20	450	690	175	20	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	22	489	750	190	22	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	940	0	-	0	1378	845
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	533	-
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	729	-	-	-	160	363
Stage 1	-	-	-	-	421	-
Stage 2	-	-	-	-	588	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	729	-	-	-	155	363
Mov Cap-2 Maneuver	-	-	-	-	155	-
Stage 1	-	-	-	-	408	-
Stage 2	-	-	-	-	588	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	29.3
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	729	-	-	-	175
HCM Lane V/C Ratio	0.03	-	-	-	0.155
HCM Control Delay (s)	10.1	-	-	-	29.3
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	0.5

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	80	0	0	180	0	0
Future Vol, veh/h	80	0	0	180	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	-	-	150	-	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	87	0	0	196	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	87	0	283	87
Stage 1	-	-	-	-	87	-
Stage 2	-	-	-	-	196	-
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	-	-	1509	-	707	971
Stage 1	-	-	-	-	936	-
Stage 2	-	-	-	-	837	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1509	-	707	971
Mov Cap-2 Maneuver	-	-	-	-	707	-
Stage 1	-	-	-	-	936	-
Stage 2	-	-	-	-	837	-

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)	-	-	-	1509	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Roosevelt Avenue Access Only AM Peak Queuing Analysis

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Intersection: 7: Geiger Rd & Honouliuli Drwy 1

Movement	EB	WB	SB
Directions Served	L	R	LR
Maximum Queue (ft)	37	12	34
Average Queue (ft)	9	1	12
95th Queue (ft)	32	12	34
Link Distance (ft)			247
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	50	50	
Storage Blk Time (%)	0	0	
Queuing Penalty (veh)	1	0	

Intersection: 8: Geiger Rd & Honouliuli Drwy 2

Movement	EB	EB	EB	WB	NB	NB	SB
Directions Served	L	T	TR	L	L	TR	LTR
Maximum Queue (ft)	12	16	20	147	108	167	45
Average Queue (ft)	1	1	3	60	38	66	10
95th Queue (ft)	7	8	15	106	79	118	36
Link Distance (ft)		783	783		330	330	197
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	100			250			
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	30	40
Average Queue (ft)	3	10
95th Queue (ft)	17	34
Link Distance (ft)		244
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Network Summary

Network wide Queuing Penalty: 1

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Roosevelt Avenue Access Only PM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	970	615	90	130	670	555	55	155	95	790	260	810
Future Volume (veh/h)	970	615	90	130	670	555	55	155	95	790	260	810
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	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	1054	668	89	141	728	603	60	168	42	859	283	600
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	944	1989	262	195	1119	1311	78	267	65	875	1080	1607
Arrive On Green	0.27	0.44	0.44	0.06	0.22	0.22	0.04	0.09	0.09	0.25	0.30	0.30
Sat Flow, veh/h	3456	4563	602	3456	5106	2758	1781	2833	690	3456	3554	2779
Grp Volume(v), veh/h	1054	497	260	141	728	603	60	104	106	859	283	600
Grp Sat Flow(s),veh/h/ln	1728	1702	1761	1728	1702	1379	1781	1777	1746	1728	1777	1389
Q Serve(g_s), s	41.0	14.5	14.7	6.0	19.5	22.2	5.0	8.4	8.8	37.1	9.0	17.5
Cycle Q Clear(g_c), s	41.0	14.5	14.7	6.0	19.5	22.2	5.0	8.4	8.8	37.1	9.0	17.5
Prop In Lane	1.00		0.34	1.00		1.00	1.00		0.40	1.00		1.00
Lane Grp Cap(c), veh/h	944	1484	768	195	1119	1311	78	168	165	875	1080	1607
V/C Ratio(X)	1.12	0.33	0.34	0.72	0.65	0.46	0.77	0.62	0.64	0.98	0.26	0.37
Avail Cap(c_a), veh/h	944	1484	768	944	1497	1515	451	509	500	875	1080	1607
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.5	27.9	28.0	69.6	53.4	26.7	71.0	65.3	65.5	55.7	39.5	17.1
Incr Delay (d2), s/veh	66.6	0.1	0.3	5.0	0.6	0.3	14.7	3.7	4.2	25.8	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	26.5	6.0	6.4	2.8	8.5	7.4	2.6	4.0	4.1	19.3	4.0	5.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	121.1	28.1	28.3	74.6	54.0	27.0	85.7	69.0	69.7	81.5	39.6	17.2
LnGrp LOS	F	C	C	E	D	C	F	E	E	F	D	B
Approach Vol, veh/h		1811			1472			270			1742	
Approach Delay, s/veh		82.3			44.9			73.0			52.5	
Approach LOS		F			D			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	44.0	20.2	14.5	71.4	12.6	51.6	47.0	38.9
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	38.0	43.0	41.0	44.0	38.0	43.0	41.0	44.0
Max Q Clear Time (g_c+I1), s	39.1	10.8	8.0	16.7	7.0	19.5	43.0	24.2
Green Ext Time (p_c), s	0.0	1.2	0.5	5.5	0.1	4.6	0.0	7.9

Intersection Summary			
HCM 6th Ctrl Delay			61.6
HCM 6th LOS			E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	140	60	165	105	285	25	1000	115	275	1225	20
Future Volume (veh/h)	35	140	60	165	105	285	25	1000	115	275	1225	20
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	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	38	152	50	179	114	55	27	1087	112	299	1332	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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	379	395	130	319	551	461	39	1488	153	340	2514	40
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.02	0.32	0.32	0.19	0.49	0.49
Sat Flow, veh/h	1206	1343	442	1172	1870	1567	1781	4703	484	1781	5178	82
Grp Volume(v), veh/h	38	0	202	179	114	55	27	786	413	299	876	477
Grp Sat Flow(s),veh/h/ln	1206	0	1785	1172	1870	1567	1781	1702	1783	1781	1702	1856
Q Serve(g_s), s	2.2	0.0	8.2	13.0	4.2	2.3	1.4	18.6	18.7	14.8	16.2	16.2
Cycle Q Clear(g_c), s	6.4	0.0	8.2	21.2	4.2	2.3	1.4	18.6	18.7	14.8	16.2	16.2
Prop In Lane	1.00		0.25	1.00		1.00	1.00		0.27	1.00		0.04
Lane Grp Cap(c), veh/h	379	0	525	319	551	461	39	1077	564	340	1653	901
V/C Ratio(X)	0.10	0.00	0.38	0.56	0.21	0.12	0.70	0.73	0.73	0.88	0.53	0.53
Avail Cap(c_a), veh/h	476	0	669	413	701	587	471	1463	766	471	1653	901
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.5	0.0	25.5	33.9	24.1	23.4	44.1	27.6	27.6	35.7	16.2	16.2
Incr Delay (d2), s/veh	0.1	0.0	0.5	1.6	0.2	0.1	20.1	1.2	2.4	13.2	0.3	0.6
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	0.7	0.0	3.5	3.8	1.9	0.9	0.8	7.5	8.1	7.5	6.0	6.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.6	0.0	25.9	35.5	24.2	23.5	64.2	28.8	30.0	48.9	16.5	16.8
LnGrp LOS	C	A	C	D	C	C	E	C	C	D	B	B
Approach Vol, veh/h		240			348			1226			1652	
Approach Delay, s/veh		26.0			29.9			30.0			22.4	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.3	34.7		32.7	8.0	50.1		32.7				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	24.0	39.0		34.0	24.0	39.0		34.0				
Max Q Clear Time (g_c+I1), s	16.8	20.7		23.2	3.4	18.2		10.2				
Green Ext Time (p_c), s	0.5	8.0		1.1	0.0	9.7		1.4				
Intersection Summary												
HCM 6th Ctrl Delay			26.1									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	8.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	5	5	130	5	5	185
Future Vol, veh/h	5	5	130	5	5	185
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	5	5	141	5	5	201

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	10	0	295	8
Stage 1	-	-	-	-	8	-
Stage 2	-	-	-	-	287	-
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	-	-	1610	-	696	1074
Stage 1	-	-	-	-	1015	-
Stage 2	-	-	-	-	762	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1610	-	635	1074
Mov Cap-2 Maneuver	-	-	-	-	635	-
Stage 1	-	-	-	-	926	-
Stage 2	-	-	-	-	762	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		7.2		9.2	
HCM LOS					A	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1055	-	-	1610	-
HCM Lane V/C Ratio	0.196	-	-	0.088	-
HCM Control Delay (s)	9.2	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.3	-

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	145	685	0	0	505	40	5	10	0	20	0	105
Future Vol, veh/h	145	685	0	0	505	40	5	10	0	20	0	105
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	158	745	0	0	549	43	5	11	0	22	0	114

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	592	0	0	745	0	0	1690	1653	745	1638	1632	572
Stage 1	-	-	-	-	-	-	1061	1061	-	571	571	-
Stage 2	-	-	-	-	-	-	629	592	-	1067	1061	-
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	984	-	-	863	-	-	74	98	414	80	101	520
Stage 1	-	-	-	-	-	-	271	300	-	506	505	-
Stage 2	-	-	-	-	-	-	470	494	-	269	300	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	984	-	-	863	-	-	46	71	414	56	73	520
Mov Cap-2 Maneuver	-	-	-	-	-	-	46	71	-	56	73	-
Stage 1	-	-	-	-	-	-	197	218	-	367	505	-
Stage 2	-	-	-	-	-	-	367	494	-	186	218	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	0	86	43.1
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	60	984	-	-	863	-	-	224
HCM Lane V/C Ratio	0.272	0.16	-	-	-	-	-	0.607
HCM Control Delay (s)	86	9.4	0	-	0	-	-	43.1
HCM Lane LOS	F	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	1	0.6	-	-	0	-	-	3.5

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	845	15	10	580	5	20
Future Vol, veh/h	845	15	10	580	5	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	-	-	50	-	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	918	16	11	630	5	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	934	0	1578	926
Stage 1	-	-	-	-	926	-
Stage 2	-	-	-	-	652	-
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	-	-	733	-	120	326
Stage 1	-	-	-	-	386	-
Stage 2	-	-	-	-	518	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	733	-	118	326
Mov Cap-2 Maneuver	-	-	-	-	118	-
Stage 1	-	-	-	-	380	-
Stage 2	-	-	-	-	518	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	21.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	241	-	-	733	-
HCM Lane V/C Ratio	0.113	-	-	0.015	-
HCM Control Delay (s)	21.8	-	-	10	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.4	-	-	0	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	855	565	20	20	20
Future Vol, veh/h	10	855	565	20	20	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	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	929	614	22	22	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	636	0	-	0	1565	614
Stage 1	-	-	-	-	614	-
Stage 2	-	-	-	-	951	-
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	947	-	-	-	123	492
Stage 1	-	-	-	-	540	-
Stage 2	-	-	-	-	375	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	947	-	-	-	120	492
Mov Cap-2 Maneuver	-	-	-	-	120	-
Stage 1	-	-	-	-	527	-
Stage 2	-	-	-	-	375	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	29
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	947	-	-	-	193
HCM Lane V/C Ratio	0.011	-	-	-	0.225
HCM Control Delay (s)	8.8	0	-	-	29
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.8

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	885	575	5	15	15
Future Vol, veh/h	5	885	575	5	15	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	50	-	-	50	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	5	962	625	5	16	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	630	0	-	0	1597	313
Stage 1	-	-	-	-	625	-
Stage 2	-	-	-	-	972	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	950	-	-	-	107	684
Stage 1	-	-	-	-	497	-
Stage 2	-	-	-	-	366	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	950	-	-	-	106	684
Mov Cap-2 Maneuver	-	-	-	-	106	-
Stage 1	-	-	-	-	495	-
Stage 2	-	-	-	-	366	-

Approach	EB		WB		SB
HCM Control Delay, s	0		0		28.7
HCM LOS					D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	950	-	-	-	184
HCM Lane V/C Ratio	0.006	-	-	-	0.177
HCM Control Delay (s)	8.8	-	-	-	28.7
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Intersection	
Int Delay, s/veh	30.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	835	45	245	515	5	70	0	305	10	0	5
Future Vol, veh/h	5	835	45	245	515	5	70	0	305	10	0	5
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	908	49	266	560	5	76	0	332	11	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	565	0	0	958	0	0	1756	2041	480	1559	2063	283
Stage 1	-	-	-	-	-	-	944	944	-	1095	1095	-
Stage 2	-	-	-	-	-	-	812	1097	-	464	968	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1003	-	-	714	-	-	~ 54	56	532	76	54	714
Stage 1	-	-	-	-	-	-	282	339	-	228	288	-
Stage 2	-	-	-	-	-	-	339	287	-	548	330	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1003	-	-	713	-	-	~ 38	35	532	20	34	714
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 38	35	-	20	34	-
Stage 1	-	-	-	-	-	-	280	337	-	227	181	-
Stage 2	-	-	-	-	-	-	211	180	-	205	328	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	4.2	147.7	222
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	38	532	1003	-	-	713	-	-	30
HCM Lane V/C Ratio	2.002	0.623	0.005	-	-	0.373	-	-	0.543
HCM Control Delay (s)	$ 694.3	22.3	8.6	-	-	13	-	-	222
HCM Lane LOS	F	C	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	8.2	4.2	0	-	-	1.7	-	-	1.8

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	420	580	160	315	270	325	725	80	190	915	115
Future Volume (veh/h)	170	420	580	160	315	270	325	725	80	190	915	115
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	457	389	174	342	61	353	788	21	207	995	45
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	211	511	433	200	500	423	419	1074	477	234	1110	489
Arrive On Green	0.12	0.27	0.27	0.11	0.27	0.27	0.12	0.30	0.30	0.13	0.31	0.31
Sat Flow, veh/h	1781	1870	1585	1781	1870	1583	3456	3554	1579	1781	3554	1565
Grp Volume(v), veh/h	185	457	389	174	342	61	353	788	21	207	995	45
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1583	1728	1777	1579	1781	1777	1565
Q Serve(g_s), s	13.6	31.3	31.4	12.8	21.8	3.9	13.3	26.4	1.3	15.2	35.6	2.7
Cycle Q Clear(g_c), s	13.6	31.3	31.4	12.8	21.8	3.9	13.3	26.4	1.3	15.2	35.6	2.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	211	511	433	200	500	423	419	1074	477	234	1110	489
V/C Ratio(X)	0.88	0.89	0.90	0.87	0.68	0.14	0.84	0.73	0.04	0.88	0.90	0.09
Avail Cap(c_a), veh/h	268	590	500	268	590	500	623	1202	534	321	1202	529
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	57.7	46.5	46.6	58.1	43.7	37.1	57.2	41.6	32.8	56.8	43.7	32.4
Incr Delay (d2), s/veh	22.3	14.7	17.3	20.0	2.6	0.2	6.7	2.1	0.0	18.9	8.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.4	16.6	14.4	6.9	10.5	1.6	6.2	11.9	0.5	8.1	16.9	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.9	61.1	63.8	78.1	46.3	37.3	63.9	43.7	32.9	75.7	52.3	32.5
LnGrp LOS	E	E	E	E	D	D	E	D	C	E	D	C
Approach Vol, veh/h		1031			577			1162			1247	
Approach Delay, s/veh		65.5			55.0			49.6			55.5	
Approach LOS		E			D			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	23.5	46.2	21.0	42.4	22.1	47.6	21.8	41.6
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	24.0	45.0	20.0	42.0	24.0	45.0	20.0	42.0
Max Q Clear Time (g_c+I1), s	17.2	28.4	14.8	33.4	15.3	37.6	15.6	23.8
Green Ext Time (p_c), s	0.3	5.2	0.2	2.9	0.8	4.0	0.2	2.1

Intersection Summary		
HCM 6th Ctrl Delay		56.3
HCM 6th LOS		E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	345	245	215	15	255	170	195	1120	15	395	1685	405
Future Volume (veh/h)	345	245	215	15	255	170	195	1120	15	395	1685	405
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	375	266	168	16	277	64	212	1217	6	429	1832	303
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	591	310	252	289	304	453	278	2364	717	491	2678	808
Arrive On Green	0.17	0.17	0.17	0.16	0.16	0.16	0.08	0.46	0.45	0.14	0.52	0.52
Sat Flow, veh/h	3563	1870	1516	1781	1870	2790	3456	5106	1578	3456	5106	1566
Grp Volume(v), veh/h	375	266	168	16	277	64	212	1217	6	429	1832	303
Grp Sat Flow(s),veh/h/ln	1781	1870	1516	1781	1870	1395	1728	1702	1578	1728	1702	1566
Q Serve(g_s), s	23.5	33.2	24.9	1.8	34.9	4.7	14.4	40.3	0.5	29.2	63.9	27.9
Cycle Q Clear(g_c), s	23.5	33.2	24.9	1.8	34.9	4.7	14.4	40.3	0.5	29.2	63.9	27.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	591	310	252	289	304	453	278	2364	717	491	2678	808
V/C Ratio(X)	0.63	0.86	0.67	0.06	0.91	0.14	0.76	0.51	0.01	0.87	0.68	0.37
Avail Cap(c_a), veh/h	623	327	265	289	304	453	446	2364	717	533	2678	808
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)	0.52	0.52	0.52	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	93.3	97.3	93.9	85.0	98.8	86.2	108.1	45.5	35.8	100.8	42.3	34.8
Incr Delay (d2), s/veh	1.6	12.1	4.4	0.2	31.2	0.3	4.3	0.8	0.0	14.1	1.4	1.3
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	11.2	17.4	10.3	0.9	19.8	1.8	6.7	17.6	0.2	14.2	27.6	11.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	94.8	109.4	98.3	85.1	130.0	86.5	112.4	46.3	35.9	114.9	43.8	36.2
LnGrp LOS	F	F	F	F	F	F	F	D	D	F	D	D
Approach Vol, veh/h		809			357			1435			2564	
Approach Delay, s/veh		100.3			120.2			56.0			54.8	
Approach LOS		F			F			E			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	38.1	115.1		43.8	23.3	129.9		43.0
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	35.0	103.0		40.0	29.0	109.0		37.0
Max Q Clear Time (g_c+I1), s	31.2	42.3		35.2	16.4	65.9		36.9
Green Ext Time (p_c), s	0.9	45.4		2.7	0.9	42.1		0.0

Intersection Summary			
HCM 6th Ctrl Delay			66.8
HCM 6th LOS			E

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)	320	50	160	35	30	30	130	1810	65	40	3165	655
Future Volume (veh/h)	320	50	160	35	30	30	130	1810	65	40	3165	655
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	387	0	82	38	33	1	141	1967	45	43	3440	417
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	496	0	210	46	40	89	160	3530	1085	69	3226	975
Arrive On Green	0.14	0.00	0.14	0.06	0.05	0.06	0.09	0.69	0.69	0.08	1.00	1.00
Sat Flow, veh/h	3563	0	1510	975	847	1585	1781	5106	1578	1781	5106	1563
Grp Volume(v), veh/h	387	0	82	71	0	1	141	1967	45	43	3440	417
Grp Sat Flow(s),veh/h/ln	1781	0	1510	1822	0	1585	1781	1702	1578	1781	1702	1563
Q Serve(g_s), s	25.2	0.0	11.9	9.3	0.0	0.1	18.8	46.4	2.2	5.6	151.6	0.0
Cycle Q Clear(g_c), s	25.2	0.0	11.9	9.3	0.0	0.1	18.8	46.4	2.2	5.6	151.6	0.0
Prop In Lane	1.00		1.00	0.54		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	496	0	210	87	0	89	160	3530	1085	69	3226	975
V/C Ratio(X)	0.78	0.00	0.39	0.82	0.00	0.01	0.88	0.56	0.04	0.63	1.07	0.43
Avail Cap(c_a), veh/h	609	0	258	197	0	185	289	3530	1085	163	3226	975
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.7	0.0	94.0	112.7	0.0	107.0	108.0	18.6	12.1	109.1	0.0	0.0
Incr Delay (d2), s/veh	6.0	0.0	1.7	16.9	0.0	0.1	26.1	0.6	0.1	8.4	36.6	1.3
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	12.3	0.0	4.8	4.9	0.0	0.1	10.0	18.8	0.8	2.7	10.9	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	105.8	0.0	95.7	129.7	0.0	107.1	134.1	19.2	12.2	117.5	36.6	1.3
LnGrp LOS	F	A	F	F	A	F	F	B	B	F	F	A
Approach Vol, veh/h		469			72			2153			3900	
Approach Delay, s/veh		104.0			129.4			26.6			33.7	
Approach LOS		F			F			C			C	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	13.2	170.9	38.4	27.5	156.6	17.4
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	7.0	6.0
Max Green Setting (Gmax), s	20.0	129.0	41.0	39.0	110.0	26.0
Max Q Clear Time (g_c+I1), s	17.6	48.4	27.2	20.8	153.6	11.3
Green Ext Time (p_c), s	0.1	60.0	2.3	0.8	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	37.5
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	0.9					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1140	755	10	15	5
Future Vol, veh/h	5	1140	755	10	15	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	1239	821	11	16	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	832	0	-	0	2076	416
Stage 1	-	-	-	-	827	-
Stage 2	-	-	-	-	1249	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	798	-	-	-	52	586
Stage 1	-	-	-	-	391	-
Stage 2	-	-	-	-	269	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	798	-	-	-	52	586
Mov Cap-2 Maneuver	-	-	-	-	52	-
Stage 1	-	-	-	-	389	-
Stage 2	-	-	-	-	269	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	82.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	798	-	-	-	67
HCM Lane V/C Ratio	0.007	-	-	-	0.324
HCM Control Delay (s)	9.5	-	-	-	82.7
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	1.2

Intersection	
Int Delay, s/veh	29.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	705	545	75	170	25
Future Vol, veh/h	10	705	545	75	170	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	766	592	82	185	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	674	0	-	0	1421	633
Stage 1	-	-	-	-	633	-
Stage 2	-	-	-	-	788	-
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	917	-	-	-	~ 150	480
Stage 1	-	-	-	-	529	-
Stage 2	-	-	-	-	448	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	917	-	-	-	~ 148	480
Mov Cap-2 Maneuver	-	-	-	-	~ 148	-
Stage 1	-	-	-	-	523	-
Stage 2	-	-	-	-	448	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	230.4
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	917	-	-	-	162
HCM Lane V/C Ratio	0.012	-	-	-	1.308
HCM Control Delay (s)	9	-	-	-	230.4
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	12.6

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	185	0	0	135	0	0
Future Vol, veh/h	185	0	0	135	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	-	-	150	-	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	201	0	0	147	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	201	0	348	201
Stage 1	-	-	-	-	201	-
Stage 2	-	-	-	-	147	-
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	-	-	1371	-	649	840
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	880	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1371	-	649	840
Mov Cap-2 Maneuver	-	-	-	-	649	-
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	880	-

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)	-	-	-	1371	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Roosevelt Avenue Access Only PM Peak Queuing Analysis

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Intersection: 7: Geiger Rd & Honouliuli Drwy 1

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	24	51
Average Queue (ft)	2	18
95th Queue (ft)	15	41
Link Distance (ft)		247
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 8: Geiger Rd & Honouliuli Drwy 2

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	TR	L	T	L	TR	LTR
Maximum Queue (ft)	24	42	62	216	161	373	374	69
Average Queue (ft)	2	5	7	102	7	341	341	23
95th Queue (ft)	13	28	33	190	83	363	379	58
Link Distance (ft)		783	783		475	330	330	197
Upstream Blk Time (%)						88	87	
Queuing Penalty (veh)						0	0	
Storage Bay Dist (ft)	100			250				
Storage Blk Time (%)				1				
Queuing Penalty (veh)				2				

Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	30	93
Average Queue (ft)	2	26
95th Queue (ft)	14	69
Link Distance (ft)		244
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Network Summary

Network wide Queuing Penalty: 2

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Renton Road Access Only AM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	700	410	20	15	845	850	10	40	5	470	85	480
Future Volume (veh/h)	700	410	20	15	845	850	10	40	5	470	85	480
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	761	446	20	16	918	924	11	43	0	511	92	324
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	868	2790	124	48	1632	1362	18	170	0	583	732	1272
Arrive On Green	0.25	0.56	0.56	0.01	0.32	0.32	0.01	0.05	0.00	0.17	0.21	0.21
Sat Flow, veh/h	3456	5011	223	3456	5106	2790	1781	3647	0	3456	3554	2773
Grp Volume(v), veh/h	761	302	164	16	918	924	11	43	0	511	92	324
Grp Sat Flow(s),veh/h/ln	1728	1702	1830	1728	1702	1395	1781	1777	0	1728	1777	1387
Q Serve(g_s), s	23.8	4.9	4.9	0.5	16.8	28.6	0.7	1.3	0.0	16.3	2.4	8.1
Cycle Q Clear(g_c), s	23.8	4.9	4.9	0.5	16.8	28.6	0.7	1.3	0.0	16.3	2.4	8.1
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	868	1895	1019	48	1632	1362	18	170	0	583	732	1272
V/C Ratio(X)	0.88	0.16	0.16	0.33	0.56	0.68	0.60	0.25	0.00	0.88	0.13	0.25
Avail Cap(c_a), veh/h	1165	1895	1019	1165	1721	1411	190	1198	0	674	1513	1881
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.5	12.2	12.2	55.1	31.8	22.1	55.6	51.8	0.0	45.7	36.5	18.8
Incr Delay (d2), s/veh	6.1	0.0	0.1	3.9	0.4	1.3	27.2	0.8	0.0	11.3	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.8	1.8	2.0	0.3	6.9	9.3	0.5	0.6	0.0	7.9	1.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.6	12.2	12.2	59.0	32.2	23.3	82.8	52.5	0.0	57.1	36.6	18.9
LnGrp LOS	D	B	B	E	C	C	F	D	A	E	D	B
Approach Vol, veh/h		1227			1858			54			927	
Approach Delay, s/veh		33.5			28.0			58.7			41.7	
Approach LOS		C			C			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	25.0	11.4	7.6	68.8	7.2	29.2	34.3	42.0
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	22.0	38.0	38.0	38.0	12.0	48.0	38.0	38.0
Max Q Clear Time (g_c+I1), s	18.3	3.3	2.5	6.9	2.7	10.1	25.8	30.6
Green Ext Time (p_c), s	0.7	0.2	0.0	3.2	0.0	2.0	2.5	5.4

Intersection Summary	
HCM 6th Ctrl Delay	33.2
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	70	20	245	225	310	115	1425	50	190	630	50
Future Volume (veh/h)	20	70	20	245	225	310	115	1425	50	190	630	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	22	76	15	266	245	119	125	1549	51	207	685	47
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	237	424	84	376	524	437	156	2155	71	241	2306	157
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.09	0.42	0.42	0.14	0.47	0.47
Sat Flow, veh/h	1009	1512	298	1287	1870	1558	1781	5077	167	1781	4881	333
Grp Volume(v), veh/h	22	0	91	266	245	119	125	1038	562	207	477	255
Grp Sat Flow(s),veh/h/ln	1009	0	1811	1287	1870	1558	1781	1702	1840	1781	1702	1810
Q Serve(g_s), s	2.1	0.0	4.3	22.2	12.2	6.7	7.8	28.5	28.5	12.8	9.7	9.8
Cycle Q Clear(g_c), s	14.3	0.0	4.3	26.5	12.2	6.7	7.8	28.5	28.5	12.8	9.7	9.8
Prop In Lane	1.00		0.16	1.00		1.00	1.00		0.09	1.00		0.18
Lane Grp Cap(c), veh/h	237	0	508	376	524	437	156	1445	781	241	1608	855
V/C Ratio(X)	0.09	0.00	0.18	0.71	0.47	0.27	0.80	0.72	0.72	0.86	0.30	0.30
Avail Cap(c_a), veh/h	259	0	546	403	564	470	458	2386	1290	458	2386	1269
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.5	0.0	30.7	40.8	33.6	31.6	50.5	26.9	26.9	47.6	18.2	18.3
Incr Delay (d2), s/veh	0.2	0.0	0.2	5.2	0.6	0.3	9.2	0.7	1.3	8.6	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.9	7.6	5.7	2.6	3.9	11.4	12.5	6.2	3.8	4.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.7	0.0	30.9	46.0	34.2	31.9	59.7	27.5	28.1	56.2	18.3	18.4
LnGrp LOS	D	A	C	D	C	C	E	C	C	E	B	B
Approach Vol, veh/h		113			630			1725			939	
Approach Delay, s/veh		32.6			38.7			30.1			26.7	
Approach LOS		C			D			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	21.3	53.8		37.6	15.8	59.2		37.6				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	29.0	79.0		34.0	29.0	79.0		34.0				
Max Q Clear Time (g_c+I1), s	14.8	30.5		28.5	9.8	11.8		16.3				
Green Ext Time (p_c), s	0.5	17.3		1.5	0.3	5.7		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			30.8									
HCM 6th LOS			C									

Intersection						
Int Delay, s/veh	7.7					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	5	175	5	5	90
Future Vol, veh/h	0	5	175	5	5	90
Conflicting Peds, #/hr	0	1	1	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	5	190	5	5	98

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	6	0	389	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	385	-
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	-	-	1615	-	615	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	688	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1614	-	542	1079
Mov Cap-2 Maneuver	-	-	-	-	542	-
Stage 1	-	-	-	-	898	-
Stage 2	-	-	-	-	688	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1026	-	-	1614	-
HCM Lane V/C Ratio	0.101	-	-	0.118	-
HCM Control Delay (s)	8.9	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	65	415	5	5	665	25	0	0	0	20	5	155
Future Vol, veh/h	65	415	5	5	665	25	0	0	0	20	5	155
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	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	71	451	5	5	723	27	0	0	0	22	5	168

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	751	0	0	456	0	0	1429	1357	454	1344	1346	738
Stage 1	-	-	-	-	-	-	596	596	-	748	748	-
Stage 2	-	-	-	-	-	-	833	761	-	596	598	-
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	858	-	-	1105	-	-	112	149	606	129	151	418
Stage 1	-	-	-	-	-	-	490	492	-	404	420	-
Stage 2	-	-	-	-	-	-	363	414	-	490	491	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	857	-	-	1105	-	-	59	131	606	117	133	418
Mov Cap-2 Maneuver	-	-	-	-	-	-	59	131	-	117	133	-
Stage 1	-	-	-	-	-	-	436	437	-	359	416	-
Stage 2	-	-	-	-	-	-	212	410	-	436	436	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	0.1	0	34.3
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	857	-	-	1105	-	-	311
HCM Lane V/C Ratio	-	0.082	-	-	0.005	-	-	0.629
HCM Control Delay (s)	0	9.6	0	-	8.3	0	-	34.3
HCM Lane LOS	A	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	-	0.3	-	-	0	-	-	4

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	405	15	25	700	5	5
Future Vol, veh/h	405	15	25	700	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	440	16	27	761	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	456	0	1263	448
Stage 1	-	-	-	-	448	-
Stage 2	-	-	-	-	815	-
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	-	-	1105	-	187	611
Stage 1	-	-	-	-	644	-
Stage 2	-	-	-	-	435	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1105	-	183	611
Mov Cap-2 Maneuver	-	-	-	-	183	-
Stage 1	-	-	-	-	629	-
Stage 2	-	-	-	-	435	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	18.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	282	-	-	1105	-
HCM Lane V/C Ratio	0.039	-	-	0.025	-
HCM Control Delay (s)	18.3	-	-	8.3	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection						
Int Delay, s/veh	0.3					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	405	700	5	5	10
Future Vol, veh/h	10	405	700	5	5	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	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	440	761	5	5	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	766	0	-	0	1223	761
Stage 1	-	-	-	-	761	-
Stage 2	-	-	-	-	462	-
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	847	-	-	-	198	405
Stage 1	-	-	-	-	461	-
Stage 2	-	-	-	-	634	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	847	-	-	-	195	405
Mov Cap-2 Maneuver	-	-	-	-	195	-
Stage 1	-	-	-	-	453	-
Stage 2	-	-	-	-	634	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	17.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	847	-	-	-	298
HCM Lane V/C Ratio	0.013	-	-	-	0.055
HCM Control Delay (s)	9.3	0	-	-	17.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection						
Int Delay, s/veh	0.4					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	395	710	40	10	10
Future Vol, veh/h	15	395	710	40	10	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	50	-	-	50	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	429	772	43	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	815	0	-	0	1233	386
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	461	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	810	-	-	-	182	613
Stage 1	-	-	-	-	417	-
Stage 2	-	-	-	-	634	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	810	-	-	-	178	613
Mov Cap-2 Maneuver	-	-	-	-	178	-
Stage 1	-	-	-	-	409	-
Stage 2	-	-	-	-	634	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	19.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	810	-	-	-	276
HCM Lane V/C Ratio	0.02	-	-	-	0.079
HCM Control Delay (s)	9.5	-	-	-	19.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	8.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	340	75	285	700	20	55	0	265	5	0	5
Future Vol, veh/h	5	340	75	285	700	20	55	0	265	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	370	82	310	761	22	60	0	288	5	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	783	0	0	452	0	0	1422	1824	226	1587	1854	392
Stage 1	-	-	-	-	-	-	421	421	-	1392	1392	-
Stage 2	-	-	-	-	-	-	1001	1403	-	195	462	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	831	-	-	1105	-	-	96	76	777	73	73	607
Stage 1	-	-	-	-	-	-	581	587	-	149	207	-
Stage 2	-	-	-	-	-	-	260	205	-	788	563	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	831	-	-	1105	-	-	74	54	777	36	52	607
Mov Cap-2 Maneuver	-	-	-	-	-	-	74	54	-	36	52	-
Stage 1	-	-	-	-	-	-	578	583	-	148	149	-
Stage 2	-	-	-	-	-	-	185	147	-	493	560	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.7	36	67.8
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	74	777	831	-	-	1105	-	-	68
HCM Lane V/C Ratio	0.808	0.371	0.007	-	-	0.28	-	-	0.16
HCM Control Delay (s)	150.3	12.3	9.4	-	-	9.5	-	-	67.8
HCM Lane LOS	F	B	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	3.9	1.7	0	-	-	1.2	-	-	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	205	290	90	420	390	425	1035	125	110	745	155
Future Volume (veh/h)	85	205	290	90	420	390	425	1035	125	110	745	155
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		1.00	1.00		0.95	1.00		0.98
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	92	223	75	98	457	248	462	1125	66	120	810	59
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	115	518	434	123	526	444	532	1349	570	146	1093	479
Arrive On Green	0.06	0.28	0.28	0.07	0.28	0.28	0.15	0.38	0.38	0.08	0.31	0.31
Sat Flow, veh/h	1781	1870	1568	1781	1870	1582	3456	3554	1501	1781	3554	1557
Grp Volume(v), veh/h	92	223	75	98	457	248	462	1125	66	120	810	59
Grp Sat Flow(s),veh/h/ln	1781	1870	1568	1781	1870	1582	1728	1777	1501	1781	1777	1557
Q Serve(g_s), s	6.3	12.2	4.5	6.7	28.9	16.6	16.2	35.7	3.5	8.2	25.4	3.4
Cycle Q Clear(g_c), s	6.3	12.2	4.5	6.7	28.9	16.6	16.2	35.7	3.5	8.2	25.4	3.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	115	518	434	123	526	444	532	1349	570	146	1093	479
V/C Ratio(X)	0.80	0.43	0.17	0.80	0.87	0.56	0.87	0.83	0.12	0.82	0.74	0.12
Avail Cap(c_a), veh/h	172	662	555	229	722	610	667	1772	748	201	1486	651
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	57.4	36.9	34.2	57.1	42.5	38.1	51.4	35.0	25.0	56.2	38.6	31.0
Incr Delay (d2), s/veh	14.5	0.6	0.2	11.3	8.5	1.1	9.9	2.8	0.1	17.5	1.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	5.7	1.8	3.4	14.5	6.6	7.8	15.8	1.3	4.4	11.2	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.9	37.5	34.3	68.3	51.0	39.2	61.3	37.8	25.1	73.7	40.0	31.1
LnGrp LOS	E	D	C	E	D	D	E	D	C	E	D	C
Approach Vol, veh/h		390			803			1653			989	
Approach Delay, s/veh		45.0			49.5			43.9			43.5	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.2	53.2	14.6	40.4	25.1	44.2	14.0	40.9
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	62.0	16.0	44.0	24.0	52.0	12.0	48.0
Max Q Clear Time (g_c+I1), s	10.2	37.7	8.7	14.2	18.2	27.4	8.3	30.9
Green Ext Time (p_c), s	0.1	9.5	0.1	1.6	0.9	6.4	0.1	3.5

Intersection Summary	
HCM 6th Ctrl Delay	45.1
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	325	145	185	35	305	280	260	1195	40	265	1080	225
Future Volume (veh/h)	325	145	185	35	305	280	260	1195	40	265	1080	225
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	353	158	110	38	332	143	283	1299	17	288	1174	130
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	497	261	206	341	358	534	354	2561	774	349	2553	772
Arrive On Green	0.14	0.14	0.14	0.19	0.19	0.19	0.10	0.50	0.49	0.10	0.50	0.49
Sat Flow, veh/h	3563	1870	1479	1781	1870	2790	3456	5106	1569	3456	5106	1570
Grp Volume(v), veh/h	353	158	110	38	332	143	283	1299	17	288	1174	130
Grp Sat Flow(s),veh/h/ln	1781	1870	1479	1781	1870	1395	1728	1702	1569	1728	1702	1570
Q Serve(g_s), s	22.7	19.1	16.6	4.2	41.9	10.5	19.2	40.8	1.3	19.6	35.8	11.0
Cycle Q Clear(g_c), s	22.7	19.1	16.6	4.2	41.9	10.5	19.2	40.8	1.3	19.6	35.8	11.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	497	261	206	341	358	534	354	2561	774	349	2553	772
V/C Ratio(X)	0.71	0.61	0.53	0.11	0.93	0.27	0.80	0.51	0.02	0.82	0.46	0.17
Avail Cap(c_a), veh/h	727	382	302	341	358	535	547	2561	774	403	2553	772
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)	0.89	0.89	0.89	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	98.7	97.1	96.0	80.2	95.4	82.7	105.3	40.0	31.2	105.8	38.9	33.8
Incr Delay (d2), s/veh	3.6	4.3	4.0	0.3	30.6	0.6	4.7	0.7	0.1	11.7	0.6	0.5
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	10.9	9.7	6.7	2.0	23.6	3.9	9.0	17.7	0.5	9.5	15.5	4.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	102.2	101.3	100.1	80.5	126.0	83.3	109.9	40.7	31.2	117.5	39.5	34.3
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		621			513			1599			1592	
Approach Delay, s/veh		101.6			110.7			52.9			53.2	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	28.2	124.4		37.5	28.6	124.0		49.9				
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	26.0	98.0		47.0	36.0	88.0		44.0				
Max Q Clear Time (g_c+I1), s	21.6	42.8		24.7	21.2	37.8		43.9				
Green Ext Time (p_c), s	0.6	44.5		5.7	1.4	40.1		0.1				
Intersection Summary												
HCM 6th Ctrl Delay			66.9									
HCM 6th LOS			E									

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)	465	5	175	10	20	10	235	3095	15	10	1525	385
Future Volume (veh/h)	465	5	175	10	20	10	235	3095	15	10	1525	385
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.98
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	509	0	100	11	22	1	255	3364	11	11	1658	203
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	555	0	237	15	29	51	277	3665	1127	34	2927	880
Arrive On Green	0.16	0.00	0.16	0.03	0.02	0.03	0.16	0.72	0.71	0.04	1.00	1.00
Sat Flow, veh/h	3563	0	1521	613	1226	1585	1781	5106	1579	1781	5106	1557
Grp Volume(v), veh/h	509	0	100	33	0	1	255	3364	11	11	1658	203
Grp Sat Flow(s),veh/h/ln	1781	0	1521	1840	0	1585	1781	1702	1579	1781	1702	1557
Q Serve(g_s), s	33.8	0.0	14.3	4.3	0.0	0.1	33.9	130.8	0.5	1.4	0.0	0.0
Cycle Q Clear(g_c), s	33.8	0.0	14.3	4.3	0.0	0.1	33.9	130.8	0.5	1.4	0.0	0.0
Prop In Lane	1.00		1.00	0.33		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	555	0	237	44	0	51	277	3665	1127	34	2927	880
V/C Ratio(X)	0.92	0.00	0.42	0.75	0.00	0.02	0.92	0.92	0.01	0.32	0.57	0.23
Avail Cap(c_a), veh/h	609	0	260	199	0	185	371	3665	1127	163	2927	880
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.8	0.0	91.5	116.1	0.0	112.5	99.9	28.0	9.9	113.9	0.0	0.0
Incr Delay (d2), s/veh	18.4	0.0	1.7	22.6	0.0	0.2	28.2	4.8	0.0	5.0	0.7	0.6
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	17.3	0.0	5.8	2.4	0.0	0.1	18.0	53.3	0.2	0.7	0.2	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	118.2	0.0	93.2	138.7	0.0	112.6	128.1	32.9	9.9	118.8	0.7	0.6
LnGrp LOS	F	A	F	F	A	F	F	C	A	F	A	A
Approach Vol, veh/h		609			34			3630			1872	
Approach Delay, s/veh		114.1			137.9			39.5			1.4	
Approach LOS		F			F			D			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	177.3		42.4	43.3	142.6		11.7
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	20.0	129.0		41.0	50.0	99.0		26.0
Max Q Clear Time (g_c+I1), s	3.4	132.8		35.8	35.9	2.0		6.3
Green Ext Time (p_c), s	0.0	0.0		1.6	1.4	58.9		0.1

Intersection Summary	
HCM 6th Ctrl Delay	35.8
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	605	995	5	5	5
Future Vol, veh/h	5	605	995	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	658	1082	5	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1087	0	-	0	1753	544
Stage 1	-	-	-	-	1085	-
Stage 2	-	-	-	-	668	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	640	-	-	-	85	484
Stage 1	-	-	-	-	286	-
Stage 2	-	-	-	-	509	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	640	-	-	-	84	484
Mov Cap-2 Maneuver	-	-	-	-	84	-
Stage 1	-	-	-	-	284	-
Stage 2	-	-	-	-	509	-

Approach	EB		WB		SB	
HCM Control Delay, s	0.1		0		32.2	
HCM LOS					D	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	640	-	-	-	143
HCM Lane V/C Ratio	0.008	-	-	-	0.076
HCM Control Delay (s)	10.7	-	-	-	32.2
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection						
Int Delay, s/veh	0					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	435	690	0	0	0
Future Vol, veh/h	0	435	690	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	50	-	-	-	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	473	750	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	750	0	-	0	1223	750
Stage 1	-	-	-	-	750	-
Stage 2	-	-	-	-	473	-
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	859	-	-	-	198	411
Stage 1	-	-	-	-	467	-
Stage 2	-	-	-	-	627	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	859	-	-	-	198	411
Mov Cap-2 Maneuver	-	-	-	-	198	-
Stage 1	-	-	-	-	467	-
Stage 2	-	-	-	-	627	-

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)	859	-	-	-	-
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	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	90	20	185	175	5	25
Future Vol, veh/h	90	20	185	175	5	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	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	98	22	201	190	5	27

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	120	0	701	109
Stage 1	-	-	-	-	109	-
Stage 2	-	-	-	-	592	-
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	-	-	1468	-	405	945
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	553	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1468	-	350	945
Mov Cap-2 Maneuver	-	-	-	-	350	-
Stage 1	-	-	-	-	791	-
Stage 2	-	-	-	-	553	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	736	-	-	1468	-
HCM Lane V/C Ratio	0.044	-	-	0.137	-
HCM Control Delay (s)	10.1	-	-	7.8	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Renton Road Access Only AM Peak Queuing Analysis

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Intersection: 7: Geiger Rd & Honouliuli Drwy 1

Movement	EB	EB	WB	SB
Directions Served	L	T	R	LR
Maximum Queue (ft)	40	19	12	38
Average Queue (ft)	9	1	0	13
95th Queue (ft)	33	13	8	34
Link Distance (ft)		116		247
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	50		50	
Storage Blk Time (%)	0		0	
Queuing Penalty (veh)	1		0	

Intersection: 8: Geiger Rd & Honouliuli Drwy 2

Movement	EB	EB	WB	NB	NB	SB
Directions Served	L	TR	L	L	TR	LTR
Maximum Queue (ft)	24	28	121	110	144	43
Average Queue (ft)	2	4	54	38	59	9
95th Queue (ft)	15	17	96	83	105	33
Link Distance (ft)		783		330	330	197
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	100		250			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	35	31
Average Queue (ft)	3	8
95th Queue (ft)	18	30
Link Distance (ft)		244
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Network Summary

Network wide Queuing Penalty: 1

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Renton Road Access Only PM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	970	615	90	130	670	570	55	155	95	800	260	810
Future Volume (veh/h)	970	615	90	130	670	570	55	155	95	800	260	810
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	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	1054	668	89	141	728	620	60	168	42	870	283	600
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	940	1999	264	195	1135	1317	78	267	65	871	1076	1600
Arrive On Green	0.27	0.44	0.44	0.06	0.22	0.22	0.04	0.09	0.09	0.25	0.30	0.30
Sat Flow, veh/h	3456	4563	602	3456	5106	2758	1781	2833	690	3456	3554	2779
Grp Volume(v), veh/h	1054	497	260	141	728	620	60	104	106	870	283	600
Grp Sat Flow(s),veh/h/ln	1728	1702	1761	1728	1702	1379	1781	1777	1746	1728	1777	1389
Q Serve(g_s), s	41.0	14.5	14.7	6.1	19.5	23.0	5.0	8.5	8.8	37.9	9.1	17.7
Cycle Q Clear(g_c), s	41.0	14.5	14.7	6.1	19.5	23.0	5.0	8.5	8.8	37.9	9.1	17.7
Prop In Lane	1.00		0.34	1.00		1.00	1.00		0.40	1.00		1.00
Lane Grp Cap(c), veh/h	940	1491	771	195	1135	1317	78	168	165	871	1076	1600
V/C Ratio(X)	1.12	0.33	0.34	0.72	0.64	0.47	0.77	0.62	0.65	1.00	0.26	0.37
Avail Cap(c_a), veh/h	940	1491	771	940	1491	1508	449	507	498	871	1076	1600
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.9	27.9	27.9	70.0	53.2	26.9	71.3	65.7	65.8	56.3	39.8	17.4
Incr Delay (d2), s/veh	68.7	0.1	0.3	5.0	0.6	0.3	14.8	3.7	4.2	30.1	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	26.8	6.0	6.4	2.8	8.5	7.7	2.6	4.0	4.2	20.2	4.1	5.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	123.5	28.0	28.2	75.0	53.8	27.1	86.1	69.3	70.0	86.5	39.9	17.5
LnGrp LOS	F	C	C	E	D	C	F	E	E	F	D	B
Approach Vol, veh/h		1811			1489			270			1753	
Approach Delay, s/veh		83.6			44.7			73.3			55.4	
Approach LOS		F			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	44.0	20.2	14.5	72.0	12.6	51.6	47.0	39.5
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	38.0	43.0	41.0	44.0	38.0	43.0	41.0	44.0
Max Q Clear Time (g_c+I1), s	39.9	10.8	8.1	16.7	7.0	19.7	43.0	25.0
Green Ext Time (p_c), s	0.0	1.2	0.5	5.5	0.1	4.6	0.0	7.8

Intersection Summary	
HCM 6th Ctrl Delay	62.9
HCM 6th LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	220	120	165	145	285	40	980	115	275	1210	45
Future Volume (veh/h)	70	220	120	165	145	285	40	980	115	275	1210	45
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	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	76	239	112	179	158	77	43	1065	111	299	1315	46
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	384	403	189	246	628	527	55	1401	146	335	2305	81
Arrive On Green	0.34	0.34	0.34	0.34	0.34	0.34	0.03	0.30	0.30	0.19	0.46	0.46
Sat Flow, veh/h	1138	1200	562	1025	1870	1569	1781	4697	489	1781	5065	177
Grp Volume(v), veh/h	76	0	351	179	158	77	43	771	405	299	884	477
Grp Sat Flow(s),veh/h/ln	1138	0	1763	1025	1870	1569	1781	1702	1782	1781	1702	1838
Q Serve(g_s), s	5.3	0.0	16.7	17.3	6.2	3.5	2.4	20.8	20.9	16.6	19.3	19.3
Cycle Q Clear(g_c), s	11.5	0.0	16.7	34.0	6.2	3.5	2.4	20.8	20.9	16.6	19.3	19.3
Prop In Lane	1.00		0.32	1.00		1.00	1.00		0.27	1.00		0.10
Lane Grp Cap(c), veh/h	384	0	592	246	628	527	55	1016	532	335	1549	837
V/C Ratio(X)	0.20	0.00	0.59	0.73	0.25	0.15	0.78	0.76	0.76	0.89	0.57	0.57
Avail Cap(c_a), veh/h	384	0	592	246	628	527	422	1312	687	422	1549	837
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.5	0.0	27.9	42.2	24.4	23.5	48.7	32.2	32.2	40.1	20.3	20.3
Incr Delay (d2), s/veh	0.3	0.0	1.6	10.3	0.2	0.1	20.2	1.9	3.7	17.8	0.5	0.9
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	1.5	0.0	7.3	5.2	2.8	1.3	1.4	8.7	9.4	8.8	7.5	8.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.8	0.0	29.5	52.4	24.6	23.6	68.9	34.2	35.9	57.9	20.8	21.2
LnGrp LOS	C	A	C	D	C	C	E	C	D	E	C	C
Approach Vol, veh/h		427			414			1219			1660	
Approach Delay, s/veh		29.3			36.4			36.0			27.6	
Approach LOS		C			D			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	25.0	36.2		40.0	9.2	52.1		40.0				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	24.0	39.0		34.0	24.0	39.0		34.0				
Max Q Clear Time (g_c+I1), s	18.6	22.9		36.0	4.4	21.3		18.7				
Green Ext Time (p_c), s	0.4	7.3		0.0	0.1	9.0		2.3				

Intersection Summary		
HCM 6th Ctrl Delay		31.5
HCM 6th LOS		C

Intersection	
Int Delay, s/veh	8.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	5	5	145	5	5	185
Future Vol, veh/h	5	5	145	5	5	185
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	5	5	158	5	5	201

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	10	0	329	8
Stage 1	-	-	-	-	8	-
Stage 2	-	-	-	-	321	-
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	-	-	1610	-	665	1074
Stage 1	-	-	-	-	1015	-
Stage 2	-	-	-	-	735	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1610	-	600	1074
Mov Cap-2 Maneuver	-	-	-	-	600	-
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	735	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1052	-	-	1610	-
HCM Lane V/C Ratio	0.196	-	-	0.098	-
HCM Control Delay (s)	9.3	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.3	-

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	150	680	0	0	495	30	5	10	0	20	0	120
Future Vol, veh/h	150	680	0	0	495	30	5	10	0	20	0	120
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	163	739	0	0	538	33	5	11	0	22	0	130

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	571	0	0	739	0	0	1686	1636	739	1626	1620	556
Stage 1	-	-	-	-	-	-	1065	1065	-	555	555	-
Stage 2	-	-	-	-	-	-	621	571	-	1071	1065	-
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	1002	-	-	867	-	-	74	101	417	82	103	531
Stage 1	-	-	-	-	-	-	269	299	-	516	513	-
Stage 2	-	-	-	-	-	-	475	505	-	267	299	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1002	-	-	867	-	-	44	73	417	57	75	531
Mov Cap-2 Maneuver	-	-	-	-	-	-	44	73	-	57	75	-
Stage 1	-	-	-	-	-	-	195	216	-	374	513	-
Stage 2	-	-	-	-	-	-	358	505	-	184	216	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	0	86	41.8
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	60	1002	-	-	867	-	-	243
HCM Lane V/C Ratio	0.272	0.163	-	-	-	-	-	0.626
HCM Control Delay (s)	86	9.3	0	-	0	-	-	41.8
HCM Lane LOS	F	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	1	0.6	-	-	0	-	-	3.8

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	685	15	10	505	5	20
Future Vol, veh/h	685	15	10	505	5	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	-	-	50	-	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	745	16	11	549	5	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	761	0	1324	753
Stage 1	-	-	-	-	753	-
Stage 2	-	-	-	-	571	-
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	-	-	851	-	172	410
Stage 1	-	-	-	-	465	-
Stage 2	-	-	-	-	565	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	851	-	170	410
Mov Cap-2 Maneuver	-	-	-	-	170	-
Stage 1	-	-	-	-	459	-
Stage 2	-	-	-	-	565	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	17.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	320	-	-	851	-
HCM Lane V/C Ratio	0.085	-	-	0.013	-
HCM Control Delay (s)	17.3	-	-	9.3	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection						
Int Delay, s/veh	0.7					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	690	495	20	20	20
Future Vol, veh/h	10	690	495	20	20	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	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	750	538	22	22	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	560	0	-	0	1310	538
Stage 1	-	-	-	-	538	-
Stage 2	-	-	-	-	772	-
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	1011	-	-	-	175	543
Stage 1	-	-	-	-	585	-
Stage 2	-	-	-	-	456	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1011	-	-	-	172	543
Mov Cap-2 Maneuver	-	-	-	-	172	-
Stage 1	-	-	-	-	574	-
Stage 2	-	-	-	-	456	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	21.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1011	-	-	-	261
HCM Lane V/C Ratio	0.011	-	-	-	0.167
HCM Control Delay (s)	8.6	0	-	-	21.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	725	505	5	15	15
Future Vol, veh/h	5	725	505	5	15	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	50	-	-	50	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	5	788	549	5	16	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	554	0	-	0	1347	275
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	798	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1014	-	-	-	154	723
Stage 1	-	-	-	-	543	-
Stage 2	-	-	-	-	442	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1014	-	-	-	153	723
Mov Cap-2 Maneuver	-	-	-	-	153	-
Stage 1	-	-	-	-	540	-
Stage 2	-	-	-	-	442	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	21.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1014	-	-	-	253
HCM Lane V/C Ratio	0.005	-	-	-	0.129
HCM Control Delay (s)	8.6	-	-	-	21.3
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection	
Int Delay, s/veh	18.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	670	45	245	440	5	70	0	305	10	0	5
Future Vol, veh/h	5	670	45	245	440	5	70	0	305	10	0	5
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	728	49	266	478	5	76	0	332	11	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	483	0	0	778	0	0	1535	1779	390	1387	1801	242
Stage 1	-	-	-	-	-	-	764	764	-	1013	1013	-
Stage 2	-	-	-	-	-	-	771	1015	-	374	788	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1076	-	-	834	-	-	79	81	609	102	79	759
Stage 1	-	-	-	-	-	-	362	411	-	256	315	-
Stage 2	-	-	-	-	-	-	359	314	-	619	400	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1076	-	-	833	-	-	~ 59	55	608	35	53	759
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 59	55	-	35	53	-
Stage 1	-	-	-	-	-	-	360	409	-	255	215	-
Stage 2	-	-	-	-	-	-	243	214	-	280	398	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	4	76.1	105.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	59	608	1076	-	-	833	-	-	51
HCM Lane V/C Ratio	1.29	0.545	0.005	-	-	0.32	-	-	0.32
HCM Control Delay (s)	$ 330.3	17.8	8.4	-	-	11.3	-	-	105.8
HCM Lane LOS	F	C	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	6.5	3.3	0	-	-	1.4	-	-	1.1

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	150	310	535	160	265	275	310	735	80	205	960	100
Future Volume (veh/h)	150	310	535	160	265	275	310	735	80	205	960	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	163	337	308	174	288	54	337	799	22	223	1043	32
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	192	428	363	203	440	372	412	1118	497	254	1200	529
Arrive On Green	0.11	0.23	0.23	0.11	0.24	0.24	0.12	0.31	0.31	0.14	0.34	0.34
Sat Flow, veh/h	1781	1870	1585	1781	1870	1583	3456	3554	1579	1781	3554	1567
Grp Volume(v), veh/h	163	337	308	174	288	54	337	799	22	223	1043	32
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1583	1728	1777	1579	1781	1777	1567
Q Serve(g_s), s	10.8	20.3	22.3	11.5	16.7	3.2	11.4	23.8	1.2	14.7	33.0	1.7
Cycle Q Clear(g_c), s	10.8	20.3	22.3	11.5	16.7	3.2	11.4	23.8	1.2	14.7	33.0	1.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	192	428	363	203	440	372	412	1118	497	254	1200	529
V/C Ratio(X)	0.85	0.79	0.85	0.86	0.66	0.15	0.82	0.71	0.04	0.88	0.87	0.06
Avail Cap(c_a), veh/h	282	655	555	282	655	554	692	1363	606	356	1363	601
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.5	43.5	44.3	52.2	41.5	36.3	51.5	36.3	28.6	50.4	37.2	26.8
Incr Delay (d2), s/veh	14.6	3.6	7.6	16.8	1.7	0.2	4.0	1.4	0.0	16.4	5.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.6	9.8	9.5	6.1	7.9	1.3	5.2	10.5	0.4	7.7	15.1	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.2	47.1	51.8	69.0	43.1	36.5	55.6	37.7	28.6	66.8	42.9	26.9
LnGrp LOS	E	D	D	E	D	D	E	D	C	E	D	C
Approach Vol, veh/h		808			516			1158			1298	
Approach Delay, s/veh		52.9			51.2			42.8			46.7	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	23.1	43.7	19.7	33.4	20.3	46.5	18.9	34.2
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	24.0	46.0	19.0	42.0	24.0	46.0	19.0	42.0
Max Q Clear Time (g_c+I1), s	16.7	25.8	13.5	24.3	13.4	35.0	12.8	18.7
Green Ext Time (p_c), s	0.4	5.7	0.2	3.0	0.9	5.5	0.2	1.9

Intersection Summary			
HCM 6th Ctrl Delay			47.4
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	275	245	185	15	255	170	190	1130	15	395	1715	365
Future Volume (veh/h)	275	245	185	15	255	170	190	1130	15	395	1715	365
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	315	244	135	16	277	65	207	1228	6	429	1864	276
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	560	294	238	289	304	453	273	2409	731	491	2731	825
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.08	0.47	0.46	0.14	0.53	0.53
Sat Flow, veh/h	3563	1870	1512	1781	1870	2790	3456	5106	1578	3456	5106	1566
Grp Volume(v), veh/h	315	244	135	16	277	65	207	1228	6	429	1864	276
Grp Sat Flow(s),veh/h/ln	1781	1870	1512	1781	1870	1395	1728	1702	1578	1728	1702	1566
Q Serve(g_s), s	19.6	30.3	19.8	1.8	34.9	4.8	14.1	40.1	0.5	29.2	64.2	24.3
Cycle Q Clear(g_c), s	19.6	30.3	19.8	1.8	34.9	4.8	14.1	40.1	0.5	29.2	64.2	24.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	560	294	238	289	304	453	273	2409	731	491	2731	825
V/C Ratio(X)	0.56	0.83	0.57	0.06	0.91	0.14	0.76	0.51	0.01	0.87	0.68	0.33
Avail Cap(c_a), veh/h	623	327	265	289	304	453	446	2409	731	533	2731	825
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)	0.65	0.65	0.65	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	93.5	98.0	93.6	85.0	98.8	86.2	108.3	44.1	34.7	100.8	40.9	32.7
Incr Delay (d2), s/veh	1.3	12.2	3.0	0.2	31.2	0.3	4.3	0.8	0.0	14.1	1.4	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.3	15.9	8.1	0.9	19.8	1.8	6.6	17.5	0.2	14.2	27.7	9.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	94.8	110.3	96.6	85.1	130.0	86.5	112.6	44.9	34.7	114.9	42.3	33.8
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	C
Approach Vol, veh/h		694			358			1441			2569	
Approach Delay, s/veh		100.6			120.1			54.5			53.5	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	38.1	117.2		41.7	23.0	132.4		43.0				
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	35.0	103.0		40.0	29.0	109.0		37.0				
Max Q Clear Time (g_c+I1), s	31.2	42.1		32.3	16.1	66.2		36.9				
Green Ext Time (p_c), s	0.9	45.9		3.4	0.9	41.9		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			65.0									
HCM 6th LOS			E									

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)	370	50	185	35	30	30	135	1745	65	40	3125	685
Future Volume (veh/h)	370	50	185	35	30	30	135	1745	65	40	3125	685
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	441	0	110	38	33	1	147	1897	44	43	3397	425
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	523	0	222	46	40	89	166	3492	1073	69	3170	957
Arrive On Green	0.15	0.00	0.15	0.06	0.05	0.06	0.09	0.68	0.68	0.08	1.00	1.00
Sat Flow, veh/h	3563	0	1514	975	847	1585	1781	5106	1578	1781	5106	1563
Grp Volume(v), veh/h	441	0	110	71	0	1	147	1897	44	43	3397	425
Grp Sat Flow(s),veh/h/ln	1781	0	1514	1822	0	1585	1781	1702	1578	1781	1702	1563
Q Serve(g_s), s	28.9	0.0	16.0	9.3	0.0	0.1	19.6	44.8	2.2	5.6	0.0	0.0
Cycle Q Clear(g_c), s	28.9	0.0	16.0	9.3	0.0	0.1	19.6	44.8	2.2	5.6	0.0	0.0
Prop In Lane	1.00		1.00	0.54		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	523	0	222	87	0	89	166	3492	1073	69	3170	957
V/C Ratio(X)	0.84	0.00	0.50	0.82	0.00	0.01	0.89	0.54	0.04	0.63	1.07	0.44
Avail Cap(c_a), veh/h	609	0	259	197	0	185	289	3492	1073	163	3170	957
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.7	0.0	94.2	112.7	0.0	107.0	107.6	19.1	12.7	109.1	0.0	0.0
Incr Delay (d2), s/veh	10.1	0.0	2.4	16.9	0.0	0.1	26.2	0.6	0.1	8.4	38.7	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.4	0.0	6.6	4.9	0.0	0.1	10.4	18.3	0.8	2.7	11.4	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	109.8	0.0	96.6	129.7	0.0	107.1	133.8	19.7	12.7	117.5	38.7	1.4
LnGrp LOS	F	A	F	F	A	F	F	B	B	F	F	A
Approach Vol, veh/h		551			72			2088			3865	
Approach Delay, s/veh		107.2			129.4			27.6			35.5	
Approach LOS		F			F			C			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.2	169.1		40.2	28.4	154.0		17.4
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	20.0	129.0		41.0	39.0	110.0		26.0
Max Q Clear Time (g_c+I1), s	17.6	46.8		30.9	21.6	2.0		11.3
Green Ext Time (p_c), s	0.1	58.3		2.3	0.8	107.4		0.2

Intersection Summary		
HCM 6th Ctrl Delay		40.0
HCM 6th LOS		D

Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	0.2					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	980	680	5	5	5
Future Vol, veh/h	5	980	680	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	1065	739	5	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	744	0	-	0	1817	372
Stage 1	-	-	-	-	742	-
Stage 2	-	-	-	-	1075	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	861	-	-	-	77	626
Stage 1	-	-	-	-	433	-
Stage 2	-	-	-	-	327	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	861	-	-	-	77	626
Mov Cap-2 Maneuver	-	-	-	-	77	-
Stage 1	-	-	-	-	430	-
Stage 2	-	-	-	-	327	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	33.5
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	861	-	-	-	137
HCM Lane V/C Ratio	0.006	-	-	-	0.079
HCM Control Delay (s)	9.2	-	-	-	33.5
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection						
Int Delay, s/veh	0					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	700	520	0	0	0
Future Vol, veh/h	0	700	520	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	50	-	-	-	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	761	565	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	565	0	-	0	1326	565
Stage 1	-	-	-	-	565	-
Stage 2	-	-	-	-	761	-
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	1007	-	-	-	172	524
Stage 1	-	-	-	-	569	-
Stage 2	-	-	-	-	461	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1007	-	-	-	172	524
Mov Cap-2 Maneuver	-	-	-	-	172	-
Stage 1	-	-	-	-	569	-
Stage 2	-	-	-	-	461	-

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)	1007	-	-	-	-
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	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	185	10	85	145	20	185
Future Vol, veh/h	185	10	85	145	20	185
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	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	201	11	92	158	22	201

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	212	0	549	207
Stage 1	-	-	-	-	207	-
Stage 2	-	-	-	-	342	-
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	-	-	1358	-	497	833
Stage 1	-	-	-	-	828	-
Stage 2	-	-	-	-	719	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1358	-	463	833
Mov Cap-2 Maneuver	-	-	-	-	463	-
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	719	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		2.9		11.5	
HCM LOS					B	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	773	-	-	1358	-
HCM Lane V/C Ratio	0.288	-	-	0.068	-
HCM Control Delay (s)	11.5	-	-	7.8	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	1.2	-	-	0.2	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Renton Road Access Only PM Peak Queuing Analysis

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Intersection: 7: Geiger Rd & Honouliuli Drwy 1

Movement	EB	WB	SB
Directions Served	L	R	LR
Maximum Queue (ft)	30	4	39
Average Queue (ft)	2	0	16
95th Queue (ft)	15	3	38
Link Distance (ft)			247
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	50	50	
Storage Blk Time (%)	0		
Queuing Penalty (veh)	0		

Intersection: 8: Geiger Rd & Honouliuli Drwy 2

Movement	EB	EB	EB	WB	NB	NB	SB
Directions Served	L	T	TR	L	L	TR	LTR
Maximum Queue (ft)	12	20	31	160	261	294	73
Average Queue (ft)	1	2	4	69	107	130	18
95th Queue (ft)	10	15	19	125	228	248	53
Link Distance (ft)		783	783		330	330	197
Upstream Blk Time (%)					0	1	
Queuing Penalty (veh)					0	0	
Storage Bay Dist (ft)	100			250			
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	24	39
Average Queue (ft)	1	9
95th Queue (ft)	12	34
Link Distance (ft)		244
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Renton Road & Roosevelt Avenue Accesses AM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	700	410	20	15	845	850	10	40	5	470	85	480
Future Volume (veh/h)	700	410	20	15	845	850	10	40	5	470	85	480
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		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	761	446	20	16	918	924	11	43	1	511	92	324
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	868	2790	124	48	1632	1362	18	169	4	583	732	1272
Arrive On Green	0.25	0.56	0.56	0.01	0.32	0.32	0.01	0.05	0.05	0.17	0.21	0.21
Sat Flow, veh/h	3456	5011	223	3456	5106	2790	1781	3550	82	3456	3554	2773
Grp Volume(v), veh/h	761	302	164	16	918	924	11	21	23	511	92	324
Grp Sat Flow(s),veh/h/ln	1728	1702	1830	1728	1702	1395	1781	1777	1855	1728	1777	1387
Q Serve(g_s), s	23.8	4.9	4.9	0.5	16.8	28.6	0.7	1.3	1.3	16.3	2.4	8.1
Cycle Q Clear(g_c), s	23.8	4.9	4.9	0.5	16.8	28.6	0.7	1.3	1.3	16.3	2.4	8.1
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.04	1.00		1.00
Lane Grp Cap(c), veh/h	868	1895	1019	48	1632	1362	18	85	89	583	732	1272
V/C Ratio(X)	0.88	0.16	0.16	0.33	0.56	0.68	0.60	0.25	0.25	0.88	0.13	0.25
Avail Cap(c_a), veh/h	1165	1895	1019	1165	1721	1411	190	599	625	674	1513	1881
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.5	12.2	12.2	55.1	31.8	22.1	55.6	51.7	51.8	45.7	36.5	18.8
Incr Delay (d2), s/veh	6.1	0.0	0.1	3.9	0.4	1.3	27.2	1.5	1.5	11.3	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.8	1.8	2.0	0.3	6.9	9.3	0.5	0.6	0.7	7.9	1.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.6	12.2	12.2	59.0	32.2	23.3	82.8	53.3	53.2	57.1	36.6	18.9
LnGrp LOS	D	B	B	E	C	C	F	D	D	E	D	B
Approach Vol, veh/h		1227			1858			55			927	
Approach Delay, s/veh		33.5			28.0			59.2			41.7	
Approach LOS		C			C			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	25.0	11.4	7.6	68.8	7.2	29.2	34.3	42.0
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	22.0	38.0	38.0	38.0	12.0	48.0	38.0	38.0
Max Q Clear Time (g_c+I1), s	18.3	3.3	2.5	6.9	2.7	10.1	25.8	30.6
Green Ext Time (p_c), s	0.7	0.2	0.0	3.2	0.0	2.0	2.5	5.4

Intersection Summary			
HCM 6th Ctrl Delay			33.2
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	65	15	245	180	310	50	1425	50	190	630	50
Future Volume (veh/h)	20	65	15	245	180	310	50	1425	50	190	630	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	22	71	12	266	196	92	54	1549	51	207	685	49
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	273	432	73	380	519	433	71	2161	71	242	2538	180
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.04	0.43	0.43	0.14	0.52	0.52
Sat Flow, veh/h	1080	1555	263	1296	1870	1558	1781	5077	167	1781	4866	346
Grp Volume(v), veh/h	22	0	83	266	196	92	54	1038	562	207	478	256
Grp Sat Flow(s),veh/h/ln	1080	0	1818	1296	1870	1558	1781	1702	1840	1781	1702	1808
Q Serve(g_s), s	1.9	0.0	3.9	21.8	9.4	5.1	3.4	28.2	28.2	12.7	8.7	8.8
Cycle Q Clear(g_c), s	11.3	0.0	3.9	25.7	9.4	5.1	3.4	28.2	28.2	12.7	8.7	8.8
Prop In Lane	1.00		0.14	1.00		1.00	1.00		0.09	1.00		0.19
Lane Grp Cap(c), veh/h	273	0	505	380	519	433	71	1449	783	242	1775	943
V/C Ratio(X)	0.08	0.00	0.16	0.70	0.38	0.21	0.76	0.72	0.72	0.86	0.27	0.27
Avail Cap(c_a), veh/h	302	0	553	414	569	474	462	2407	1301	462	2407	1278
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.1	0.0	30.5	40.3	32.6	31.0	53.1	26.5	26.5	47.2	14.9	14.9
Incr Delay (d2), s/veh	0.1	0.0	0.2	4.7	0.5	0.2	15.5	0.7	1.2	8.5	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.7	7.5	4.4	2.0	1.8	11.3	12.3	6.2	3.3	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.3	0.0	30.7	45.0	33.0	31.2	68.6	27.2	27.8	55.7	15.0	15.1
LnGrp LOS	D	A	C	D	C	C	E	C	C	E	B	B
Approach Vol, veh/h		105			554			1654			941	
Approach Delay, s/veh		32.1			38.5			28.7			24.0	
Approach LOS		C			D			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	21.2	53.6		37.0	10.4	64.3		37.0				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	29.0	79.0		34.0	29.0	79.0		34.0				
Max Q Clear Time (g_c+I1), s	14.7	30.2		27.7	5.4	10.8		13.3				
Green Ext Time (p_c), s	0.5	17.4		1.4	0.1	5.7		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			29.1									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	7.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	5	170	5	5	75
Future Vol, veh/h	0	5	170	5	5	75
Conflicting Peds, #/hr	0	1	1	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	5	185	5	5	82

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	6	0	379	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	375	-
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	-	-	1615	-	623	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	695	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1614	-	551	1079
Mov Cap-2 Maneuver	-	-	-	-	551	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	695	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1018	-	-	1614	-
HCM Lane V/C Ratio	0.085	-	-	0.114	-
HCM Control Delay (s)	8.9	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	55	430	5	5	670	20	0	0	0	20	5	150
Future Vol, veh/h	55	430	5	5	670	20	0	0	0	20	5	150
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	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	60	467	5	5	728	22	0	0	0	22	5	163

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	751	0	0	472	0	0	1423	1351	470	1340	1342	740
Stage 1	-	-	-	-	-	-	590	590	-	750	750	-
Stage 2	-	-	-	-	-	-	833	761	-	590	592	-
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	858	-	-	1090	-	-	114	150	594	130	152	417
Stage 1	-	-	-	-	-	-	494	495	-	403	419	-
Stage 2	-	-	-	-	-	-	363	414	-	494	494	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	857	-	-	1090	-	-	62	135	594	120	136	417
Mov Cap-2 Maneuver	-	-	-	-	-	-	62	135	-	120	136	-
Stage 1	-	-	-	-	-	-	447	448	-	364	415	-
Stage 2	-	-	-	-	-	-	216	410	-	447	447	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.1	0	33.2
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	857	-	-	1090	-	-	311
HCM Lane V/C Ratio	-	0.07	-	-	0.005	-	-	0.612
HCM Control Delay (s)	0	9.5	0	-	8.3	0	-	33.2
HCM Lane LOS	A	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	-	0.2	-	-	0	-	-	3.8

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	415	15	25	805	5	5
Future Vol, veh/h	415	15	25	805	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	451	16	27	875	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	467	0	1388	459
Stage 1	-	-	-	-	459	-
Stage 2	-	-	-	-	929	-
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	-	-	1094	-	157	602
Stage 1	-	-	-	-	636	-
Stage 2	-	-	-	-	385	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1094	-	153	602
Mov Cap-2 Maneuver	-	-	-	-	153	-
Stage 1	-	-	-	-	620	-
Stage 2	-	-	-	-	385	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	20.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	244	-	-	1094	-
HCM Lane V/C Ratio	0.045	-	-	0.025	-
HCM Control Delay (s)	20.4	-	-	8.4	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection						
Int Delay, s/veh	0.3					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	410	805	5	5	10
Future Vol, veh/h	10	410	805	5	5	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	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	446	875	5	5	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	880	0	-	0	1343	875
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	468	-
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	768	-	-	-	168	349
Stage 1	-	-	-	-	408	-
Stage 2	-	-	-	-	630	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	768	-	-	-	165	349
Mov Cap-2 Maneuver	-	-	-	-	165	-
Stage 1	-	-	-	-	400	-
Stage 2	-	-	-	-	630	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	20.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	768	-	-	-	254
HCM Lane V/C Ratio	0.014	-	-	-	0.064
HCM Control Delay (s)	9.8	0	-	-	20.1
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	400	815	40	10	10
Future Vol, veh/h	15	400	815	40	10	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	50	-	-	50	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	435	886	43	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	929	0	-	0	1353	443
Stage 1	-	-	-	-	886	-
Stage 2	-	-	-	-	467	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	734	-	-	-	153	563
Stage 1	-	-	-	-	364	-
Stage 2	-	-	-	-	630	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	734	-	-	-	150	563
Mov Cap-2 Maneuver	-	-	-	-	150	-
Stage 1	-	-	-	-	356	-
Stage 2	-	-	-	-	630	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	21.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	734	-	-	-	237
HCM Lane V/C Ratio	0.022	-	-	-	0.092
HCM Control Delay (s)	10	-	-	-	21.7
HCM Lane LOS	B	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	345	75	285	800	20	55	0	265	5	0	5
Future Vol, veh/h	5	345	75	285	800	20	55	0	265	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	375	82	310	870	22	60	0	288	5	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	892	0	0	457	0	0	1481	1938	229	1699	1968	446
Stage 1	-	-	-	-	-	-	426	426	-	1501	1501	-
Stage 2	-	-	-	-	-	-	1055	1512	-	198	467	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	756	-	-	1100	-	-	87	65	774	60	62	560
Stage 1	-	-	-	-	-	-	577	584	-	128	183	-
Stage 2	-	-	-	-	-	-	241	181	-	785	560	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	756	-	-	1100	-	-	67	46	774	29	44	560
Mov Cap-2 Maneuver	-	-	-	-	-	-	67	46	-	29	44	-
Stage 1	-	-	-	-	-	-	573	580	-	127	131	-
Stage 2	-	-	-	-	-	-	171	130	-	490	556	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.5	41.8	85.9
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	67	774	756	-	-	1100	-	-	55
HCM Lane V/C Ratio	0.892	0.372	0.007	-	-	0.282	-	-	0.198
HCM Control Delay (s)	183.4	12.4	9.8	-	-	9.6	-	-	85.9
HCM Lane LOS	F	B	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	4.3	1.7	0	-	-	1.2	-	-	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	210	290	90	485	370	475	985	125	105	745	155
Future Volume (veh/h)	85	210	290	90	485	370	475	985	125	105	745	155
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		1.00	1.00		0.95	1.00		0.98
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	92	228	91	98	527	224	516	1071	66	114	810	55
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	115	565	474	122	572	484	576	1302	549	139	986	431
Arrive On Green	0.06	0.30	0.30	0.07	0.31	0.31	0.17	0.37	0.37	0.08	0.28	0.28
Sat Flow, veh/h	1781	1870	1569	1781	1870	1582	3456	3554	1498	1781	3554	1554
Grp Volume(v), veh/h	92	228	91	98	527	224	516	1071	66	114	810	55
Grp Sat Flow(s),veh/h/ln	1781	1870	1569	1781	1870	1582	1728	1777	1498	1781	1777	1554
Q Serve(g_s), s	6.6	12.6	5.6	7.0	35.3	14.8	19.0	35.4	3.8	8.2	27.6	3.4
Cycle Q Clear(g_c), s	6.6	12.6	5.6	7.0	35.3	14.8	19.0	35.4	3.8	8.2	27.6	3.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	115	565	474	122	572	484	576	1302	549	139	986	431
V/C Ratio(X)	0.80	0.40	0.19	0.81	0.92	0.46	0.90	0.82	0.12	0.82	0.82	0.13
Avail Cap(c_a), veh/h	192	635	533	192	635	537	640	1755	740	192	1481	648
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.8	35.9	33.5	59.5	43.5	36.4	52.9	37.2	27.2	58.9	43.8	35.1
Incr Delay (d2), s/veh	12.0	0.5	0.2	12.4	17.9	0.7	14.3	2.4	0.1	17.8	2.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	5.8	2.2	3.6	19.1	5.9	9.4	15.7	1.4	4.4	12.5	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.7	36.4	33.7	72.0	61.3	37.0	67.2	39.6	27.3	76.6	46.2	35.2
LnGrp LOS	E	D	C	E	E	D	E	D	C	E	D	D
Approach Vol, veh/h		411			849			1653			979	
Approach Delay, s/veh		43.7			56.1			47.8			49.1	
Approach LOS		D			E			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.1	53.5	14.8	45.2	27.6	42.0	14.4	45.7
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	64.0	14.0	44.0	24.0	54.0	14.0	44.0
Max Q Clear Time (g_c+I1), s	10.2	37.4	9.0	14.6	21.0	29.6	8.6	37.3
Green Ext Time (p_c), s	0.1	9.2	0.1	1.7	0.6	6.3	0.1	2.4

Intersection Summary	
HCM 6th Ctrl Delay	49.5
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	330	145	185	35	305	280	295	1165	40	265	1080	235
Future Volume (veh/h)	330	145	185	35	305	280	295	1165	40	265	1080	235
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	359	158	110	38	332	143	321	1266	17	288	1174	133
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	499	262	207	341	358	534	392	2558	773	349	2494	753
Arrive On Green	0.14	0.14	0.14	0.19	0.19	0.19	0.11	0.50	0.49	0.10	0.49	0.48
Sat Flow, veh/h	3563	1870	1480	1781	1870	2790	3456	5106	1569	3456	5106	1569
Grp Volume(v), veh/h	359	158	110	38	332	143	321	1266	17	288	1174	133
Grp Sat Flow(s),veh/h/ln	1781	1870	1480	1781	1870	1395	1728	1702	1569	1728	1702	1569
Q Serve(g_s), s	23.1	19.0	16.6	4.2	41.9	10.5	21.8	39.5	1.3	19.6	36.7	11.6
Cycle Q Clear(g_c), s	23.1	19.0	16.6	4.2	41.9	10.5	21.8	39.5	1.3	19.6	36.7	11.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	499	262	207	341	358	534	392	2558	773	349	2494	753
V/C Ratio(X)	0.72	0.60	0.53	0.11	0.93	0.27	0.82	0.49	0.02	0.82	0.47	0.18
Avail Cap(c_a), veh/h	727	382	302	341	358	535	547	2558	773	403	2494	753
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)	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	98.7	96.9	95.9	80.2	95.4	82.7	104.0	39.7	31.2	105.8	40.8	35.4
Incr Delay (d2), s/veh	3.7	4.3	4.0	0.3	30.6	0.6	6.7	0.7	0.1	11.7	0.6	0.5
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	11.1	9.7	6.7	2.0	23.6	3.9	10.3	17.1	0.5	9.5	15.9	4.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	102.4	101.2	99.9	80.5	126.0	83.3	110.7	40.4	31.3	117.5	41.4	36.0
LnGrp LOS	F	F	F	F	F	F	F	D	C	F	D	D
Approach Vol, veh/h		627			513			1604			1595	
Approach Delay, s/veh		101.7			110.7			54.4			54.7	
Approach LOS		F			F			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	28.2	124.2		37.6	31.3	121.2		49.9				
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	26.0	98.0		47.0	36.0	88.0		44.0				
Max Q Clear Time (g_c+I1), s	21.6	41.5		25.1	23.8	38.7		43.9				
Green Ext Time (p_c), s	0.6	44.5		5.7	1.5	39.5		0.1				

Intersection Summary			
HCM 6th Ctrl Delay			68.0
HCM 6th LOS			E

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)	460	5	175	10	20	10	200	3100	15	10	1535	375
Future Volume (veh/h)	460	5	175	10	20	10	200	3100	15	10	1535	375
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.98
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	504	0	99	11	22	1	217	3370	11	11	1668	207
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	551	0	235	15	29	51	239	3671	1129	34	3042	915
Arrive On Green	0.15	0.00	0.15	0.03	0.02	0.03	0.13	0.72	0.71	0.04	1.00	1.00
Sat Flow, veh/h	3563	0	1521	613	1226	1585	1781	5106	1580	1781	5106	1558
Grp Volume(v), veh/h	504	0	99	33	0	1	217	3370	11	11	1668	207
Grp Sat Flow(s),veh/h/ln	1781	0	1521	1840	0	1585	1781	1702	1580	1781	1702	1558
Q Serve(g_s), s	33.4	0.0	14.1	4.3	0.0	0.1	28.8	130.9	0.5	1.4	0.0	0.0
Cycle Q Clear(g_c), s	33.4	0.0	14.1	4.3	0.0	0.1	28.8	130.9	0.5	1.4	0.0	0.0
Prop In Lane	1.00		1.00	0.33		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	551	0	235	44	0	51	239	3671	1129	34	3042	915
V/C Ratio(X)	0.91	0.00	0.42	0.75	0.00	0.02	0.91	0.92	0.01	0.32	0.55	0.23
Avail Cap(c_a), veh/h	609	0	260	199	0	185	371	3671	1129	163	3042	915
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.9	0.0	91.7	116.1	0.0	112.5	102.5	27.9	9.8	113.9	0.0	0.0
Incr Delay (d2), s/veh	18.1	0.0	1.7	22.6	0.0	0.2	25.6	4.9	0.0	5.0	0.7	0.5
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	17.1	0.0	5.8	2.4	0.0	0.1	15.2	53.3	0.2	0.7	0.2	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	117.9	0.0	93.4	138.7	0.0	112.6	128.1	32.7	9.8	118.8	0.7	0.5
LnGrp LOS	F	A	F	F	A	F	F	C	A	F	A	A
Approach Vol, veh/h		603			34			3598			1886	
Approach Delay, s/veh		113.9			137.9			38.4			1.3	
Approach LOS		F			F			D			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	177.6		42.1	38.2	148.0		11.7
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	20.0	129.0		41.0	50.0	99.0		26.0
Max Q Clear Time (g_c+I1), s	3.4	132.9		35.4	30.8	2.0		6.3
Green Ext Time (p_c), s	0.0	0.0		1.7	1.3	59.5		0.1

Intersection Summary			
HCM 6th Ctrl Delay			35.0
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	610	1100	15	5	5
Future Vol, veh/h	5	610	1100	15	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	663	1196	16	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1212	0	-	0	1877	606
Stage 1	-	-	-	-	1204	-
Stage 2	-	-	-	-	673	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	573	-	-	-	70	441
Stage 1	-	-	-	-	248	-
Stage 2	-	-	-	-	506	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	573	-	-	-	69	441
Mov Cap-2 Maneuver	-	-	-	-	69	-
Stage 1	-	-	-	-	246	-
Stage 2	-	-	-	-	506	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	38.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	573	-	-	-	119
HCM Lane V/C Ratio	0.009	-	-	-	0.091
HCM Control Delay (s)	11.3	-	-	-	38.3
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	450	690	110	10	5
Future Vol, veh/h	15	450	690	110	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	489	750	120	11	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	870	0	-	0	1331	810
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	521	-
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	775	-	-	-	170	380
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	596	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	775	-	-	-	166	380
Mov Cap-2 Maneuver	-	-	-	-	166	-
Stage 1	-	-	-	-	429	-
Stage 2	-	-	-	-	596	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	24.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	775	-	-	-	204
HCM Lane V/C Ratio	0.021	-	-	-	0.08
HCM Control Delay (s)	9.7	-	-	-	24.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection						
Int Delay, s/veh	2.2					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	75	0	75	175	0	20
Future Vol, veh/h	75	0	75	175	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	-	-	150	-	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	82	0	82	190	0	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	82	0	436	82
Stage 1	-	-	-	-	82	-
Stage 2	-	-	-	-	354	-
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	-	-	1515	-	578	978
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	710	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1515	-	547	978
Mov Cap-2 Maneuver	-	-	-	-	547	-
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	710	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.3	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	978	-	-	1515	-
HCM Lane V/C Ratio	0.022	-	-	0.054	-
HCM Control Delay (s)	8.8	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Renton Road & Roosevelt Avenue Accesses AM Peak Queuing Analysis

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Intersection: 7: Geiger Rd & Honouliuli Drwy 1

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	30	25
Average Queue (ft)	10	12
95th Queue (ft)	33	32
Link Distance (ft)		247
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 8: Geiger Rd & Honouliuli Drwy 2

Movement	EB	EB	EB	WB	NB	NB	SB
Directions Served	L	T	TR	L	L	TR	LTR
Maximum Queue (ft)	30	9	26	107	99	138	35
Average Queue (ft)	2	0	4	57	36	59	11
95th Queue (ft)	13	6	18	90	77	102	35
Link Distance (ft)		783	783		330	330	197
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	100			250			
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	24	35
Average Queue (ft)	2	9
95th Queue (ft)	16	32
Link Distance (ft)		244
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Network Summary

Network wide Queuing Penalty: 0

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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Renton Road & Roosevelt Avenue Accesses PM Peak

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	970	615	90	130	670	570	55	155	95	800	260	810
Future Volume (veh/h)	970	615	90	130	670	570	55	155	95	800	260	810
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	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	1054	668	89	141	728	620	60	168	42	870	283	600
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	940	1999	264	195	1135	1317	78	267	65	871	1076	1600
Arrive On Green	0.27	0.44	0.44	0.06	0.22	0.22	0.04	0.09	0.09	0.25	0.30	0.30
Sat Flow, veh/h	3456	4563	602	3456	5106	2758	1781	2833	690	3456	3554	2779
Grp Volume(v), veh/h	1054	497	260	141	728	620	60	104	106	870	283	600
Grp Sat Flow(s),veh/h/ln	1728	1702	1761	1728	1702	1379	1781	1777	1746	1728	1777	1389
Q Serve(g_s), s	41.0	14.5	14.7	6.1	19.5	23.0	5.0	8.5	8.8	37.9	9.1	17.7
Cycle Q Clear(g_c), s	41.0	14.5	14.7	6.1	19.5	23.0	5.0	8.5	8.8	37.9	9.1	17.7
Prop In Lane	1.00		0.34	1.00		1.00	1.00		0.40	1.00		1.00
Lane Grp Cap(c), veh/h	940	1491	771	195	1135	1317	78	168	165	871	1076	1600
V/C Ratio(X)	1.12	0.33	0.34	0.72	0.64	0.47	0.77	0.62	0.65	1.00	0.26	0.37
Avail Cap(c_a), veh/h	940	1491	771	940	1491	1508	449	507	498	871	1076	1600
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.9	27.9	27.9	70.0	53.2	26.9	71.3	65.7	65.8	56.3	39.8	17.4
Incr Delay (d2), s/veh	68.7	0.1	0.3	5.0	0.6	0.3	14.8	3.7	4.2	30.1	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	26.8	6.0	6.4	2.8	8.5	7.7	2.6	4.0	4.2	20.2	4.1	5.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	123.5	28.0	28.2	75.0	53.8	27.1	86.1	69.3	70.0	86.5	39.9	17.5
LnGrp LOS	F	C	C	E	D	C	F	E	E	F	D	B
Approach Vol, veh/h		1811			1489			270			1753	
Approach Delay, s/veh		83.6			44.7			73.3			55.4	
Approach LOS		F			D			E			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	44.0	20.2	14.5	72.0	12.6	51.6	47.0	39.5				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	38.0	43.0	41.0	44.0	38.0	43.0	41.0	44.0				
Max Q Clear Time (g_c+I1), s	39.9	10.8	8.1	16.7	7.0	19.7	43.0	25.0				
Green Ext Time (p_c), s	0.0	1.2	0.5	5.5	0.1	4.6	0.0	7.8				
Intersection Summary												
HCM 6th Ctrl Delay			62.9									
HCM 6th LOS			E									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	180	60	165	130	285	25	980	115	275	1210	45
Future Volume (veh/h)	70	180	60	165	130	285	25	980	115	275	1210	45
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	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	76	196	53	179	141	60	27	1065	112	299	1315	47
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	376	441	119	302	583	489	38	1442	151	338	2408	86
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.02	0.31	0.31	0.19	0.48	0.48
Sat Flow, veh/h	1173	1414	382	1124	1870	1568	1781	4693	493	1781	5061	181
Grp Volume(v), veh/h	76	0	249	179	141	60	27	772	405	299	884	478
Grp Sat Flow(s),veh/h/ln	1173	0	1797	1124	1870	1568	1781	1702	1782	1781	1702	1838
Q Serve(g_s), s	4.9	0.0	10.4	14.3	5.3	2.6	1.4	19.1	19.2	15.4	17.3	17.3
Cycle Q Clear(g_c), s	10.1	0.0	10.4	24.7	5.3	2.6	1.4	19.1	19.2	15.4	17.3	17.3
Prop In Lane	1.00		0.21	1.00		1.00	1.00		0.28	1.00		0.10
Lane Grp Cap(c), veh/h	376	0	560	302	583	489	38	1046	548	338	1619	874
V/C Ratio(X)	0.20	0.00	0.44	0.59	0.24	0.12	0.70	0.74	0.74	0.88	0.55	0.55
Avail Cap(c_a), veh/h	434	0	649	358	676	566	454	1410	738	454	1619	874
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.9	0.0	25.9	35.8	24.1	23.2	45.8	29.2	29.2	37.1	17.5	17.5
Incr Delay (d2), s/veh	0.3	0.0	0.6	1.9	0.2	0.1	20.9	1.4	2.7	14.7	0.4	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	4.5	4.0	2.4	1.0	0.8	7.8	8.4	7.9	6.5	7.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.2	0.0	26.5	37.6	24.3	23.3	66.7	30.6	31.9	51.8	17.9	18.2
LnGrp LOS	C	A	C	D	C	C	E	C	C	D	B	B
Approach Vol, veh/h		325			380			1204			1661	
Approach Delay, s/veh		26.9			30.4			31.8			24.1	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.9	34.9		35.3	8.0	50.8		35.3				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	24.0	39.0		34.0	24.0	39.0		34.0				
Max Q Clear Time (g_c+I1), s	17.4	21.2		26.7	3.4	19.3		12.4				
Green Ext Time (p_c), s	0.5	7.8		1.1	0.0	9.5		1.8				

Intersection Summary			
HCM 6th Ctrl Delay			27.6
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	8.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	5	5	125	5	5	175
Future Vol, veh/h	5	5	125	5	5	175
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	5	5	136	5	5	190

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	10	0	285	8
Stage 1	-	-	-	-	8	-
Stage 2	-	-	-	-	277	-
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	-	-	1610	-	705	1074
Stage 1	-	-	-	-	1015	-
Stage 2	-	-	-	-	770	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1610	-	645	1074
Mov Cap-2 Maneuver	-	-	-	-	645	-
Stage 1	-	-	-	-	929	-
Stage 2	-	-	-	-	770	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1055	-	-	1610	-
HCM Lane V/C Ratio	0.185	-	-	0.084	-
HCM Control Delay (s)	9.2	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.3	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	145	685	0	0	505	30	5	10	0	20	0	105
Future Vol, veh/h	145	685	0	0	505	30	5	10	0	20	0	105
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	158	745	0	0	549	33	5	11	0	22	0	114

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	582	0	0	745	0	0	1685	1643	745	1633	1627	567
Stage 1	-	-	-	-	-	-	1061	1061	-	566	566	-
Stage 2	-	-	-	-	-	-	624	582	-	1067	1061	-
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	992	-	-	863	-	-	75	100	414	81	102	523
Stage 1	-	-	-	-	-	-	271	300	-	509	507	-
Stage 2	-	-	-	-	-	-	473	499	-	269	300	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	992	-	-	863	-	-	46	73	414	57	74	523
Mov Cap-2 Maneuver	-	-	-	-	-	-	46	73	-	57	74	-
Stage 1	-	-	-	-	-	-	197	218	-	371	507	-
Stage 2	-	-	-	-	-	-	369	499	-	186	218	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	0	84.3	42
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	61	992	-	-	863	-	-	227
HCM Lane V/C Ratio	0.267	0.159	-	-	-	-	-	0.599
HCM Control Delay (s)	84.3	9.3	0	-	0	-	-	42
HCM Lane LOS	F	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0.9	0.6	-	-	0	-	-	3.4

Intersection						
Int Delay, s/veh	0.4					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	775	15	10	535	5	20
Future Vol, veh/h	775	15	10	535	5	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	-	-	50	-	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	842	16	11	582	5	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	858	0	1454	850
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	604	-
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	-	-	783	-	143	360
Stage 1	-	-	-	-	419	-
Stage 2	-	-	-	-	546	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	783	-	141	360
Mov Cap-2 Maneuver	-	-	-	-	141	-
Stage 1	-	-	-	-	413	-
Stage 2	-	-	-	-	546	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	19.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	275	-	-	783	-
HCM Lane V/C Ratio	0.099	-	-	0.014	-
HCM Control Delay (s)	19.5	-	-	9.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	785	520	20	20	20
Future Vol, veh/h	10	785	520	20	20	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	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	853	565	22	22	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	587	0	-	0	1440	565
Stage 1	-	-	-	-	565	-
Stage 2	-	-	-	-	875	-
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	988	-	-	-	146	524
Stage 1	-	-	-	-	569	-
Stage 2	-	-	-	-	408	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	988	-	-	-	143	524
Mov Cap-2 Maneuver	-	-	-	-	143	-
Stage 1	-	-	-	-	557	-
Stage 2	-	-	-	-	408	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	24.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	988	-	-	-	225
HCM Lane V/C Ratio	0.011	-	-	-	0.193
HCM Control Delay (s)	8.7	0	-	-	24.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.7

Intersection						
Int Delay, s/veh	0.6					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	815	530	5	15	15
Future Vol, veh/h	5	815	530	5	15	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	50	-	-	50	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	5	886	576	5	16	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	581	0	-	0	1472	288
Stage 1	-	-	-	-	576	-
Stage 2	-	-	-	-	896	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	991	-	-	-	128	709
Stage 1	-	-	-	-	526	-
Stage 2	-	-	-	-	398	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	991	-	-	-	127	709
Mov Cap-2 Maneuver	-	-	-	-	127	-
Stage 1	-	-	-	-	523	-
Stage 2	-	-	-	-	398	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	24.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	991	-	-	-	215
HCM Lane V/C Ratio	0.005	-	-	-	0.152
HCM Control Delay (s)	8.7	-	-	-	24.7
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Intersection	
Int Delay, s/veh	24

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	765	45	245	465	5	70	0	305	10	0	5
Future Vol, veh/h	5	765	45	245	465	5	70	0	305	10	0	5
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	250	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	832	49	266	505	5	76	0	332	11	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	510	0	0	882	0	0	1653	1910	442	1466	1932	255
Stage 1	-	-	-	-	-	-	868	868	-	1040	1040	-
Stage 2	-	-	-	-	-	-	785	1042	-	426	892	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1051	-	-	762	-	-	~ 65	67	563	89	65	744
Stage 1	-	-	-	-	-	-	314	368	-	246	306	-
Stage 2	-	-	-	-	-	-	352	305	-	577	358	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1051	-	-	761	-	-	~ 47	43	563	27	42	744
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 47	43	-	27	42	-
Stage 1	-	-	-	-	-	-	312	366	-	245	199	-
Stage 2	-	-	-	-	-	-	227	198	-	236	356	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	4.2	108.7	146.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	47	563	1051	-	-	761	-	-	40
HCM Lane V/C Ratio	1.619	0.589	0.005	-	-	0.35	-	-	0.408
HCM Control Delay (s)	$ 495	20.1	8.4	-	-	12.3	-	-	146.8
HCM Lane LOS	F	C	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	7.5	3.8	0	-	-	1.6	-	-	1.4

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	150	365	580	160	280	270	325	725	80	190	915	100
Future Volume (veh/h)	150	365	580	160	280	270	325	725	80	190	915	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	163	397	368	174	304	61	353	788	21	207	995	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	189	490	415	200	501	424	421	1100	489	235	1135	500
Arrive On Green	0.11	0.26	0.26	0.11	0.27	0.27	0.12	0.31	0.31	0.13	0.32	0.32
Sat Flow, veh/h	1781	1870	1585	1781	1870	1583	3456	3554	1579	1781	3554	1566
Grp Volume(v), veh/h	163	397	368	174	304	61	353	788	21	207	995	30
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1583	1728	1777	1579	1781	1777	1566
Q Serve(g_s), s	11.7	25.9	29.0	12.5	18.5	3.8	13.0	25.6	1.2	14.8	34.4	1.7
Cycle Q Clear(g_c), s	11.7	25.9	29.0	12.5	18.5	3.8	13.0	25.6	1.2	14.8	34.4	1.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	189	490	415	200	501	424	421	1100	489	235	1135	500
V/C Ratio(X)	0.86	0.81	0.89	0.87	0.61	0.14	0.84	0.72	0.04	0.88	0.88	0.06
Avail Cap(c_a), veh/h	246	604	512	246	604	511	638	1284	570	329	1284	566
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	57.2	45.0	46.2	56.8	41.6	36.3	55.9	39.9	31.4	55.5	41.8	30.7
Incr Delay (d2), s/veh	20.7	6.8	14.7	23.1	1.2	0.2	6.1	1.6	0.0	17.8	6.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.4	12.9	13.1	6.9	8.7	1.5	6.0	11.4	0.5	7.8	16.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.9	51.7	60.9	79.9	42.8	36.4	62.0	41.5	31.5	73.3	48.4	30.8
LnGrp LOS	E	D	E	E	D	D	E	D	C	E	D	C
Approach Vol, veh/h		928			539			1162			1232	
Approach Delay, s/veh		60.0			54.1			47.5			52.1	
Approach LOS		E			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	23.2	46.3	20.6	40.1	21.9	47.6	19.8	40.8
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	24.0	47.0	18.0	42.0	24.0	47.0	18.0	42.0
Max Q Clear Time (g_c+I1), s	16.8	27.6	14.5	31.0	15.0	36.4	13.7	20.5
Green Ext Time (p_c), s	0.3	5.5	0.1	3.0	0.9	5.1	0.2	2.0

Intersection Summary	
HCM 6th Ctrl Delay	52.9
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	285	245	215	15	255	170	195	1120	15	395	1685	370
Future Volume (veh/h)	285	245	215	15	255	170	195	1120	15	395	1685	370
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	321	251	168	16	277	65	212	1217	6	429	1832	277
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	571	300	243	289	304	453	278	2393	726	491	2707	817
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.08	0.47	0.46	0.14	0.53	0.52
Sat Flow, veh/h	3563	1870	1514	1781	1870	2790	3456	5106	1578	3456	5106	1566
Grp Volume(v), veh/h	321	251	168	16	277	65	212	1217	6	429	1832	277
Grp Sat Flow(s),veh/h/ln	1781	1870	1514	1781	1870	1395	1728	1702	1578	1728	1702	1566
Q Serve(g_s), s	20.0	31.2	25.2	1.8	34.9	4.8	14.4	39.9	0.5	29.2	63.1	24.7
Cycle Q Clear(g_c), s	20.0	31.2	25.2	1.8	34.9	4.8	14.4	39.9	0.5	29.2	63.1	24.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	571	300	243	289	304	453	278	2393	726	491	2707	817
V/C Ratio(X)	0.56	0.84	0.69	0.06	0.91	0.14	0.76	0.51	0.01	0.87	0.68	0.34
Avail Cap(c_a), veh/h	623	327	265	289	304	453	446	2393	726	533	2707	817
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)	0.62	0.62	0.62	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	93.0	97.7	95.2	85.0	98.8	86.2	108.1	44.5	35.1	100.8	41.3	33.3
Incr Delay (d2), s/veh	1.2	12.3	6.0	0.2	31.2	0.3	4.3	0.8	0.0	14.1	1.4	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.5	16.4	10.4	0.9	19.8	1.8	6.7	17.4	0.2	14.2	27.2	9.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	94.2	110.0	101.2	85.1	130.0	86.5	112.4	45.3	35.1	114.9	42.7	34.5
LnGrp LOS	F	F	F	F	F	F	F	D	D	F	D	C
Approach Vol, veh/h		740			358			1435			2538	
Approach Delay, s/veh		101.1			120.1			55.1			54.0	
Approach LOS		F			F			E			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	38.1	116.5		42.5	23.3	131.2		43.0				
Change Period (Y+Rc), s	6.0	7.0		6.0	6.0	7.0		6.0				
Max Green Setting (Gmax), s	35.0	103.0		40.0	29.0	109.0		37.0				
Max Q Clear Time (g_c+I1), s	31.2	41.9		33.2	16.4	65.1		36.9				
Green Ext Time (p_c), s	0.9	45.6		3.2	0.9	42.8		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			65.9									
HCM 6th LOS			E									

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)	360	50	160	35	30	30	130	1755	65	40	3130	680
Future Volume (veh/h)	360	50	160	35	30	30	130	1755	65	40	3130	680
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	430	0	83	38	33	1	141	1908	44	43	3402	426
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	517	0	219	46	40	89	160	3501	1075	69	3196	966
Arrive On Green	0.15	0.00	0.15	0.06	0.05	0.06	0.09	0.69	0.68	0.08	1.00	1.00
Sat Flow, veh/h	3563	0	1513	975	847	1585	1781	5106	1578	1781	5106	1563
Grp Volume(v), veh/h	430	0	83	71	0	1	141	1908	44	43	3402	426
Grp Sat Flow(s),veh/h/ln	1781	0	1513	1822	0	1585	1781	1702	1578	1781	1702	1563
Q Serve(g_s), s	28.2	0.0	11.9	9.3	0.0	0.1	18.8	45.0	2.2	5.6	150.2	0.0
Cycle Q Clear(g_c), s	28.2	0.0	11.9	9.3	0.0	0.1	18.8	45.0	2.2	5.6	150.2	0.0
Prop In Lane	1.00		1.00	0.54		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	517	0	219	87	0	89	160	3501	1075	69	3196	966
V/C Ratio(X)	0.83	0.00	0.38	0.82	0.00	0.01	0.88	0.55	0.04	0.63	1.06	0.44
Avail Cap(c_a), veh/h	609	0	258	197	0	185	289	3501	1075	163	3196	966
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	99.8	0.0	92.8	112.7	0.0	107.0	108.0	18.9	12.5	109.1	0.0	0.0
Incr Delay (d2), s/veh	9.1	0.0	1.5	16.9	0.0	0.1	26.1	0.6	0.1	8.4	35.9	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.9	0.0	4.9	4.9	0.0	0.1	10.0	18.3	0.8	2.7	10.6	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	108.9	0.0	94.3	129.7	0.0	107.1	134.1	19.6	12.6	117.5	35.9	1.4
LnGrp LOS	F	A	F	F	A	F	F	B	B	F	F	A
Approach Vol, veh/h		513			72			2093			3871	
Approach Delay, s/veh		106.5			129.4			27.1			33.0	
Approach LOS		F			F			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.2	169.5		39.8	27.5	155.2		17.4
Change Period (Y+Rc), s	6.0	7.0		5.0	6.0	7.0		6.0
Max Green Setting (Gmax), s	20.0	129.0		41.0	39.0	110.0		26.0
Max Q Clear Time (g_c+I1), s	17.6	47.0		30.2	20.8	152.2		11.3
Green Ext Time (p_c), s	0.1	58.6		2.2	0.8	0.0		0.2

Intersection Summary			
HCM 6th Ctrl Delay			38.0
HCM 6th LOS			D

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1070	710	5	10	5
Future Vol, veh/h	5	1070	710	5	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	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	5	1163	772	5	11	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	777	0	-	0	1948	389
Stage 1	-	-	-	-	775	-
Stage 2	-	-	-	-	1173	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	837	-	-	-	63	610
Stage 1	-	-	-	-	416	-
Stage 2	-	-	-	-	293	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	837	-	-	-	63	610
Mov Cap-2 Maneuver	-	-	-	-	63	-
Stage 1	-	-	-	-	414	-
Stage 2	-	-	-	-	293	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	53.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	837	-	-	-	90
HCM Lane V/C Ratio	0.006	-	-	-	0.181
HCM Control Delay (s)	9.3	-	-	-	53.6
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	700	535	30	95	15
Future Vol, veh/h	10	700	535	30	95	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	50	-	-	-	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	761	582	33	103	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	615	0	-	0	1382	599
Stage 1	-	-	-	-	599	-
Stage 2	-	-	-	-	783	-
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	965	-	-	-	159	502
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	450	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	965	-	-	-	157	502
Mov Cap-2 Maneuver	-	-	-	-	157	-
Stage 1	-	-	-	-	543	-
Stage 2	-	-	-	-	450	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	62.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	965	-	-	-	173
HCM Lane V/C Ratio	0.011	-	-	-	0.691
HCM Control Delay (s)	8.8	-	-	-	62.6
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	4.1

Intersection	
Int Delay, s/veh	2.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	180	0	55	130	0	85
Future Vol, veh/h	180	0	55	130	0	85
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	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	196	0	60	141	0	92

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	196	0	457	196
Stage 1	-	-	-	-	196	-
Stage 2	-	-	-	-	261	-
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	-	-	1377	-	562	845
Stage 1	-	-	-	-	837	-
Stage 2	-	-	-	-	783	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1377	-	537	845
Mov Cap-2 Maneuver	-	-	-	-	537	-
Stage 1	-	-	-	-	800	-
Stage 2	-	-	-	-	783	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.3	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	845	-	-	1377	-
HCM Lane V/C Ratio	0.109	-	-	0.043	-
HCM Control Delay (s)	9.8	-	-	7.7	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2026 Renton Road & Roosevelt Avenue Accesses PM Peak Queuing Analysis

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Intersection: 7: Geiger Rd & Honouliuli Drwy 1

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	24	49
Average Queue (ft)	3	18
95th Queue (ft)	16	42
Link Distance (ft)		247
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 8: Geiger Rd & Honouliuli Drwy 2

Movement	EB	EB	EB	WB	NB	NB	SB
Directions Served	L	T	TR	L	L	TR	LTR
Maximum Queue (ft)	23	22	43	176	352	362	57
Average Queue (ft)	1	1	4	76	206	240	17
95th Queue (ft)	11	12	21	139	416	424	50
Link Distance (ft)		783	783		330	330	197
Upstream Blk Time (%)					32	35	
Queuing Penalty (veh)					0	0	
Storage Bay Dist (ft)	100			250			
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Geiger Rd & Honouliuli Drwy 3

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	31	57
Average Queue (ft)	3	15
95th Queue (ft)	19	45
Link Distance (ft)		244
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	50	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Network Summary

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Appendix C:
Pre-Assessment Consultation Comments and Responses

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State of Hawaiʻi

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DAVID Y. IGE
GOVERNOR

CURT T. OTAGURO
COMPTROLLER

AUDREY HIDANO
DEPUTY COMPTROLLER

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

(P)20.082

JUN - 1 2020

Mr. Paul Christiansen
Department of Environmental Services (ENV)
City and County of Honolulu
1000 Uluohia Street, Suite 308
Kapolei, Hawaii 96707
(via e-mail at **p.christiansen@honolulu.gov**)

Dear Mr. Christiansen:

Subject: Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for including the Department of Accounting and General Services' (DAGS) in your pre-assessment consultation process on the subject project. The project does not appear to directly impact any existing facilities that are managed or operated by DAGS, and we have no comments to offer at this time. However, we do intend to monitor this project as it develops, given the proximity of certain State facilities that are located within Kapolei.

If you have any questions or require further information, please call Mr. Dennis Chen of the Planning Branch at 586-0491.

Sincerely,

CHRISTINE L. KINIMAKA
Public Works Administrator

DC:mo
c: Mr. Jack Pobuk, Department of Environmental Services, City and County of Honolulu
(via e-mail at **jpobuk@honolulu.gov**)
Mr. Aaron Weieneth, AECOM
(via e-mail at **aaron.weieneth@aecom.com**)

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-079

September 9, 2021

Ms. Christine L. Kinimaka, Public Works Administrator
State of Hawai'i, Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawai'i 96810-0119

Dear Ms. Kinimaka:

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your letter dated June 1, 2020, regarding the pre-assessment consultation for the subject project. We understand that the Department of Accounting and General Services has no comments at this time but will continue to monitor the project.

We appreciate your participation in the pre-assessment consultation process. Your letter and this response will be included in the Draft Environmental Assessment (DEA). Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

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

IN REPLY REFER TO:
DIR 0464
STP 8.2921

June 2, 2020

Ms. Lori M.K. Kahikina, P. E.
Director
Department of Environmental Services
City and County of Honolulu
1000 Uluohia Street, Suite 308
Kapolei, Hawaii 96707

Attention: Mr. Paul Christiansen

Dear Ms. Kahikina:

Subject: Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and Ewa Refuse Convenience Center Relocation
Ewa, Oahu, Hawaii
Tax Map Key: (1) 9-1-013:007; 9-1-069:003

The Hawaii Department of Transportation (HDOT) understands the City and County of Honolulu, Department of Environmental Services (ENV) is in the process of phased improvements to the Honouliuli Wastewater Treatment Plant (WWTP), including the construction of ENV support facilities, as described in previous Environmental Impact Statements.

Highways Division (HDOT-HWY)

Additional environmental impact documentation is required for the following related actions:

1. Improvements to two unimproved driveways from Renton Road (County jurisdiction) to the ENV support facilities. Both driveways cross the former Oahu Railway and Land Company (OR&L) railroad Right-of-Way (ROW) (State jurisdiction) that is aligned along the northern boundary of the ENV support facilities parcel.

2. A new driveway on Franklin D. Roosevelt (Roosevelt) Avenue (State Route 8940) to provide direct access to the ENV support facilities.

3. Relocation of the existing onsite Ewa Refuse Convenience Center (RCC) accessed directly from Geiger Road (County jurisdiction) to a new location within the WWTP property.

HDOT-HWY has reviewed the preliminary materials and has the following comments organized in the numerical order of the improvements listed above:

1. OR&L ROW

    a. The federal government, through Federal Highway Administration (FHWA), deeded the OR&L 40-foot wide ROW to the State of Hawaii on June 5, 1980 for use as bikeway and pedestrian routes, as appropriate, of the historic property. All licenses, permits, easements and occupancy agreements issued by HDOT for uses within the OR&L ROW require written approval from the State Historic Preservation Division (SHPD) and FHWA, per the deed.

    b. Use of the OR&L ROW requires FHWA approval; therefore, it is considered a federal action requiring compliance with National Environmental Policy Act and Section 106 of the National Historic Preservation Act prior to seeking written approval from SHPD and FHWA. The deed explicitly requires preservation of the historic facility in accordance with Section 4(f) and requires Section 4(f) analysis of "transportation projects." In 2013, FHWA clarified that "transportation projects" do not have to be federally funded to require Section 4(f) analysis.

    c. All coordination, consultation and work efforts among HDOT, FHWA, SHPD and other stakeholders shall be the responsibility of the branch or office issuing the approval. A use and occupancy agreement will be requested from HDOT-HWY ROW Branch.

    d. The Leeward Bikeway Phase I (HDOT project: STP-BW-0300(8)) construction contract was awarded and includes the OR&L ROW segment adjacent to the ENV support facilities. Motor vehicle crossings of the OR&L ROW are not consistent with the deed. The Environmental Assessment (EA) shall provide compelling reasons for the proposed crossings of OR&L ROW for motor vehicles. Describe the potential impacts to multimodal transportation, recreation, historic properties, and traffic safety in the EA.

    e. Propose an action alternative that meets the purpose and need of the ENV support facilities and does not require motor vehicle crossing of OR&L ROW. Consider travel demand management strategies that reduce the number of trips generated during peak traffic hours.

    f. HDOT-HWY supports the use of existing or proposed pedestrian and bike routes from nearby roadways into the ENV site for employees.

2. New Access on Roosevelt Avenue

    a. Roosevelt Avenue was transferred to the HDOT under a 2001 Memorandum of Understanding regarding the Barbers Point Naval Air Station (BPNAS) closure and transfer of land from the federal government to the BPNAS Redevelopment Commission (subsequently to Hawaii Community Development Authority). The roadways did not meet HDOT or City and County of Honolulu (CCH) roadway standards. The intent was for the HDOT to manage those roadways transferred to the State until they were improved to CCH standards, at which time the roadways would be dedicated to CCH. The ROW remains in HDOT jurisdiction.

b. New access driveways and other work within the State ROW require HDOT-HWY approval.

c. Clarify the proposed location of the proposed access relative to access driveways on the opposite edge of Roosevelt Avenue.

d. A Traffic Impact Analysis Report (TIAR) is required to assess traffic conditions and safety. See Item 4 below.

3. Relocation of the Ewa RCC

   a. Describe onsite traffic circulation for existing and proposed operations at the two parcels.

   b. Describe anticipated changes in Ewa RCC waste management capacity that may result in an increase in trip generation.

   c. Submit a TIAR. See Item 4 below.

4. EA/TIAR: Based on a review of the project information provided, the HDOT-HWY anticipates a potential adverse impact to the HDOT ROW. Submit a TIAR prepared and stamped by a licensed engineer for review by HDOT. The TIAR and EA should include the following, in addition to addressing the comments above:

   a. Existing trip generation at the site, inclusive of all operations at the WWTP and ENV support parcels.

   b. Existing multimodal traffic and safety conditions in the study area, inclusive of cars, trucks, bikes, pedestrians and transit.

   c. HDOT and OR&L ROW boundaries, and all existing and proposed access driveways.

   d. Forecasted traffic and safety conditions in the horizon year (year at full project build-out), with and without the project. If the project construction is phased over multiple years, interim horizon years should be analyzed for the completion of each phase.

   e. Anticipated development projects and changes in land use in the study area.

f. Analysis of the proposed action and action alternatives impacts to traffic conditions and safety.

g. Recommend measures to mitigate impacts, as needed.

Airports Division (HDOT-A)

1. The proposed project is located approximately 1.5 miles from Kalaeloa Airport. All projects within 5 miles from Hawaii State airports are subject to the land use compatibility requirements of the State of Hawaii's Technical Assistance Memorandum (TAM). The TAM can be viewed at the following link: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf

2. The Airport Zoning Act, Hawaii Revised Statutes, Chapter 262, requires HDOT-A to prevent hazards and non-conforming uses that conflict with the Federal Aviation Administration (FAA) Hazardous Wildlife Attractants requirements. HDOT-A requires that the proposed land use, construction, and operations do not create wildlife attractants. In addition to the TAM, please review FAA Advisory Circular 150/5200-33C, *Hazardous Wildlife Attractants On Or Near Airports for guidance*.

If there are any questions, please contact Mr. Blayne Nikaido of the HDOT Statewide Transportation Planning Office at (808) 831-7979 or via email at blayne.h.nikaido@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

c: Jack Pobuk – ENV
Aaron Weieneth – AECOM

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-080

September 9, 2021

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

Dear Mr. Butay:

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your letter dated June 2, 2020, regarding the pre-assessment consultation for the subject project.

Your comments will be considered in the Draft Environmental Assessment (DEA). We acknowledge the crossings of the historic Oahu Railway & Land Company (OR&L) right-of-way require a Use and Occupancy Agreement (UOA) from the Department of Transportation as well as written approval from the State Historic Preservation Division and the Federal Highway Administration (FHWA). We appreciate your letter to the FHWA, Hawaii Division, dated September 18, 2020, in which you express support of our request, with modification, for certain allowed exemptions from the Section 106 and Section 4(f) processes. The DEA will include a Traffic Impact Assessment Report for the proposed action, and will also address the land use requirements due to the project location approximately 1.5 miles from Kalaeloa Airport.

We appreciate your participation in the pre-assessment consultation process. Your letter and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

From: Sen. Kurt Fevella
To: p.christiansen@honolulu.gov
Cc: jpobuk@honolulu.gov
Subject: [EXTERNAL] IN OPPOSITION OF PROPOSED CROSSINGS OF THE HISTORICAL OR&L TRACKS
Date: Wednesday, June 03, 2020 4:36:13 PM
Attachments: image003.png

I am opposed to both of these proposed crossings of the historical OR&L tracks. In your introduction you state that you are required to obtain a use and occupancy agreement from the State of Hawaii's Department of Transportation. You say these driveways cross land which is under HDOT's jurisdiction. We find this misleading in that you are not describing it as it really is, historic OR&L railroad tracks that are on the National Register of Historic Places. The tracks were placed in that location around 1890. Every time a crossing is put in it degrades the fabric of the historical tracks. Once it is done it cannot be undone. It is lost forever.I am 100% against any new crossings going over the historical train tracks. This is a piece of Hawaii's history and we should all be opposing any time someone wants to destroy that piece of history for future generations to enjoy.

Kurt Fevella

Senator Kurt Fevella
State of Hawaii, District 19
Minority Leader/ Minority Floor Leader

State Capitol, Room 217
415 S. Beretania Street,
Honolulu, HI 96813
Phone: (808) 586-6360
Fax: (808) 586-6361
senfevella@capitol.hawaii.gov

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

IN REPLY REFER TO:
PRO 21-089

September 9, 2021

The Honorable Kurt Fevella
State Senate
415 South Beretania Street, Room 217
Honolulu, Hawai'i 96813

Dear Senator Fevella:

Thank you for your email dated June 3, 2020, regarding the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment.

Your comments will be considered in the Draft Environmental Assessment (DEA). We understand that you are opposed to the two proposed crossings of the historic Oahu Railway & Land Company (OR&L) railroad tracks and right-of-way (ROW). The DEA will include descriptions of the proposed work, assessment of the needs and impacts, and will offer mitigation measures. It is our hope that this DEA will help advance the dialogue between the key stakeholders, including the State Department of Transportation, the State Historic Preservation Division, and the Federal Highway Administration, and allow for progress to be made towards the proposed Programmatic Agreement (PA) for the OR&L ROW.

We appreciate your participation in the pre-assessment consultation process. Your email and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

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

June 16, 2020

LD513

ATTN: Paul Christiansen
Department of Environmental Services
City and County of Honolulu
1000 Uluohia Street, Suite 308 *via email: p.christiansen@honolulu.gov*
Kapolei, HI 96707

Dear Sirs:

SUBJECT: Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and ʻEwa Refuse Convenience Center Relocation Environmental Assessment; Located at Honouliuli, ʻEwa District, Island of Oahu; TMK: (1) 9-1-126:014, 9-1-069:003 & 004, 9-1-013:007, City Right-of-Way (ROW) on Renton Road, and State ROW on Roosevelt Avenue

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 DLNR's various divisions for their review and comment.

Enclosed are responses/comments from our (a) Division of Aquatic Resources, (b) Engineering Division, (c) Division of Forestry and Wildlife, and (c) Land Division – Oahu District. Should you have any questions about the attached comments, 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

Enclosure(s)
cc: Central Files
Jack Pobuk, ENV *via email: jpobuk@honolulu.gov*
Aaron Weieneth, AECOM *via email: aaron.weieneth@aecom.com*

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

June 5, 2020

LD 513

MEMORANDUM

TO: **DLNR Agencies:**

_X_ Div. of Aquatic Resources *(via email: Kendall.L.Tucker@hawaii.gov)*
___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: DLNR.Land@hawaii.gov)*
_X_ Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: **Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and ʻEwa Refuse Convenience Center Relocation Environmental Assessment**
LOCATION: Honouliuli, ʻEwa District, Island of Oahu; TMK: (1) 9-1-126:014, 9-1-069:003 & 004, 9-1-013:007; also City Right-of-Way (ROW) on Renton Road, and State ROW on Roosevelt Avenue.
APPLICANT: **Department of Environmental Services, City & County of Honolulu**

Transmitted for your review and comment is information on the above-referenced subject. Please submit any comments to Land Division via email at DLNR.Land@hawaii.gov by **June 12, 2020.**

If no response is received by the above date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

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

Signed: ______________

Print Name: Brian J. Neilson
Date: Jun 15, 2020

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

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

Date: June 8, 2020
DAR # CV0016

MEMORANDUM

TO: Brian J. Neilson
DAR Administrator

FROM: Glenn Higashi GH, Aquatic Biologist

SUBJECT: Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and ‘Ewa Refuse Convenience Center Relocation Environmental Assessment

Request Submitted by: Russell Y. Tsuji, Land Administrator

Location of Project: Honouliuli, ‘Ewa District, Island of Oahu;

Brief Description of Project:

The City and County of Honolulu (City), Department of Environmental Services (ENV) is proposing access road improvements for the ENV Support Facilities project and relocation of the existing 'Ewa Refuse Convenience Center at the Honouliuli Wastewater Treatment Plant. ENV is in the process of preparing an Environmental Assessment (EA) for this proposed action and is seeking input from interested parties during this pre-assessment consultation phase. Location of the proposed access road improvements and relocation of the existing 'Ewa Resfuse Convienience Center at the Honouliuli Wastewater Treatment Plant involves TMK: (1) 9-1-126:014, 9-1-069:003 & 004, 9-1-013:007; also City Right-of-Way (ROW) on Renton Road, and State ROW on Roosevelt Avenue

Comments:

☐ No Comments ☒ Comments Attached

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: ______________________ Date: Jun 15, 2020
Brian J. Neilson
DAR Administrator

DAR# CV0016

Brief Description of Project

The proposed access road improvements for the ENV Support Facilities project involves two existing driveways connect the Honouliuli WWTP expansion property to Renton Road to the north. These driveways cross the 40-ft wide right-of-way of the former OR&L railroad {OR&L ROW) that is under the jurisdiction of HDOT. Both driveways were used by the previous owner at the time the City purchased the property, and the City plans to retain these driveways and provide upgrades appropriate for continued use into the future. Both driveways are currently unimproved gravel roads.

The proposed action involves:

1.) Improvement, restoration, and maintenance of the existing driveway crossing the HDOT OR&L ROW from Renton Road to maintain dedicated access to the leased telecommunications facility in the northwest corner of the Honouliuli WWTP expansion area property. The proposed improvements include paving the driveway and constructing an upgraded railroad crossing conforming to design requirements of HDOT and the Hawaiian Railway Society. The upgraded railroad crossing is intended for restoration and maintenance of the existing tracks and is not anticipated to have an adverse impact to the Hawaiian Railway Society railroad operations. Since the City's existing fence and gate at this location are in poor condition, the City also plans to replace the fence and gate. An additional new pedestrian gate will also be added by this driveway to facilitate bicycle and pedestrian access for employees to the new Leeward Bikeway being constructed by the State in the OR&L ROW and to provide access to a bus stop on Renton Road.

2,) Improvement, restoration, and maintenance of the existing unpaved road (Malia Street) and
access driveway connecting Renton Road to the ENV support facilities, including improvements to the crossing of the HDOT OR&l ROW. The proposed improvements Improvement, restoration, and maintenance of an existing unpaved road (Malia Street) and
include paving the street and access driveway from the WWTP expansion property to Renton Road and constructing an upgraded railroad crossing conforming to design requirements of HDOT and the Hawaiian Railway Society. The upgraded railroad crossing is
intended for restoration and maintenance of the existing tracks and is not anticipated to have an adverse impact to the Hawaiian Railway Society railroad operations. Since the City's
existing fence along the property line and the existing vehicle gate for this driveway are in
poor condition, the City also plans to replace the fence and the gate. Widening of Renton
Road to install a westbound left turn lane will likely be required to manage increased traffic
volumes associated with the proposed Malia Street entrance.

DAR# CV0016

Brief Description of Project

3.) A new driveway from Roosevelt Avenue to provide access to the ENV support facilities. The
proposed improvements include constructing a new paved access driveway from the WWTP
expansion property to connect to Roosevelt Avenue. The work also includes constructing a new gate in the existing fence belonging to HDOT. It is noted that the existing fence, which was part of the perimeter fence of the former Barbers Point Naval Air Station, is mentioned as a contributing element of the historic 'Ewa Battlefield. Approval for installation of the gate in this existing fence from the appropriate authorities will be needed. It is anticipated that the proposed gate will be a minor modification of the fence, with the intention of maintaining preservation of the fence itself, and will not adversely impact or detract from the value of the fence as a historic contributing element. Widening of Roosevelt Avenue to install an eastbound left turn lane will likely be required to manage increased traffic volumes.

The proposed relocation of the existing 'Ewa Refuse Convenience Center at the Honouliuli Wastewater Treatment Plant The 'Ewa Refuse CC is especially intended for receiving
residents' solid waste that is not appropriate to be placed in the residents' curb-side carts for
pick-up. This includes bulky waste items and some items that should be recycled, such as white
goods, tires, and similar types of recyclable waste. The 'Ewa Refuse CC is currently located on
Geiger Road, on the same City property as the Honouliuli WWTP, to the west of the main entrance to the Honouliuli WWTP. On certain collection days (e.g. weekends, holidays), due to
the current limited space and capacity for vehicle unloading, high usage of the convenience center results in congestion and backup of traffic on Geiger Road, including blockage of the main Honouliuli WWTP driveway. Relocation of the 'Ewa Refuse CC to an available open area within the Honouliuli WWTP property is proposed to alleviate this traffic congestion on Geiger Road and provide a more efficient facility for the community. The relocated convenience center will have more space to accommodate waiting vehicles on site, minimizing the potential for vehicles to back up on Geiger Road. The larger footprint and additional collection areas of the new facility will provide space for better internal traffic circulation and quicker unloading.

The proposed actions involve:

1.) Relocation of the Refuse Division's existing 'Ewa Refuse CC on Geiger Road to within the
Honouliuli WWTP site. The improvements will include new paved roads, new paved unloading and storage areas, and associated facilities. The existing Honouliuli WWTP

DAR# CV0016

Brief Description of Project

facilities will be removed as needed to clean up the site, and the site will be available for future use by ENV. At this time there are no plans for redevelopment of this site. Future use may include uses related to the operation of the 'Ewa Refuse CC, such as an auxiliary storage or staging area, or uses related to the operation and maintenance of the WWTP.

DAR# CV0016

Comments

The proposed project involving the ENV Support Facilities Access Road Improvements and ‘Ewa Refuse Convenience Center Relocation are not expected to have adverse impacts on aquatic resources, as there are no streams or water bodies within/adjacent to the vicinity of this proposed project.

Thank you for providing us the opportunity to review and comment on the Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and ‘Ewa Refuse Convenience Center Relocation Environmental Assessment. Should there be any changes, amendments or modifications to the current plans, DAR requests the opportunity to review and comment on those changes.

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

June 5, 2020

LD 513

MEMORANDUM

FROM:
~~TO:~~ **DLNR Agencies:**

X Div. of Aquatic Resources *(via email: Kendall.L.Tucker@hawaii.gov)*
__ 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: DLNR.Land@hawaii.gov)*
X Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

TO:
~~FROM:~~ Russell Y. Tsuji, Land Administrator Russell Tsuji

SUBJECT: **Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment**

LOCATION: Honouliuli, 'Ewa District, Island of Oahu; TMK: (1) 9-1-126:014, 9-1-069:003 & 004, 9-1-013:007; also City Right-of-Way (ROW) on Renton Road, and State ROW on Roosevelt Avenue.

APPLICANT: **Department of Environmental Services, City & County of Honolulu**

Transmitted for your review and comment is information on the above-referenced subject. Please submit any comments to Land Division via email at DLNR.Land@hawaii.gov by **June 12, 2020.**

If no response is received by the above date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

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

Signed: [signature]

Print Name: Carty S. Chang, Chief Engineer
Date: Jun 11, 2020

Attachments
Cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji

Ref: Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and Ewa Refuse Convenience Center Relocation Environmental Assessment
TMK(s): (1) 9-1-126:014, 9-1-069:003 & 004, 9-1-013:007; also City Right-of-Way (ROW) on Renton Road, and State ROW on Roosevelt Avenue
Location: Honouliuli, Ewa District, Island of Oahu
Applicant: Department of Environmental Services, City & County of Honolulu

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). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR 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 Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

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) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4896.

Signed: [signature]
CARTY S. CHANG, CHIEF ENGINEER

Date: Jun 11, 2020

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

June 5, 2020

LD 513/Log no 2674

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources *(via email: Kendall.L.Tucker@hawaii.gov)*
__ 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: DLNR.Land@hawaii.gov)*
X Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

Russell Tsuji

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and ‘Ewa Refuse Convenience Center Relocation Environmental Assessment**
LOCATION: Honouliuli, ‘Ewa District, Island of Oahu; TMK: (1) 9-1-126:014, 9-1-069:003 & 004, 9-1-013:007; also City Right-of-Way (ROW) on Renton Road, and State ROW on Roosevelt Avenue.
APPLICANT: **Department of Environmental Services, City & County of Honolulu**

Transmitted for your review and comment is information on the above-referenced subject. Please submit any comments to Land Division via email at DLNR.Land@hawaii.gov by **June 12, 2020.**

If no response is received by the above date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

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

Signed: DGS

Print Name: DAVID G. SMITH, Administrator
Date: Jun 15, 2020

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

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

June 15, 2020

Log no. 2674

MEMORANDUM

TO: RUSSELL Y. TSUJI, Administrator
Land Division

FROM: DAVID G. SMITH, Administrator

SUBJECT: **Division of Forestry and Wildlife Comments for Pre-Assessment Consultation for Department of Environmental Services (ENV) Support Facilities Access Road Improvements and ‘Ewa Refuse Convenience Center Relocation Environmental Assessment.**

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your inquiry regarding pre-assessment consultation for ENV support facilities access road improvements and ‘Ewa refuse convenience center relocation Environmental Assessment on O‘ahu, Hawai‘i, TMKs: (1) 9-1-126:014, (1) 9-1-069:003 and 004, (1) 9-1-013:007; also City Right-of-Way (ROW) on Renton Road, and State ROW on Roosevelt Avenue. The proposed project consists of constructing a new paved access driveway, improvement and maintenance of existing roads, construction of the new ‘Ewa refuse convenience center, and removal of the old convenience center.

The State endangered Hawaiian Short-eared Owl or Pueo (*Asio flammeus sandwichensis*) has the potential to occur in the project site vicinity. Pueo are a crepuscular species, most active during dawn and dusk twilights. DOFAW recommends twilight pre-construction surveys by a qualified biologist prior to clearing vegetation. If Pueo nests are present, a buffer zone should be established in which no clearing occurs until nesting ceases, and DOFAW staff should be notified.

DOFAW is concerned about attracting vulnerable birds to areas that may host nonnative predators such as cats, rodents, and mongoose. This land development is likely to increase human activity in the area and may generate more predator attractants such as trash. We recommend taking action to minimize predator presence; remove cats, place bait stations for rodents and mongoose, and provide covered trash receptacles.

The State listed Hawaiian Hoary Bat or ‘Ōpe‘ape‘a (*Lasiurus cinereus semotus*) has the potential to occur in the vicinity of the project area and may roost in nearby trees. If any site clearing is required this should be timed to avoid disturbance during the bat birthing and pup rearing season (June 1 through September 15). If this cannot be avoided, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed without consulting DOFAW.
We note that artificial lighting can adversely impact seabirds that may pass through the area at night by causing disorientation. This disorientation can result in collision with manmade artifacts

or grounding of birds. For nighttime lighting that might be required, DOFAW recommends that all lights be fully shielded to minimize impacts. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15. This is the period when young seabirds take their maiden voyage to the open sea. For illustrations and guidance related to seabird-friendly light styles that also protect the dark, starry skies of Hawaiʻi please visit: https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.

DOFAW recommends minimizing the movement of plant or soil material between worksites, such as in fill. Soil and plant material may contain invasive fungal pathogens (e.g. Rapid ʻŌhiʻa Death), vertebrate and invertebrate pests (e.g. Little Fire Ants, Coconut Rhinoceros Beetles), or invasive plant parts that could harm our native species and ecosystems. We recommend consulting the Oʻahu Invasive Species Committee at (808) 266-7994 in planning, design, and construction of the project to learn of any high-risk invasive species in the area and ways to mitigate spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution to prevent the spread of Rapid ʻŌhiʻa Death and other harmful fungal pathogens.

We appreciate your efforts to work with our office for the conservation of our native species. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Lauren Taylor, Protected Species Habitat Conservation Planning Coordinator at (808) 587-0010 or lauren.taylor@hawaii.gov.

Sincerely,

| DGS

DAVID G. SMITH
Administrator

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

June 5, 2020

LD 513

MEMORANDUM

TO: **DLNR Agencies:**
_X_ Div. of Aquatic Resources *(via email: Kendall.L.Tucker@hawaii.gov)*
__ 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: DLNR.Land@hawaii.gov)*
_X_ Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator Russell Tsuji
SUBJECT: **Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment**
LOCATION: Honouliuli, 'Ewa District, Island of Oahu;
TMK: (1) 9-1-126:014, 9-1-069:003 & 004, 9-1-013:007; also City Right-of-Way (ROW) on Renton Road, and State ROW on Roosevelt Avenue.
APPLICANT: **Department of Environmental Services, City & County of Honolulu**

Transmitted for your review and comment is information on the above-referenced subject. Please submit any comments to Land Division via email at DLNR.Land@hawaii.gov by **June 12, 2020.**

If no response is received by the above date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
(X) We have no comments, at this time
( ) Comments are attached.

Signed: Patti E. Miyashiro BC

Print Name: Patti E. Miyashiro
Date: June 8, 2020

Attachments
Cc: Central Files

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 • FAX: (808) 768-3487 • WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-078

September 9, 2021

Mr. Russel Y. Tsuji, Land Administrator
State of Hawai'i, Department of Land and Natural Resources, Land Division
P.O. Box 621
Honolulu, Hawai'i 96809

Dear Mr. Tsuji:

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your letter dated June 16, 2020, regarding the pre-assessment consultation for the subject project.

Your comments will be considered in the Draft Environmental Assessment (DEA). Thank you for the reminder of applicable flood hazard requirements, considerations for endangered species such as the Pueo and 'Ōpe'ape'a, measures to be taken to protect vulnerable birds, and preventing spread of invasive species via plant or soil material. The DEA will include potential strategies for mitigation of these issues, as appropriate.

We appreciate your participation in the pre-assessment consultation process. Your letter and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

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City and County of Honolulu

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POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU
801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

KIRK CALDWELL
MAYOR

SUSAN BALLARD
CHIEF

JOHN D. McCARTHY
CLYDE K. HO
DEPUTY CHIEFS

OUR REFERENCE EO-DK

May 27, 2020

MEMORANDUM

TO: Lori M.K. Kahikina, P.E., Director
Department of Environmental Services (ENV)

ATTENTION: Paul Christensen, Civil Engineer V, Office of Administrative Support – CIP Program and Planning

FROM: Allan T. Nagata, Assistant Chief of Police, Support Services Bureau

SUBJECT: Pre-Assessment Consultation, Draft Environmental Assessment, for ENV Support Facilities Access Road Improvements and Ewa Refuse Convenience Center Relocation Project

This is in response to your agency's memorandum of May 15, 2020, requesting input regarding the subject above.

The Honolulu Police Department does not have any comments or concerns at this time.

If there are any questions, please call Major Craig Uehira of District 8 (Waianae, Kapolei) at 723-8400.

Thank you for the opportunity to review the project.

Allan T. Nagata
Assistant Chief of Police
Support Services Bureau

cc: Mr. Jack Pobuk, ENV
Mr. Aaron Weieneth, AECOM

DEPARTMENT OF ENVIRONMENTAL SERVICES

CITY AND COUNTY OF HONOLULU

1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-081

September 9, 2021

MEMORANDUM

TO: Rade K. Vanic, Interim Chief
Honolulu Police Department

FROM: Wesley T. Yokoyama, P.E.
Director

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and ʻEwa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your memo dated May 27, 2020, regarding the pre-assessment consultation for the subject project. We understand that the Honolulu Police Department has no comments at this time.

We appreciate your participation in the pre-assessment consultation process. Your memo and this response will be included in the Draft Environmental Assessment. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

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

June 3, 2020

TO: LORI KAHIKINA, P. E., DIRECTOR
DEPARTMENT OF ENVIRONMENTAL SERVICES

ATTN: PAUL CHRISTIANSEN, CIVIL ENGINEER V
OFFICE OF ADMINISTRATIVE SUPPORT-CAPITAL IMPROVEMENT PROJECTS PROGRAM AND PLANNING

FROM: MANUEL P. NEVES, FIRE CHIEF

SUBJECT: PREASSESSMENT CONSULTATION
DEPARTMENT OF ENVIRONMENTAL SERVICES (ENV) SUPPORT FACILITIES ACCESS ROAD IMPROVEMENTS AND EWA REFUSE CONVENIENCE CENTER RELOCATION

In response to your letter dated May 15, 2020, 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, Section 18.2.3.2.2.)

   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. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Battalion Chief Wayne Masuda of our Fire Prevention Bureau at 723-7151 or wmasuda@honolulu.gov.

MANUEL P. NEVES
Fire Chief

MPN/WM:bh

cc: Jack Pobuk, ENV
Aarin Weieneth, AECOM

FPB1 ~~ann~~
20-114 MAY 22 2020

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

KIRK CALDWELL
MAYOR

LORI M.K. KAHIKINA, P.E.
DIRECTOR

TIMOTHY A. HOUGHTON
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

FIRE 5
MAY 21 2020
615

IN REPLY REFER TO
PRO 20-053

May 15, 2020

F1 ________ F2 ________
572

Dear Interested Party:

SUBJECT: Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment 91-1000 Geiger Rd. 9-1-013-007

The City and County of Honolulu (City), Department of Environmental Services (ENV) is proposing access road improvements for the ENV Support Facilities project and relocation of the existing 'Ewa Refuse Convenience Center at the Honouliuli Wastewater Treatment Plant. ENV is in the process of preparing an Environmental Assessment (EA) for this proposed action and is seeking input from interested parties during this pre-assessment consultation phase.

Note this pre-assessment consultation process does not supersede the formal notification process mandated by provisions of Hawai'i Revised Statutes (HRS) Chapter 343 and Hawai'i Administrative Rules (HAR) Chapter 11-200.1. The latter will occur in the coming months and will accompany the publication of the Draft EA for your review in the Office of Environmental Quality Control's *The Environmental Notice*. ENV is also coordinating concurrently and separately with the Federal Highway Administration regarding National Environmental Policy Act (NEPA) compliance.

Enclosed for your review is a project description and figures. Note that the figures are in draft form and may be revised during the iterative design and environmental review process.

Please submit any pre-assessment consultation input for the EA via email within 21 days of the date of this letter to the following:

Paul Christiansen, ENV p.christiansen@honolulu.gov

and copy:

Jack Pobuk, ENV jpobuk@honolulu.gov

Aaron Weieneth, AECOM aaron.weieneth@aecom.com

HONOLULU FIRE DEPT
2020 MAY 31 AM

Should you have any questions, please contact Paul Christiansen at (808) 768-3470 or at p.christiansen@honolulu.gov.

Sincerely,

Lori M.K. Kahikina, P.E.
Director

Enclosures:
1. Project Description
2. Draft Project Figures

Environmental Assessment for Honouliuli Environmental Services Support Facilities Access Road Improvements and ʻEwa Refuse Convenience Center Relocation

City and County of Honolulu, Department of Environmental Services

Introduction and Background

The City and County of Honolulu (City) Department of Environmental Services (ENV) is currently undertaking a large, multi-phase construction program to upgrade and expand the Honouliuli Wastewater Treatment Plant (WWTP). The start-up of the initial phases of construction were begun in early 2019. The improvement program includes upgrades to the treatment process, odor control systems, sludge drying for biosolids recycling, development of renewable energy from biogas and solar photovoltaic systems, and other benefits to the environment and the community. Some of this work is necessary to comply with requirements of the 2010 Consent Decree between the City, the U.S. Environmental Protection Agency, and the State Department of Health, as well as with future National Pollutant Discharge Elimination System discharge permits and other regulations. The program includes development of the vacant WWTP expansion land at the existing WWTP, including construction of support facilities for ENV, upgrades to receiving facilities for liquid waste haulers, and relocation of the ʻEwa Refuse Convenience Center. One impact of this development of the site will be a future increase in traffic coming to and from the WWTP site. In consideration of the projected traffic volumes, ENV's plans include adequate access driveways and roadway infrastructure to accommodate the increase in traffic.

The City is required to obtain a Use and Occupancy Agreement (UOA) from the State of Hawaiʻi Department of Transportation (HDOT) for each of two existing driveways and one new driveway needed for the new support facilities to be built on the Honouliuli WWTP expansion land. These driveways cross land which is under HDOT's jurisdiction. The UOAs are also needed for proposed underground water, sewer, and other utilities planned to be located at these driveways. An Environmental Assessment (EA) meeting Hawaiʻi Revised Statutes (HRS) Chapter 343 is a requirement for HDOT approval of the UOAs. In addition, the proposed relocation of the City's existing ʻEwa Refuse Convenience Center (ʻEwa Refuse CC) within the Honouliuli WWTP facility requires an EA. The central common purpose and need for these actions is to provide traffic improvements. The purpose and need for the underground utilities is to provide adequate utility service connections between the Honouliuli WWTP expansion property and Renton Road to the north and Roosevelt Avenue to the south. The EA will assess these proposed actions as a whole to adequately address overall cumulative impacts.

The City purchased 48 acres of land adjacent to the Honouliuli WWTP in 2010 for the purpose of expanding the existing WWTP and for related support facilities. The expansion includes upgrading the Honouliuli WWTP to full secondary treatment by June 1, 2024, in accordance with the requirements of the 2010 Consent Decree. The 2010 Consent Decree requires upgrading both the Honouliuli WWTP and the Sand Island WWTP to full secondary treatment. Due to the limited available land at the Sand Island WWTP site, the City has proposed to relocate certain non-process support facilities currently located at the Sand Island WWTP site to the Honouliuli WWTP expansion property. In addition to the problem of limited land at the Sand Island WWTP, moving these facilities to the inland Honouliuli WWTP site provides better protection against coastal storms, flooding, tsunamis, and future climate change impacts. These support facilities include the central laboratory, central maintenance and storage, administrative offices, and the central SCADA/telemetering/emergency management facilities. The City also plans to construct an Administration Building for ENV on the Honouliuli WWTP expansion property. The "Honouliuli Wastewater Treatment Plant Secondary Treatment and Support Facilities, Final

Environmental Impact Statement", dated March 2017 ("2017 FEIS") evaluated these proposed improvements.

The 2017 FEIS included disclosure of the plans for two of the three driveways crossing HDOT property, but not in specific details necessary for the required UOAs with HDOT. Also, the 2017 FEIS did not include the proposed relocation of the 'Ewa Refuse CC. Subsequent to the 2017 FEIS, the City has done further planning work and development of the projects, including developing more details of the improvements needed for the three driveways. The City has also proposed relocating the existing 'Ewa Refuse CC from its current location on Geiger Road to the west of the main entrance to the Honouliuli WWTP to an expanded site within the Honouliuli WWTP facility. This is expected to result in traffic improvements to Geiger Road and will enhance the solid waste collection and recycling service provided to the community. These additional activities will be included in the EA for the purpose of meeting HRS 343 requirements for the proposed improvements.

Additional detail on the proposed project components are provided below, including a purpose and need statement, proposed action description, and identification of alternatives considered. Figures are also attached that identify the locations of the proposed improvements.

Project Components

1. **Environmental Services Support Facilities Access Road Improvements**

   - **Purpose and need:**

     Two existing driveways connect the Honouliuli WWTP expansion property to Renton Road to the north. These driveways cross the 40-ft wide right-of-way of the former OR&L railroad (OR&L ROW) that is under the jurisdiction of HDOT. Both driveways were used by the previous owner at the time the City purchased the property, and the City plans to retain these driveways and provide upgrades appropriate for continued use into the future. The driveway located at the western end of the WWTP expansion property was originally used for access by various agriculture support activities. Later, when a cell phone communication tower was built on the property, the driveway was allowed to be used as the access driveway to the cell tower for maintenance purposes. The cell tower is currently in active use under a lease agreement with the City, operating under arrangements similar to those with the previous owner. The second driveway, identified as Malio Street, and located approximately in the middle of the WWTP expansion property, has a history going back to before World War II when it served as an important connection between agriculture-related activities on both sides of the railroad tracks during the time of active OR&L railroad operations. Both driveways are currently unimproved gravel roads.

     The continued use of these two driveways is important for the planned development of the WWTP expansion land by the City. The increase in activity on the site resulting from the new ENV facilities will include a significant volume of daily commuter traffic. The driveways are needed for access to the site, for both normal and emergency access purposes, and will mitigate traffic congestion and bottlenecks that would otherwise occur. This access will allow morning traffic coming from Kualaka'i Parkway and Kapolei Parkway to flow directly to the WWTP expansion property, and in the reverse direction in the afternoon, helping to minimize addition of congestion to Geiger Road and Fort Weaver Road. Since the driveways are currently unimproved gravel roads, the City plans to pave the driveways and construct new railroad crossings meeting design requirements of HDOT and the Hawaiian Railway Society. The railroad crossings will be an improvement upon the current condition of the railroad tracks and will include appropriate safety markings, signals and/or gates as required. The proposed future underground utilities to be located at these driveways may include potable water, recycled water, sewer, electrical, and communication lines. Pedestrian and bicycle access will be provided at these two driveways to meet the need for pedestrian and bicycle access between the ENV facilities and the new Leeward Bikeway being constructed by the State in the OR&L ROW, as well as to Renton Road and the surrounding communities. The Leeward Bikeway is a key part of the overall traffic planning for the community, as well as fulfillment of a primary purpose for the HDOT OR&L ROW. The proposed connection to the new ENV facilities at the two existing driveways will be a beneficial addition to both the City's and the State's projects.

A new access driveway from the WWTP expansion property to Roosevelt Avenue is planned for purposes of improved access and mitigation of traffic bottlenecks that would otherwise occur. This access is important for commuters coming from Roosevelt Avenue and Geiger Road. Without this access, traffic would need to traverse through the existing WWTP facilities in order to reach the new support facilities. This would not be acceptable due to the anticipated volume of daily traffic, and the need to limit access to the WWTP facilities for security and public safety reasons. Proposed future underground utilities to be located at this driveway may include potable water, recycled water, sewer, electrical, and communication lines.

- **Proposed Action:**

  a. Improvement, restoration, and maintenance of an existing driveway crossing the HDOT OR&L ROW from Renton Road to maintain dedicated access to the leased telecommunications facility in the northwest corner of the Honouliuli WWTP expansion area property. The proposed improvements include paving the driveway and constructing an upgraded railroad crossing conforming to design requirements of HDOT and the Hawaiian Railway Society. The upgraded railroad crossing is intended for restoration and maintenance of the existing tracks and is not anticipated to have an adverse impact to the Hawaiian Railway Society railroad operations. Since the City's existing fence and gate at this location are in poor condition, the City also plans to replace the fence and gate. An additional new pedestrian gate will also be added by this driveway to facilitate bicycle and pedestrian access for employees to the new Leeward Bikeway being constructed by the State in the OR&L ROW and to provide access to a bus stop on Renton Road.

  b. Improvement, restoration, and maintenance of an existing unpaved road (Malio Street) and access driveway connecting Renton Road to the ENV support facilities, including improvements to the crossing of the HDOT OR&L ROW. The proposed improvements include paving the street and access driveway from the WWTP expansion property to Renton Road and constructing an upgraded railroad crossing conforming to design requirements of HDOT and the Hawaiian Railway Society. The upgraded railroad crossing is intended for restoration and maintenance of the existing tracks and is not anticipated to have an adverse impact to the Hawaiian Railway Society railroad operations. Since the City's existing fence along the property line and the existing vehicle gate for this driveway are in poor condition, the City also plans to replace the fence and the gate. Widening of Renton Road to install a westbound left turn lane will likely be required to manage increased traffic volumes associated with the proposed Malio Street entrance.

  c. A new driveway from Roosevelt Avenue to provide access to the ENV support facilities. The proposed improvements include constructing a new paved access driveway from the WWTP expansion property to connect to Roosevelt Avenue. The work also includes constructing a new gate in the existing fence belonging to HDOT. It is noted that the existing fence, which was part of the perimeter fence of the former Barbers Point Naval Air Station, is mentioned as a contributing element of the historic 'Ewa Battlefield. Approval for installation of the gate in this existing fence from the appropriate authorities will be needed. It is anticipated that the proposed gate will be a minor modification of the fence, with the intention of maintaining preservation of the fence itself, and will not adversely impact or detract from the value of the fence as a historic contributing element. Widening of Roosevelt Avenue to install an eastbound left turn lane will likely be required to manage increased traffic volumes.

- **Alternatives:**

  a. No Action: For this alternative, ENV support facilities access road improvements would not be implemented, and the existing Honouliuli WWTP entrance on Geiger Road would be the only available access to the expansion property and the new ENV facilities. This alternative would require driving through the Honouliuli WWTP. This would not be acceptable because the WWTP's existing internal roads are inadequate for the anticipated volume of daily traffic, and there is limited space to widen or improve these internal roads. Also, because of the need to limit access to the WWTP facilities for security and public safety reasons, only vehicles necessary for WWTP operations and maintenance activities should be allowed to drive within the WWTP site.

2. 'Ewa Refuse Convenience Center Relocation

- **Purpose and need:** The 'Ewa Refuse CC is one of the City's nine public refuse drop-off locations that is used by residents to dispose of household rubbish. It is especially intended for receiving residents' solid waste that is not appropriate to be placed in the residents' curb-side carts for pick-up. This includes bulky waste items and some items that should be recycled, such as white goods, tires, and similar types of recyclable waste. The 'Ewa Refuse CC is currently located on Geiger Road, on the same City property as the Honouliuli WWTP, to the west of the main entrance to the Honouliuli WWTP. On certain collection days (e.g. weekends, holidays), due to the current limited space and capacity for vehicle unloading, high usage of the convenience center results in congestion and backup of traffic on Geiger Road, including blockage of the main Honouliuli WWTP driveway. Relocation of the 'Ewa Refuse CC to an available open area within the Honouliuli WWTP property is proposed to alleviate this traffic congestion on Geiger Road and provide a more efficient facility for the community. The relocated convenience center will have more space to accommodate waiting vehicles on site, minimizing the potential for vehicles to back up on Geiger Road. The larger footprint and additional collection areas of the new facility will provide space for better internal traffic circulation and quicker unloading.

- **Proposed Action:**

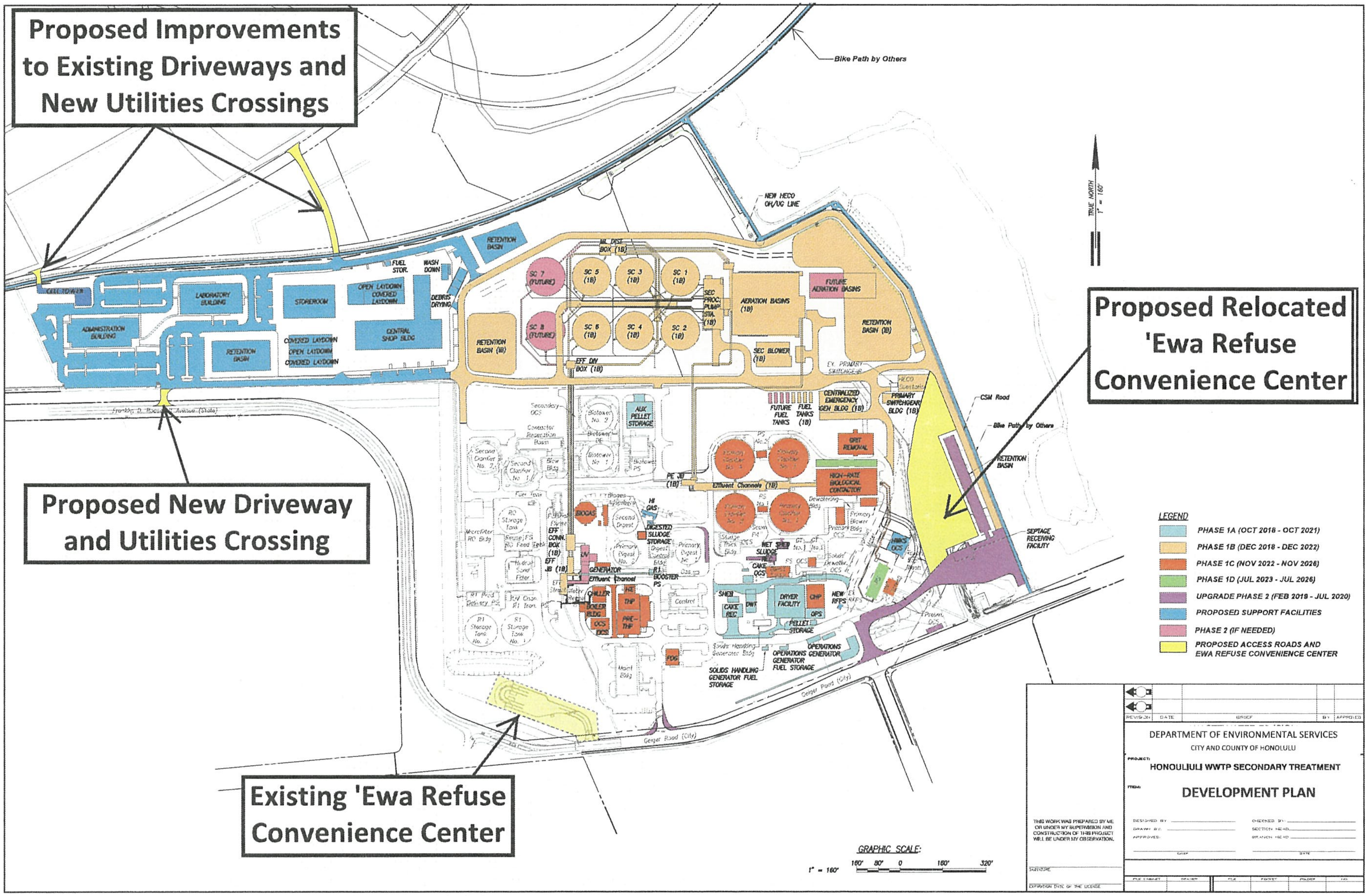
  a. Relocation of the Refuse Division's existing 'Ewa Refuse CC on Geiger Road to within the Honouliuli WWTP site. The improvements will include new paved roads, new paved unloading and storage areas, and associated facilities. The existing Honouliuli WWTP entrance used by septage haulers coming from Geiger Road will be used to provide access to the new relocated 'Ewa Refuse CC.

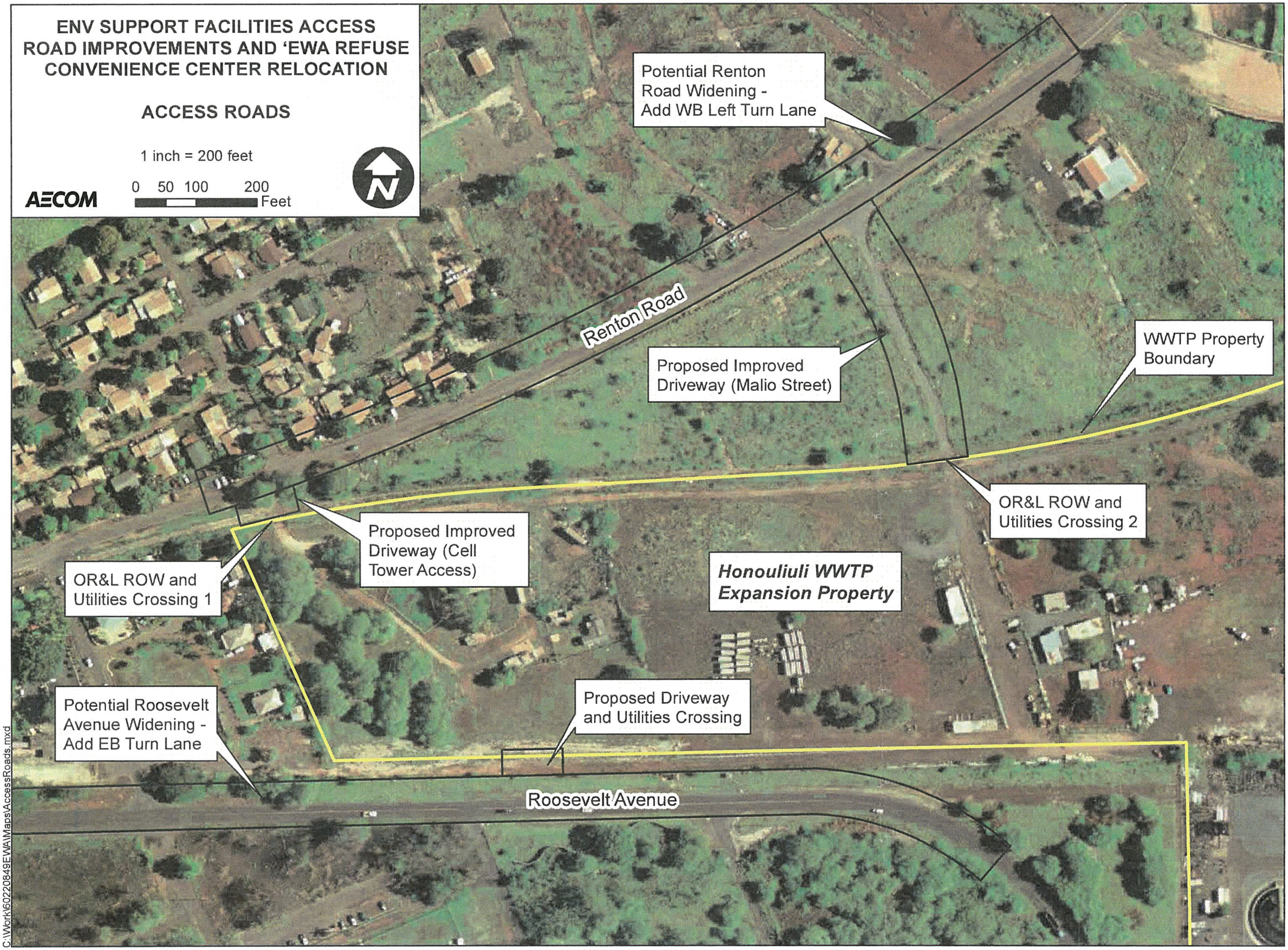
  b. The existing 'Ewa Refuse CC site will be discontinued from its present use, unnecessary facilities will be removed as needed to clean up the site, and the site will be available for future use by ENV. At this time there are no plans for redevelopment of this site. Future use may include uses related to the operation of the 'Ewa Refuse CC, such as an auxiliary storage or staging area, or uses related to the operation and maintenance of the WWTP.

- **Alternatives:**

  a. No Action: The 'Ewa Refuse CC would remain at its existing location. There would continue to be occasional congestion and backup of traffic on Geiger Road, including blockage of the main Honouliuli WWTP driveway.

ENV SUPPORT FACILITIES ACCESS ROAD IMPROVEMENTS AND EWA REFUSE CONVENIENCE CENTER RELOCATION




ENV SUPPORT FACILITIES ACCESS
ROAD IMPROVEMENTS AND ʻEWA REFUSE
CONVENIENCE CENTER RELOCATION
ACCESS ROADS
1 inch = 200 feet
0 50 100 200
Feet
AECOM
N
Potential Renton
Road Widening -
Add WB Left Turn Lane
Renton Road
Proposed Improved
Driveway (Malio Street)
WWTP Property
Boundary
OR&L ROW and
Utilities Crossing 2
Proposed Improved
Driveway (Cell
Tower Access)
OR&L ROW and
Utilities Crossing 1
Honouliuli WWTP
Expansion Property
Potential Roosevelt
Avenue Widening -
Add EB Turn Lane
Proposed Driveway
and Utilities Crossing
Roosevelt Avenue
C:\Work\60220849EWA\Maps\AccessRoads.mxd

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

IN REPLY REFER TO:
PRO 21-082

September 9, 2021

MEMORANDUM

TO: Lionel E. Camara, Jr., Acting Fire Chief
Honolulu Fire Department

FROM: Wesley T. Yokoyama, P.E.
Director

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and ‘Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your memo dated June 3, 2020, regarding the pre-assessment consultation for the subject project.

We appreciate the comments regarding fire department access roads, water supply for fire protection, and submittal of civil drawings. These issues will be addressed as appropriate in the Draft Environmental Assessment (DEA), and also during the design and construction phases.

We appreciate your participation in the pre-assessment consultation process. Your memo and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Ulu`ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

RECEIVED
JUN - 8 2020
AECOM

KIRK CALDWELL
MAYOR

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 20-273

June 4, 2020

MEMORANDUM

TO: Lori M.K. Kahikina, P.E., Director
Department of Environmental Services

ATTENTION: Paul Christiansen

FROM: Ross S. Sasamura, P.E.
Director and Chief Engineer
Department of Facility Maintenance

SUBJECT: Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for the opportunity to review and comment on the subject project.

- Once construction phase commence, install approved Best Management Practices fronting all drainage facilities on Geiger Road.
- During construction and upon completion of project any damages/deficiencies to Geiger Road, Malio Road, and Franklin D. Roosevelt Avenue shall be corrected to City Standards and accepted by the City.
- Jet fuel line was identified on an easement map. Please see attachment.
- Any new utility line shall be installed at least 3 feet below finished surface per Department of Planning and Permitting requirements.
- Trench work shall comply with the City's "Trenching Permits and Repaving of Streets" memo dated 9/30/2004.

If there are any questions, please call Mr. Lan Yoneda of the Division of Road Maintenance at 768-3600.

Attachments

cc: AECOM – Jack Pobuk Aaron Weieneth

OFFICE OF THE MANAGING DIRECTOR
CITY AND COUNTY OF HONOLULU
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PHONE: (808) 523-4331 • FAX: (808) 523-4242 • INTERNET: www.honolulu.gov

JEREMY HARRIS
MAYOR

BENJAMIN B. LEE, FAIA
MANAGING DIRECTOR

MALCOLM J. TOM
DEPUTY MANAGING DIRECTOR

September 30, 2004

TO: ERIC CRISPIN, DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING

CLIFF JAMILE, P.E., CHIEF ENGINEER
BOARD OF WATER SUPPLY

TIMOTHY STEINBERGER, P.E., DIRECTOR
DEPARTMENT OF DESIGN AND CONSTRUCTION

LARRY LEOPARDI, P.E., DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF FACILITY MAINTENANCE

FRANK DOYLE, P.E., DIRECTOR
DEPARTMENT OF ENVIRONMENTAL SERVICES

KEOKI MIYAMOTO, ACTING DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

BILL BALFOUR, JR., DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

DAVID ARAKAWA, CORPORATION COUNSEL
DEPARTMENT OF THE CORPORATION COUNSEL

FROM: BENJAMIN B. LEE, FAIA
MANAGING DIRECTOR

SUBJECT: **TRENCHING PERMITS AND REPAVING OF STREETS**

The policy for all trenching work on all City and County of Honolulu (City) owned or maintained roadways shall be as follows:

- Owner (HECO, VERIZON, GASCO, BWS, City agencies, and Others) shall **SELF CERTIFY** that trenching activities, which include all construction/emergency repairs, have been constructed as per City standards and/or specifications. Implicit to this certification is increased effort by the owners to take compaction tests (mechanical, nuclear gage, or other means) to ensure contract and specification compliance. The owners shall self-inspect their own or their contractors' work to ensure quality control and acceptable levels of compliance.

- The City shall work with the Hawaii Local Technical Assistance Program and others to provide an ongoing training program, which addresses the needs of inspectors to effectuate good quality trench restoration and pavement repair.

- The warranty period for all aspects of the trench restoration shall be increased to two years. Owners shall be responsible to correct any trench failures within that two-year period.

- All trenching in City roadways shall be designed to minimize trench alignment wandering with consideration given to the probable vehicles' wheel tracking within the travel way. This should help to provide improved pavement smoothness by keeping the trench locations outside of the vehicles' wheel tracking whenever possible.

- Flowable Fill or Controlled Low Strength Material (CLSM) shall be permitted for use as backfill as per the specifications. The CLSM shall be specified at a 28-day compressive strength between 50 and 100 psi to permit ease of subsequent mechanical excavation through the CLSM. The CLSM shall not be permitted higher than the bottom level of the permeable base layer so as to permit drainage flow through the pavement.

- Native soil or better material shall be permitted as long as the material conforms to City standards and specifications.

- The permanent pavement restoration shall be accomplished as soon as practicable but not to exceed two months after trench is backfilled. This applies to emergency repairs and designed/contracted construction.

- Trenches running longitudinally to the travel way on roadways where the paved travel way is greater than 36 feet shall be cold planed a minimum of two inches and repaved to the original grade. The paving shall be a minimum width of one lane not exceeding 15 feet in width with a minimum of two feet in added length to each end of the longitudinal trench. The replaced pavement within the trench limits, plus an additional one foot on each side of the trench (T-section), shall have a minimum thickness of four inches of asphalt concrete or match the existing pavement thickness, whichever is greater.

- Trenches running longitudinally to the travel way on roadways where the paved travel way is 36 feet or less shall be repaved to the trench width plus an additional one foot on each side of the trench (T- section) with a recommended two feet in added length to each end of the longitudinal trench. The replaced pavement shall have a minimum thickness of four inches of asphalt concrete or match the existing pavement thickness, whichever is greater.

- Trenches running perpendicular or skew to the travel way and/or longitudinal trenches less than ten feet in length shall be repaved a minimum of four feet wide with the trench centered within the paved width (T-section) or the paved area shall be the trench width plus an additional one foot on each side of the trench (T-section), whichever is greater. The length of the repaved trench shall be repaved a recommended two feet in added length to each end of the trench. The replaced pavement shall have a minimum thickness of four inches of asphalt concrete or match the existing pavement thickness, whichever is greater.

- Rectangular excavations (manholes or pits) shall be a minimum of three feet by four feet or two feet larger in each dimension than the excavated area, whichever is greater. The replaced pavement shall have a minimum thickness of four inches of asphalt concrete or match the existing pavement thickness, whichever is greater.

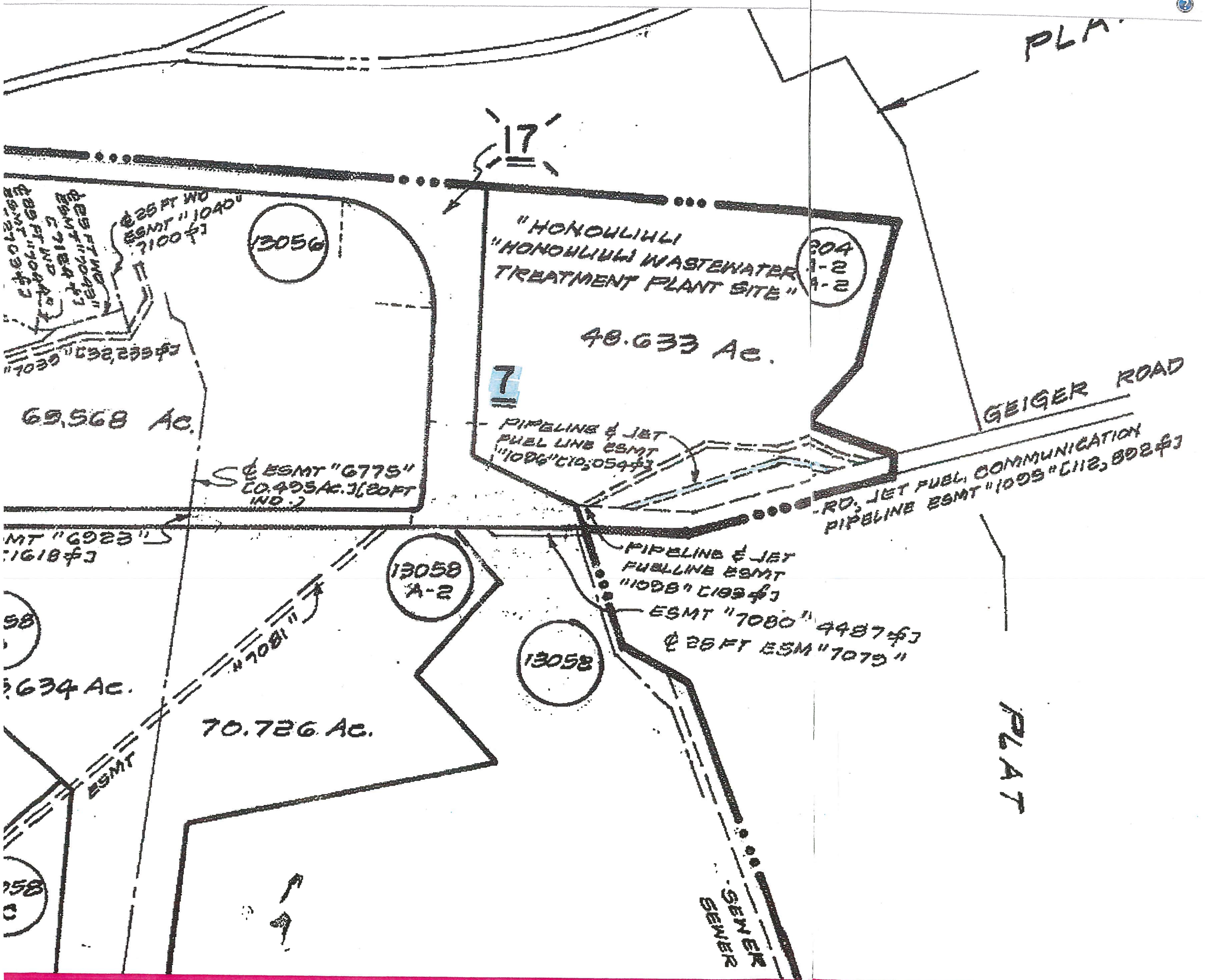
This policy is effective immediately. Please inform all applicable utility companies and governmental agencies and develop procedures to enforce this policy.

BENJAMIN B. LEE, FAIA
Managing Director

BBL:aa

CONCUR:

MAYOR JEREMY HARRIS



17
"HONOULIULI
"HONOULIULI WASTEWATER
TREATMENT PLANT SITE"
48.633 Ac.
7
13056
69.568 Ac.
℄ 25 FT WD
ESMT "1040"
[100 ♯]
PIPELINE & JET
FUEL LINE ESMT
"1096" [10,054 ♯]
℄ ESMT "6775"
[0.495 Ac.] [80 FT
WD.]
GEIGER ROAD
RD. JET FUEL COMMUNICATION
PIPELINE ESMT "1095" [112,802 ♯]
PIPELINE & JET
FUELLINE ESMT
"1098" [189 ♯]
ESMT "7080" 4487 ♯]
℄ 25 FT ESM "7079"
13058
A-2
13058
70.726 Ac.
"7081"
ESMT
"1035" [32,235 ♯]
SEWER
SEWER
PLAT
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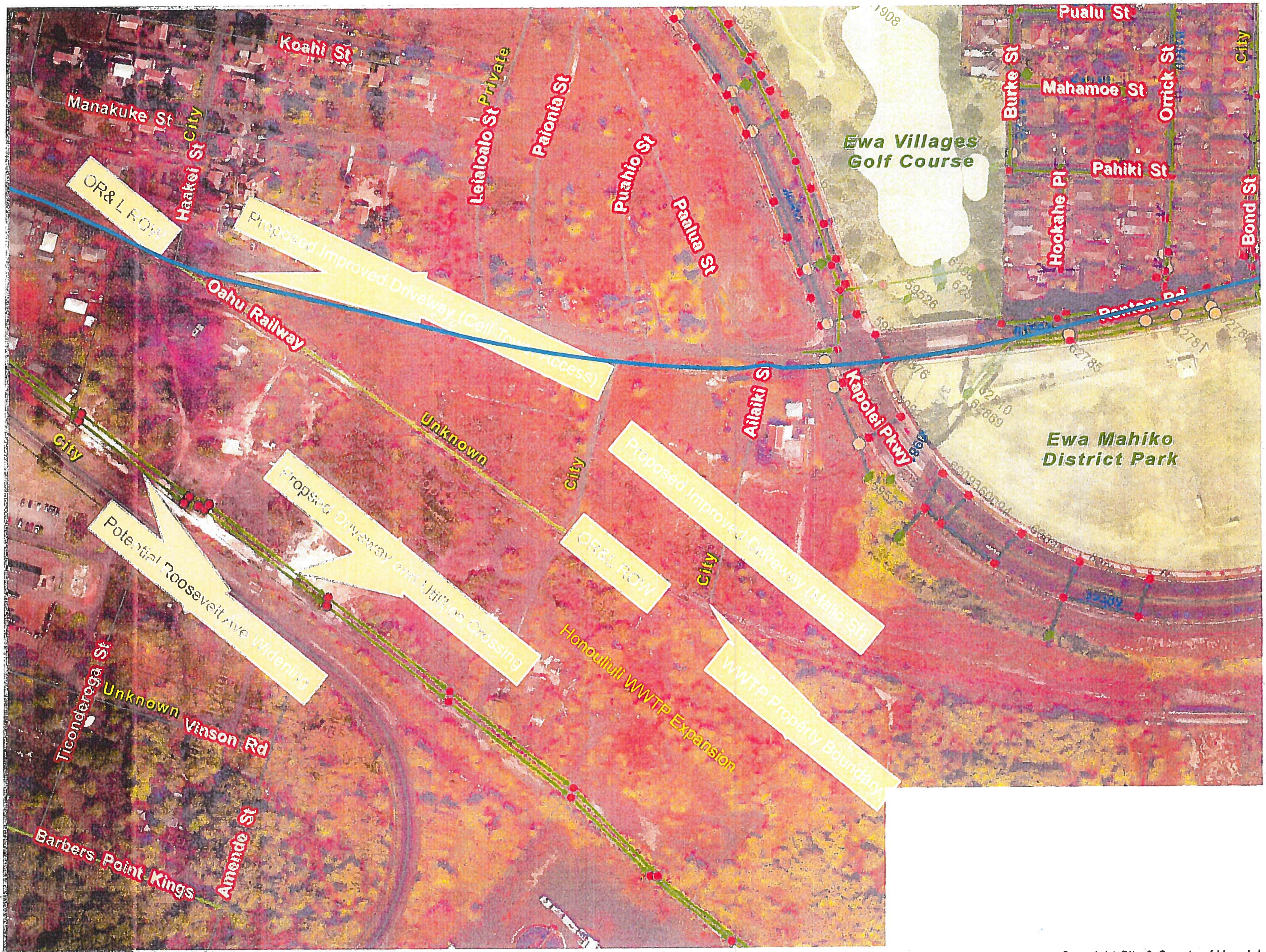
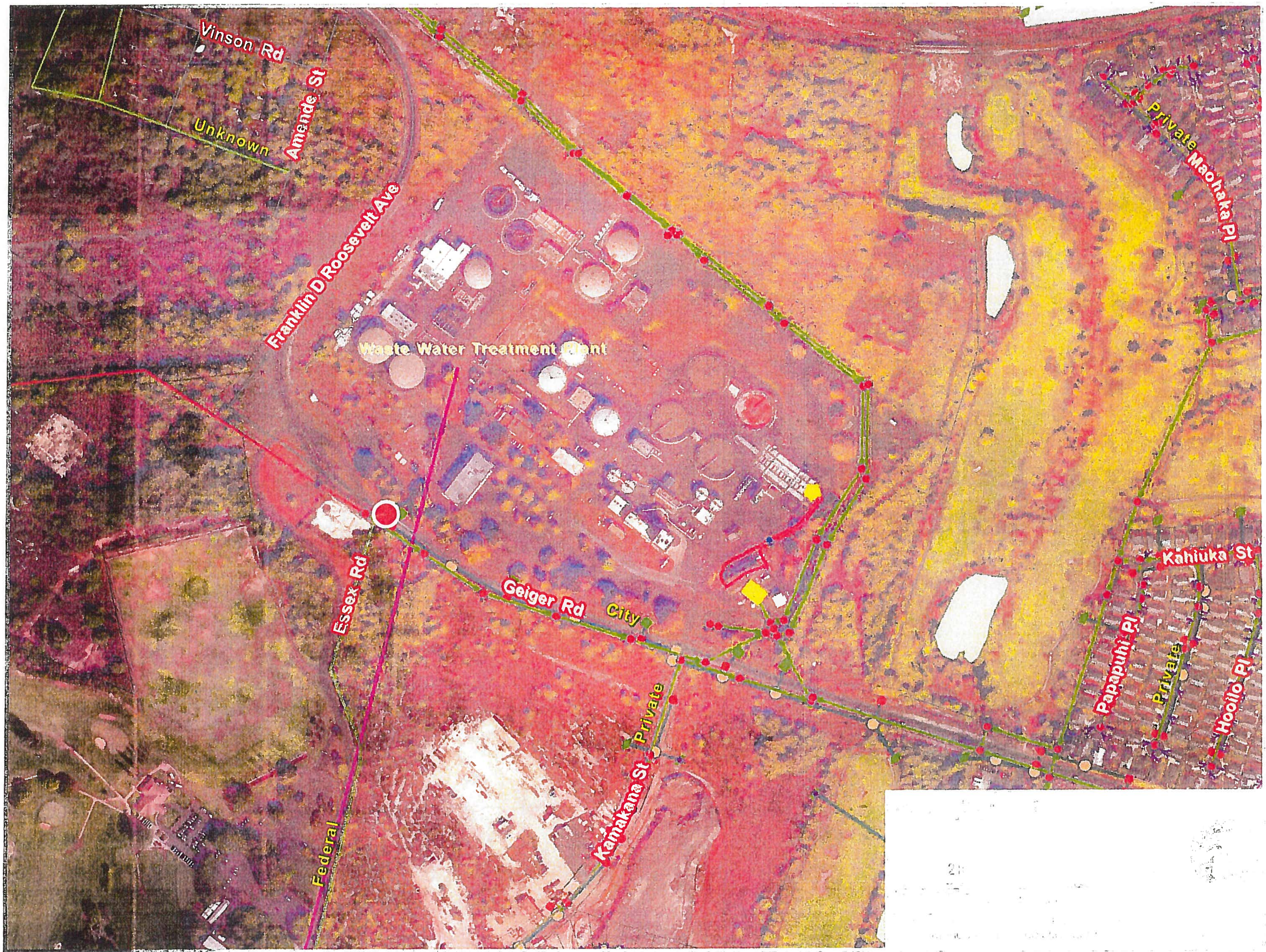


Prepared by:

Date Prepared:



Prepared by:

Date Prepared:

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-073

September 9, 2021

MEMORANDUM

TO: Roger Babcock, Jr., Ph.D., P.E., Director and Chief Engineer
Department of Facility Maintenance

FROM: Wesley T. Yokoyama, P.E.
Director

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your memo dated June 4, 2020, regarding the pre-assessment consultation for the subject project.

The comments received from the Department of Facility Maintenance will be addressed as appropriate in the Draft Environmental Assessment (DEA), and also during the design and construction phases. Thank you for the comment on the fuel line easement on the property. The Navy has decommissioned this fuel line, the process for cancellation of the easement has been initiated.

We appreciate your participation in the pre-assessment consultation process. Your memo and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

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

KIRK CALDWELL
MAYOR

KATHY K. SOKUGAWA
ACTING DIRECTOR

TIMOTHY F. T. HIU
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

June 5, 2020

2020/ELOG-932(CK)

Ms. Lori M.K. Kahikina, P.E., Director
City and County of Honolulu
Department of Environmental Services
1000 Uluohia Street, Suite 308
Kapolei, Hawaii 96707

Dear Ms. Kahikina:

SUBJECT: Pre-Assessment Consultation - Environmental Analysis
Honouliuli Wastewater Treatment Plant Upgrades
91-1000 Geiger Road - Ewa Beach
Tax Map Key 9-1-013: 007 and 9-1-069: 003 and 004

This is in response to your letter, received May 18, 2020, requesting comments regarding the upcoming preparation of an Environmental Assessment (EA) as required under Chapter 343, Hawaii Revised Statures (HRS). We understand that the majority of the ongoing improvements at the Honouliuli Wastewater Treatment Plant (HWWTP) were analyzed under an Environmental Impact Statement, dated March 2017, and approved under Special Use Permit No. 2017/SUP-2. Therefore, the scope of the proposed EA is limited to analyzing potential environmental impacts that may occur as a result of implementing newly required access road improvements and the relocation of the convenience center (Project). We also understand that improvements to the HWWTP are necessary to comply with a 2010 Consent Decree requiring the City to meet established milestones for improving wastewater treatment plans and collection systems (Civil No. 94-00765 DAE-KSC). The following are our comments for the items to address in the upcoming EA:

1. Based on a review of our records, and the information provided in your request, the HWWTP is currently located in the I-2 Intensive Industrial and AG-1 Restricted Agriculture Districts. It appears the proposed road improvements for support services and the relocated convenience center would be located in both districts. Therefore, please include a discussion of the Project's consistency with the applicable development standards for each of these zoning districts under the Land Use Ordinance (LUO), Chapter 21 of the Revised Ordinances of Honolulu (ROH).

2. Part of the AG-1-zoned land is also in the State Land Use Agricultural District, and therefore is subject to the development regulations under Section 205-4.5, HRS. The EA should discuss this.

3. For purposes of the LUO the existing HWWTP is allowed in both zoning districts as a "public use and structure".

4. Please include a discussion of any new or modified land use permits anticipated to be required prior to Project implementation, whether a Waiver to any LUO development regulation will be required, and how the Project will comply with the conditions of any previously-issued land use permits applicable to the HWWTP.

5. Our records indicate that Kaloi Gulch Stream runs through the eastern portion of Parcel 3, and the stream and its surrounding riparian area are considered "Forested Shrub Wetlands." Therefore, the EA should discuss any potential impacts to stream waters or wetlands that may occur as a result of relocating the convenience center and any associated activities to this area.

Thank you for the opportunity to comment on this proposal. Should you have any questions, please contact Christi Keller, of our staff, at (808) 768-8087 or c.keller@honolulu.gov.

Very truly yours,

for Kathy K. Sokugawa
Acting Director

cc: Mr. Paul Christensen, ENV (via email at p.christensen@honolulu.gov)
Mr. Jack Pobuk, ENV (via email at jpobuk@honolulu.gov)
Mr. Aaron Weieneth, AECOM (via email at aaron.weieneth@aecom.com)

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
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RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-075

September 9, 2021

MEMORANDUM

TO: Dean Uchida, Director
Department of Planning and Permitting

FROM: Wesley T. Yokoyama, P.E.
Director

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your letter dated June 5, 2020, regarding the pre-assessment consultation for the subject project.

Your comments will be considered in the Draft Environmental Assessment (DEA), including a discussion of the current property zoning, permitted uses, and compliance with land use regulations and permits. Also, the DEA will discuss potential impacts of the proposed project to the Kaloi Gulch Stream.

We appreciate your participation in the pre-assessment consultation process. Your memo and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

DEPARTMENT OF ENVIRONMENTAL SVCS

'20 JUN 16 P1 :29

June 12, 2020

TO: LORI M. K. KAHIKINA
DEPARTMENT OF ENVIRONMENTAL SERVICES

ATTN: PAUL CHRISTIANSEN
JACK POBUK

FROM: for ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED MAY 15, 2020 REQUESTING COMMENTS ON THE PRE-ASSESSMENT CONSULTATION FOR DEPARTMENT OF ENVIRONMENTAL SERVICES SUPPORT FACILITIES ACCESS ROAD IMPROVEMENTS AND EWA REFUSE CONVENIENCE CENTER RELOCATION ENVIRONMENTAL ASSESSMENT – TAX MAP KEY: 9-1-013: 007; 9-1-017: 003 & 103; 9-1-069: 003, 9-1-126: 014

The comments stated in our letter dated May 14, 2019 regarding the Proposed Public Infrastructure Map (PIM) Revision for Ewa Leeward Refuse Collection Baseyard, 2019/PIM-1 and our letter dated February 28, 2020 regarding the Proposed Support Facilities Project remain valid and are supplemental with the following:

> The existing potable water system does not have sufficient redundancy to provide reliable water service and fire protection for the expansion of these critical facilities. We understand that the Support Facilities administration building is proposed on the west end of the property and the Refuse Convenience Center is proposed to be relocated to the east end of the property. Therefore, a 16-inch pipeline should be extended from Geiger Road and Roosevelt Road through the proposed Malio Street utilities crossing to the Renton Road and Kapolei Parkway intersection to create a pipeline loop system. The Board of Water Supply is working with Environmental Services on a joint development agreement to share the cost of the 16-inch pipeline loop connection because of mutual benefits to the Waste Water Treatment Plant expansion and the water distribution system.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

IN REPLY REFER TO:
PRO 21-076

September 9, 2021

MEMORANDUM

TO: Ernest Y.W. Lau, P.E., Manager and Chief Engineer
Board of Water Supply

FROM: Wesley T. Yokoyama, P.E.
Director

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and ‘Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your memo dated June 12, 2020, regarding the pre-assessment consultation for the subject project.

Your comment regarding the need for extension of the existing potable water system from Geiger Road to Roosevelt Avenue and Renton Road is acknowledged. Pursuant to ongoing discussions between the Board of Water Supply and the Department of Environmental Services, the Draft Environmental Assessment (DEA) will include this work in the proposed action.

We appreciate your participation in the pre-assessment consultation process. Your memo and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

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

KIRK CALDWELL
MAYOR

MARK YONAMINE, P.E.
DIRECTOR

HAKU MILLES, P.E.
DEPUTY DIRECTOR

June 19, 2020

MEMORANDUM

TO: Lori Kahikina, Director
Department of Environmental Services

FROM: For Mark Yonamine, P.E., Director

SUBJECT: Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements and Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for the opportunity to review and comment. The Department of Design and Construction does not have any comments at this time.

Should you have any further questions, please contact me at 768-8480.

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
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TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-072

September 9, 2021

MEMORANDUM

TO: Alexander Kozlov, P.E., Director
Department of Design and Construction

FROM: Wesley T. Yokoyama, P.E.
Director

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your memo dated June 19, 2020, regarding the pre-assessment consultation for the subject project.

We understand the Department of Design and Construction has no comments at this time.

We appreciate your participation in the pre-assessment consultation process. Your memo and this response will be included in the Draft Environmental Assessment. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

DEPARTMENT OF PARKS & RECREATION
CITY AND COUNTY OF HONOLULU
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Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

DEPARTMENT OF ENVIRONMENTAL SVCS

'20 AUG 31 P1:15

KIRK CALDWELL
MAYOR

MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

August 26, 2020

MEMORANDUM

TO: Lori M.K. Kahikina, P.E., Director
Department of Environmental Services

FROM: Michele K. Nekota
Director

SUBJECT: Pre Assessment Consultation for ENV Support Facilities Access Road Improvements and Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for the opportunity to review and comment at the Pre-Assessment stage of the Environmental Assessment for the subject projects.

The Department of Parks and Recreation has no comment.

Should you have any questions, please contact Mr. John Reid, Planner, at 768-3017.

MKN:jr
(813559)

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-074

September 9, 2021

MEMORANDUM

TO: Laura H. Thielen, Director
Department of Parks & Recreation

FROM: Wesley T. Yokoyama, P.E.
Director

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your memo dated August 26, 2020, regarding the pre-assessment consultation for the subject project.

We understand that the Department of Parks and Recreation has no comments at this time.

We appreciate your participation in the pre-assessment consultation process. Your memo and this response will be included in the Draft Environmental Assessment. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

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Private/Individuals

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Weieneth, Aaron

From: Michael Rice <michaelirice@outlook.com>
Sent: Saturday, May 23, 2020 5:08 AM
To: repcabanilla@capital.hawaii.gov ; rmenor@honolulu.gov; kmpine@honolulu.gov; Weieneth, Aaron; jpobuk@honolulu.gov; p.christiansen@honolulu.gov
Subject: [EXTERNAL] No new Rail Crossings

Aloha.
I'm writing to voice opposition to 2 new grade crossings across the historic Oahu Railway and Land Company right of way in Ewa. My understanding that these crossings are part of a project to expand the Waste Water. Each new grade crossing degrades the historic significance of what remains of the railway, and seams to be an unwise waste of money considering there are already grade crossings only a couple blocks away in either direction (Kapolei Parkway, the new crossing at Ka Makana Ali'I, and in front of the Hawaiian Railway Society yard and station.)

Mahalo for your time,
Michael Rice

Sent from Mail for Windows 10

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
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RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-087

September 9, 2021

SENT VIA EMAIL

Mr. Michael Rice
michaelrice@outlook.com

Dear Mr. Rice:

Thank you for your email dated May 22, 2020, regarding the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and ‘Ewa Refuse Convenience Center Relocation Environmental Assessment.

Your comments will be considered in the Draft Environmental Assessment (DEA). We understand that you are opposed to the two proposed crossings of the historic Oahu Railway & Land Company (OR&L) railroad tracks and right-of-way (ROW). The DEA will include descriptions of the proposed work, assessment of the needs and impacts, and will offer mitigation measures. It is our hope that this DEA will help advance the dialogue between the key stakeholders, including the State Department of Transportation, the State Historic Preservation Division, and the Federal Highway Administration, and allow for progress to be made towards the proposed Programmatic Agreement (PA) for the OR&L ROW.

We appreciate your participation in the pre-assessment consultation process. Your email and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

Hawaiian Railway Society

A Member of the Association of Railroad Museums
P.O. Box 60369, Ewa Station, Ewa Beach, HI 96706
(808) 681-5461 or Hawaiianrailway.com

May 30, 2020

The Hawaiian Railway is opposed to both of these proposed crossings of the historical OR&L tracks. In your introduction you state that you are required to obtain a use and occupancy agreement from the State of Hawaii's Department of Transportation. You say these driveways cross land which is under HDOT's jurisdiction. We find this misleading in that you are not describing it as it really is, historic OR&L railroad tracks that are on the National Register of Historic Places. The tracks were placed in that location around 1890. Every time a crossing is put in it degrades the fabric of the historical tracks. Once it is done it cannot be undone. It is lost forever.

You say Malio St has a history behind it, however, your office stated at a prior meeting that there is no easement indicating that this road was illegally installed in the first place. No one, including HDOT can provide any history of issuing an easement or UOA for these 2 dirt roads crossing the tracks. It was even stated during a Right of Way survey that HDOT conducted in 2016 that the roads were illegal. This road has no purpose but convenience for you. It would make more sense and affect fewer people if the entrance road was built off of Geiger/Roosevelt Rd. Unlike Renton Rd which has residents living on one side of the road, Geiger/Roosevelt has no residents that would be affected by the increased traffic. The location of your new proposed driveway off of Geiger/Roosevelt gives complete access to your expansion area. You could easily create a road on the west end of the property and then turn to the north to access all of the facilities.

As for the second crossing to access the cell phone communication tower, why in the world does this road need to be upgraded? Cell phone companies use the existing dirt crossing without any problems or issues. There is no need to upgrade the dirt road. You indicated the upgraded railroad crossing is intended for restoration and maintenance of the existing tracks. This improvement in no way will affect our ability to maintain and restore the existing tracks.

At prior meetings you have said that you would look for other options. Have you done this and what were those options?

In closing we are 100% against any new crossings going over the historical train tracks. This is a piece of Hawaii's history and we oppose any time someone wants to destroy that piece of history for future generations to enjoy.

Robert Yatchmenoff, President

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-084

September 9, 2021

Mr. Robert Yatchmenoff, President
Hawaiian Railway Society
P.O. Box 60369
'Ewa Station
'Ewa Beach, Hawai'i 96706

Dear Mr. Yatchmenoff:

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your letter dated May 30, 2020, regarding the pre-assessment consultation for the subject project.

Your comments will be considered in the Draft Environmental Assessment (DEA). We understand that the Hawaiian Railway Society opposes the two proposed crossings of the historic Oahu Railway & Land Company (OR&L) railroad tracks and right-of-way (ROW). The DEA will include descriptions of the proposed work, assessment of the needs and impacts, and will offer mitigation measures. It is our hope that this DEA will help advance the dialogue between the key stakeholders, including the State Department of Transportation, the State Historic Preservation Division, and the Federal Highway Administration, and allow for progress to be made towards the proposed Programmatic Agreement (PA) for the OR&L ROW.

We appreciate your participation in the pre-assessment consultation process. Your letter and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

Aloha,

I'm writing this letter in Oppose of the City's crossing of the sewer project.

Mahalo,
Rayne Kauhi

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-088

September 9, 2021

SENT VIA EMAIL

Ms. Rayne Kauhi
kauhirayne@gmail.com

Dear Ms. Kauhi:

Thank you for your email dated June 3, 2020, regarding the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment.

Your comments will be considered in the Draft Environmental Assessment (DEA). We understand that you are opposed to the two proposed crossings of the historic Oahu Railway & Land Company (OR&L) railroad tracks and right-of-way (ROW). The DEA will include descriptions of the proposed work, assessment of the needs and impacts, and will offer mitigation measures. It is our hope that this DEA will help advance the dialogue between the key stakeholders, including the State Department of Transportation, the State Historic Preservation Division, and the Federal Highway Administration, and allow for progress to be made towards the proposed Programmatic Agreement (PA) for the OR&L ROW.

We appreciate your participation in the pre-assessment consultation process. Your email and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

From:	Christiansen, Paul
To:	Pobuk, Jack; Weieneth, Aaron
Subject:	[EXTERNAL] FW: Please: Input: Urging the EA draft for "ENV Support Facilities Access Road Impovements" be revised to avoid legal liability for City & AECOM
Date:	Friday, June 05, 2020 2:18:57 PM

Hi Jack and Aaron,

FYI, I noticed your email addresses were misspelled.

Paul Christiansen, PE

Civil Engineer

Department of Environmental Services

CIP Program and Planning

City and County of Honolulu

(808) 768-3470

From: Melvin Masuda [mailto:melmasudahawaii25@gmail.com]
Sent: Thursday, June 4, 2020 6:14 PM
To: Kahikina, Lori M K <lkahikina@honolulu.gov>; Christiansen, Paul <p.christiansen@honolulu.gov>; j.pobuk@honolulu.gov; aaron.weleneth@aecom.com
Cc: Higa, Crayton <chiga3@honolulu.gov>; Melvin Masuda <melmasudahawaii25@gmail.com>
Subject: Please: Input: Urging the EA draft for "ENV Support Facilities Access Road Impovements" be revised to avoid legal liability for City & AECOM

ALOHA e [GREETINGS] / DEAR ENV DIRECTOR KAHIKINI AND ENV STAFFERS CHRISTIANSEN AND POBUCK AS WELL AS AARON WEIENETH OF THE AECOM FIRM (formerly known as AECOM Technology Corporation):

As an Attorney at Law who provides pro bono legal advice to one of my favorite community organizations -- the Hawaiian Railway Society, based in Ewa -- I am urgently writing to you to call attention to legal discrepancies in the "Pre-Assessment Consultation for ENV Support Facilities Access Road Improvements, ..." dated May 15 (and open for public comment until 21 days later, which is June 4).

The following legal discrepancies, indeed, border on outright misrepresentation and may result in litigation and liability for the City & County Department of Environmental Services (ENV) and for the contractor, AECOM, previously called AECOM Technology Corporation.

(1) On Page 3 of 5, under "Proposed Action," "a.," it is stated, on Lines 4 to 8: "The proposed improvements include paving the driveway and constructing an upgraded railroad crossing conforming to design requirements of HDOT and the Hawaiian Railway Society.

The upgraded railroad crossing is intended for restoration and maintenance of the existing tracks and is not expected to have an adverse impact to the Hawaiian Railway Society railroad operations."

As Steven Wendt, Operations Manager for the Hawaiian Railway Society has indicated in an earlier submittal to you: The Hawaiian Railway Society has not sought "an upgraded railroad crossing" and certainly has NOT provided or approved of "design requirements."

Mr. Wendt points out that -- contrary to the Pre-assessment Draft Statement that "The upgraded railroad crossing...is not expected to have an adverse impact to the Hawaiian Railway Society railroad operations" -- the adverse impact will be major and irreversible: Historic authenticity has been crucial to public support of the Hawaiian Railway Society, and the "proposed improvements" are a direct degradation of the historic OR&L (Oahu Railway & Land) railroad tracks -- which are on the National Register of Historic Places and cannot be altered in any way without applying for such alteration with the National Register of Historic Places.

(2) Also, on Page 3 of 5, under "Proposed Action," "b.," it is stated: "Improvement, restoration, and maintenance of an existing unpaved road (Malio Street) and access driveway connecting Renton Road to the ENV support facilities, including improvements to the crossing of the HDOT OR&L ROW. The proposed improvements include paving the street [Malio] and access driveway from the WWTP expansion property to Renton Road and constructing an upgraded railroad crossing conforming to design requirements of HDOT and the Hawaiian Railway Society...."

Again, please note that the Hawaiian Railway Society has -- in no way, shape, or form -- agreed to -- and, in fact, opposes -- the paving of Malio Stret and the soi-disant "constructing [of] an upgraded railroad crossing conforming to design requirements of...the Hawaiian Railway Society." Mr. Wendt has pointed this out to you in his prior remarks sent to you n behalf of the Society.

As Mr. Wendt has indicated, with due respect, Malio Road has no purpose, but is apparently an inconvenience to the Department. Also, a better solution -- which totally avoids violating the National Historic Register Landmark status of the railway tracks -- is to build an entrance road elsewhere -- specifically off Geiger and Roosevelt Roads. Locating a proposed new driveway there wold allow ENV ready access to its facilities.

*** * * ***

So, for all of the reasons stated above, I respectfully request the "Pre-Assessment Consultation" document dated May 15, 2020, be amended to remove any implication of approval of the proposals

by the Hawaiian Railway Society -- because there has, indeed, been no approval -- and, in fact, there is opposition from the Hawaiian Railway Society because of the negative impact on its most valuable asset -- railroad tracks of the 19th Century whose historical significance has not been degraded or altered in any way.

Sincerely and Aloha,
Melvin (Mel) Masuda, J.D., M.P.A.
Attorney at Law
Hawaii Attorney License Number
747-0

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-086

September 9, 2021

SENT VIA EMAIL

Mr. Melvin Masuda, J.D., M.P.A., Attorney at Law
melmasudahawaii25@gmail.com

Dear Mr. Masuda:

Thank you for your email dated June 4, 2020, regarding the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and ʻEwa Refuse Convenience Center Relocation Environmental Assessment.

Your comments will be considered in the Draft Environmental Assessment (DEA). We understand that the Hawaiian Railway Society opposes the two proposed crossings of the historic Oahu Railway & Land Company (OR&L) railroad tracks and right-of-way (ROW). The DEA and companion historical consultation process will comply with all applicable laws and regulations, including those pertaining to work on historic properties. The DEA will include descriptions of the proposed work, assessment of the needs and impacts, and will offer mitigation measures. It is our hope that this DEA will help advance the dialogue between the key stakeholders, including the State Department of Transportation, the State Historic Preservation Division, and the Federal Highway Administration, and allow for progress to be made towards the proposed Programmatic Agreement (PA) for the OR&L ROW.

We appreciate your participation in the pre-assessment consultation process. Your email and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

HISTORIC HAWAIʻI FOUNDATION

680 Iwilei Road, Suite 690 • Honolulu, HI 96817 • (808) 523-2900 • www.historichawaii.org

June 5, 2020

Lori M.K. Kahikina, P.E.
Director
Department of Environmental Services
City & County of Honolulu
1000 Uluohia St., Suite 308
Kapolei, HI 96707

Via email to: Paul Christiansen [p.christiansen@honolulu.gov]

Re: Honouliuli Environmental Services Support Facilities Access Road Improvements and ʻEwa Refuse Convenience Center Relocation
Pre-Assessment Consultation for Environmental Assessment (HRS 343 and HAR 11-200.1)
ʻEwa Beach, Island of Oʻahu, State of Hawaiʻi
TMKs: 9-1-013:007, 9-1-069:004 and 9-1-069:003, and others

Dear Ms. Kahikina:

Historic Hawaiʻi Foundation (HHF) is providing comments in response to a public notice requesting pre-consultation comments for issues to be addressed in an Environmental Assessment related to a proposal to construct roads and driveways to support a new wastewater treatment plant and relocation of a refuse center.

The notice states that an Environmental Assessment (EA) is being prepared in compliance with Chapter 343, Hawaiʻi Revised Statutes. City & County of Honolulu (CCH or City) Department of Environmental Services (ENV) is the agency responsible for the action. The project also involves permits, licenses, funding, and/or approvals of federal agencies, which triggers National Environmental Policy Act (NEPA) compliance, to be developed "concurrently and separately."

Historic Hawaiʻi Foundation is a statewide nonprofit organization established in 1974 to encourage the preservation of sites, buildings, structures, objects and districts that are significant to the history of Hawaiʻi.

HHF affirms its interest in participating in the environmental review and historic preservation compliance processes with ENV and other government agencies, including the Hawaiʻi Department of Transportation

(HDOT), the Federal Highway Administration (FHWA), the Environmental Protection Agency (EPA), and the Hawai‘i State Historic Preservation Division (SHPD).

Project Description

The Proposed Action is to incorporate additional proposed site development components into a previously-approved and currently under-construction project at the Honouliuli Wastewater Treatment Plant (WWTP). The overall project to upgrade and expand the WWTP was reviewed in a prior Environmental Impact Statement (EIS) which was finalized in 2017. Initial phases of construction began in 2019.

The City has subsequently realized that the EIS did not address increase in traffic volumes to and from the site. The current project is to amend the site plan to:

1. add access driveways and roadway infrastructure to accommodate the increase in traffic;
2. provide for underground utilities; and
3. relocate an existing refuse convenience center (CC) to another area within the overall site.

The City proposes three locations for new and expanded access points. The locations cross lands controlled by HDOT and require the City to obtain a Use and Occupancy Agreement (UOA) from HDOT.

The proposed locations are:

1. Renton Road at cell tower maintenance driveway, north side of WWTP expansion property
2. Renton Road at Malio Street, north side of WWTP expansion property
3. Roosevelt Avenue, south side of WWTP expansion property

Historic Hawai‘i Foundation Comments

1. The Environmental Assessment needs to **identify and address all of the regulatory and land use controls** the affect historic properties in the project area. The pre-consultation notice disclosed the intent to comply with Hawai‘i and National Environmental Policy Acts, but failed to disclose that additional state and federal regulations and covenants apply to this project.

   In particular, the project and its Environmental Assessment need to address:

   - **National Historic Preservation Act (NHPA),** Section 106 Consultation (36 CFR Part 800). HHF is a consulting party to the FHWA and EPA pursuant to the implementing regulations of the NHPA at 36 Part 800.2(c)(5) as an organization with a demonstrated interest in the undertaking and a concern for the effects on historic properties.
   - **Hawai‘i Revised Statutes 6E-8** and its implementing rules, HAR 13-275, which require that state and county projects which may affect historic resources provide for participation of interested persons in the historic preservation review process. HHF affirms that it is an interested person and will participate in the 6E review.

- **Deed Restrictions for the Use of the Oʻahu Railway and Land (OR&L) Right of Way (ROW),** recorded against the title on June 26, 1980 as a condition of transferring the property from the United States of America to the Hawaiʻi Department of Transportation.

  The deed includes perpetual covenants that require that HDOT "preserve the integrity of the railroad facilities" and that "operation, maintenance or alteration of said facilities shall be in accordance with State and Federal requirements applicable to facilities listed on the National Register of Historic Places."

  The covenant explicitly requires compliance with **Section 4(f) of the Department of Transportation Act**, as well as NEPA and NHPA. Section 4(f) states that any "use" of a historic property may be allowed only if there are no other "prudent and feasible" alternatives.

  The covenants also prohibit motorized vehicles on bicycle lanes, paths or pedestrian walkways in the ROW, except for maintenance purposes.

  Use of the OR&L ROW is allowed only with the written approval the Hawaiʻi State Historic Preservation Officer and the Hawaiʻi Division Administrator of FHWA.

2. The Environmental Assessment needs to **identify all historic and cultural properties** that may be affected by the action.

   Within the vicinity of the proposed project are several historic properties, including those that were previously listed on or determined eligible for the Hawaiʻi or National Registers of Historic Places. These include:

   - The OR&L Right of Way, which is listed on the National Register of Historic Places
   - The Hawaiian Railway Society ʻEwa Railroad Yard, which is listed on the Hawaiʻi Register of Historic Places
   - ʻEwa Sugar Plantation Villages, which are listed on the Hawaiʻi Register of Historic Places
   - ʻEwa Plain Battlefield, listed on the National Register of Historic Places

3. The Environmental Assessment needs to include a **full range of alternatives**, including options that would avoid effects to historic and cultural properties.

   The pre-consultation notice included only two alternatives: the preferred action and no action. The EA needs to develop additional options to address the traffic and utility needs in a way that avoids and minimizes adverse effects on historic resources.

   For example, an access point on Geiger Road (south of the WWTP property) that connects to internal roads and campus circulation could provide access without crossing the OR&L tracks on the north or affecting the ʻEwa Battlefield perimeter on the south. This access point also eliminates the plan to drive over the Leeward Bikepath, thus eliminating a safety hazard and conflict point with bicycles and pedestrians. It is also noteworthy that the deed restrictions do not allow vehicles on the paths in the OR&L right of way.

Based on the preliminary documentation provided, Historic Hawaiʻi Foundation is concerned about potential adverse effect to historic properties and cultural resources.

Historic Hawaiʻi Foundation looks forward to continuing consultation. I may be reached at Kiersten@historichawaii.org

Very truly yours,

Kiersten Faulkner

Kiersten Faulkner, AICP
Executive Director

Copies via email:

CCH Department of Environmental Services: Jack Pobuck [jpobuck@honolulu.gov]

AECOM: Aaron Weieneth [aaron.weieneth@aecom.com]

Federal Highway Administration:

Richelle Takara [Richelle.Takara@dot.gov]

Meesa Otani [meesa.otani@dot.gov]

HDOT Highways Division

George Abcede [george.abcede@hawaii.gov]

Jerry Hiyakumoto [jerry.hiyakumoto@hawaii.gov]

State Historic Preservation Division:

Susan Lebo [Susan.A.Lebo@hawaii.gov]

Tanya Gumapac-McGuire [Tanya.Gumapac-Mcguire@hawaii.gov]

Stephanie Hacker [stephanie.hacker@hawaii.gov]

Hawaiian Railway Society: Steve Vendt [steve.vendt@hawaiianrailway.com]

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
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RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-085

September 9, 2021

Ms. Kiersten Faulkner, AICP, Executive Director
Historic Hawai'i Foundation
680 Iwilei Road, Suite 690
Honolulu, Hawai'i 96817

Dear Ms. Faulkner:

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your letter dated June 5, 2020, regarding the pre-assessment consultation for the subject project.

Your comments will be considered in the Draft Environmental Assessment (DEA). The DEA and companion historical consultation process will comply with all applicable laws and regulations, including those pertaining to historic properties such as the Oahu Railway & Land Company (OR&L) right-of-way (ROW). The DEA will include descriptions of the proposed work, assessment of the needs and impacts, and will offer mitigation measures. It is our hope that this DEA will help advance the dialogue between the key stakeholders, including the State Department of Transportation, the State Historic Preservation Division, and the Federal Highway Administration, and allow for progress to be made towards the proposed Programmatic Agreement (PA) for the OR&L ROW.

We appreciate your participation in the pre-assessment consultation process. Your letter and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

From: Debbie Luning
To: "p.christiansen@honolulu.gov"
Cc: "jpobuk@honolulu.gov"; Weieneth, Aaron; Quentin Machida; Andrew Kamikawa; Brian Maja
Subject: [EXTERNAL] Pre-Assessment Consultation Comments
Date: Wednesday, June 10, 2020 2:46:50 PM

Hi Paul,

Thank you for allowing Gentry Homes to review the summary and to provide input for the EA on the planned the Honouliuli Environmental Services Support Facilities Access Road Improvements and ‘Ewa Refuse Convenience Center Relocation.

If it’s not too late, would you please consider providing the following information in the EA?

1. Proposed landscaping plans along the perimeter of the project, especially along Geiger Road and Roosevelt Avenue.
2. Information on traffic volumes at the intersection of Kamakana Street, the proposed project’s entrance (phase 2) and Geiger Road. We’d be especially interested in the following:
    1. Current traffic volumes (without the Honouliuli improvements and with Kamakana Street only partially open);
    2. Predicted traffic volumes when Kamakana Street is opened up to Ocean Pointe, Hoakalei, Ewa Beach and the rest of Ewa by Gentry West; and
    3. Predicted traffic volumes to be generated from the project’s improvements.
3. Does the City plan to install a traffic signal at that intersection as part of the project? (It was not a requirement for Gentry to install a traffic signal, although we did install conduits for a future traffic signal.)

Your consideration of our requests would be greatly appreciated.

Thank you,
Debbie Luning

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 21-077

September 9, 2021

Ms. Debbie Luning
Gentry Homes
733 Bishop Street, Suite 1400
Honolulu, Hawai'i 96813

Dear Ms. Luning:

SUBJECT: Comments on the Pre-Assessment Consultation for the ENV Support Facilities Access Road Improvements and 'Ewa Refuse Convenience Center Relocation Environmental Assessment

Thank you for your email of June 10, 2020, regarding the pre-assessment consultation for the subject project.

Your comments will be considered in the Draft Environmental Assessment (DEA). The DEA will include a Traffic Impact Assessment Report which will address traffic-related impacts. The DEA will not include landscaping plans. This project consists of driveways and a new facility located within the wastewater treatment plant property. Landscaping fronting Geiger Road and Roosevelt Avenue will not be a significant component of the project, although the Department of Environmental Services may include landscaping in other future projects.

We appreciate your participation in the pre-assessment consultation process. Your email and this response will be included in the DEA. Should you have any questions, please contact Paul Christiansen, Civil Engineer, at 768-3470 or by email at p.christiansen@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director